

Unit 02: Simulation Scenario Setup Research and Data Entry

WEB-BASED FLOOD INUNDATION MODELING WITH DSS-WISE WEB: A
SHORT COURSE ON RECENT UPDATES WITH HANDS-ON TRAINING

For
FEDERAL EMERGENCY
MANAGEMENT AGENCY



FEMA



Technical Workshop

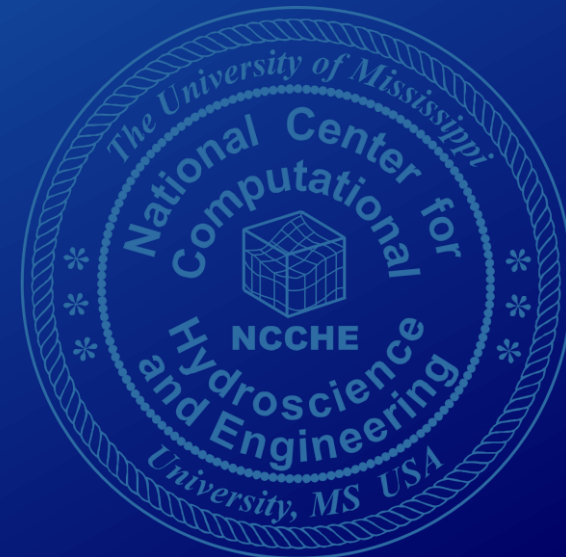
September 26th, 2024

Colorado Convention Center, Meeting Room 403

700 14th St, Denver, CO 80202

Developed by

NATIONAL CENTER FOR COMPUTATIONAL HYDROSCIENCE AND ENGINEERING
THE UNIVERSITY OF MISSISSIPPI



DSS-WISE™ Web Viewer Graphical User Interface (GUI)

2.1

DSS-WISE™ Web Viewer

Left panel offers six tabs: PREP TOOL, TOOLS, LAYERS, GROUPS, SIMULATION LIST and DOCUMENTATION.

PREP TOOL tab offers Simulation Overview, Reservoirs & Dams, Breach Parameters, Levees, Bridges to Remove, Observation Lines, Simulation Parameters and Review & Submit.

The screenshot shows the DSS-WISE Web Viewer interface. At the top, there is a header with the logo, the text "DSS-WISE Web Viewer", and user information including "UNITED STATES" and "Nuttita Pophet". A settings gear icon is also present. Below the header is a navigation bar with six icons representing different functions. The main content area is divided into a left sidebar and a central map viewer window. The sidebar contains a "Simulation Overview" section with several tabs: "Reservoirs & Dams", "Breach Parameters", "Levees", "Bridges to Remove", "Observation Lines", "Simulation Parameters", and "Review & Submit". Below these tabs, there is a message "Setup was loaded from #76532." with a "Remove" button, a "Reset Prep Tool" button, and a "Next" button. The map viewer window shows a map of the United States with various cities and states labeled. A scale bar at the bottom indicates distances in miles and feet. A feedback button is visible on the right side of the map. Several callout boxes with arrows point to specific UI elements: "Main functions" points to the navigation bar; "Data prep steps" points to the sidebar tabs; "Indicate link to a previous simulation. Click on the 'Remove' button to remove this link" points to the "Remove" button; "Reset all data input to data Prep Tool" points to the "Reset Prep Tool" button; "Proceed to next step" points to the "Next" button; "Zoom" points to the zoom in/out buttons; "Group info" points to the "UNITED STATES" button; "User info" points to the "Nuttita Pophet" button; "Settings" points to the settings gear icon; "Fullscreen map" points to the fullscreen icon; "Feedback" points to the feedback button; "Map Viewer window" points to the map area; "Show map extent" points to the scale bar; and "Viewer Settings" points to the settings dialog box. The "Viewer Settings" dialog box shows version information and two checked options: "Show elevation under cursor (uses more data and CPU)" and "Save session data in browser". The "Feedback" dialog box asks "How would you rate your experience?" and shows five smiley face icons.

Main functions

Data prep steps

Indicate link to a previous simulation. Click on the "Remove" button to remove this link

Reset all data input to data Prep Tool

Proceed to next step

Settings

Viewer Settings

Version 3.0.5 built on 2021-11-05 19:36:22

Show elevation under cursor (uses more data and CPU)

Save session data in browser

Close

Fullscreen map

Feedback

How would you rate your experience?

Want feedback like this? Try Hotjar

Zoom

Group info

User info

Map Viewer window

Show map extent




© OpenStreetMap contributors. USGS 3DEP

Reservoir Details


Name ?
Reservoir 1

Give the reservoir a name that identifies it

Reservoir Point ?

The reservoir point must be defined on the map
Click a point inside the reservoir, away from any islands, shore lines, or structures

Normal Pool Elevation (ft NAVD88) ?
 644

Normal pool elevation must be less than or equal to maximum pool elevation
Water surface elevation of the reservoir at normal pool level. If the 'Show elevation under cursor' setting is enabled, you can click the crosshairs icon to the left of the input and then click a point on the map to select its elevation.

Normal Pool Volume (ac-ft) ?
1.0




Normal volume must be a number
Water volume of the reservoir at normal pool level

Maximum Pool Elevation (ft NAVD88) ?

Breach Parameters

Select the breaching structure, type and parameters of breach

Breach Center Point ?

Click a point on the active impounding structure that will be breached. For a reservoir-type breach, the cells within the footprint of this structure will have their elevations lowered according to the breach parameters selected below. For a hydrograph-type breach, water will be released downstream of the selected structure according to the given hydrograph.

Select Breach Type ?

Reservoir Type Hydrograph Type


Choose a breach type. A reservoir-type breach means that the reservoir itself is modeled in the simulation, requiring accurate reservoir pool elevation and volume combinations in an attempt to estimate the reservoir bathymetry. The selected structure must be impounding an active reservoir. A hydrograph-type breach does not require the modeling of the reservoir, but rather the breach is modeled by its outflow hydrograph.

Select Failure Type ?

Simulation Parameters

Choose modeling parameters for your simulation

Adjust Downstream Distance



Maximum Downstream Distance (miles) ?
65

This value sets the size of the domain north, south, west, and east beyond the minimum bounding box containing all active reservoir points and impounding structures. Water will exit the domain if it reaches the edge, so make sure to include all of your area of interest including the entire area of any reservoirs when filled to their maximum pool elevation. The larger the domain, the larger the potential run time to finish the simulation. The simulation will stop when water stops spreading, so limiting the domain size may end the simulation sooner. There is a limit to the maximum number of cells in a simulation domain. The area shown on the map is approximate.

Default Faster More Detail

Cell Size (ft) ?
30

The cell size determines the size of the most basic





TOOLS tab offers Elevation Profile Tool and Dams Search Tool.

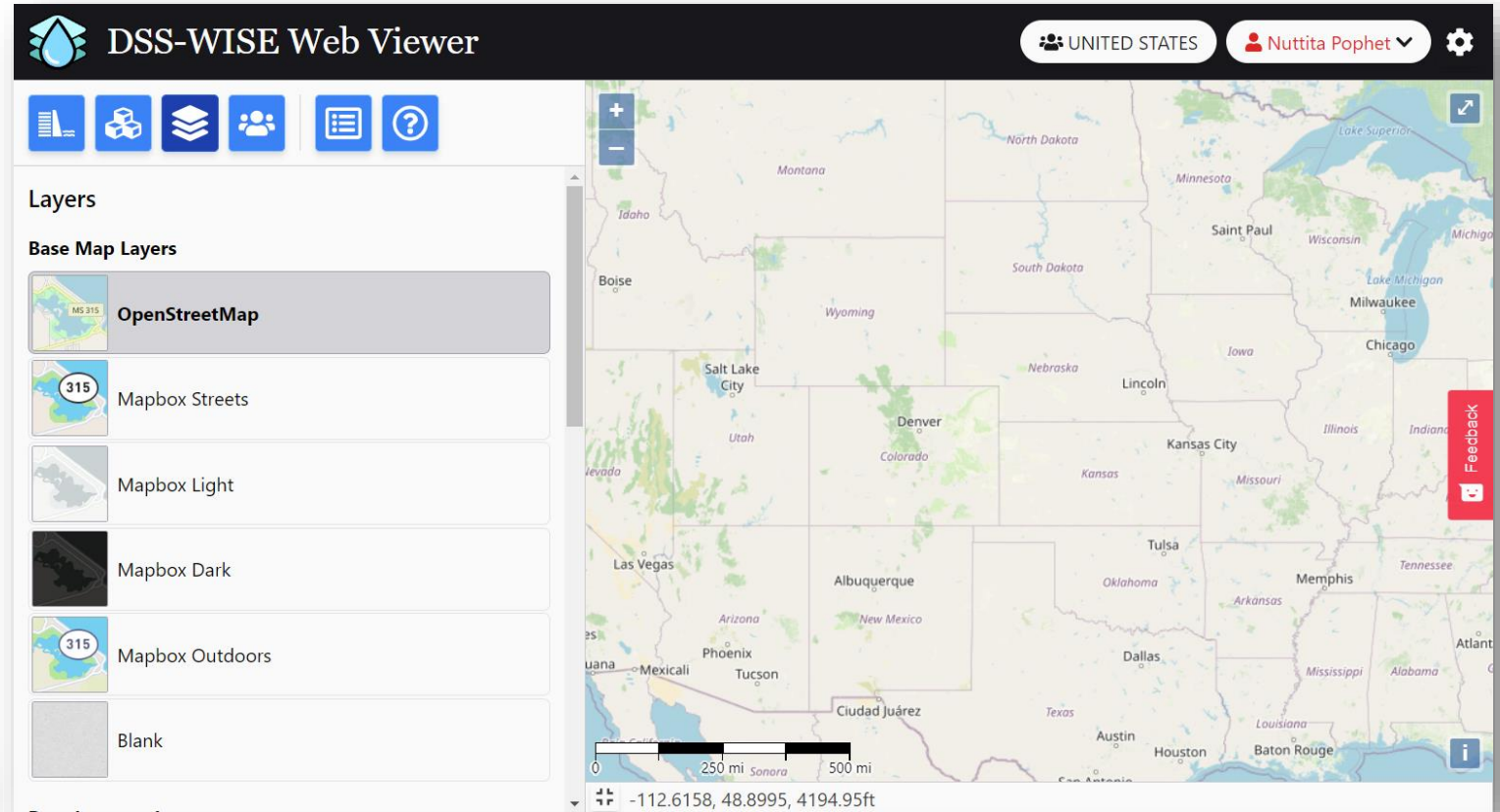
The screenshot displays the DSS-WISE Web Viewer interface. At the top left, the logo features a water drop icon next to the text "DSS-WISE Web Viewer". To the right of the logo, there are two dropdown menus: "UNITED STATES" and "Nuttita Pophet" with a gear icon for settings. Below the header is a row of six blue icons representing different map features. The main content area is titled "Tools" and contains two tool cards: "Elevation Profile Tool" with a description "Draw a profile line on the map to see a plot of elevation" and "Dams Search" with a description "Find a dam in the NID by searching for its name or NIDID". The background is a map of the United States with a red profile line drawn across the western and central regions. A scale bar at the bottom left shows 0, 250, and 500 miles. The coordinates "-119.8550, 32.1716" are displayed at the bottom center. A red "Feedback" button is visible on the right side of the map.

LAYERS tab has four sections:

- “Base Map Layers” provide five map layers and a blank layer.
- “Base Imagery Layers” provide four imagery layers.
- “Overlay Data Layers” include USGS Elevation, Group Area, Group DEM Source and national database layers.
- “Input Layers” include simulation set up features.

Base Imagery Layers

-  ESRI World Imagery
-  Bing Satellite
-  Mapbox Satellite
-  Mapbox Satellite Streets



DSS-WISE Web Viewer UNITED STATES Nuttita Pophet

Layers

Base Map Layers

- OpenStreetMap
- Mapbox Streets
- Mapbox Light
- Mapbox Dark
- Mapbox Outdoors
- Blank

Base Imagery Layers

- ESRI World Imagery
- Bing Satellite
- Mapbox Satellite
- Mapbox Satellite Streets

Overlay Data Layers

- USGS Elevation
- Group Area
- Group DEM Source
- National Inventory of Dams
- National Bridge Inventory
- National Levee Database
- National Land Cover Database

Input Layers

- Reservoirs
- Impounding Structures
- Breach Point
- User-drawn Levees
- Bridges to Remove
- Observation Lines
- Simulation Domain
- Elevation Profile

When a group is selected (in this case UNITED STATES), its geographic area is highlighted in yellow and blue stripes. The geographic area assigned to a group defines the area in which the group members can set up and launch simulations.

DSS-WISE Web Viewer

UNITED STATES Nuttita Pophet

Groups

Groups control area and administration of simulations

SHORT COURSES
This group allows running simulations anywhere in UNITED STATES for the purposes of Short Course Training.

- 0.1 - 390 miles maximum downstream distance
- 15 - 200 foot cell sizes
- 1 - 60 days maximum simulation duration

Group managers have the ability to access simulations submitted under this group

UNITED STATES
This group allows running simulations anywhere in UNITED STATES

- 0.1 - 390 miles maximum downstream distance
- 5 - 200 foot cell sizes
- 1 - 60 days maximum simulation duration

Group managers have the ability to access simulations submitted under this group

0 250 mi 500 mi

How to Use the Elevation Profile Tool and Dams Search Tool

2.2

Launching Elevation Profile Tool

First select “**Tools**” tab to display available analytical tools.

Then click on the “**Elevation Profile Tool**” button to create an elevation profile from the base DEM layer.

It is important to note that the base DEM layer does **not** represent either of the following:

- **NIL levees**
- **estimated reservoir bed topography**
- **removed bridges**

The screenshot displays a web application interface for launching the Elevation Profile Tool. On the left, a 'Tools' menu is visible, containing two options: 'Elevation Profile Tool' (with a description: 'Draw a profile line on the map to see a plot of elevation') and 'Dams Search' (with a description: 'Find a dam in the NID by searching for its name or NIDID'). A red arrow points from the text 'Then click on the “Elevation Profile Tool” button' to the 'Elevation Profile Tool' button. Another red arrow points from the text 'First select “Tools” tab' to the 'Tools' tab icon in the top navigation bar. The main map area shows a geographical view of a reservoir system, including 'John W Kyle State Park', 'Elmers Hill 91 m', 'MS 315', and 'Lower Lake'. A scale bar at the bottom indicates distances of 0, 5000 ft, and 10000 ft. The coordinates at the bottom are -89.8125, 34.4444, 343.67ft. A 'Feedback' button is visible on the right side of the map.

Elevation Profile Tool: Digitizing a Line to Extract an Elevation Profile

The screenshot displays the Elevation Profile Tool interface. On the left, there is a toolbar with icons for layers, users, and help. Below the toolbar, the title "Elevation Profile Tool" is followed by a section for "Elevation Profile Line" with a search icon and a trash icon. A prompt says "Click on the map to draw/modify the line". Below that is the "Elevation Profile" section, which contains a graph with "Elevation (ft NAVD88)" on the y-axis and "Distance (ft)" on the x-axis. A "Copy Data" button is located below the graph. At the bottom left, there is a "Back" button. The main map area shows a geographic view with a red line drawn across it, representing the digitized profile. The line starts near "Lower Lake" and goes up to "Elmers Hill 91 m". A red arrow points from a text box to the last vertex of the red line. The map includes labels for "John W Kyle State Park", "Little Tallahatchie River", and "MS 315". A scale bar at the bottom indicates 0, 5000 ft, and 10000 ft. The status bar at the bottom shows coordinates and the text "Drawing: Elevation profile line".

The cursor becomes a black dot. Digitize a polyline along which the elevation profile will be extracted and plotted. **Double click the last vertex to exit edit mode.**

Elevation Profile Tool: Plotting the Elevation Profile and Exploring Elevations Along the Profile Line

The screenshot displays the Elevation Profile Tool interface. At the top, there are several icons for navigation and settings. Below these, the tool is titled "Elevation Profile Tool". A section labeled "Elevation Profile Line" shows a length of 1.62 mi and includes icons for edit, search, reverse, and delete. The main part of the interface is split into two panels. On the left is the "Elevation Profile" graph, which plots "Elevation (ft NAVD88)" on the y-axis (ranging from 150 to 350) against "Distance (mi)" on the x-axis (ranging from 0 to 1.5). A blue line represents the profile, with a callout box indicating a point at "Distance: 0.25 mi" and "Elevation: 248.41 ft". Below the graph is a "Copy Data" button and a "Back" button. On the right is a map showing the profile line overlaid on a geographic area. The map includes labels for "John W Kyle State Park", "Elmers Hill 91 m", "MS 315", "Lower Lake", and "Little Tallahatchie River". A scale bar at the bottom of the map shows 0, 5000 ft, and 10000 ft. The map coordinates are -89.8478, 34.3915, 206.96ft. A red "Feedback" button is visible on the right side of the map.

Elevation profile along the line is extracted from the base DEM layer.

The position of the point on the plot is indicated along the line displayed on the map.

When the cursor is moved over the plot area, the distance and elevation are indicated.

Elevation Profile Tool: Copy All Elevation Profile Data to the Clipboard

Elevation Profile Tool

Elevation Profile Line
Length: 1.62 mi

Elevation Profile

Distance: 0.25 mi
Elevation: 248.41 ft

Click a point on the profile to copy its elevation

Copy Data

Back

The "Back" button may be used to return to the main Tools window.

	A	B	C	D
1	Longitude	Latitude	Distance (mi)	Elevation (ft NAVD88)
2	-89.794	34.4181	0	248.41
3	-89.7941	34.41806	0	248.41
4	-89.7941	34.41802	0.01	248.41
5	-89.7941	34.41798	0.01	248.41
6	-89.7942	34.41794	0.02	248.41
7	-89.7942	34.4179	0.02	248.41
8	-89.7943	34.41786	0.02	248.41
9	-89.7943	34.41782	0.03	248.41
10	-89.7944	34.41778	0.03	248.41
11	-89.7944	34.41774	0.03	248.41
12	-89.7945	34.4177	0.04	248.41
13	-89.7945	34.41766	0.04	248.41
14	-89.7945	34.41762	0.05	248.41
15	-89.7946	34.41758	0.05	248.41
16	-89.7946	34.41754	0.05	248.41
17	-89.7947	34.4175	0.06	248.41
18	-89.7947	34.41746	0.06	248.41
19	-89.7948	34.41742	0.06	248.41
20	-89.7948	34.41738	0.07	248.41
21	-89.7949	34.41734	0.07	248.41
22	-89.7949	34.4173	0.08	248.41
23	-89.7949	34.41726	0.08	248.41
24	-89.795	34.41722	0.08	248.41
25	-89.795	34.41718	0.09	248.41
26	-89.7951	34.41714	0.09	248.41
27	-89.7951	34.41709	0.09	248.41

Clicking on "Copy Data" button copies the extracted points into the clipboard for further analysis using a third part program, such as a spreadsheet software.

Launching Dams Search Tool

The screenshot shows a web application interface for launching the Dams Search Tool. The interface is divided into three main sections:

- Top Navigation Bar:** Contains six blue icons representing different tools: a bar chart, a 3D cube, a stack of layers, a group of people, a list, and a question mark.
- Tools Sidebar:** Titled "Tools", it contains two tool buttons:
 - Elevation Profile Tool:** Features a bar chart icon and the text "Elevation Profile Tool" and "Draw a profile line on the map to see a plot of elevation".
 - Dams Search:** Features a magnifying glass icon and the text "Dams Search" and "Find a dam in the NID by searching for its name or NIDID". A red arrow points from a text box to this button.
- Map:** Displays a map of a region with a dam labeled "Elmers Hill 91 m". Other features include "John W Kyle State Park", "Lower Lake", "MS 315", and "Little Tallahatchie River". The map includes a scale bar (0 to 10000 ft), a coordinate display (-89.8125, 34.4444, 343.67ft), a zoom in (+) and zoom out (-) button, a share icon, a feedback button, and an information icon (i).

Click on the “**Dams Search**” button to find a dam in the NID by searching for its **name** or **NID ID**.



Dams Search Tool

NID Search Term ?

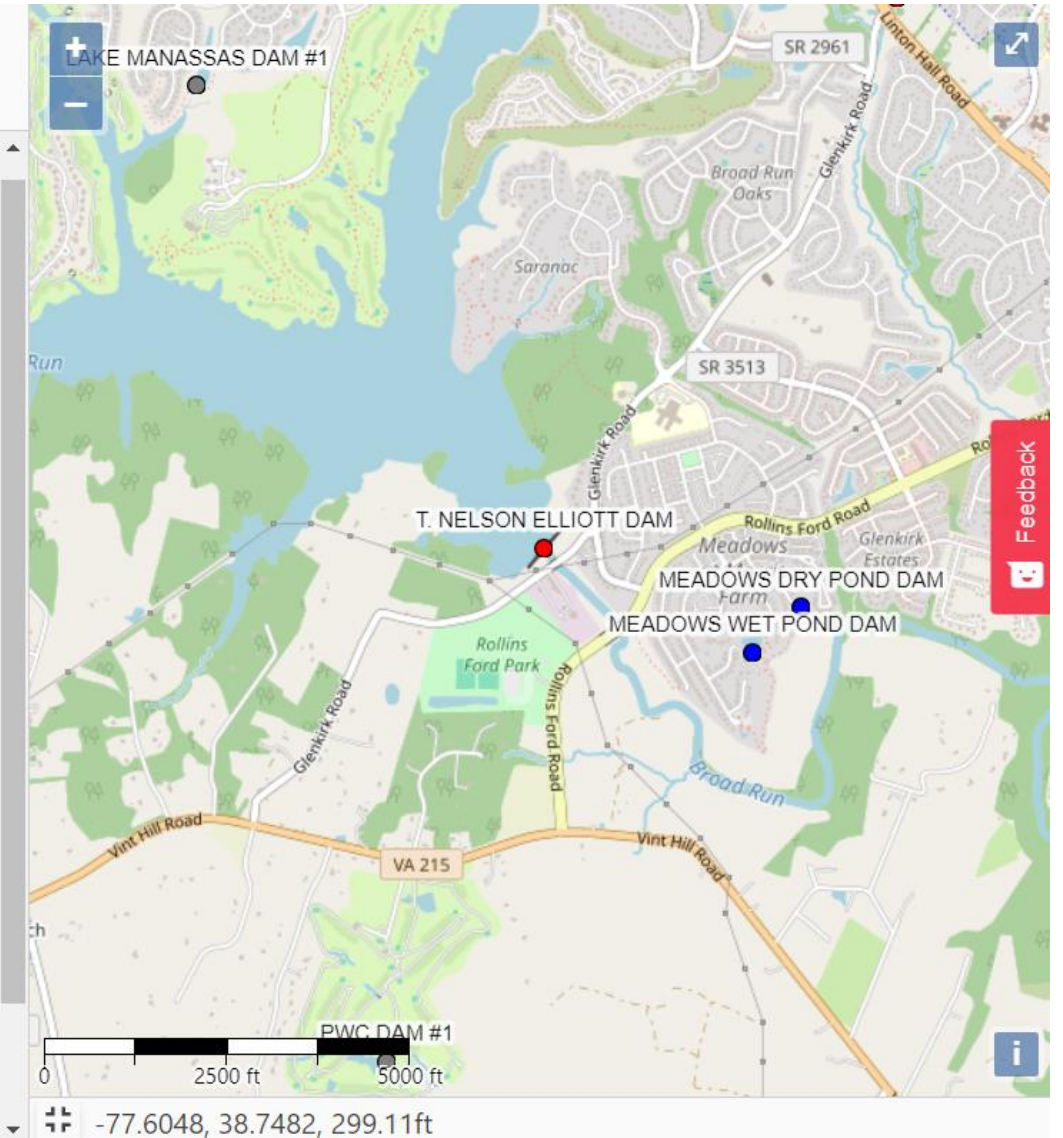
T. N

Type at least 3 characters of a query to search for

Results:

Name	READING ANTHRACITE CO - NEW ST. NICHOLAS BREAKER	Import +
NIDID	PA83520	
Hydraulic Height (ft)		
Normal Storage (ac-ft)	0	
Max. Storage (ac-ft)	4,100	
Hazard	● High	

Name	T. NELSON ELLIOTT DAM	Import +
NIDID	VA153002	
Hydraulic Height (ft)	76	
Normal Storage (ac-ft)	16,000	
Max. Storage (ac-ft)	33,000	
Hazard	● High	



As the user starts typing the **name** (or **NID ID**) of the dam, the possible choices are populated in a list below.

T. Nelson Elliott Dam is already in the list and can be selected.

Click on the result to zoom in to the dam on the map viewer.

Click on the **“Import”** button to add reservoir and dam to simulation setup.

Example based on T. Nelson Elliott Dam:
Characteristics of the Dam and the Reservoir

2.3

Description of the test Case: T. Nelson Elliott Dam (VA15302) / Location of the Facility





<http://patch.com/virginia/manassas/an--manassas-city-rehabilitates-tn-elliottlake-manassas-dam>

T. Nelson Elliott Dam in Virginia, will be used as a test case to demonstrate the capabilities offered by the DSS-WISE™ Web and the new DSS-WISE™ Lite capability

Short Course NID Number	VA15302
Dam Name	T. Nelson Elliott Dam
NID Number	VA15302
Maximum Storage (Acre-ft)	28000
Pool Elevation at Maximum Storage (ft)	302
Normal Pool Storage (Acre-ft)	15951
Pool Elevation at Normal Pool (ft)	290
Normal Pool Surface Area (Acres)	750
Dam Crest Elevation (ft)	302
Dam Crest Length (ft)	1250
Hydraulic Height (ft)	60
Elevation of the toe of the dam (=302-60)	242

The T. Nelson Elliott Dam is located in Prince William County, Virginia. It is a composite dam that consists of both concrete and earthen sections. The dam is 1,306 feet long and 74 feet high from the dam crest to the stream. The dam was designed in 1968 by Hayes, Seay, Mattern & Mattern and is categorized as a Class I (high hazard) dam by the Virginia Department of Conservation and Recreation (DCR), which is the regulatory agency that has jurisdiction over the dam.

(http://en.wikipedia.org/wiki/Burke_Lake)

Description of the test Case: T. Nelson Elliott Dam (VA15302) / Data from NID

Dam Name	T. Nelson Elliott Dam
River	Broad Run
State	VA
County	PRINCE WILLIAM
NID Height (ft)	79
Dam Length (ft)	1250
Owner Name	City of Manassas
Private Dam	N
NID Storage	28000
Max Discharge	0
Max Storage	28000
Drainage Area	60
Longitude	-77.6216
Latitude	38.7633
Dam Designer	Hayes, Seay, Mattern & Mattern, Inc.
Core	
Foundation	
EAP	Y
Inspection Date	2/9/2004
Spillway Type	U
Spillway Width	0
NIDID	VA15302
Owner Type	Local Government
Dam Type	Gravity
Primary Purpose	Hydroelectric
All Purposes	Hydroelectric, Water Supply
Other Dam Name	Broad Run Dam
Inspection Frequency	0
Dam Height (ft)	79
Structural Height (ft)	0
Hydraulic Height (ft)	60
Surface Area	750

Dam Name	T. Nelson Elliott Dam
State Reg. Dam	Y
State Reg. Agency	
Year Completed	1968
State ID	15302
Section	
Year Modified	
Outlet Gates	
Volume	0
Number of Locks	0
Length of Locks	0
Width of Locks	0
Fed Funding	
Fed Design	
Fed Construction	
Fed Regulatory	
Fed Inspection	
Fed Operation	
Fed Owner	
Fed Other	
Source Agency	VA
Submit Date	07/23/2008
Congressional District	VA11
Political Party	D
Normal Storage	15951
Congressional Rep.	Gerald E. Connolly (D)
Other Structure Id	
URL Address	
Number of Separate Structures	0
Permitting Authority	Y
Inspection Authority	Y
Enforcement Authority	Y
Jurisdictional Dam	Y

Estimation of Breach Parameters

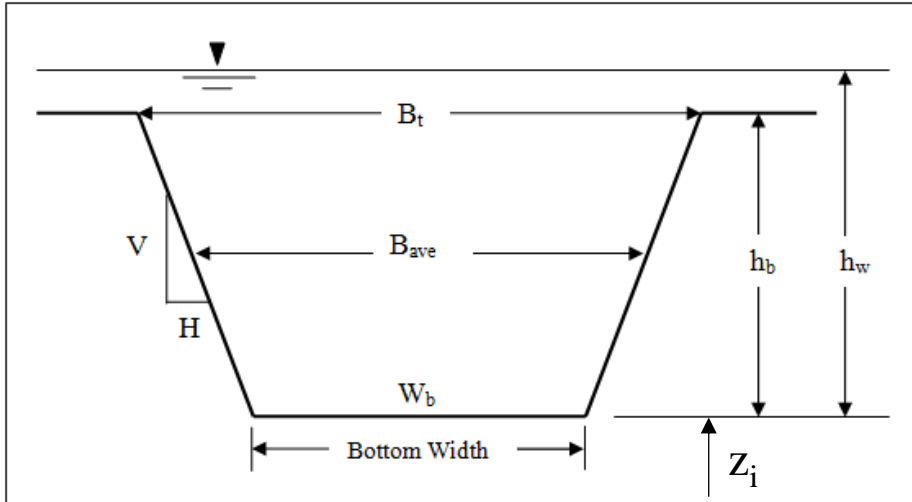
2.4

Idealized Breach Geometry for Embankment Dam and Available Semi-Empirical Parametric Equations

DSS-WISE™ Lite uses the parametric model approach for defining the breach parameters of embankment dams.

The breach is assumed to have a trapezoidal shape.

The bottom width of the breach and the formation time of the breach are needed.



B_t = Top width of breach

B_{ave} = Average width of breach

W_b = Bottom width of breach

T_f = Formation time of breach

h_w = Depth of water above bottom of breach

h_b = Height from top of dam to bottom of breach

Z_i = Breach invert elevation

Parameters needed by DSS-WISE™ Lite

When an embankment dam is selected, the user is invited to provide the breach bottom elevation and choose the failure mode either overtopping or piping.

Based on the data given by the user, the DSS-WISE™ Lite provides the user with breach parameters computed utilizing the following three equations:

Froehlich (1995)
Froehlich (2008)
Von Thun & Gillette (1990)

The user can either select one of the three pre-computed set of parameters or choose to enter their own set of values. Additionally, the user can define if the embankment is “erosion resistant” or “easily erodible”.

Input data needed from the user to compute breach parameters with different equations:

	MacDonald and Langridge-Monopolis	Froehlich (1995)	Froehlich (2008)	Von Thun & Gillette
1	Embankment Top Length =			
2	Top of Dam Elev. =	Top of Dam Elev. =	Top of Dam Elev. =	Top of Dam Elev. =
3	Pool Elev. =			
4	Channel Invert Elev. =			
5	Breach Invert Elev. =	Breach Invert Elev. =	Breach Invert Elev. =	Breach Invert Elev. =
6	Volume @ Pool Elev. =	Volume @ Pool Elev. =	Volume @ Pool Elev. =	Volume @ Pool Elev. =
7	Dam Crest Width, C =			
8	U/S SS =			
9	D/S SS =			

1
0
1
1

K_o =	K_o =	C_B =
Side Slope =	Side Slope =	Side Slope =

Selected based on the mode of failure (overtopping or piping). We can directly ask the failure type and select the values accordingly.

Depends on the reservoir volume and can be automatically selected.

Selected based on the soil type (cohesionless or cohesive).

Popular Semi-Empirical Parametric Equations for Embankment Dam Breach

Froehlich (1995a):

Froehlich utilized 63 earthen, zoned earthen, earthen with a core wall (i.e. clay), and rockfill data sets to develop a set of equations to predict average breach width, side slopes, and failure time. The data that Froehlich used for his regression analysis had the following ranges:

- **Height of the dams:** 3.66 – 92.96 m (12 – 305 ft)
 - with 90% < 30 m, and 76% < 15 m
- **Volume of water at breach time:** 0.0130 – 660.0 m³ x 10⁶ (11 - 535,000 acre-ft)
 - (with 87% < 25.0 m³ x 10⁶, and 76% < 15.0 m³ x 10⁶)

$$B_{ave} = 0.1803 K_o V_w^{0.32} h_b^{0.19}$$

$$t_f = 0.00254 V_w^{0.53} h_b^{-0.90}$$

- Where:
- B_{ave} = Average Breach Width (m)
 - K_o = Constant (1.4 for overtopping failures, 1.0 for piping)
 - V_w = Reservoir volume at time of failure (m³)
 - h_b = Height of the final breach (m)
 - t_f = Breach formation time (hrs).

Froehlich states that the average side slopes should be:

- 1.4H:1V Overtopping failures
- 0.9H:1V Otherwise (i.e. piping/seepage)

Froehlich (2008):

In 2008 Dr. Froehlich updated his breach equations based on the addition of new data. Dr. Froehlich utilized 74 earthen, zoned earthen, earthen with a core wall (i.e. clay), and rockfill data sets to develop a set of equations to predict average breach width, side slopes, and failure time. The data that Froehlich used for his regression analysis had the following ranges:

- **Height of the dams:** 3.05 – 92.96 m (10 – 305 ft)
 - with 93% < 30 m, and 81% < 15 m
- **Volume of water at breach time:** 0.0139 – 660.0 m³ x 10⁶ (11.3 - 535,000 acre-ft)
 - (with 86% < 25.0 m³ x 10⁶, and 82% < 15.0 m³ x 10⁶)

$$B_{ave} = 0.27 K_o V_w^{0.32} h_b^{0.04}$$

$$t_f = 63.2 \sqrt{\frac{V_w}{gh_b^2}}$$

- Where:
- B_{ave} = Average Breach Width (m)
 - K_o = Constant (1.3 for overtopping failures, 1.0 for piping)
 - V_w = Reservoir volume at time of failure (m³)
 - h_b = Height of the final breach (m)
 - g = Gravitational acceleration (9.80665 m/s²)
 - t_f = Breach formation time (Seconds).

- 1.0 H:1V Overtopping failures
- 0.7 H:1V Otherwise (i.e. piping/seepage)

Von Thun and Gillette (1990):

Von Thun and Gillette used 57 dams from both the Froehlich (1987) paper and the MacDonald and Langridge-Monopolis (1984) paper to develop their methodology. The method proposes to use breach side slopes of 1.0H:1.0V, except for dams with cohesive soils, where side slopes should be on the order of 0.5H:1V to 0.33H:1V. The data that Von Thun and Gillette used for their regression analysis had the following ranges:

- **Height of the dams:** 3.66 – 92.96 m (12 – 305 ft)
 - with 89% < 30 m, and 75% < 15 m
- **Volume of water at breach time:** 0.027 – 660.0 m³ x 10⁶ (22 - 535,000 acre-ft)
 - with 89% < 25.0 m³ x 10⁶, and 84% < 15.0 m³ x 10⁶

$$B_{ave} = 2.5 h_w + C_b$$

- Where:
- B_{ave} = Average breach width (m)
 - h_w = Depth of water above the bottom of the breach (m)
 - C_b = Coefficient, which is a function of reservoir size, see below.

Reservoir Size, m ³	C_b , meters	Reservoir Size, acre-feet	C_b , feet
< 1.23*10 ⁶	6.1	< 1,000	20
1.23*10 ⁶ - 6.17*10 ⁶	18.3	1,000-5,000	60
6.17*10 ⁶ - 1.23*10 ⁷	42.7	5,000-10,000	140
> 1.23*10 ⁷	54.9	>10,000	180

Concrete Dam Failure

Estimation of breach parameters for concrete dams is challenging. There are no widely accepted procedures or clear guidelines.



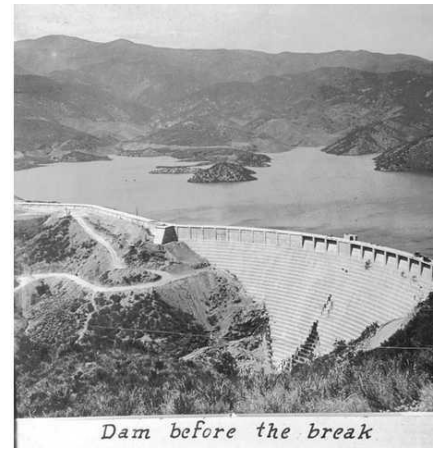
Remnants of the Austin, Pennsylvania, dam after its failure on September 30, 1911.

Concrete dams are built as vertical monoliths that are later connected together.

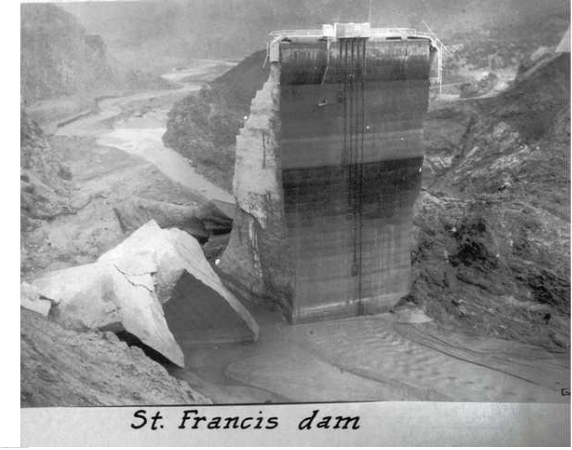
Estimate how many monoliths will fail?



Sweetwater Dam failure of 1916



Dam before the break



St. Francis dam

On March 12, 1928, St. Francis Dam gives way in Los Angeles, failed killing over 500 people. The St. Francis Dam was a curved concrete gravity dam, built to create a large regulating and storage reservoir as part of the Los Angeles Aqueduct.

Shih Kang Dam, Taiwan, damaged in the 7.6-magnitude Chi Chi earthquake in September 1999. It is the first concrete dam known to have failed in an earthquake.
(<http://www.wenatcheeworld.com/photos/2013/mar/08/189085/>)



Estimated Breach Characteristics for T. Nelson Elliott Dam (VA15302)

MacDonald and Langridge-Monopolis

* envelope equation (tend to give high estimates)

Note: The MLM equation uses volume thru the breach in its equation but for simplicity, the volume at time of failure was used. As a result, if significant volume passes through the spillway, the volume used in the calculation may be a little high. However, the Max High breach is usually the only scenario where this could happen because all other scenarios are below the spillway.

V_{eroded}	=	89	ac-ft	109,540	m ³	slopes: 0.5	
t_f	=	1.2	hrs	1.2	hrs	379	B_t = Top Width (ft)
W_b	=	319	ft	97	m	TRUE	Fits within embankment?

Froehlich (1995)

K_o	=	1.4	Constant (1.4 for overtopping failures, 1.0 for piping)				
Side Slope	=	1.4	H:1V Slopes: 1.4 overtopping; 0.9 piping				
B_{ave}	=	372	ft	113	m	456	B_t = Top Width (ft)
W_b	=	288	ft	88	m	TRUE	Fits within embankment?
t_f	=	1.8	hrs	1.8	hrs		

Froehlich (2008)

K_o	=	1.3	Constant (1.3 for overtopping failures, 1.0 for piping)				
Side Slope	=	1.3	H:1V Slopes: 1.3 overtopping; 0.9 piping				
B_{ave}	=	334	ft	102	m	412	B_t = Top Width (ft)
W_b	=	256	ft	78	m	TRUE	Fits within embankment?
t_f	=	1.8	hrs	1.8	hrs		

Von Thun & Gillette

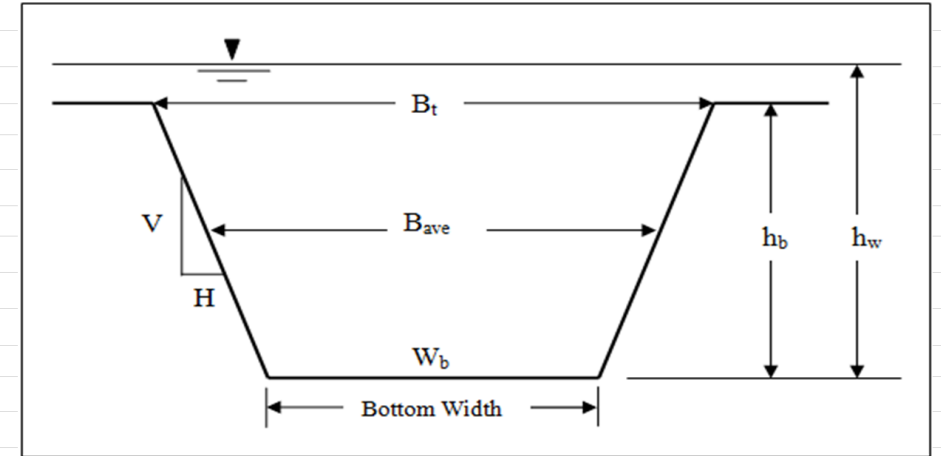
C_B	=	20	ft	6.1	m	(Width based on reservoir size (See table below))	
Side Slope	=	1.0	H:1V Slopes: 1.0 ; 0.5-0.33 for cohesive soils				
B_{ave}	=	170	ft	52	m	230	B_t = Top Width (ft)
$W_{b_{f1}}$	=	110	ft	34	m	TRUE	Fits within embankment?
t_{f1}	=	0.6	hrs	0.6158	hrs	(erosion resistant)	
t_{f2}	=	0.3	hrs	0.2743	hrs	(easily erodible)	

Reservoir Size	C_B (ft)	C_B (m)
< 1,000 ac-ft	20	6.1
1,000 - 5,000 ac- ft	60	18.3
5,000 - 10,000 ac- ft	140	42.7
> 10,000 ac-ft	180	54.9

Choose either t_{f1} or t_{f2} (do not add)

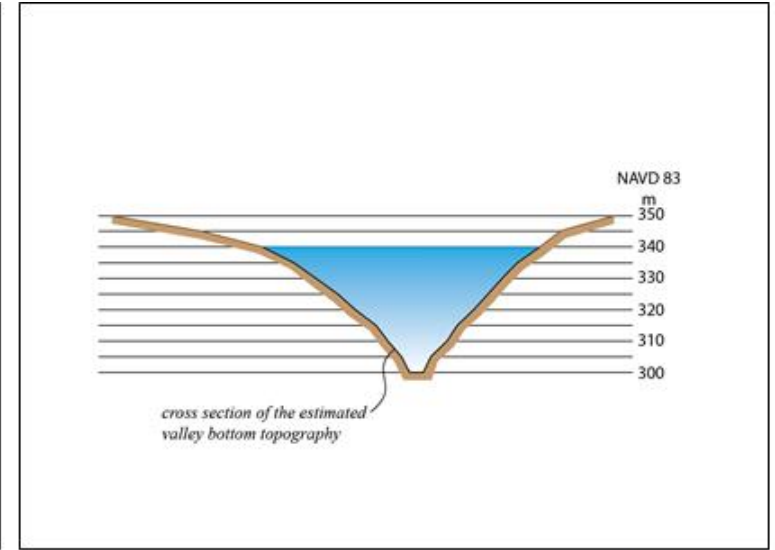
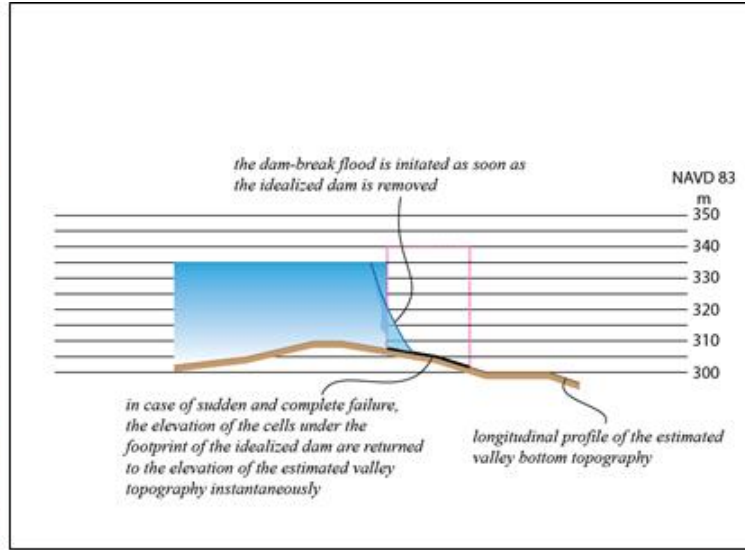
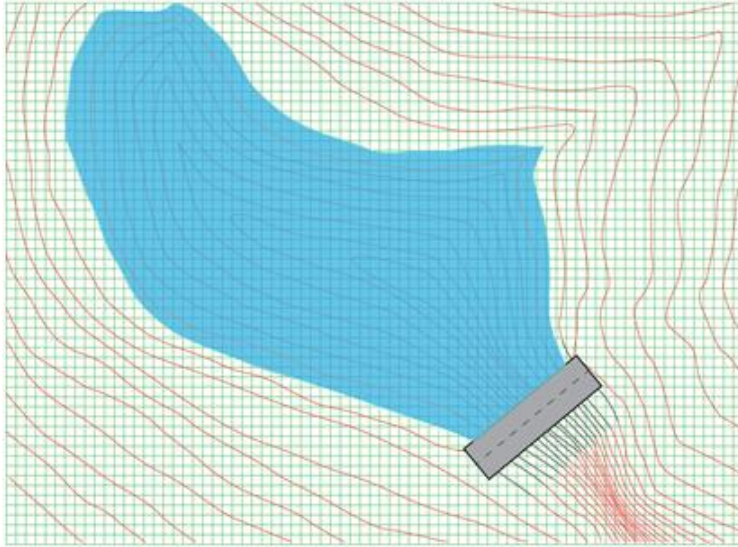
Summary of Methods

Method	Bottom Width (ft)	Time (Hrs)	
MLM	319	1.2	
Froehlich (1995)	288	1.8	
Froehlich (2008)	256	1.8	
VTG	110	0.6	erosion resistant
		0.3	easily erodible



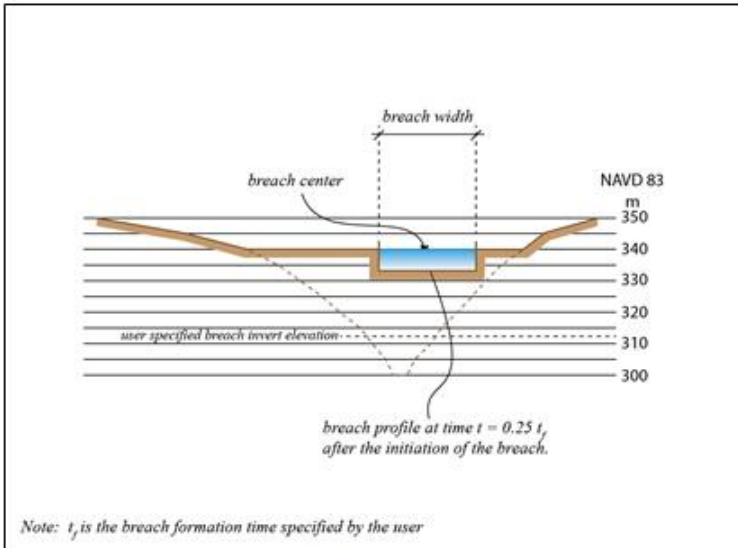
Breach Invert Elevation: 242 (=302-60) ft NAVD 88
 Breach Width: 180 ft
 Breach Formation Time: 0.3 hrs

Simplified Illustration of the Estimation of the Removal of Dams, Reservoir Bed Elevation, and Breaching Process / 4

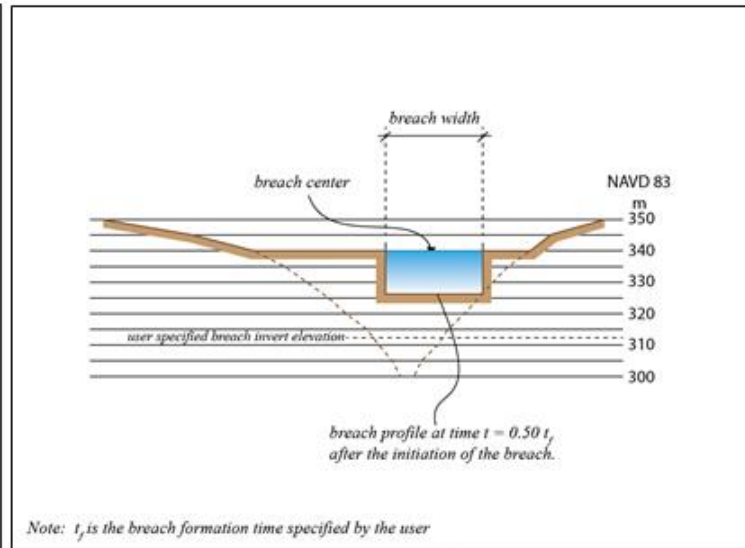


Reservoir is filled up to the water surface elevation at failure, which is specified by the user

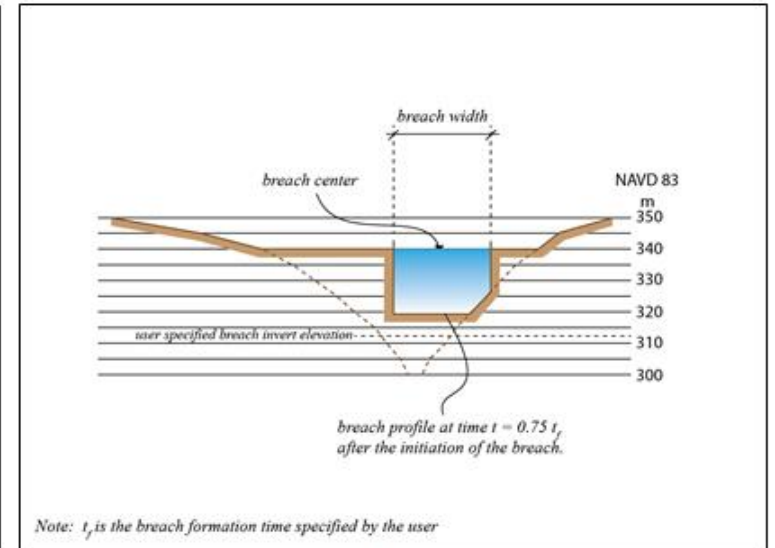
Transversal profile A-A and longitudinal profile BB show that, in case of sudden and complete failure, elevation of cells defining idealized dam are returned to their estimated valley elevation. This initiates the dam-break flood



Note: t_b is the breach formation time specified by the user



Note: t_b is the breach formation time specified by the user



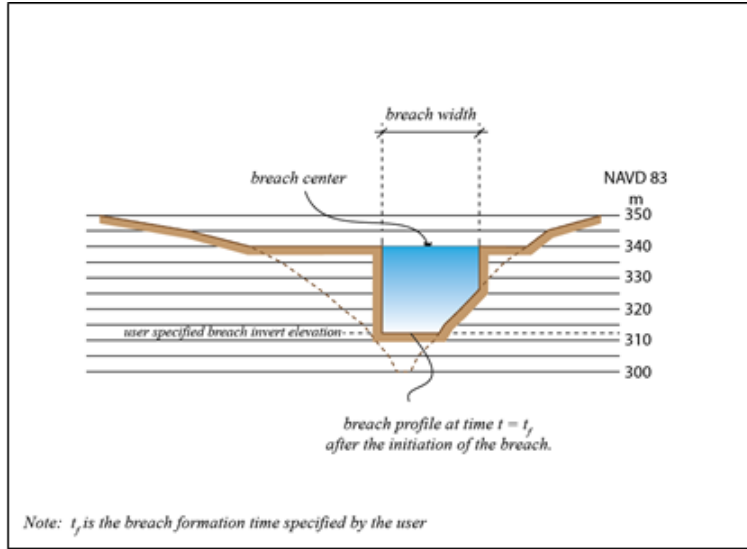
Note: t_b is the breach formation time specified by the user

In case of partial and gradual failure cells under the footprint of the breach area are lowered with a linear speed

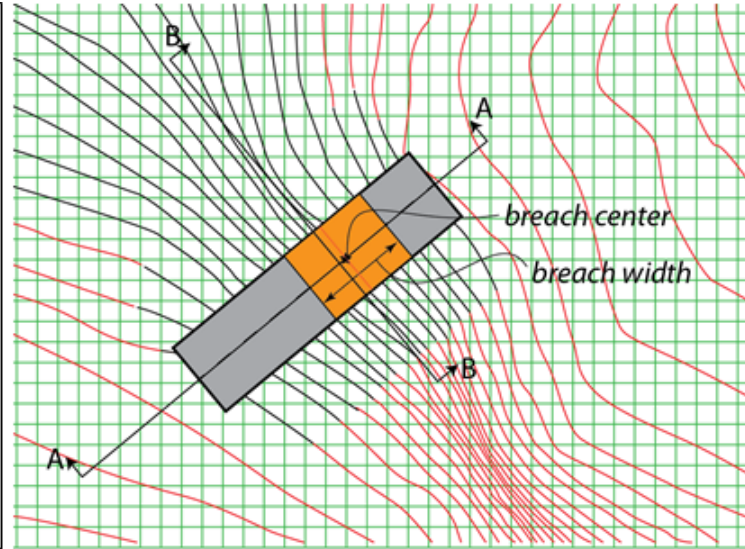
Note that as the elevation of the cells are lowered to create the breach, they do not cut into the original terrain

When the elevation of the cell becomes equal to the estimated valley elevation, it is no longer lowered

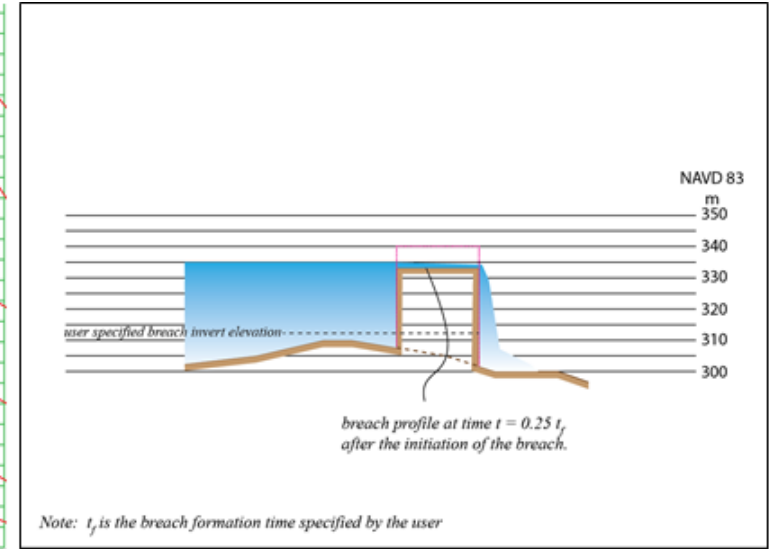
Simplified Illustration of the Estimation of the Removal of Dams, Reservoir Bed Elevation, and Breaching Process / 5



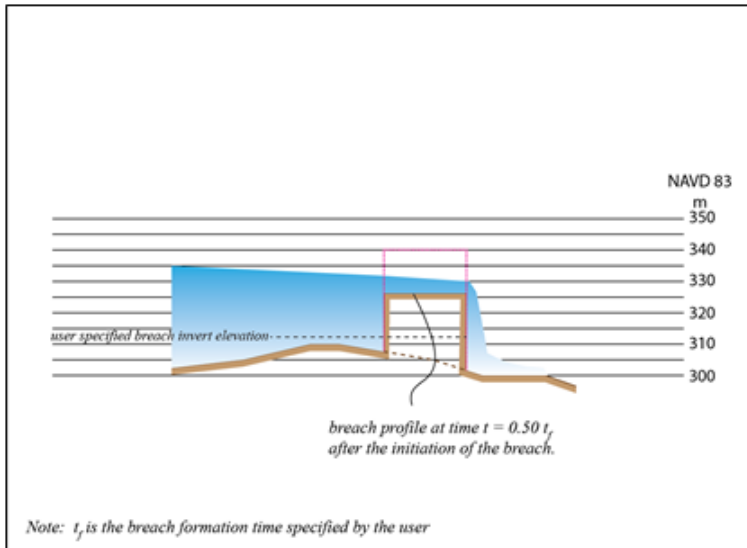
When all the cells reach the specified breach invert elevation, or the estimated valley elevation, breaching stops



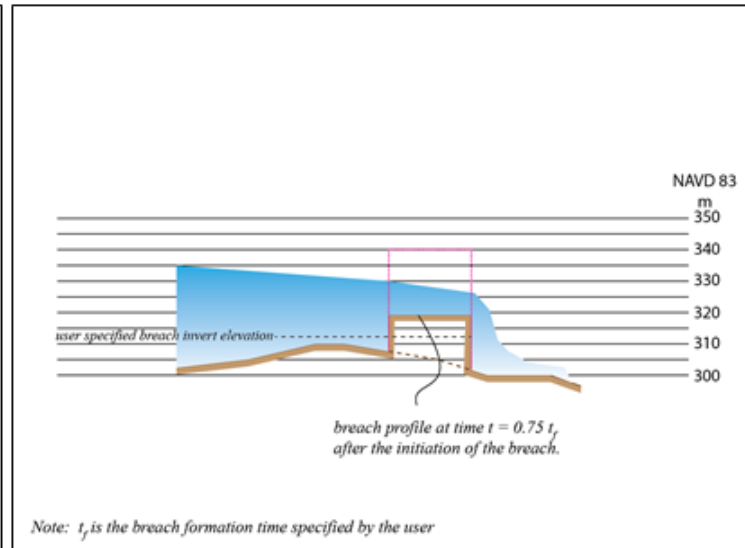
Let us now observe the partial and gradual breaching process on the longitudinal profile B-B



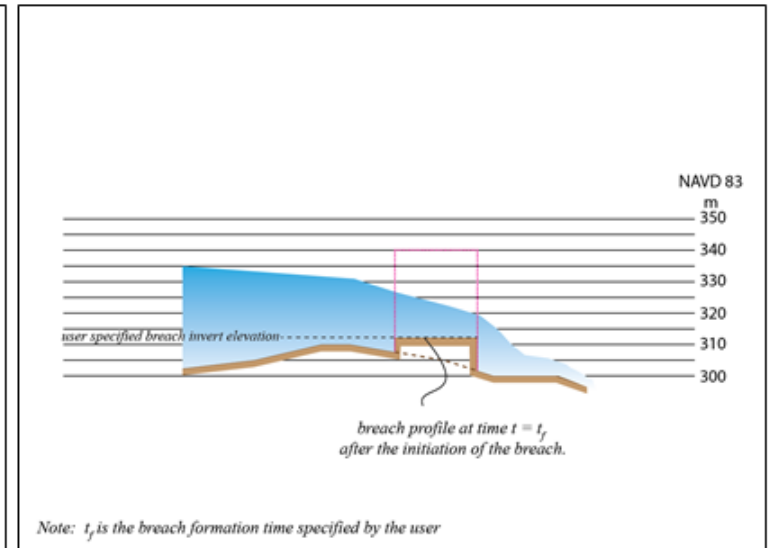
At $t = 0.25 t_p$, cells are lowered by an amount equal to $\frac{1}{4}$ of the elevation difference between the crest and breach invert



At $t = 0.50 t_p$, cells are lowered by an amount equal to $\frac{1}{2}$ of the elevation difference between the crest and breach invert



At $t = 0.75 t_p$, cells are lowered by an amount equal to $\frac{3}{4}$ of the elevation difference between the crest and breach invert



At $t = t_p$, the breaching process is completed since all cells have reached the elevation of breach invert of the valley

DSS-WISE™ Lite Prep Tool

2.5

PREP TOOL Tab: Reservoirs & Dams

By default, the “PREP TOOL” and “Simulation Overview” tabs are active. Click on “Reservoirs & Dams” button to begin setting up a simulation.

The screenshot displays the DSS-WISE Web Viewer interface. The top header shows the application name and a user profile for Nuttita Pophet. The left sidebar contains a 'Simulation Overview' menu with several options: 'Reservoirs & Dams' (highlighted with a red box), 'Breach Parameters', 'Levees', 'Bridges to Remove', 'Observation Lines', 'Simulation Parameters', and 'Review & Submit'. A red button labeled 'Reset Prep Tool' is located at the bottom of the sidebar. The main area features a map of the United States with various cities and states labeled. A red box highlights the 'UNITED STATES' group name in the top right corner, with a red arrow pointing to it. A callout box with a white background and black text explains: 'The group under which the simulation will be prepared and submitted (in this case UNITED STATES). To change working group, click on group name to access “GROUPS” tab.' A 'Next' button is visible at the bottom left of the map area.

DSS-WISE Web Viewer

UNITED STATES | Nuttita Pophet

Reservoirs & Dams

Model reservoirs and the structures that impound them

2 Add Reservoir

Click on **"Add Reservoir"** button to begin setting up a simulation.

Denote **errors** in the current setup

Dam Search Tool

Click to access **"Dam Search Tool"**

Errors:

- There must be at least one reservoir, even if it is inactive
- There must be at least one active dam

Prev Next

Scale: 0 to 500 miles. Coordinates: -108.8306, 49.2051, 2971.56ft

PREP TOOL Tab: Reservoirs & Dams

Reservoir Details guides the user to input information on the reservoir to be modeled.

Provide **“Reservoir Name”**

Select the **“Reservoir Point”** by clicking on **“Draw feature”** button and selecting a point inside the reservoir, away from any islands, shorelines, or structures.

Click to select an elevation by clicking on the map

DSS-WISE Web Viewer

UNITED STATES Nuttita Pophet

Reservoir Details

Name
Reservoir 1

Reservoir Point

Normal Pool Elevation (ft NAVD88) 1.0

Normal Pool Volume (ac-ft) 1.0

Maximum Pool Elevation (ft NAVD88) 1.0

Maximum Pool Volume (ac-ft) 1.0

Failure Pool Elevation (ft NAVD88) 1.0

Failure Pool Volume (ft) 1.0

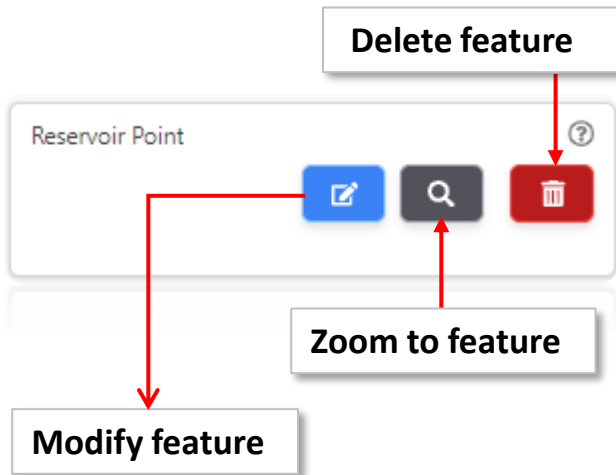
Done

Map: Broad Run, Eagle Island, Glenkirch Elementary School, Spoke Way Drive, Brown Thrasher, Warrenton Drive, SR 3505, -77.6341, 38.7589, 341.40ft

Provide Normal pool elevation (ft. NAVD88) - Water surface elevation of the reservoir at normal pool level,
Normal pool volume (ac-ft.) - Water volume of the reservoir at normal pool level,
Maximum pool elevation (ft. NAVD88) - Water surface elevation of the reservoir at maximum pool level. The other pool levels must be less than or equal to this,
Maximum pool volume (ac-ft.) - Water volume of the reservoir at maximum pool level. The other pool levels must be less than or equal to this,
Failure pool elevation (ft. NAVD88) - Water surface elevation of the reservoir at the start of the failure scenario. The value is automatically set to the maximum pool elevation until the user modifies this field, and
Failure pool volume (ac-ft.) - Water volume of the reservoir at the start of the failure scenario. The bathymetry estimation process will attempt to match this volume. The value is automatically set to the maximum pool volume until the user modifies this field.

After the “Reservoir Point” is selected, the user can:

- Modify the point by clicking on the “**Modify feature**” button,
- Zoom to the point by clicking on the “**Zoom to feature**” button, or
- Delete the point by clicking on the “**Delete feature**” button.



The screenshot shows the DSS-WISE Web Viewer interface. At the top, it displays 'DSS-WISE Web Viewer', 'UNITED STATES', and the user 'Nuttita Pophet'. The left sidebar contains various tool icons. The main panel is titled 'Reservoir Details' and lists the following information:

Field	Value
Name	T. NELSON ELLIOTT DAM Reservoir
Reservoir Point	Draw/modify the reservoir point on the map
Normal Pool Elevation (ft NAVD88)	290
Normal Pool Volume (ac-ft)	15951
Maximum Pool Elevation (ft NAVD88)	302
Maximum Pool Volume (ac-ft)	28000
Failure Pool Elevation (ft NAVD88)	290

The map on the right shows the reservoir with a blue dot representing the 'Reservoir Point' in edit mode. A red arrow points to this dot with the text: 'The “Reservoir Point” in edit mode.' Another red arrow points to the 'Stop modifying' button (a blue circle with a white 'X') in the 'Reservoir Point' section of the details panel, with the text: 'Click on “Stop modifying” button to stop modifying the “Reservoir Point”.' A 'Done' button is located at the bottom of the details panel. The status bar at the bottom shows coordinates and the text: 'Modifying: T. NELSON ELLIOTT DAM Reservoir'.

Dam Details guides the user to input information concerning all structures impounding a reservoir. **More than one structure can be defined but note that only one of these structures can be breached.** For each structure, the user is prompted to provide:

- The **Name of the structure**, the **Crest Elevation** (in ft. NAVD 88), the **Hydraulic Height** of the structure (in ft.), **NID ID** (optional), the **Structure Types**, and
- The **Dam Crest Line** by draw a line on the map along the centerline of the structure. Make sure to draw it long enough to intersect the abutments at an elevation that will contain the reservoir at its maximum pool elevation.

Once the dam crest line is fully defined, the line on the map will expand to show the approximate base width and average width. The **blue side** is upstream (facing the reservoir) while the **red side** is downstream. The user can click **“Flip feature”** button, if otherwise.

The screenshot displays the DSS-WISE Web Viewer interface. At the top, it shows the application name 'DSS-WISE Web Viewer', the location 'UNITED STATES', and the user 'Nuttita Pophet'. Below the header is a navigation bar with icons for home, layers, users, lists, and help. The main content area is divided into a left sidebar with tool icons and a central panel for 'Dam Details'. The 'Dam Details' form includes fields for Name (T. Nelson Elliott Dam), Dam Crest Line (Length: 1,372 ft), Crest Elevation (ft NAVD88) (302), Hydraulic Height (ft) (60), NID ID (optional) (VA15302), and Structure Types (Embankment and Gravity checked, Concrete Arch unchecked). A red box highlights the 'Flip feature' button in the 'Dam Crest Line' section. The right side of the interface shows a map of the dam area with a scale bar and coordinates (-77.6247, 38.7687, 288.52ft).

In some cases, there may be more than one structure impounding the same reservoir/pool, such as a main dam and a saddle dam.

DSS-WISE™ Lite allows defining multiple impounding dams for the same reservoir. However, only one of the structures can be breached.

IMPORTANT NOTE: In the NID, the NID ID is not a unique number. When multiple structures are impounding the dam, they may share the same NID. A search of the NID using NIDID may return multiple structures. It is user's responsibility to make sure that the properties are entered correctly for each impounding structure.



Main Dam

Saddle Dam

PREP TOOL Tab: Reservoirs & Dams

When edit mode is activated the color of the crest line changes to blue color.



Position the cursor on the vertex to be corrected



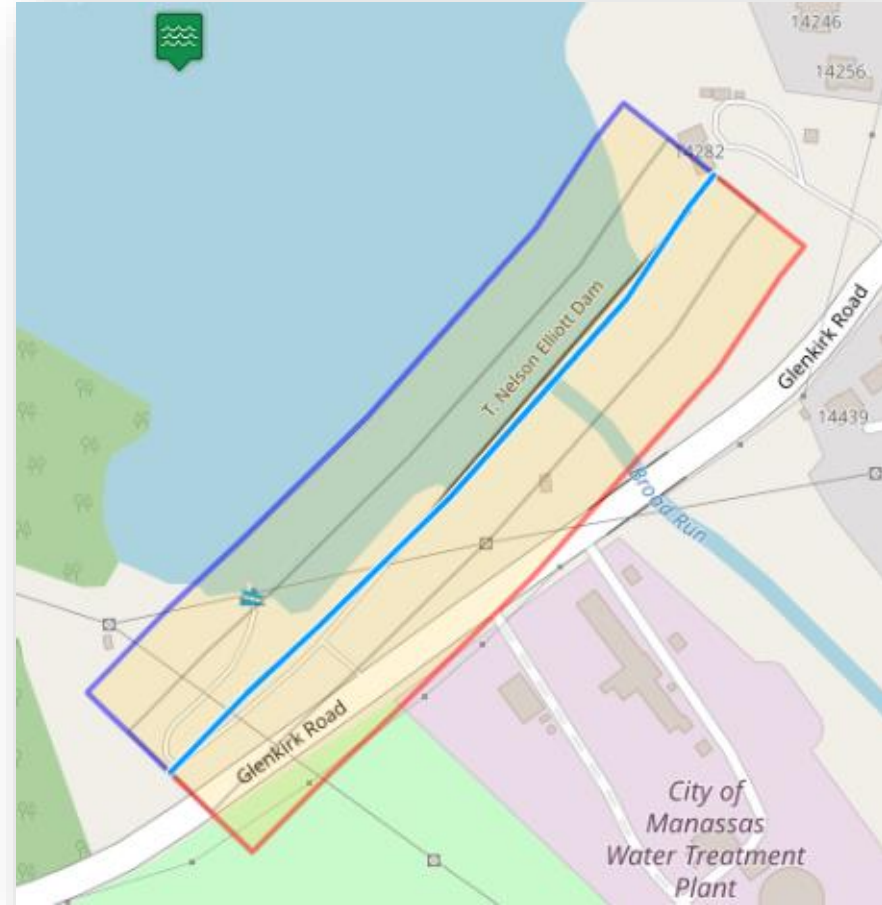
Click on the vertex to be corrected and drag it to the correct position and release the mouse click



The crest line has been corrected. After exiting edit mode, the crest line changes to yellow color.



One can also add a new vertex very easily. Click anywhere on the line to create a new point and drag the vertex to desired position and let go the mouse click.



Delete a point by holding down the alt keyboard button and clicking on it.

Breach Parameters prompts the user to select the breaching structure, type and parameters of breach.

Breach Center Point: Click a point on the active impounding structure that will be breached.

For a **reservoir-type breach**, the cells within the footprint of this structure will have their elevations lowered according to the breach parameters selected below.

For a **hydrograph-type breach**, water will be released downstream of the selected structure according to the given hydrograph.

The screenshot displays the DSS-WISE Web Viewer interface. The top navigation bar includes the application logo, the title "DSS-WISE Web Viewer", and user information for "UNITED STATES" and "Nuttita Pophet". A sidebar on the left contains a vertical menu of icons for various tools. The main configuration panel on the left is titled "Breach Parameters" and contains the following sections:

- Breach Center Point:** A text input field with a red border, a search icon, and a delete icon. Below it, the text "Selected dam: T. Nelson Elliott Dam, toe at 242 ft" is displayed.
- Breach Type:** Two buttons: "Reservoir" (active) and "Hydrograph".
- Failure Type:** Two radio buttons: "Sudden and Complete Failure" (selected) and "Partial Breach Failure".

At the bottom of the configuration panel are "Prev" and "Next" buttons. The right side of the interface shows a map of the T. Nelson Elliott Dam area. A red square on the dam is labeled "Breach point". An orange line along the dam's length is labeled "Breach width (orange color line)". A text box on the map states: "After selecting the breach point, the toe elevation of the dam will be displayed." The map includes a scale bar (0 to 1000 ft) and coordinates (-77.6208, 38.7668, 313.58ft).

DSS-WISE Web Viewer

Breach Parameters
Select the breaching structure, type and parameters of breach

Breach Center Point

Selected dam: T. Nelson Elliott Dam, toe at 242 ft

Breach Type

Reservoir Hydrograph

Failure Type

Sudden and Complete Failure Partial Breach Failure

Prev Next

A **reservoir-type breach** means that the reservoir itself is modeled in the simulation, requiring accurate reservoir pool elevation and volume combinations in an attempt to estimate the reservoir bathymetry. The selected structure must be impounding an active reservoir.

A **hydrograph-type breach** does not require the modeling of the reservoir, but rather the breach is modeled by its outflow hydrograph.

Sudden and complete failure causes the entire length of the structure to fail instantaneously at the very beginning of the simulation.

Partial breach gradually breaches the dam based on the final breach width and breach formation time information provided by the user. Thus, the user will be prompted to provide additional data to define breach width and breach formation time.

Breach type is chosen as Partial

Enter the numeric value of **Invert Elevation** (feet NAVD 88) of the lowest point of the breach. Breaches are modeled as rectangular progressions of the affected computational cells from the dam crest at the start of the simulation and decrease linearly to this elevation. If the **'Show elevation under cursor'** setting is enabled, you can click the **crosshairs icon** to the left of the input and then click a point on the map to select its elevation.

Viewer Settings ✕

Version 3.0.5 built on 2021-11-05 19:36:22

- Show elevation under cursor (uses more data and CPU)
- Save session data in browser

Close

Failure Type ?

Sudden and Complete Failure

Partial Breach Failure

Invert Elevation (ft NAVD88) ?

⛶

Maximum fraction of failure volume released: 100%

Select a breach equation (optional) ?

Froehlich (1995) ▼

Failure Type	Avg. Width (ft)	Formation Time (hr)
Overtopping	297.6	1.67
Piping	212.5	1.67

Average Width (ft) ?

Formation Time (hr) ?

Breach type is chosen as **Partial**

Choose a breach equation from the **drop-down** to show a list of calculated values in the table that appears below it. The user can select the values by clicking on a row of the table, but for concrete-type dam failures, only general guidance is available. The breach equation calculator will only be enabled after you've fully defined an active reservoir, selected the breach point on top of one of its fully-defined, active dams, and entered a valid breach invert elevation.

DSS-WISE Web Viewer

Failure Type

- Sudden and Complete Failure
- Partial Breach Failure

Invert Elevation (ft NAVD88) 242

Maximum fraction of failure volume released: 100%

Select a breach equation (optional)

Xu and Zhang Simplified (2009)

Failure Type	Erodibility	Avg. Width (ft)	Formation Time (hr)
Overtopping	High	464.6	1.64
Overtopping	Medium	293.3	2.84
Overtopping	Low	241.3	8.82
Piping	High	270.8	1.64
Piping	Medium	170.9	2.84
Piping	Low	140.6	8.82

Average Width (ft) 180

Formation Time (hr) 0.3

PREP TOOL Tab: Breach Parameters

Breach Hydrograph tab allows the user to define the breach hydrograph directly.

The hydrograph values should be typed or pasted from an external data source into the text area with commas, spaces, newlines, or tabs separating the values. The first value in each time-discharge pair must start at 0 with units of hours, and time values must increase monotonically. The discharge values must all be greater than or equal to 0, with units of cubic feet per second.

Breach Type

Reservoir Hydrograph

Failure Type

Sudden and Complete Failure

Partial Breach Failure

Breach Outflow Hydrograph

Discharge (cfs)

Time (hr)

Breach Outflow Hydrograph Values

0,0
1,5000
5,0

Outflow Width (ft)

180

This width determines how wide of an area, centered on the breach point, the breach hydrograph discharge will be released. It should be regarded as akin to the breach width for a reservoir-type breach.

PREP TOOL Tab: Levee Details

The screenshot displays the DSS-WISE Web Viewer interface. At the top, it shows the user's location as 'UNITED STATES' and the name 'Nuttita Pophet'. Below this is a navigation bar with various icons. The main panel is titled 'Levee Details' and contains several input fields and controls:

- Name:** 'Levee 1' (with a help icon).
- Levee Center Line:** 'Length: 1,589 ft' (with edit, search, undo, and delete icons).
- Start Elevation (ft NAVD88):** 300 (with a help icon).
- End Elevation (ft NAVD88):** 320 (with a help icon).
- Width (ft):** 300 (with a help icon).

At the bottom of the panel is an 'Elevation Profile' graph showing 'Elevation (ft NAVD88)' on the y-axis (ranging from 275 to 350) and 'Distance (ft)' on the x-axis (ranging from 0 to 1500). A data box on the graph indicates: Distance: 949.85 ft, Levee: 311.95 ft, Terrain: 288.52 ft. A 'Done' button is located at the bottom left of the panel.

The map on the right shows a geographical area with a drawn levee feature (a purple shaded area) crossing a water body labeled 'Broad Run'. A red arrow points to the drawn levee with the text 'The drawn levee'. Another red arrow points to a point on the levee with the text 'The position of the point on the plot is indicated along the line displayed on the map.' A blue arrow points to the map area with the text 'When the cursor is moved over the plot area, the distance and elevation are indicated.' A white box with a red arrow points to the width field with the text 'Width of the levee with half being to the left of the line and half being to the right. The width shown on the map is approximate.'

Enter the levee name

Click to draw feature on the map along the centerline of the levee

The elevation of the first point clicked on the drawn feature. The line's elevation will change linearly from the start elevation to the end elevation.

The elevation of the last point clicked on the drawn feature.

Elevation profiles along the levee center line.

The drawn levee

The position of the point on the plot is indicated along the line displayed on the map.

Width of the levee with half being to the left of the line and half being to the right. The width shown on the map is approximate.

When the cursor is moved over the plot area, the distance and elevation are indicated.

PREP TOOL Tab: Bridge to Remove Details

Bridge tab allows the user to identify the bridges that must be removed from the DEM to create a passage for the flood flow. This tab is optional, given the fact that normally, the bridges are not supposed to be in the in the USGS NED layer, which is used to cut out the computational domain for the simulation. Some USGS NED tiles, however, may have mistakenly left the bridges in the DEM. These bridges may be identified and taken out if their span length is greater than the cell size. Otherwise, the bridge must be considered as a sub-cell feature and ignored.

Bridge tab is selected

Select **"LAYERS"** tab and check **"National Bridge Inventory"** box to display the bridges in the databases

Bridge to Remove Details

Name

Bridge Center Point

Span Width (ft)

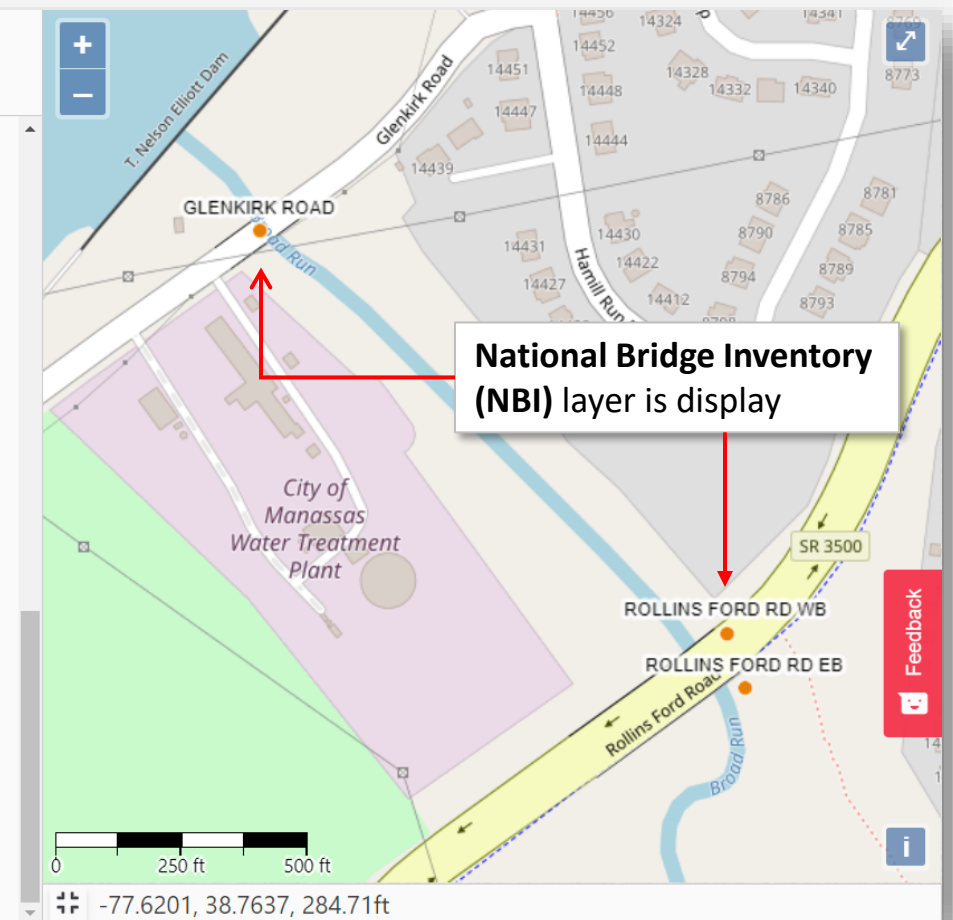
Done

Overlay Data Layers

- USGS Elevation
- Group Area
- Group DEM Source
- National Inventory of Dams
- National Bridge Inventory
- National Levee Database
- National Land Cover Database

Input Layers

- Reservoirs
- Impounding Structures
- Breach Point
- User-drawn Levees
- Bridges to Remove
- Observation Lines
- Simulation Domain
- Elevation Profile



PREP TOOL Tab: Bridge to Remove Details

Using the DEM as background layer may help in deciding whether the bridge is in the DEM or not.

The screenshot displays the DSS-WISE Web Viewer interface. At the top, the title 'DSS-WISE Web Viewer' is visible, along with user information 'UNITED STATES' and 'Nuttita Pophet'. Below the title bar is a navigation menu with icons for home, layers, users, lists, and help. The main content area is divided into a left sidebar with icons and a central panel titled 'Bridge to Remove Details'. This panel contains three input fields: 'Name' (with the value 'Buckland Mill Road Bridge'), 'Bridge Center Point' (with edit, search, and delete icons), and 'Span Width (ft)' (with the value '200'). A 'Done' button is located at the bottom of the panel. To the right of the panel is a map showing a topographic view of a bridge crossing a river. A red dot on the map is labeled 'BUCKLAND MILL ROAD'. A white box with the text 'Bridge to remove' and a red arrow points to the bridge structure. A scale bar at the bottom of the map shows 0, 100, and 200 feet, and the coordinates are -77.6656, 38.7708, 296.62ft. A 'Feedback' button is visible in the bottom right corner of the map area.

Enter the name of the bridge to remove

Click a point on the map in the center of the bridge span to be taken out of the DEM

Width of the opening underneath the bridge deck that is to be removed from the DEM to allow a hydraulic connection to be made from one side to the other

PREP TOOL Tab: Observation Line Details

Observation lines are polyline defining a transverse cross section at which it is desired to record the discharge hydrograph. Prep tool automatically defines an observation line at the crest line of the dam to measure record the bridge discharge. Observation Lines tab allows the user to define up to 10 additional observation lines, at desired locations. Observation line is defined as a polyline. The vertices of the polyline are defined by clicking their location on the map.

Enter the name of the observation line

Click on the map along the line across which to measure the time history of discharge. Make sure the line is long enough to have both ends at high enough elevation such that the expected flow of water does not go around it. These lines will be used as measurement tools only and will not have an effect on the flow of water.

The screenshot displays the DSS-WISE Web Viewer interface. At the top, the title bar shows "DSS-WISE Web Viewer" and the user "Nuttita Pophet". Below the title bar is a navigation menu with icons for Home, Layers, Users, Lists, and Help. The main content area is split into two panels. The left panel, titled "Observation Line Details", contains a form with the following fields and controls:

- Name:** A text input field containing "Observation Line 1".
- Observation Line Center Line:** A section containing a text input field with "Length: 2,002 ft" and three action buttons: a blue edit button, a dark blue search button, and a red delete button.

The right panel is a map showing a section of Broad Run. A green line, representing the observation line, is drawn across the river. A red arrow points from a text box labeled "Observation line" to this green line. The map also shows the T. Nelson Elliott Dam, the City of Manassas Water Treatment Plant, and various roads like Rollins Ford Road and Sharpshinned Drive. A scale bar at the bottom indicates 0, 500 ft, and 1000 ft. The map coordinates are -77.6245, 38.7646, 288.52ft. A "Done" button is located at the bottom left of the map area.

The screenshot shows the DSS-WISE Web Viewer interface. At the top, there is a navigation bar with the logo, the text "DSS-WISE Web Viewer", and user information for "UNITED STATES" and "Nuttita Pophet". Below this is a toolbar with various icons. The main panel is titled "Simulation Parameters" and contains several input fields and buttons. A sidebar on the left has icons for different simulation components. A map on the right shows a simulation domain extent over the Washington, DC area, with a red arrow pointing to the "Simulation domain extent" label. A red box highlights the "Edit Manning Roughness Values" button, with a callout box pointing to it that says "Click to edit Manning Roughness Values (optional)".

Simulation Parameters
Choose modeling parameters for your simulation

Domain Buffer Distance (miles) 65

Cell Size (ft) 200

Default Faster Detailed

Approximately 11.78M computational cells in domain

Maximum Simulation Duration (days) 5

Advanced Options (optional)

Edit Manning Roughness Values

Prev Next

Simulation domain extent

Click to edit Manning Roughness Values (optional)

This value sets the size of the domain north, south, west, and east beyond the minimum bounding box containing all active reservoir points and impounding structures.

The cell size determines the size of the most basic unit of computation for the simulation. The digital elevation model grid will be resampled to this size, and all features are modeled using cells of this size.

The maximum simulation duration sets the limit on the number of days after the start of the breach that the scenario will continue. The simulation will end once this time has been reached no matter what, so it must be at least as long as the breach formation time or the end of the breach hydrograph.

PREP TOOL Tab: Simulation Parameters (Manning Roughness Values)

The Advanced Options, which are optional, allow the user to edit Manning Roughness Values.

If the values are modified, the icon color next to the modified field will be enabled. The value can be reset to the default value by clicking this button

The screenshot shows the DSS-WISE Web Viewer interface. The top navigation bar includes the DSS-WISE logo, the text 'DSS-WISE Web Viewer', and user information for 'UNITED STATES' and 'Nuttita Pophet'. Below the navigation bar is a toolbar with icons for various simulation parameters. The main content area is titled 'Manning Roughness Values' and displays a list of categories with their corresponding values and reset buttons. The 'Unclassified' category is highlighted with a red box, and its reset button is also highlighted with a red box. A callout box points to the reset button with the text 'Reset to default value'. The background shows a map of the Washington, D.C. area with a red location marker.

Category	Value	Reset Button
Unclassified	0.035	Enabled (Blue)
Open Water	0.033	Disabled (Grey)
Perennial Snow/Ice	0.01	Disabled (Grey)
Developed, Open Space	0.04	Enabled (Blue)
Developed, Low Intensity	0.0678	Disabled (Grey)
Developed, Medium Intensity	0.0678	Disabled (Grey)

The screenshot shows the 'DSS-WISE Web Viewer' interface. At the top, there is a header with the logo, the text 'DSS-WISE Web Viewer', and user information: 'UNITED STATES' and 'Nuttita Pophet'. Below the header is a navigation bar with several icons. The main content area is titled 'Review & Submit' and contains a form with the following fields:

- Project Name:** T. NELSON ELLIOTT DAM
- Scenario Name:** Reservoir-type, partial breach failure
- Scenario Description:** 1 active reservoir, 1 active impounding structure, Reservoir-type, partial breach failure of T. NELSON ELLIOTT DAM

At the bottom of the form is a green 'Submit Simulation' button. To the right of the form is a map showing a dam structure (T. Nelson Elliott Dam) on a river (Broad Run). The map includes a scale bar (0 to 2000 ft) and coordinates (-77.6416, 38.7706, 288.55ft). There are also 'Prev' and 'Feedback' buttons visible.

Enter a name of the overall project for your reference later.

Enter a name for this specific scenario within a project for your reference later.

Enter a description for this specific scenario for your reference later.

Click to submit simulation

Monitoring the Reservoir-Type Simulation for T. Nelson Elliott Dam on Status and Results Page

2.6

Displaying the List of Simulations Performed by the User

DSS-WISE Web Viewer

Review & Submit
Describe your simulation and submit it

Project Name
T. NELSON ELLIOTT DAM

Scenario Name
Reservoir-type, partial breach failure

Scenario Description
1 active reservoir
1 active impounding structure
Reservoir-type, partial breach failure of T. NELSON ELLIOTT DAM

Submit Simulation

Prev

Simulation List button

DSS-WISE™ Web Portal

Home About Help System Logged in as: Nutlila Pophel Log out

Decision Support System for Water Infrastructural Security Web

Simulation Results
View and download results of DSS-WISE™ Lite Simulations

Announcement
DSS-WISE Web HCOM PAR Data Updated
December 14, 2023
The HCOM module has been updated to use the 2021 LandScan USA datasets for nighttime and daytime population. All HCOM simulations going forward will use these new datasets for PAR calculation. However, the Census block data still uses the 2010 version at this time.

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In DSS-WISE™ Web Viewer, click on the **“Simulation List”** button to go to **“Simulation Lists”** page. The user can also access **“Simulation Lists”** page from DSS-WISE™ Web Portal by clicking **“Simulation Results”** tab. This action displays a list of all the simulations performed by the user.

Simulation List

Home Portal About Help Nuttita Pophet

Category

- My Simulations 92
- Supervised groups 76.182

Groups

- SHORT COURSES
- UNITED STATES 91

Group UNITED STATES

Search Sim. Name, Scen. Name, Scen. Description, Job #

Showing 1-10 out of 91

ID	Project Name	Submission Date	Status	Link	Load
76532	T. NELSON ELLIOTT DAM	5/7/2024, 10:34 AM	🔄	view result page	Load
76504	T. Nelson Elliott Dam	5/6/2024, 4:53 PM	✅ HCOM	view result page	Load
75326	Edenville and Sanford Dams 20 m	3/26/2024, 5:46 PM	✅ HCOM	view result page	Load

Click on “**view result page**” button to view status and other information, and to download data

Monitoring a Simulation while it is Running

Status & Results

Home Portal About Help Nuttita Pophet

#76660 • VA15302 May 12, 2024 7:48:03 pm

Nuttita Pophet UNITED STATES

Layers

Base Layers

Maps


- OpenStreetMap
- Mapbox Streets
- Mapbox Light
- Mapbox Outdoors
- Mapbox Dark
- Blank

Imagery

- ESRI World Imagery
- Bing Satellite
- Mapbox Satellite
- Mapbox Satellite Streets

Elevation

- USGS Elevation



Simulation: Running

May 12, 2024 7:49:05 pm less than a minute less than a minute estimated remaining

Distance Achieved: **3 miles**

Time Achieved: **0.0 days**

30,978 compute cells

Breaching Reservoir Vol. **59.8% Released**

40.2% Remaining

Terminate Simulation Early

Data Prep: Finished

May 12, 2024 7:48:25 pm less than a minute

Filled reservoir volume match:

1. Reservoir 1: **100%**

Simulation Details

Project name
T. Nelson Elliott Dam

Scenario name
Partial Breach Sunny Day Failure

Scenario description
180 ft breach Reservoir at Max Pool
This simulation was created from #76659

Scenario Properties

Cell size:	45 ft
Breach type:	Partial breach
Breach width:	180 ft
Breach formation time:	0.3 hr
Breach invert elevation:	242 ft
Reservoir 1:	Reservoir 1 290 ft / 15,951 ac-ft

Request Intermediate Results

Downloads

Inundation Extent at 3 miles 6.6 kB
Shapefile containing inundation extent at 3 miles

Inundation Extent at 7 miles 13.26 kB
Shapefile containing inundation extent at 7 miles

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Status & Results

Home Portal About Help Nuttita Pophet

#76660 • VA15302 May 12, 2024 7:48:03 pm

Nuttita Pophet UNITED STATES

Layers

Base Layers

Maps

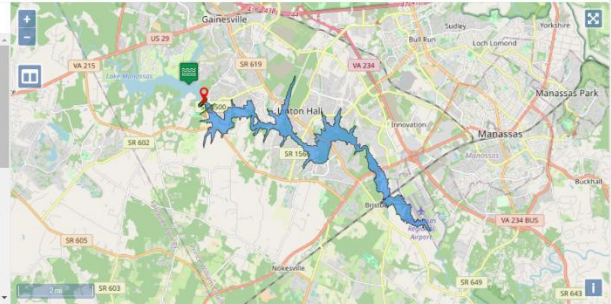
- OpenStreetMap
- Mapbox Streets
- Mapbox Light
- Mapbox Outdoors
- Mapbox Dark
- Blank

Imagery

- ESRI World Imagery
- Bing Satellite
- Mapbox Satellite
- Mapbox Satellite Streets

Elevation

- USGS Elevation



Simulation: Running

May 12, 2024 7:49:05 pm less than a minute 2 mins estimated remaining

Distance Achieved: **7 miles**

Time Achieved: **0.19 days**

54,547 compute cells

Breaching Reservoir Vol. **99.7% Released**

0.3% Remaining

Terminate Simulation Early

Data Prep: Finished

May 12, 2024 7:48:25 pm less than a minute

Filled reservoir volume match:

1. Reservoir 1: **100%**

Simulation Details

Project name
T. Nelson Elliott Dam

Scenario name
Partial Breach Sunny Day Failure

Scenario description
180 ft breach Reservoir at Max Pool
This simulation was created from #76659

Scenario Properties

Cell size:	45 ft
Breach type:	Partial breach
Breach width:	180 ft
Breach formation time:	0.3 hr
Breach invert elevation:	242 ft
Reservoir 1:	Reservoir 1 290 ft / 15,951 ac-ft

Request Intermediate Results

Downloads

Inundation Extent at 3 miles 6.6 kB
Shapefile containing inundation extent at 3 miles

Inundation Extent at 7 miles 13.26 kB
Shapefile containing inundation extent at 7 miles

You can request intermediate results while the simulation is running

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Simulation Ended. DSS-WISE HCOM for Human Consequences Assessment is Ready to be Launched

Status & Results
Home Portal About Help Nuttitia Pophet

#76660 • VA15302 May 12, 2024 7:48:03 pm Nuttitia Pophet UNITED STATES

Layers

Base Layers

Maps

- OpenStreetMap
- Mapbox Streets
- Mapbox Light
- Mapbox Outdoors
- Mapbox Dark
- Blank

Imagery

- ESRI World Imagery
- Bing Satellite
- Mapbox Satellite
- Mapbox Satellite Streets

Elevation

- USGS Elevation

Simulation: Running

May 12, 2024 7:49:05 pm 4 miles 22 days estimated remaining

Distance Achieved 15 miles

Time Achieved 0.92 days

117,415 compute cells

Terminate Simulation Early

Data Prep: Finished

May 12, 2024 7:48:25 pm less than a minute

Filled reservoir volume match:

1. Reservoir 1: 100%

Simulation Details [Load](#)

<p>Project name T. Nelson Elliott Dam</p> <p>Scenario name Partial Breach Sunny Day Failure</p> <p>Scenario description 180 ft breach Reservoir at Max Pool This simulation was created from #76659</p>	<p>Scenario Properties</p> <p>Cell size: 45 ft</p> <p>Breach type: Partial breach</p> <p>Breach width: 180 ft</p> <p>Breach formation time: 0.3 hr</p> <p>Breach invert elevation: 242 ft</p> <p>Reservoir 1: Reservoir 1 290 ft / 15,951 ac-ft</p>
--	--

Downloads [Request Intermediate Results](#)

- 📄 Inundation Extent at 15 miles 42.5 kB
Shapefile containing inundation extent at 15 miles [Download](#)
- 📄 Inundation Extent at 3 miles 6.6 kB
Shapefile containing inundation extent at 3 miles [Download](#)
- 📄 Inundation Extent at 7 miles 13.26 kB
Shapefile containing inundation extent at 7 miles [Download](#)

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Status & Results
Home Portal About Help Nuttitia Pophet

#76660 • VA15302 May 12, 2024 7:48:03 pm Nuttitia Pophet UNITED STATES

Layers

Base Layers

Maps

- OpenStreetMap
- Mapbox Streets
- Mapbox Light
- Mapbox Outdoors
- Mapbox Dark
- Blank

Imagery

- ESRI World Imagery
- Bing Satellite
- Mapbox Satellite
- Mapbox Satellite Streets

Elevation

- USGS Elevation

Human Consequences: Available

[Calculate HCOM](#)

Simulation: Finished

May 12, 2024 7:49:05 pm 7 mins

Distance Achieved 15.5 miles

Time Achieved 1 day

120,269 compute cells

Data Prep: Finished

May 12, 2024 7:48:25 pm less than a minute

Filled reservoir volume match:

1. Reservoir 1: 100%

Simulation Details [Load](#)

<p>Project name T. Nelson Elliott Dam</p> <p>Scenario name Partial Breach Sunny Day Failure</p> <p>Scenario description 180 ft breach Reservoir at Max Pool This simulation was created from #76659</p>	<p>Scenario Properties</p> <p>Cell size: 45 ft</p> <p>Breach type: Partial breach</p> <p>Breach width: 180 ft</p> <p>Breach formation time: 0.3 hr</p> <p>Breach invert elevation: 242 ft</p> <p>Reservoir 1: Reservoir 1 290 ft / 15,951 ac-ft</p>
--	--

Downloads [Request Intermediate Results](#)

- 📄 **Simulation Results Package** 10.21 MB
Zipped results package containing final report, shapefiles, gridded raster files, and other outputs [List](#) [Download](#)

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Launching DSS-WISE HCOM Post-Processing for T. Nelson Elliott Dam

2.7

Launching and Monitoring Post-processing for Human Consequences Assessment Using DSS-WISE HCOM

Status & Results
Home Portal About Help Nuttita Pophet

#76659 • VA15302 May 12, 2024 7:25:02 pm
Nuttita Pophet
UNITED STATES

Layers Query Tool

Base Layers

Maps

- OpenStreetMap
- Mapbox Streets
- Mapbox Light
- Mapbox Outdoors
- Mapbox Dark
- Blank

Imagery

- ESRI World Imagery
- Bing Satellite
- Mapbox Satellite
- Mapbox Satellite Streets

Elevation

- USGS Elevation

Human Consequences: Available

Calculate HCOM

Simulation: Finished
May 12, 2024 7:26:13 pm 4 mins

Distance Achieved 15.5 miles

Time Achieved 1 day

120,269 compute cells

Data Prep: Finished
May 12, 2024 7:25:19 pm less than a minute

Filled reservoir volume match:

1. Reservoir 1: 100%

Simulation Details Load

Project name	Scenario Properties
T. Nelson Elliott Dam	Cell size: 45 ft
Scenario name Partial Breach Sunny Day Failure	Breach type: Partial breach
Scenario description 180 ft breach Reservoir at Max Pool	Breach width: 180 ft
This simulation was created from #76657	Breach formation time: 0.3 hr
	Breach invert elevation: 242 ft
	Reservoir 1: Reservoir 1 290 ft / 15,951 ac-ft

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Status & Results
Successfully launched HCOM

#76659 • VA15302 May 12, 2024 7:25:02 pm
Nuttita Pophet
UNITED STATES

Layers Query Tool

Base Layers

Maps

- OpenStreetMap
- Mapbox Streets
- Mapbox Light
- Mapbox Outdoors
- Mapbox Dark
- Blank

Imagery

- ESRI World Imagery
- Bing Satellite
- Mapbox Satellite
- Mapbox Satellite Streets

Elevation

- USGS Elevation

Human Consequences: Queued
less than a minute

Queue position: 1

Simulation: Finished
May 12, 2024 7:26:13 pm 4 mins

Distance Achieved 15.5 miles

Time Achieved 1 day

120,269 compute cells

Data Prep: Finished
May 12, 2024 7:25:19 pm less than a minute

Filled reservoir volume match:

1. Reservoir 1: 100%

Simulation Details Load

Project name	Scenario Properties
T. Nelson Elliott Dam	Cell size: 45 ft
Scenario name Partial Breach Sunny Day Failure	Breach type: Partial breach
Scenario description 180 ft breach Reservoir at Max Pool	Breach width: 180 ft
This simulation was created from #76657	Breach formation time: 0.3 hr
	Breach invert elevation: 242 ft
	Reservoir 1: Reservoir 1 290 ft / 15,951 ac-ft

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53

Monitoring a Simulation while it is Running

#76659 • VA15302 May 12, 2024 7:25:02 pm
 UNITED STATES

Layers Query Tool

Base Layers

Maps

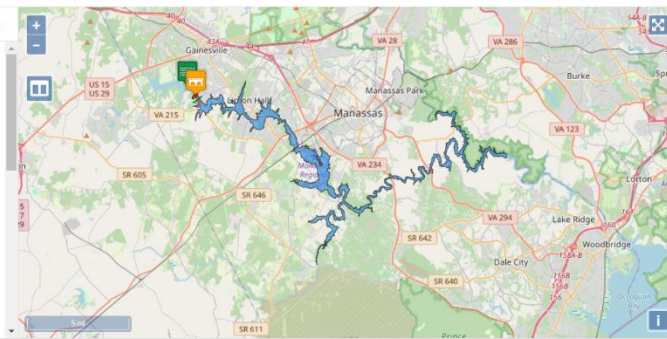
- OpenStreetMap
- Mapbox Streets
- Mapbox Light
- Mapbox Outdoors
- Mapbox Dark
- Blank

Imagery

- ESRI World Imagery
- Bing Satellite
- Mapbox Satellite
- Mapbox Satellite Streets

Elevation

- USGS Elevation



Human Consequences: Running

May 12, 2024 7:34:20 pm less than a minute

Simulation: Finished

May 12, 2024 7:26:13 pm 4 mins

Distance Achieved	Breaching Reservoir Vol.
15.5 miles	99.9% Released
Time Achieved	120,269 compute cells
1 day	0.1% Remaining

Data Prep: Finished

May 12, 2024 7:25:19 pm less than a minute


Filled reservoir volume match:

1. Reservoir 1: 100%

Simulation Details [Load](#)


<p>Project name</p> <p>T. Nelson Elliott Dam</p> <p>Scenario name</p> <p>Partial Breach Sunny Day Failure</p> <p>Scenario description</p> <p>180 ft breach Reservoir at Max Pool</p> <p>This simulation was created from #76657</p>	<p>Scenario Properties</p> <p>Cell size: 45 ft</p> <p>Breach type: Partial breach</p> <p>Breach width: 180 ft</p> <p>Breach formation time: 0.3 hr</p> <p>Breach invert elevation: 242 ft</p> <p>Reservoir 1: Reservoir 1 290 ft / 15,951 ac-ft</p>
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#76659 • VA15302 May 12, 2024 7:25:02 pm
 UNITED STATES

Layers Query Tool

Base Layers

Maps

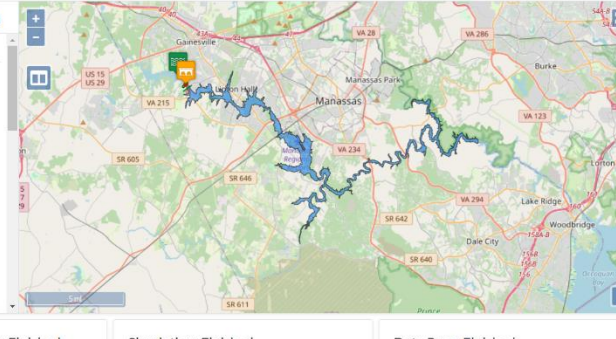
- OpenStreetMap
- Mapbox Streets
- Mapbox Light
- Mapbox Outdoors
- Mapbox Dark
- Blank

Imagery

- ESRI World Imagery
- Bing Satellite
- Mapbox Satellite
- Mapbox Satellite Streets

Elevation

- USGS Elevation



Human Consequences: Finished

May 12, 2024 7:34:20 pm 2 mins

Nighttime PAR: 2.028

Daytime PAR: 818

Inundated Area: 4,765 acres

Virginia counties: 3

Simulation: Finished

May 12, 2024 7:26:13 pm 4 mins

Distance Achieved	Breaching Reservoir Vol.
15.5 miles	99.9% Released
Time Achieved	120,269 compute cells
1 day	0.1% Remaining

Data Prep: Finished

May 12, 2024 7:25:19 pm less than a minute


Filled reservoir volume match:

1. Reservoir 1: 100%

Simulation Details [Load](#)


<p>Project name</p> <p>T. Nelson Elliott Dam</p> <p>Scenario name</p> <p>Partial Breach Sunny Day Failure</p> <p>Scenario description</p> <p>180 ft breach Reservoir at Max Pool</p> <p>This simulation was created from #76657</p>	<p>Scenario Properties</p> <p>Cell size: 45 ft</p> <p>Breach type: Partial breach</p> <p>Breach width: 180 ft</p> <p>Breach formation time: 0.3 hr</p> <p>Breach invert elevation: 242 ft</p> <p>Reservoir 1: Reservoir 1 290 ft / 15,951 ac-ft</p>
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 **Human Consequences Results Package** 20.55 MB

Zipped results package containing final report, shapefiles, gridded raster files, and other outputs

List Download

10 minute break

Please make sure that you have created an account on DSS-WISE Web so you can participate in the hands-on exercise in a later session!

<https://dsswiseweb.ncche.olemiss.edu/useraccount/signup.php>

On the group application page, apply to **SHORT COURSE**
ASDSO

