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

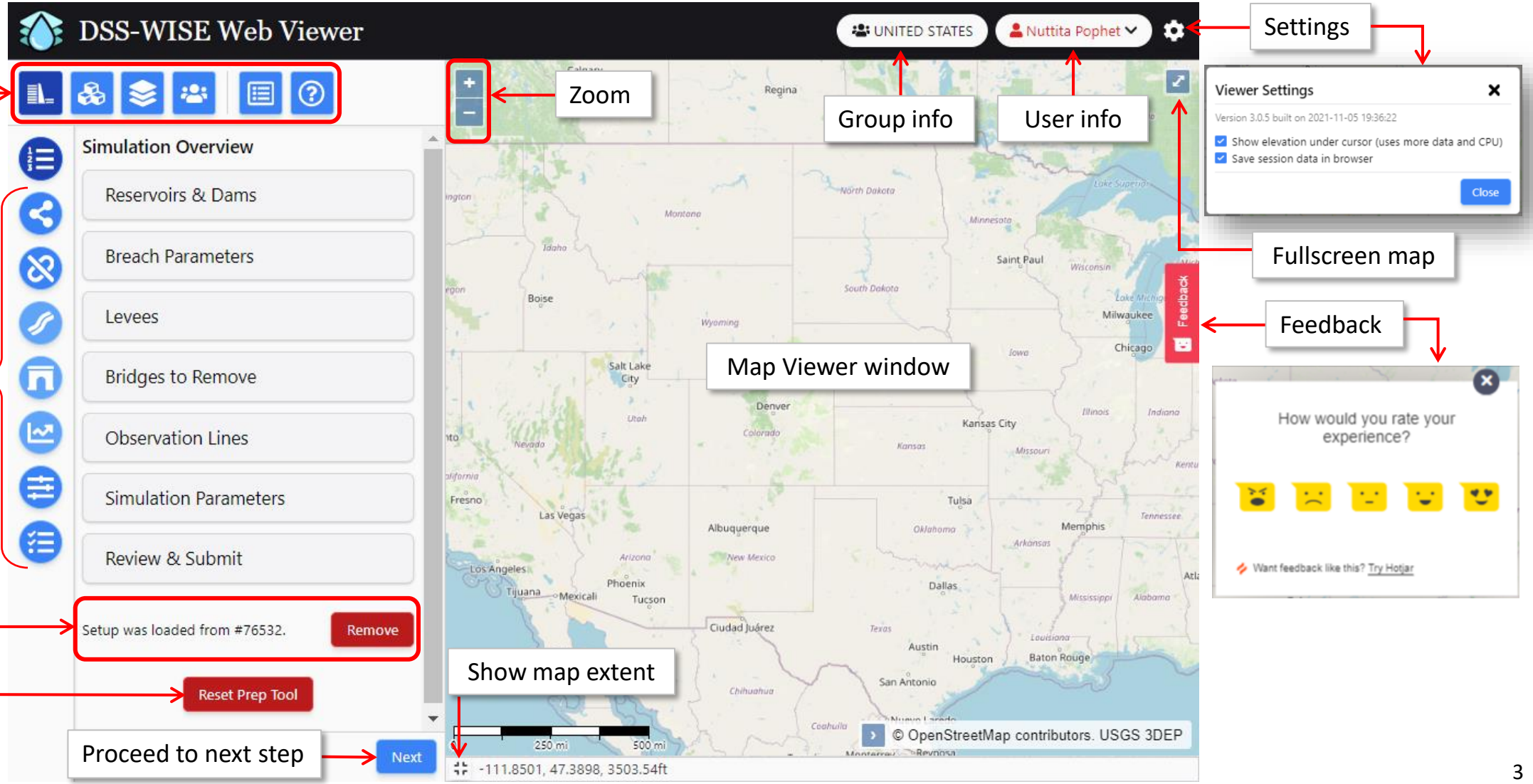
NATIONAL CENTER FOR COMPUTATIONAL HYDROSCIENCE AND ENGINEERING
THE UNIVERSITY OF MISSISSIPPI

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

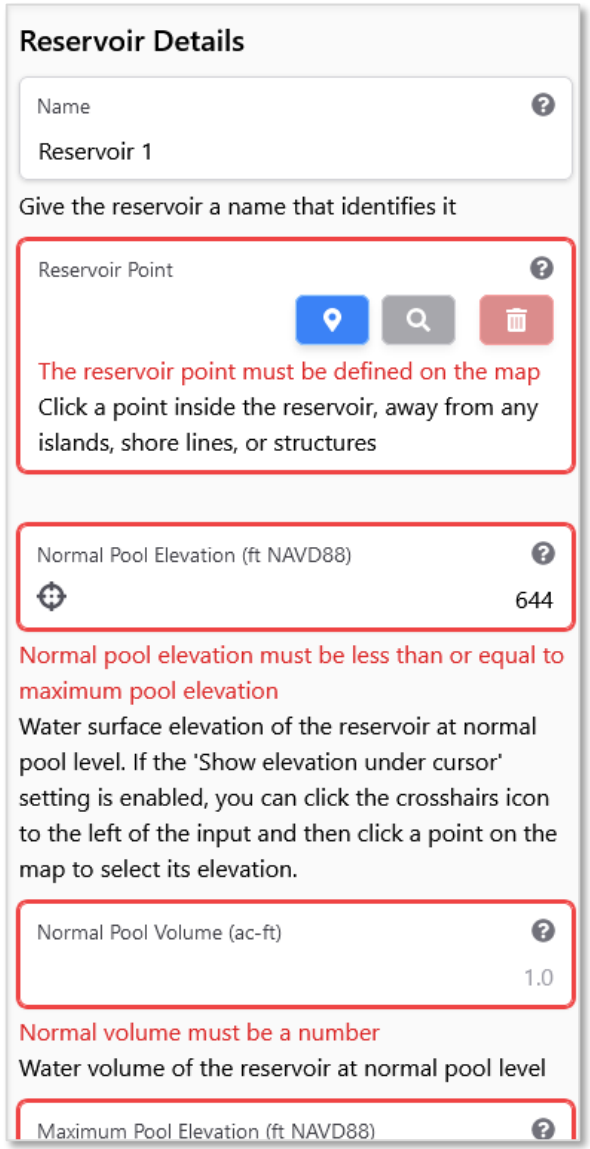
2.1

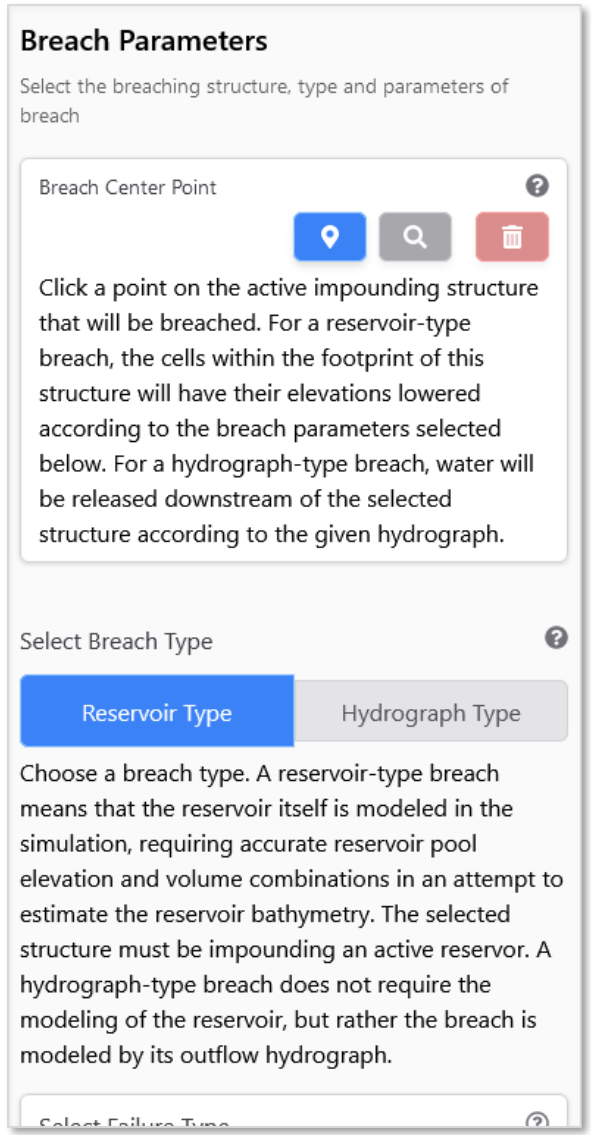
DSS-WISE™ Web Viewer

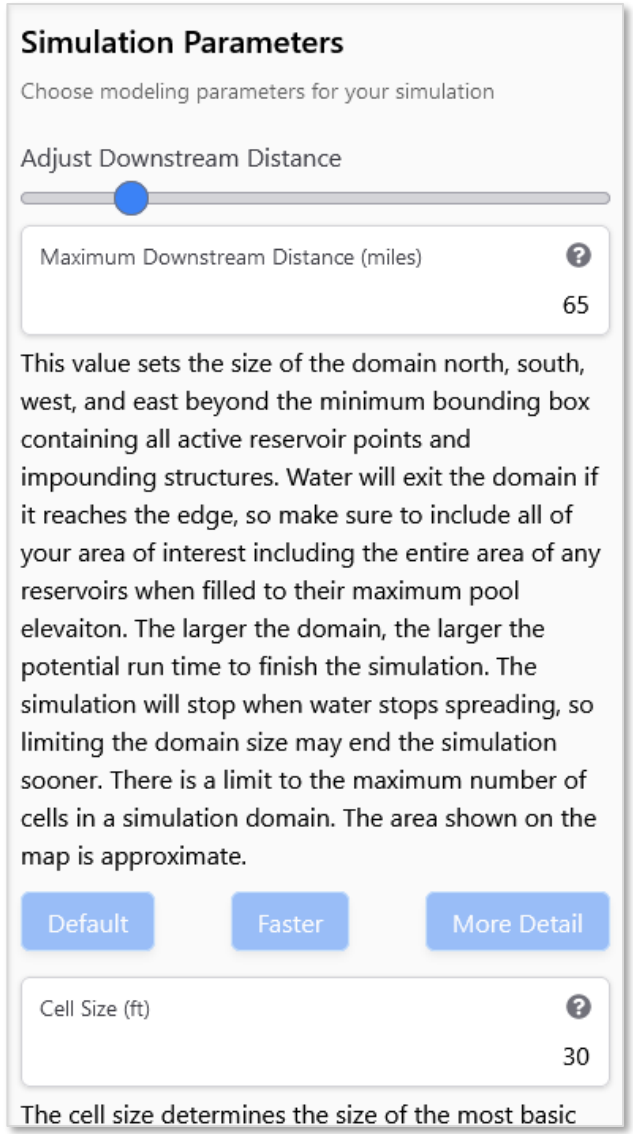
Left panel offers six tabs: PREP TOOL, TOOLS, LAYERS, GROUPS, SIMULATION LIST and DOCUMENTATION.
PREP TOOL tab offers Simulation Overview, Reservoirs & Dams, Breach Parameters, Levees, Bridges to Remove, Observation Lines, Simulation Parameters and Review & Submit.



DSS-WISE™ Web Viewer: DSS-WISE™ Lite PREP TOOL with Contextualized Help System

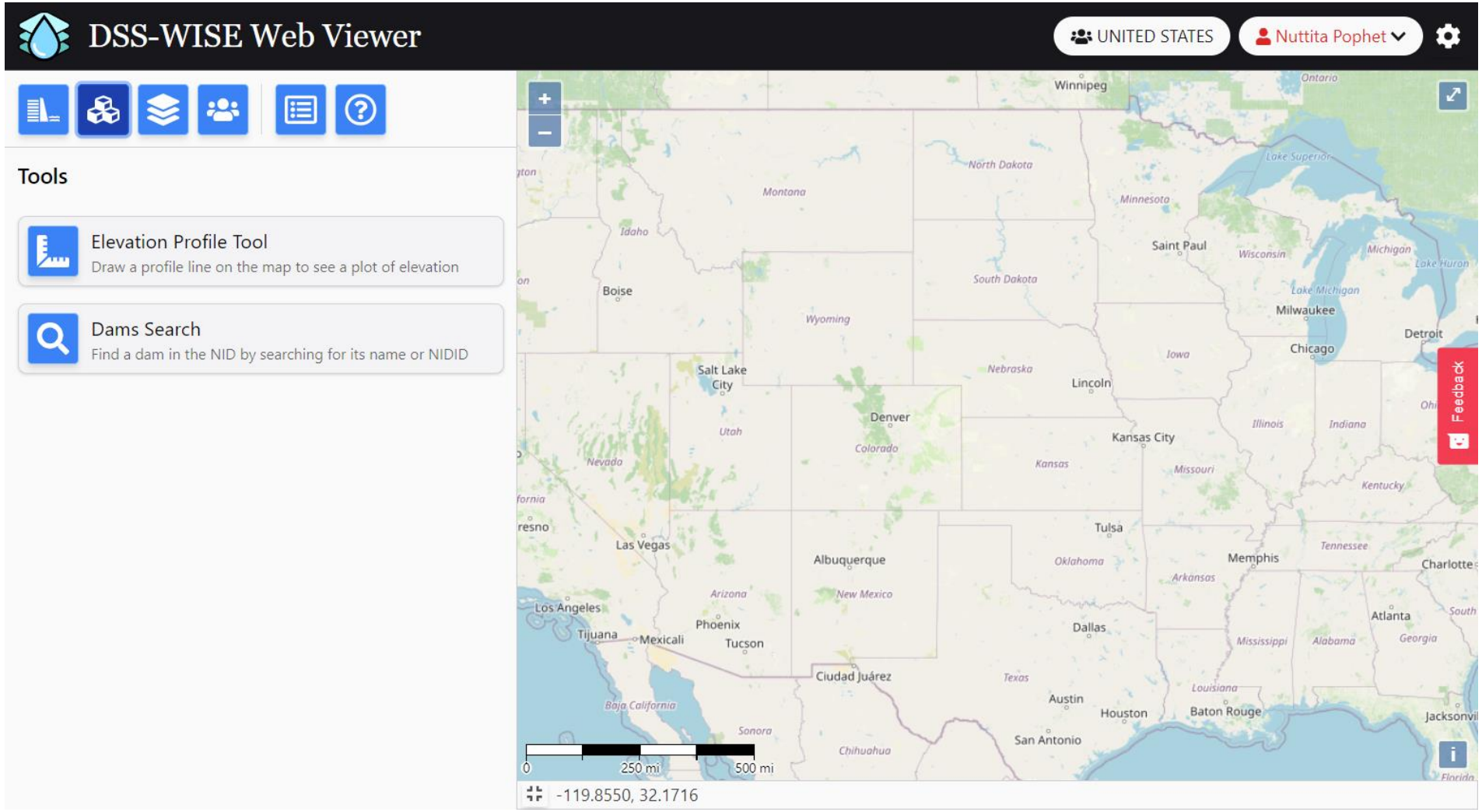






DSS-WISE™ Web Viewer: TOOLS tab

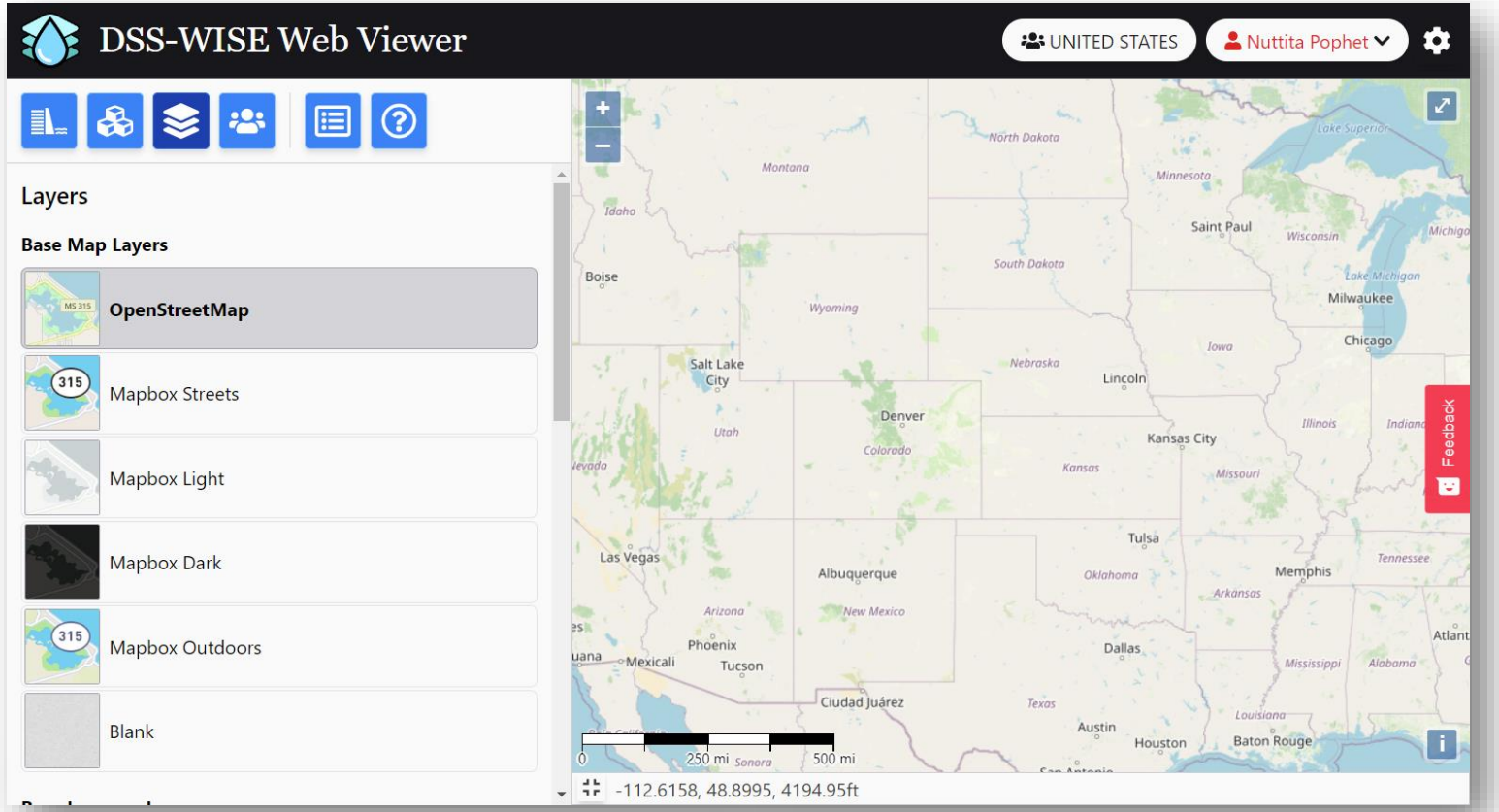
TOOLS tab offers Elevation Profile Tool and Dams Search Tool.



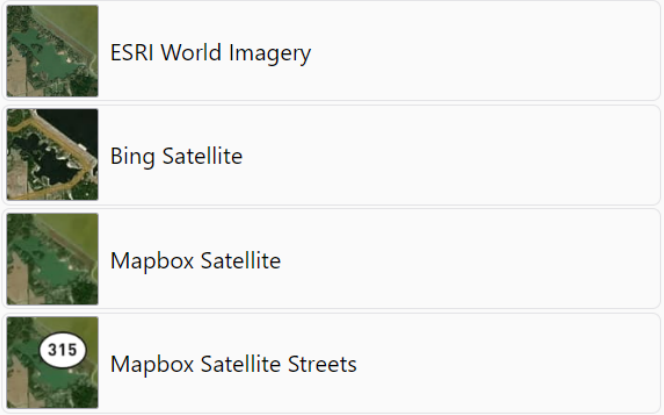
DSS-WISE™ Web Viewer: LAYERS tab

LAYERS tab has four sections:

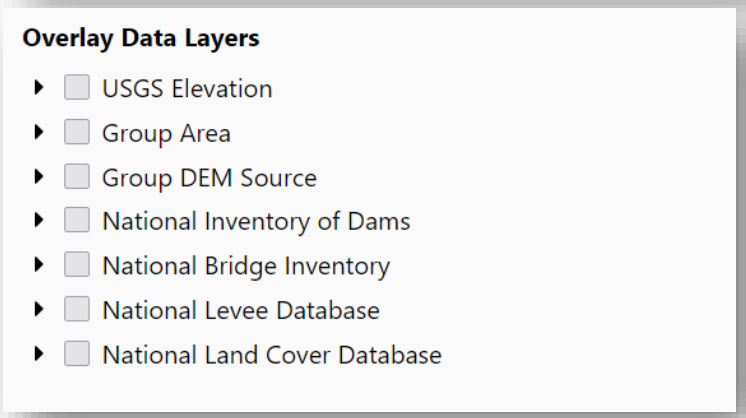
- "Base Map Layers" provide five map layers and a blank layer.
- "Base Imagery Layers" provide four imagery layers.
- "Overlay Data Data Layers" include USGS Elevation, Group Area, Group DEM Source and national database layers.
- "Input Layers" include simulation set up features.



Base Imagery Layers



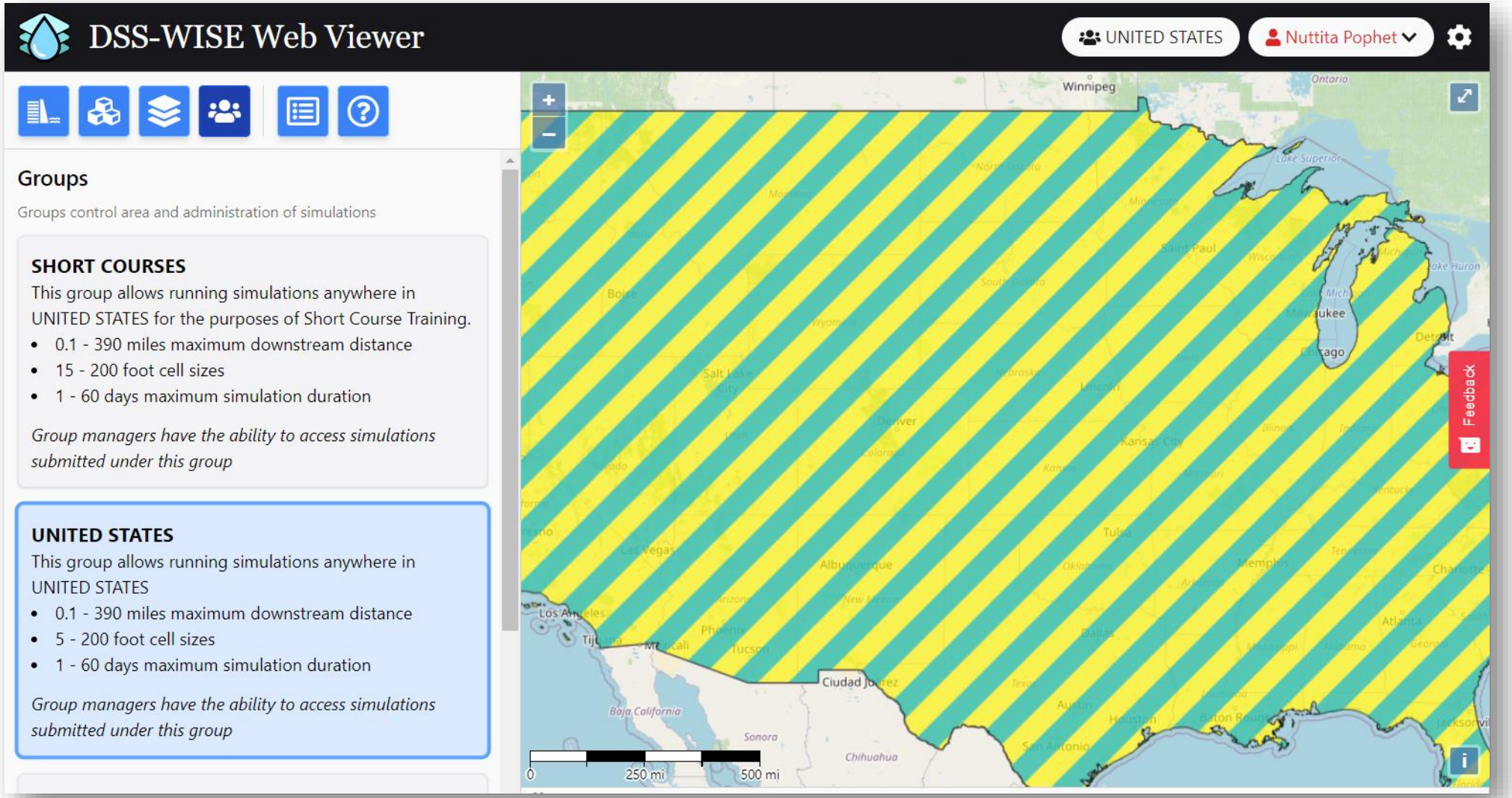
Overlay Data Layers



Input Layers

DSS-WISE™ Web Viewer: GROUPS tab

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.



How to Use the Elevation Profile Tool and Dams Search Tool

2.2

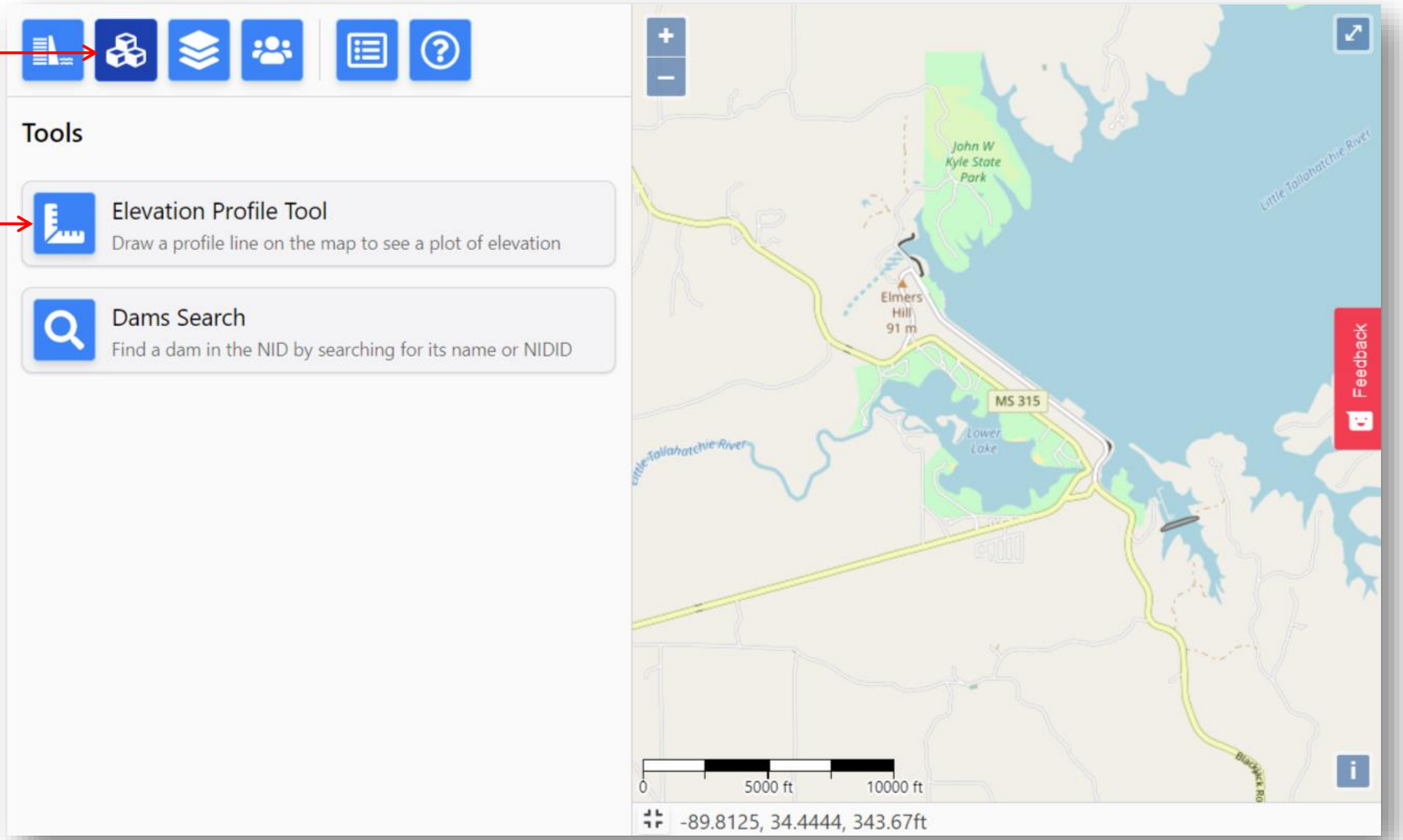
Launching Elevation Profile Tool

First select "**Tools**" tab to display available analytical tools.

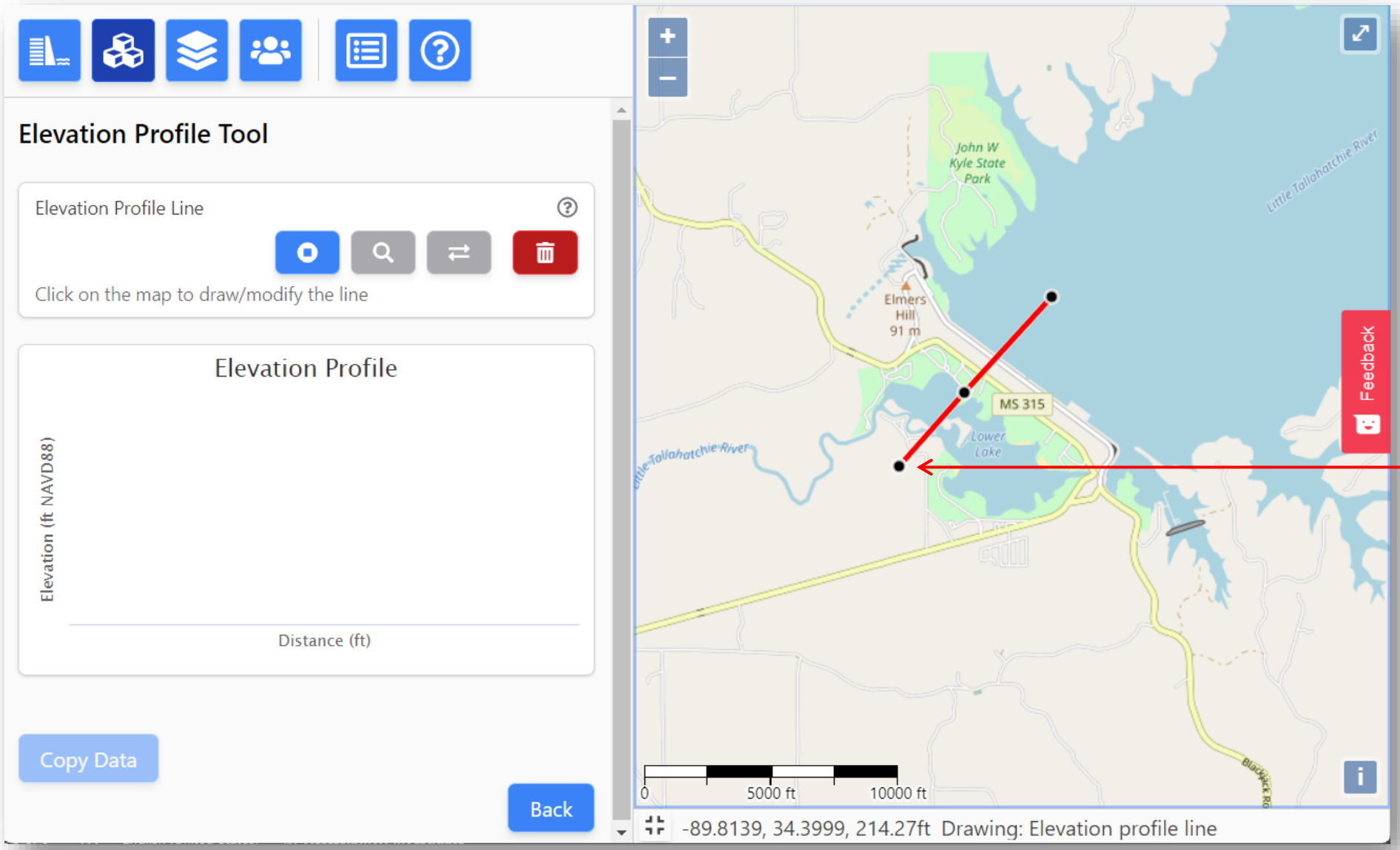
Then click on the "**Elevation Profile Tool**" button to create an elevation profile from the base DEM layer.

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**

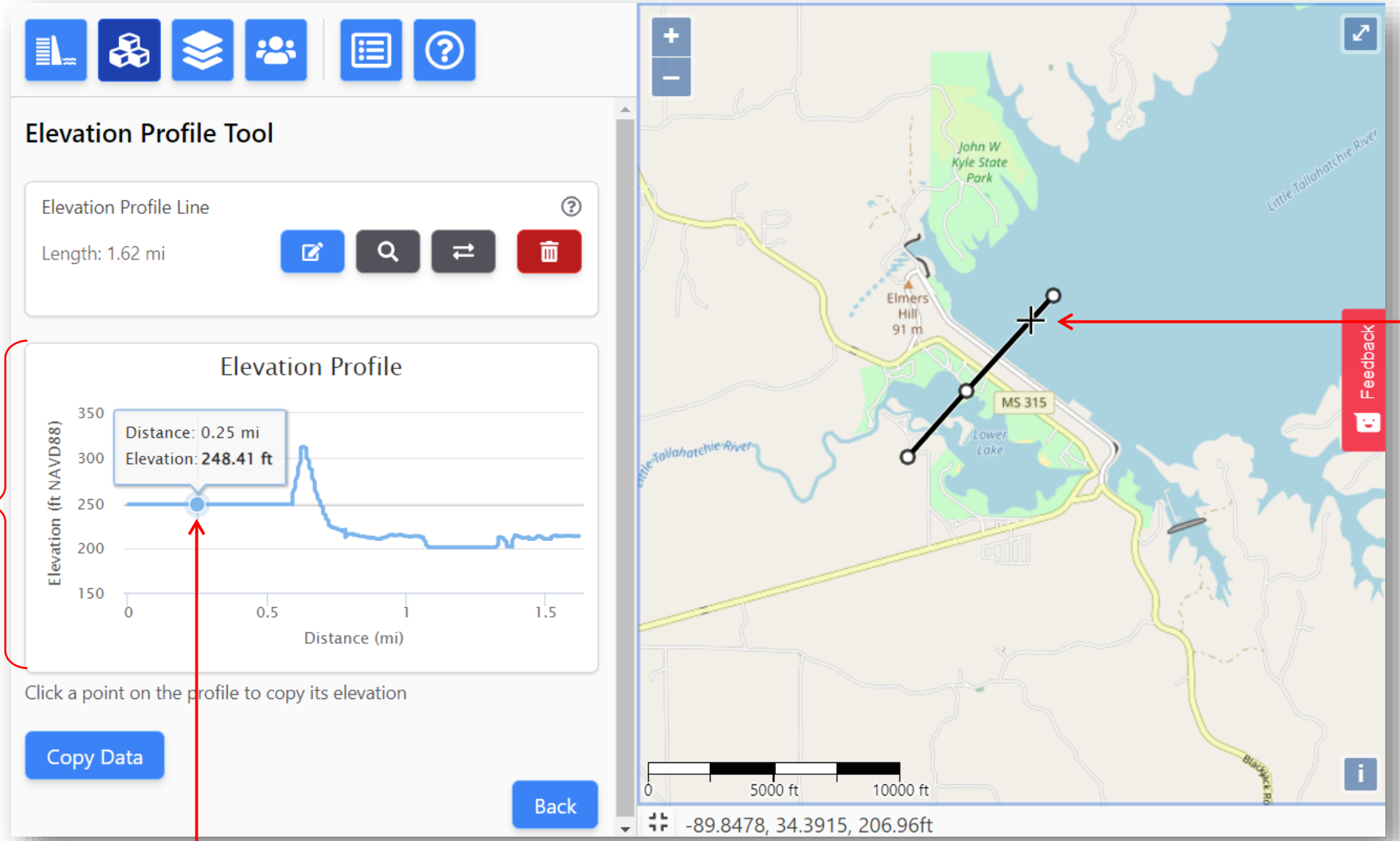


Elevation Profile Tool: Digitizing a Line to Extract an Elevation Profile



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

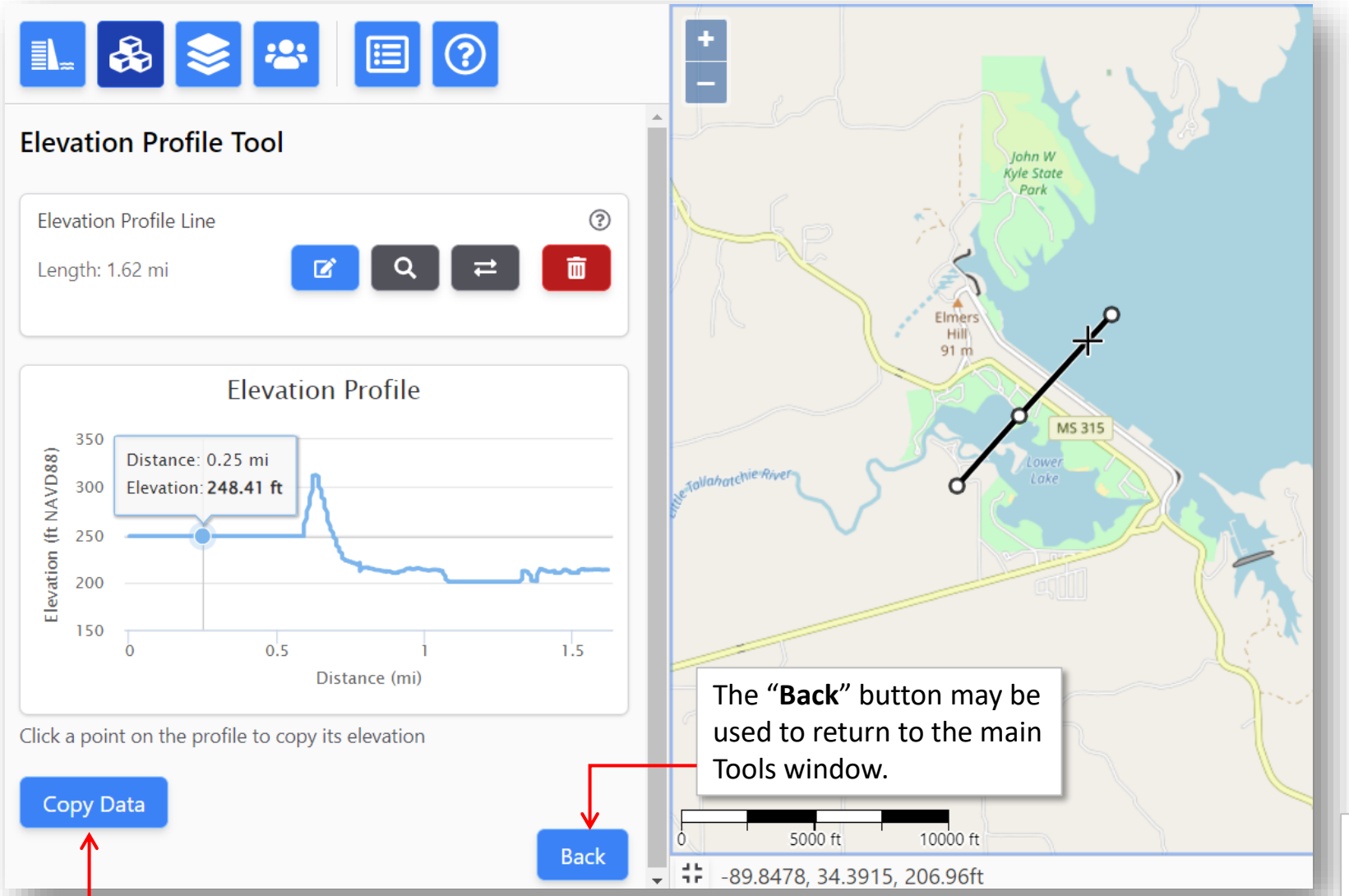


Elevation profile along the line is extracted from the base DEM layer.

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



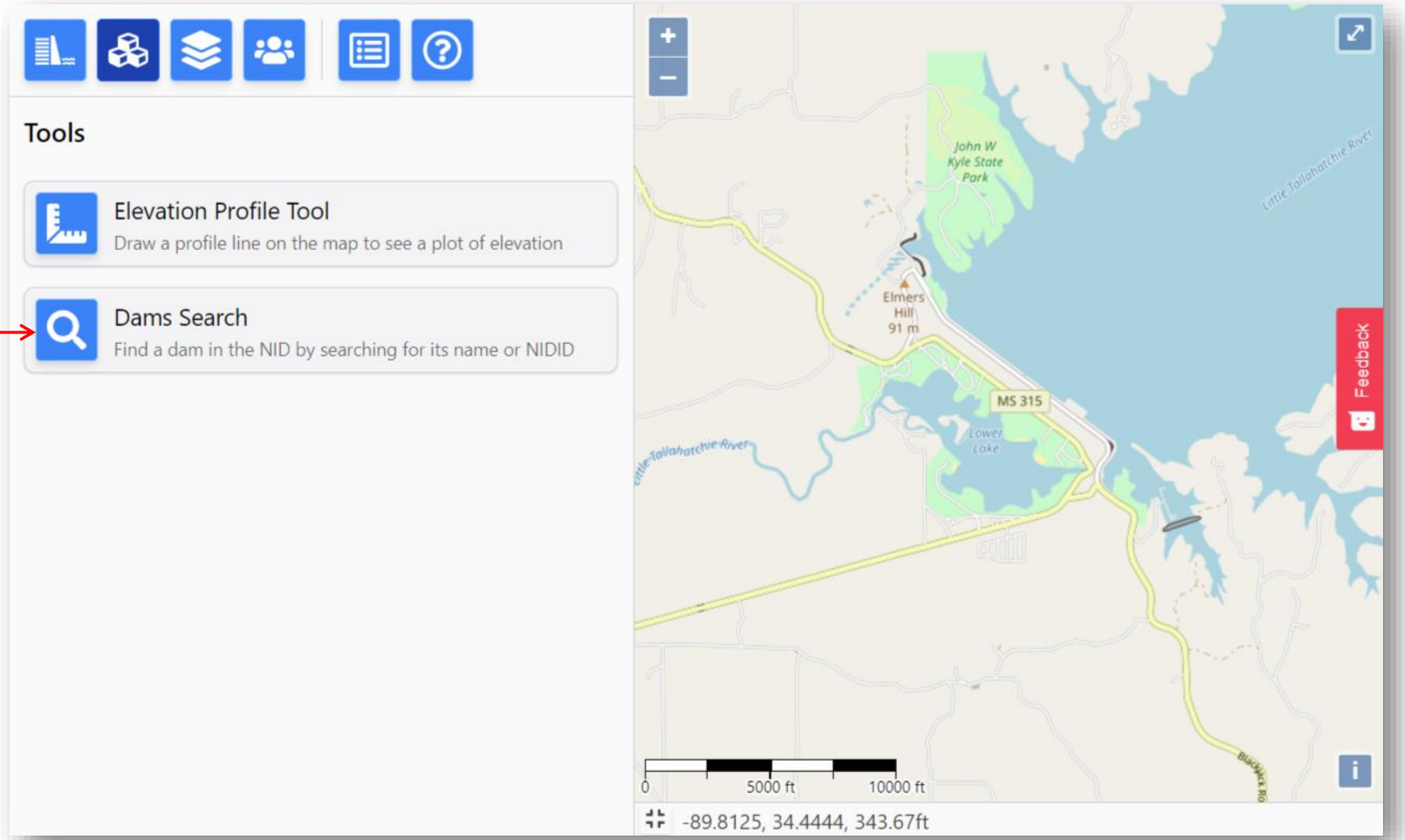
The "**Back**" button may be used to return to the main Tools window.

	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

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

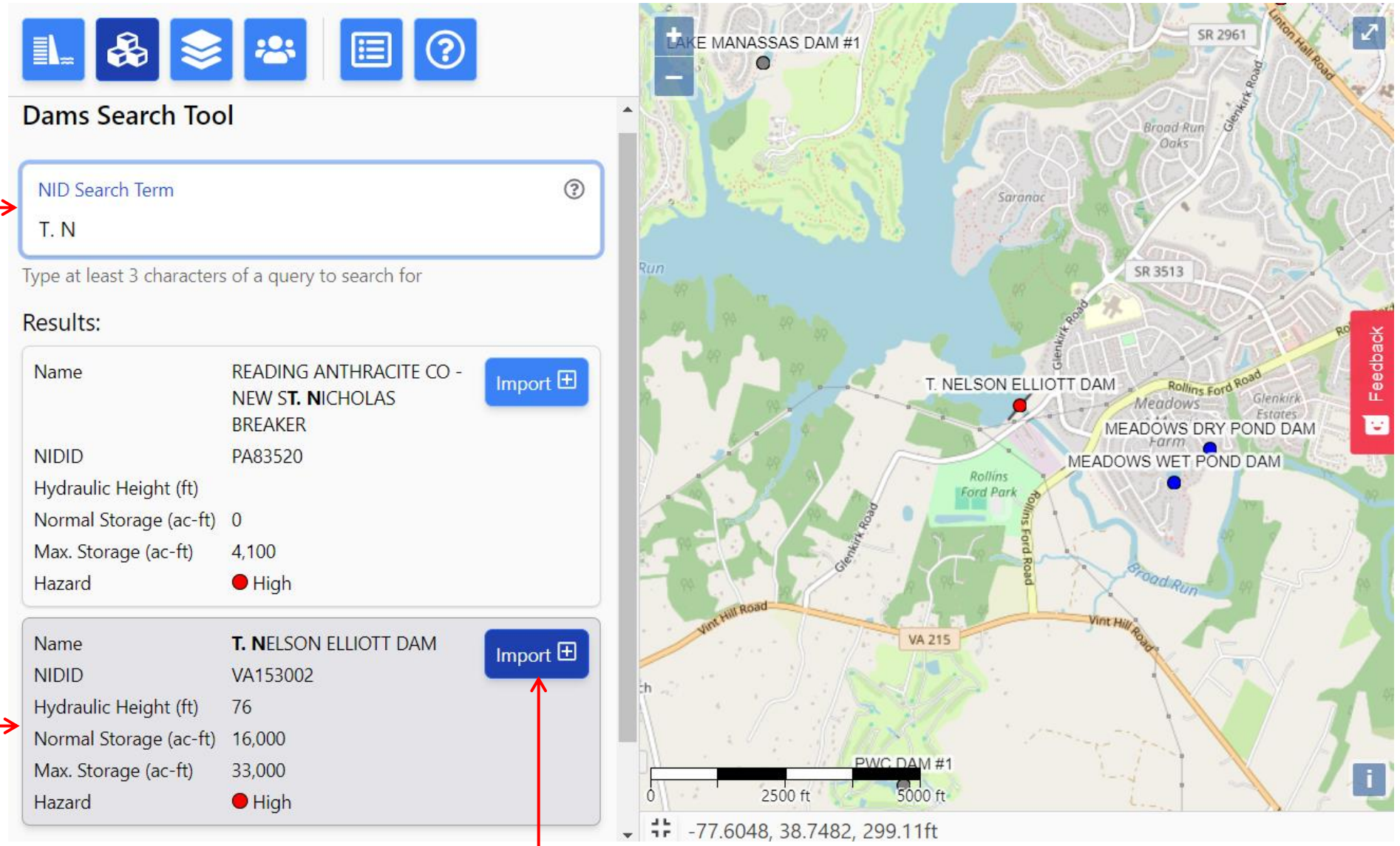


Dams Search Tool

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.

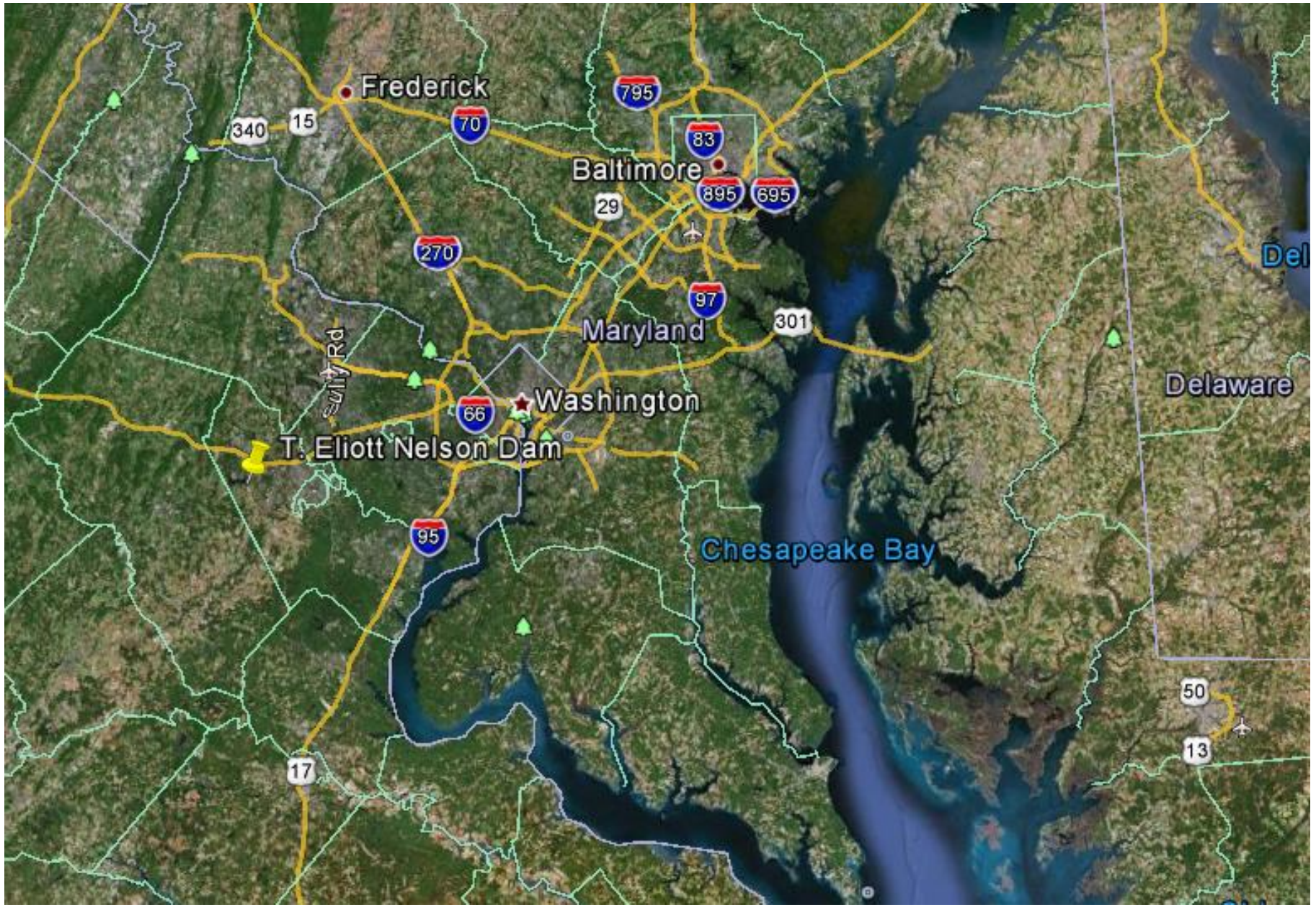


Click on the "**Import**" button to add reservoir and dam to simulation setup.

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



Description of the test Case: T. Nelson Elliott Dam (VA15302) / Characteristics of the Dam and the Reservoir

http://patch.com/virginia/manassas/an--manassas-city-rehabilitates-tn-elliotlake-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

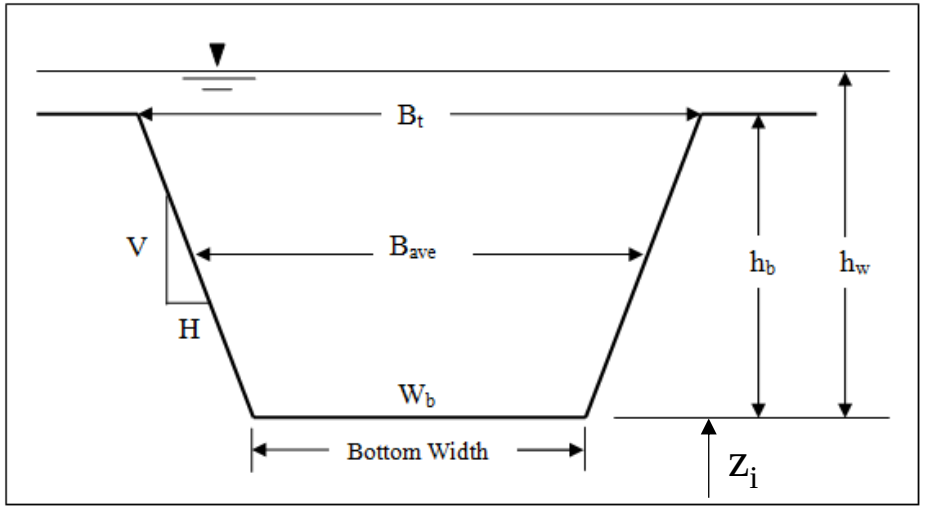
2.4

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_l = 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 =			
				Depends on the reservoir volume and can be automatically selected.
10		K_o =	K_o =	C_B =
11		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.		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 as 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 m^3 x 10^6 (11 - 535,000 acre-ft)
  - (with 87% < 25.0 m^3 x 10^6, and 76% < 15.0 m^3 x 10^6)

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

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

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 (m^3)
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 as 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 m^3 x 10^6 (11.3 - 535,000 acre-ft)
  - (with 86% < 25.0 m^3 x 10^6, and 82% < 15.0 m^3 x 10^6)

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

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

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 (m^3)
h_b	=	Height of the final breach (m)
g	=	Gravitational acceleration (9.80665 m/s^2)
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 m^3 x 10^6 (22 - 535,000 acre-ft)
  - with 89% < 25.0 m^3 x 10^6, and 84% < 15.0 m^3 x 10^6

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

Where:

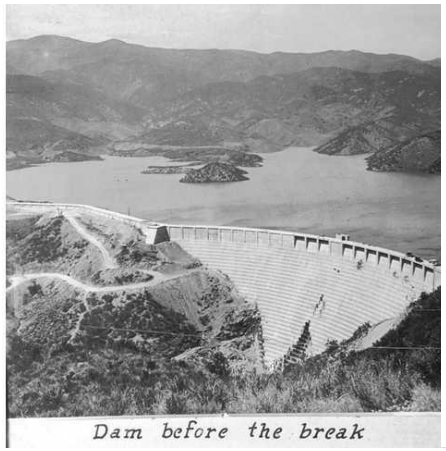
B_{ave}	=	Average breach width (m)
h_w	=	Depth of water above the bottom of the breach (m)
C_b	=	Coefficient, which is a function of reservoir size, see below.

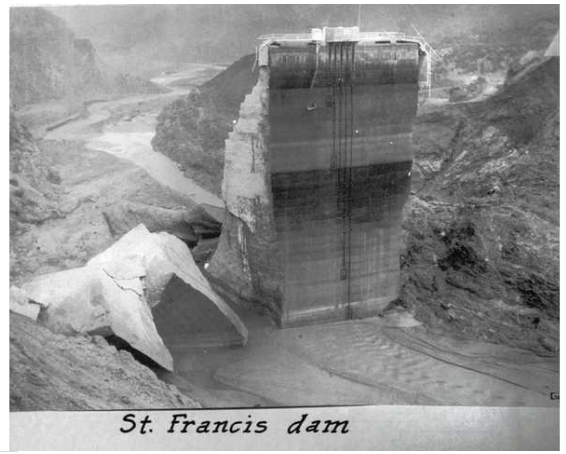
Reservoir Size, m^3	C_b, meters	Reservoir Size, acre-feet	C_b, feet
< $1.23*10^6$	6.1	< 1,000	20
$1.23*10^6$ - $6.17*10^6$	18.3	1,000-5,000	60
$6.17*10^6$ - $1.23*10^7$	42.7	5,000-10,000	140
> $1.23*10^7$	54.9	>10,000	180

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.

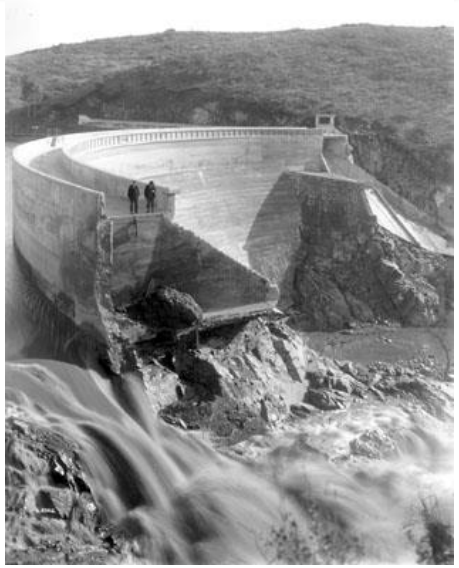




On March 12, 1928, St. Francis Dam gives way in Los Angeles, failed killing over 500 people. The St. Francis Dam was a curved concrete gravity dam, built to create a large regulating and storage reservoir as part of the Los Angeles Aqueduct.

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

Estimate how many monoliths will fail?



Sweetwater Dam failure of 1916

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			

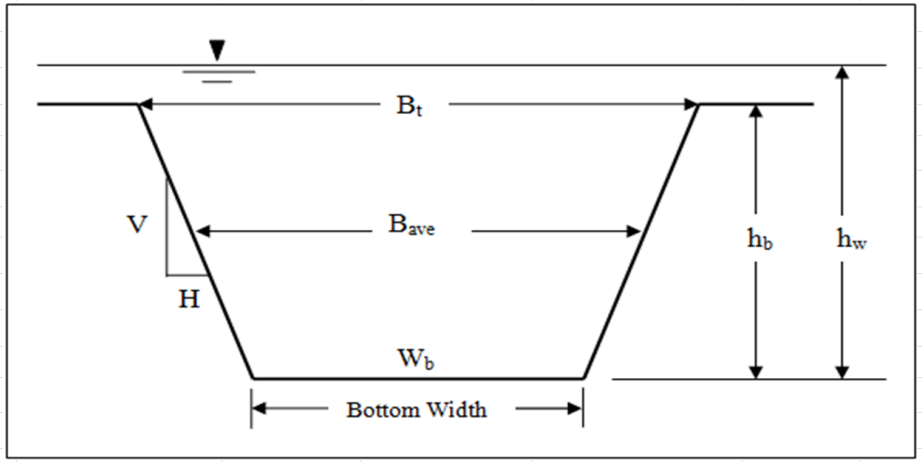
Von Thun & Gillette

C_B =	20	ft	6.1	m	(Width based on reservoir size (See table below))		
Side Slope =	1.0		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)		Choose either tf1 or tf2 (do not add)
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

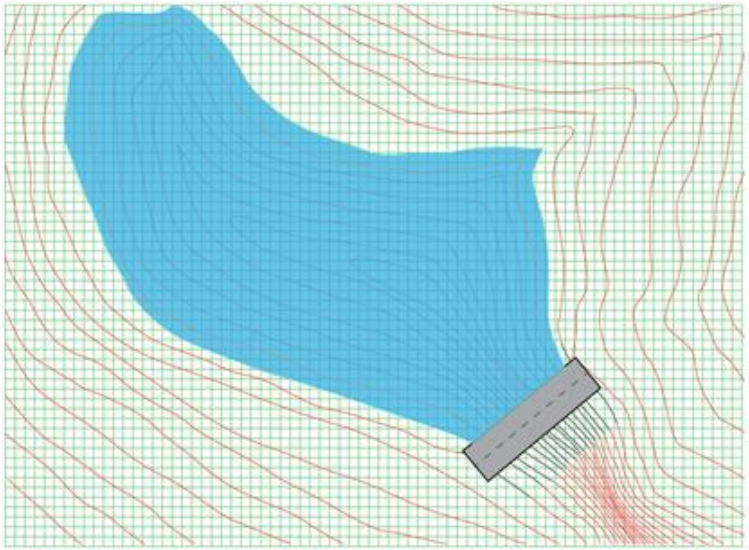
Summary of Methods

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

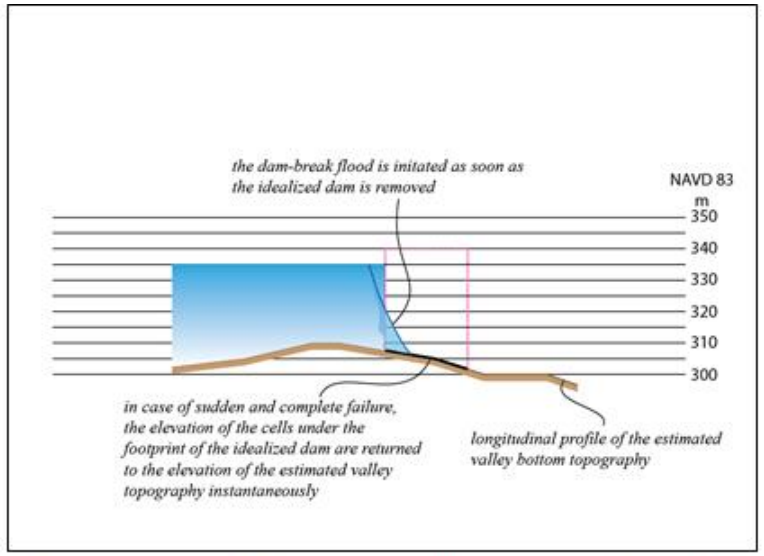


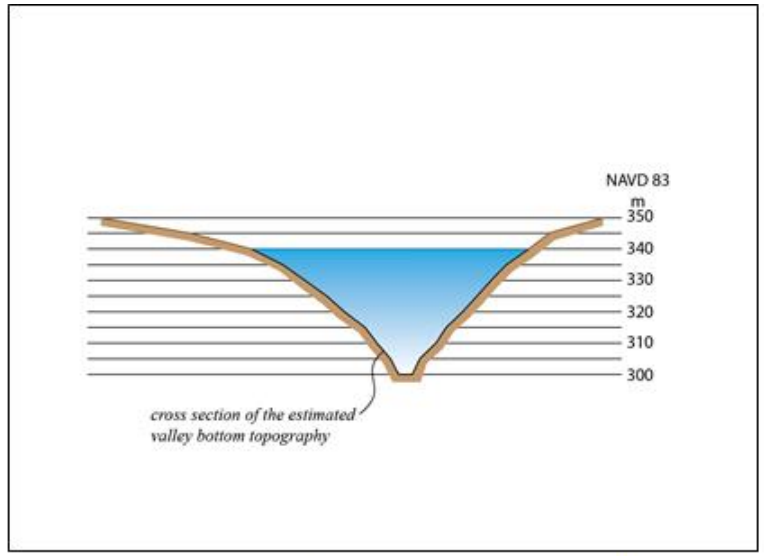
Breach Invert Elevation: 242 (=302-60) ft NAVD 88
Breach Width: 180 ft
Breach Formation Time: 0.3 hrs

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

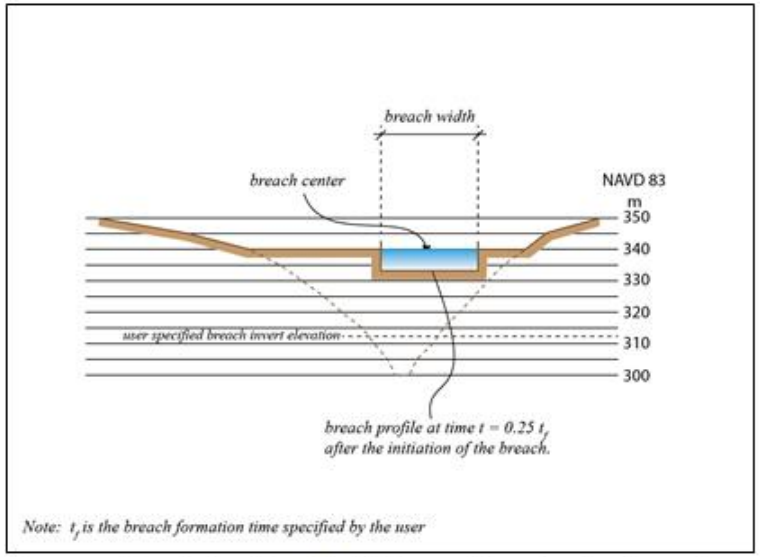


Reservoir is filled up to the water surface elevation at failure, which is specified by the user

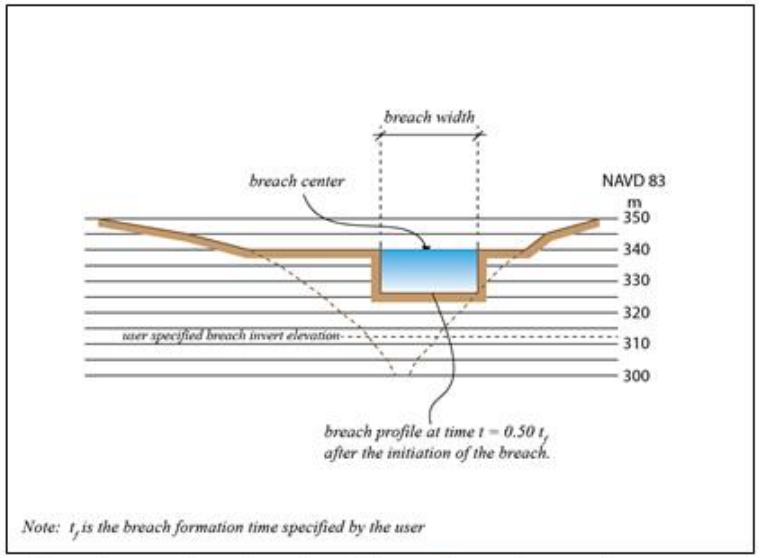




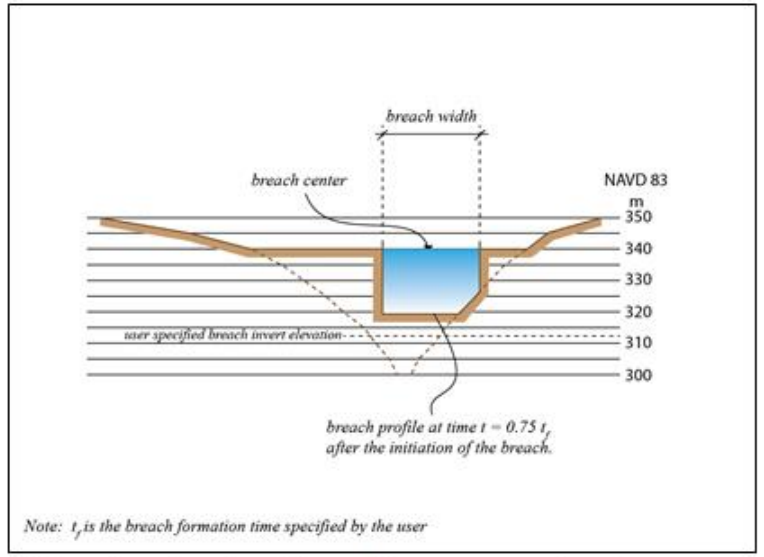
Transversal profile A-A and longitudinal profile BB show that, in case of sudden and complete failure, elevation of cells defining idealized dam are returned to their estimated valley elevation. This initiates the dam-break flood



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

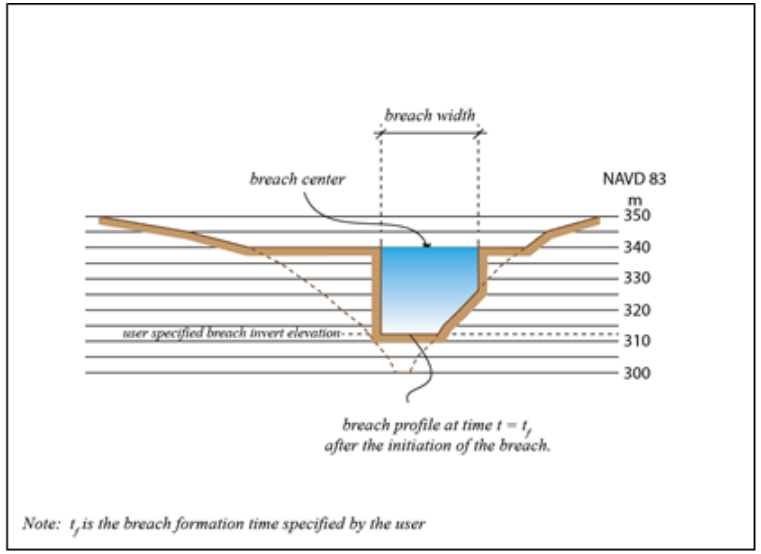


Note that as the elevation of the cells are lowered to create the breach, they do not cut into the original terrain

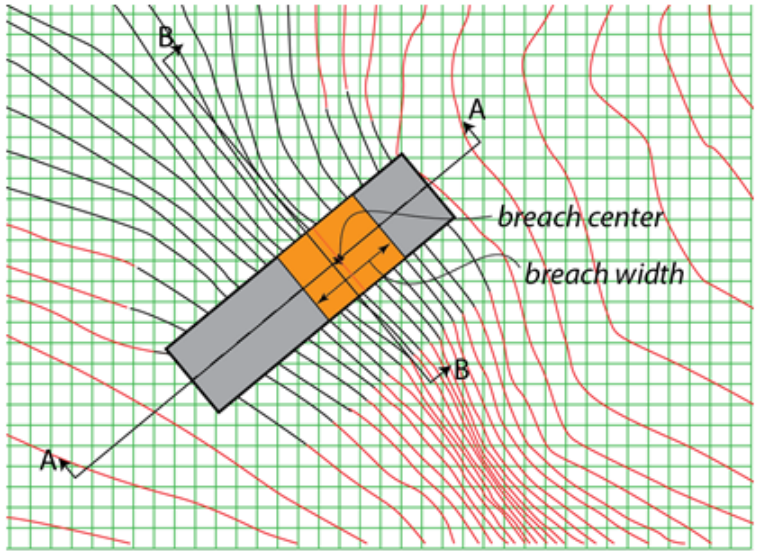


When the elevation of the cell becomes equal to the estimated valley elevation, it is no longer lowered

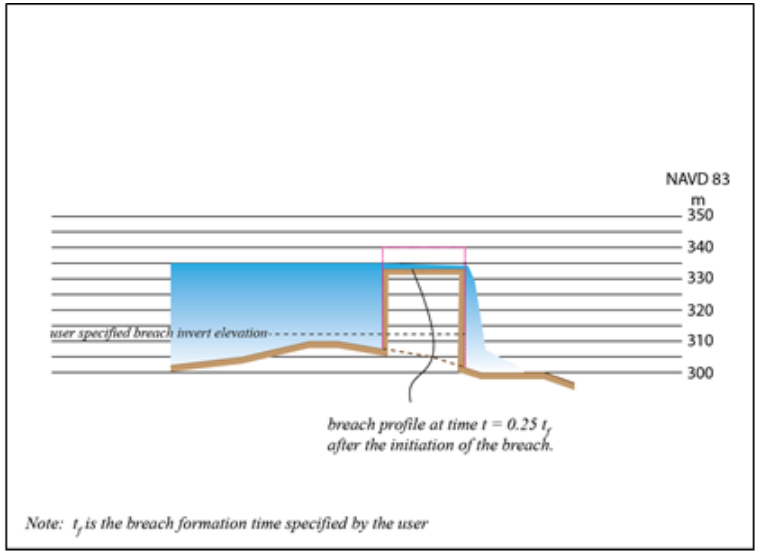
Simplified Illustration of the Estimation of the Removal of Dams, Reservoir Bed Elevation, and Breaching Process / 5



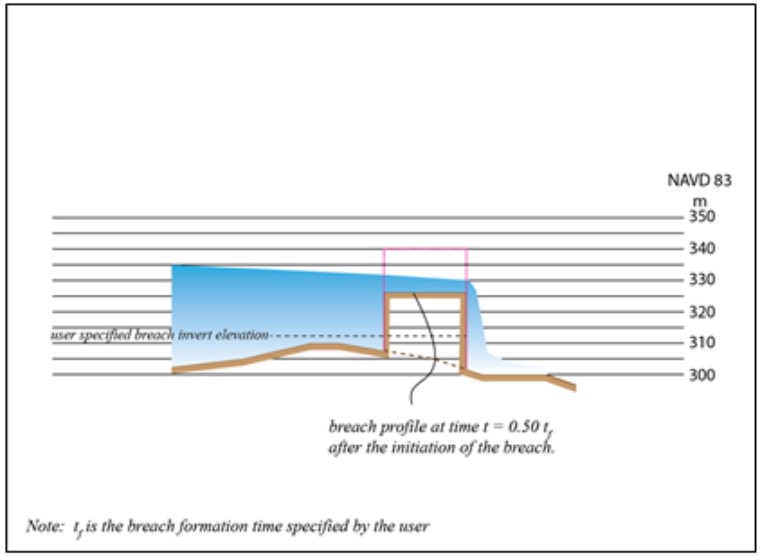
When all the cells reach the specified breach invert elevation, or the estimated valley elevation, breaching stops



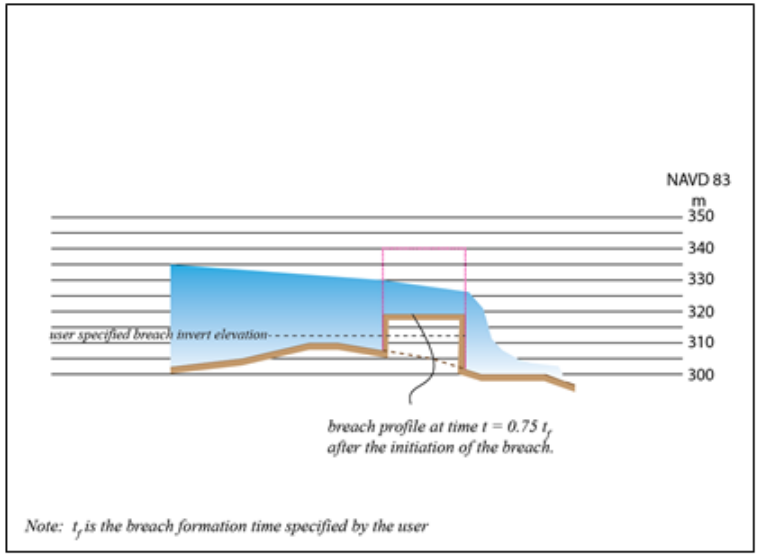
Let us now observe the partial and gradual breaching process on the longitudinal profile B-B



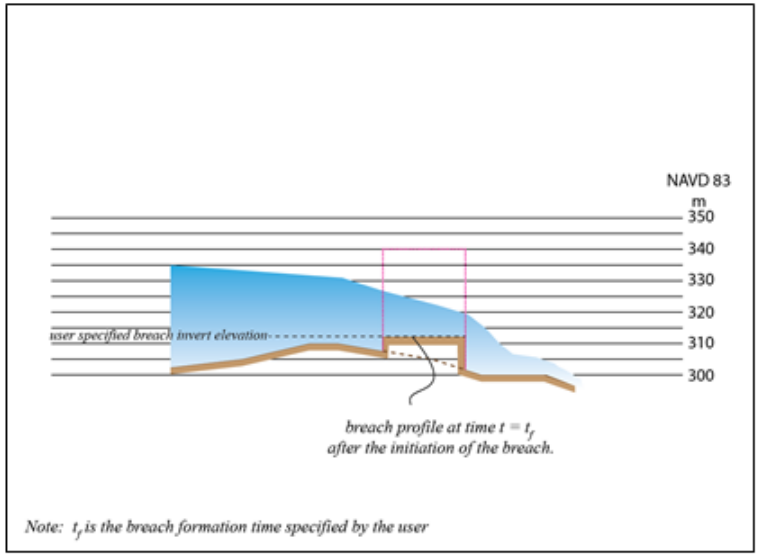
At t = 0.25 t_f, cells are lowered by an amount equal to ¼ of the elevation difference between the crest and breach invert



At t = 0.50 t_f, cells are lowered by an amount equal to ½ of the elevation difference between the crest and breach invert



At t = 0.75 t_f, cells are lowered by an amount equal to ¾ of the elevation difference between the crest and breach invert



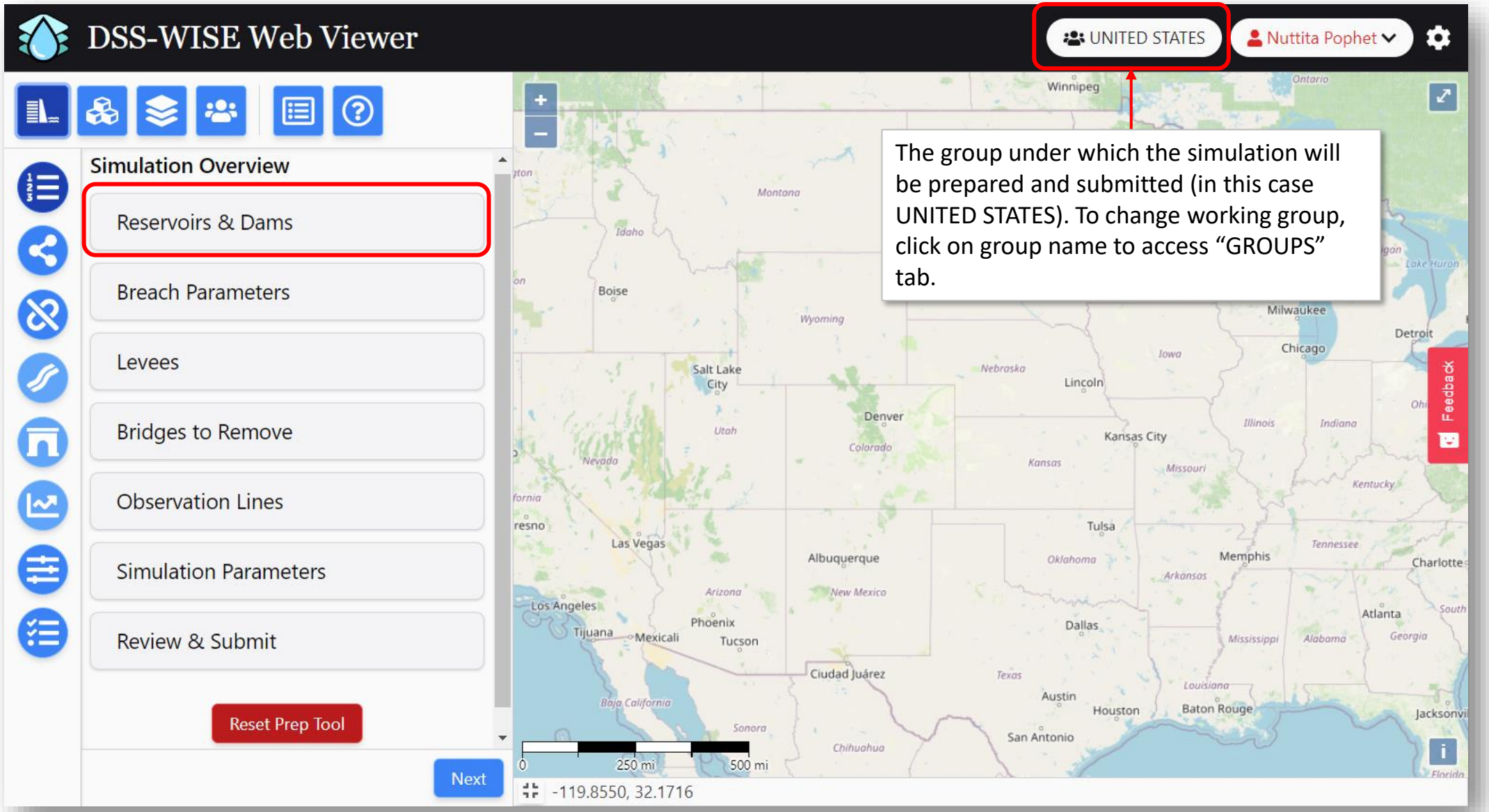
At t = t_f, the breaching process is completed since all cells have reached the elevation of breach invert of the valley

DSS-WISE™ Lite Prep Tool

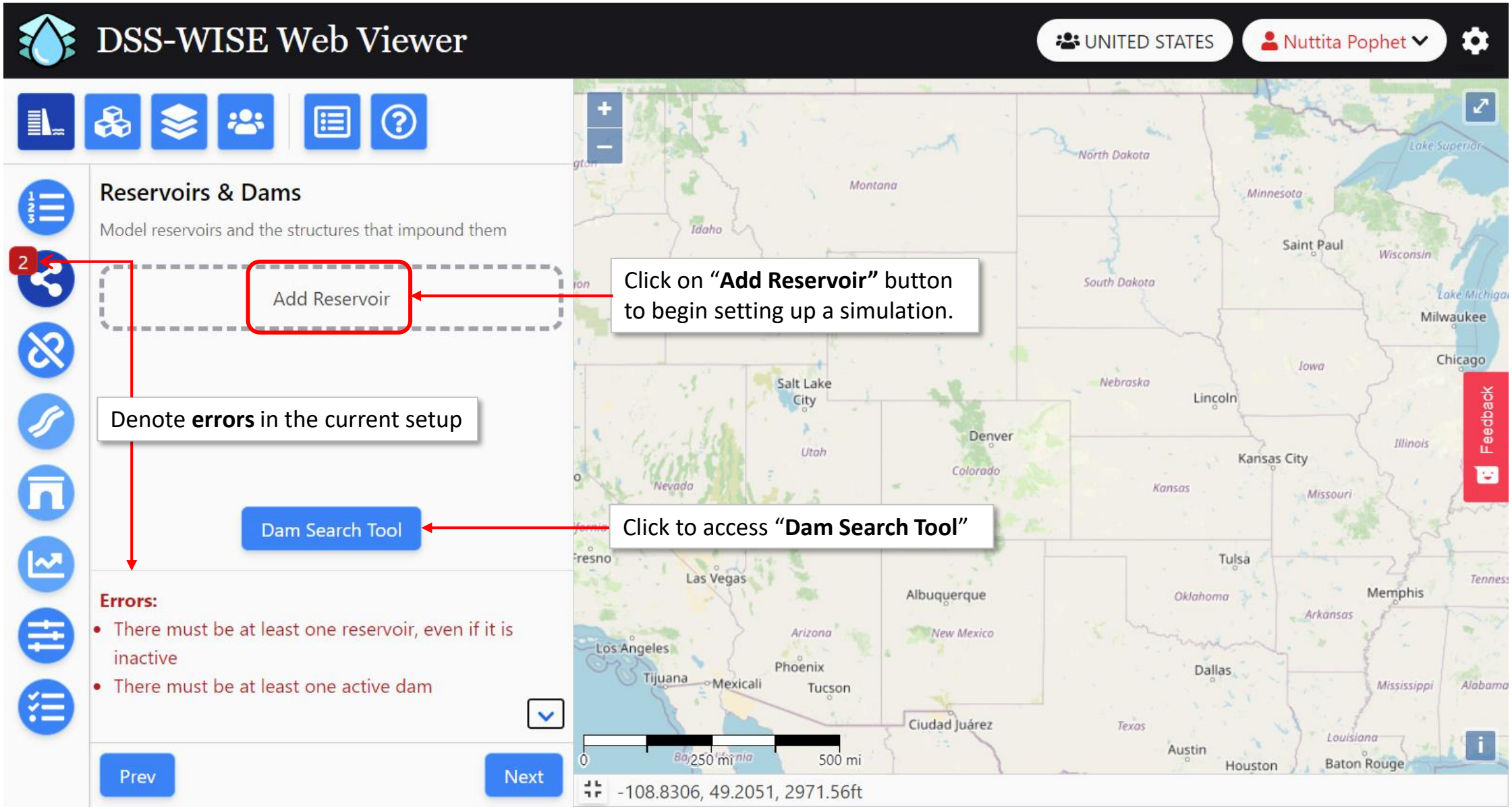
2.5

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.



PREP TOOL Tab: **Reservoirs** & Dams



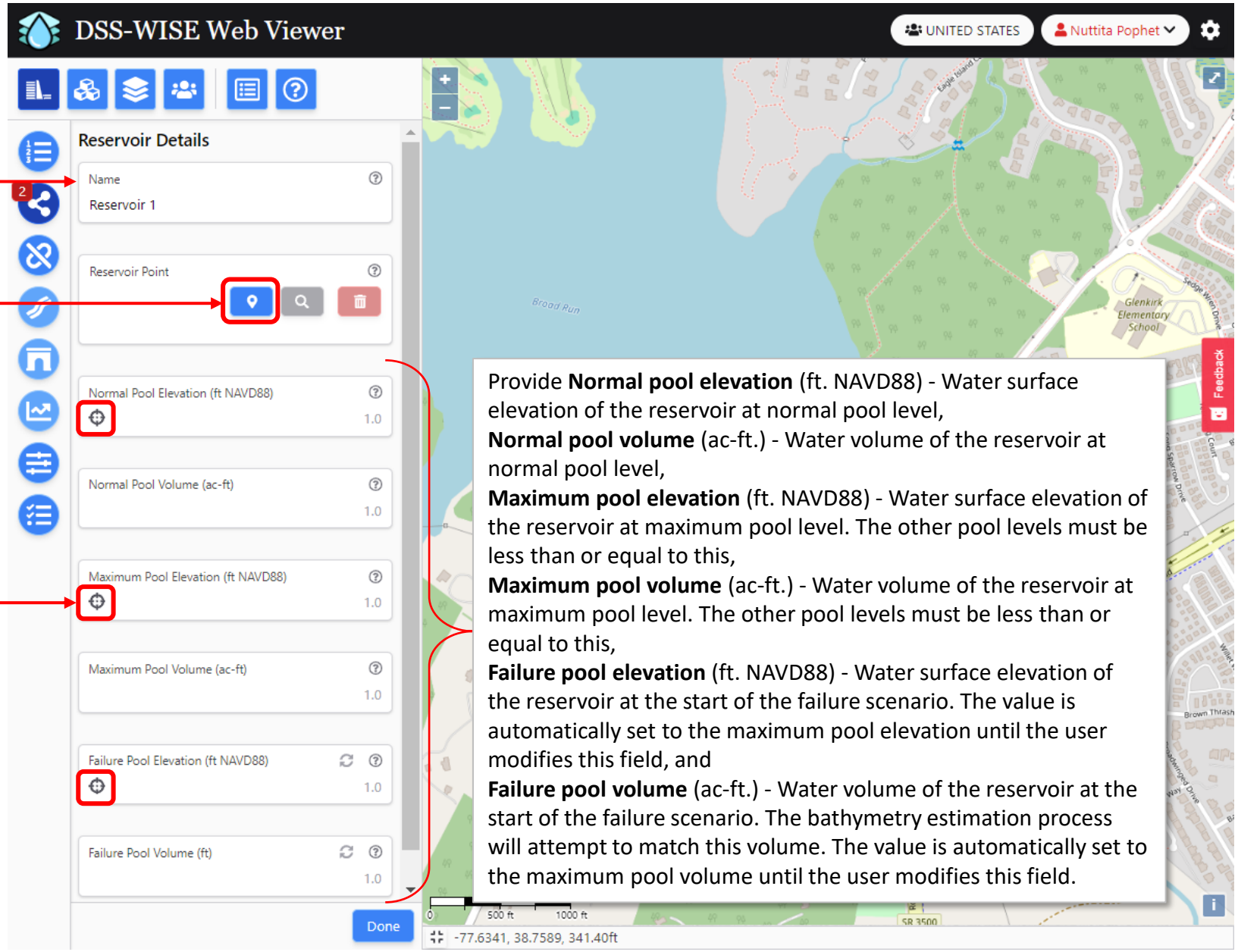
PREP TOOL Tab: Reservoirs & **Dams**

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

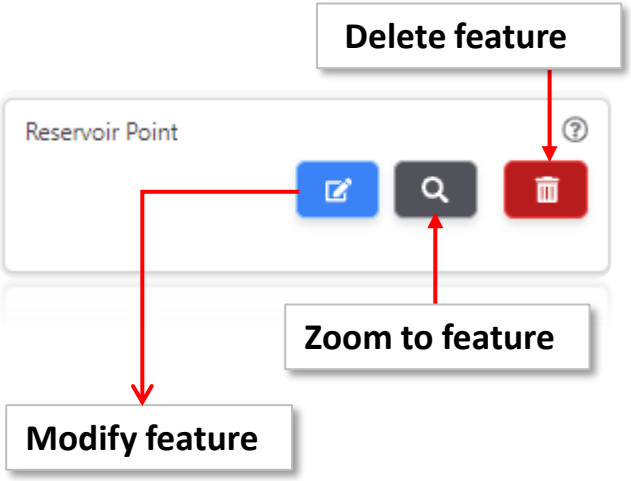


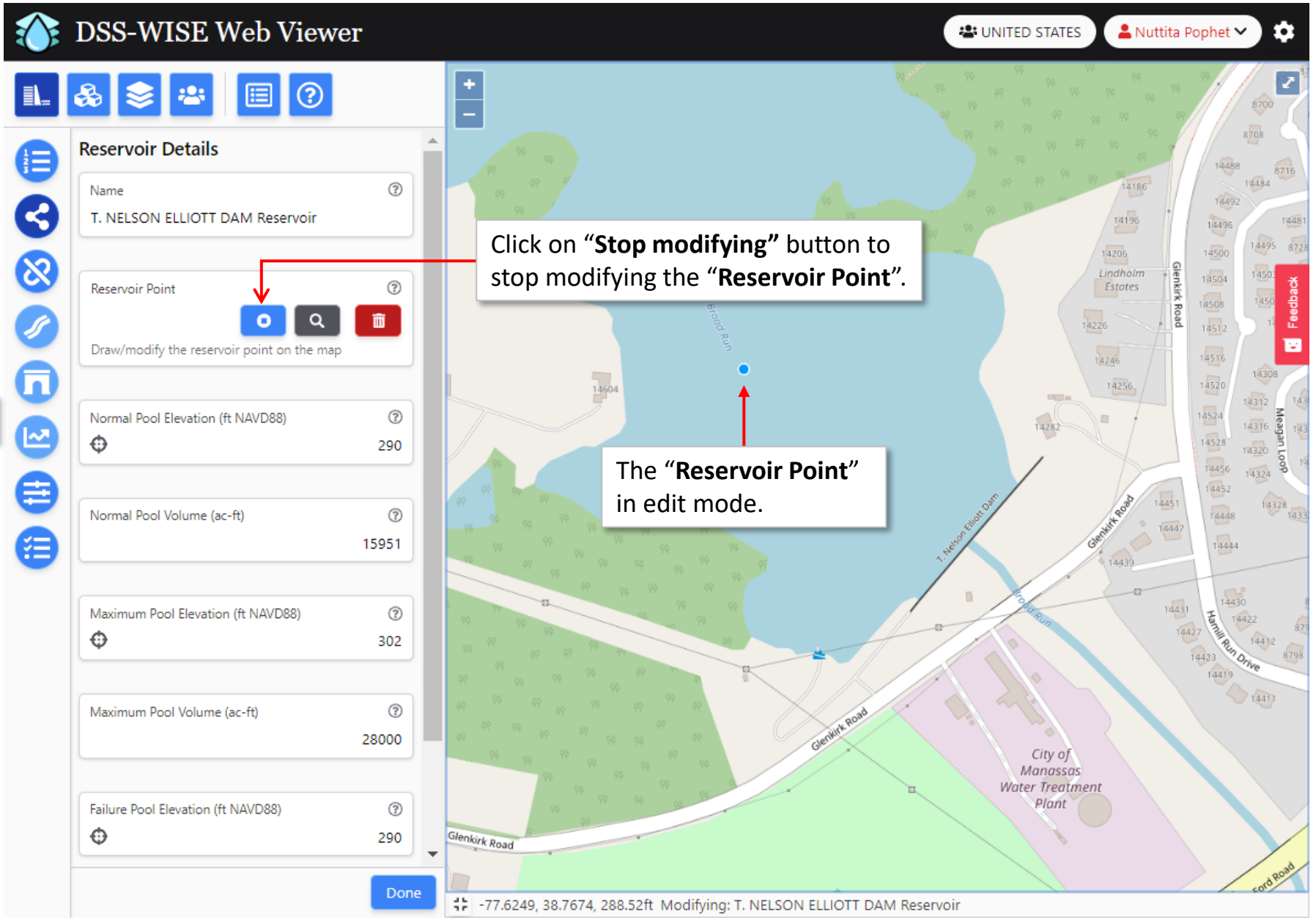
Provide **Normal pool elevation** (ft. NAVD88) - Water surface elevation of the reservoir at normal pool level,
Normal pool volume (ac-ft.) - Water volume of the reservoir at normal pool level,
Maximum pool elevation (ft. NAVD88) - Water surface elevation of the reservoir at maximum pool level. The other 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.

PREP TOOL Tab: Reservoirs & **Dams**

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.



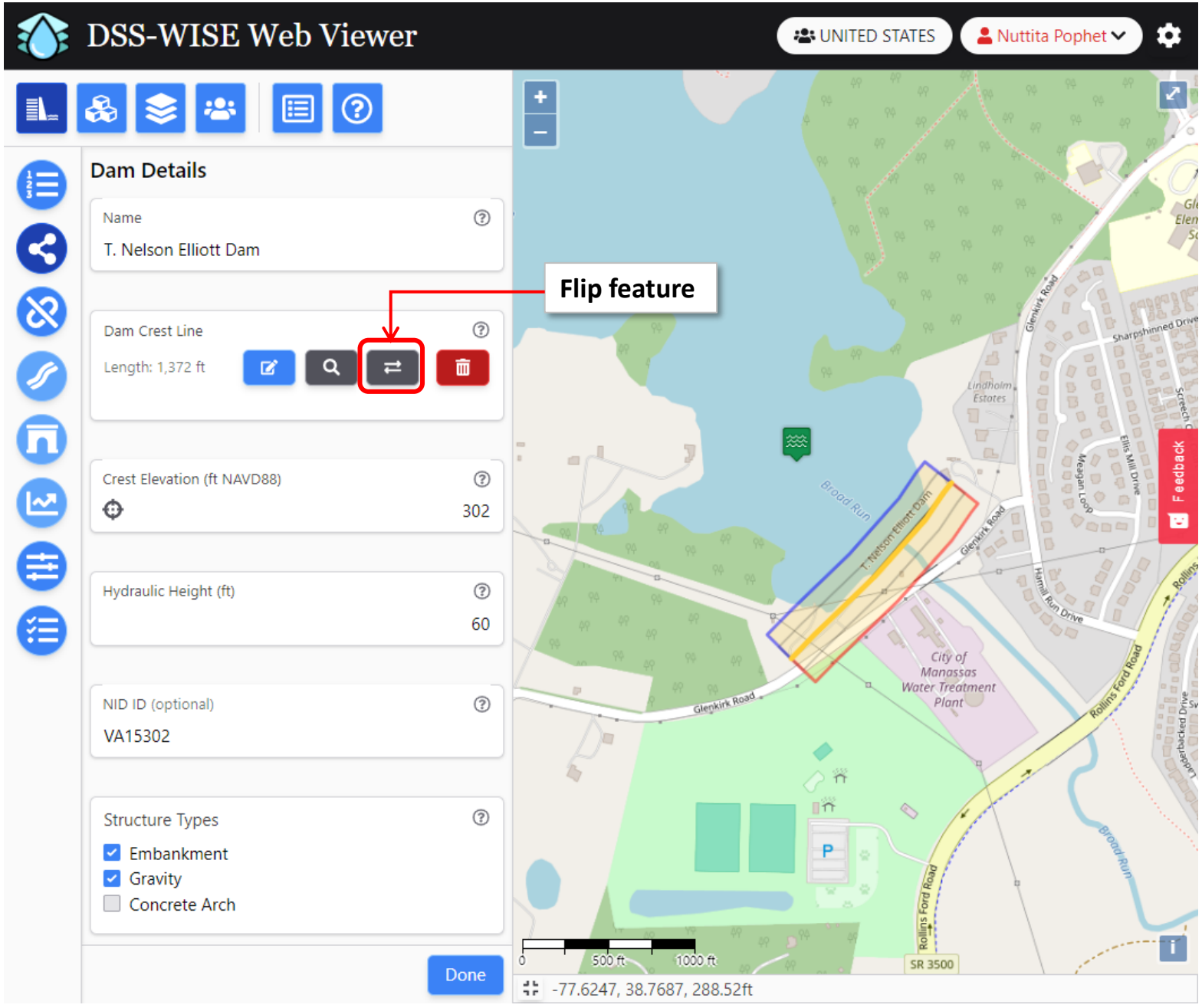


PREP TOOL Tab: Reservoirs & **Dams**

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.



PREP TOOL Tab: Reservoirs & **Dams**

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.

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.

PREP TOOL Tab: Reservoirs & **Dams**

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.

PREP TOOL Tab: Breach Parameters

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.

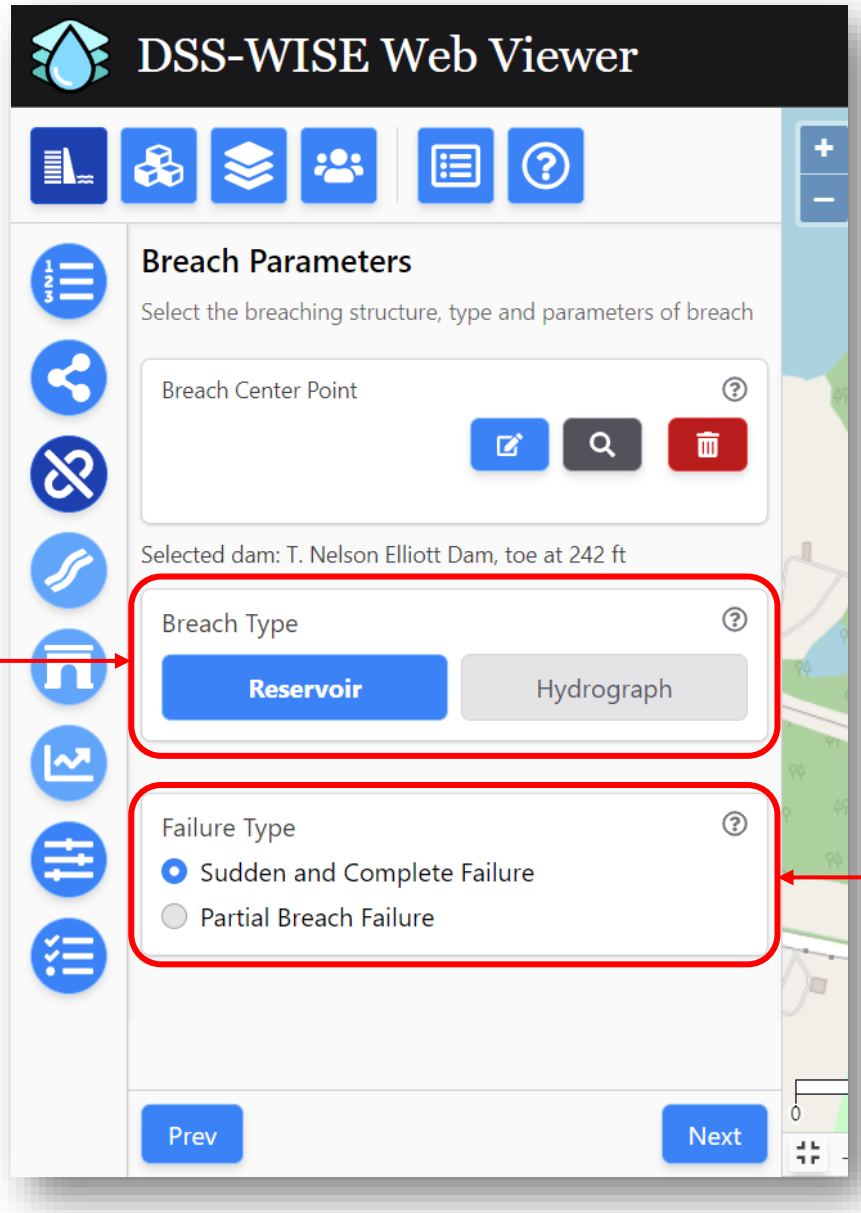
For a **reservoir-type breach**, the cells within the footprint of this structure will have their elevations lowered according to the breach parameters selected below.

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

PREP TOOL Tab: Breach Parameters

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.



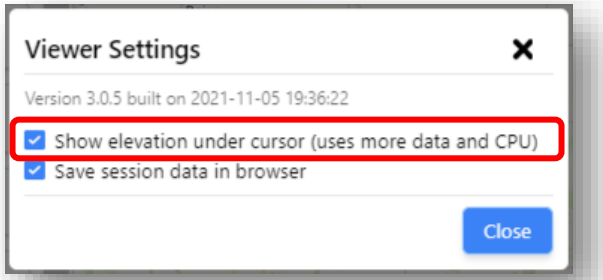
Sudden and complete failure causes the entire length of the structure to fail instantaneously at the very beginning of the simulation.

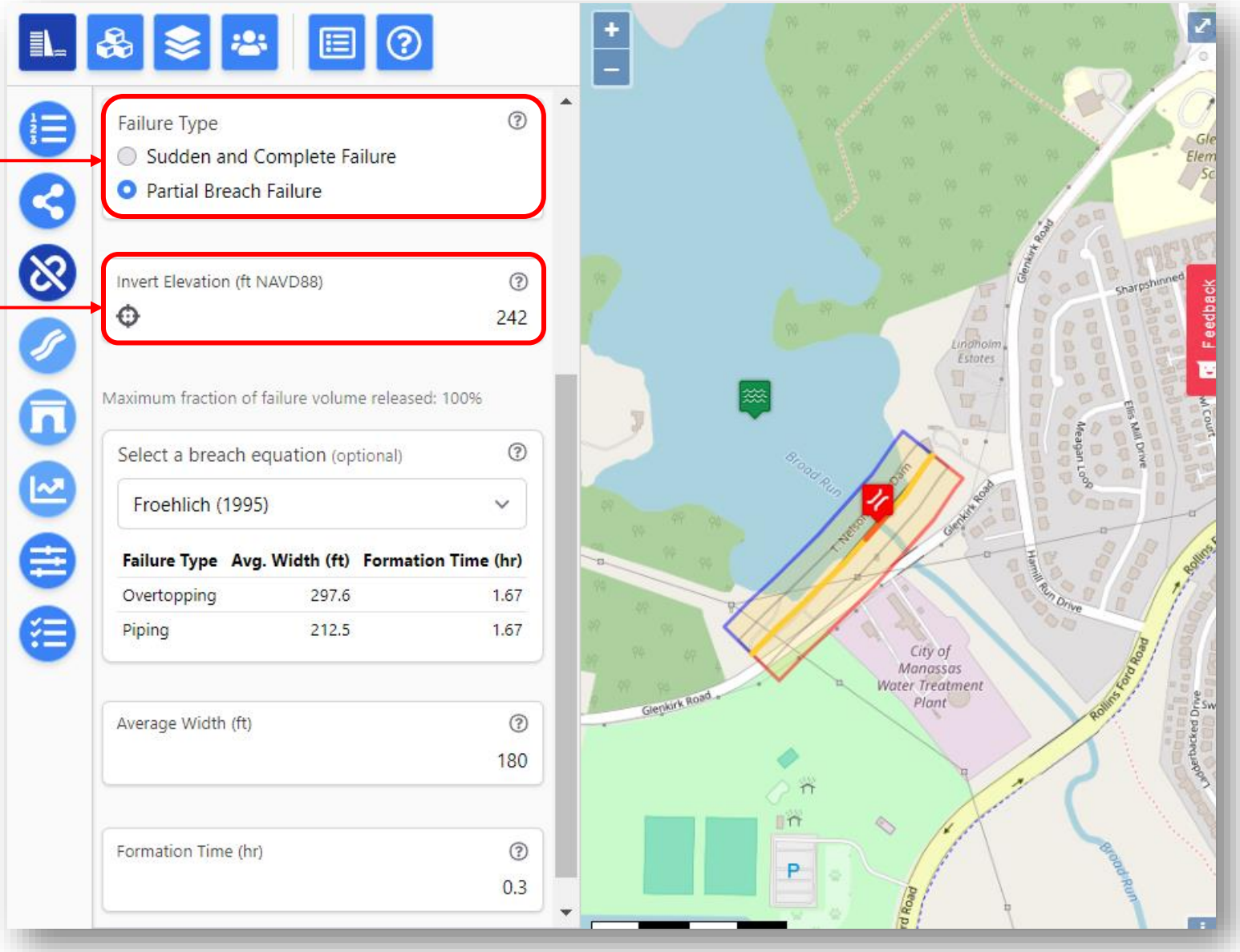
Partial breach gradually breaches the dam based on the final breach width and breach formation time information provided by the user. Thus, the user will be prompted to provide additional data to define breach width and breach formation time.

PREP TOOL Tab: Breach Parameters

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.

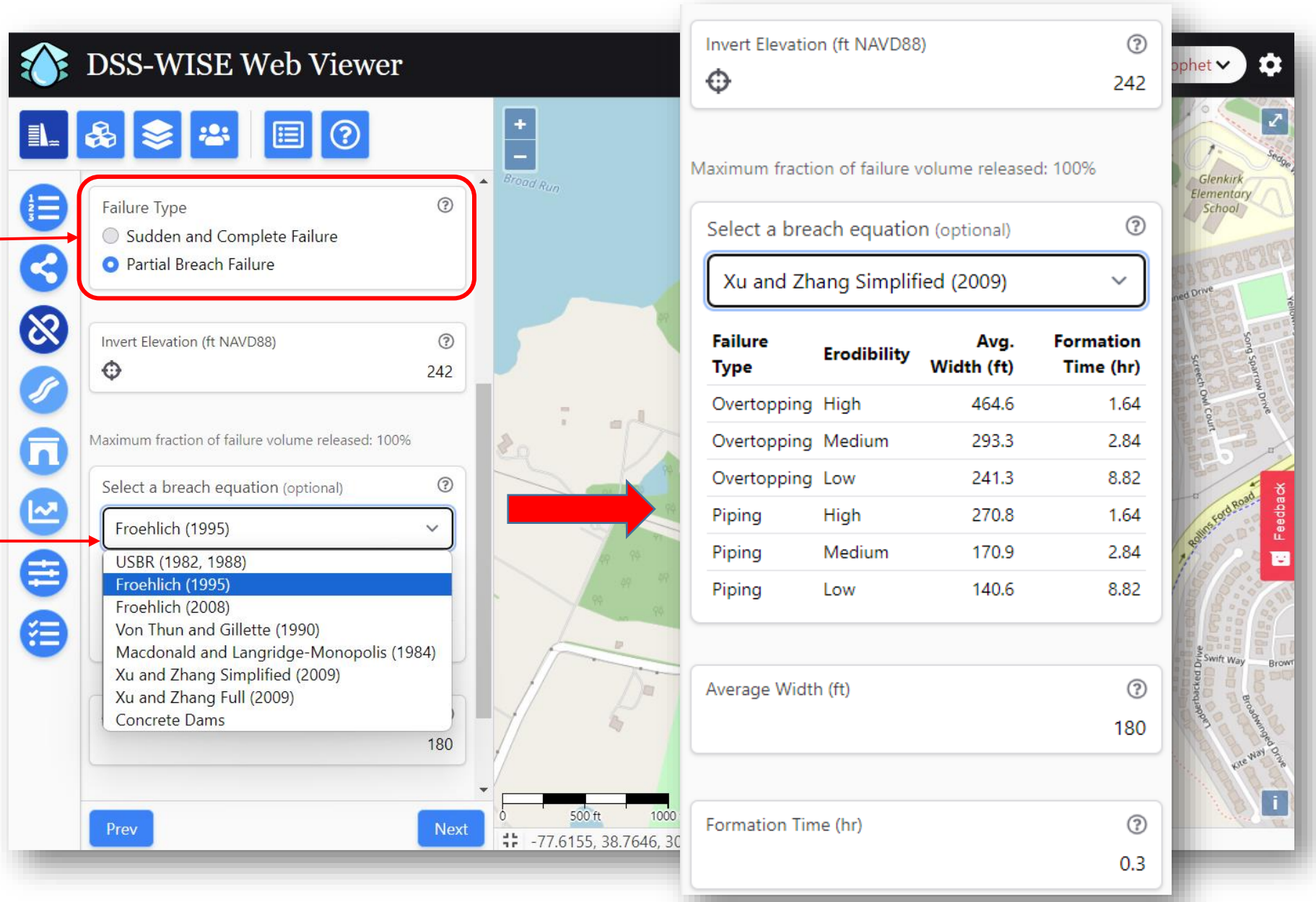




PREP TOOL Tab: Breach Parameters

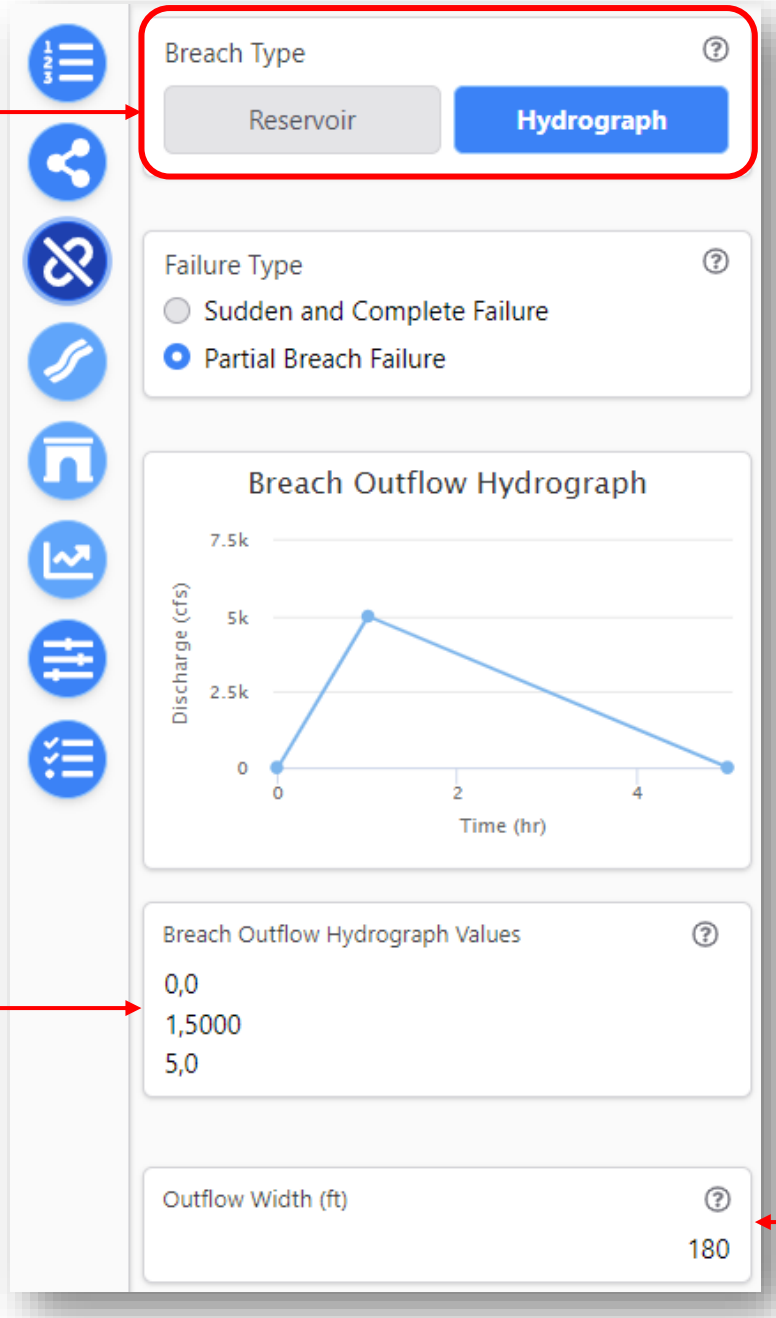
Breach type is chosen as **Partial**

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.



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.

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

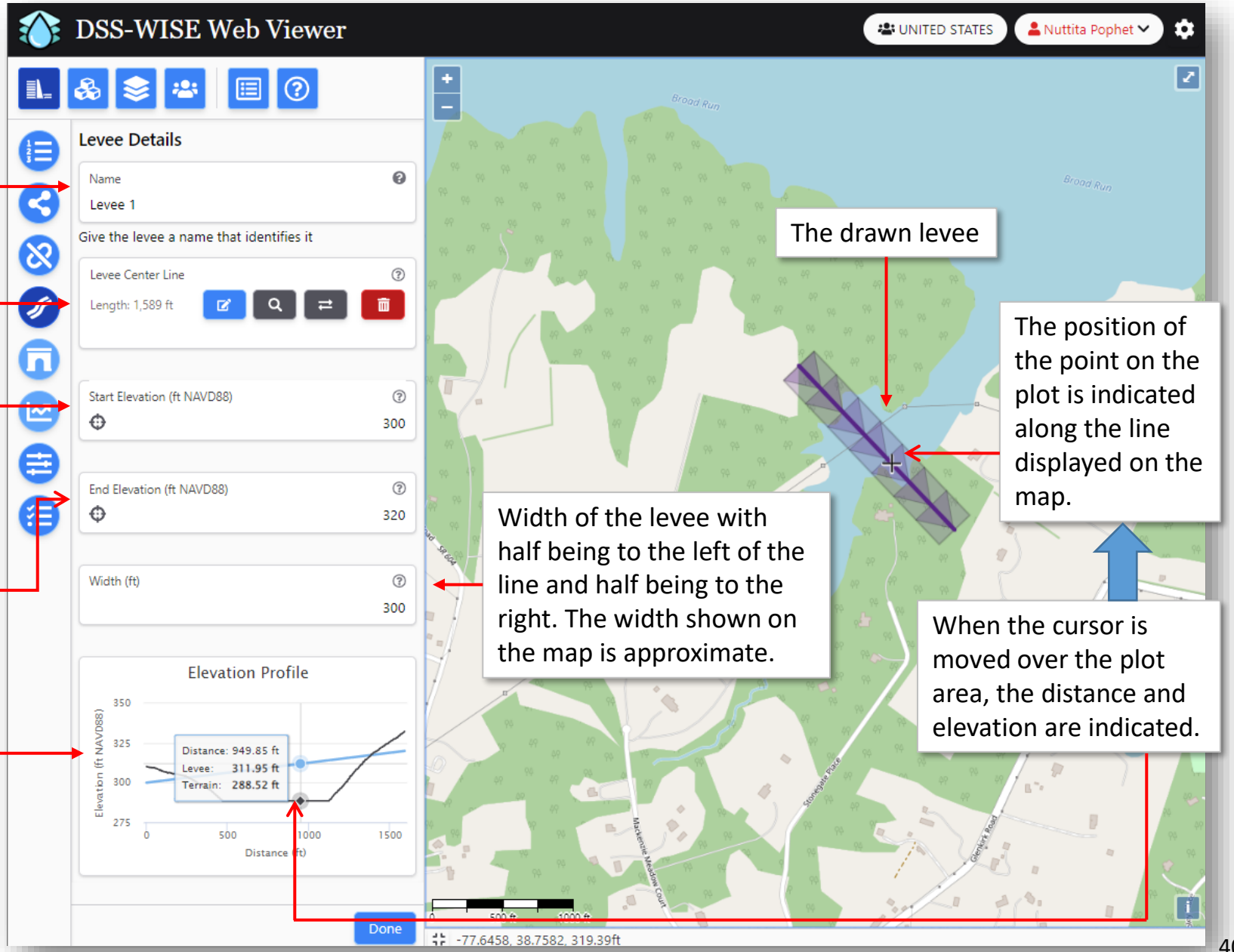
Enter the levee name

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.

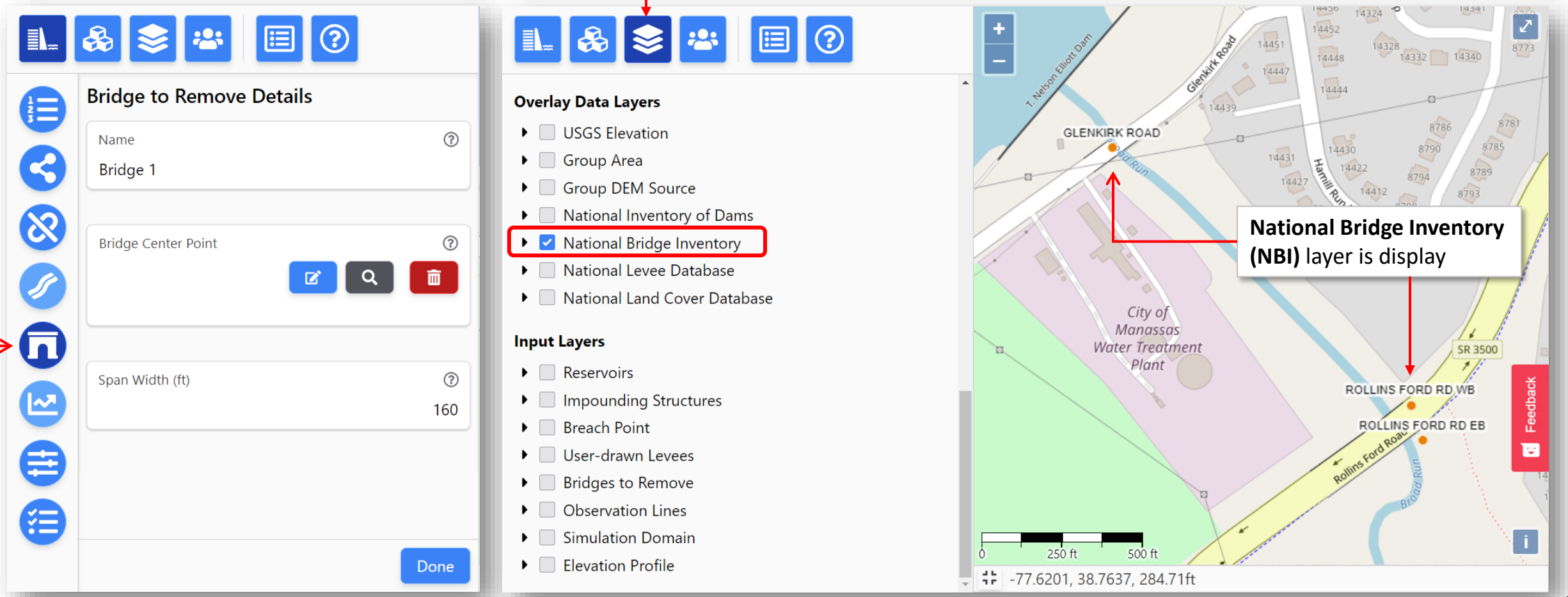


PREP TOOL Tab: Bridge to Remove Details

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



National Bridge Inventory (NBI) layer is display

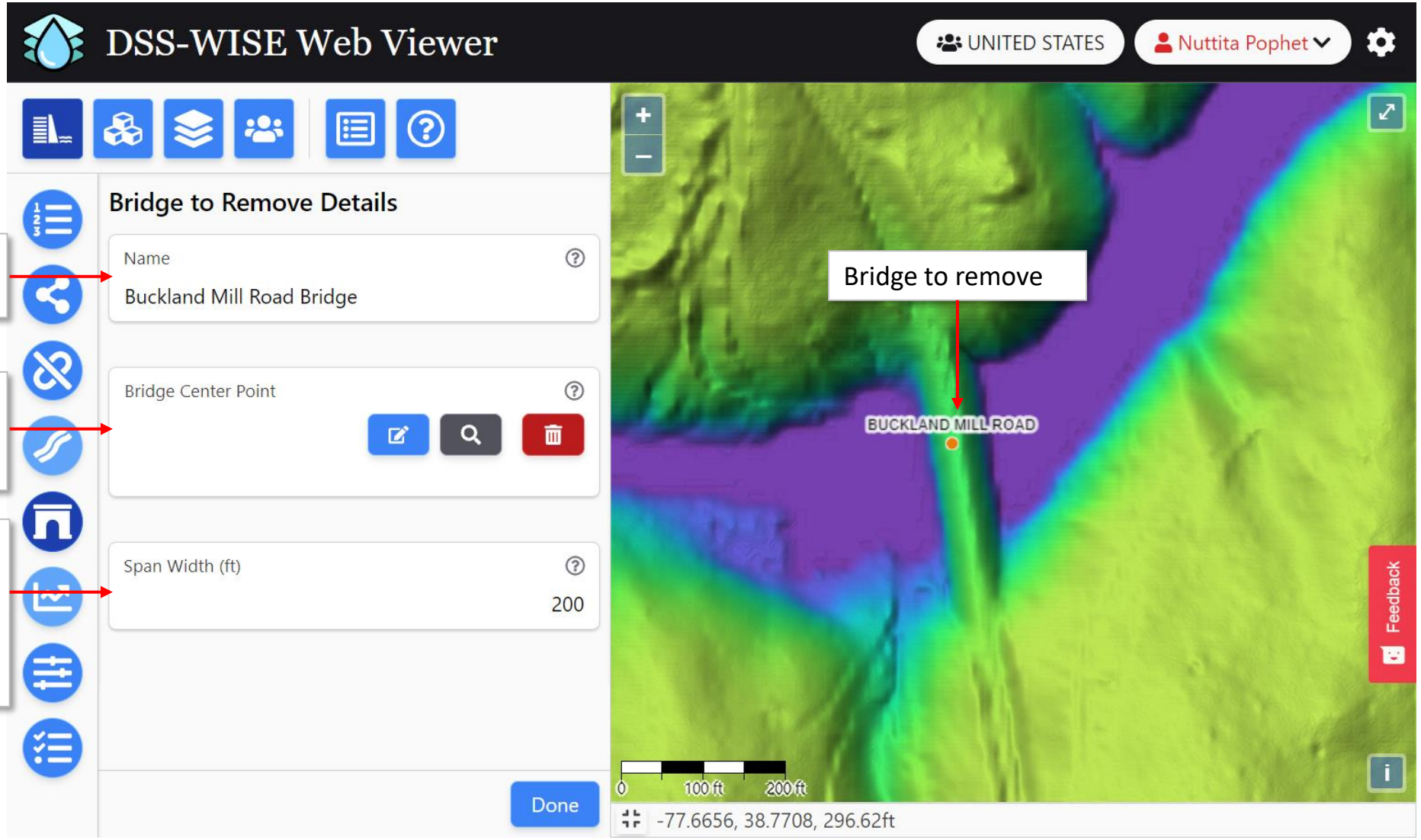
PREP TOOL Tab: Bridge to Remove Details

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

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

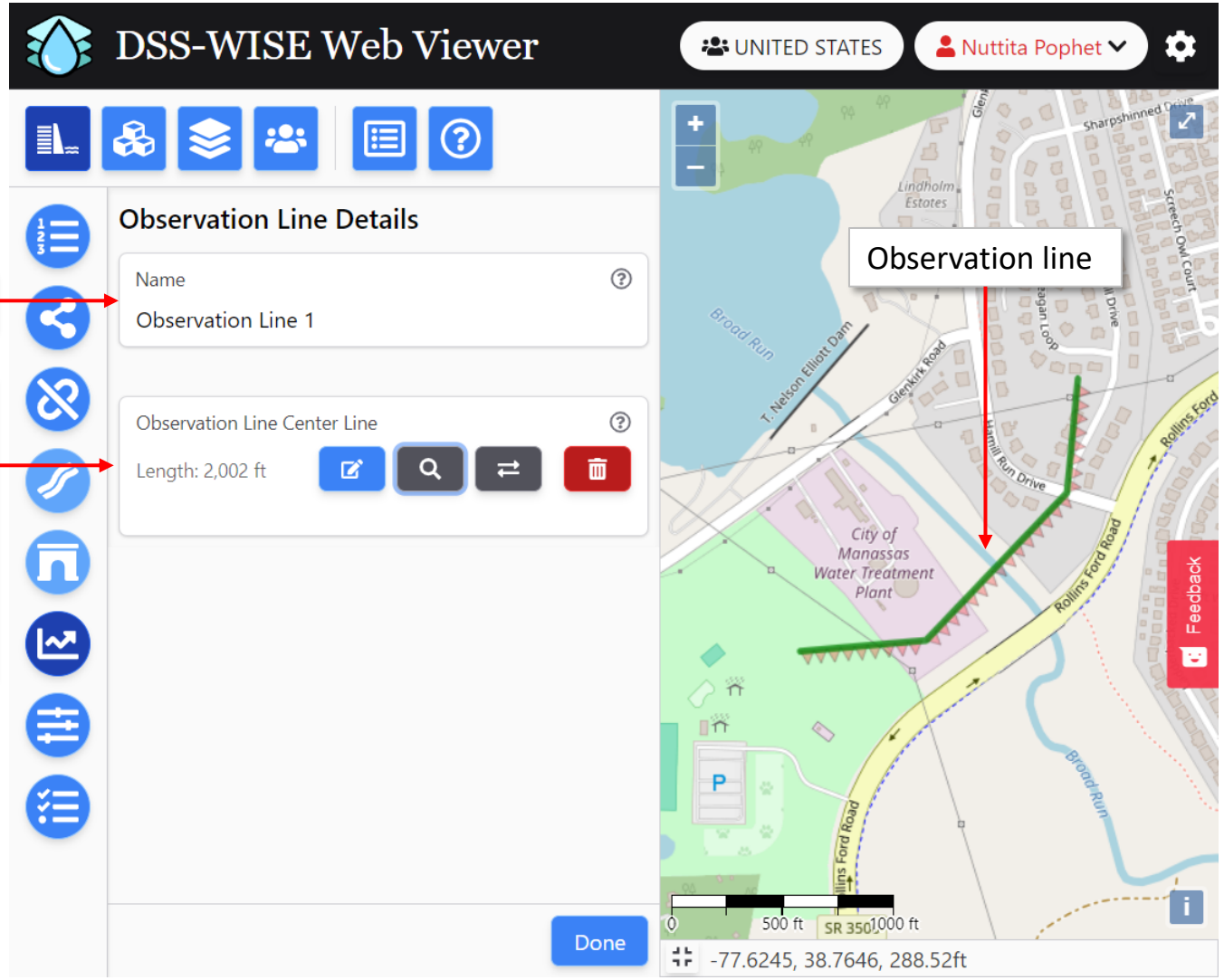


PREP TOOL Tab: Observation Line Details

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.

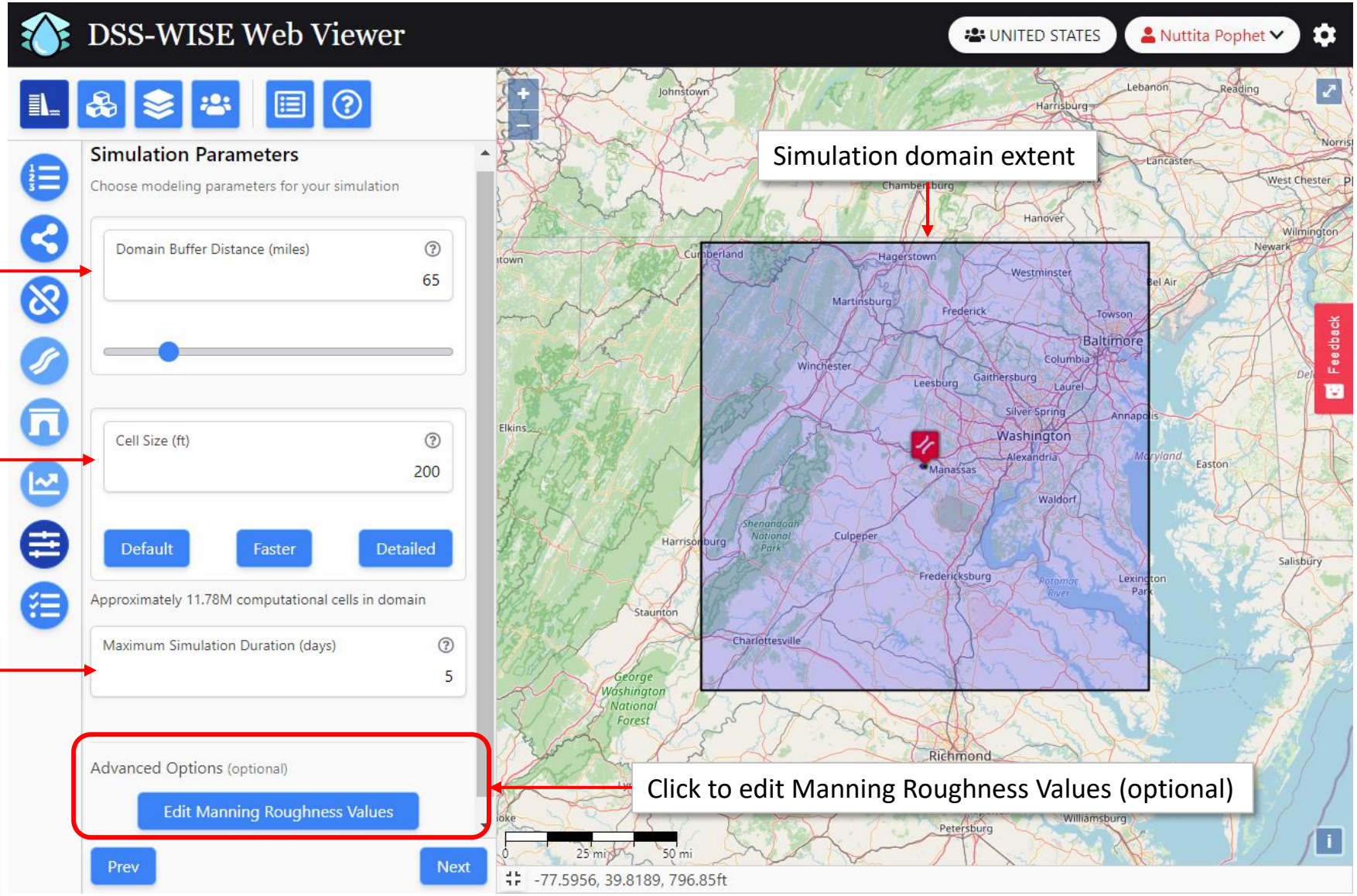


PREP TOOL Tab: Simulation Parameters

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.

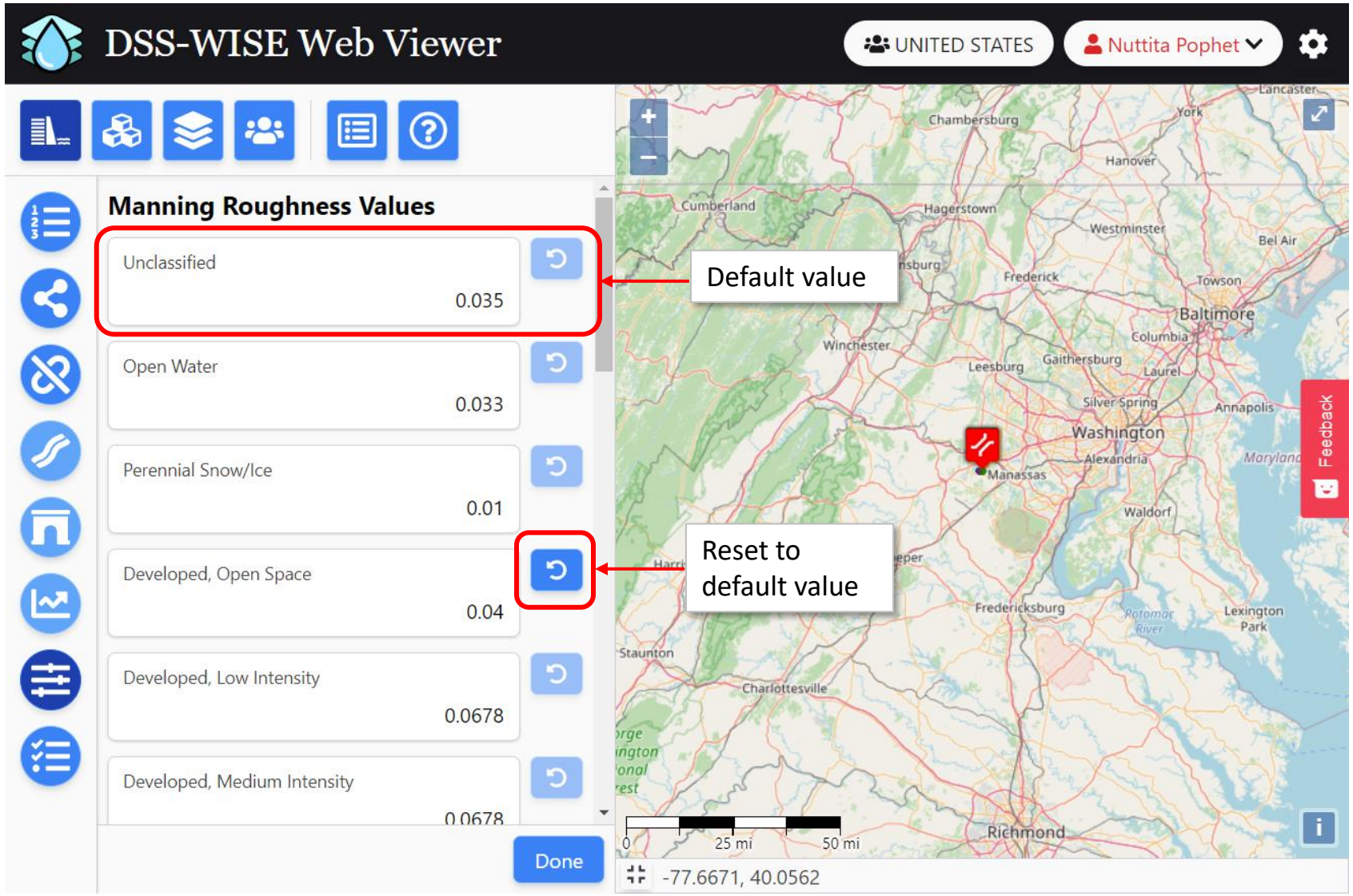
The maximum simulation duration sets the limit on the number of days after the start of the breach that the scenario will continue. The simulation will end once this time has been reached no matter what, so it must be at least as long as the breach formation time or the end of the breach hydrograph.



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



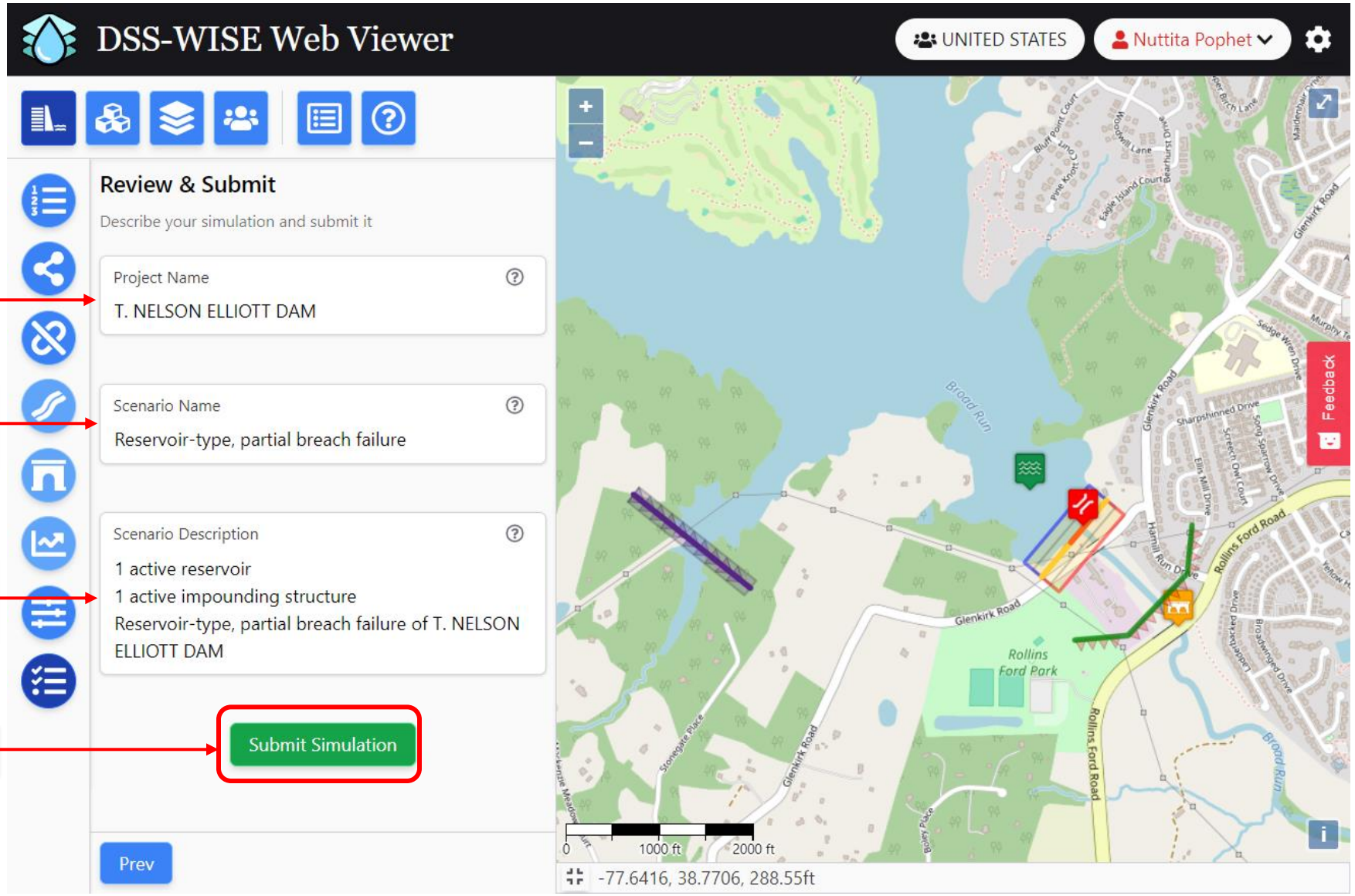
PREP TOOL Tab: Review & Submit

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.

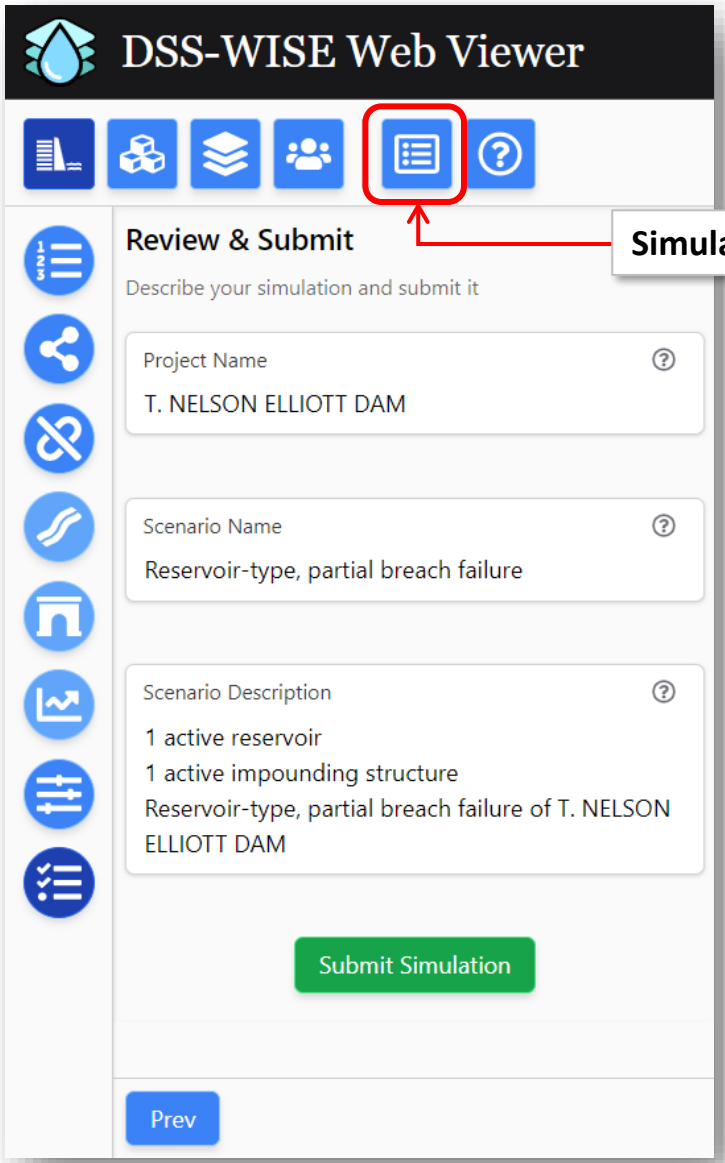
Click to submit simulation



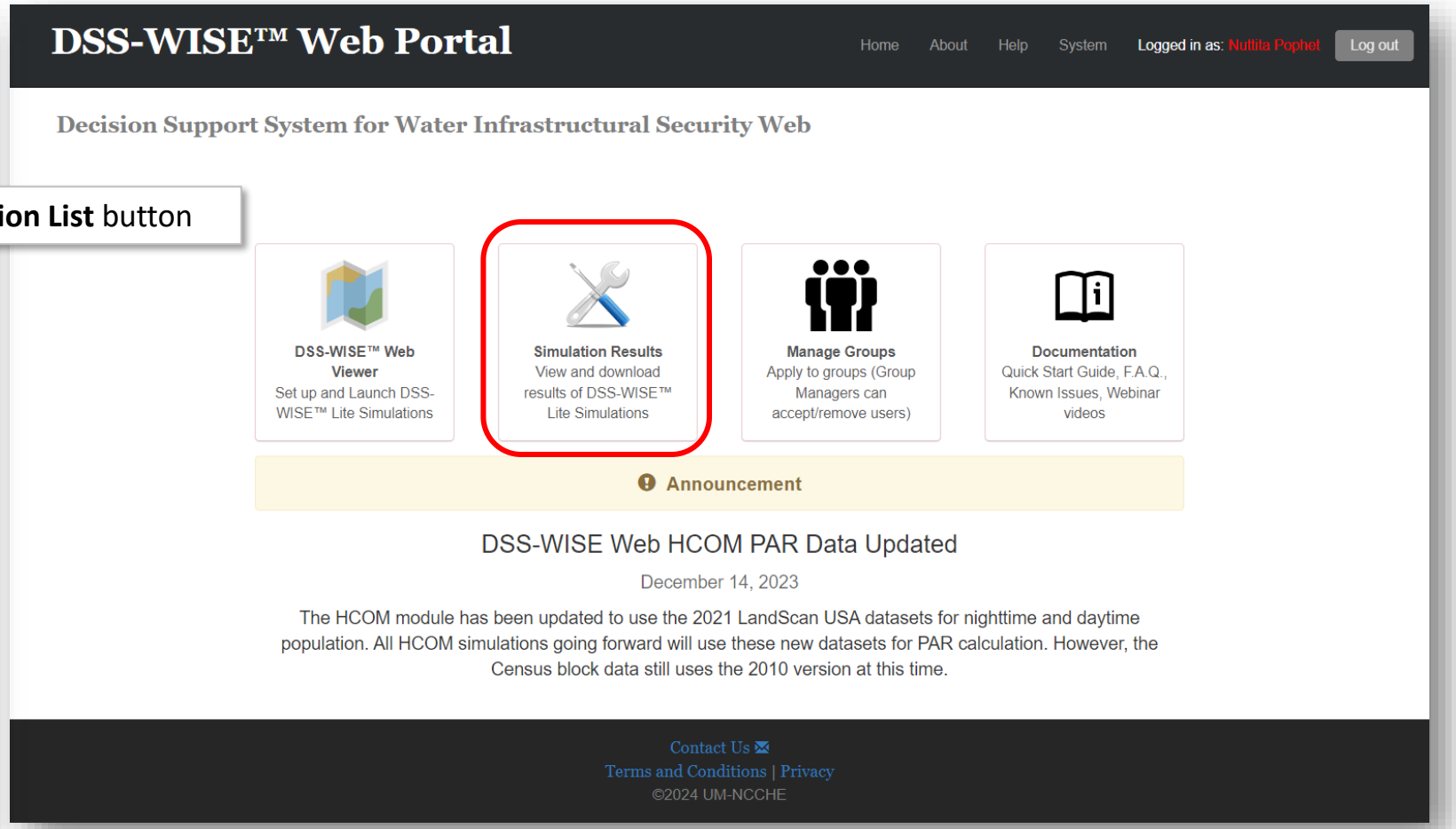
Monitoring the Reservoir-Type Simulation for T. Nelson Elliott Dam on Status and Results Page

2.6

Displaying the List of Simulations Performed by the User

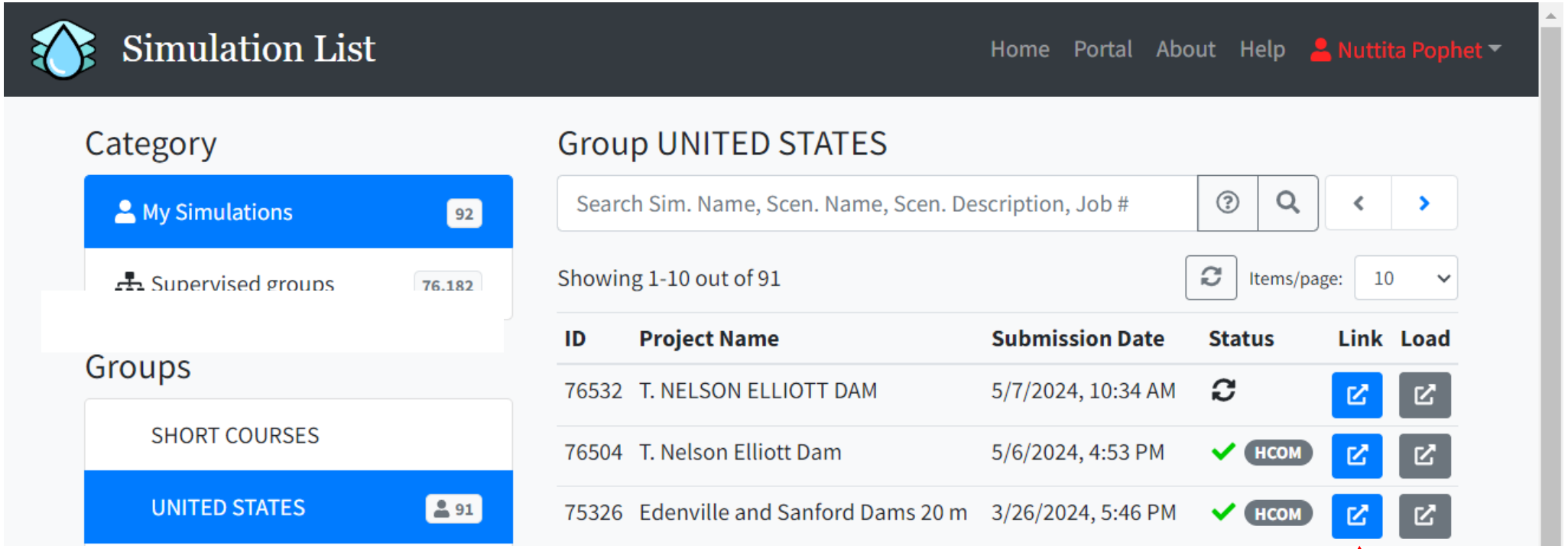


Simulation List button



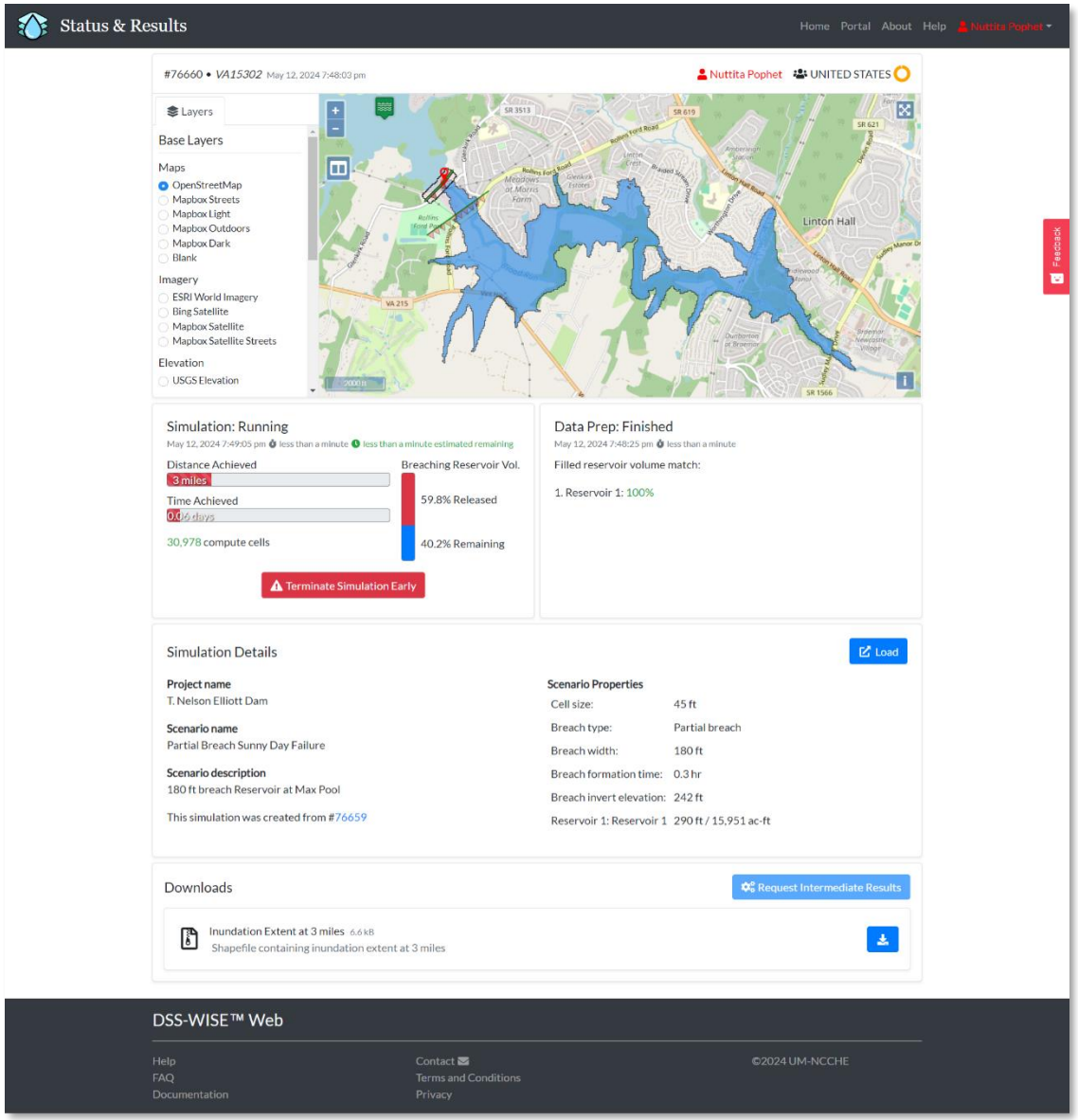
In DSS-WISE™ Web Viewer, click on the "**Simulation List**" button to go to "**Simulation Lists**" page. The user can also access "**Simulation Lists**" page from DSS-WISE™ Web Portal by clicking "**Simulation Results**" tab. This action displays a list of all the simulations performed by the user.

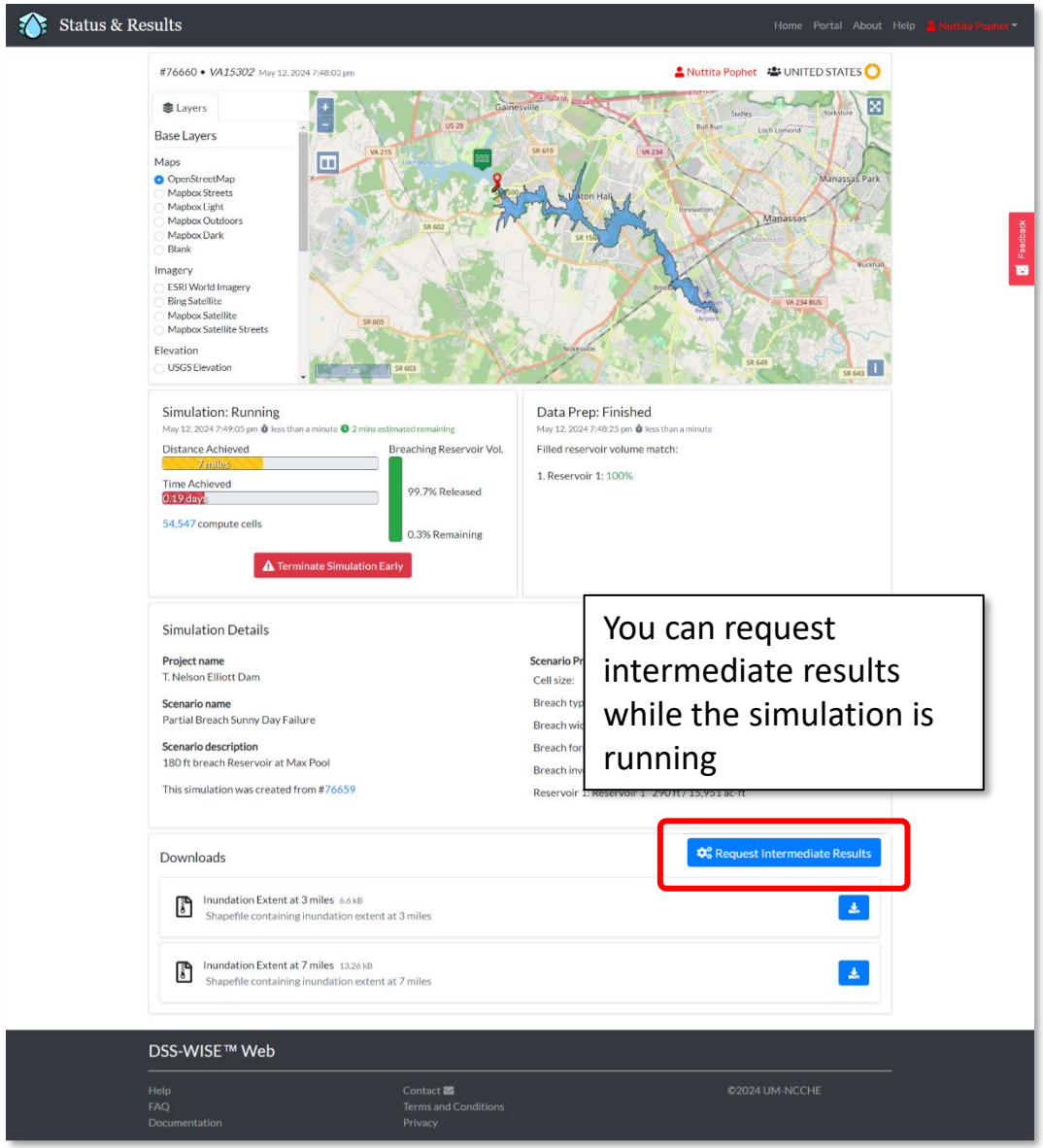
Displaying the List of Simulations Performed by the User



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

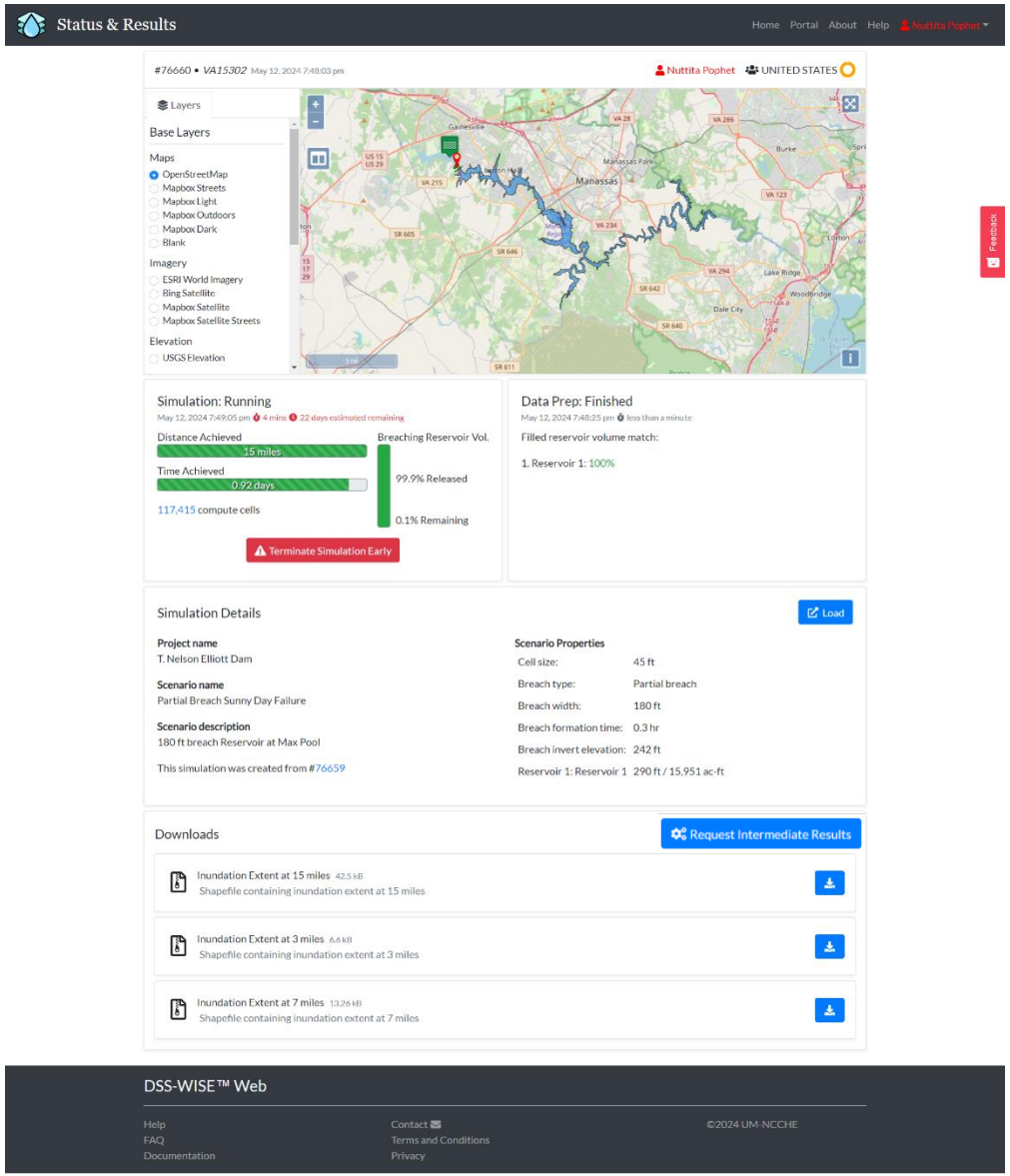
Monitoring a Simulation while it is Running

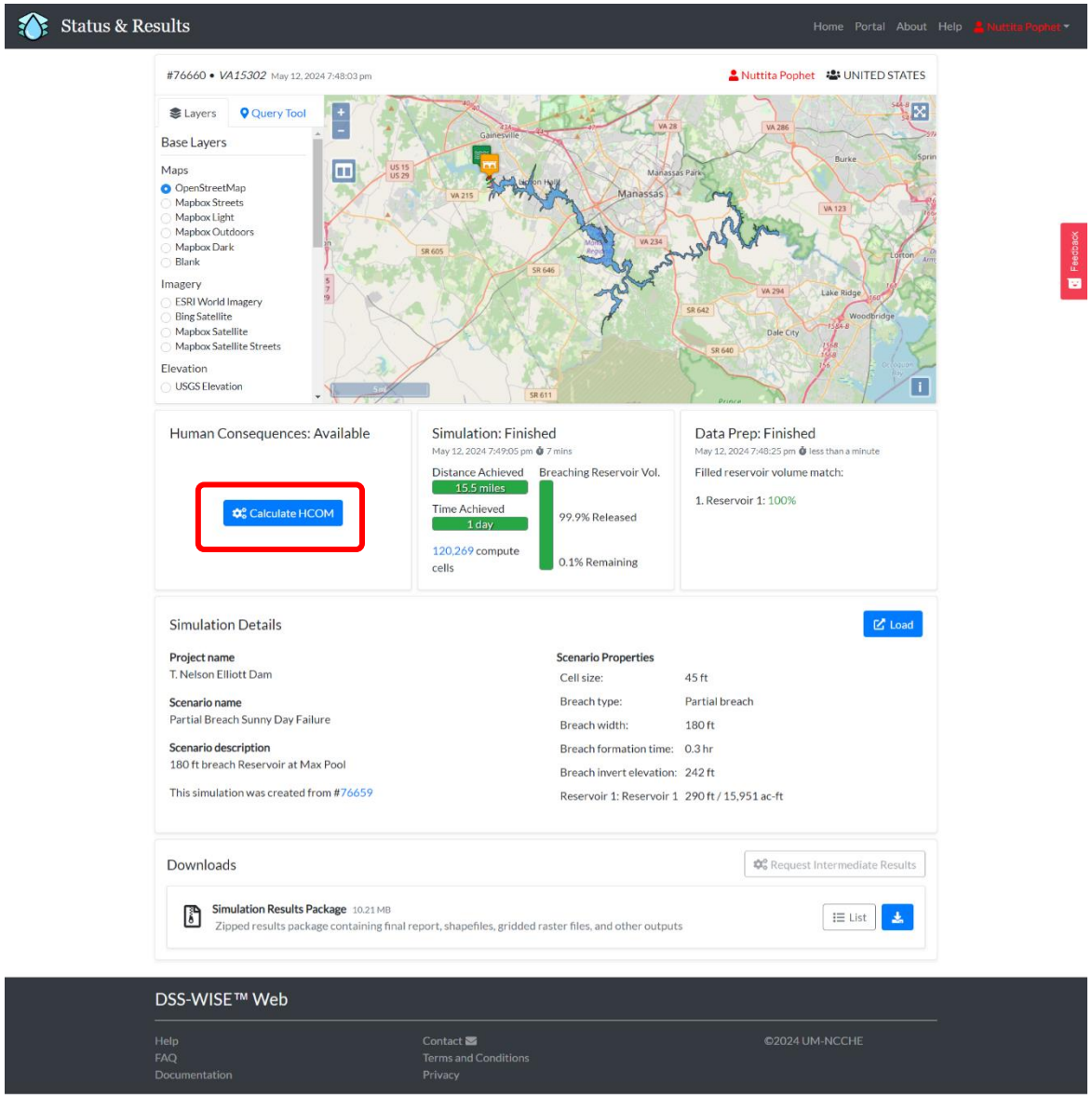




You can request intermediate results while the simulation is running

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

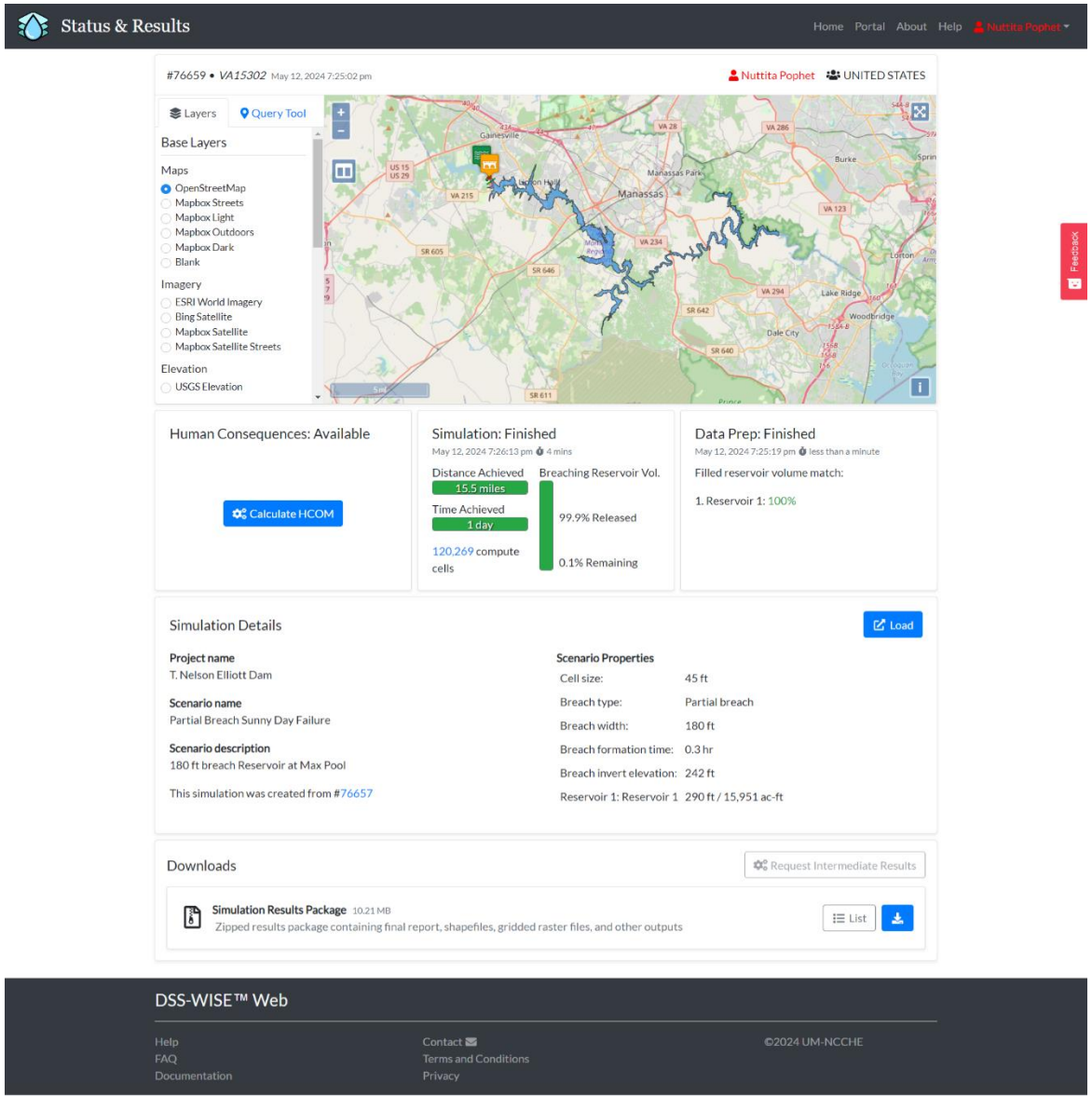


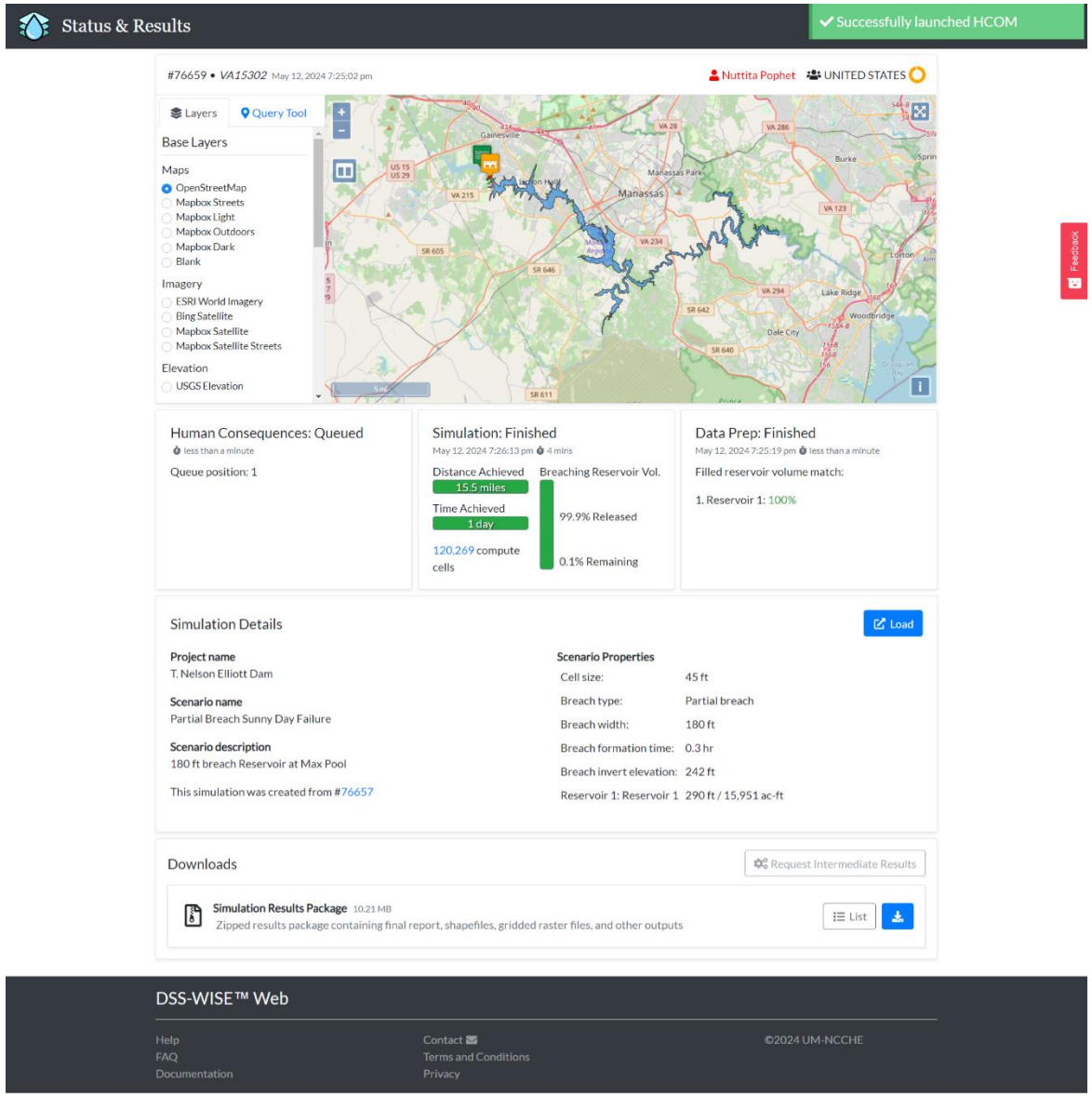


Launching DSS-WISE HCOM Post-Processing for T. Nelson Elliott Dam

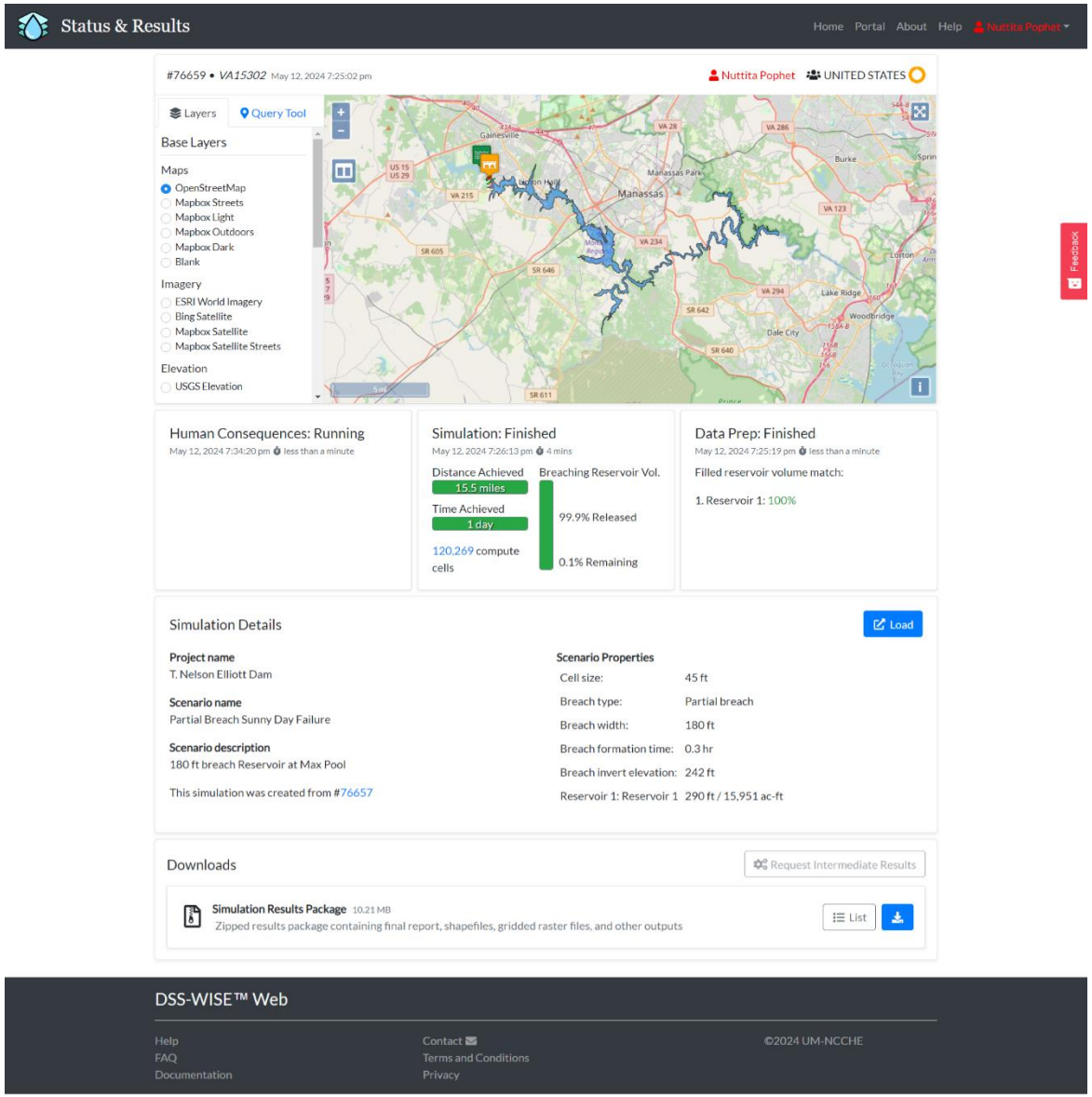
2.7

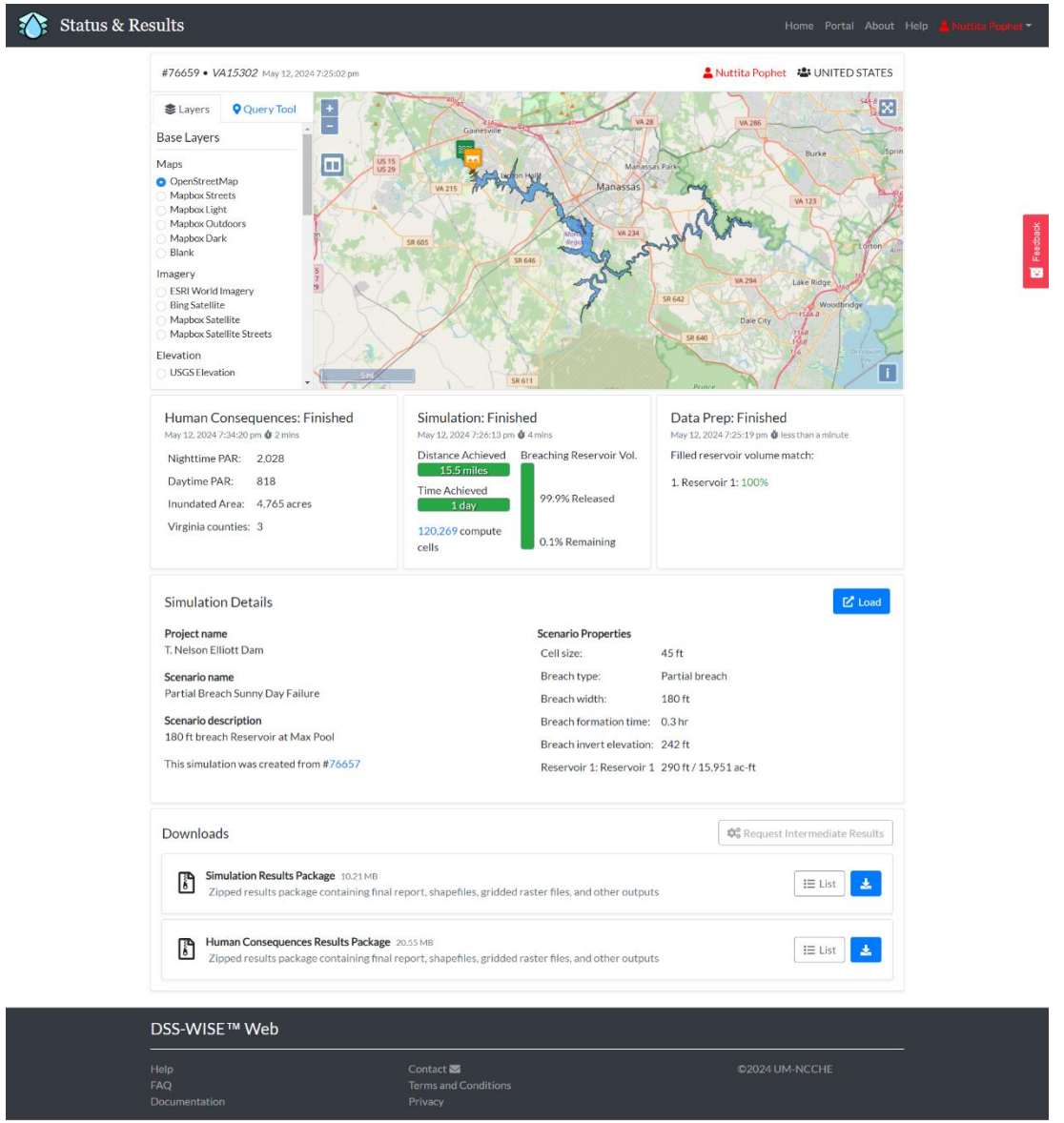
Launching and Monitoring Post-processing for Human Consequences Assessment Using DSS-WISE HCOM





Monitoring a Simulation while it is Running





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**