Introduction to HEC-FDA 2.0
23 January 2025
Q&A Summary

This Special PCoP webinar provided an overview of the newly released Version 2.0 of the Hydraulic Engineering Center's (HEC) Flood Damage Reduction Analysis (HEC-FDA) software program. HEC-FDA is USACE's only tool certified to carry out inland flood risk assessment in support of flood risk management recommendations and has supported 49 chief's reports in the last 10 years. Version 2.0 of HEC-FDA is a complete re-write of the HEC-FDA codebase and brings along a decade's worth of improvements. The webinar was presented by Brennan Beam (Hydraulic Engineer), Jordan Lucas (Economist), and Dr. Richard J Nugent III (Economist, FDA Lead).
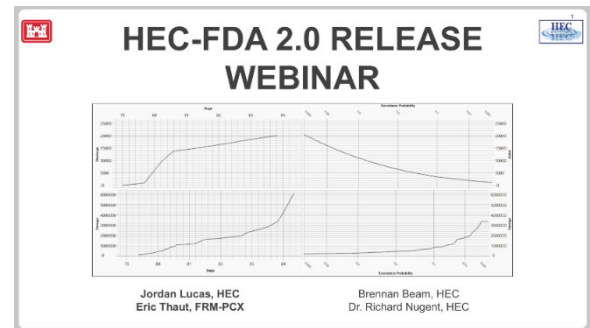
HEC-FDA 2.0 Resources:
- *[HEC-FDA 1.4.3 to HEC-FDA 2.0. Transition Plan](#)*
- *HEC FCA resources can be found on the [Planning Community Toolbox](#).*
- *[Certification Memo](#), which states that HEC-FDA 2.0 has been certified for use by USACE offices when conducting FRM studies.*
- *[Release Notes](#)*

This summary of the Question/Answer session of the webinar is not a transcription; questions and responses have been edited and reordered for clarity. To provide a more complete FAQ, the PCoP Webinar Q/A session was combined with the Q/A from a duplicate webinar provided to the Flood & Coastal Storm Risk Management Community of Practice.

HEC-FDA 2.0 Basics

Are there estimates on the impacts to schedule and costs of these recommended transitions, sensitivity analysis, or further associated actions?
Estimated levels of effort depend on data availability, study complexity, and user experience with the new version. If all data is available and users have accessed training on the software, a HEC-FDA 2.0 study could be built within a day's work.

Is this software for economists only?
This software is for economists, engineers, and planners. Ideally, economists and engineers are running the software together. It is important for planners to be familiar with the software and, in particular, the results produced by the software.

When using OneDrive, is it recommended that users should store all software and data on their hard drive?
It is recommended that users run the software and data on their hard drive, and then back it up to OneDrive.

FDA 2.0 Functionality and Limitations

What type of Monte Carlo sampling methodology does HEC-FDA 2.0 use?
The Monte Carlo sampling methodology is the same between the past and present versions, as is described in the release notes.

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Is it possible to incorporate functionality for below-ground water surface elevation (WSE) damage calculations on a structure-by-structure basis to accurately model basement damages?
Yes. Each structure is assigned its own beginning damage depth. Additionally, users will still assign all structures with basements to a common occupancy type with a damage curve that starts below the ground elevation. The difference from version 1.4.3 is that if HEC-FDA 2.0 calculates a WSE at a structure below the ground through interpolation of stages between frequencies, 2.0 will throw that damage calculation out because a WSE below the ground is typically a nonsensical result. While damage happens below the ground, in this modeling context, flood damage does not happen below the ground until surface water (with a WSE above the ground) enters a structure or reaches the structure. However, if the user provides a beginning damage depth below the ground surface and a water surface elevation is calculated below the ground surface, 2.0 will accrue positive damage accordingly.

Does HEC-FDA 2.0 assess risk non-structural measure risk?
The way that FDA 2.0 is used to assess non-structural measure risk is the same as FDA 1.4.3, ideally through modifications to the structure inventory or optionally through modifications to occupancy types. However, there is a helpful difference between version 1.4.3 and 2.0 when modeling nonstructural measures in that version 2.0 allows the user to import multiple structure inventories, such as for each different nonstructural plan, whereas 1.4.3 required the user to chop up one structure inventory into different modules.

Can HEC-FDA 2.0 only calculate 90% assurance, or can FDA 2.0 also calculate 85%, 95%, etc.?
The user interface is not currently configured to allow the user to specify the assurance of interest; the Annual Exceedance Probabilities on which assurance is reported are hard-coded. HEC is tracking that providing more flexibility on assurance would be a helpful user enhancement and has an active ticket to work on this.

How does assurance apply to non-structural measures?
HEC-FDA 2.0 has the capability to assess multiple target stages for a given simulation, stages which can be related to differential structure elevations. This is an improvement over version 1.4.3, which required that levees be applied for that purpose, but it is still a workaround. HEC can collaborate with the FRM-PCX and HQUSACE on best practices for the workaround. A future planned research and development (R&D) effort includes work to address this need appropriately.

How is assurance calculated for non-structural alternatives at the individual structure level?
HEC-FDA 2.0 does not support assurance calculations at the individual structure level. A statement of need is currently being processed to address this limitation. However, in HEC-FDA 2.0, evaluating project performance statistics at different stages at the index location may be more manageable if structures are grouped. That said, implementing structure-level assurance calculations remains years away.

Does HEC-FDA 2.0 calculate stage transform functions from imported Hydrology and Hydraulics (**H&H) .hdf files (unsteady), or do they need to be calculated outside of the tool?**
All H&H summary relationships with uncertainty (e.g., flow-frequency, stage-flow, etc.) will need to be calculated outside of HEC-FDA 2.0. The tool does not currently have the capability to pass the requisite data from HEC-RAS to HEC-FDA.

<u>Input, Output, and Export Features</u>

Are there more data/inputs needed to use HEC-FDA 2.0?
The Quick Start Guide has a great page for describing needed inputs. There is a difference in that flow-frequency functions and stage-flow functions cannot be pulled directly from the hydraulics data set in

2.0 like they could be pulled from the water surface profiles in 1.4.3. That said, the water surface profiles in 1.4.3 did not include any of the uncertainty information needed for those relationships, so users still had to modify every single relationship. As a result, the additional work in 2.0 for specifying these relationships is marginal. Additionally, since users can now copy and paste into and out of the software, H&H summary relationships with uncertainty can be organized in Excel and pasted into FDA, which brings time savings and reduction in the chance for data entry error. Additionally, there is an option to retrieve stage-frequency functions from the hydraulics data set at provided index points if the study does not involve flow data. Users still need to modify these functions for the appropriate equivalent record length. Finally, 2.0 can import summary relationships in the same tab delimited format as 1.4.3, which is an efficient approach to fully specifying these relationships without clicking lots of buttons. The tab delimited format is described in Appendix D of the Version 1.4.1 User's Manual.

What model outputs are available that provide damage information on individual structures in the structure inventory?
Users may be accustomed to using the structure detail out file. That exact same file is being reported with the structure info, stages, damage, as well as a log file with all the errors that come up during an aggregated stage damage compute. The number of structures damaged for each stage in the state damage compute is reported directly in the structure details subdirectory; previously, that table had to be developed from the structure detail out file.

Does the output structure file take geotechnical data into account?
No, the output structure does not account for levees. Being able to evaluate expected annual damages at the structural level, which would involve levees, has been proposed for an upcoming R&D effort.

Is there an output from the tool that can be used for mapping purposes?
Currently, there is no output available for mapping. The development of mapping capabilities was postponed to prioritize software delivery. However, a statement of need has been submitted to secure research and development funding for this feature. Additionally, the team is collaborating with the USACE Engineer Research Development Center on the risk visualization project to enable the creation of maps that illustrate risks and benefits in relation to socio-economic variables.

Are users able to export damage distributions more easily than in HEC-FDA version 1.4.3? For example, to use in @Risk software for developing distributed benefit-cost ratios or for other purposes?
No, not at this time. HEC-FDA 2.0 currently has limited data export capabilities, but adding this functionality is a priority for future development.

Is there an export option for tables, graphs, and other visuals from the tool?
All tables and graphs can be copied from the software and pasted into reports. While the tool cannot bulk export results yet, the HEC-FDA team is tracking that this would be a helpful enhancement.