



U.S. Army Corps of Engineers (USACE)
BUILDING STRONG®

Hydrologic Engineering Center (CEIWR-HEC) Watershed Analysis Tool (HEC-WAT)

Background

- HEC-WAT is an integrated system of software, designed for interactive use in a multi-tasking environment to provide information for decision makers to support alternative analysis.
- Meets the USACE requirement of performing water resources studies in a comprehensive, systems based, life-cycle approach with risk analysis.
- Provides an overarching interface that streamlines & integrates the analytical process of Water Resource Studies.
- Software development began in 2004; Peer Review & Beta release 2006; Version 1.0 scheduled for 2017.



"The Corps of Engineers must focus on starting fewer Civil Works projects, but doing them well and completing them properly, thus delivering benefits sooner and more efficiently and proving our value to the Nation. We also must shift to a watershed, systems-based approach to water resources decision making, working closely with our customers, partners and stakeholders, in order to leverage each other's knowledge, capabilities and resources."
— MG Temple, Acting USACE Commander, U.S Army Corps of Engineers (February 2012)



Integrated Software

- Hydrology - HEC-HMS, HEC-GeoHMS
- Reservoir Operations - HEC-ResSim
- Hydraulics - HEC-RAS, HEC-GeoRAS
- Economics - HEC-FIA
- Environmental - HEC-EFM
- Statistical - HEC-SSP
- Other Software - GSSHA, FLO-2D, ADH, RiverWare

Mission

- Provide software that helps USACE offices perform all types of water resources studies in a coordinated and comprehensive fashion including comprehensive watershed studies & small CAP studies.
- Meets USACE needs for an integration tool that addresses the systems perspective of IWRM.
- Designed to be used for multi-group/multi-agency studies as well as by a single entity.
- Improve coordination & communication across a study team.
- Provide a transparent, open collaborative & trusting modeling environment.
- Provide decision makers with a tool that intuitively provides economic, performance and consequence information to support alternative selection.

HEC-WAT

- Integrates models & tools that are used during the analytical process.
- Shares data across models through DSS file, inundation maps, depth grids.
- Provides the visualization tools to create models, edit models, & compare alternatives.
- Develops a spatially correct representation of the watershed.
- Coordinates a watershed study, while the individual pieces of software provide the analytical computations.
- The "plug-in" concept developed for HEC-WAT allows the integration of the individual pieces of software without requiring special code to support the individual pieces of software.



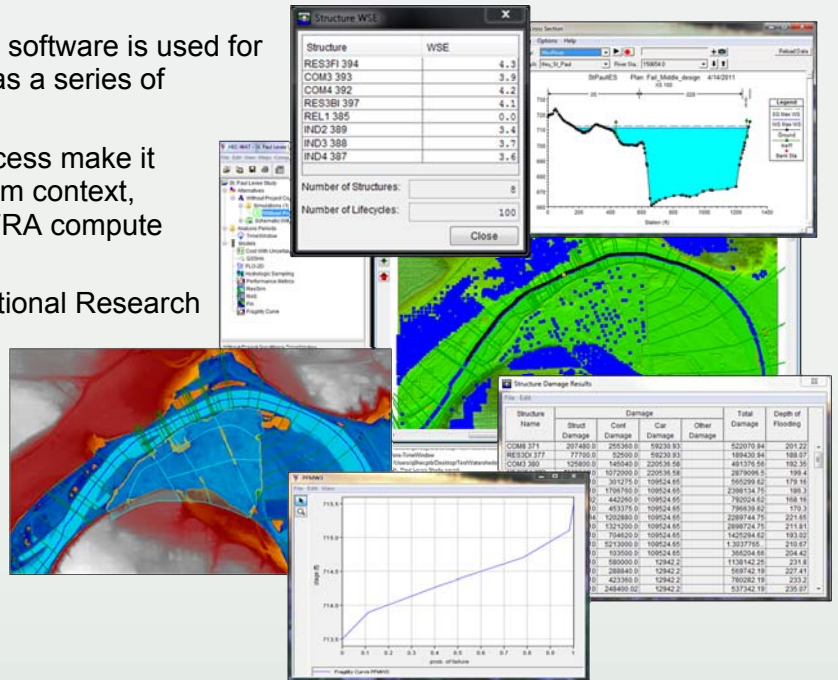
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Flood Risk Analysis (FRA) Compute Option

- A compute option that allows HEC-WAT to truly perform system-wide benefit analyses assessing risk and uncertainty in complex, interdependent systems and with a life-cycle approach.
- USACE guidance requires risk analysis for all flood damage reduction studies and requires that it be done in a systems approach.
- HEC-FDA (Flood Damage Reduction Analysis) software is used for risk analysis, but HEC-FDA looks at a system as a series of independent projects.
- Limitations of the current USACE planning process make it difficult to perform a risk assessment in a system context, therefore CEIWR-HEC began developing the FRA compute option for HEC-WAT.
- Accommodates recommendations from the National Research Council (NRC) report & aids in implementing the Chief of Engineers' Campaign Plan.
- Will be an effective tool for risk communication & be used as a tool for levee assessment & certification.
- Development began in 2010; will be included in Version 1.0 of HEC-WAT.



FRA Capabilities

- FRA will apply the Monte Carlo simulation & allow for life-cycle computation of consequences (economic and loss-of-life) and associated performance indices.
- Performs sampling with hydrologic, hydraulic, geotech and economic uncertainties.
- Uncertainty analysis through parameter sampling in all integrated models involved in an FRA compute (life-cycle transients).
- Supports risk communication by providing the performance metrics: annual exceedance probability (AEP), assurance (CNP), long-term exceedance probability (LTEP).
- Distributed computing which allows the FRA compute to perform parallel computations within one computer, distributed across multiple computers, or in a cloud environment.
- Will be an effective tool for risk communication & be used as a tool for levee assessment & certification.

Future Activities

- Release of HEC-WAT Version 1.0 (2017)
- Implementation of Life-Cycle Cost Analysis (LCCA); Version 3.0 of HEC-WAT
- Columbia River Treaty 2014/2024 Review
- FIRO Study
- Dam Safety Studies

