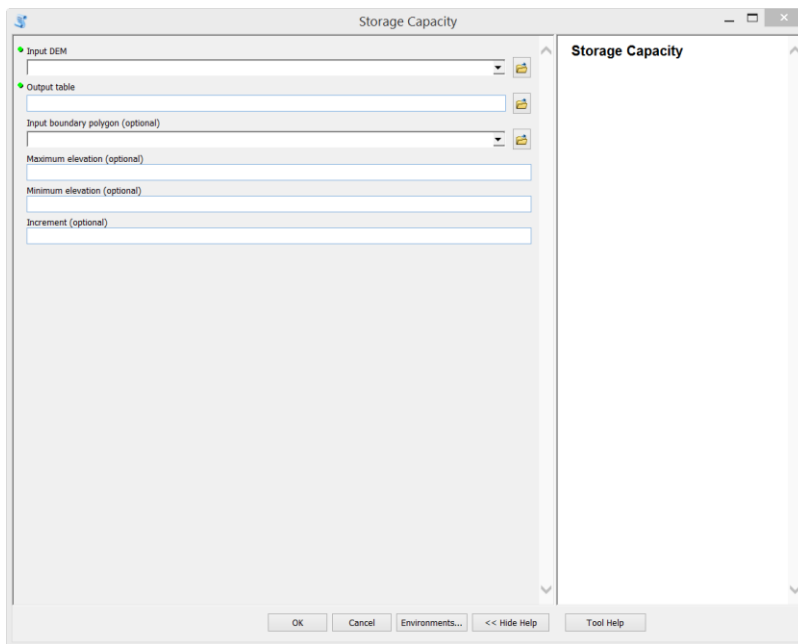# Storage Capacity tool for ArcGIS Desktop

The Storage Capacity tool allows you to generate a table of water surface elevations and corresponding storage capacities for a Digital Elevation Model (DEM) that represent a reservoir or any other terrain surface. Storage capacity is determined as the net accumulated volume or surface area of the underlying region for a given water surface elevation. By using this tool, you can quickly and easily create a storage capacity profile table for any elevation raster and further visualize your results graphically on a plotting software package.
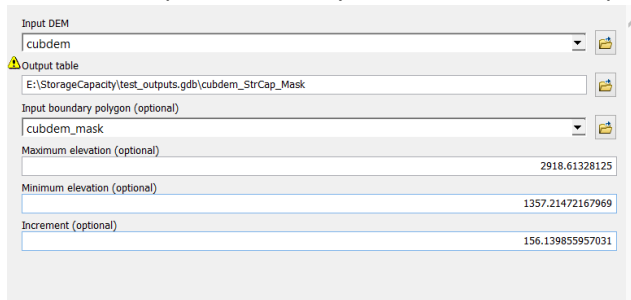
The tool dialogue

Syntax

Parameter	Explanation	Data Type
Input DEM	The input raster representing a continuous surface	Raster Layer
Input boundary polygon (optional)	The feature used to clip the input features	Feature Layer
Maximum elevation (optional)	The maximum water free surface elevation to use while assessing storage capacity. A default value equal to the minimum elevation value of the raster is populated when the Input DEM file path is specified.	Double
Minimum elevation (optional)	The minimum water free surface elevation to use while assessing storage capacity. A default value equal to the minimum elevation value of the raster is populated when the Input DEM file path is specified.	Double

Increment (optional)	Incremental heights starting at Minimum elevation going up to Maximum elevation where storage capacity is assessed. A default incremental value is provided such there are a total of 10 increments from Minimum to Maximum elevation.	Double
Output table	The output table showing the results of elevation vs. Water Surface Area and Storage Volume. By default, the output will be a geodatabase table. If the path is not in a geodatabase, the format will be determined by the extension. If the extension is .dbf, it will be in dBASE format. If no extension is specified, the output will be an INFO table.	Table

<u>Usage</u>

The Cub River watershed located just north of Preston, Idaho is used as an example to demonstrate tool usage. In this example we will provide an input DEM along with an optional input boundary polygon.

1) Open ArcMap and navigate to the folder '\StorageCapacity' where this document resides.

2) Locate folder named '\StorageCapacity\test_data'. Within this folder is the input DEM for Cub River under the file name 'cubdem'. A boundary polygon shapefile representing the largest watershed within this DEM can be located in the same folder under the file name 'cubdem_mask.shp'.

3) Expand the toolbox named '\StorageCapacity\Storage Capacity v1.0.pyt' and double-click the Storage Capacity icon.

4) Populate the Storage Capacity tool dialogue as shown below using the Input DEM and Input boundary polygon located in step 2. Choose a location for the Output table. In this example, '\StorageCapacity\test_outputs.gdb' File Geodatabase is chosen as the output location and the output file name 'cubdem_StrCap_Mask' is assigned. In this case, a warning symbol is displayed since this output has already been created from a previous run.

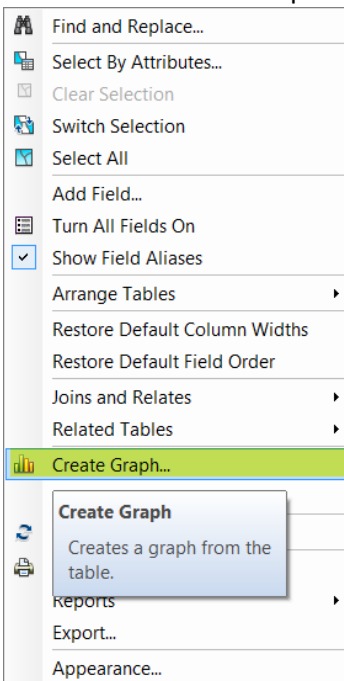5) Accept default values provided for Maximum, Minimum Elevation & Increments.

6) Click Ok to run the tool.

7) Once the tool completes successfully, an output table is created at the file location specified.

8) The output results can be viewed on ArcMap in the Table window as shown below.

OBJECTID *	Elevation	Area	Volume
1	1513.354578	34079600	3115164923.876953
2	1669.494434	74842400	11651671203.027344
3	1825.63429	106552400	25798968394.775391
4	1981.774146	136509200	44869915467.578125
5	2137.914001	166322400	68570289215.087891
6	2294.053857	188857200	96420268671.044922
7	2450.193713	211676000	127414554740.67383
8	2606.333569	238706400	162843054234.42383
9	2762.473425	247225200	200952093111.37695
10	2918.613281	248067600	239659732435.20508

9) You can visualize the results by plotting Elevation vs. Area or Elevation vs. Volume to study the trends in storage capacity for different water surface elevations. The graphical results for this example are generated using the Create Graph Wizard on ArcMap. In the Table window click the Table options Icon shown below.

10) Now click on Create Graph Wizard as shown below.

11) Within the Create Graph Wizard use the drop down menu to select the following options.

Graph Type >> Vertical Line
Layer >> cubdem_StrCap_Mask (default)
Y Field >> Elevation
X Field (optional) >> Area

12) Click on Next and select suitable graph properties such as title and axis names, and click on Finish. The Elevation vs. Water Surface Area graph for Cub River Watershed has been created now.

13) Follow a similar approach to generate Elevation vs. Storage Volume graph by choosing the options shown below in the Create Graph Wizard.

14) The two graphs generated for the Cub River Watershed are shown below,

Elevation vs. Water Surface Area

Water-surface area for Cub River Watershed

Graph of Elevation vs. Storage Volume

Storage Colume for Cub River Watershed