**Depression Analysis Toolbox for ArcGIS**

About this document

This document provides details on a depression analysis toolbox that delineates hierarchical depressions from a LiDAR DEM using a contour tree algorithm. Geometric properties such as depression area, storage volume, depth, etc., can also be derived. The program has been tested on ArcGIS 10.3.1.

NOTE: This program is for testing purposes, and subject to change. Please send feedback to Dr. Qiusheng Wu (https://wetlands.io)
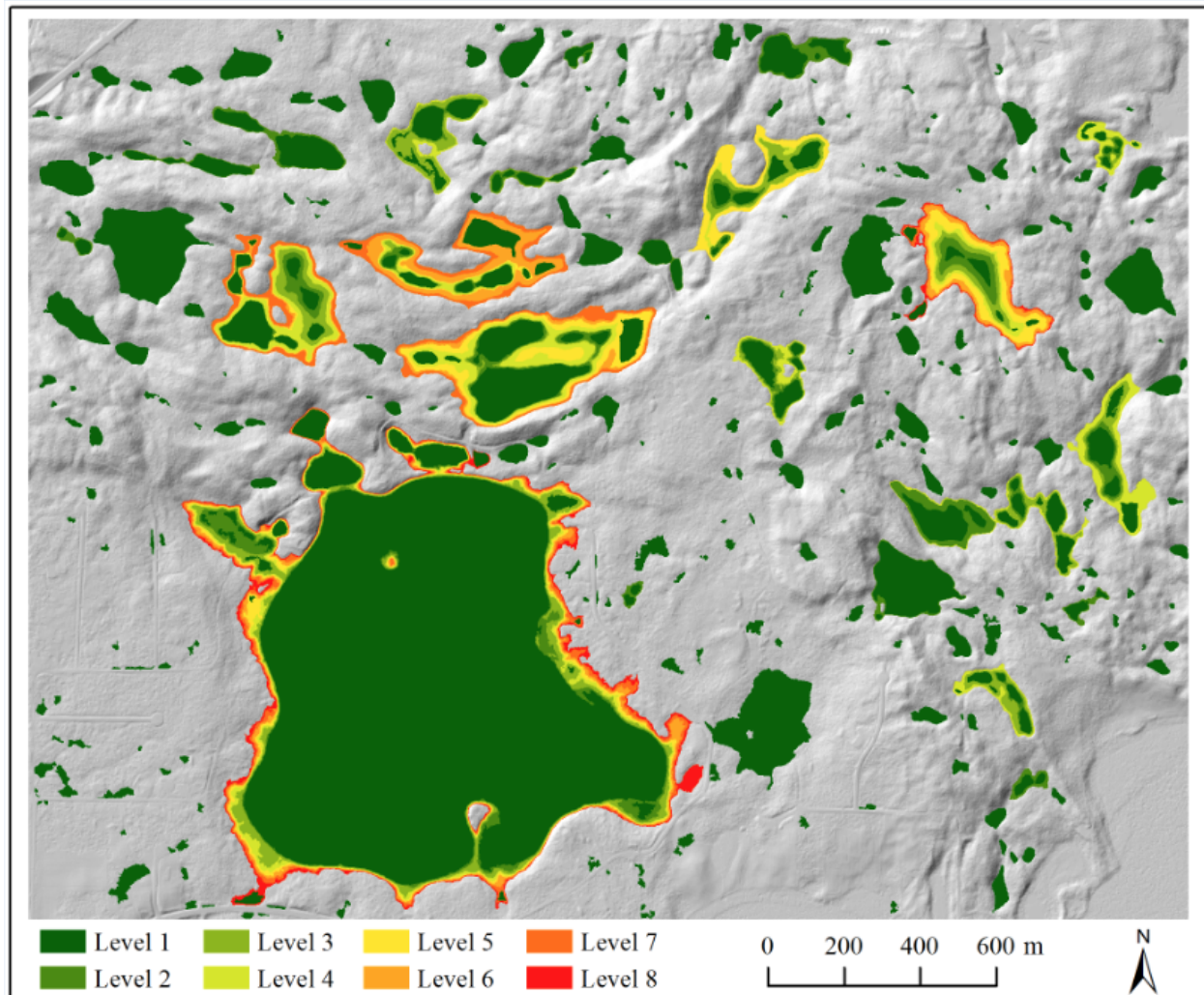
Introduction

Depressions derived using traditional depression-filling algorithm, such as the ArcGIS Fill tool (ArcToolbox -> Spatial Analysis Tools -> Hydrology -> Fill)
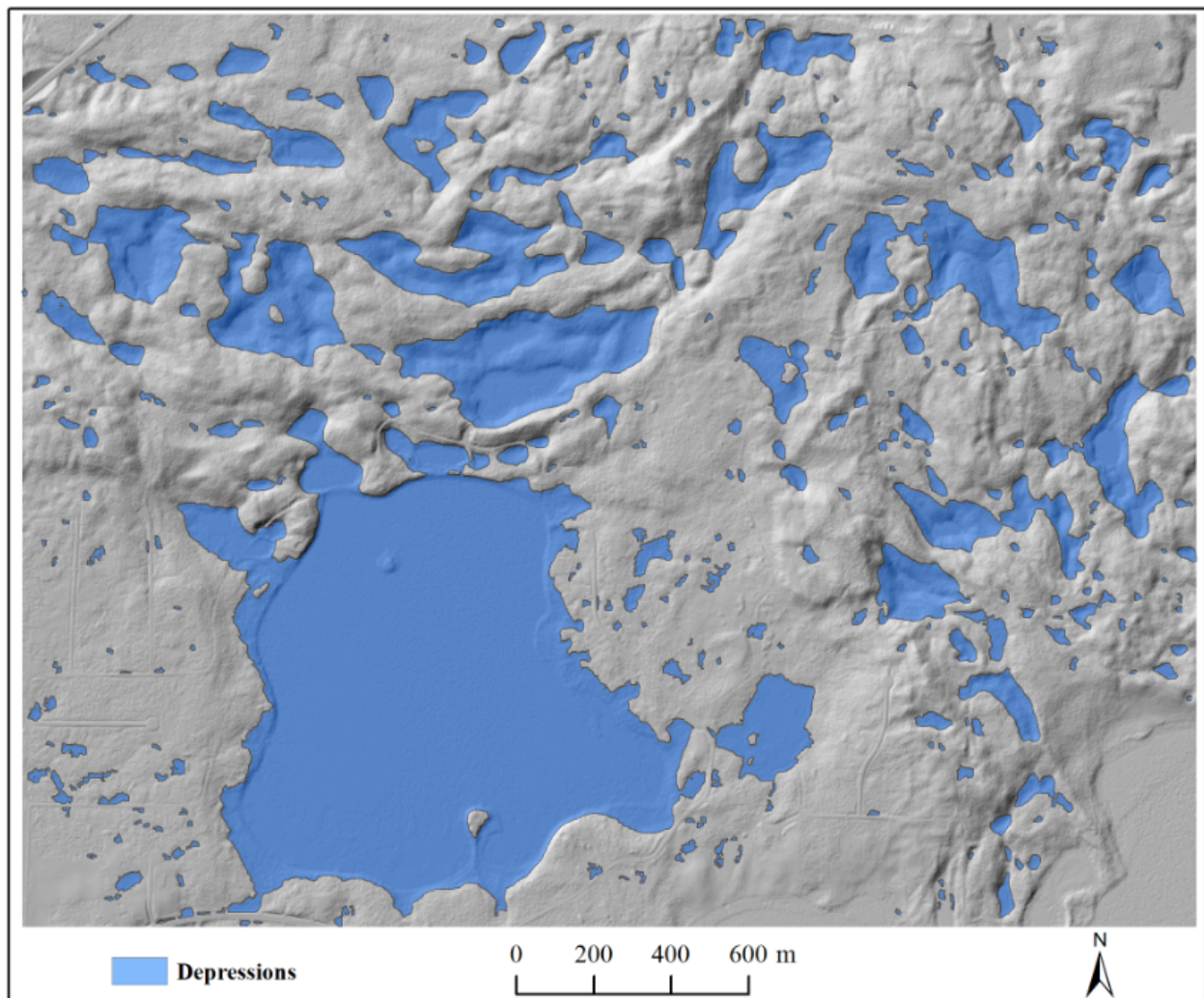
Contours generated on the LiDAR DEM

Elevation
373 m — 425 m
Contours
0 200 400 600 m
N
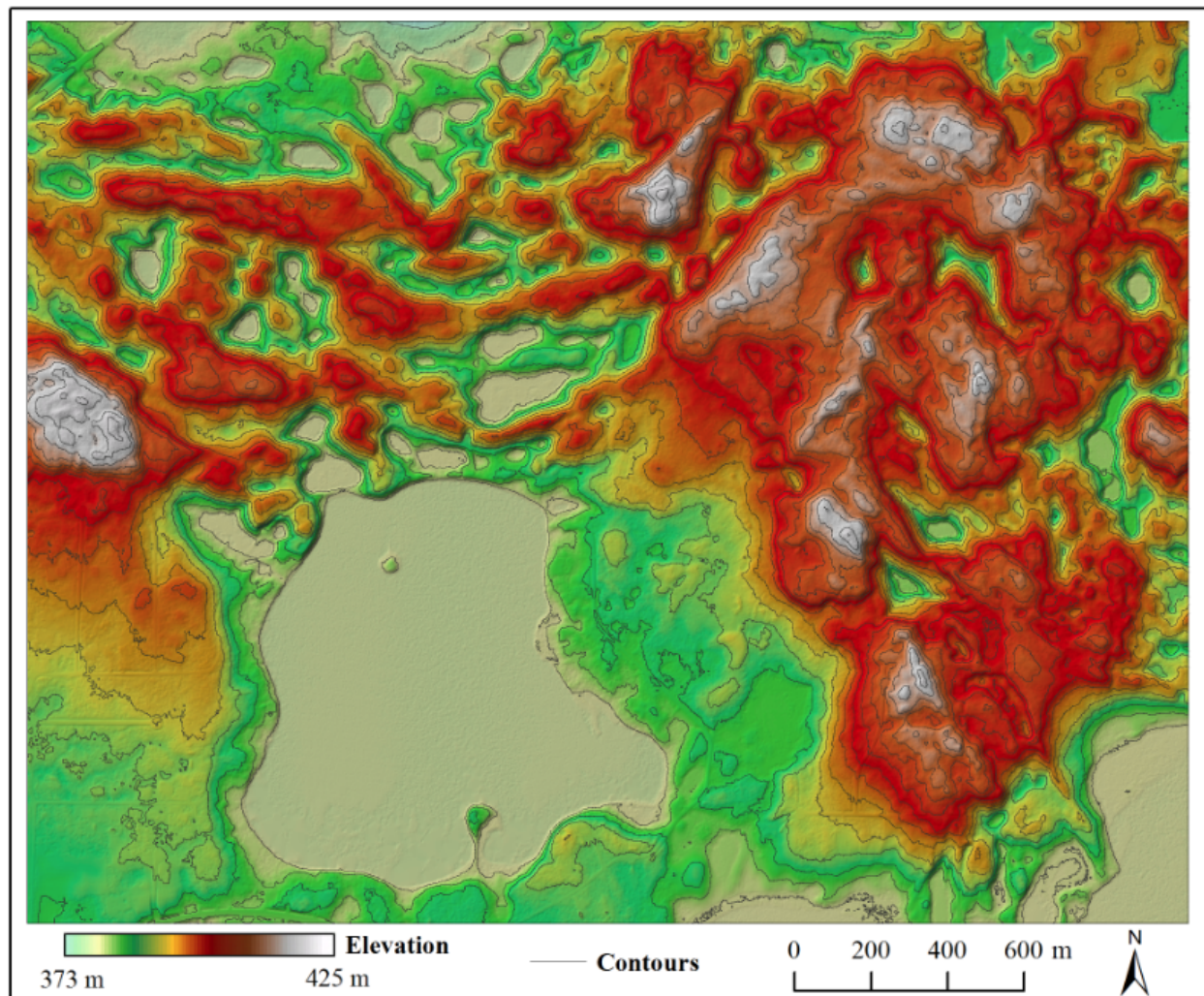
Depressions derived using the localized contour tree algorithm.

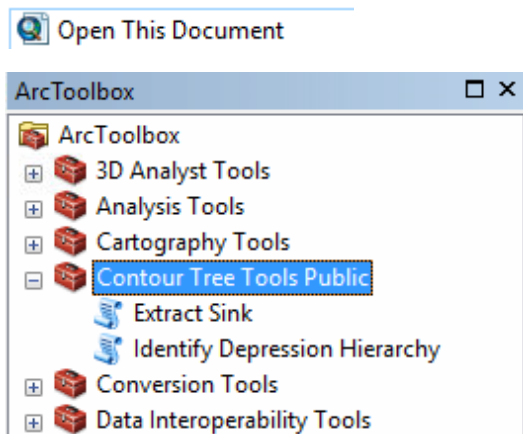## Usage

Given below are instructions on how to derive hierarchical depressions using the toolbox.

- **Toolbox file structure**
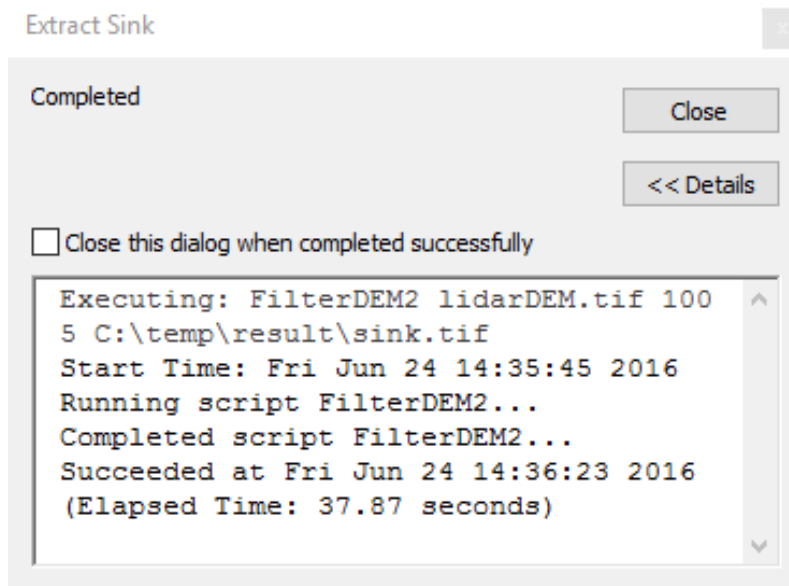
- **Open the ArcMap Document**. The testing data and toolbox should be automatically loaded.

- **Extract Sink**. This step extracts a subset of the DEM that represents surface depressions, which will be used as the input for the following step

Extract Sink

Completed

Close

<< Details

☐ Close this dialog when completed successfully

```
Executing: FilterDEM2 lidarDEM.tif 100
5 C:\temp\result\sink.tif
Start Time: Fri Jun 24 14:35:45 2016
Running script FilterDEM2...
Completed script FilterDEM2...
Succeeded at Fri Jun 24 14:36:23 2016
(Elapsed Time: 37.87 seconds)
```
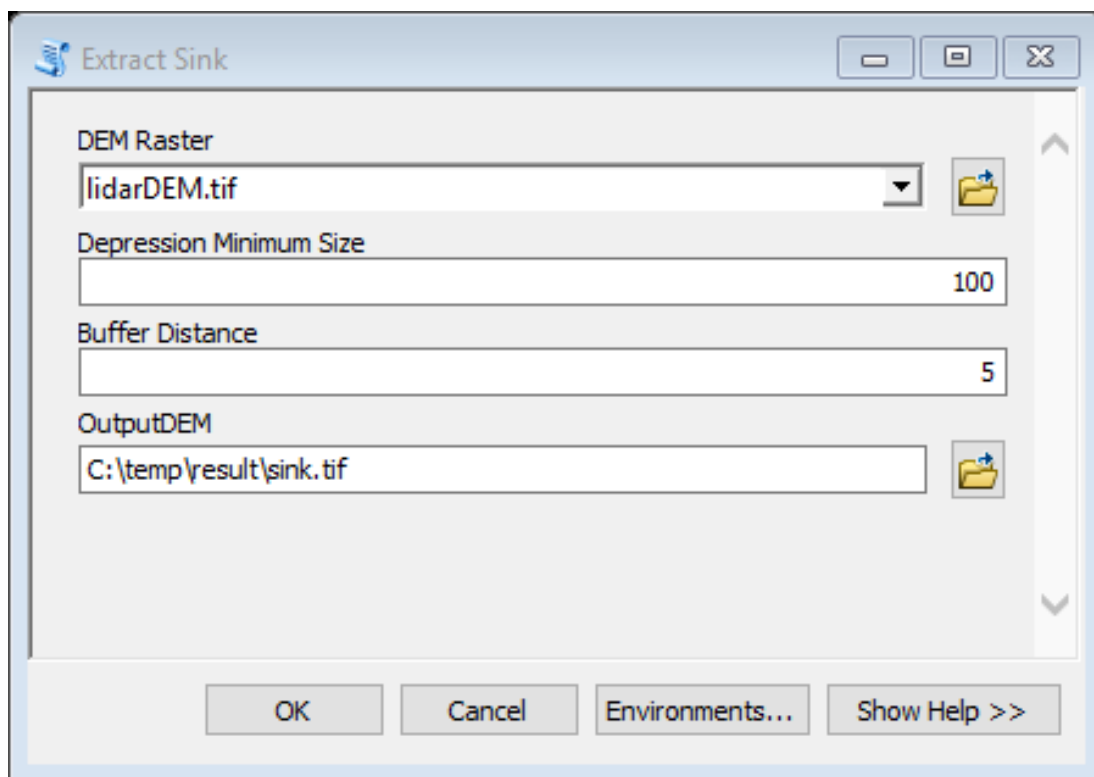
- **Extract depression hierarchy.** The results can be saved as Shapefile or Geodatabase Feature Dataset.

Identify Depression Hierarchy

LiDAR DEM

sink.tif

Contour Interval

1

Base Contour

0

Minimum Area

100

Minimum Depth

0.5

Output Path

C:\temp\result\depression.shp

OK   Cancel   Environments...   Show Help >>
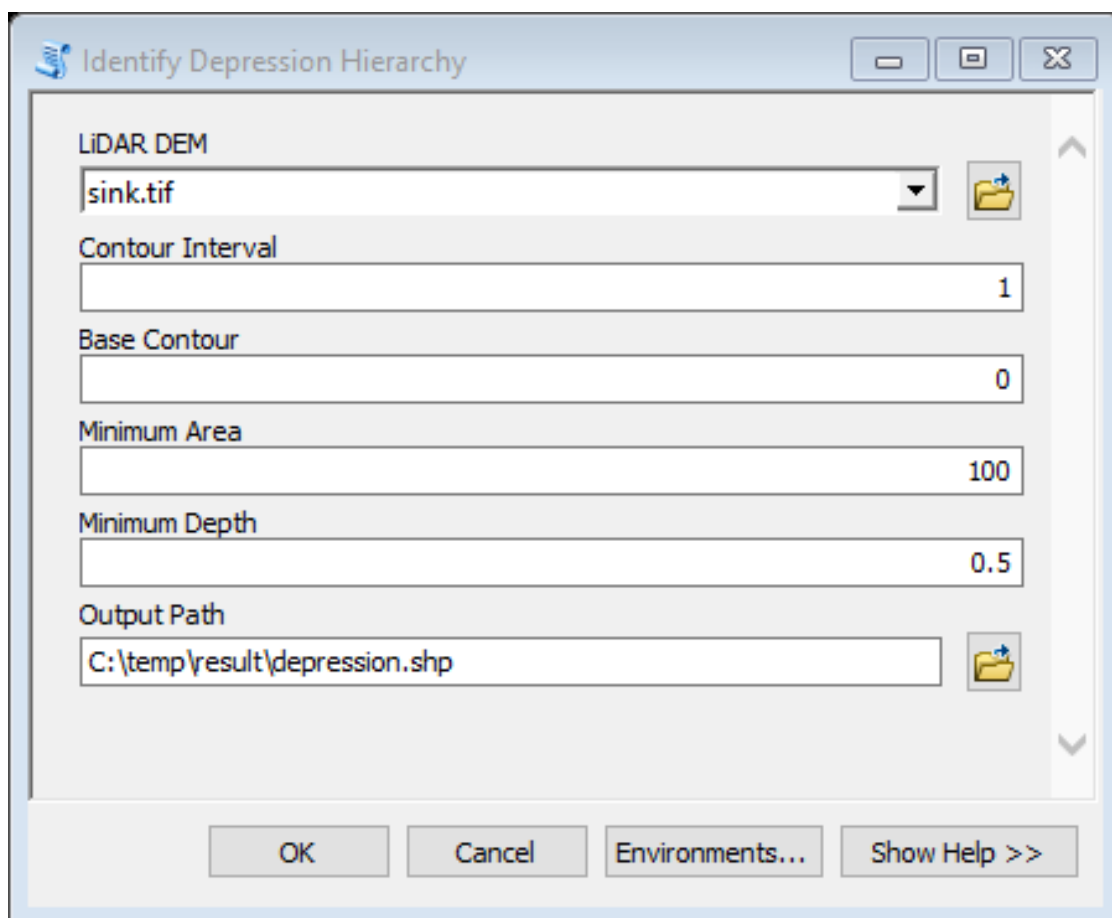
Identify Depression Hierarchy

Completed

[Close]

[<< Details]

☐ Close this dialog when completed successfully

```
Executing: DepressionIdentification
sink.tif 1 0 100 0.5 C:\temp\result
\depression.shp
Start Time: Fri Jun 24 14:41:32 2016
Running script
DepressionIdentification...
CalculateContour_Line Over!
GetContourID_Contour_Area Over!
CalculateContour_Polygon Over!
GetContourID4Polygon Over!
GetPolygonNeighbor Over!
GetStatisticalDataTable Over!
JoinAllTables Over!
UpdateAllNbrInfo Over!
IdentifyLevel0 Over!
IdentifyLevel1 Over!
IdentifyLevel2 Over!
IdentifyLevelPeak Over!
postProcess Over!
Completed script
DepressionIdentification...
Succeeded at Fri Jun 24 14:43:32 2016
(Elapsed Time: 2 minutes 0 seconds)
```
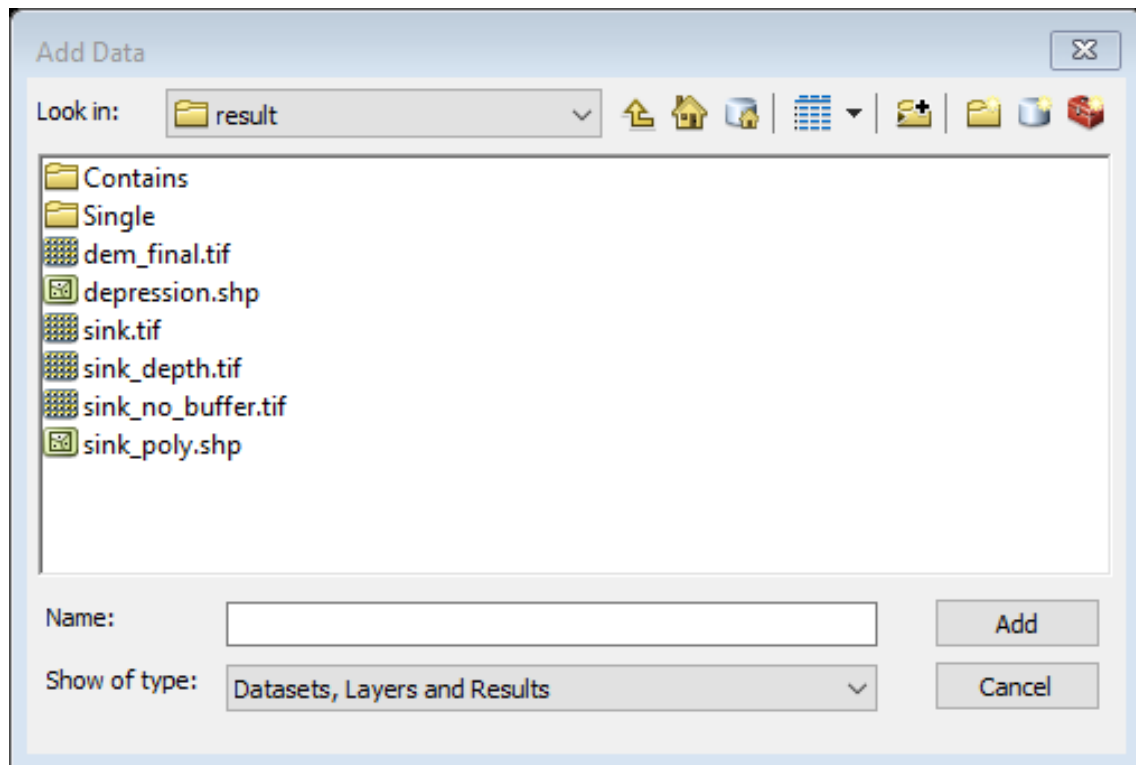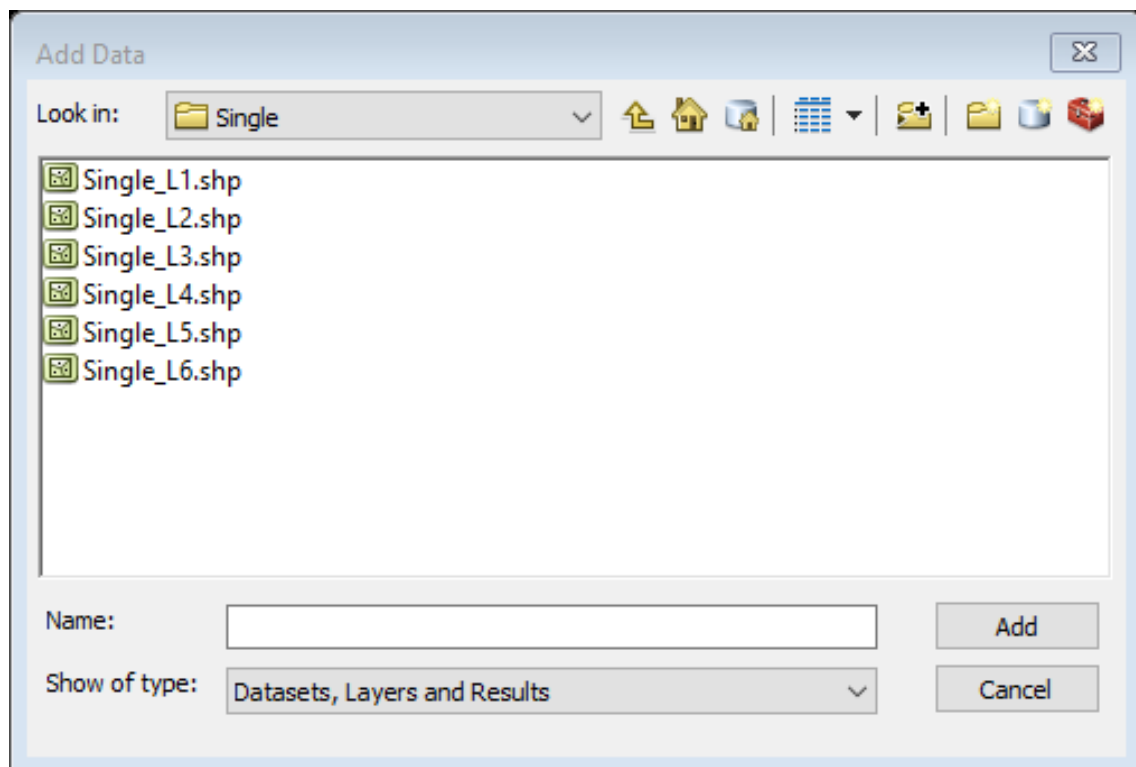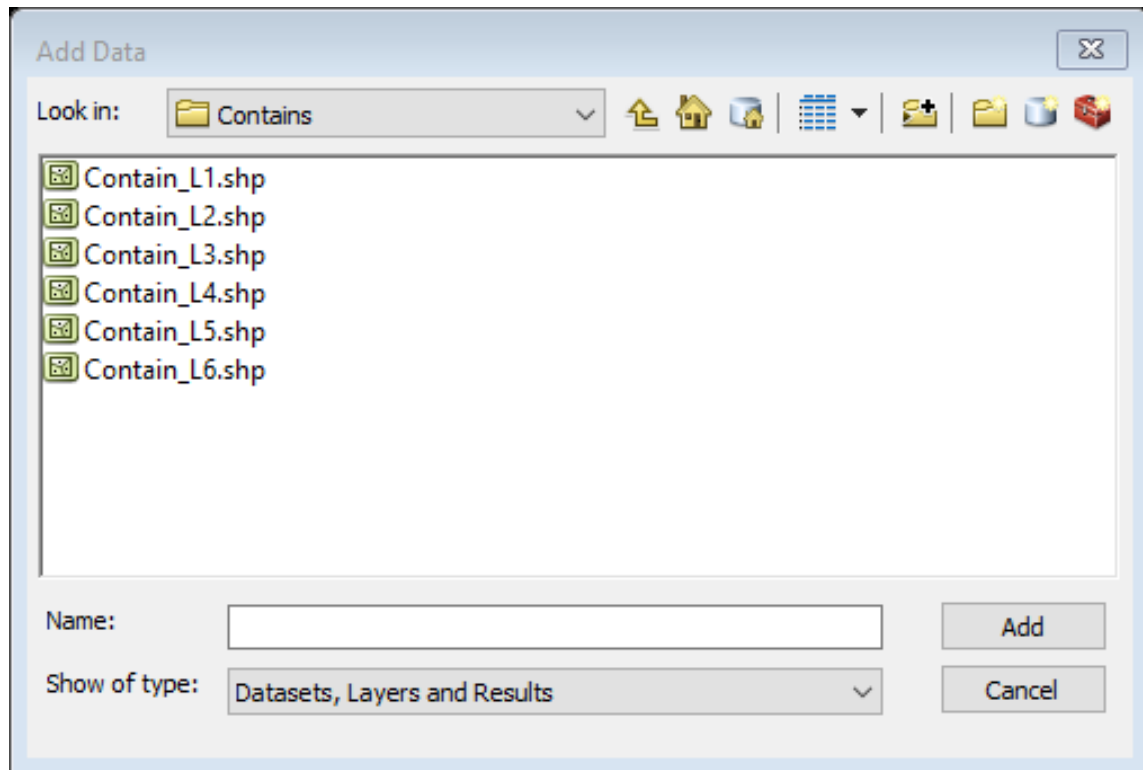
- **Depression extraction results.**

- **Polygons for each individual depression level**

- **Polygons for combined depression levels**. For example, Contain_L2.shp is the union of Single_L1.shp and Single_L2.shp, Contain_L3.shp is the union of Contain_L2.shp and Single_L3.shp, and so on.

Add Data

Look in: ☐ Contains

- ▦ Contain_L1.shp
- ▦ Contain_L2.shp
- ▦ Contain_L3.shp
- ▦ Contain_L4.shp
- ▦ Contain_L5.shp
- ▦ Contain_L6.shp

Name:

Show of type: Datasets, Layers and Results

Add

Cancel

- **Attribute table.**

Table

Single_L1

FID	Shape	COUNT	MIN	MAX	RANGE	MEAN	STD	AREA	Volume
0	Polygon	425	383.387512	385.03949	1.651978	384.315538	0.463657	425	290.896484
1	Polygon	1155	389.123322	392.128082	3.004761	390.950373	0.743213	1155	1212.318909
2	Polygon	421	388.371155	390.053406	1.682251	389.303965	0.441153	421	293.030548
3	Polygon	4100	388.345215	393.078247	4.733032	391.325227	1.290084	4100	6866.56946
4	Polygon	901	390.34613	393.073517	2.727386	391.951282	0.718996	901	944.895111
5	Polygon	251	386.259888	387.057404	0.797516	386.709249	0.199504	251	72.978546
6	Polygon	2843	382.964203	387.088409	4.124207	385.555512	0.973514	2843	4106.67847
7	Polygon	1325	378.238312	379.051727	0.813416	378.599821	0.214683	1325	530.237274
8	Polygon	1997	384.461212	387.060516	2.599304	386.09984	0.618308	1997	1797.619537
9	Polygon	8541	378.951019	387.164612	8.213593	383.443359	2.457222	8541	30377.26947
10	Polygon	8129	378.462585	381.165405	2.70282	379.370688	0.684715	8129	13244.6763
11	Polygon	6580	378.226654	382.076782	3.850128	379.785986	1.099484	6580	14568.21002
12	Polygon	2071	379.864166	382.04129	2.177124	381.097246	0.60333	2071	1869.603851
13	Polygon	570	393.024414	394.036224	1.01181	393.564574	0.281709	570	248.192749
14	Polygon	2088	378.620575	382.118225	3.49765	380.376441	0.920763	2088	3389.990906

◄◄ ◄ 0 ► ►◄ ▦▦ (0 out of 212 Selected)

Single_L1