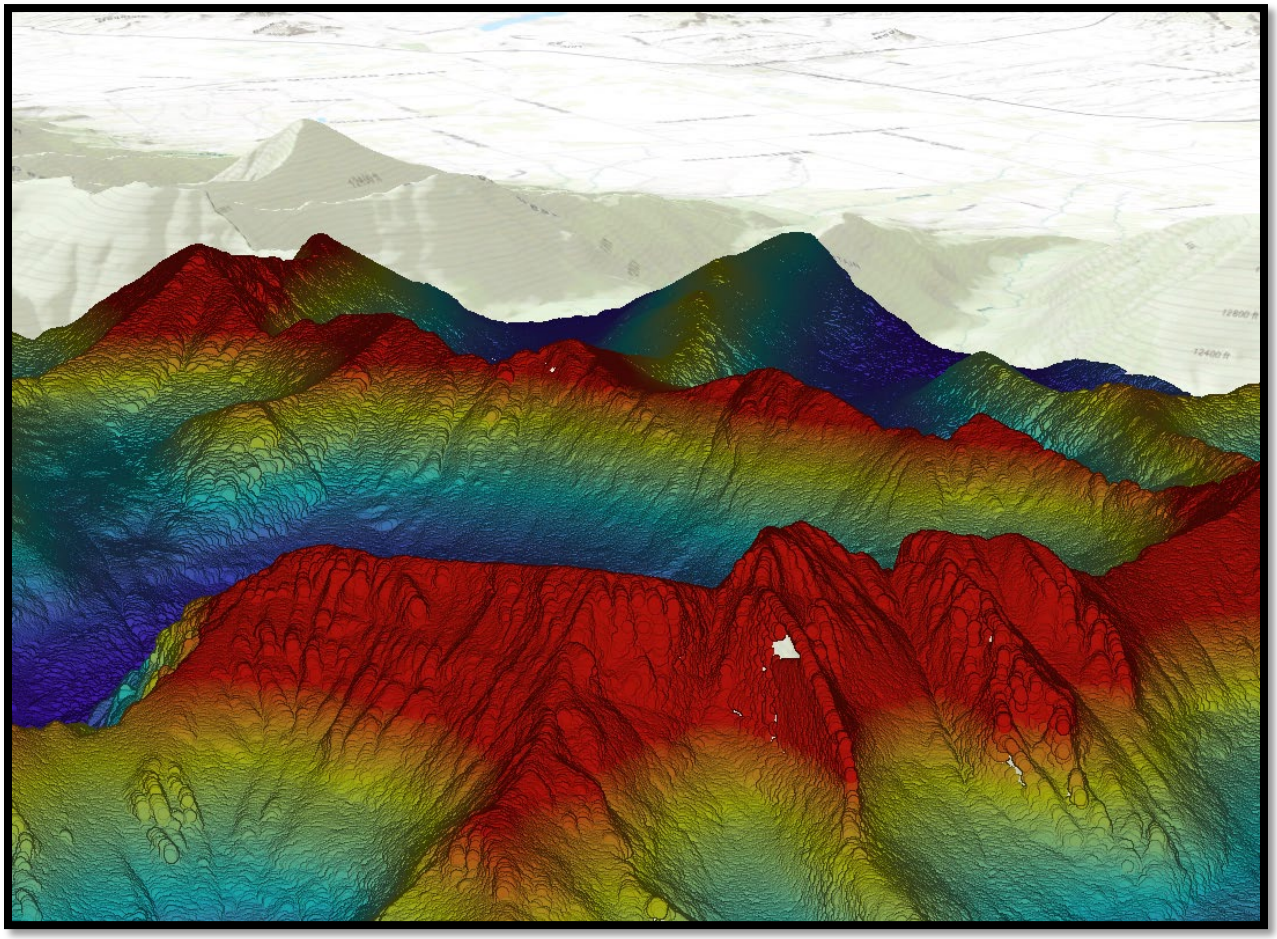
ArcGIS Pro LiDAR Toolbox



SUMMARY:

The ArcGIS Pro LiDAR Toolbox provides the tools to create digital elevation models (DEM), slope and hillshade models, intensity surfaces, elevation contours, classified polygons, and 3D point clouds from raw LiDAR data (.las/.laz/.zlas). The toolbox also provides optional tools for reclassifying ground, noise, and building classifications. The outputs of the toolbox are written to a file geodatabase (.gdb) and LiDAR Dataset (.lasd).

INSTALLATION:

To install the ArcGIS Pro LiDAR Toolbox, navigate to the **All CO NRCS** team in Microsoft Teams, then to the **GIS** team channel (Figure 1). Select **Files** from the ribbon, then the **Tools** folder. Right-click the three-dot option button to the right of the **ArcGIS Pro LiDAR Toolbox** then select **Download** from the menu (Figure 2). Once downloaded, locate the zip file, right-click and select **Extract All**. Select an appropriate location and extract the zip file.

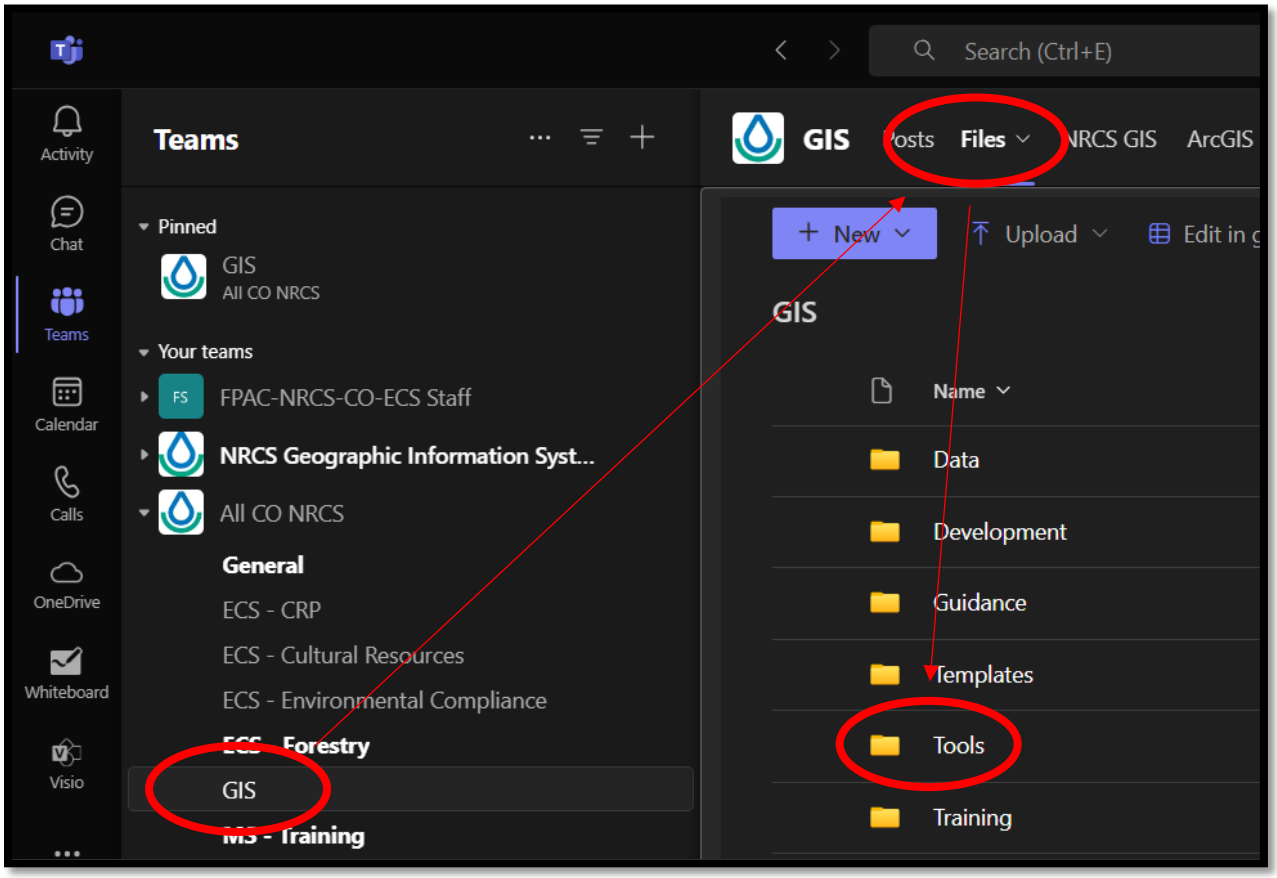


Figure 1

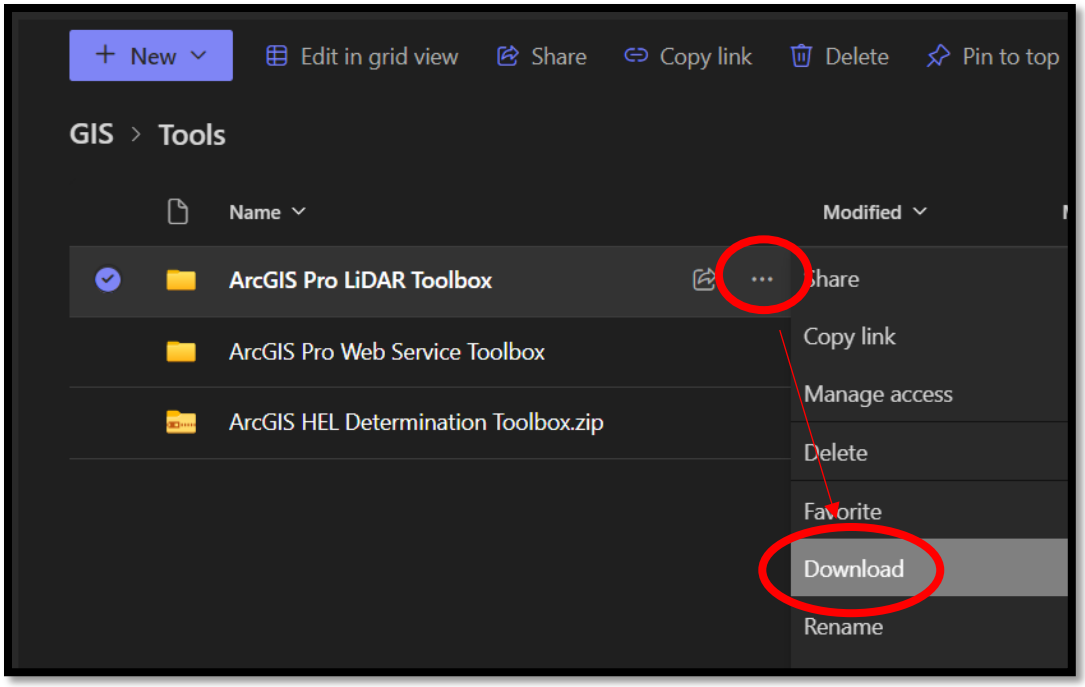


Figure 2

Open a project in ArcGIS Pro. Open the Catalog, right-click the **Toolboxes** folder, and select **Add Toolbox** (Figure 3). Navigate to the location of the extracted folder from the previous step and select the **ArcGIS Pro LiDAR Toolbox.pyt** file and click OK. The toolbox will now appear in the **Toolboxes** folder in the Catalog.

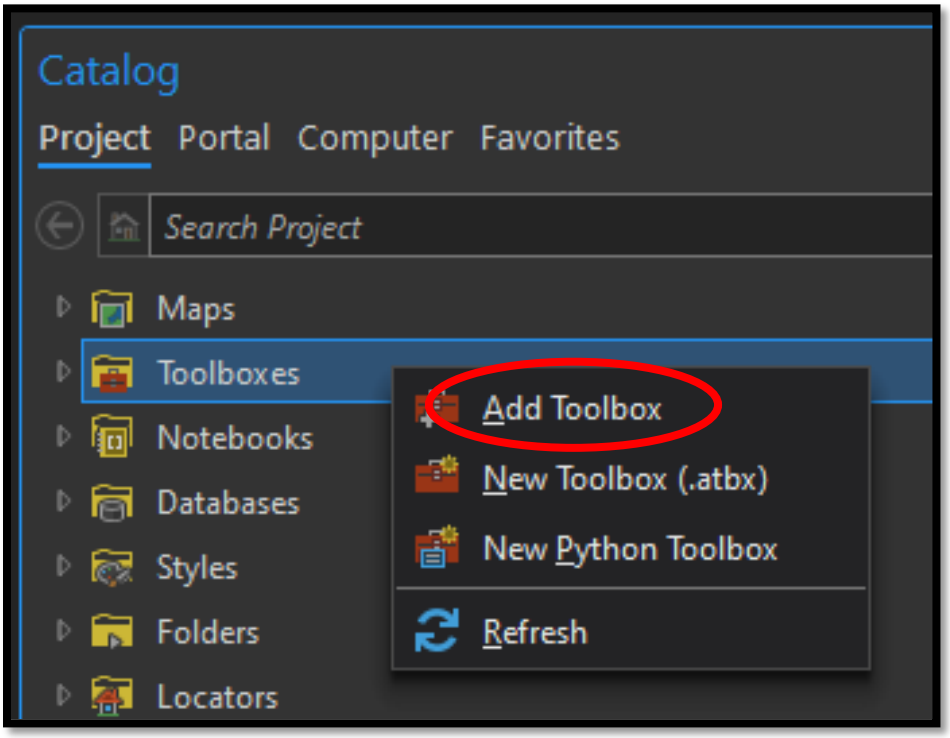


Figure 3

Expand the toolbox and select the **Create LiDAR Products** tool. The tool dialog will open (Figure 4). The tool has four required parameters (denoted with a red asterisk), and a variety of optional parameters. The parameters are outlined below:

Input LAS/LAZ Files: (Required) One or more *.las, *.zlas or *.laz files. Note: the point classification tools (see below) are only available if all the inputs are uncompressed *.las files.

Output Folder: (Required) The output folder where the file geodatabase and LiDAR dataset will be created.

Output Name: (Required) The name of the output geodatabase and LiDAR dataset.

LAS File Coordinate System: (Required) The coordinate system of the input point cloud data. Note: the tool will generally auto-populate this parameter. All input LiDAR files must be in the same coordinate system.

Extent Polygon: (Optional) If you need to process a subset of the input point cloud (like a specific project or property boundary) you can provide a polygon feature class for the Extent Polygon and the outputs will be limited to that polygon boundary; if a polygon is not provided, the entire extent of the input point cloud will be processed and output.

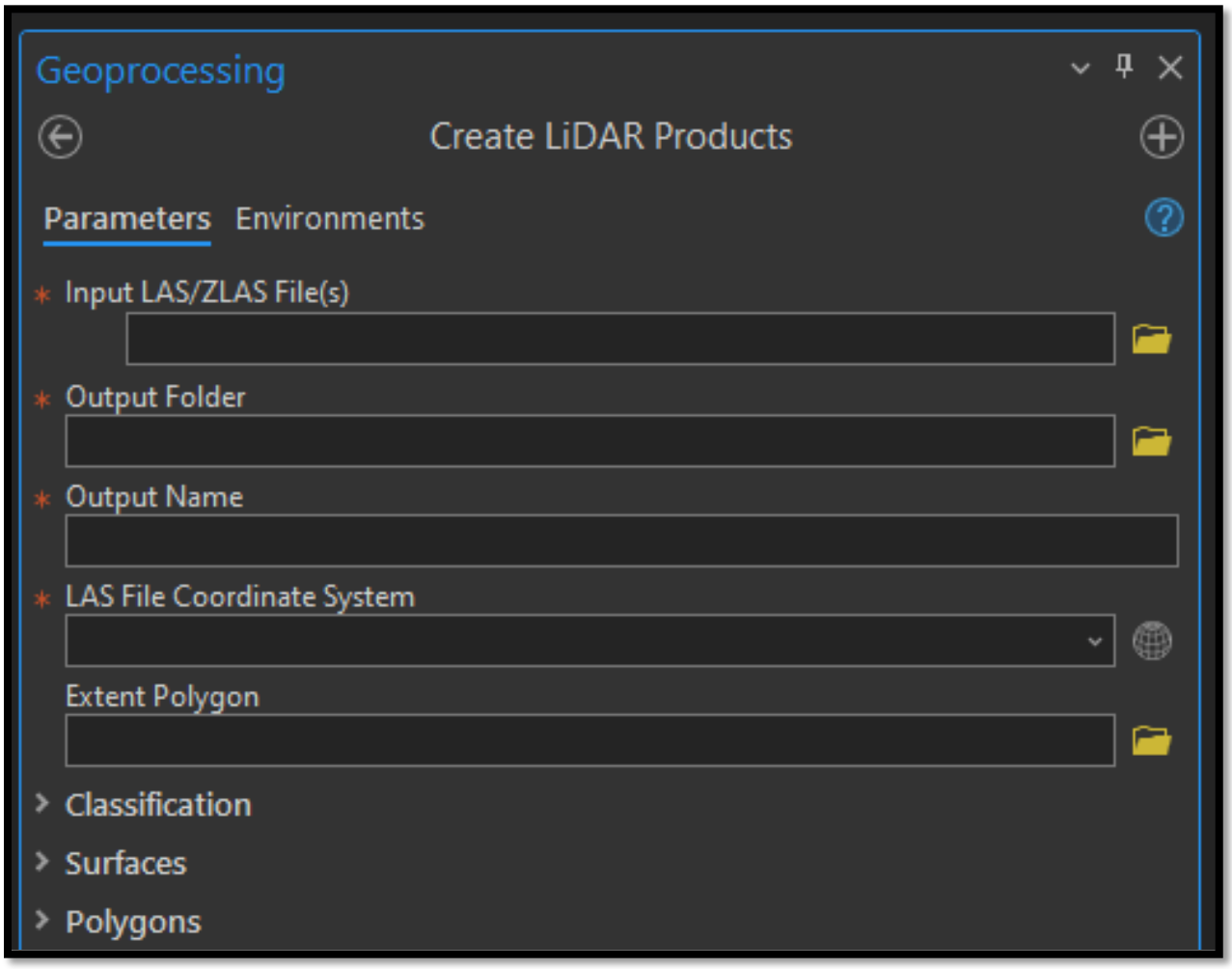


Figure 4

Once you have selected one or more LiDAR point cloud files for processing, specified an output folder and name, selected (or verified) the input coordinate system, and optionally provided an extent polygon, you are ready to specify the preprocessing classifications and output/derivative products. The classifications and outputs are organized into four groups - **Classification**, **Surfaces**, **Contours**, and **Polygons** (Figure 5):

Classification Group:

The classification tools are intended to provide optional, fine-grained classification of ground, noise, and building points. This is particularly important if you intend to extract building footprints or create a Digital Elevation Model from the ground points. Note: The Classification group is only available if all the input files are *.las format. Reclassification of compressed LiDAR data (*.laz, *.zlas) is not supported.

- **Reclassify LAS Buildings**: (Optional) Select to classify building points (LiDAR Class Code 06). This will classify points with certain spatial characteristics as buildings and is useful for identifying standing structures.
- **Reclassify LAS Ground**: (Optional) Select to classify ground points (LiDAR Class Code 02). This will evaluate the unclassified/unassigned points and determine if they should be ground points and included in the Digital elevation Model (which includes only the ground points).
- **Reclassify LAS Noise**: (Optional) Select to classify noise points (LiDAR Class Code 18). This will flag and exclude points with unusual/erroneous spatial characteristics.

Surfaces Group:

The Surfaces group provides the tools to optionally create elevation, slope, hillshade, and intensity rasters; the outputs are written to the file geodatabase.

- **Digital Elevation Model**: (Optional) Select to create a Digital Elevation Model (DEM).
- **Slope**: (Optional – only available if DEM is selected above) Select to create a slope (percent) model.
- **Hillshade**: (Optional – only available if DEM is selected above) Select to create a hillshade model.
- **Intensity**: (Optional) Select to output the intensity surface.

Contours Group:

The Contours group provides the tools to create elevation contours from the derived DEM. Note: The Contours group is only available if Digital Elevation Model was selected in the Surfaces Group.

- **Create Contours**: (Optional) Select to create elevation contours.
- **Contour Interval**: (Required if Create Contours is selected) Specify the contour interval (in the units of the source data).

Polygons Group:

- **Extract LiDAR Classes as Polygons**: (Optional) Select one or more LiDAR classifications to extract as polygons (e.g. Buildings, Roads, etc. if classified)
- **Aggregate Polygons**: (Optional) Select to aggregate the classified polygons to remove small holes and extraneous features.
- **Minimum Polygon/Hole Area**: (Required if Aggregate Polygons is selected) The minimum polygon/hole size to be kept in the aggregated output polygon layer. Holes or polygons smaller than this value will be removed/aggregated.

Once you have selected the desired outputs, click **Run** in the bottom right:

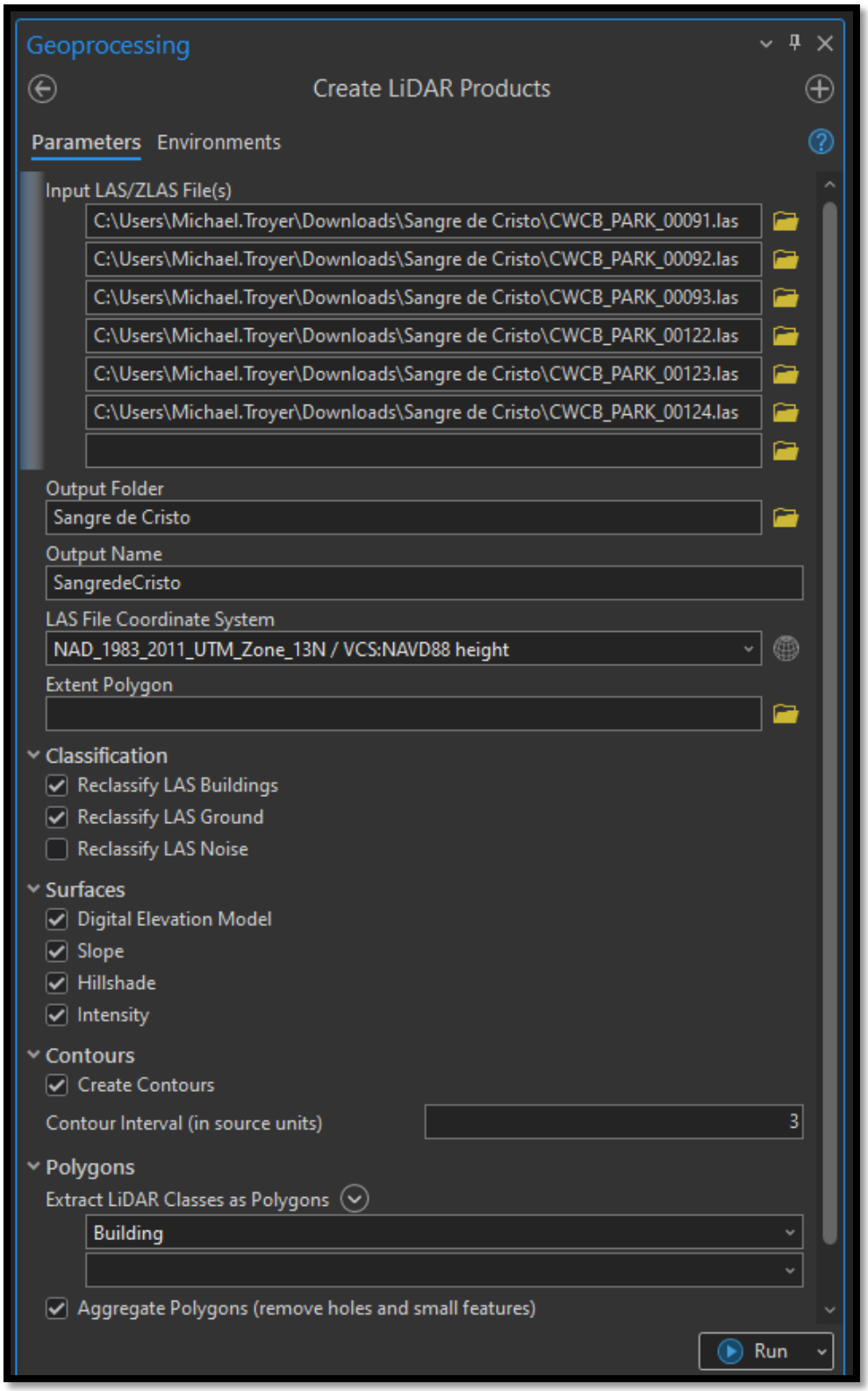


Figure 5

Once the tool is complete, you will now have a file geodatabase (.gdb) and a LiDAR dataset (.lasd) at the location specified and with the name specified in the tool. Depending on the specific outputs selected, the geodatabase will contain one or more rasters and/or a polygon feature class (Figure 6). Right-click any of the raster or feature classes in the geodatabase and select **Add to Current Map**.

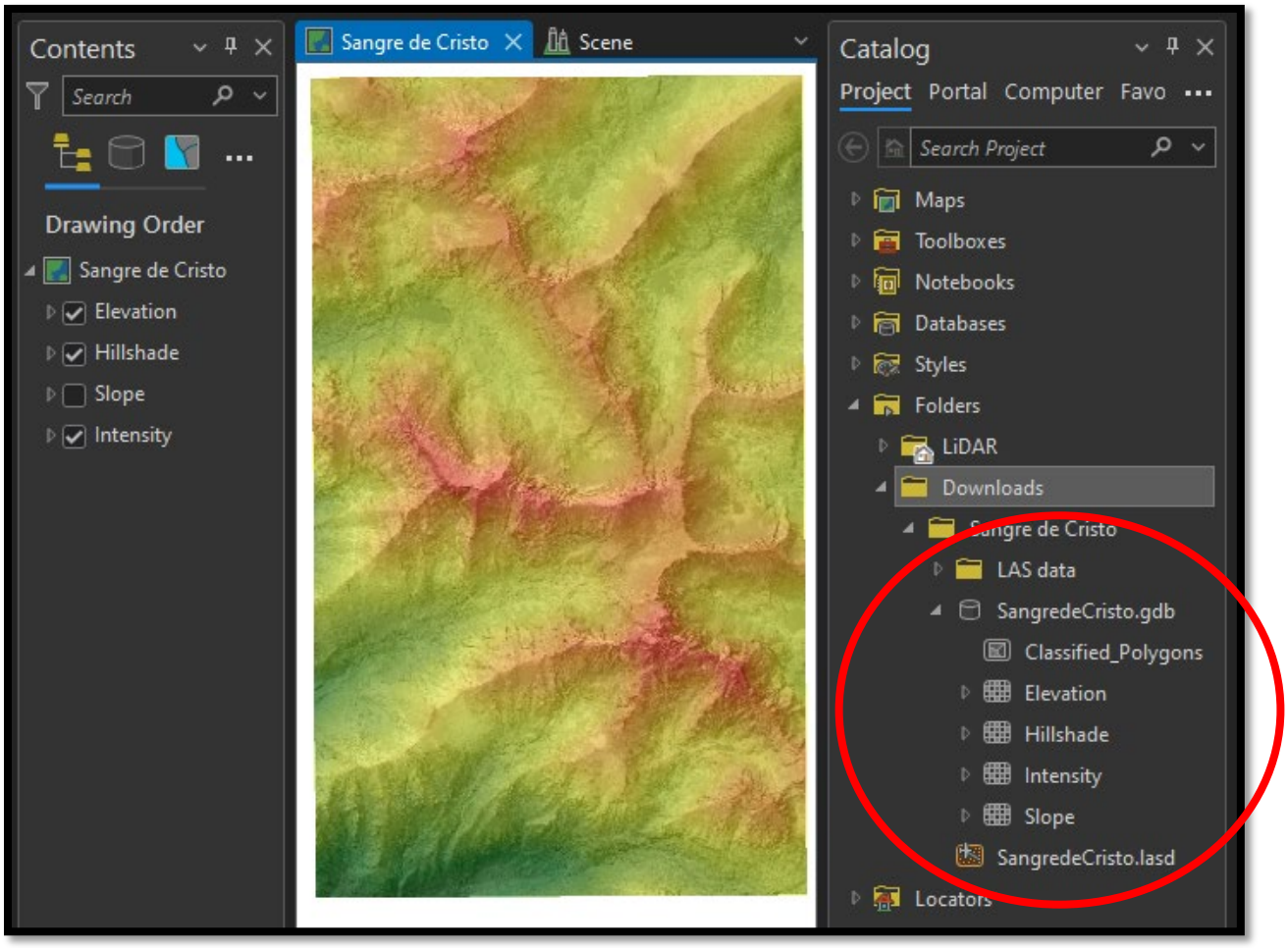


Figure 6

You can also visualize the LiDAR point cloud directly by right clicking the .lasd file and selecting **Add to Current Map** to view the point cloud in 2D, or right-click and select **Add to New > Local Scene** (Figure 7) to view the point cloud in 3D (Figure 8)

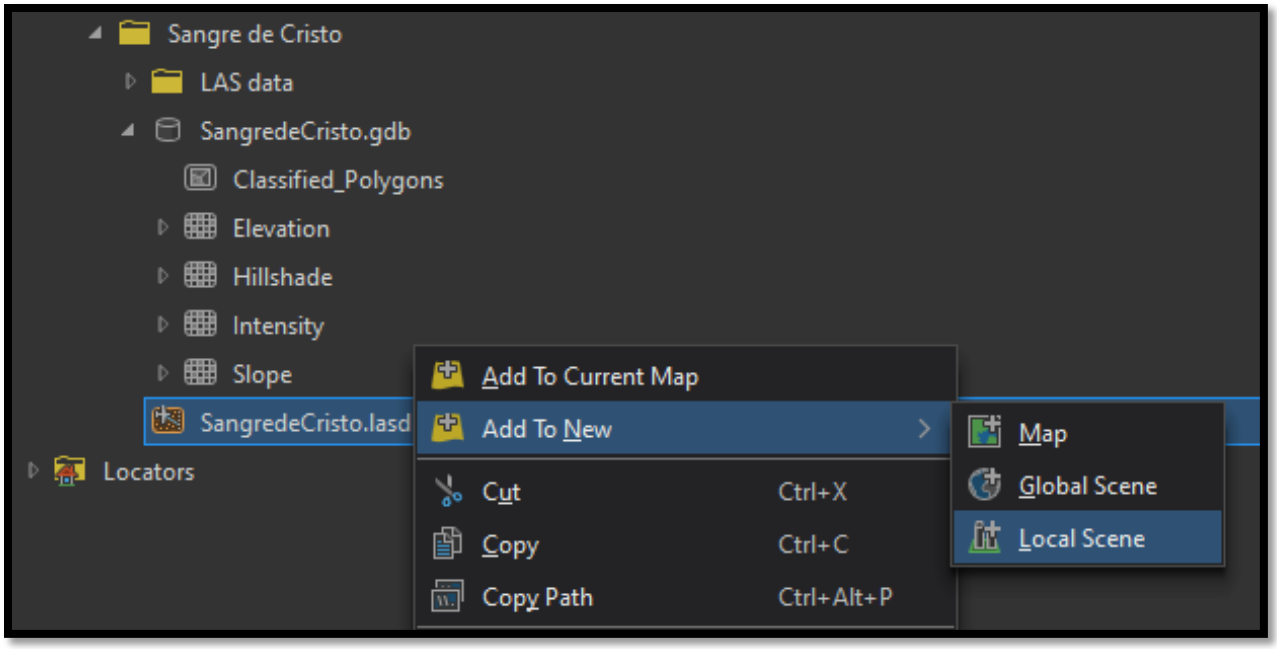

Sangre de Cristo
LAS data
SangredeCristo.gdb
Classified_Polygons
Elevation
Hillshade
Intensity
Slope
SangredeCristo.lasd
Locators
Add To Current Map
Add To New
Cut Ctrl+X
Copy Ctrl+C
Copy Path Ctrl+Alt+P
Map
Global Scene
Local Scene

Figure 7

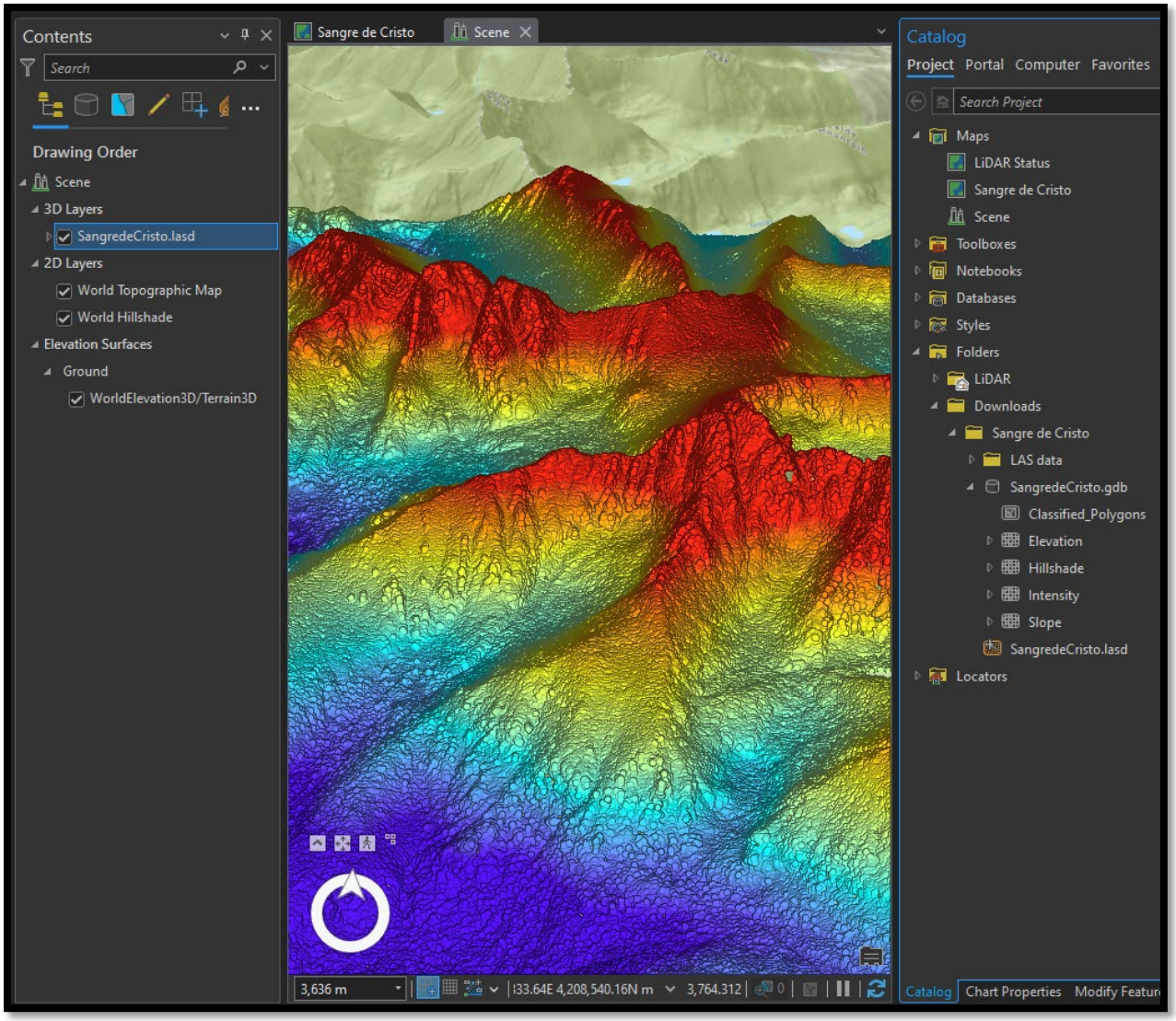


Figure 8

For additional information, questions, comments, or tool suggestions contact Michael Troyer - Colorado State GIS Specialist at Michael.Troyer@usda.gov.