

Appendix 1. Procedure for using ArcGIS to create a SRTM-based structure surface.

This appendix includes the Python script used in conjunction with ArcGIS 10.6.1 and the Spatial Analyst extension to create a structure surface and derive dip direction and dip from the surface. To use this script with different datasets on a different computer, an experienced Python script writer would have to edit the script.

Inputs:

Contact: polyline feature class of late Ordovician Lebanon-Ridley geologic contact.

SRTM: raster SRTM DTM.

Snail Shell and Nanna Caves: polyline feature class of Snail Shell and Nanna Cave passages.

Output:

DistancePoints: polyline feature class having as attributes (a) distance to Snail Shell and Nanna Caves, (b) dip of structure surface, and (c) dip direction of structure surface.

1. The Lebanon-Ridley contact is a polyline feature class. Convert the polyline to a point feature class consisting of the vertices of the lines in the polyline feature class.

```
# The following inputs are layers or table views: "Contact"
```

```
arcpy.FeatureVerticesToPoints_management(in_features="Contact",  
out_feature_class="C:/Users/mabolins/Documents/ArcGIS/Default.gdb/  
/Contact_FeatureVertices", point_location="ALL")
```

2. Convert SRTM raster values from signed integer to floating point.

```
arcpy.gp.RasterCalculator_sa('Float("SRTM")',  
"c:/users/mabolins/documents/arcgis/default.gdb/SRTM_float")
```

3. Extract floating point SRTM values to Lebanon-Ridley points.

The following inputs are layers or table views:

```
"Contact_FeatureVertices", "SRTM_float"
```

```
arcpy gp.ExtractValuesToPoints_sa("Contact_FeatureVertices",
```

```
"SRTM_float",
```

```
"C:/Users/mabolins/Documents/ArcGIS/Default.gdb/Extract_ContactV  
ertices", "INTERPOLATE", "VALUE_ONLY")
```

4. Use Lebanon-Ridley points and natural neighbor interpolation to create a structure surface. Maintain the 28 m cell size of SRTM.

The following inputs are layers or table views:

```
"Extract_ContactVertices"
```

```
arcpy gp.NaturalNeighbor_sa("Extract_ContactVertices", "RASTERVALU",
```

```
"C:/Users/mabolins/Documents/ArcGIS/Default.gdb/StructureSurface"  
, "28")
```

5. Use structure surface to create a dip direction (aspect) raster.

The following inputs are layers or table views: "StructureSurface"

```
arcpy gp.Aspect_sa("StructureSurface",
```

```
"C:/Users/mabolins/Documents/ArcGIS/Default.gdb/DipDirection",
```

```
"PLANAR", "METER")
```

6. Use structure surface to create a dip (slope) raster.

The following inputs are layers or table views: "StructureSurface"

```
arcpy gp.Slope_sa("StructureSurface",
```

```
"C:/Users/mabolins/Documents/ArcGIS/Default.gdb/Dip", "DEGREE",
```

```
"1", "PLANAR", "METER")
```

7. Use polyline of both caves to create a distance-to-cave raster. Generate a raster having a 50 m cell size. Use Environment to set the processing extent to match the structure surface ("StructureSurface").

The following inputs are layers or table views: "Snail Shell and Nanna Caves"

```
arcpy gp.EucDistance_sa("Snail Shell and Nanna Caves",
```

```
"C:/Users/mabolins/Documents/ArcGIS/Default.gdb/Distance1", "",
```

```
"50", "", "PLANAR")
```

8. Multiply dip raster by 0 and add the result to the distance raster to create a distance raster in which cells have been set to null if they are null in the dip and dip direction rasters.

```
arcpy.gp.RasterCalculator_sa("Dip" * 0 + "Distance1",  
"c:/users/mabolins/documents/arcgis/default.gdb/Distance2")
```

9. Convert distance raster to point feature class.

```
# The following inputs are layers or table views: "Distance2"  
arcpy.RasterToPoint_conversion(in_raster="Distance2",  
out_point_features="C:/Users/mabolins/Documents/ArcGIS/Default.gdb/DistancePoints", raster_field="Value")
```

10. Extract dip direction and dip from rasters to point feature class without interpolation.

```
# The following inputs are layers or table views: "DistancePoints"  
arcpy.gp.ExtractMultiValuesToPoints_sa("DistancePoints", "Dip  
Dip;DipDirection DipDirection", "NONE")
```

11. Use DistancePoints point feature class attribute table in further analysis with spreadsheet and stereonet software.