



Habitat Volume Model (HabVol)

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This web site hosts the **Habitat Volume Model (HabVol)** open source code, User's Guide, and associated implementation and post-processing routines.

HabVol Model Description

The Habitat Volume Model (HabVol) calculates a geometric volume of suitable habitat for a specific organism and life stage (e.g., adult striped bass, juvenile soft clam) as it changes over time. It can be run using fixed criteria or bioenergetics calculations. When run with fixed criteria, physiological tolerances of the organisms are used to calculate the volume of suitable habitat in terms of salinity, temperature and dissolved oxygen, as well as their intersection. When run in bioenergetics mode, the volume of habitat is calculated that corresponds to a user-defined threshold in potential growth.

HabVol is an open-source offline model written in Fortran and is based on an algorithm that calculates the volume of habitat given one or more constraints (Smith et al. 2009). HabVol uses output from a coupled 3D hydrodynamic model, the Regional Ocean Modeling System (ROMS), and a dissolved oxygen model implemented within ROMS (Li 2012) to calculate the volume of suitable habitat in each model grid cell. The HabVol model grid cells are the same as the ROMS model grid cells. For more information on the application of HabVol, please see Schlenger et al. (2013) and Schlenger (2012). Please cite Schlenger et al. (2013) when referring to HabVol.

Zachary Schlag is the developer of HabVol with input from Katharine Smith, Adam Schlenger, and Elizabeth North. Katharine Smith is the developer of the algorithm for calculating volume from ROMS grid cells (Smith et al. 2009). Adam Schlenger helped adapt and test the bioenergetics models for use in HabVol. HabVol was developed with support from National Oceanic and Atmospheric Administration (NOAA) Coastal Hypoxia Research Program (NA07NOS4780191).

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HabVol Code

HabVol Open Source Code. To refer to HabVol in a peer-reviewed publication, please cite the publication(s) listed in the [Description](#) section above.

[HabVol_License.txt](#)

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License file. This license was based on the ROMS license. Please note that this license applies to all sections of LTRANS v.2b except those listed in the 'External Dependencies and Programs' section below.
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[HabVol.zip](#)

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HabVol Code. This zip file contains the HabVol code, license, and Instruction Manual. Before using LTRANS v.2b, please read the *External Dependencies and Programs* section below. This version of LTRANS is parameterized to run with the input files that are available in the *HabVol Example Input Files* section below, which also contains a tar ball with this code and the example input files.
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External Dependencies and Programs. HabVol requires **NetCDF libraries**. Because HabVol reads-in ROMS-generated NetCDF (.nc) files, it requires that the appropriate NetCDF libraries be installed on your computer (see files and links below).

[VF-NetCDF.zip](#)

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Windows Visual Fortran NetCDF libraries. These NetCDF files that are compatible with Visual Fortran were downloaded from the [Unidata NetCDF Binaries](#) Website for LTRANS v.1. The NetCDF 90 files were downloaded from [Building the F90 API for Windows for the Intel ifort compiler](#) website. The VF-NetCDF.zip folder contains README.txt that describes where to place the

enclosed files. If these files do not work, you may have to download updated versions or build your own by following the instructions at the [UCAR Unidata NetCDF website](#).

NetCDF website

Linux NetCDF libraries. Linux users will likely have to build their own Fortran 90 libraries using the source code/binaries that are available on the [UCAR Unidata NetCDF website](#).

HabVol Example Input Files. These files can be used to test HabVol. They include example ROMS grid and history files (.nc) that are needed to run HabVol. Many thanks to Yun Lifer sharing the ROMS .nc files. The HabVol code above is configured to run with these input files. **Note: please download the tar (HabVol.tgz) and history file between the hours of 5 pm and 6 am Eastern Standard Time because of their large size.**

CBP_GRID_wUV.nc

ROMS grid file (for HabVol input). File is from the Chesapeake Bay ROMS model with simplified biogeochemistry (implemented by Yun Li and Ming Li).

ly04_0351.nc

ROMS predictions (history) file (for HabVol input). File is from the Chesapeake Bay ROMS model with simplified biogeochemistry (implemented by Yun Li and Ming Li).

HabitatVolumeBoundary.csv

Input file that contains the latitude and longitude coordinates that specify the boundaries of the Habitat Volume Model (if they are a subset of the ROMS model domain).

STD_Volumes.csv StTp_Volumes.csv output_variable_definitions.txt

HabVol output files for this test case (.csv) and a description of the variables that appear in them (.txt).

HabVol.tgz

This tar ball (**0.5 GB**) contains the LTRANS code as well as all example input files and the User's Guide. Use the included makefile to compile and then run LTRANS.exe on your Linux machine. **DOWNLOAD AFTER WORKING HOURS (Eastern Standard Time) PLEASE!!**

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HabVol User's Guide and Bug Reports

Please send comments or suggestions regarding the User's Guide and Bug Reports to enorth@umces.edu.

Schlenger, A. J., Z. Schlag, and E. W. North. 2013. Habitat Volume Model (HabVol) User's Guide. University of Maryland Center for Environmental Science, Horn Point Laboratory. Cambridge, MD. 14 pp. ([.pdf](#))

Bug Reports and Fixes:

[Report No. 1.](#) Bug fix for special case (edge of habitat) calculations, by Katharine Smith, 3/31,2018

[Report No. 2.](#) Bug fix for special case (edge of habitat) calculations, "pie problem", by Katharine Smith, 3/31,2018

HabVol Publications

Schlenger, A. J. , E. W. North, Z. Schlag, Y. Li, D. H. Secor, K. A. Smith, and E. J. Niklitschek. In press. Modeling the influence of hypoxia on the potential habitat of Atlantic sturgeon (*Acipenser oxyrinchus*): a comparison of two methods. Marine Ecology Progress Series 483:257-272. To request a .pdf, please contact aschleng@umces.edu.

Smith, K.A., E. W. North, and D. H. Secor. 2009. Estimating habitat volume based on physical and biogeochemical models. ICES CM/K:09. To request a .pdf, please contact enorth@umces.edu.

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