

Hazus Flood Assessment Structure Tool (FAST)

The Hazus Flood Assessment Structure Tool (FAST) calculates building-level flood impacts with user-provided building and flood depth data. FAST uses the Hazus Flood model methodology to assign depth damage functions to buildings according to their occupancy type, first floor elevation, foundation type, and number of stories. Flood depth is then extracted at every building and used as a depth damage function parameter to calculate flood losses in dollars. Flood-generated debris is estimated using building area in square feet. Please refer to the [Hazus Flood Model Technical Manual](#) for more information on the methodologies for calculating flood impacts that are used by FAST.

Building data must be formatted as a .csv file according to the specifications outlined in the "FASTBuildingData.pdf" located in the "Help" folder of the FAST download. Flood depth data must be formatted as a .tiff raster. Sample building data for Honolulu, HI are included in the "UDF" folder.

The Hazus Team would like to thank the Oregon Department of Geology and Mineral Industries for developing an early version of this tool: https://www.oregongeology.org/pubs/ofr/O-18-04/O-18-04_user_guide.pdf

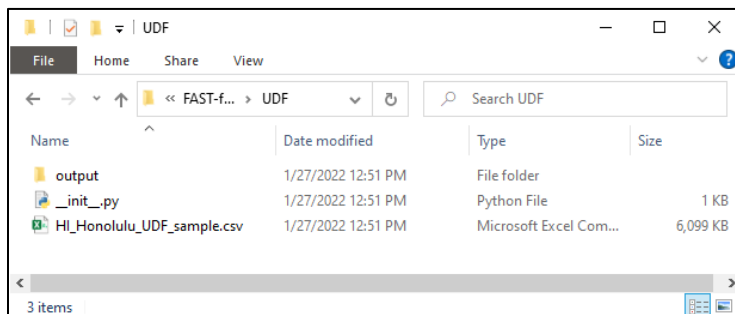
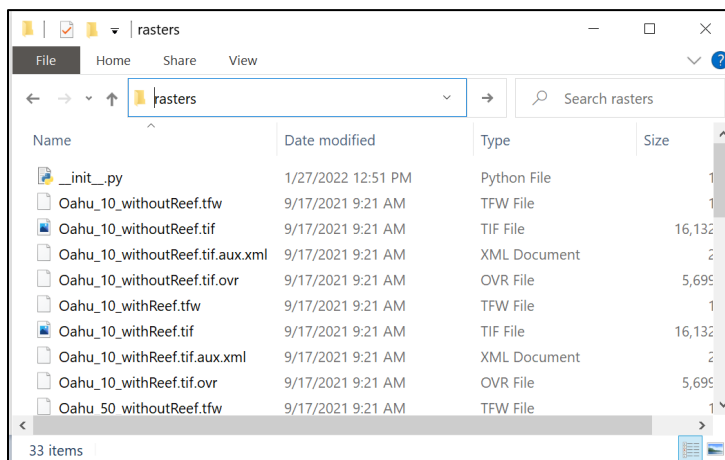
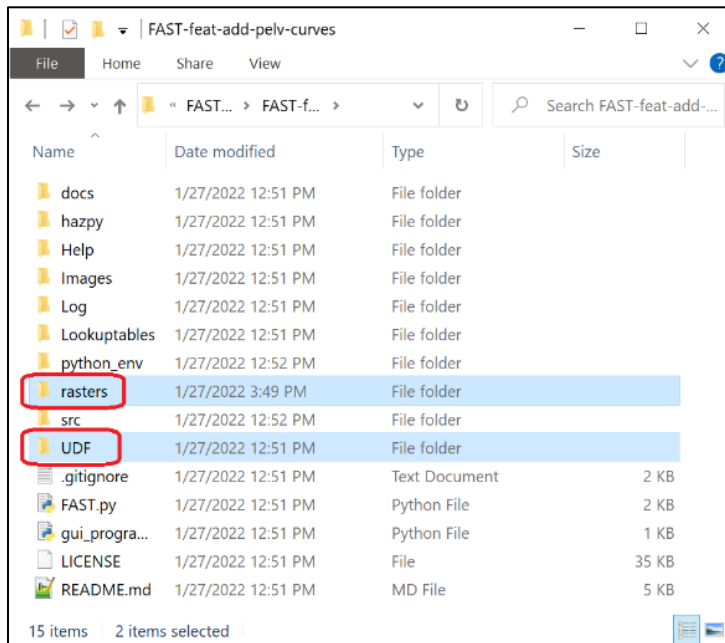
REQUIREMENTS

A live internet connection or Hazus is required for PELV analysis for the PELV curve by Census Tract lookup. The tool will check if Hazus is installed to use the tract geometries locally, and if not, it will use an online Census API.

Miniforge is required to manage Python virtual environments. The tool will check for and install Miniforge if it is not already installed. It will also automatically install updates to the tool.

TO USE

1. Place your formatted building data in the "UDF" subfolder. Place your flood depth data (feet) in the "Rasters" subfolder. Guidance for formatting building data can be found in the Help folder: "Help/FASTBuildingData.pdf".

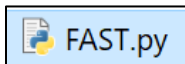


2. Double-click "FAST.py". When the tool opens it will also open a console window that has white text and a black background. The console window displays some information as the analysis is run.

- a. Miniforge is required to manage Python virtual environments. The tool will check for Miniforge and install it if it's missing.

Please Note: If you have Anaconda installed on your machine, double-clicking the "FAST.py" may not work at first. To resolve this issue, open the "src" folder and run the "install-miniforge.py" by double-clicking on it. This will manually install Miniforge and allow you to double-click the "FAST.py" afterwards to run updates and use the tool.

- b. The tool will also check for and update to the latest version of the tool.



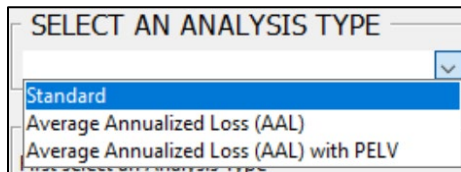
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Checking for tool updates
Starting the HAZUS FAST application...
Starting FAST...
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A screenshot of the FAST - Flood Assessment Structure Tool window. The window has a title bar with a minus, maximize, and close button. The main area contains several sections: "SELECT A FLOOD TYPE" with a dropdown menu, "SELECT AN ANALYSIS TYPE" with a dropdown menu, "SELECT DEPTH GRID(S)" with a text field and a note "First select an Analysis Type", "SELECT USER DEFINED FACILITIES (UDF) FILE" with a "Browse to UDF (.csv) File" button, and "REVIEW FIELD MAPPING" which is a table with three columns: "FIELD", "MAPPED UDF FIELD", and "REQUIRED". Below the table, there is a legend: "Fields named similar to defaults are search for.", "Red fields are required and must be mapped.", "Green fields have been mapped successfully.", and "Yellow fields have not been mapped, but are not required." At the bottom right, there are "Run" and "Quit" buttons.

3. Choose the Flood Type: "Riverine", "CoastalA", or "CoastalV"

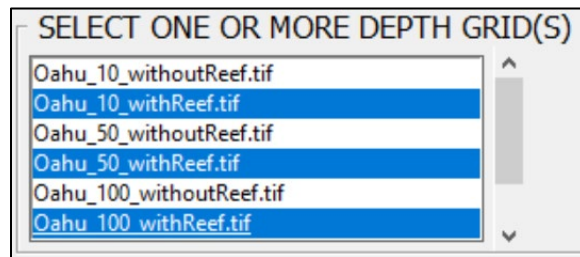
A screenshot of the "SELECT A FLOOD TYPE" section of the FAST - Flood Assessment Structure Tool window. The dropdown menu is open, showing three options: "Coastal A", "Coastal V", and "Riverine". "Coastal A" is currently selected and highlighted in blue.

4. Choose the Analysis Type: "Standard", "Average Annualized Loss" (AAL) or (PELV).



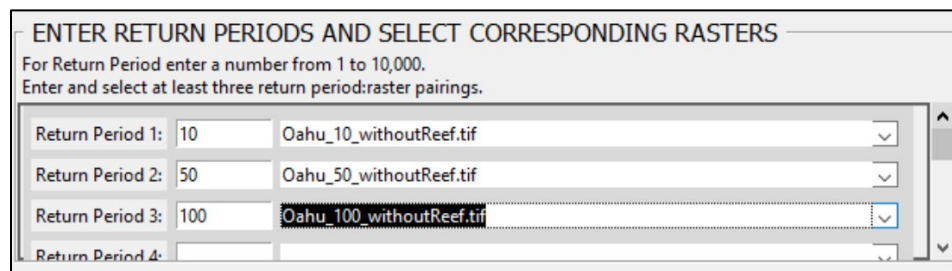
There are different depth grid selection options depending on the Analysis Type.

1. Standard



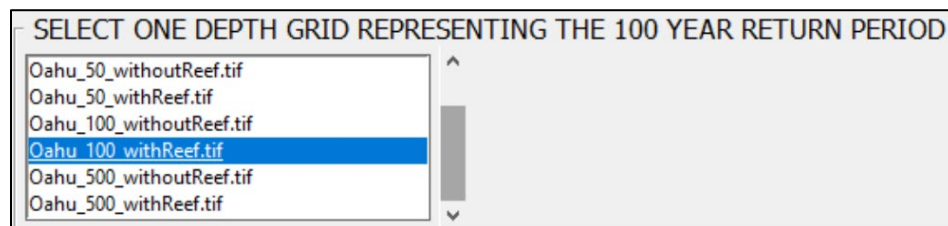
Select one or more depth grids. Use cntrl-mouse click or shift-mouse click to select multiple.

2. Average Annualized Loss (AAL)



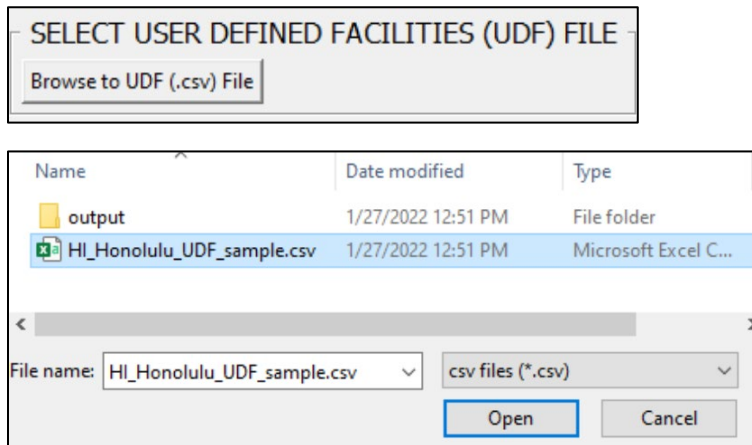
Enter a return period between 1 and 10,000 and choose its corresponding depth grid raster from the drop down to its immediate right. There can be up to 12 return periods, and it needs a minimum of three.

3. Average Annualized Loss (AAL) with PELV

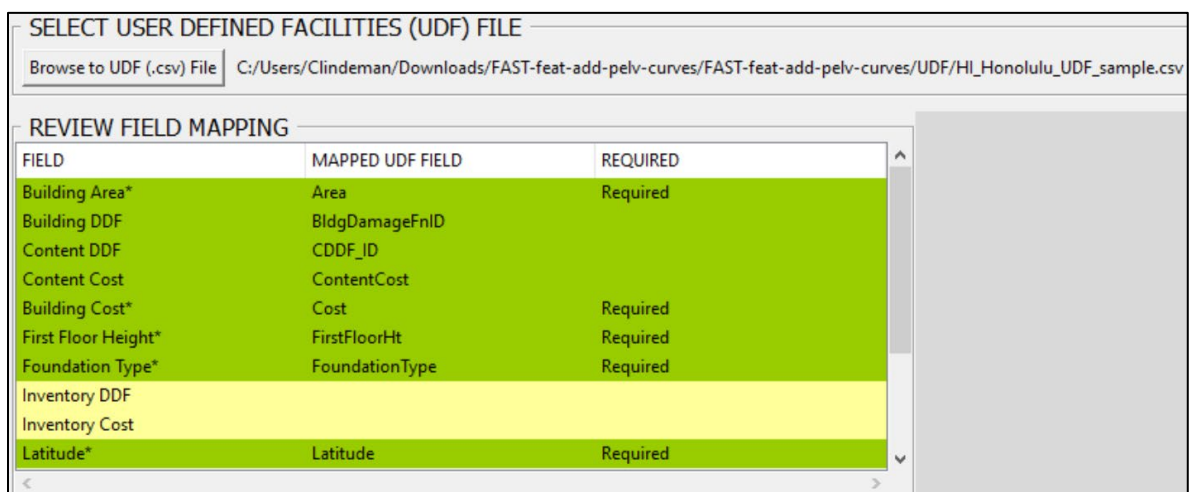


Select one depth grid that represents the 100-year return period.

5. Select a User Defined Facilities (UDF) .csv file

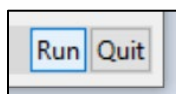


Click the button to open a Select File window and choose a UDF file.



Once a UDF file has been selected FAST will check that it has the required fields, denoted by an '*' and 'Required' value in the REQUIRED column. If a required field is missing the analysis won't be allowed to run and the UDF data will need to be adjusted.

6. Click Run to start the analysis



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Process completed successfully.  
Total processing time: 95 minutes.
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The console window will notify when the analysis is complete.

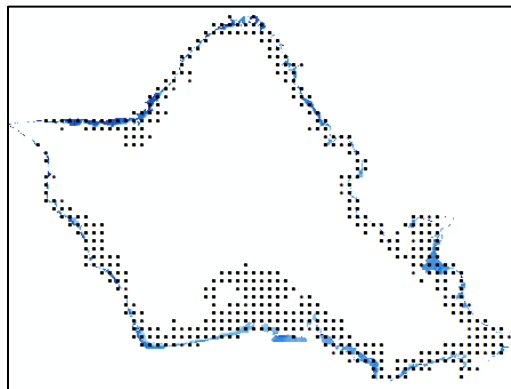
DOCUMENTATION

Please see the Help folder for guidance on formatting building data and customizing depth damage functions.

Please see the Docs folder for a PowerPoint describing the features of the FAST GUI, a AAL lookup table providing the Probability of Elevation (PELV) curves with return period flood depths relative to the 1% event and the PELV curve lookup table from the FEMA Building Codes Saves (BCS) report by Census Tract. Note that FAST PELV utilizes the median (50) value in this lookup table.

Sample Data includes UDF for the island of Oahu and 4 multi-return period depth grids based on a recent USGS study assessing scenarios where the upper 1 meter of reef is degraded: <https://pubs.er.usgs.gov/publication/ofr20211054>. The Honolulu locations are simplified to eliminate sharing issues. This sample data support assessments using all methods available in FAST:

1. Standard
2. Multi return period Average Annualized Loss (AAL) (3 or more return period depth grids are required)
3. AAL based on the NFIP Probability of Elevation (PELV) curves (only the 100-year (1%) depth grid is required)



Sample Oahu user defined facilities (UDF) and 500-year-without-reef depth grid.

To customize the damage functions used by FAST to calculate losses, review the guidelines in the "FASTDamageFunctions.pdf" in the "Help" folder.

The Census Tract boundaries used are from 2010.

CONTACT

For questions: contact the Hazus Team at fema-hazus-support@fema.dhs.gov