

Hydrologic Modeling with HEC-HMS

21 June 2023

Mike Bartles, P.E.

Tom Brauer, P.E.

Jay Pak, Ph.D., P.E.

Hydrologic Engineering Center



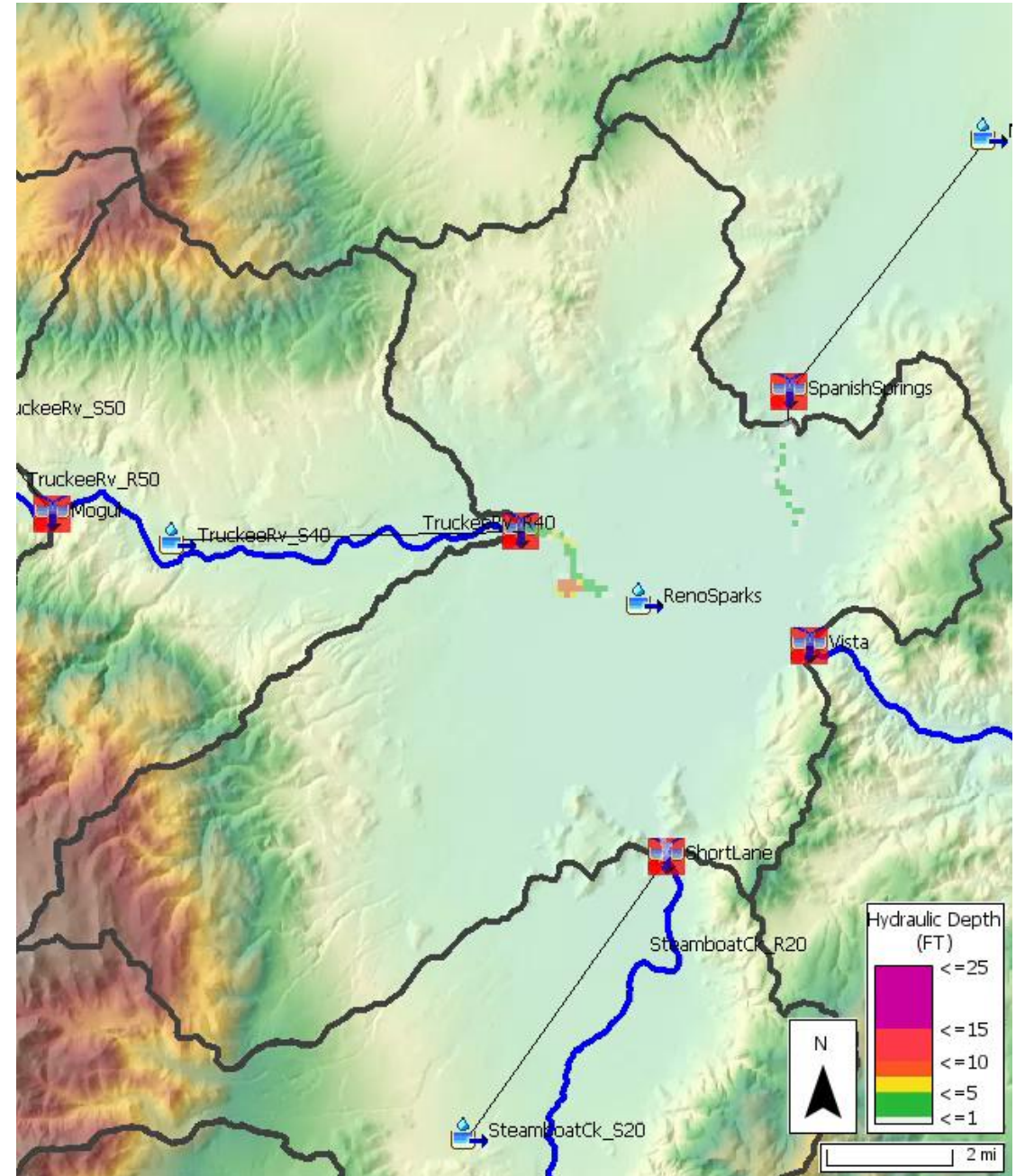
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Agenda

- Introductions
- Introduction to HEC-HMS
- Tech Transfer Materials and Documentation
- Purposes of HEC-HMS
- Software Demonstration
 - [Generating a Flow Forecast for Magat River, Philippines](#)
- Break
- Sediment and Reservoir Siltation
- Upcoming Enhancements
- Q&A



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Tom Brauer

- University of Florida
 - B.S. (2010)
 - M.S. (2011)
- USACE – Galveston District
- USACE – Hydrologic Engineering Center (HEC)
 - HEC-HMS Lead Developer



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Mike Bartles

- Penn State University
 - B.S. (2009)
- USACE – Philadelphia District
- Villanova University
 - M.S. (2014)
- USACE – Hydrologic Engineering Center (HEC)
- HEC-HMS team member and HEC-SSP Team Lead

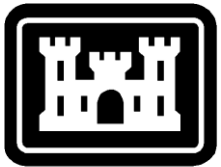


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Jay Pak

- Kyung Hee University, Seoul, Korea
 - B.S. (1992) & M.S. (1994)
- University of Southern California
 - M.S. (1998) & Ph.D. (2005)
- USACE – Los Angeles District & Far East District
- USACE – Hydrologic Engineering Center (HEC)
 - Watershed Scale Sediment and Post-Fire Hydrology/Debris Flow Specialist



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HEC-HMS Overview

- Free!
- ~75,000 downloads per year
- Latest Release
 - Version 4.10
- Beta Release
 - Version 4.11-beta.16
- MacOS and Linux versions available



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A screenshot of the HEC-HMS Downloads page on the US Army Corps of Engineers website. The page has a dark header with navigation links: About, Newsletters, Software, Publications, Training, Visitors, Links, Contact. A search bar is on the right. Below the header, the breadcrumb trail is HOME > SOFTWARE > HEC-HMS > DOWNLOADS. The main content area is divided into two columns. The left column is a navigation menu with links: HEC-HMS, Features, Downloads (highlighted), Documentation, Training Material, Known Issues, Bug Report, Suggestions, Email List, and Support Policy. The right column contains two sections: 'Windows' and 'macOS'. The 'Windows' section includes a disclaimer, a 'Beta Version' download link for HEC-HMS 4.11 Beta 16 (238 MB), and a 'Current Version (Primary Download Site)' section with links for HEC-HMS 4.10 for Windows (202 MB) and HEC-HMS 4.10 Portable Version (238 MB). The 'macOS' section includes a disclaimer, installation instructions, and download links for the Beta Version (168 MB) and Current Version (240 MB).

US Army Corps of Engineers Hydrologic Engineering Center

HOME > SOFTWARE > HEC-HMS > DOWNLOADS

HEC-HMS

- HEC-HMS
- Features
- Downloads**
- Documentation
- Training Material
- Known Issues
- Bug Report
- Suggestions
- Email List
- Support Policy

HEC-HMS has been developed for the U.S. Army Corps of Engineers. However, software developed at the Hydrologic Engineering Center is made available to the public whenever appropriate. Use is not restricted and individuals outside of the Corps of Engineers may use the program without charge. HEC will not provide user assistance or support for this software to non-Corps users. Downloading this software indicates full acceptance of your responsibility in the use of this program. Please see the [distribution policy](#) for more details.

Windows

The Windows setup package contains HEC-HMS 4.10. After starting the program, Documentation and Sample projects are available from the Help menu. HEC-HMS 4.10 has been tested on Windows 10 64-Bit.

Beta Version:
[Download HEC-HMS 4.11 Beta 16 \(238 MB\) \[Release Notes\]](#)

Current Version (Primary Download Site):
[Download HEC-HMS 4.10 for Windows \(202 MB\) \[Release Notes\]](#)
[Download HEC-HMS 4.10 Portable Version \(238 MB\) \[Release Notes\]](#)

> **Archived Versions:**

macOS

The disk image contains HEC-HMS 4.10. After starting the program, Documentation and Sample projects are available from the Help menu.

HEC-HMS 4.10 has been tested on macOS Monterey. Install HEC-HMS by dragging the app to the Application folder.

We do not currently use an Apple Developer account to digitally sign the application. See instructions [here](#) for running the application.

Beta Version:
[Download HEC-HMS 4.11 Beta 16 \(168 MB\) \[Release Notes\]](#)

Current Version:
[Download HEC-HMS 4.10 \(240 MB\) \[Release Notes\]](#)

> **Archived Versions:**

[Link to Downloads](#)

Tech Transfer Materials and Documentation

- Documentation
 - [Release Notes](#)
 - [User's Manual](#)
 - [Technical Reference Manual](#)
 - [Applications Guide](#)
 - [Validation Guide](#)
- Training Materials
 - [Tutorials and Guides](#)
 - [Hydrologic Modeling with HEC-HMS](#)
 - [Advanced Applications of HEC-HMS](#)
 - [Hydrology and Hydraulics for Dam Safety](#)
 - [Webinars](#)
 - [Conference Materials](#)



Tech Transfer Materials and Documentation



The screenshot displays the HEC-HMS Tutorials and Guides website. The main navigation bar includes links for HEC-HMS Home, HMS-HMS Docs, and HEC-HMS Downloads, along with a search bar. The left sidebar contains a 'Viewport Control' button and a list of tutorial topics, with 'Generating a Flow Forecast for Magat River, Philippines' selected. The main content area features the title 'Generating a Flow Forecast for Magat River, Philippines', a PDF download icon, and a breadcrumb trail. Below the title, there is an 'Introduction' section with a list of sub-components and a 'Study Area' section.

HEC-HMS Tutorials and Guides

HEC-HMS Home HMS-HMS Docs HEC-HMS Downloads

Generating a Flow Forecast for Magat River, Philippines

Introduction
Study Area

Generating a Flow Forecast for Magat River, Philippines

Introduction

This tutorial is comprised of the following sub-components:

1. [Delineating the Magat River Basin Model](#)
2. [Parameterizing the Magat River Basin Model](#)
3. [Creating Boundary Conditions for the Magat River Basin Model](#)
4. [Creating and Calibrating the Oct2010 Simulation](#)
5. [Running an Automated Forecast for the Magat River Basin](#)

Study Area



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[Link to Tutorials and Guides](#)

Tech Transfer Materials and Documentation

The screenshot shows the HEC-HMS Training website. The header includes 'HEC-HMS Training', navigation links for 'HEC-HMS Home', 'HEC-HMS Docs', and 'HEC-HMS Downloads', and a search bar. The main content area is titled 'Hydrologic Modeling with HEC-HMS (2022)' and includes a PDF download icon. The page describes the course content, which covers an introduction to the Hydrologic Modeling System, GIS tools, data entry, precipitation approaches, infiltration, runoff, baseflow, and channel routing. It also mentions parameter estimation techniques and model calibration. A table at the bottom provides links to YouTube videos, workshop files, and PowerPoint presentations for the course.

HEC-HMS Training / Hydrologic Modeling with HEC-HMS (2022) PDF

Hydrologic Modeling with HEC-HMS (2022)

The course provides an introduction to the Hydrologic Modeling System, HEC-HMS, focusing both on using the program and performing watershed studies. The course starts with a summary and overview of the program and the mechanics of constructing watershed models. Then, components of the software are studied in detail. Major modules include GIS tools, data entry, historic precipitation approaches, computing infiltration and excess surface runoff, transforming excess precipitation to runoff, baseflow, and channel routing. Parameter estimation techniques are taught throughout with instruction about model calibration. Instruction material is supported with workshops that illustrate the basic steps of building a model for project applications. A final project is included that ties together topics to create a calibrated model from scratch.

The following table provides links to YouTube videos for all lectures. Links are provided to the workshop pages located in the HEC-HMS Tutorials and Guides space. All workshop files can be downloaded from the workshops pages as well. Finally, all PowerPoint files are included below and can be downloaded for reference. You will need **HEC-HMS version 4.11** or newer to open the workshop files. You can download the software from <https://www.hec.usace.army.mil/software/hec-hms/downloads.aspx>.

Lectures and Workshops	Videos and Links	PowerPoint Files
Lecture 0: Overview of Hydrologic Modeling for Studies	Overview of Hydrologic Modeling for Studies	L 0 Overview of Hydrologic Modeling For Project Studies.pptx



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[Basic HEC-HMS Class Materials](#)

Tech Transfer Materials and Documentation

HEC-HMS Training

HEC-HMS Home HEC-HMS Docs HEC-HMS Downloads

HEC-HMS Training / HEC-HMS USACE HH&C CoP Webinar Series

HEC-HMS USACE HH&C CoP Webinar Series

PDF

Hydrologic Modeling with HEC-HMS (2022)

Hydrology & Hydraulics for Dam Safety (2022)

Advanced Applications of HEC-HMS (2023)

Post-Wildfire Debris Flow Modeling with HEC-HMS (2023)

HEC-HMS USACE HH&C CoP Webinar Series

Technical Transfer Material

RMC Advanced HMS Workshop 2023

Date	Topic	Presenter	PowerPoint Presentation	Link to Video
Q2 FY23	Snowmelt Modeling Enhancements	Natasha Sokolovskaya, Mike Bartles, and Avital Breverman		



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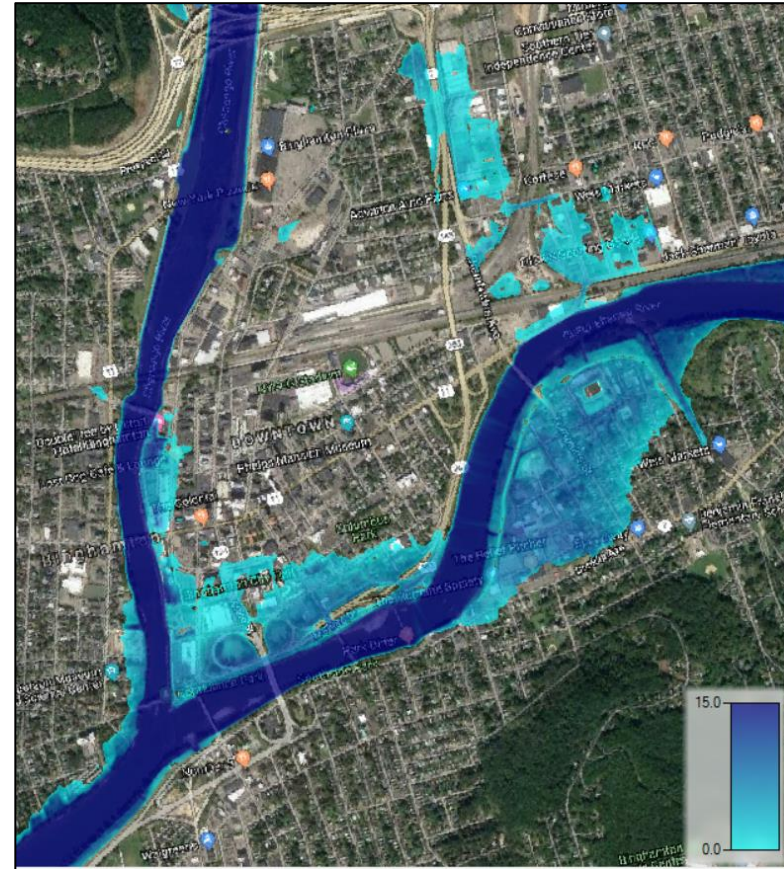
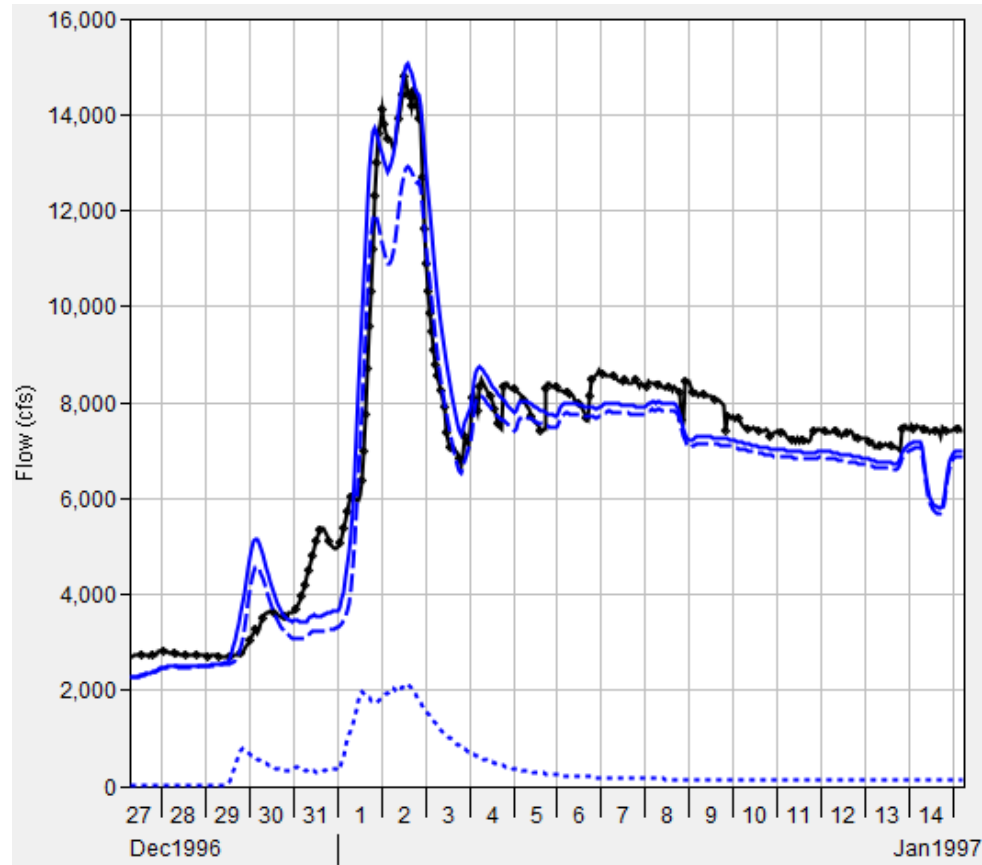
[HEC-HMS Webinars](#)

Purpose of HEC-HMS

- **Simulate the hydrologic processes of dendritic watersheds**
 - Estimate runoff for short (hours to days) and long (months to years) time windows
 - Analyze water availability, urban drainage, flow forecasting, future urbanization impacts, reservoir spillway design, flood damage reduction, floodplain regulation, systems operation, and sediment transport
 - Generate output(s) for use in other applications

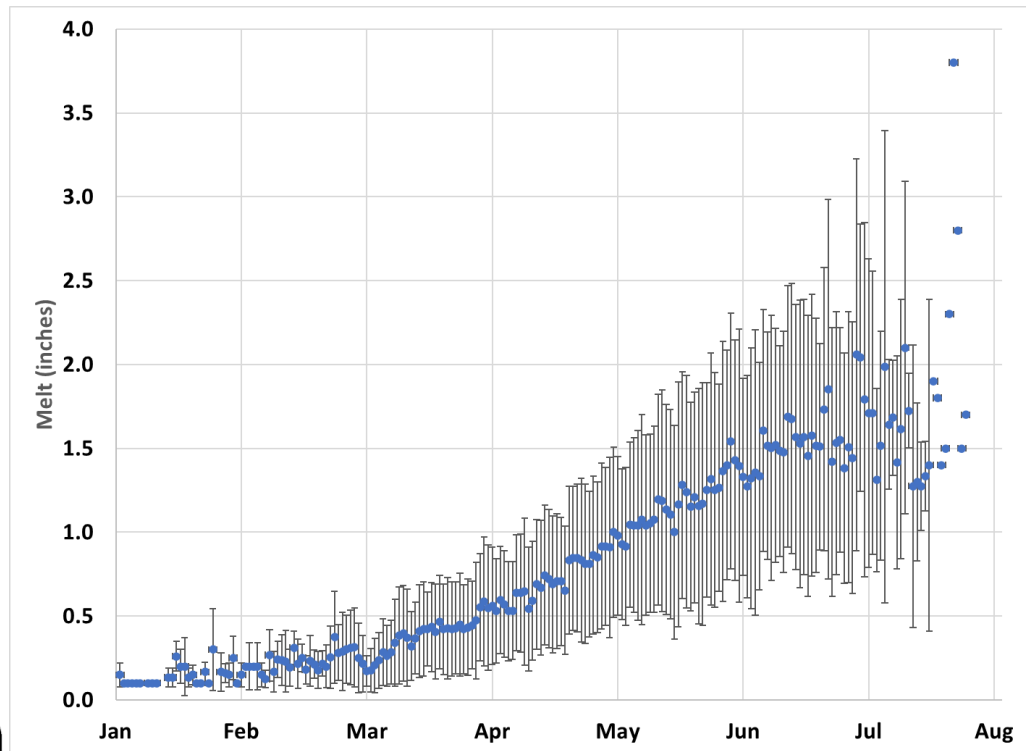


Purpose of HEC-HMS

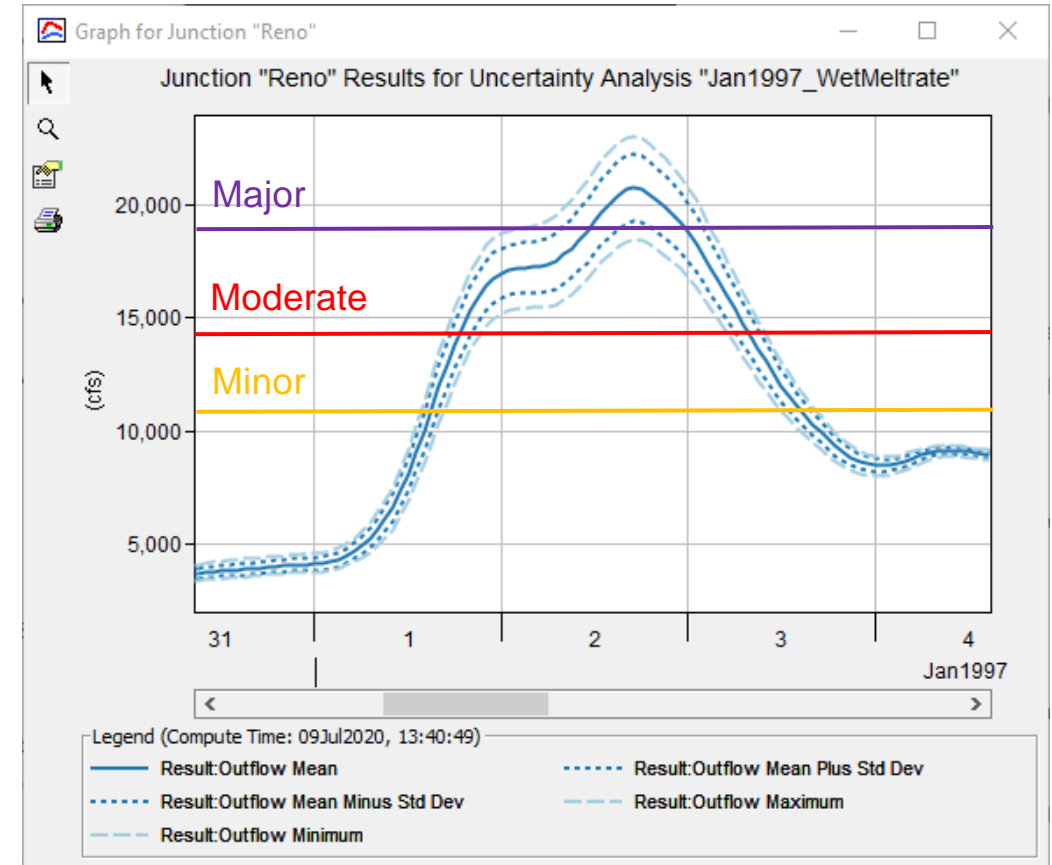


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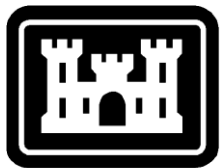
Purpose of HEC-HMS



Uncertain Snow Melt



Uncertain Runoff



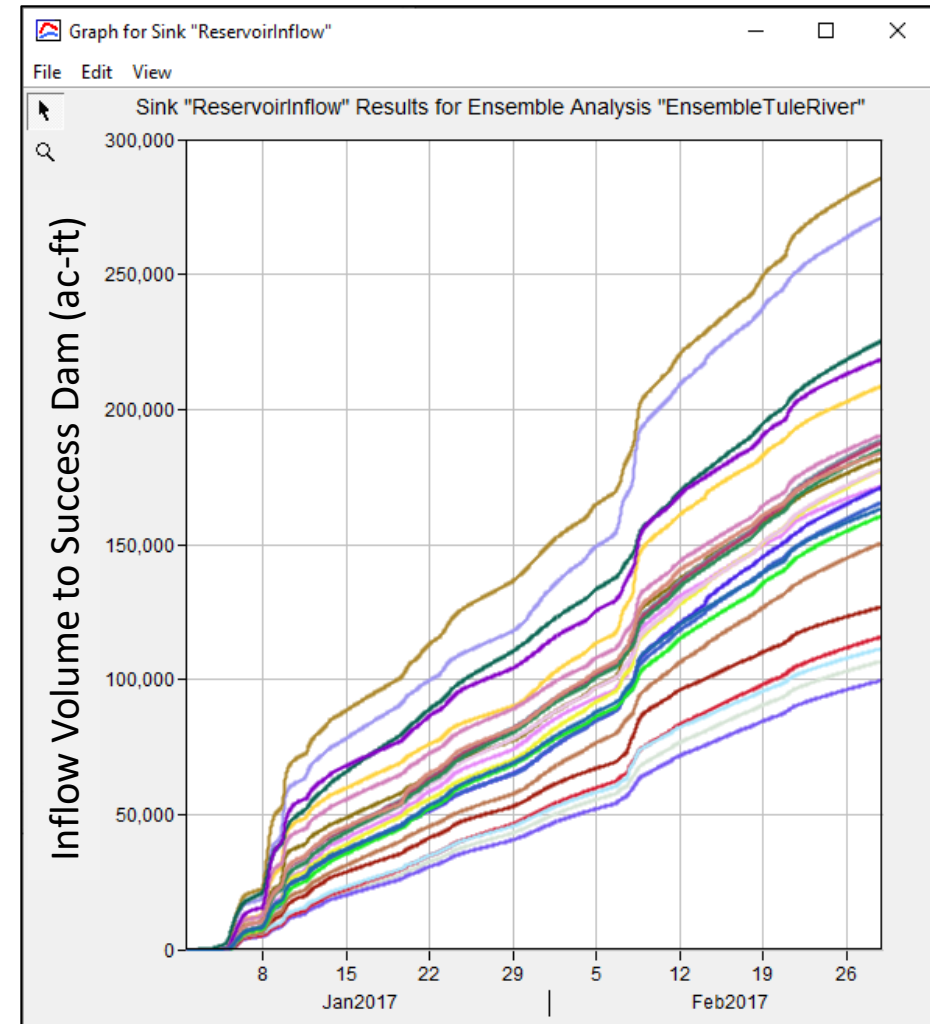
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Other Common Use Cases

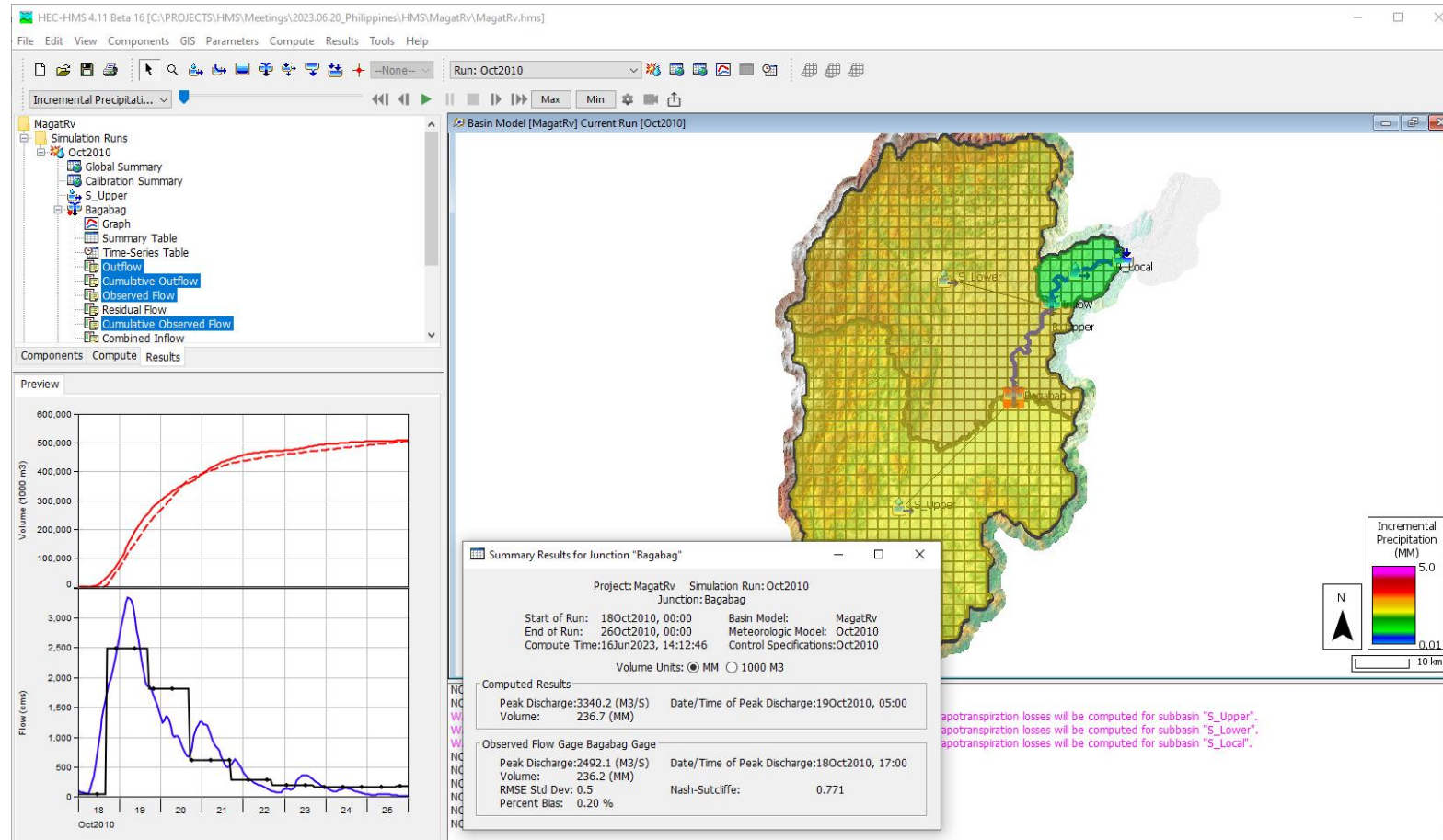
- Feasibility Studies
- Dam and Levee Safety Risk Assessments
- Flow- and Stage-Frequency Analyses
- Flood Forecasting
- **Quantitative Climate Change Assessments**



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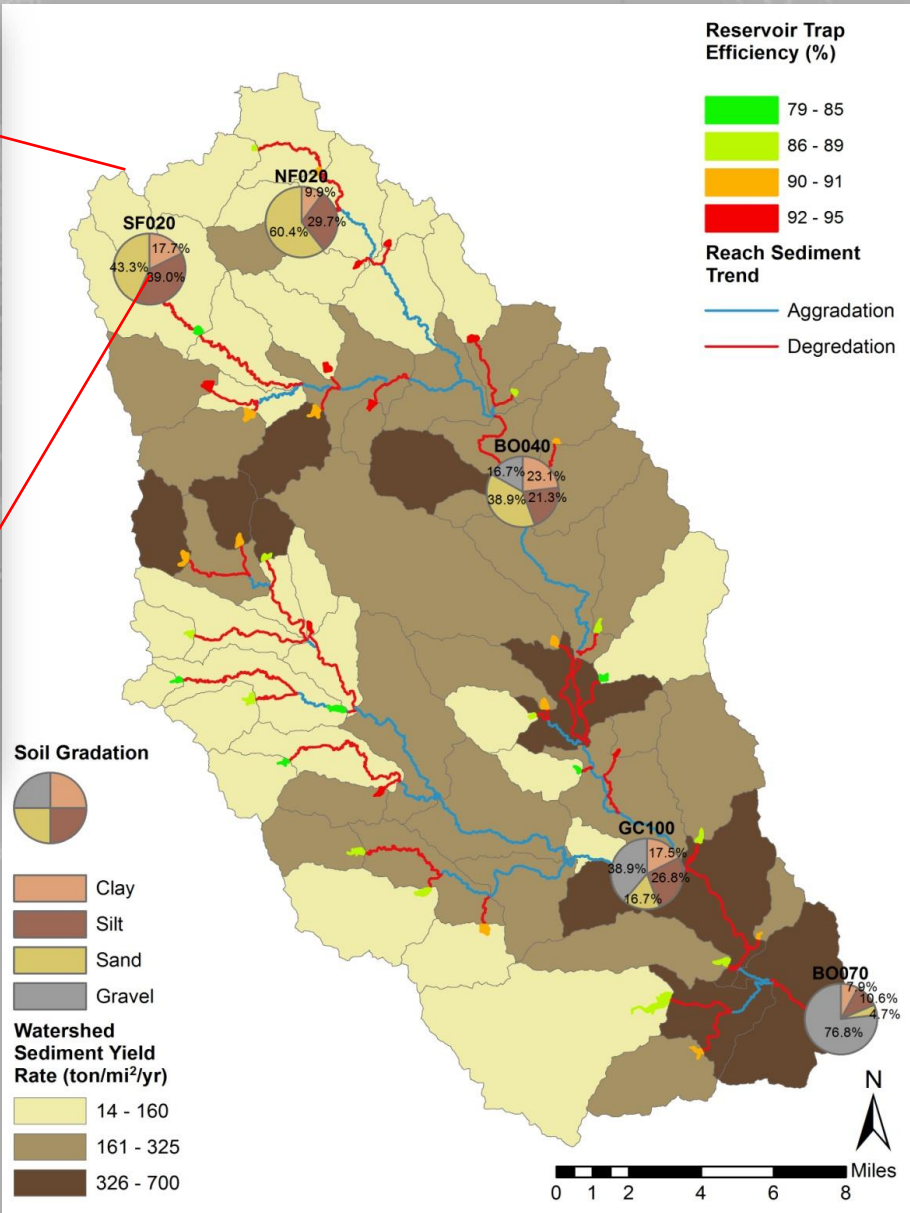
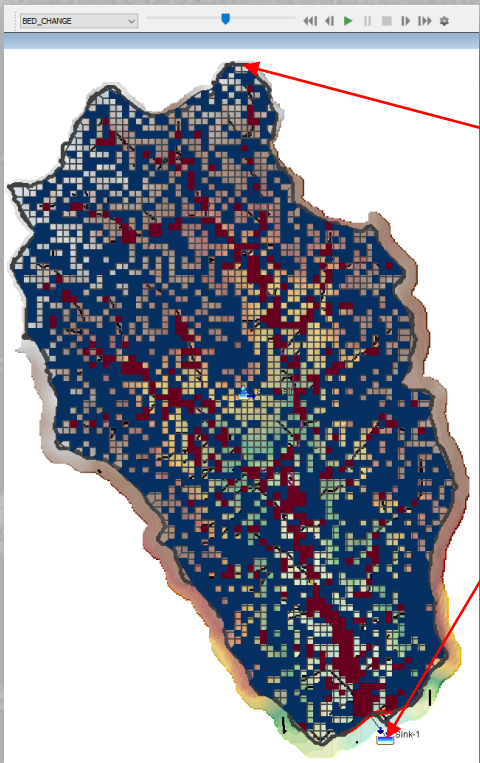
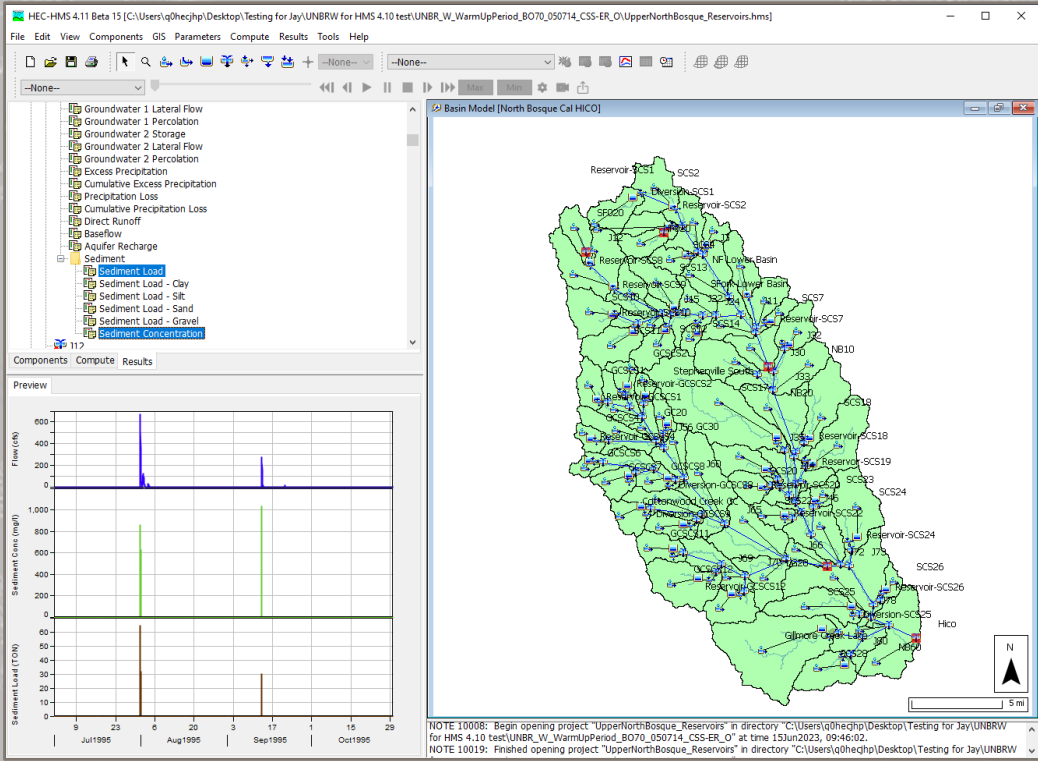


Software Demonstration



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SURFACE EROSION & SEDIMENT TRANSPORT MODELING CAPABILITIES IN HEC-HMS



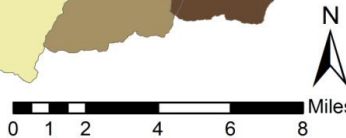
Jay Pak, Ph.D., P.E.

Watershed Scale Sediment and Post-Fire Hydrology/Debris Flow Analysis Specialist, USACE IWR-HEC

"The views, opinions and findings contained in this report are those of the authors(s) and should not be construed as an official Department of the Army position, policy or decision, unless so designated by other official documentation."



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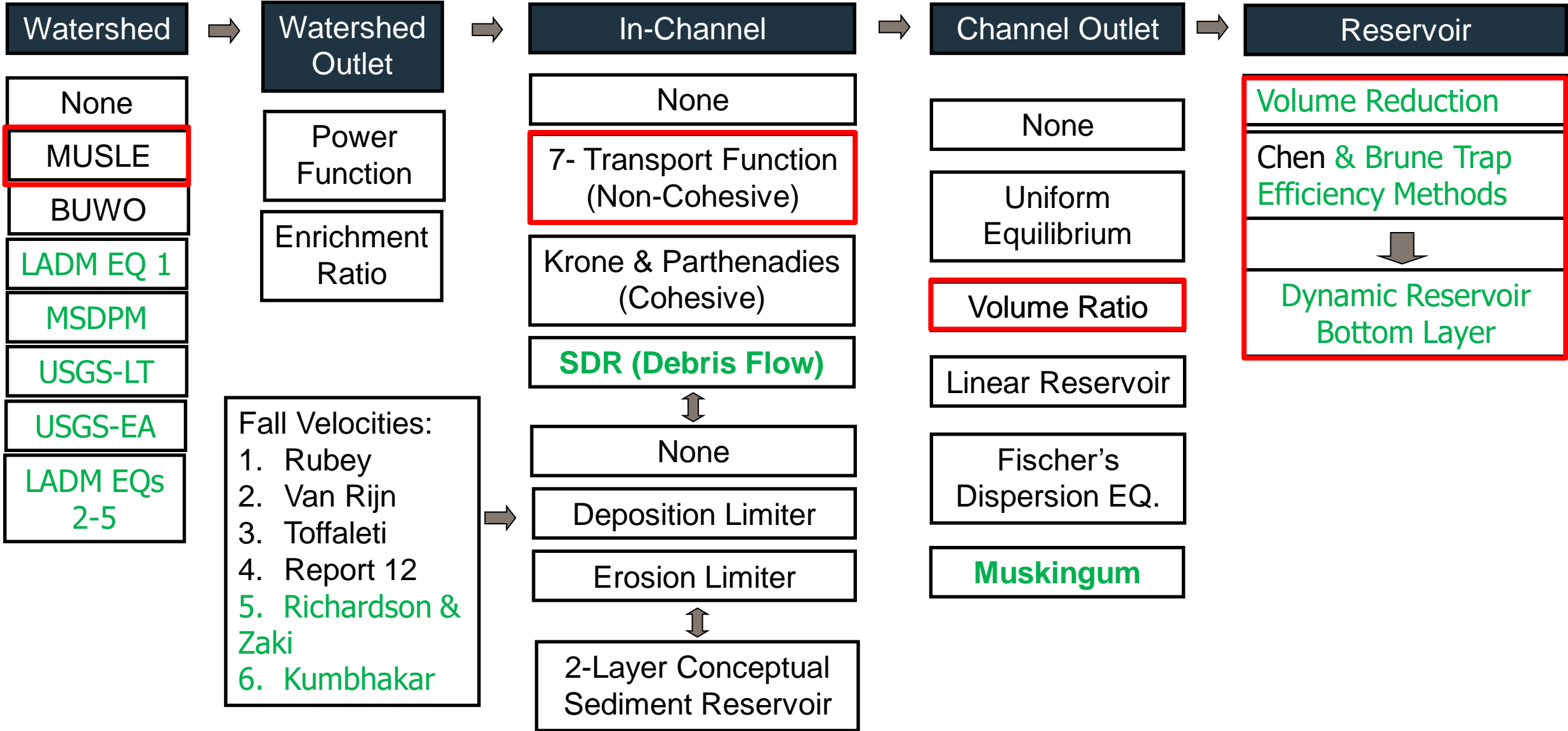


OVERVIEW

1. Surface Erosion and Sediment Transport Process
2. Surface Erosion Method (Watershed/Subbasin)
3. Transport Potential Functions (Channel/Reach)
4. Dynamic Volume Reduction/Siltation Method (Reservoir)
5. Case Studies:
 - Large Reservoir Volume Reduction Studies (Long-Term Simulation)
 - Sediment Analysis Study with Upper North Bosque River Watershed (UNBRW), TX



SURFACE EROSION AND SEDIMENT/DEBRIS TRANSPORT PROCESS





SUBBASIN: MUSLE EQUATION



- Modified Universal Soil Loss Equation (MUSLE).
 - Developed by Williams, 1975.
 - Rainfall energy factor replaced by *Runoff factor*
 - Incorporates detachment and transport
 - Applicable to individual storms

$$\text{Sed} = 11.8(Q_{\text{surf}} \times q_{\text{peak}})^{0.56} \times K \times \text{LS} \times C \times P$$

- Sed = Sediment Yield per Event (metric tons)
- Q_{surf} = Surface Runoff Volume (m^3)
- q_{peak} = Peak Runoff Rate (m^3/s)
- K = Soil Erodibility Factor
- LS = Topographic Factor
- C = Cover and Management Factor
- P = Support Practice Factor

Subbasin		Canopy		Surface	
Loss	Transform	Baseflow	Erosion	Options	
Basin Name: North Bosque Calibration					
Element Name: SCS12					
*Erodibility Factor:	0.38				
*Topographic Factor:	4.21				
*Cover Factor:	0.00437				
*Practice Factor:	1				
*Threshold (CFS)	11				
*Exponent:	0.75				
Gradation Curve:	SCS12				



REACH: TRANSPORT POTENTIAL FUNCTIONS



- Ackers-White (1973)
- Englund-Hansen (1967)
- Laursen (1968)-Copeland (1989)
- Myer-Peter-Müller (1948)
- Toffaleti (1968)
- Yang (1973/1984)
- Wilcock (2001)
- **Sediment Delivery Ratio (SDR)**

A little guide to how Stanford thinks about transport functions

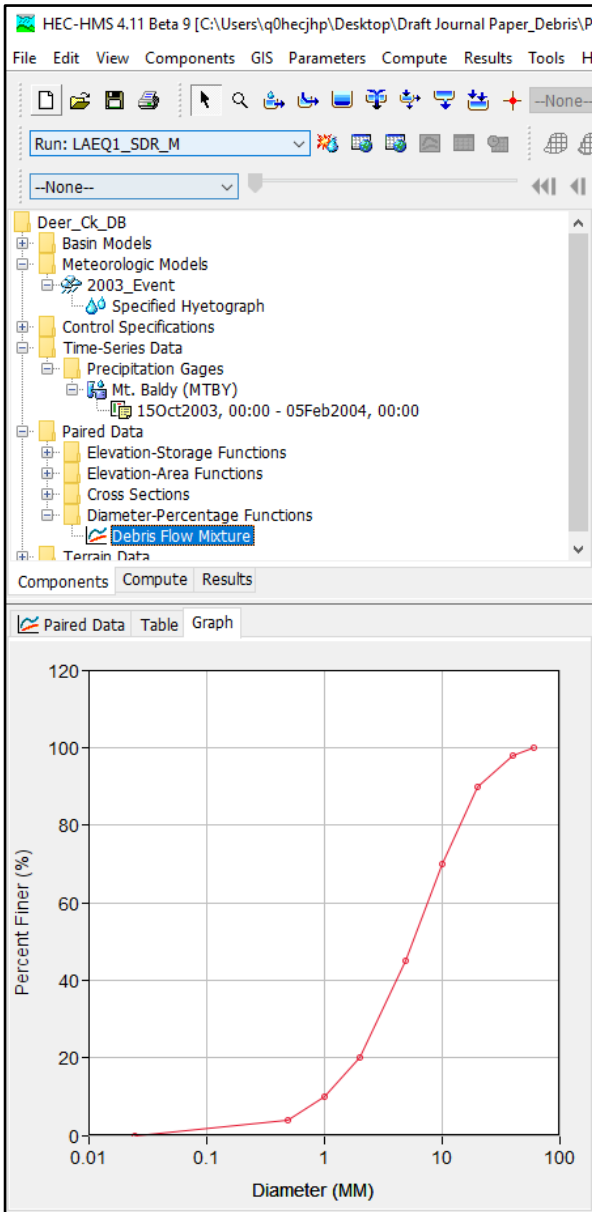
What is the Sediment Type?	What Functions are 'In Play'?	Additional Considerations?
Clay	Krone-Parthinades	
Silt	Laursen-Copeland Krone-Parthinades	-If mixed with clay – need additional data
Sand	Ackers-White Englund-Hansen Toffaletti Yang Laursen-Copeland	-Primarily for 'large rivers' – not good for coarse material
Gravel+	MPM ¹ Wilcock ¹ Yang Larsen-Copeland	-Recommend Wong-Parker correction -Mainly for 'bimodal' beds (gravel or cobble beds with 25-40% sand) – must use surface gradation and 'Active Layer' mixing method -Separate gravel function -Separate gravel function

Excess Shear Stress	Stream Power
Meyer-Peter Muller	Ackers-White (<i>tV</i>)
Laursen-Copeland	Englund-Hansen (<i>tV</i>)*
Wilcock and Crowe	Yang (<i>VS</i>)

The screenshot shows the HEC-HMS 4.11 Beta 9 interface. The 'Basin Model' tab is active, and the 'Sediment' function is selected. The 'Name' field is set to 'Deer Ck DB LADE1 SDR-M'. The 'Transport Potential' is set to 'Sediment Delivery Ratio'. A dropdown menu is open, showing the following options: Ackers-White, Engelund-Hansen, Laursen-Copeland, Meyer-Peter Muller, Sediment Delivery Ratio (highlighted), and Toffaleti. Below the dropdown, the 'Cohesive Potential' is set to 'Wilcock' and 'Yang'. The 'Specific Gravity' is 2.65. The 'Clay Density (KG/M3)' is 480.55, 'Silt Density (KG/M3)' is 1041.2, and 'Sand Density (KG/M3)' is 1489.7. The 'Fall Velocity' is set to 'Van Rijn' and the 'Grade Scale' is 'Clay Silt Sand Gravel'.



REACH: TRANSPORT CAPACITY



Bed Material and Inflowing Load divided into separate grain classes (up to 20)

Transport Potential is calculated for each grain size

Transport Capacity (Existing 7-transport Potential Functions) =
(Transport Potential for each grain size) X (fraction of that material in active layer of bed)

Where:

T_c = Total transport capacity

N = number of grain size classes

β_j = % of active layer composed of material in grain size class "j"

T_j = Transport potential computed for 100% of the material grain class "j"

$$T_c = \sum_{j=1}^n \beta_j T_j$$

SDR is not function of fraction of each grain size material in active layer of bed)

Transport Potential = Transport Capacity



REACH: SEDIMENT CHANNEL ROUTING



- Fisher's
- Linear Reservoir
- Uniform Equilibrium
- Volume Ratio**
- Muskingum

$$Sed_{out} = \frac{Volume_{out}}{Volume_{channel}} Sed_{channel}$$

Basin Name: Uniform Equilibrium
Element Name: Reach-1

Initial Bed Curve: W-1

Erosion Limit: Length-Depth Ratio

Deposition Method: EffectiveDepth

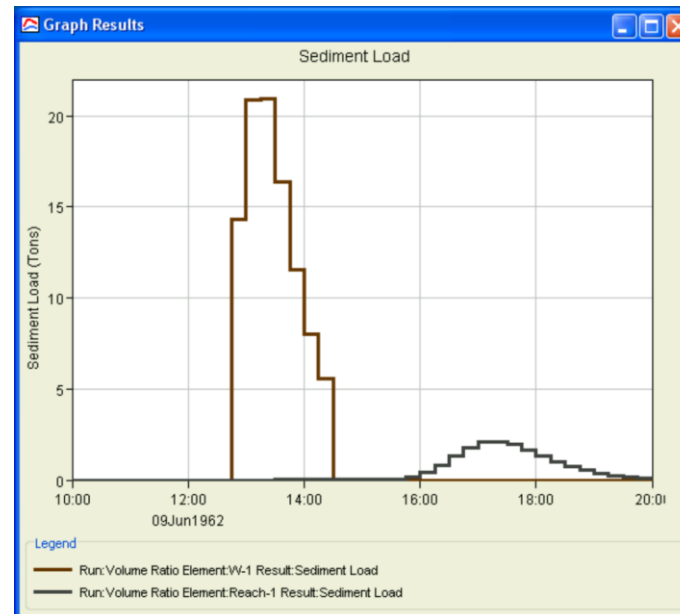
Temperature Method: Average

*Temperature (F) 55.4

*Bed Width (FT) 20

*Bed Depth (FT) 10

*Active Bed Factor: 2



HEC-HMS 4.11 Beta 9 [C:\Users\q0hecjhp\Desktop\Draft Journal Paper_Debris\Pd

File Edit View Components GIS Parameters Compute Results Tools He

Deer_Ck_DB

- Basin Models
 - Basin 1
 - Deer_Ck_DB_LADE1
 - S_1
 - S_2
 - J_2
 - Reach-1
 - S_3
 - Sink-1
 - Deer_Ck_DB_LADE1_E&H
 - Deer_Ck_DB_LADE1_SDR-M
 - Deer_Ck_DB_LADE1_1SB
 - Deer_Ck_DB_MSDDPM
 - Deer_Ck_DB_MSDDPM_SDR-M
- Meteorologic Models
- Control Specifications
- Time-Series Data
- Paired Data
- Terrain Data

Components Compute Results

Reach Routing Sediment Options

Basin Name: Deer_Ck_DB_LADE1
Element Name: Reach-1

Description:

Downstream: Sink-1

Routing Method: Muskingum-Cunge

Loss/Gain Method: --None--

Sediment Method: Uniform Equilibrium

--None--

Fischer's Dispersion

Linear Reservoir

Muskingum

Uniform Equilibrium

Volume Ratio



RESERVOIR: CHEN'S SEDIMENT TRAP EFFICIENCY METHOD (CHEN 1975)

- Critical settling velocity

$$v_c = \frac{h}{T} = \frac{Q}{A} = \text{overflow rate}$$

- Trapping Efficiency

- Stratified (quiescent) reservoir (upper bound)

$$TE = 100 \frac{v_s}{v_c} = 100 \frac{A}{Q} v_s$$

- Mixed (turbulent) reservoir (lower bound)

$$TE = 100 \left[1 - e^{-\frac{v_s}{v_c}} \right]$$

Fall Velocities (v_s):

1. Rubey
2. Van Rijn
3. Toffaleti
4. Report 12

- The settling velocity is computed using the method selected for the Basin Model.
- The critical settling velocity is computed as the discharge rate (Q) from the reservoir divided by the surface area (A). The computations are performed separately for each grain size class or subclass.



RESERVOIR: BRUNE'S SEDIMENT TRAP EFFICIENCY METHOD (BRUNE 1953)



- Capacity/Annual Inflow Ratio

$$V_* = \frac{V_{res}}{V_{inflow}}$$

- V_{res} = Reservoir Capacity
- V_{inflow} = Annual Inflow (A user specified initial value is required)

- Trapping Efficiency

$$TE = a[1 - 2e^{-bV_*^{0.35}}]$$

- a = Coefficient (Low=95, Medium=97, High=100)
- b = Coefficient (Low=5.37, 6.42, High=7.71)

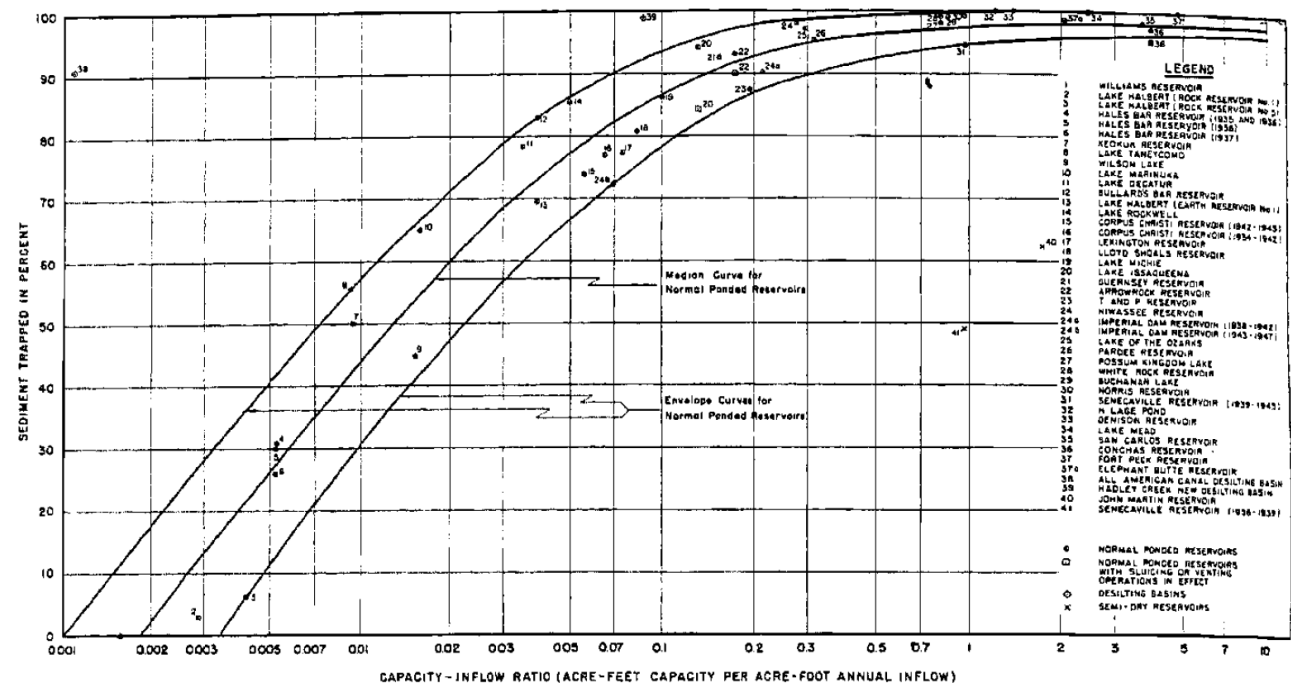


Fig. 6--Trap efficiency as related to capacity-inflow ratio, type of reservoir, and method of operation



RESERVOIR: SEDIMENT ROUTING METHODOLOGY



- Sediment deposition

$$D_b = Q_{sed}^{In} \times \frac{TE}{100}$$

- Suspended sediment

$$S_R = Q_{sed}^{In} - D_b$$

- Outflow sediment

$$Q_{sed}^{Out} = S_R \frac{V_{Out}}{V_R}$$

Q_{sed}^{In} = Total Inflow Sediments

Q_{sed}^{Out} = Total Outflow Sediments

V_{Out} = Outflow volume

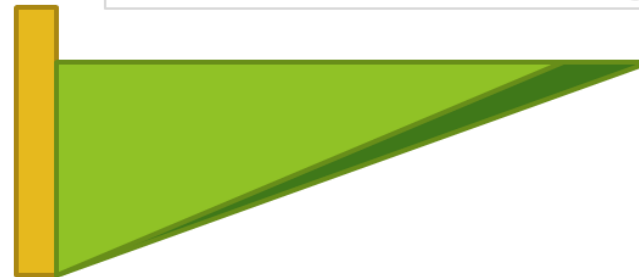
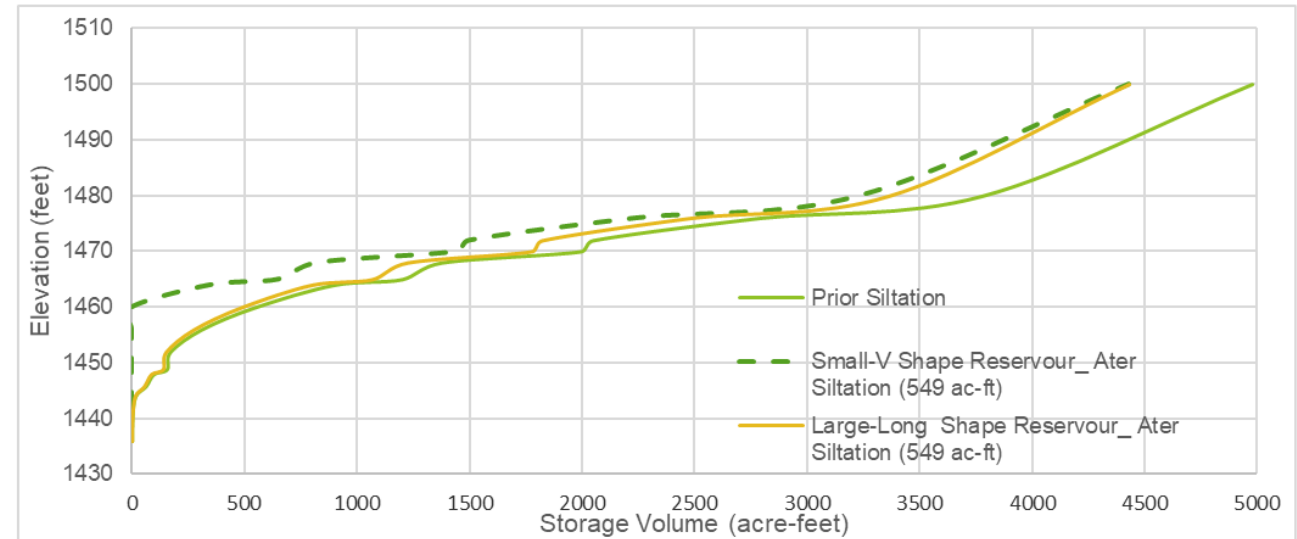
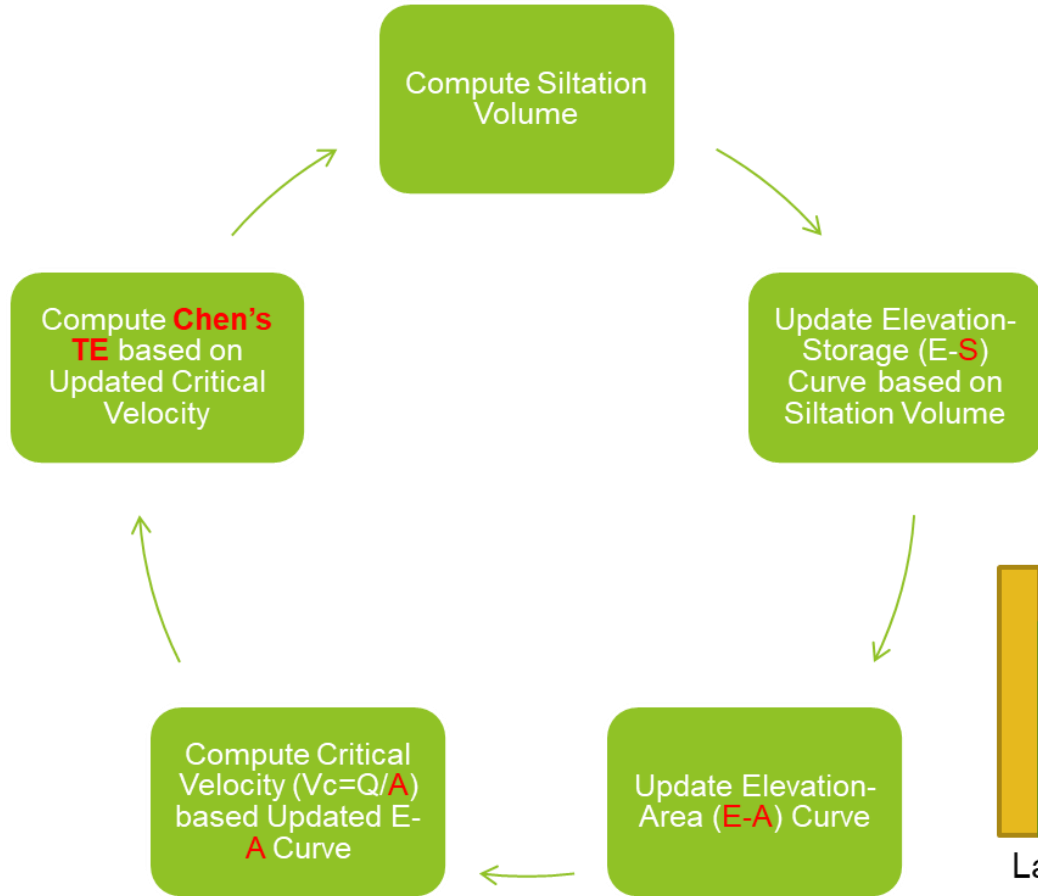
V_R = Reservoir volume



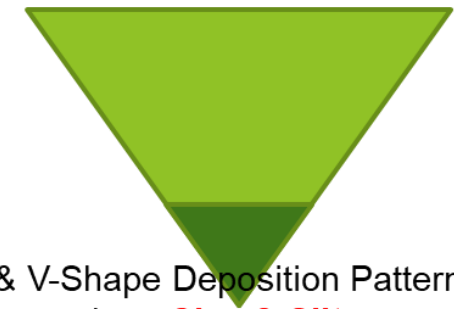
RESERVOIR: VOLUME REDUCTION PROCESS



Update Elevation-Storage-Area-Discharge Curves Each Time Step based on siltation volume



Large & Long-Shape Deposition Pattern for granular materials such as **Sand & Gravel**



Small & V-Shape Deposition Pattern for fine particles such as **Clay & Silt**

Clay & Silt: Only 1-Option (V-Shape)

Sand & Gravel: 2-Option (V-Shape or Elongated Taper)



RESERVOIR: HEC-HMS GUI FOR TWO SEDIMENT TRAP EFFICIENCY METHODS



Reservoir Sediment Options

Basin Name: Brand_Canyon_MSDP
Element Name: Brand_DB

Description:

Downstream: --None--

Method: Outflow Structures

Storage Method: Elevation-Storage-Area

*Elev-Stor Function: Brand_DB

*Elev-Area Function: Brand_DB

Initial Condition: Elevation

*Initial Elevation (M): 262

Main Tailwater: Assume None

Auxiliary: --None--

Time Step Method: Automatic Adaption

Outlets: 0

Spillways: 1

Dam Tops: 0

Pumps: 0

Dam Break: No

Dam Seepage: No

Release: No

Evaporation: No

Sediment Method: Chen Sediment Trap
Brune Sediment Trap
Chen Sediment Trap
Complete Sediment Trap
Specified Sediment
Zero Sediment Trap

Reservoir Sediment Options

Basin Name: North Bosque Cal HICO
Element Name: Reservoir-SCS14

Method: Average Value

*Annual Inflow Volume (AC-FT): 20000

*Capacity Elevation (FEET): 1480

*Constant A: 97

*Constant B: 6.42

Reservoir Capacity Method: Yes

Deposition Shape: V-Shape
V-Shape
Elongated Taper

Reservoir Sediment Options

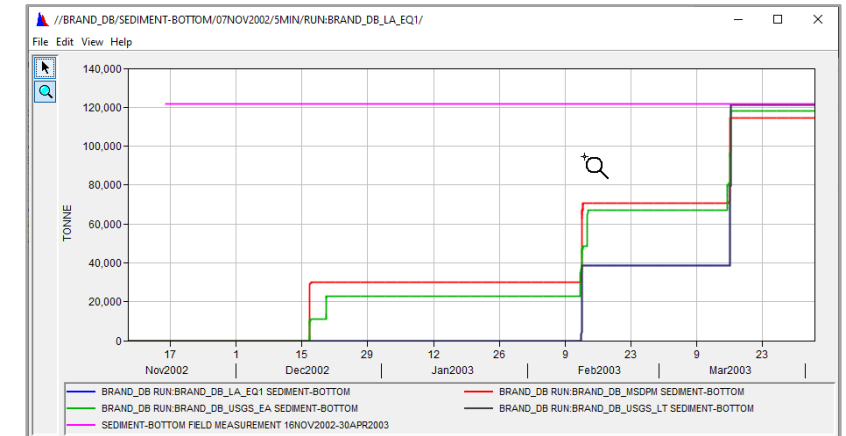
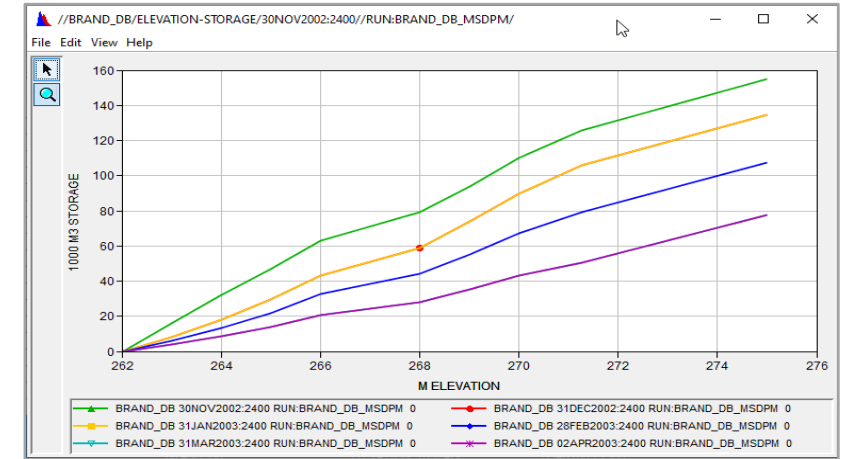
Basin Name: North Bosque Cal HICO
Element Name: Reservoir-SCS14

Method: Average

*Temperature (F): 55.4

Reservoir Capacity Method: Yes

Deposition Shape: V-Shape
V-Shape
Elongated Taper





CASE STUDIES: LARGE RESERVOIR VOLUME REDUCTION



Basin Model

- Inflow element
- Reservoir element
- Outflow element

Inflow Element

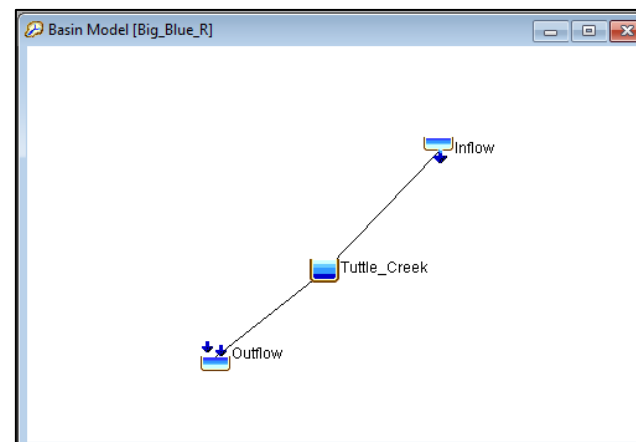
- Daily sediment loads taken from the Kansas Watershed Study
- Incoming gradation from USGS measurements

Reservoir Element

- Initial elevation-storage and elevation-area tables
- Trapping Efficiency: both the Brune and Chen methods tested
- Deposition Shape: both the V-shape and Elongated tested
- Outflow: specified release

Control Specifications

- Timestep: 12 hours
- Simulation period
 - Tuttle Creek: 1972-2020
 - Kanopolis: 1960-2017
 - Perry: 1979-2009



Components Compute Results

Paired Data Table Graph

Diameter (MM)	Percent Finer (%)	
0.0400		47
0.0625		88
2.0000		100

Basin Name: Tuttle Elong Brune Calib
 Element Name: Tuttle

Description:

Downstream: Sink-1
 Method: Outflow Structures

Storage Method: Elevation-Storage-Area

*Elev-Stor Function: Tuttle 1972

*Elev-Area Function: Tuttle 1972

Initial Condition: Elevation

*Initial Elevation (FT) 1080.7

Main Tailwater: Assume None

Auxiliary: --None--

Time Step Method: Automatic Adaption

Outlets: 0

Spillways: 0

Dam Tops: 0

Pumps: 0

Dam Break: No

Dam Seepage: No

Release: Yes

Evaporation: No

Sediment Method: Brune Sediment Trap



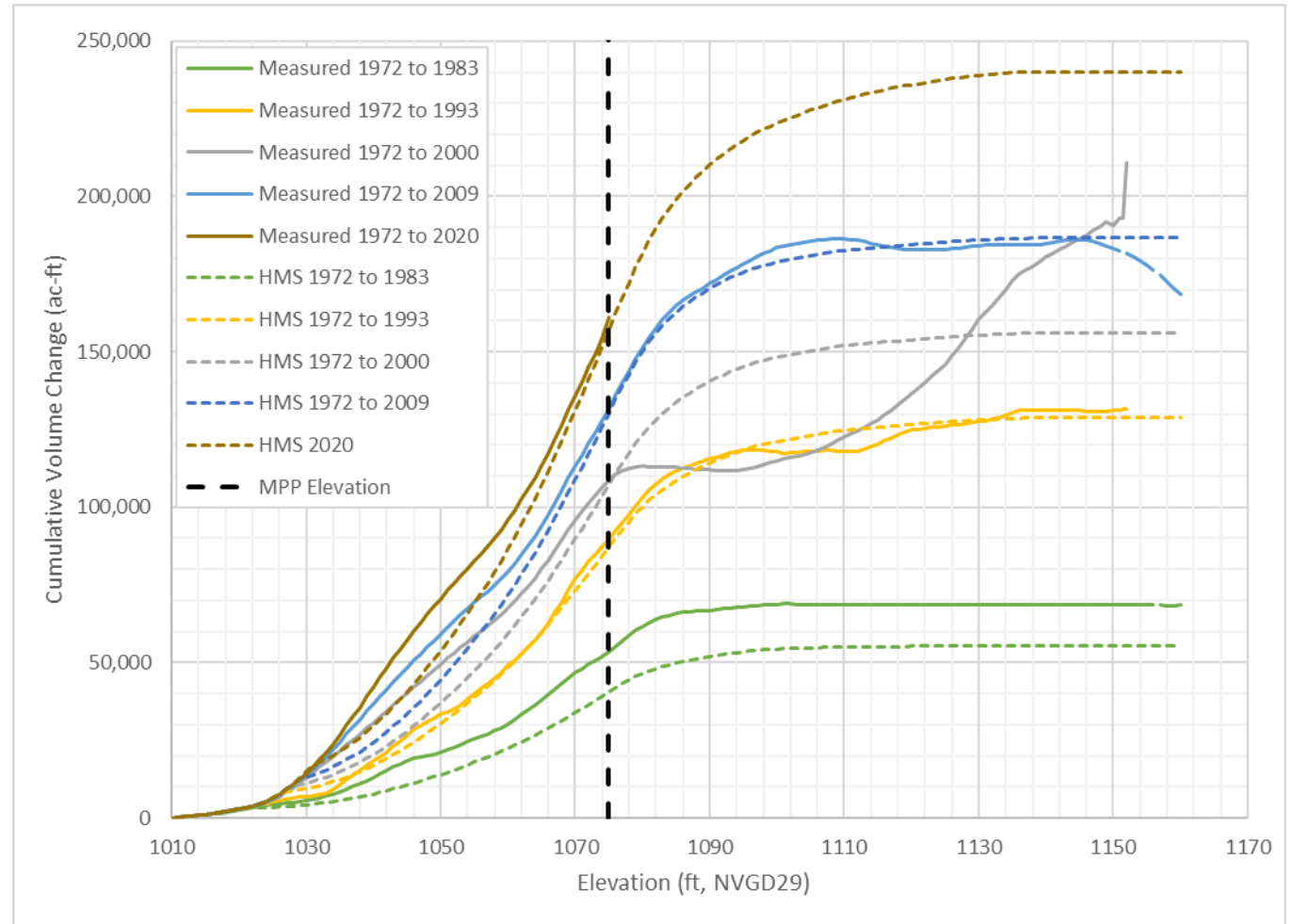
TUTTLE CREEK RESULTS



Calibration Method

- Shifted majority of fine and silt fraction to sand
- Maintained volume balance by lowering sand and clay specific weights
- Final gradation was 5% clay and 95% sand
- Models further calibrated by adjusting sand specific weight
- Measured data may have errors

Name: Tuttle Elong Brune Calib	
Transport Potential:	--None--
Cohesive Potential:	--None--
* Specific Gravity:	2.65
* Clay Specific Weight (LB/FT3)	23.2
* Silt Specific Weight (LB/FT3)	65
* Sand Specific Weight (LB/FT3)	49.57
* Fall Velocity:	Rubey
Grade Scale:	Clay Silt Sand Gravel



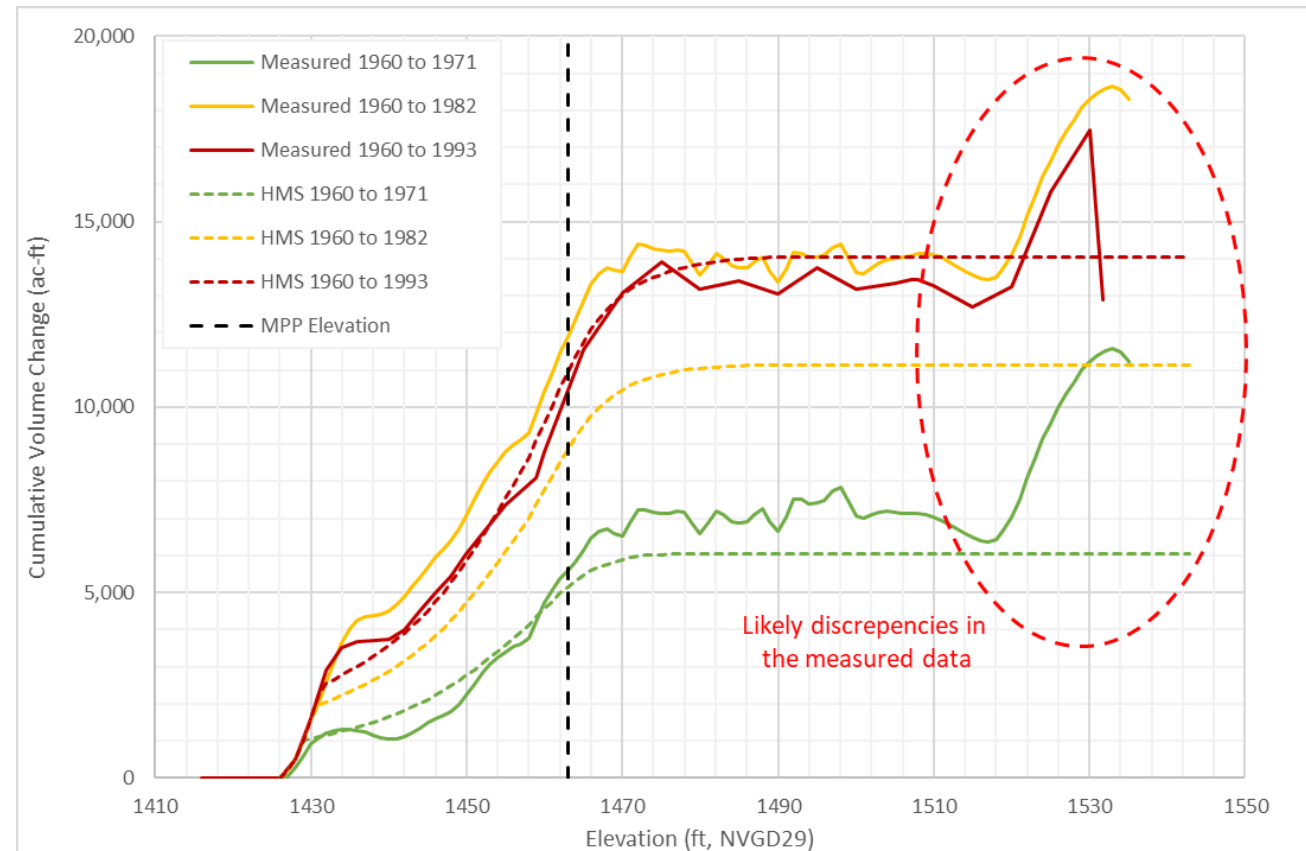


KANOPOLIS RESULTS (OLDER SURVEYS)



Calibration

- Applied same methodology as for Tuttle Creek
- Kanopolis showed more deposition at lower elevations
- Final gradation was 10% clay and 90% sand.
- Errors in the observed data.

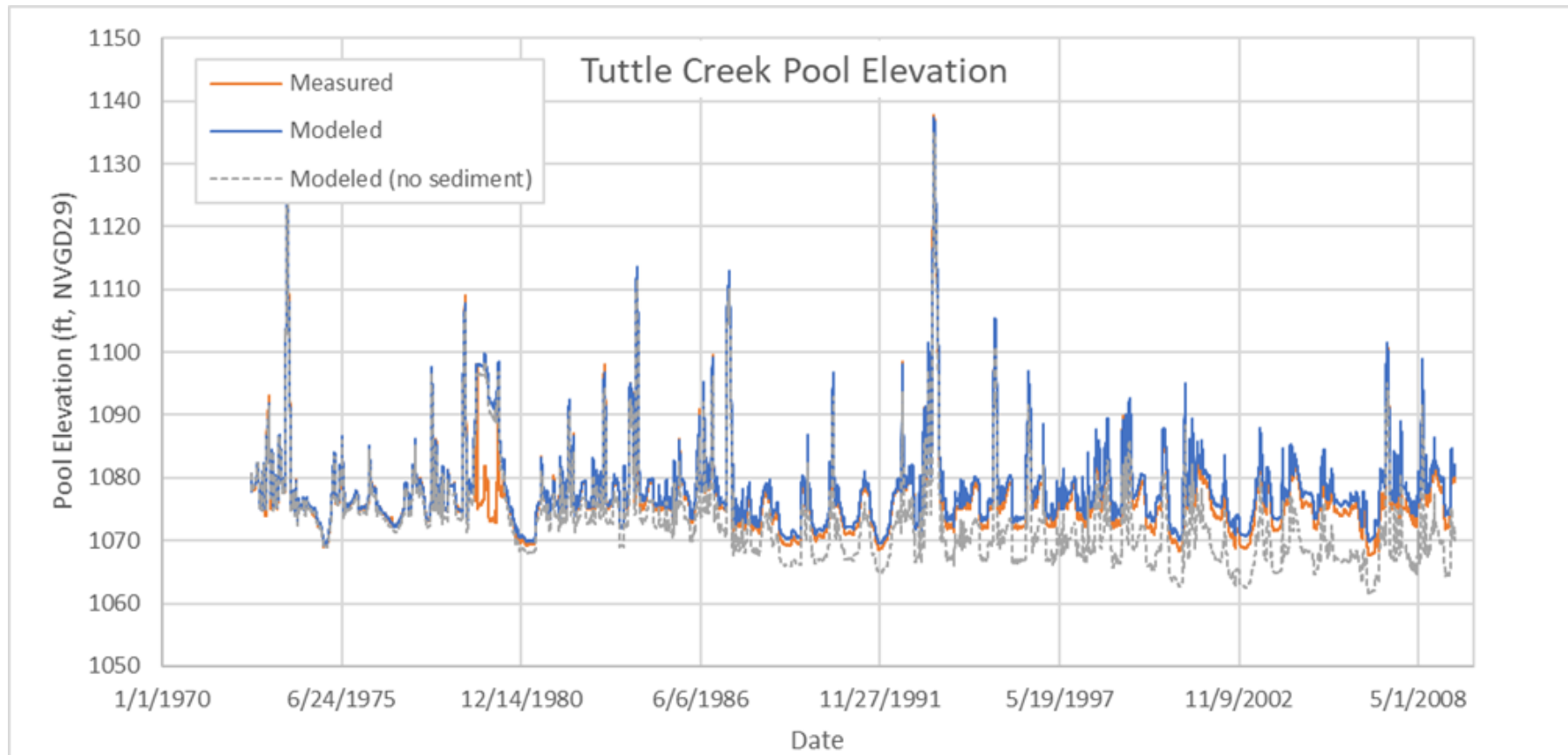




POOL ELEVATION

Modeled pool elevation matched well with observed

Without sediment, the model underpredicts stage by as much as 9 feet





HEC-RAS COMPARISON

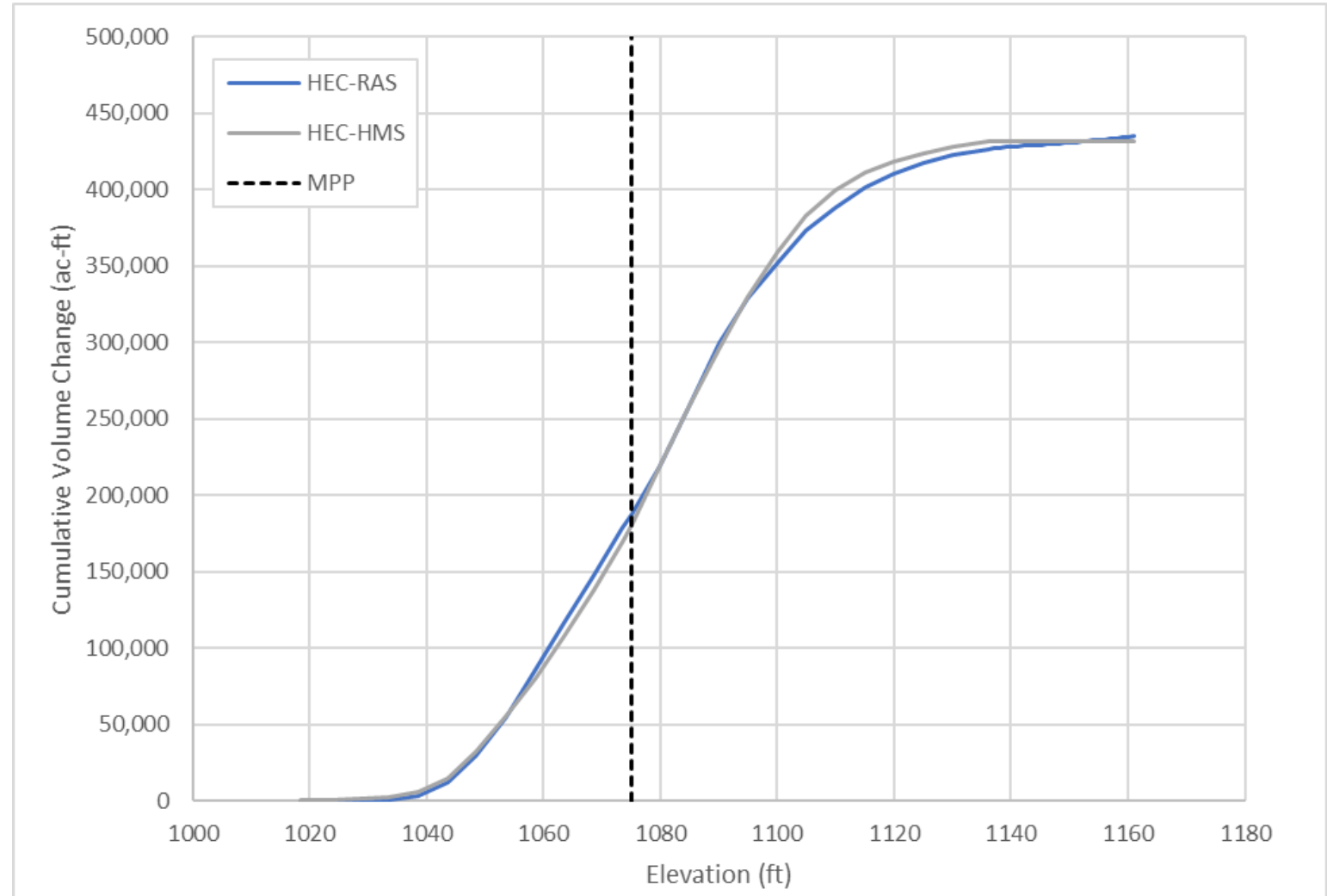


HEC-RAS Model

- 1D quasi-unsteady sediment
- Same inputs for incoming sediment load
- Calibrated to the 2009-2020 period

Comparison

- Both model agreed relatively well
- HEC-RAS deposits more sediment at higher elevations





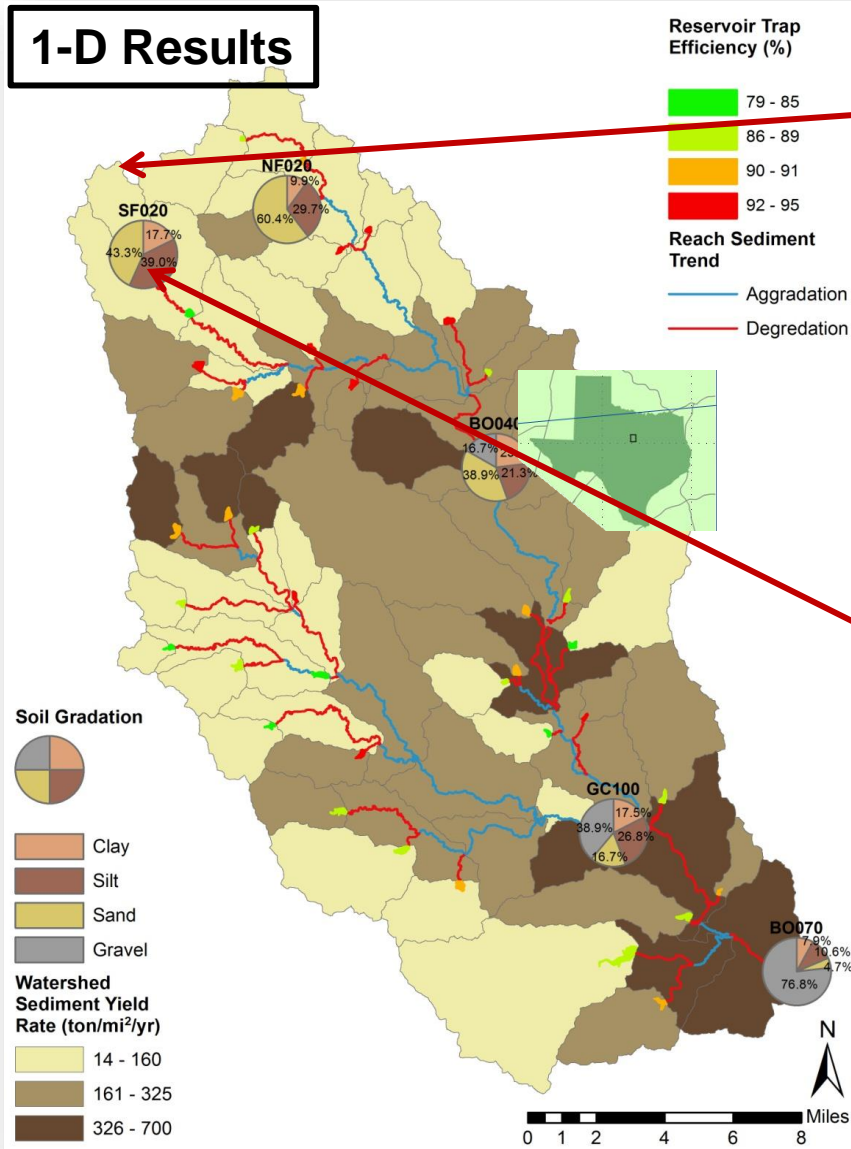
CASE STUDY: UNBRW



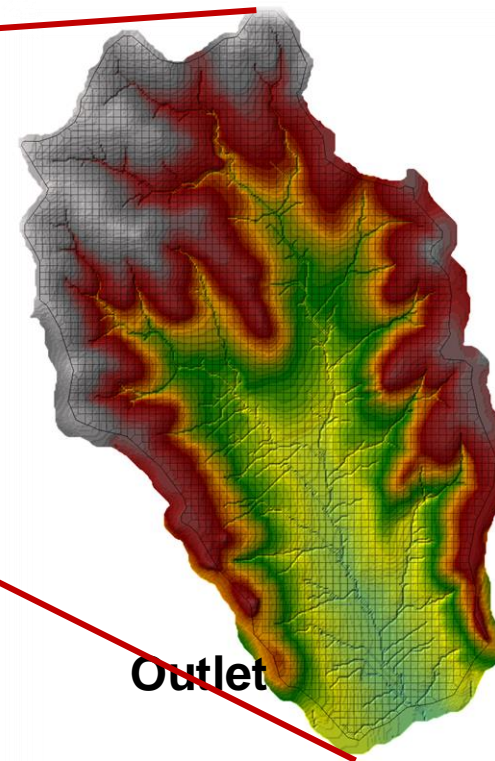
1-D Model

- Precipitation: 750 mm/year
- Soil Type: fine sandy loams
- 1D Area: 355.6 mi² (921 km²)
- Elevation: 299 m - 495 m
- Subbasin: 68
- Reservoir: 40

1-D Results

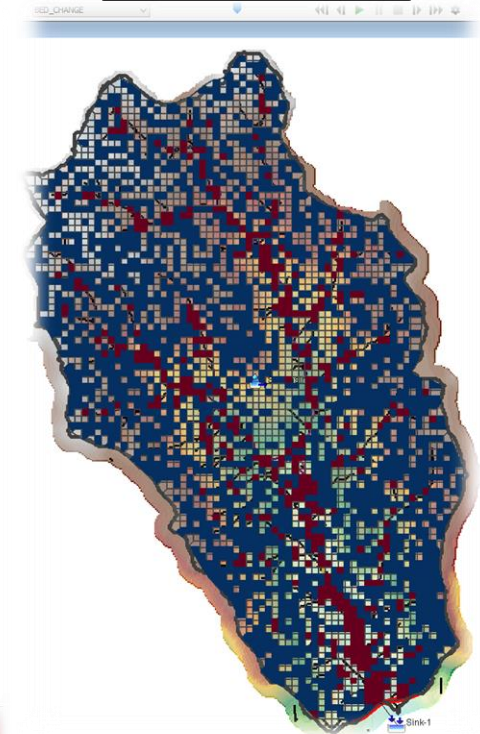


2-D Results



2-D Model

- 2D Area: 3.3 mi² (8.5 km²)
- Elevation: 1457 ft – 1624 ft (444 m – 495 m)
- Terrain Model: 10 m DEM
- Grid Cell Number: 4035
- Grid Cell Size: 150 ft X 150 ft



2-D STM Results

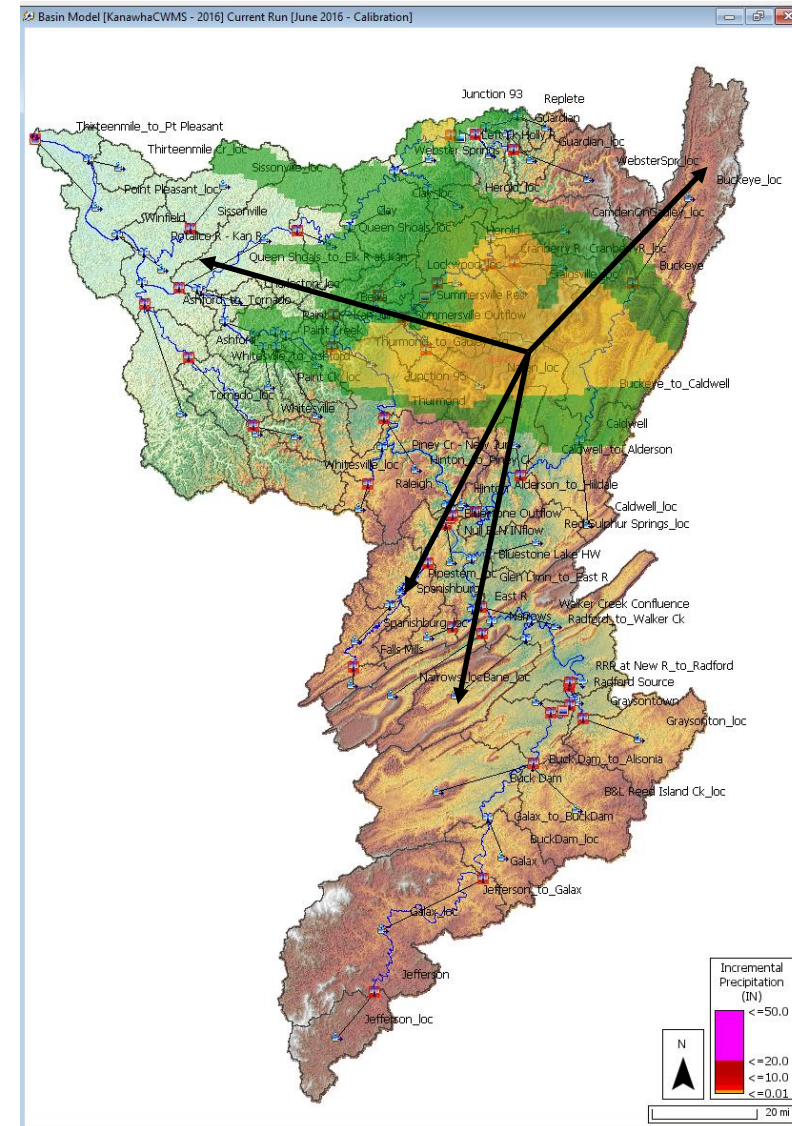
- Water Depth
- Flow Velocity
- Concentration
- Bed Change

Upcoming Enhancements

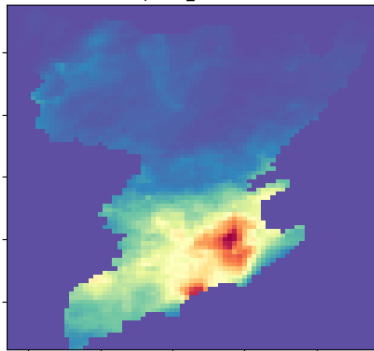
- Ensemble analysis enhancements
- Time-varying parameters
- Temporal disaggregation of daily gridded inputs
- Gridded data modeling enhancements
- ***Stochastic Storm Transposition***
Sediment transport and debris flow enhancements



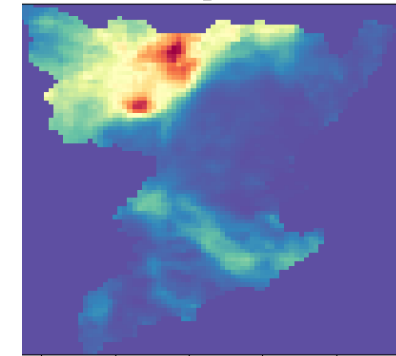
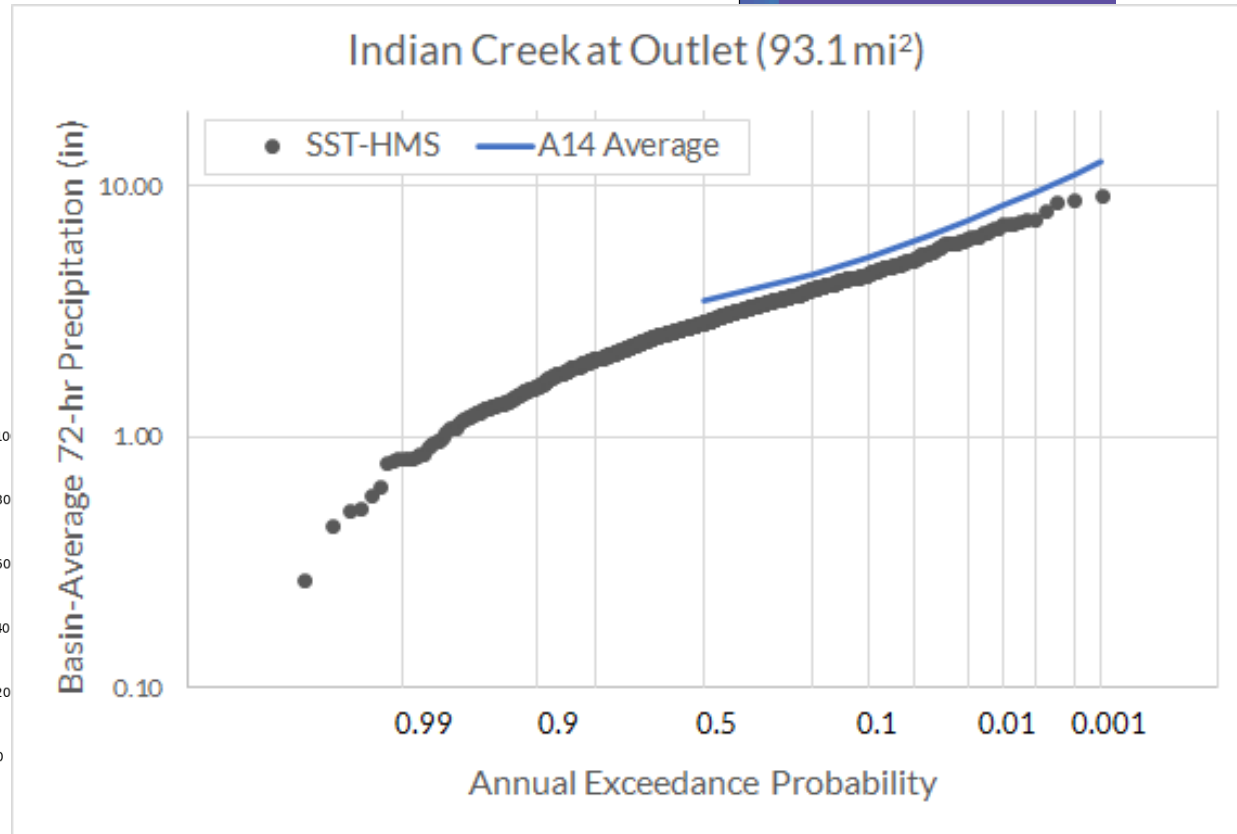
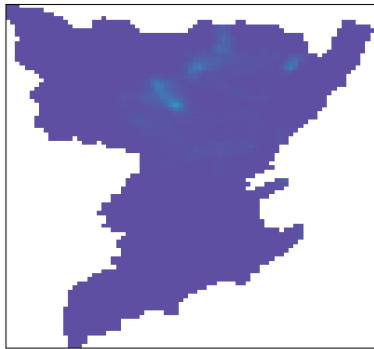
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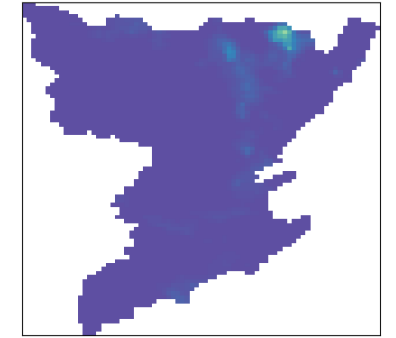
Stochastic Storm Transposition



2009-09-20 00



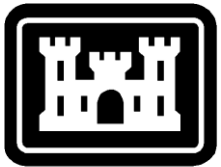
2009-09-20 00



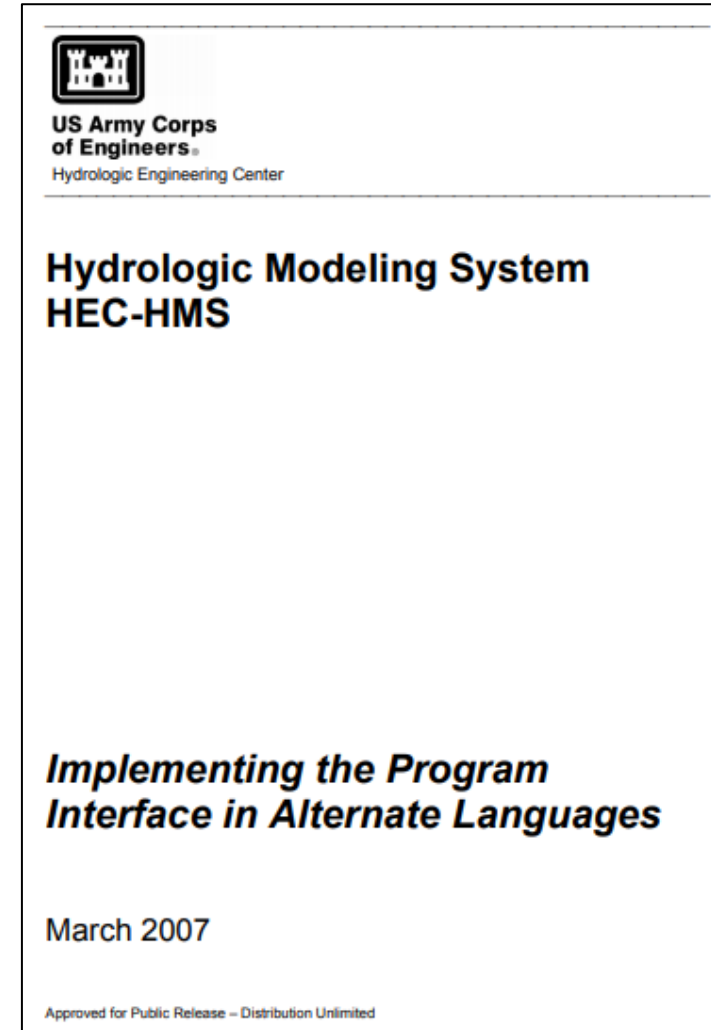
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Interface Translation

- HEC-HMS was designed to operate independent of regional and language settings on a user's computer
- 95+ language, countries, and/or locales are supported

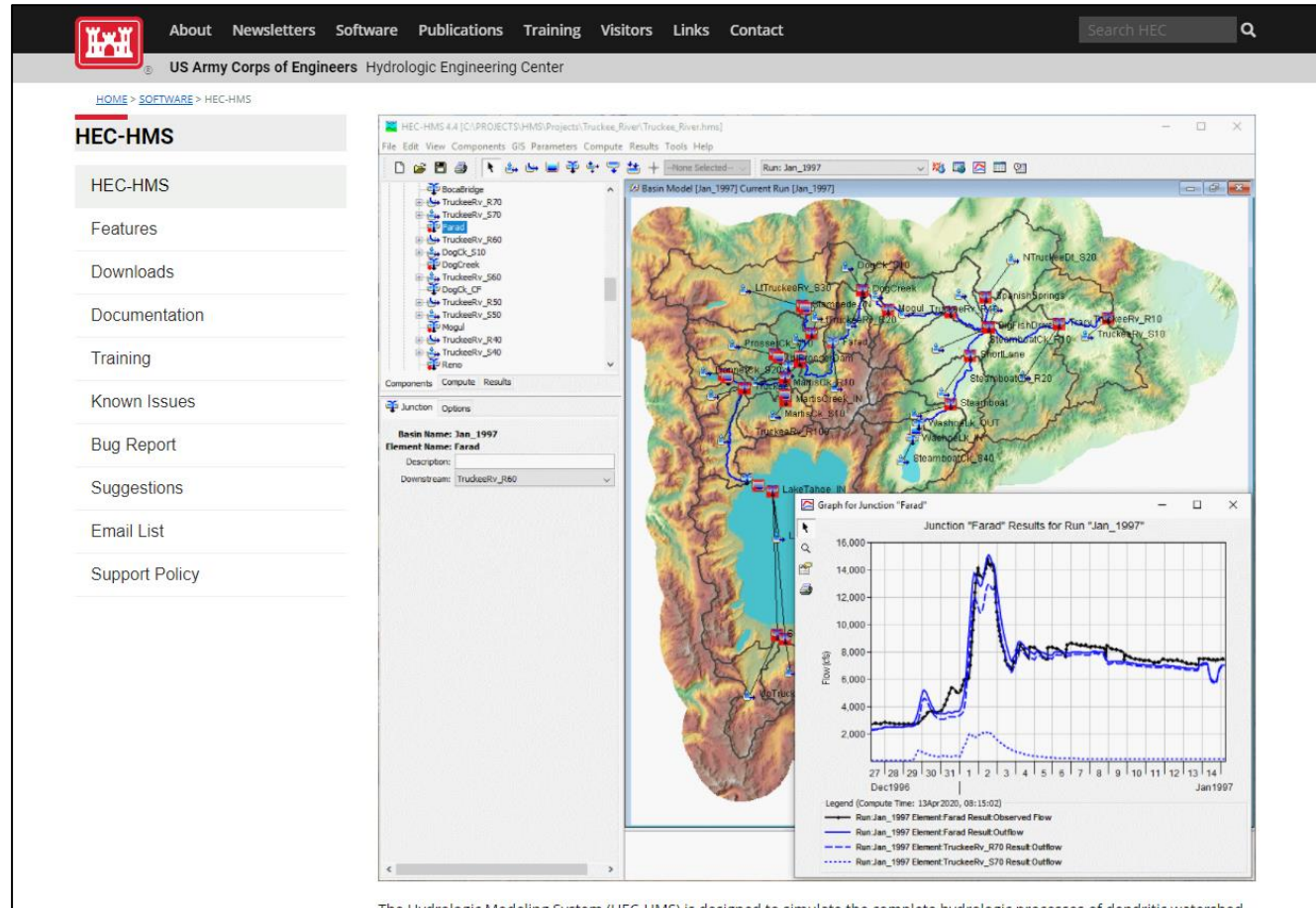


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Thank You!



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