# Welcome

## Southwest User Conference

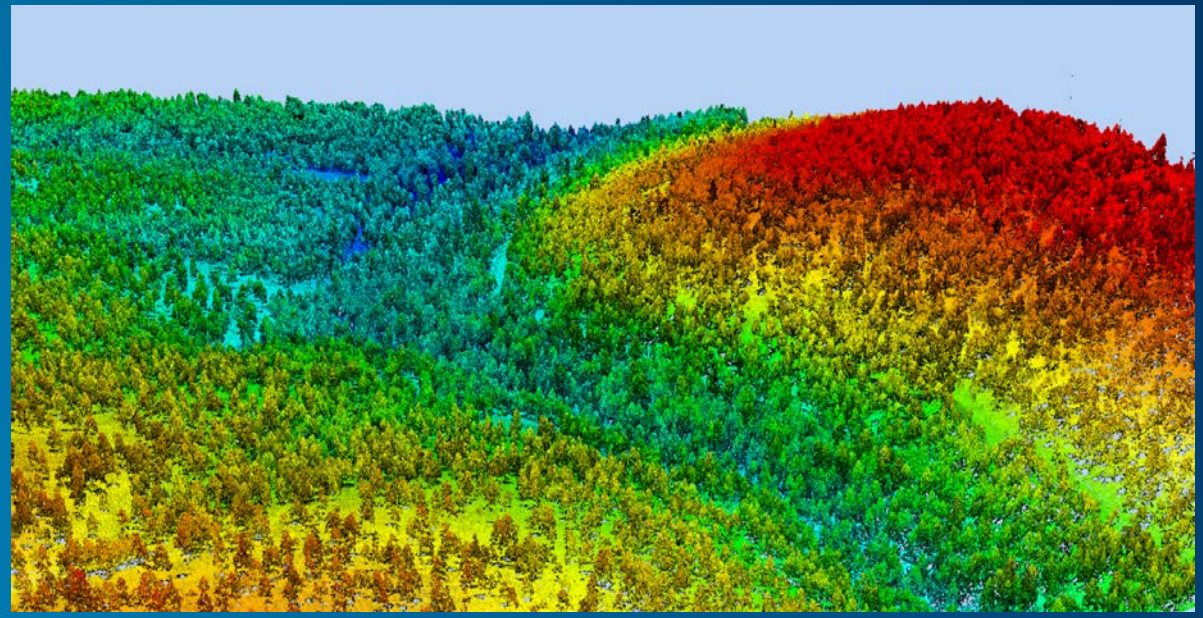
December 2-4 | Santa Fe, New Mexico

# Working with Lidar in ArcGIS

David Vaillancourt

# Workshop Agenda

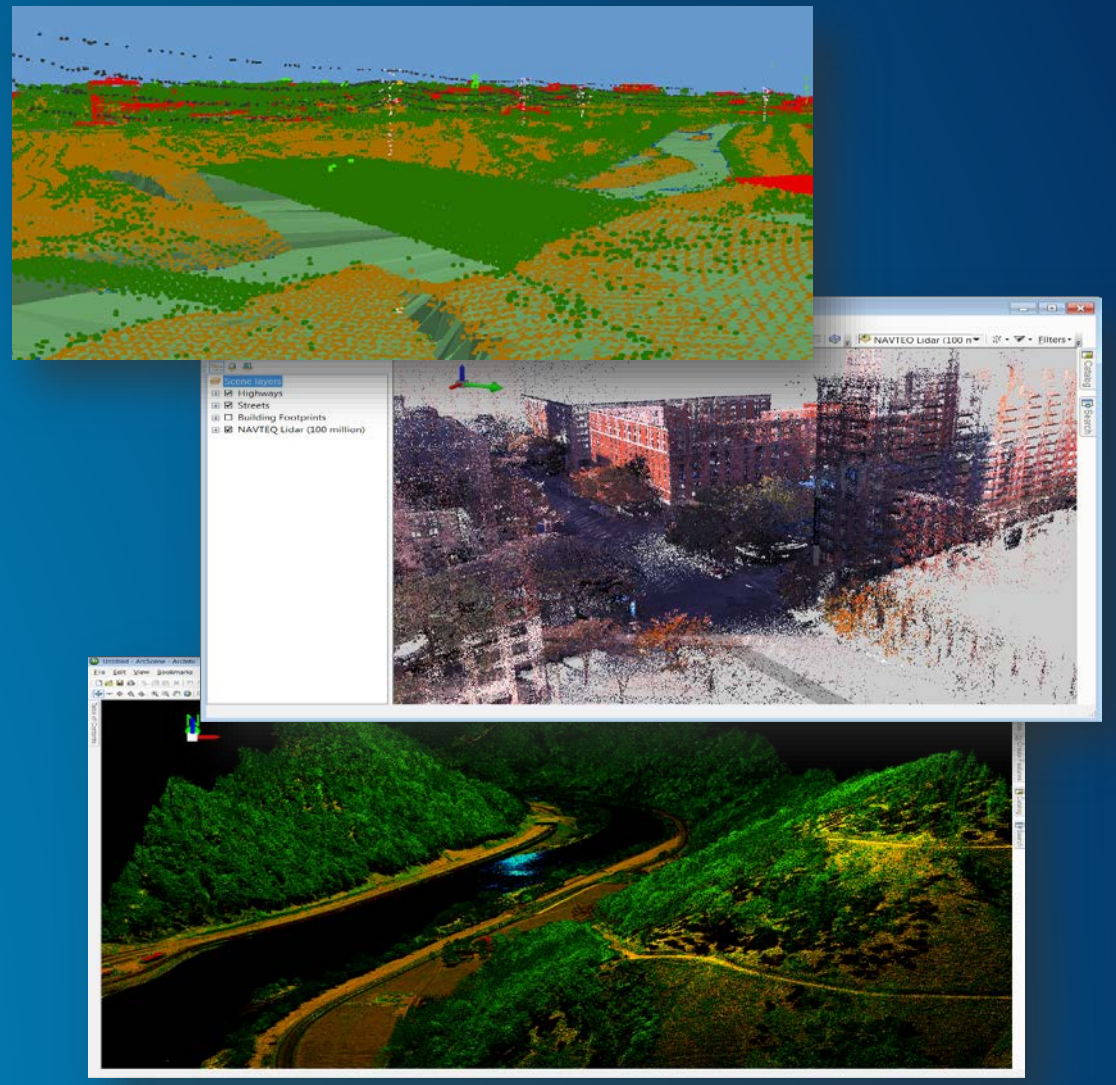
- Lidar Concepts
- Managing Lidar with LAS Datasets
- Lidar derived / elevation products
  - Terrain Datasets
  - Mosaic Datasets



# Types of Lidar

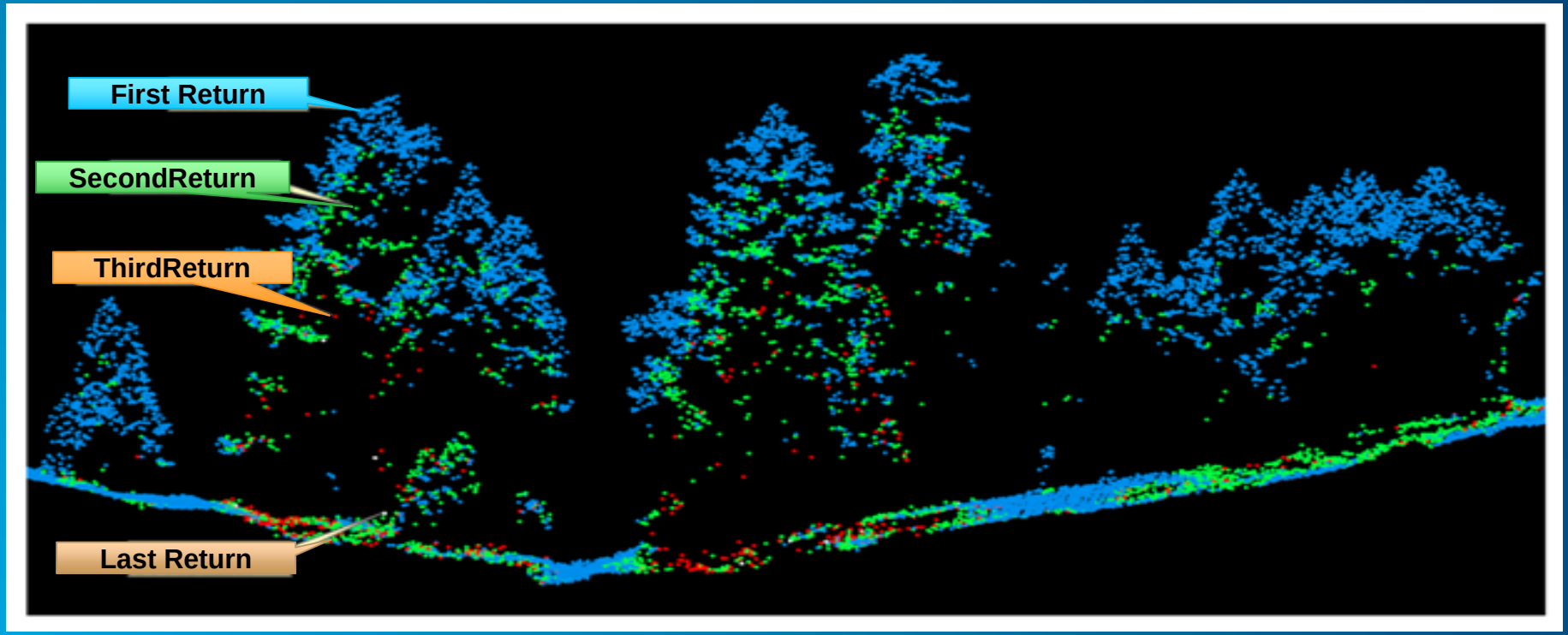
- Airborne
  - Captured from aircraft
  - Suitable for surface analysis

- Terrestrial and Mobile
  - Captured from the surface
  - Suitable for feature location and
  - data validation



# Lidar Data

- Very rich, but contains a lot of data not required for many applications



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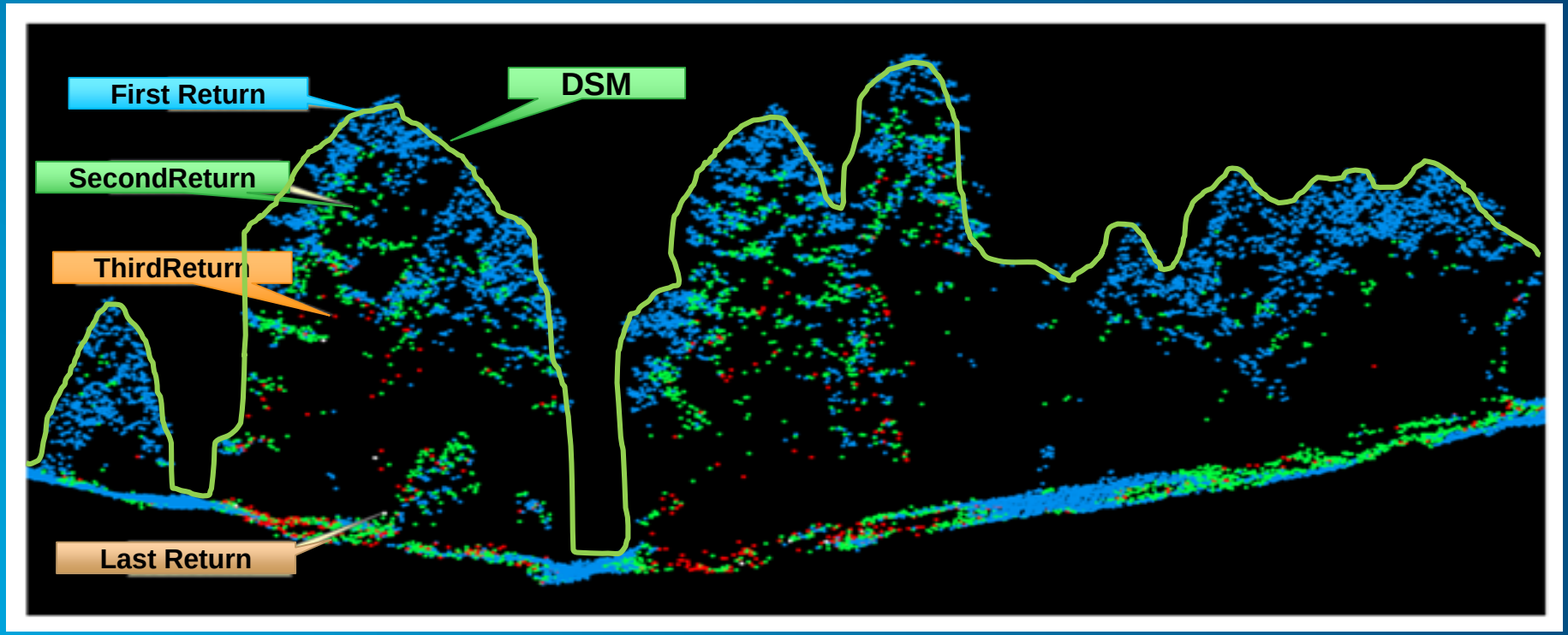

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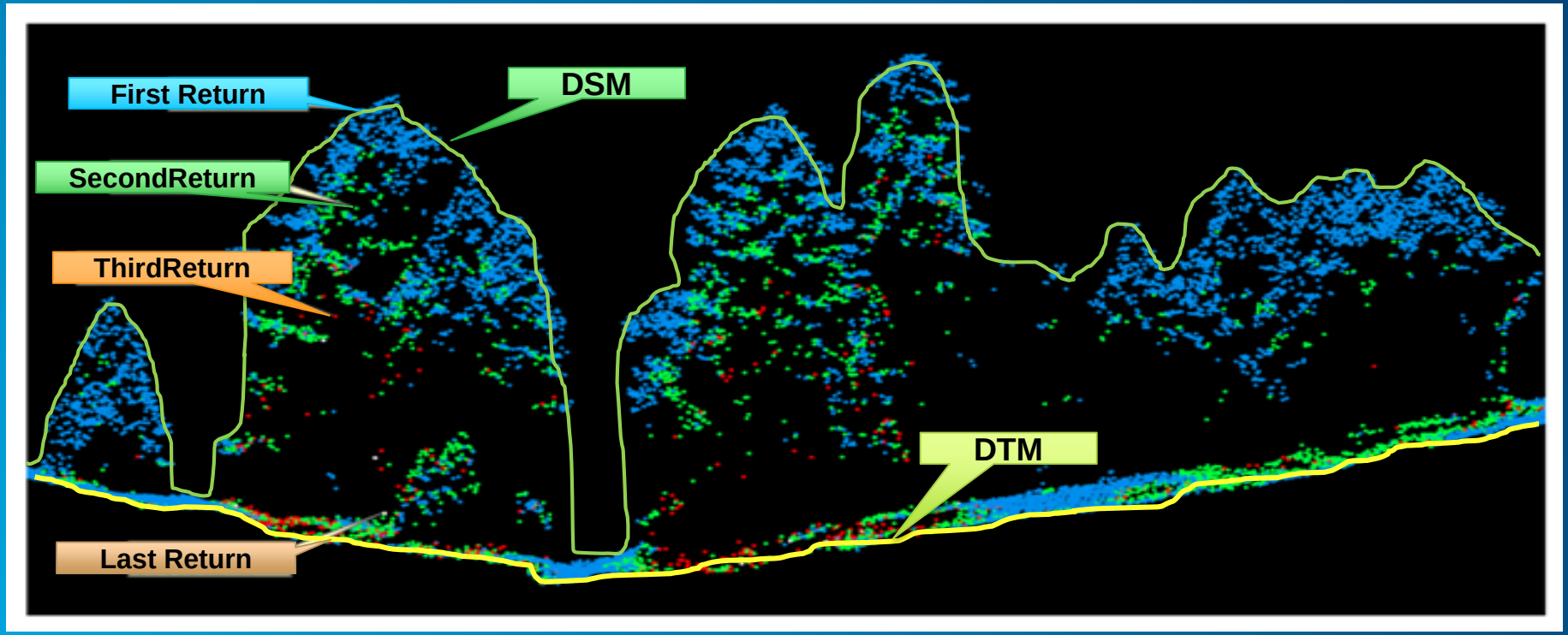

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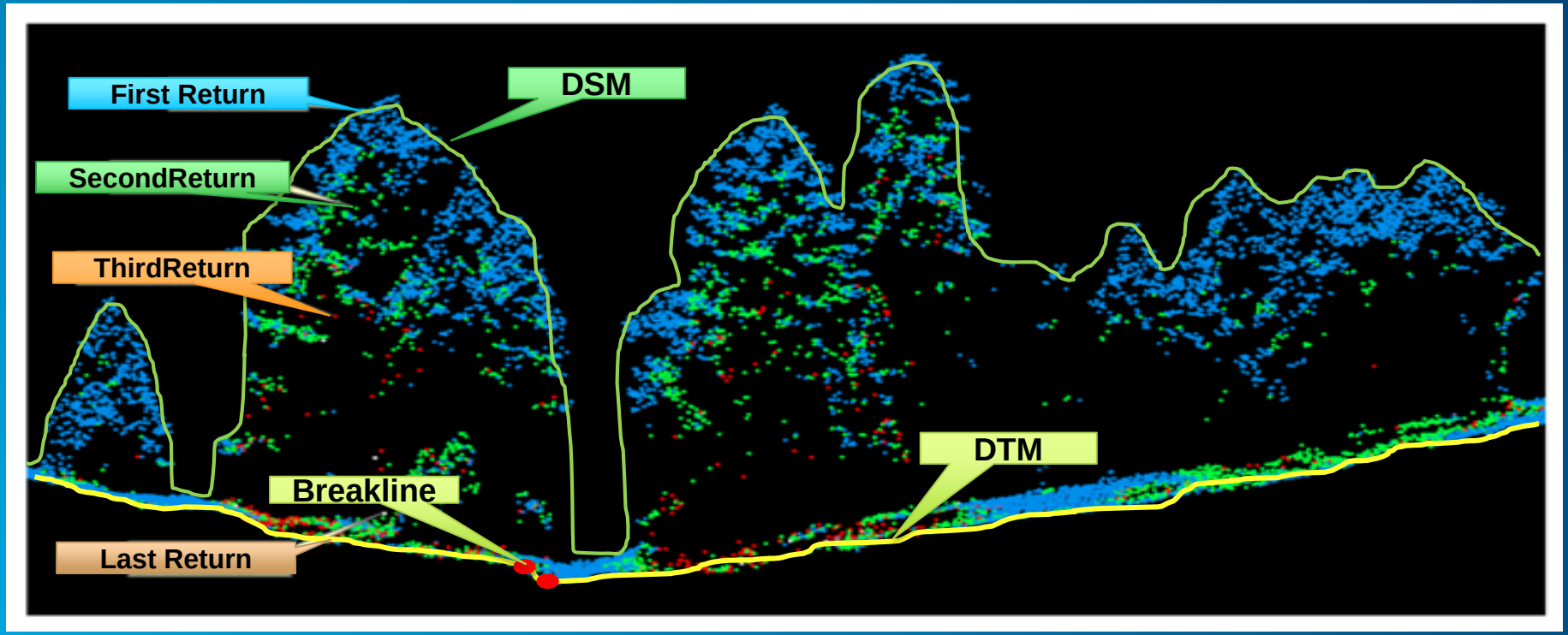
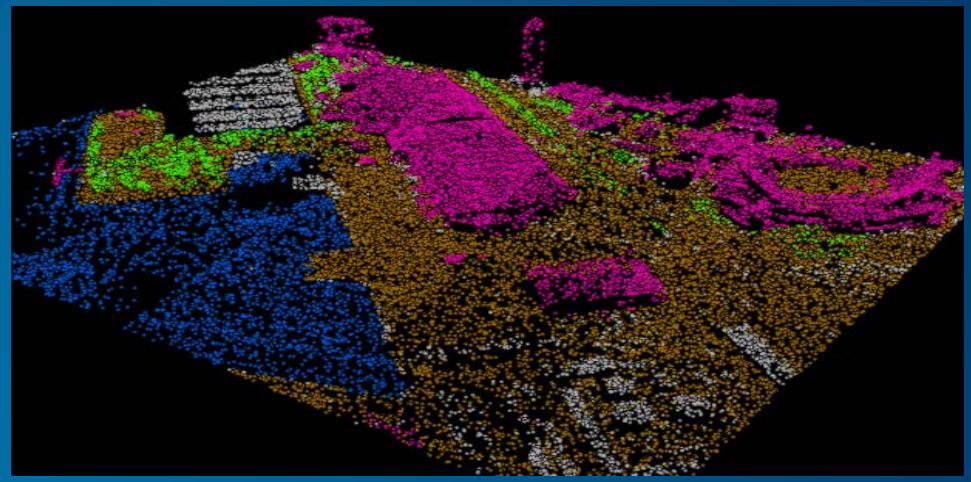


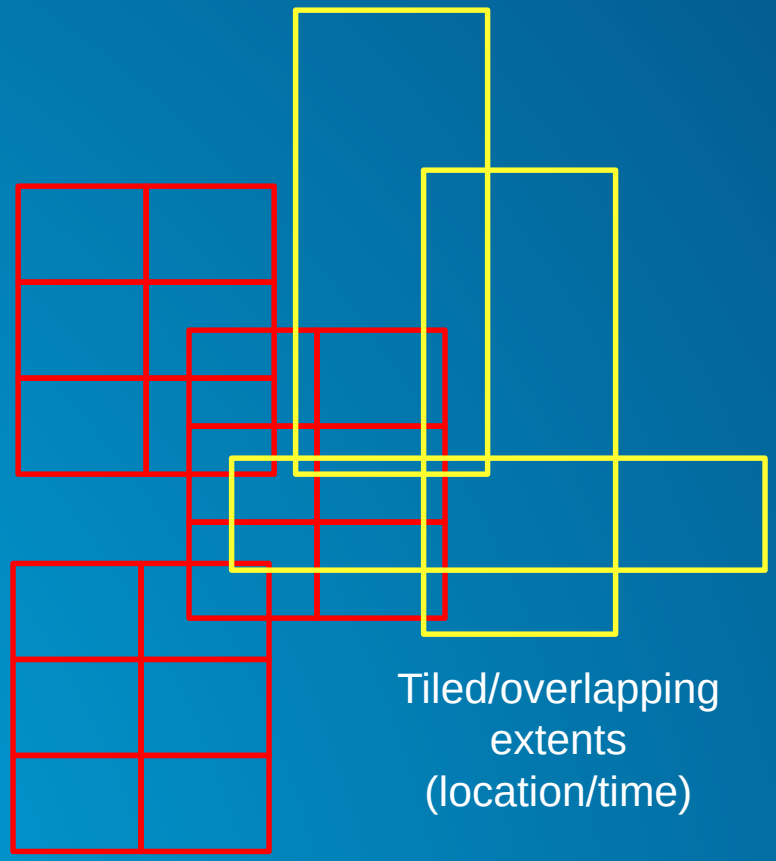
# Key Lidar Functionality

- Surface analysis
  - First-return, Bare-earth
- Feature extraction
  - Digitizing, Point classification
- Background information
  - Measuring, Data validation
- Sharing
  - Serving
  - Zip-and-ship



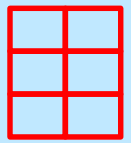
# Lidar support in ArcGIS

Multiple files/folders

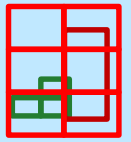


Tiled/overlapping extents (location/time)

**Analyze and update**



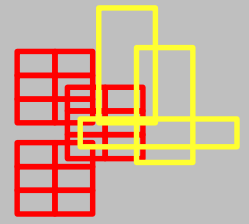
LAS dataset



Terrain dataset

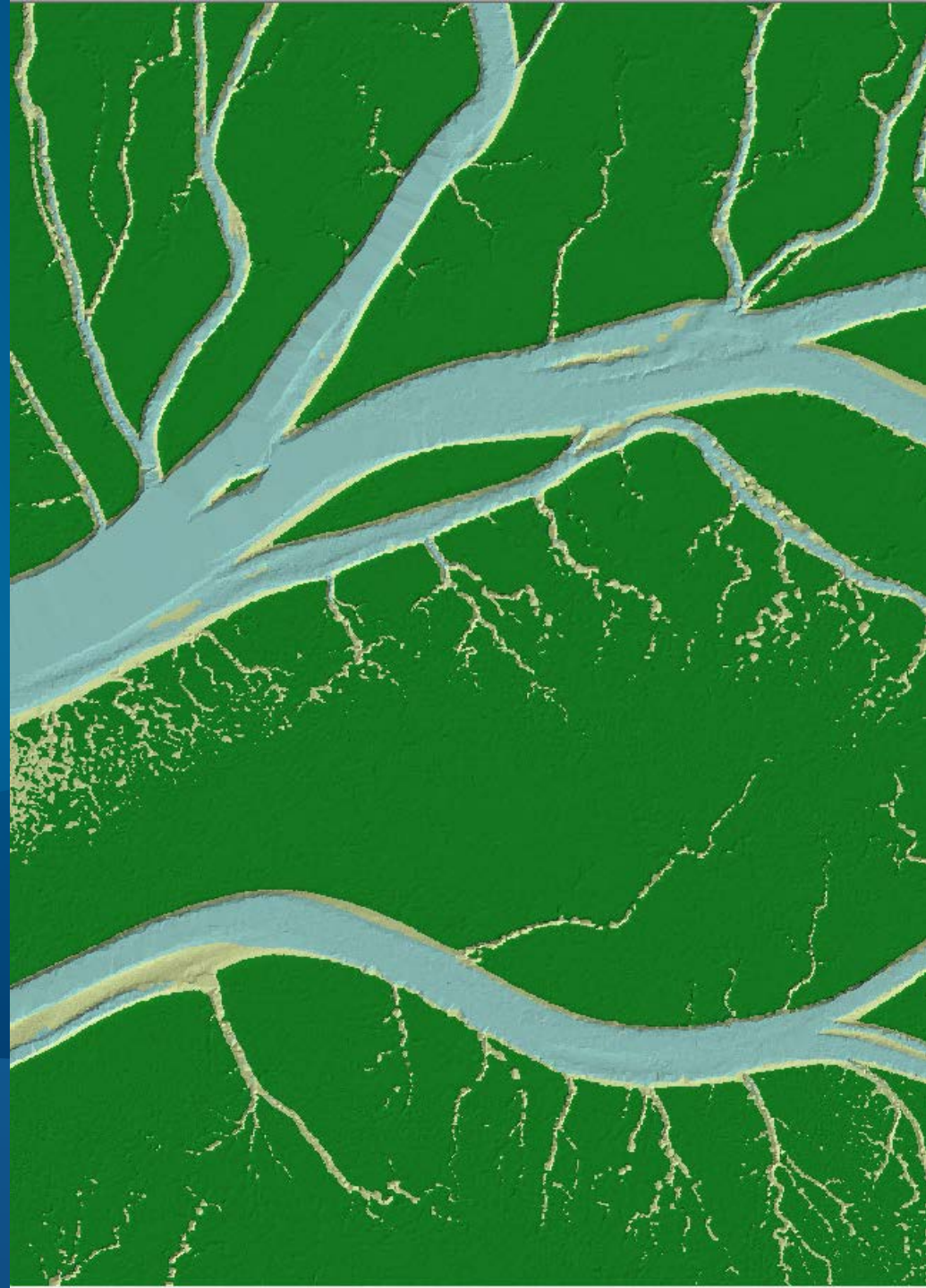
LAS/ Terrain dataset

**Manage, serve, share**



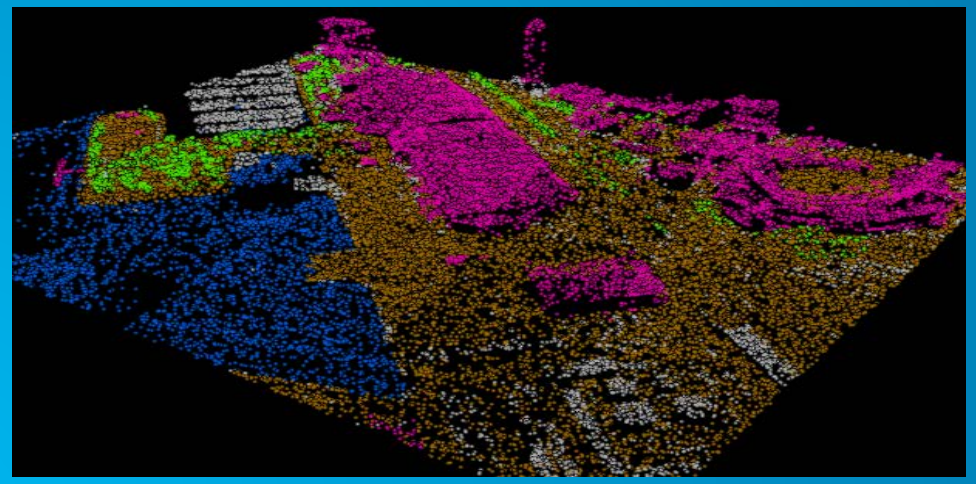
Mosaic dataset

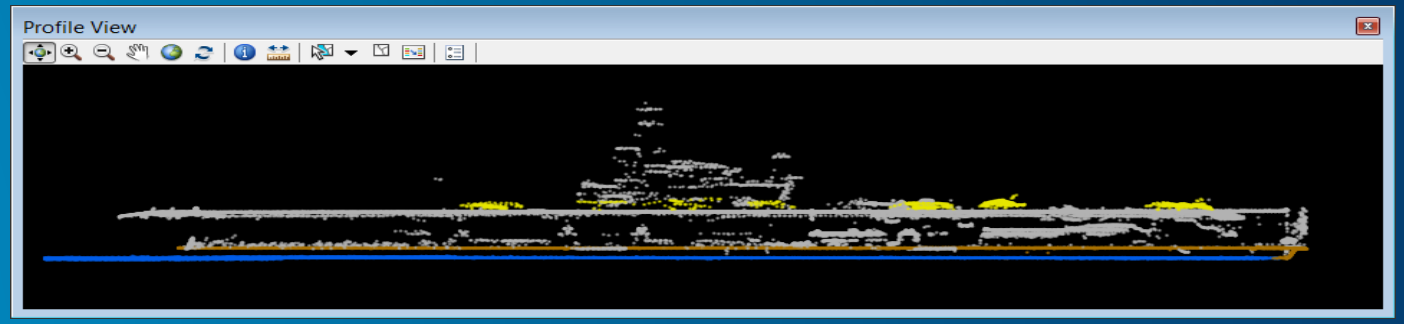
# LAS dataset



# LAS Dataset

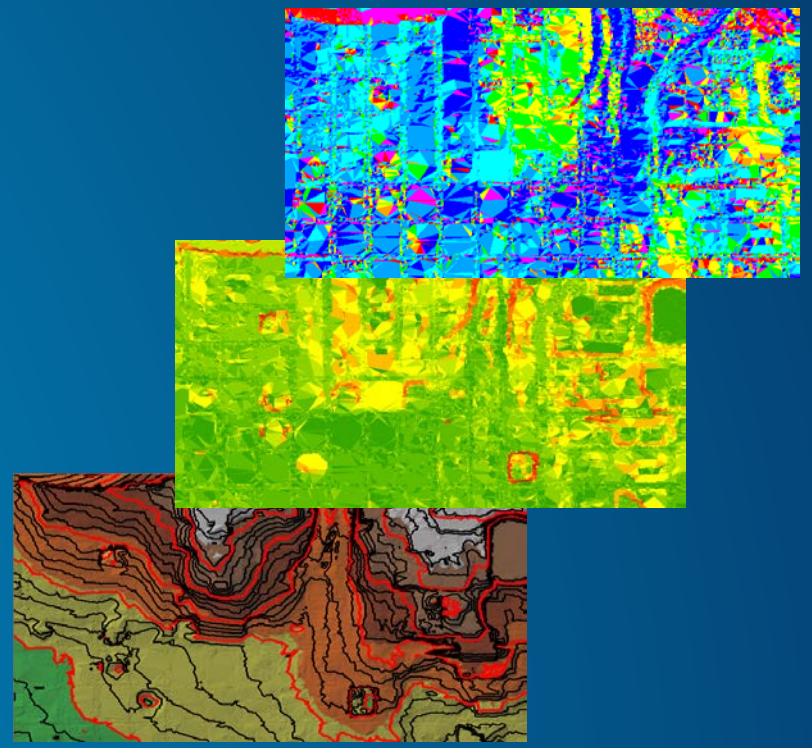
- Data type (new @ 10.1)
- File based – not in a GDB
- Stores references to LAS files on disk
- Optionally reference breakline data
- Treats a collection of LAS files as one logical dataset





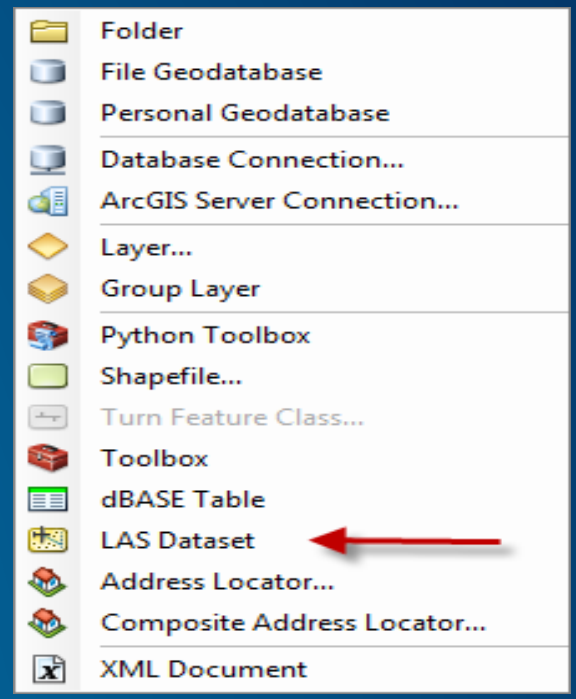
# LAS Dataset Strengths

- **Scalability**
  - **Works directly on LAS files**
- **Data Integration**
  - **Point cloud and breakline support**
  - **Storage efficient**
- **Data Management**
  - **I/O efficient**
  - **Edit LAS classifications**

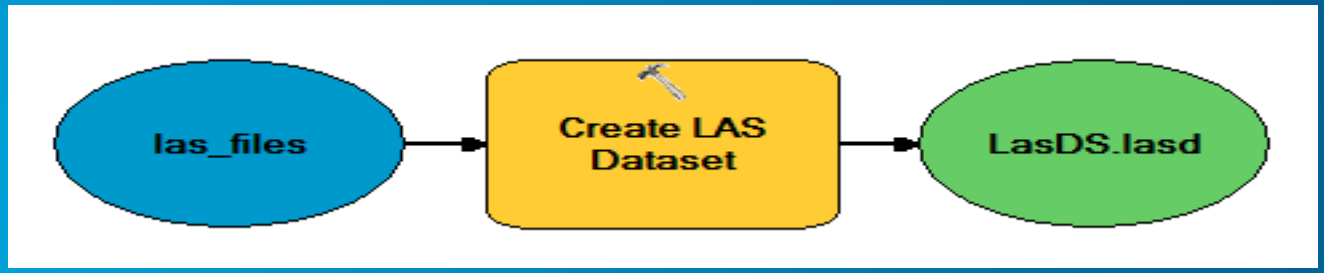


# LAS Dataset – Creation

- **Interactively via Catalog**
  - **File folder context menu**

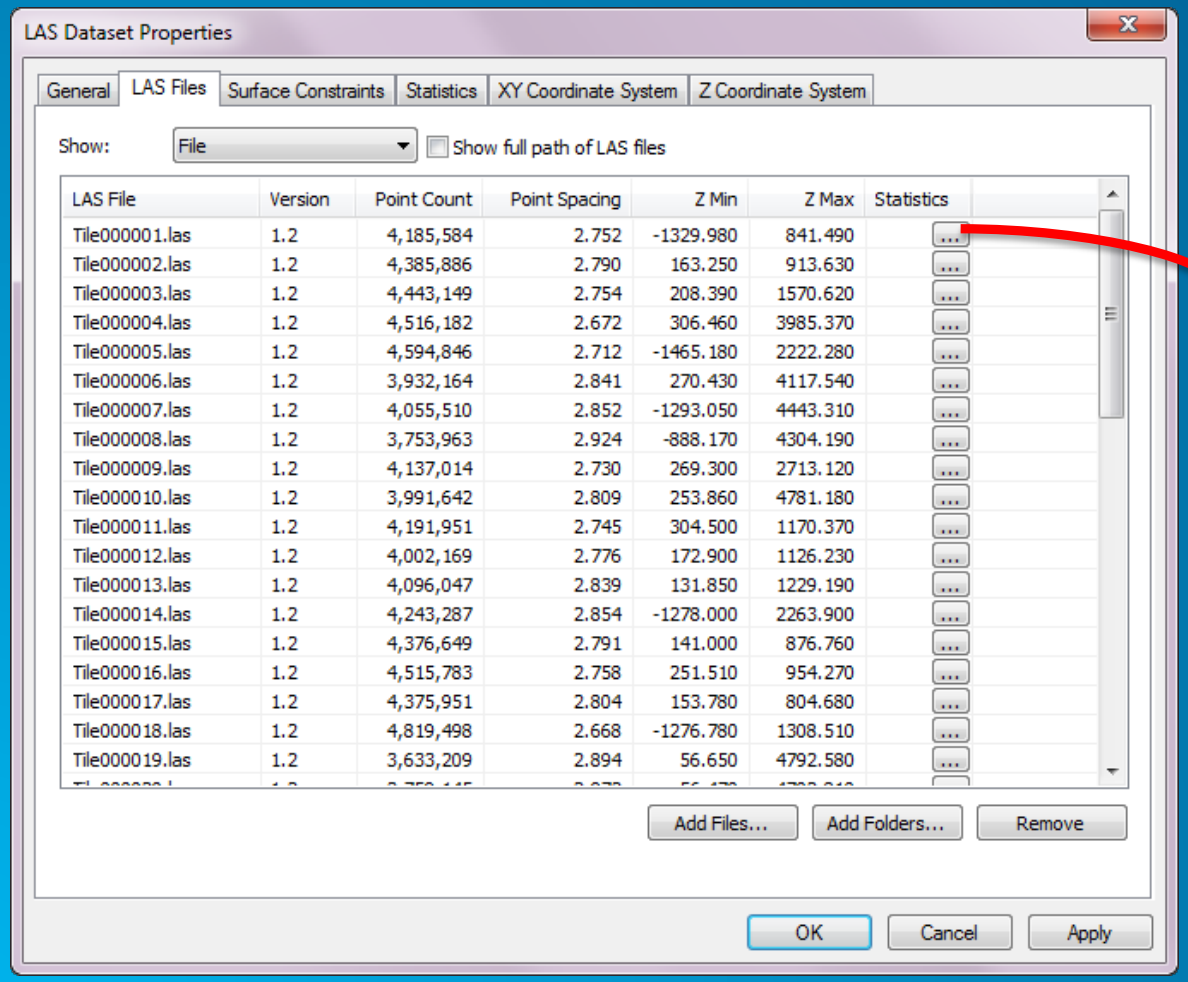


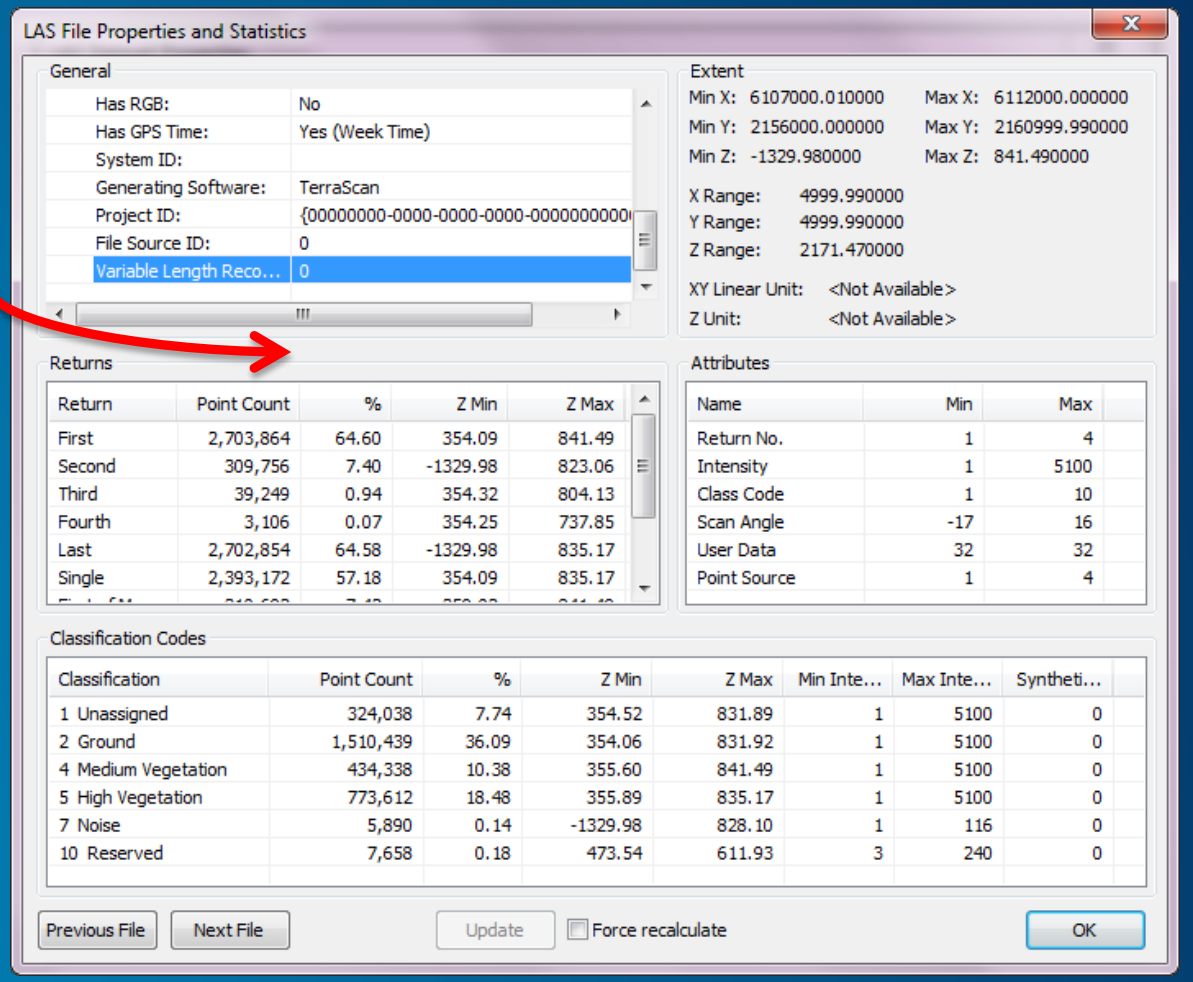

- **Using scripts and models with geoprocessing tools**



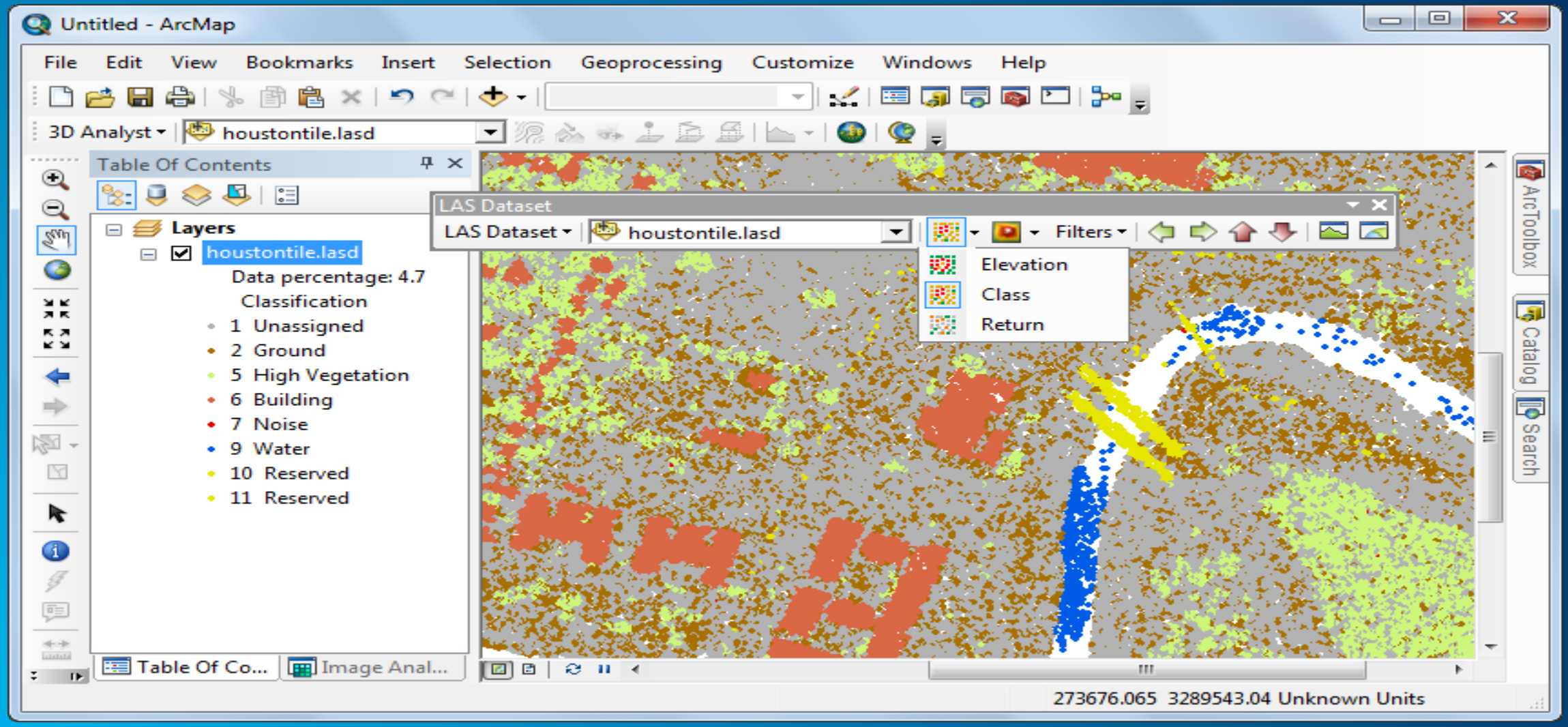
# QA\QC: LAS file based statistics

- **LAS Dataset Properties: LAS File Statistics**

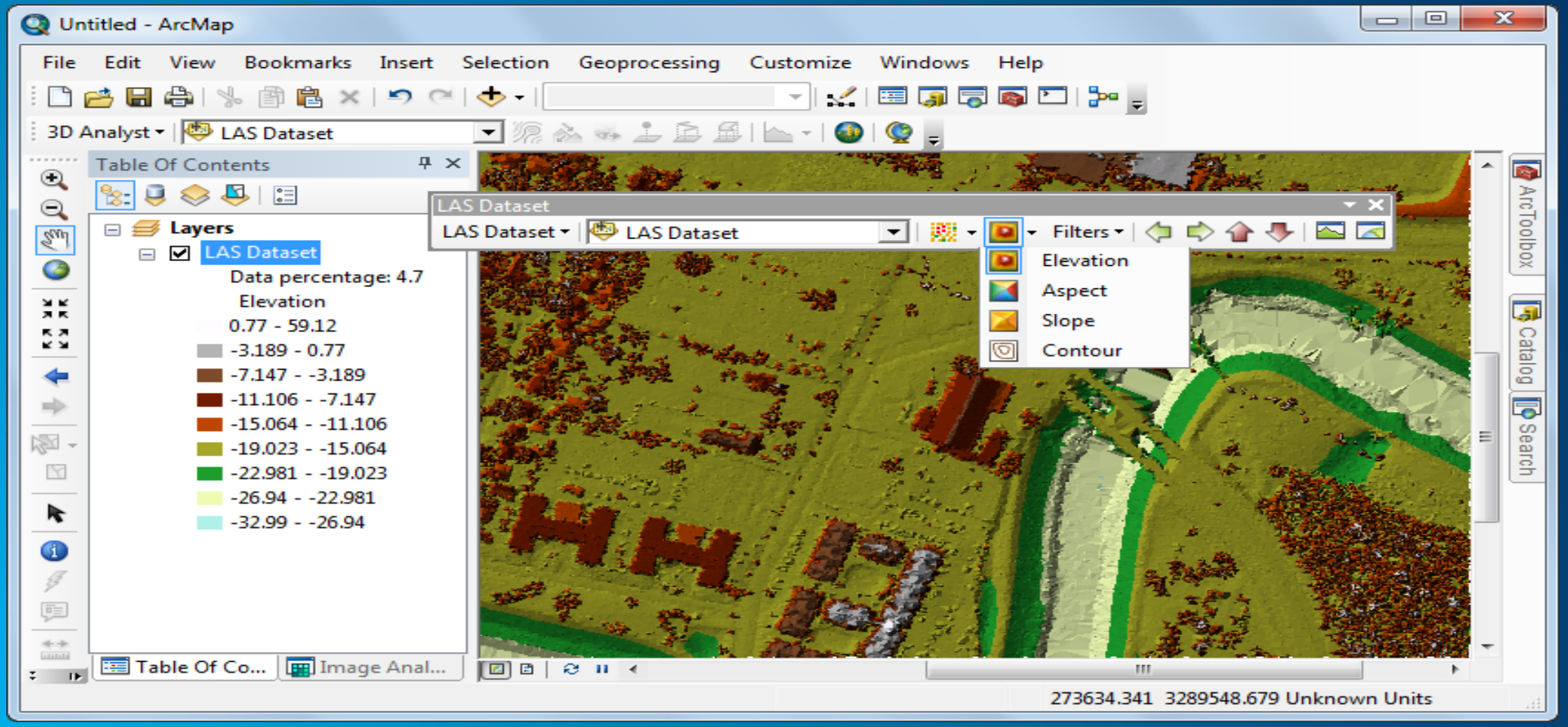


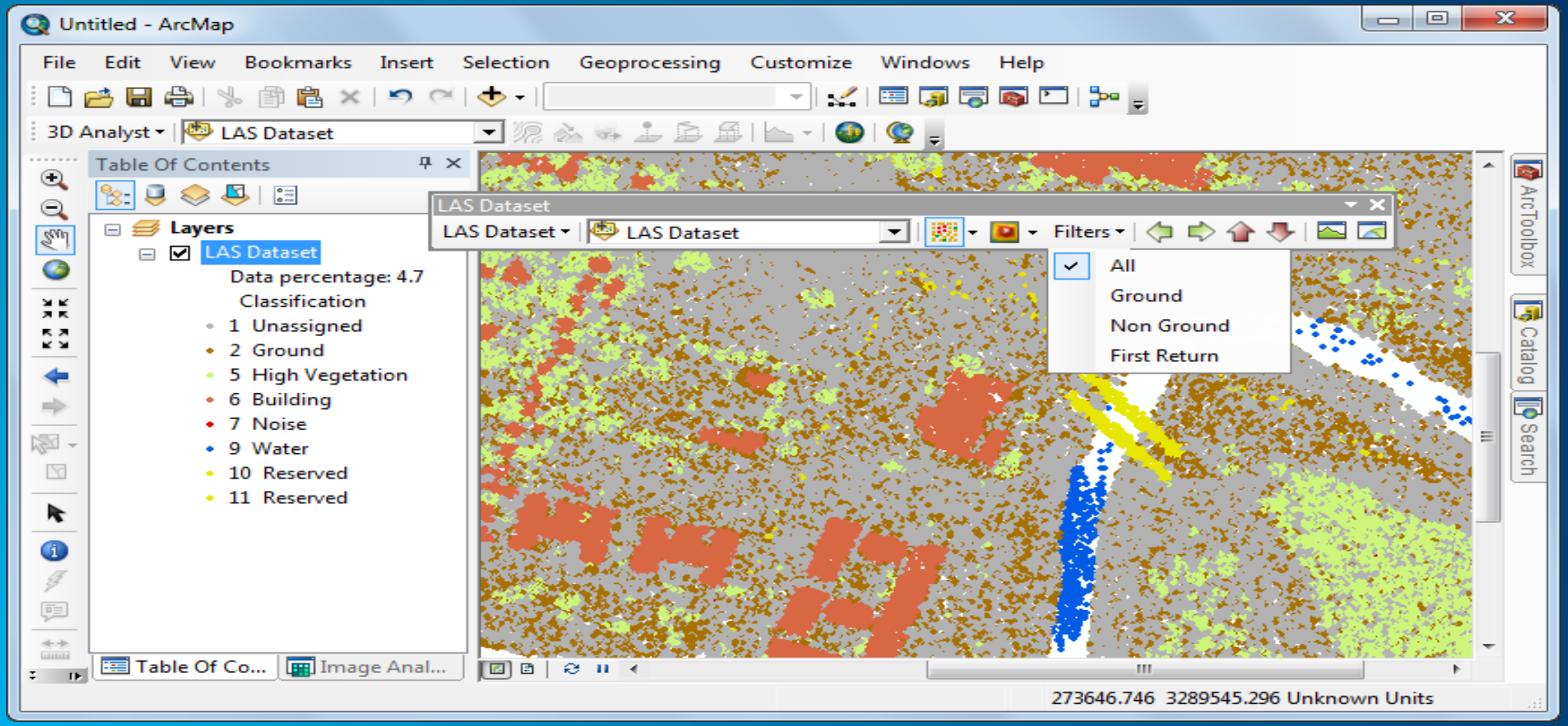
# LAS Dataset – Point display



# LAS Dataset – Surface Display

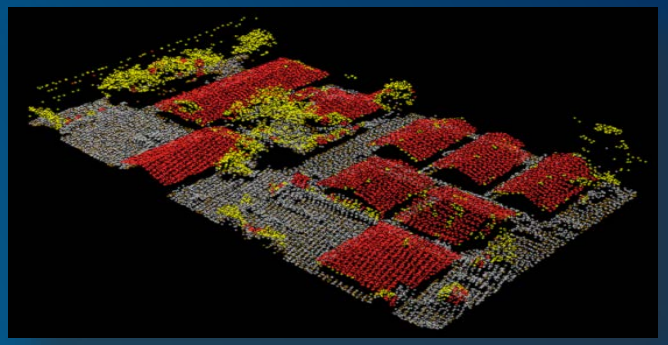


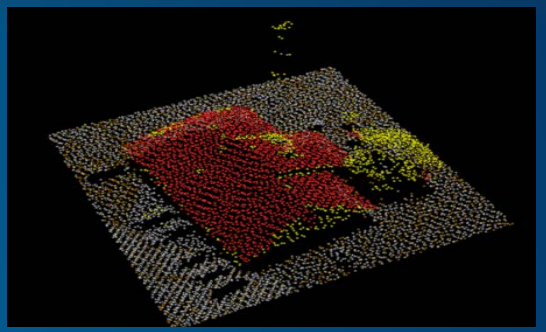
# LAS Dataset – Point Filters



# Edit classification codes

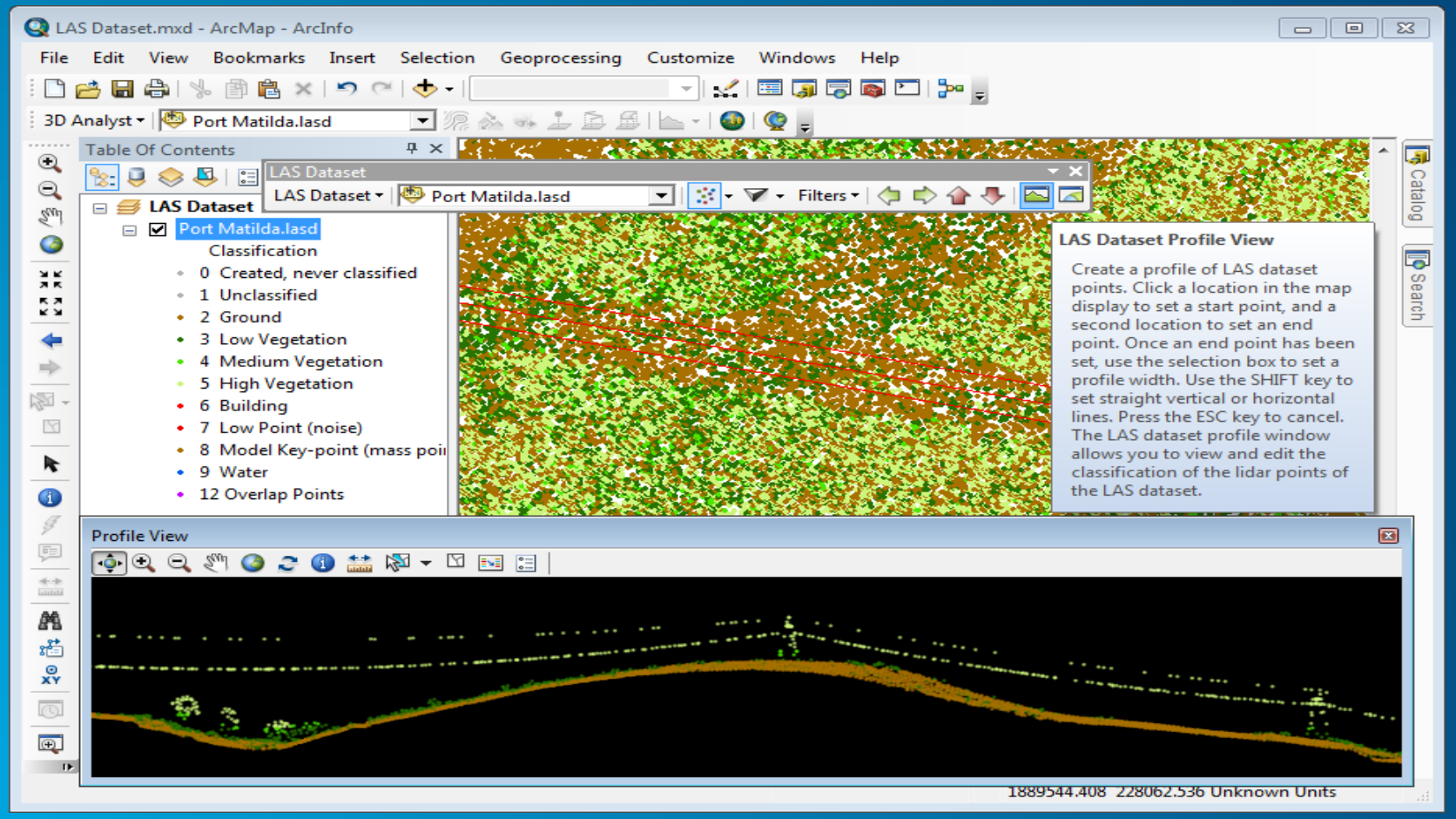
- **Manual**
  - Fixing data anomalies and misclassifications via point profile window
- **Automated (GP tools)**
  - Classify relative to feature data
  - Reclassify to standard LAS specification



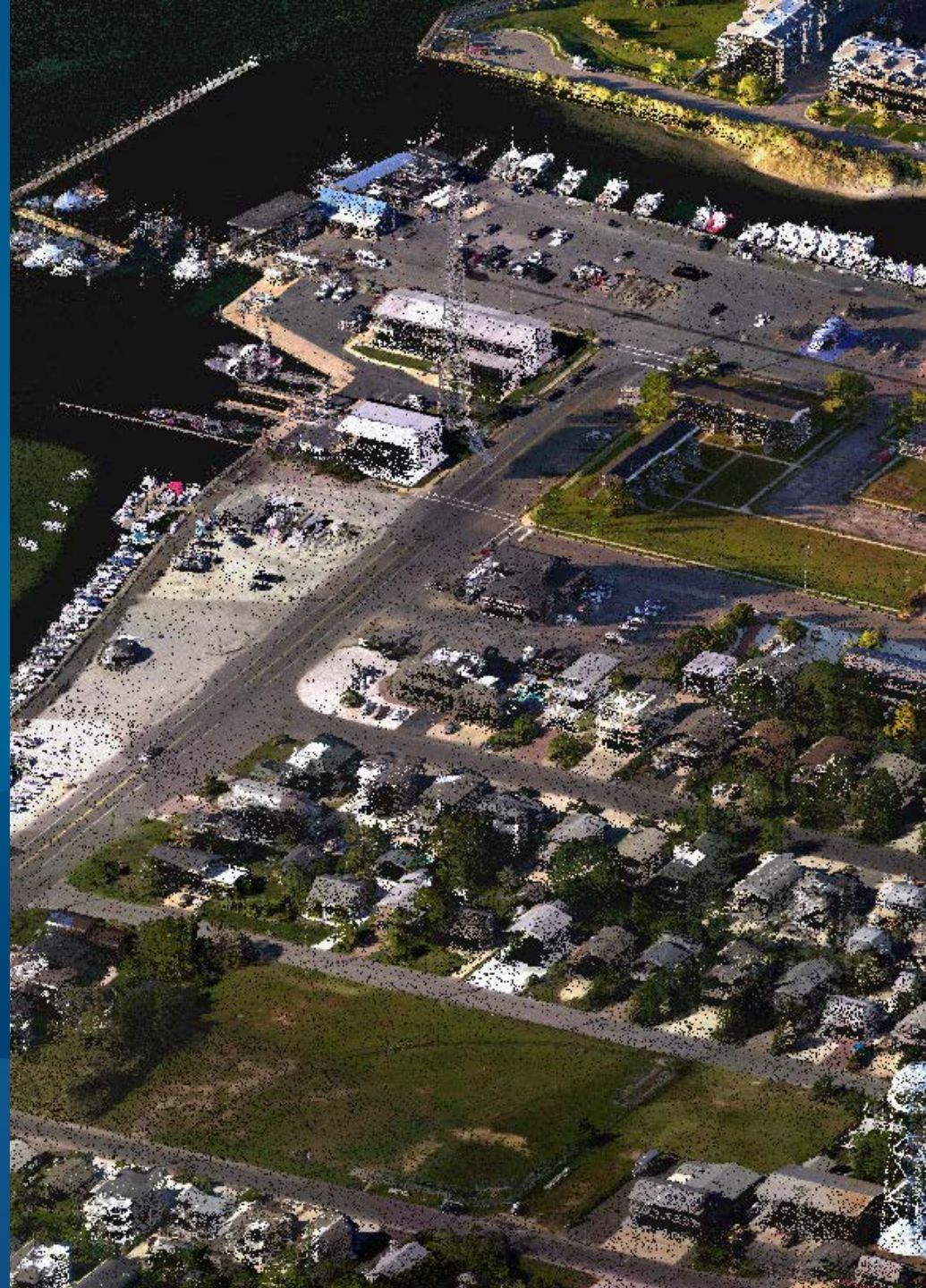


# LAS Dataset

- Interactive Editing



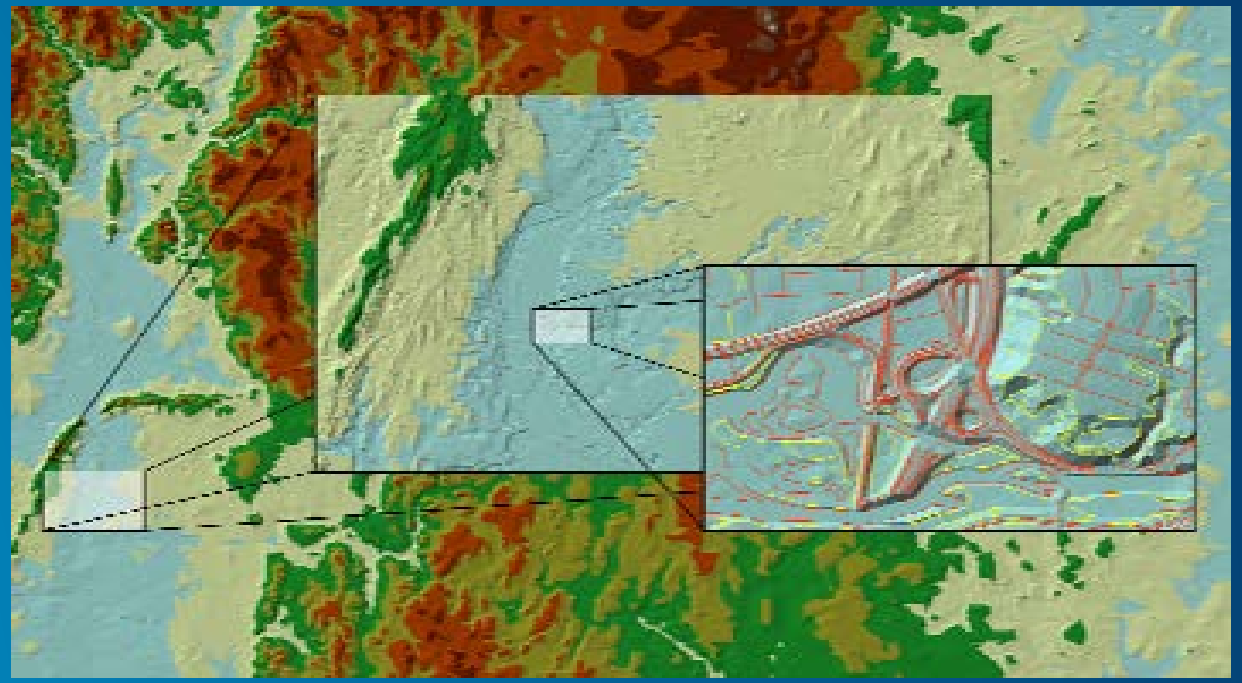
# Demo: LAS Dataset



# Terrain dataset

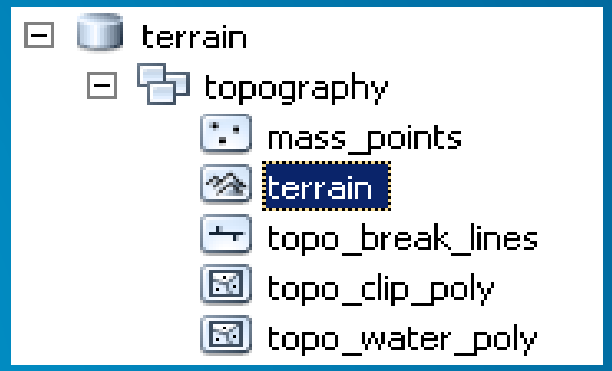
# Managing lidar data in a terrain dataset

- A multi-resolution surface created from measurements stored in feature classes
- Typical applications:
  - Topographic mapping
  - Bathymetric mapping
- Typical data sources:
  - Photogrammetric data
  - Lidar
  - Sonar



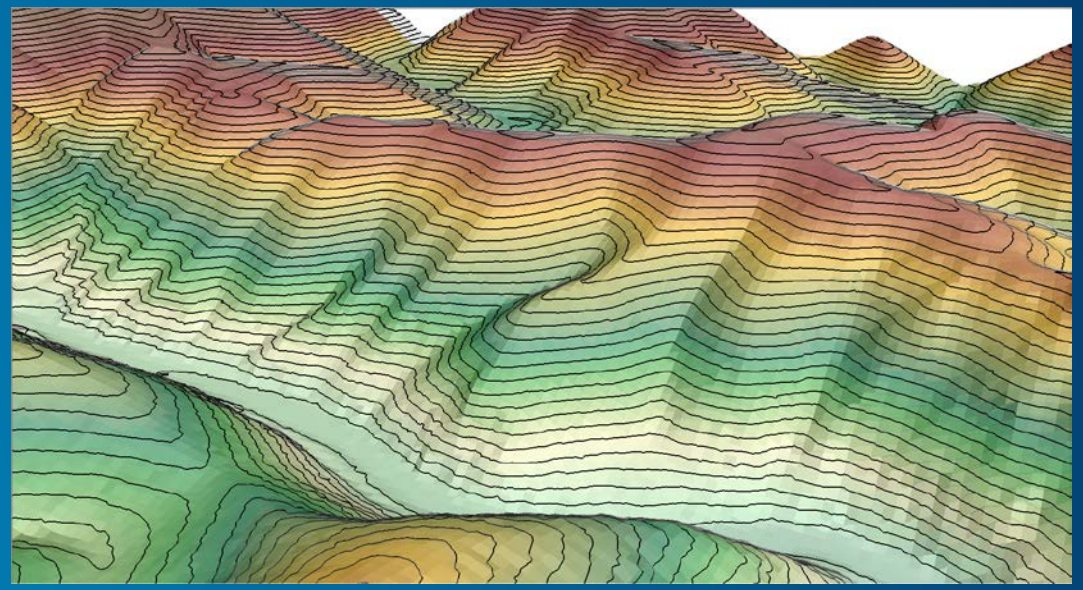
# What is a terrain dataset?

- Terrain datasets live inside feature datasets within the geodatabase
- Identify which feature classes participate and how they contribute
- Rules specify how features are used to define a surface



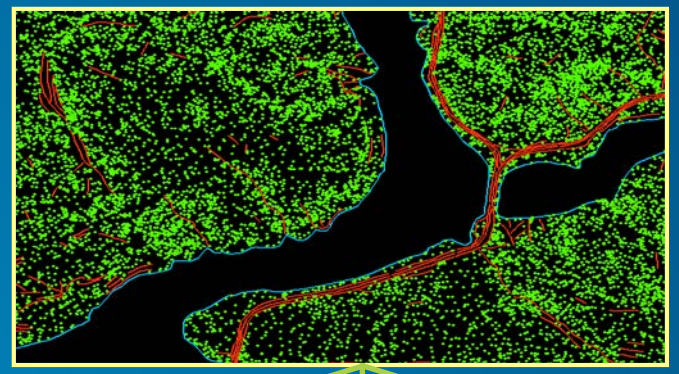
# Terrain dataset advantages

- Scalability
  - Large collections of mass point data (e.g. LIDAR)
  - Data integration
  - Need surface to live with source data
- Data management
  - Database tools
  - Editing/update
  - Multi-user

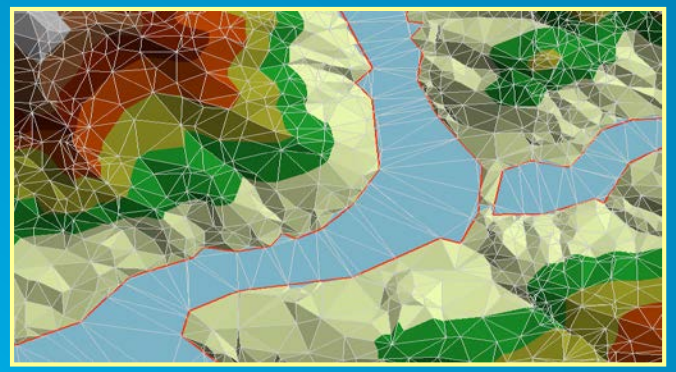


# Multiresolution surface model

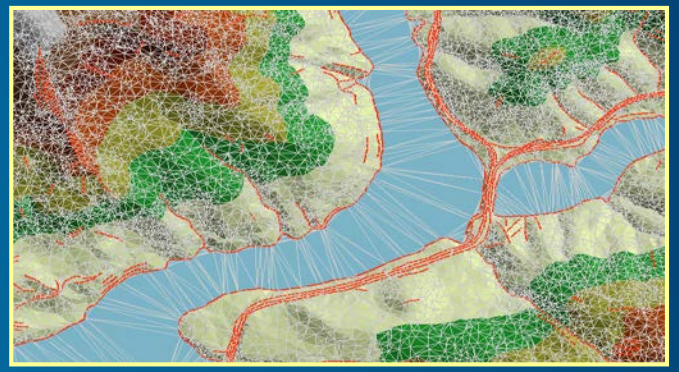
Points and breaklines



Terrain Pyramids



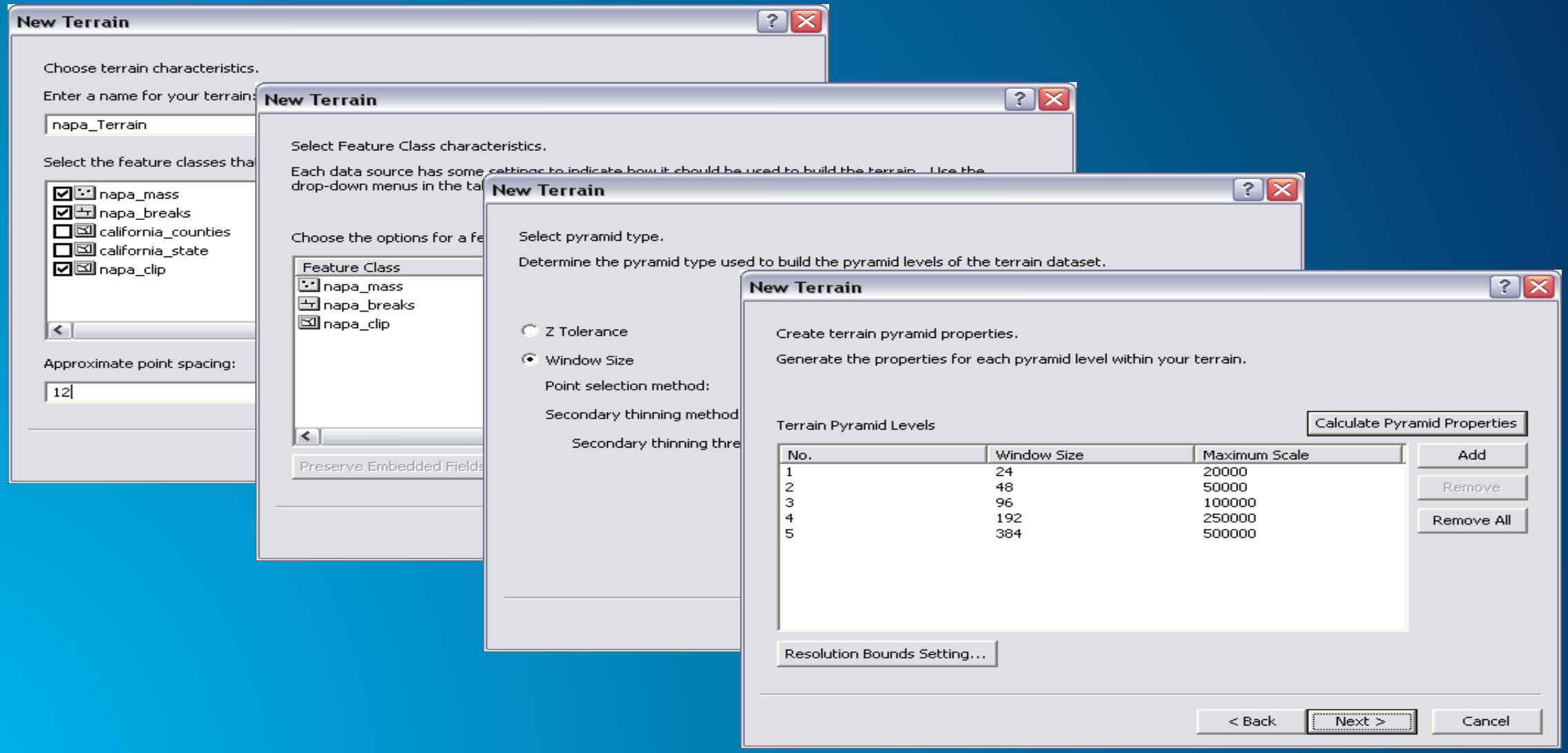
Thinned lidar point set



Full **resolution lidar point set**

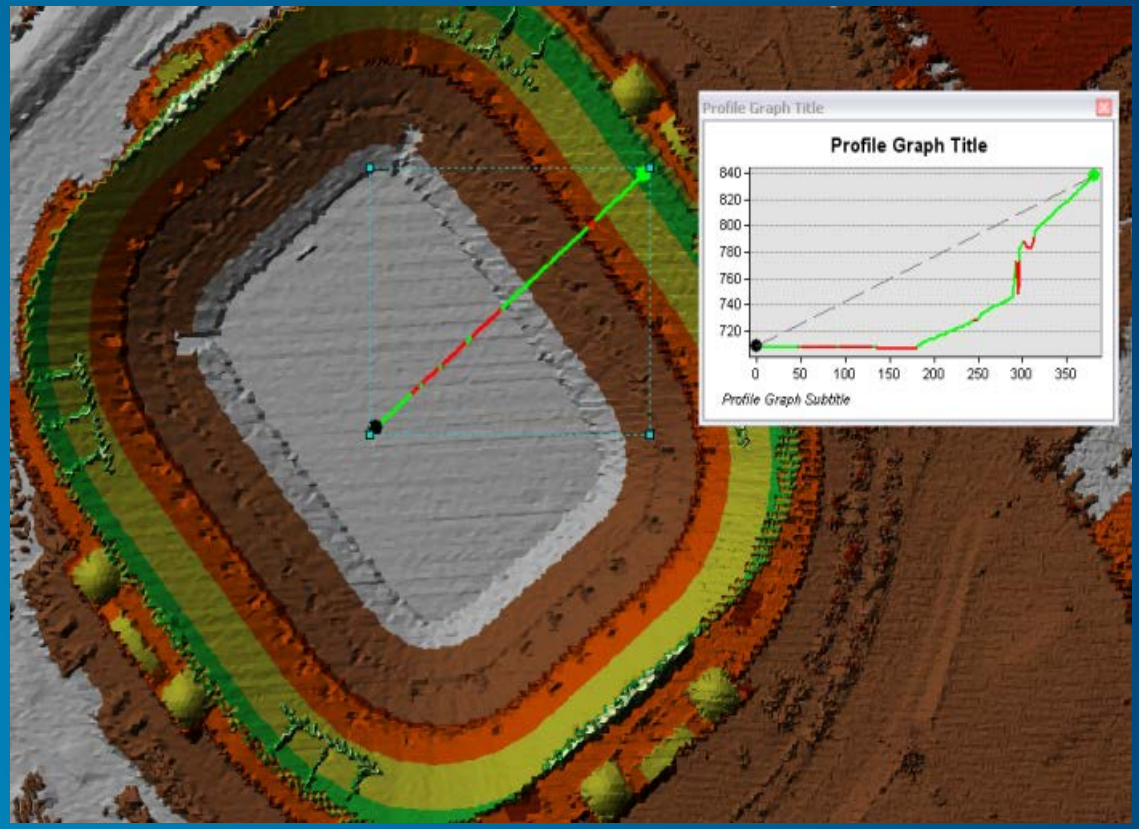
**Multiresolution terrain dataset (TIN structure)**

# Creating a terrain dataset

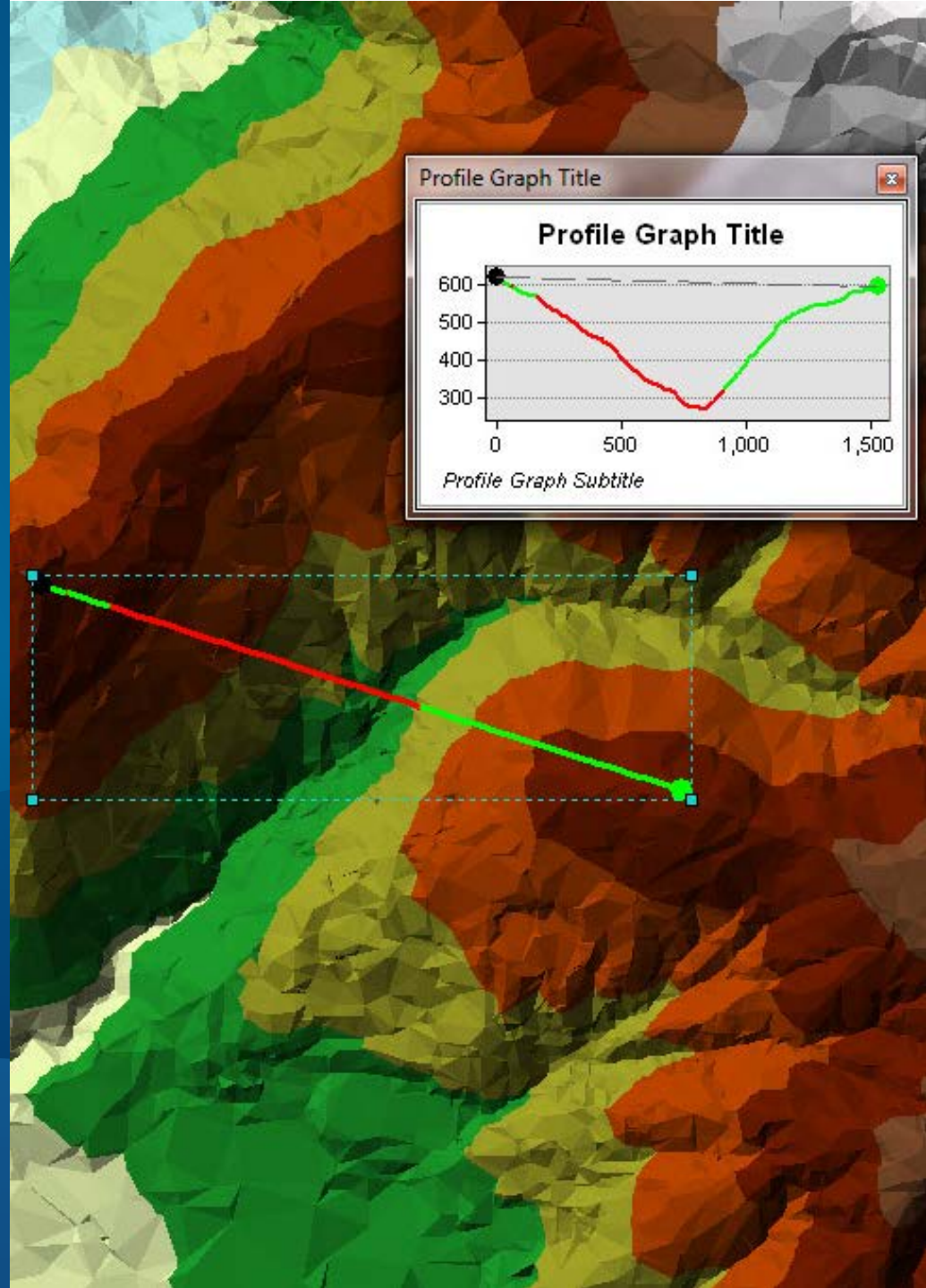


# Analysis capabilities for terrain datasets

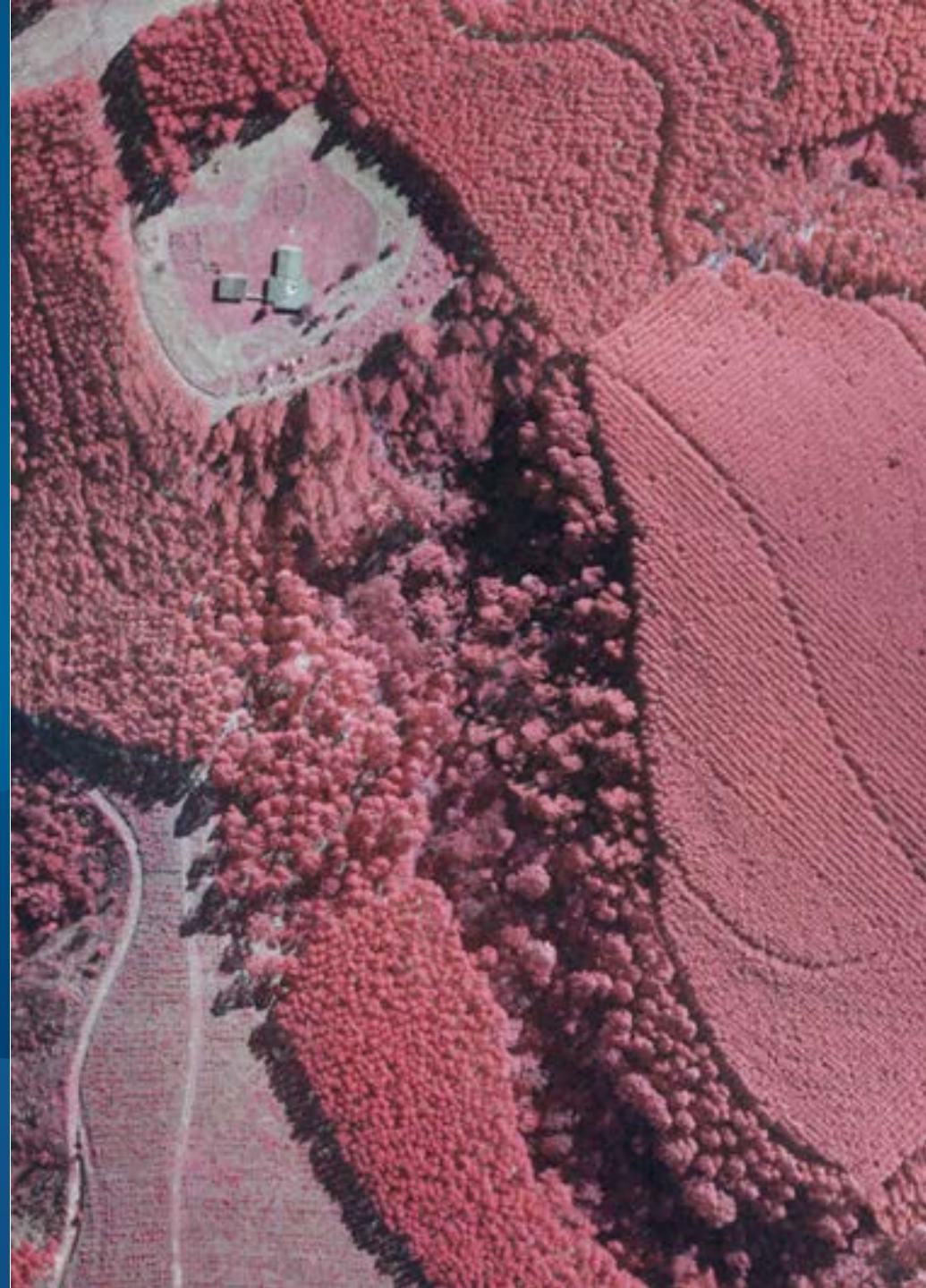
- QA/QC data
- DEM, DSM
- Slope
- Aspect
- Contours
- Surface differencing
- Intensity image
- Forest canopy estimation
- Data area delineation
- Thinning, reducing noise
- Spot interpolation
- Profiling



# Demo: Terrain Dataset

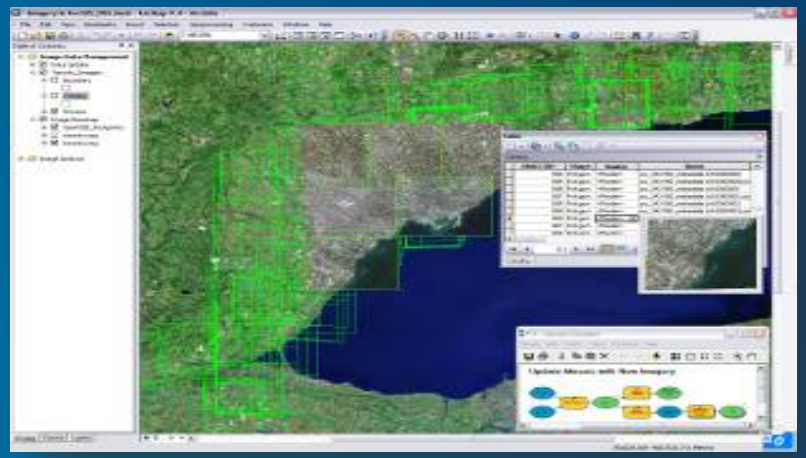


# Mosaic dataset



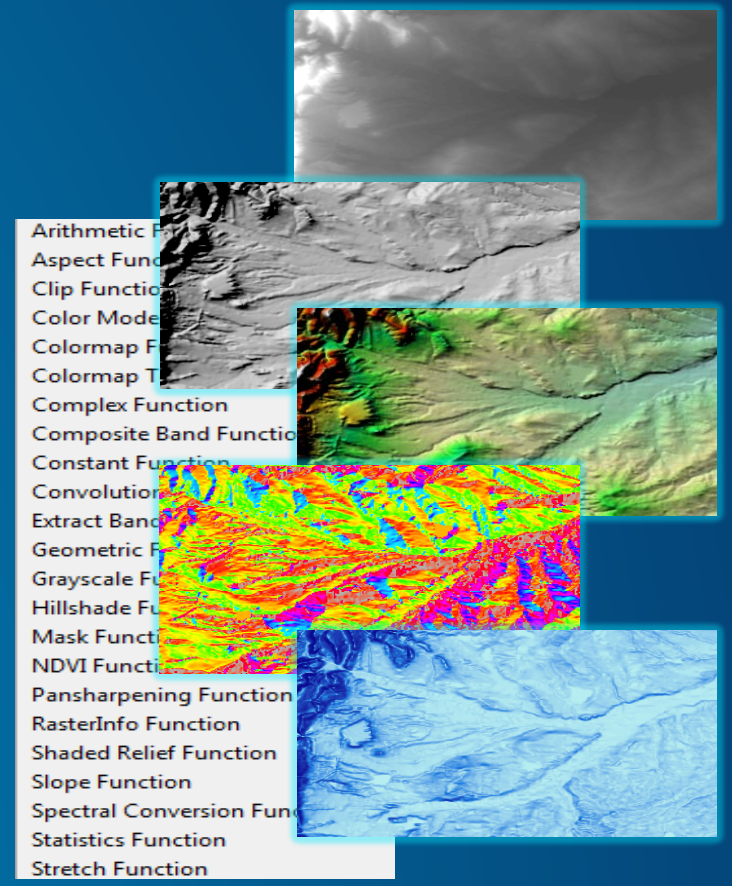
# What is the Mosaic Dataset?

- A geodatabase data model used to catalog, process, visualize and share your collections of imagery and lidar data
- Support for
  - LAS files
  - LAS datasets
  - Terrain datasets
- Indirect data management
- Unlimited size
- Provides dynamic rasterization, mosaicking, and on-the-fly processing



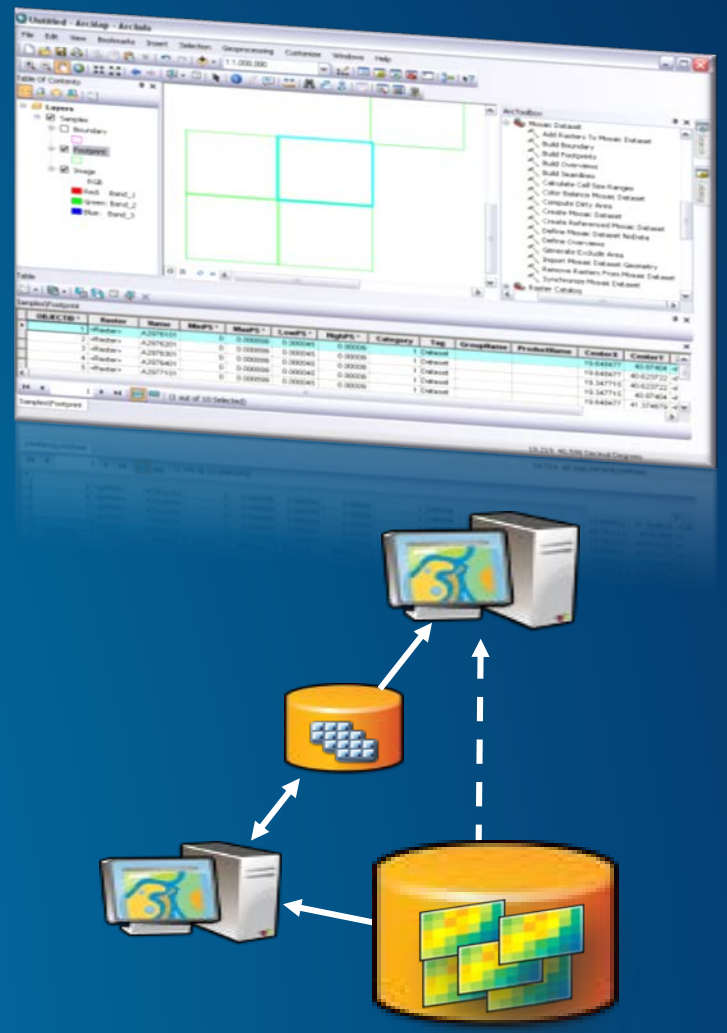
# On-The-Fly Processing

- Data is processed as it is accessed
- Create multiple products from one source
- Processing for elevation
  - Hillshade
  - Shaded Relief
  - Aspect
  - Slope
  - Convolution Filters
- Define processing functions
  - On each item
  - On entire collection



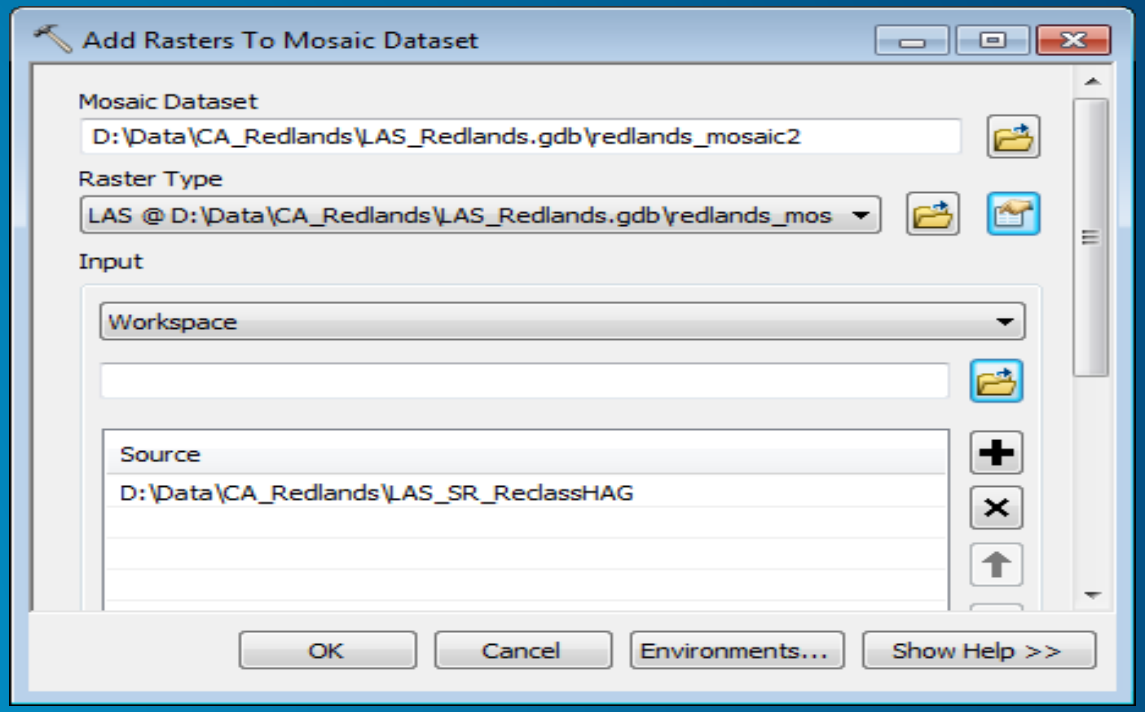
# Building a Mosaic Dataset

- Store in a geodatabase
  - Build with geoprocessing tools
  - Automation with models or Python
- Simple workflow
  1. Create mosaic dataset
  2. Add imagery
  3. Optionally, edit properties and functions
- Can interactively edit and view in ArcMap
  - All layers are displayed
  - Edit and add fields in table window

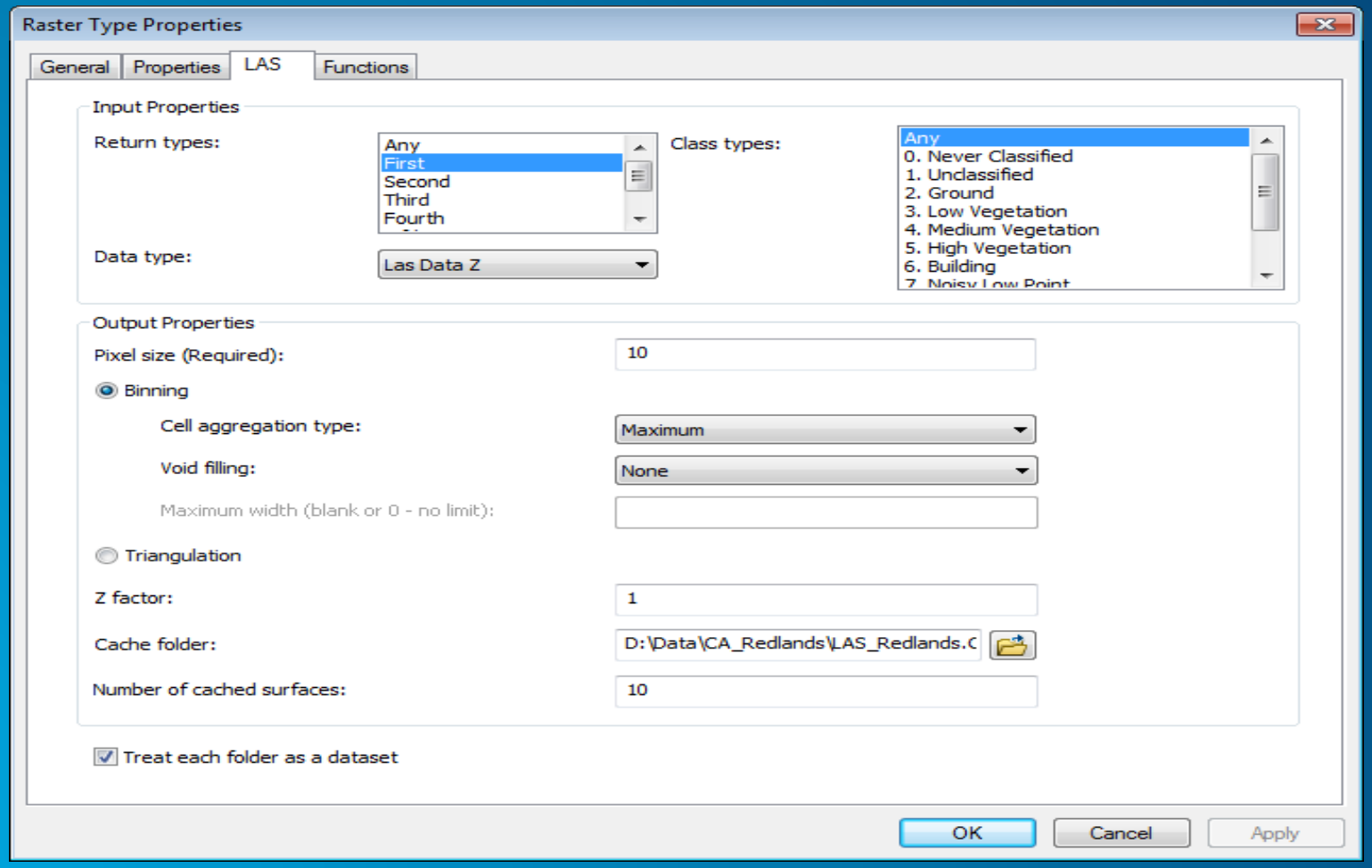


# Mosaic Dataset – Adding Lidar

- Lidar sources treated as raster type
  - LAS
  - LAS Dataset
  - Terrain Dataset

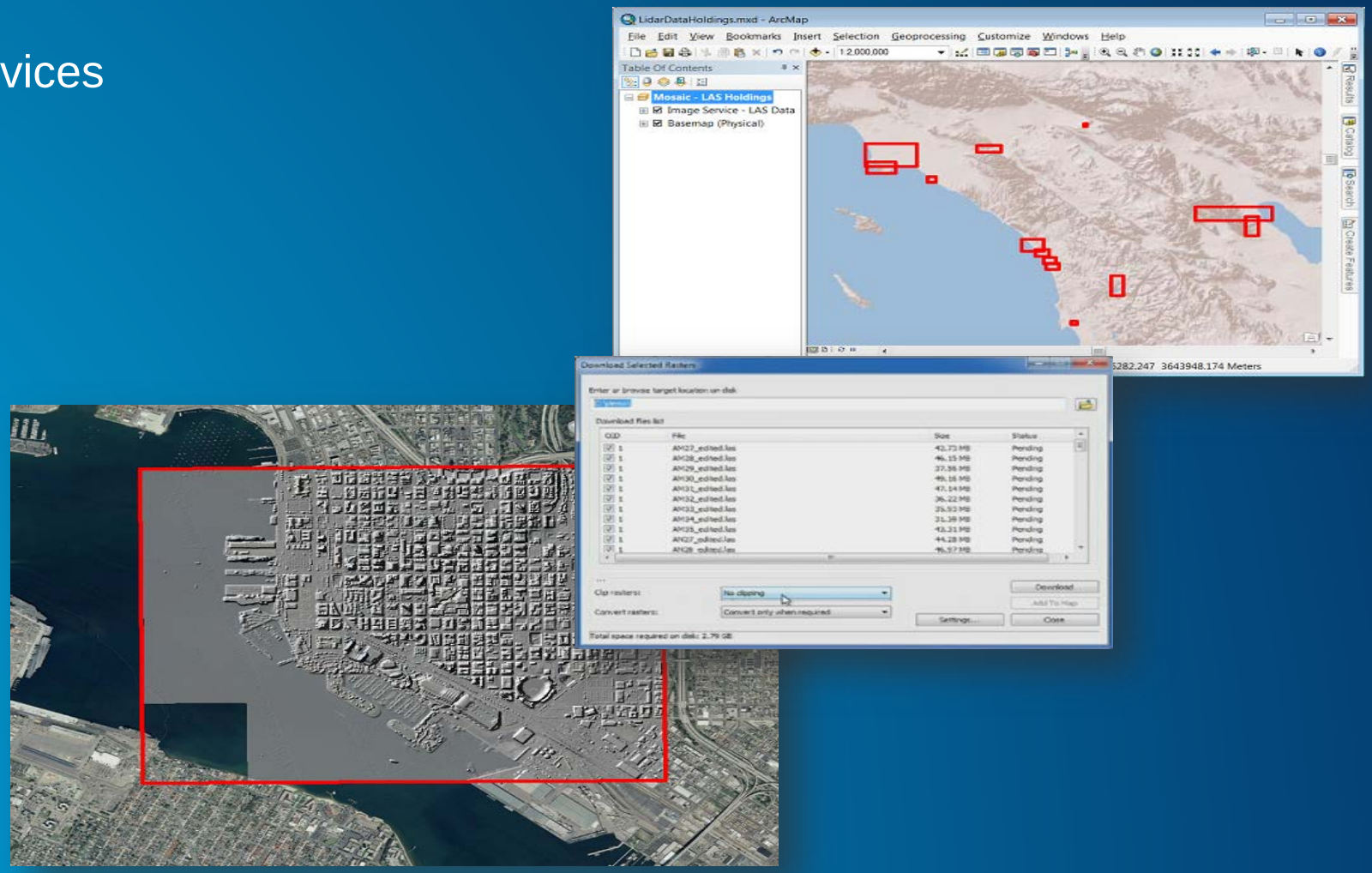


# LAS Type Properties

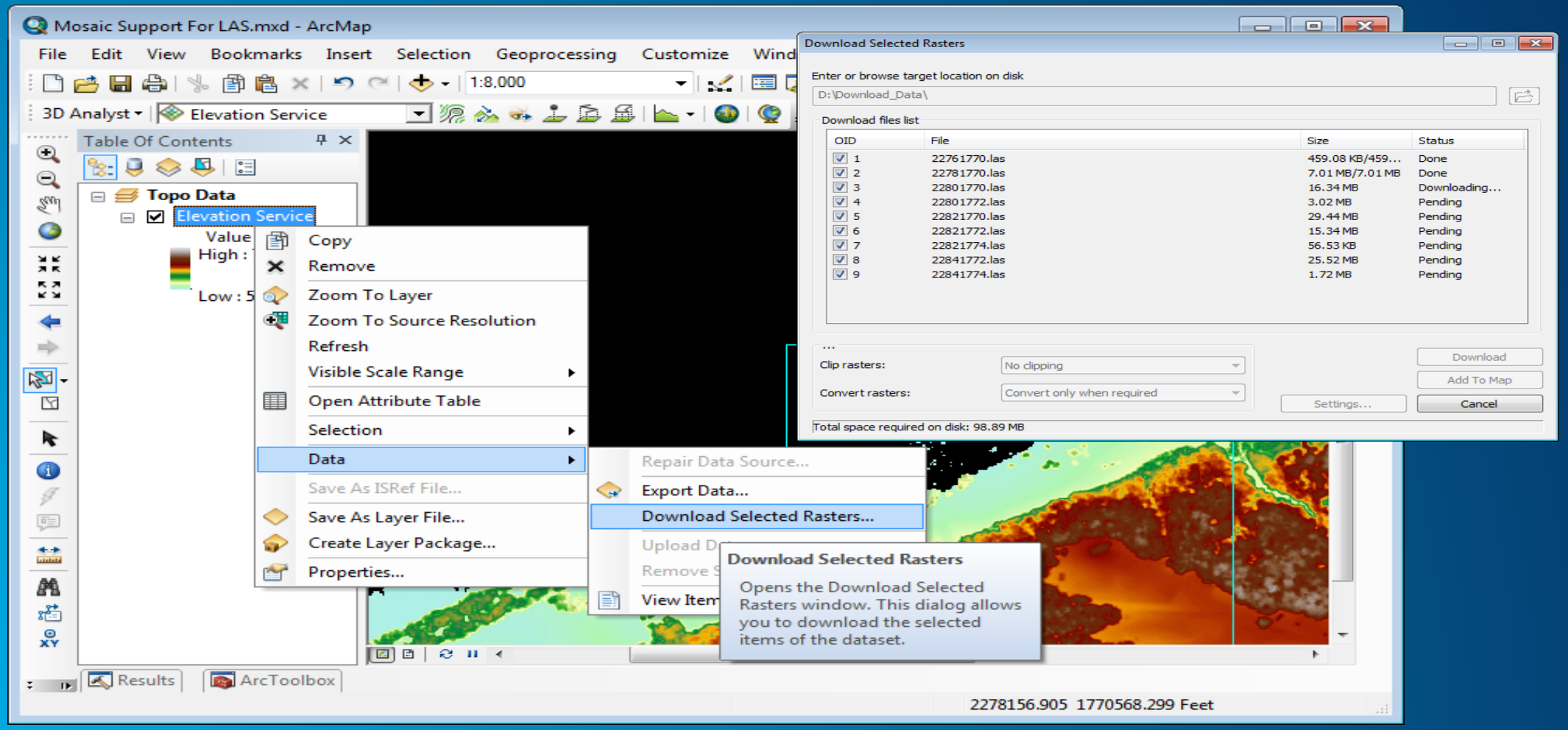


# Sharing Lidar Data

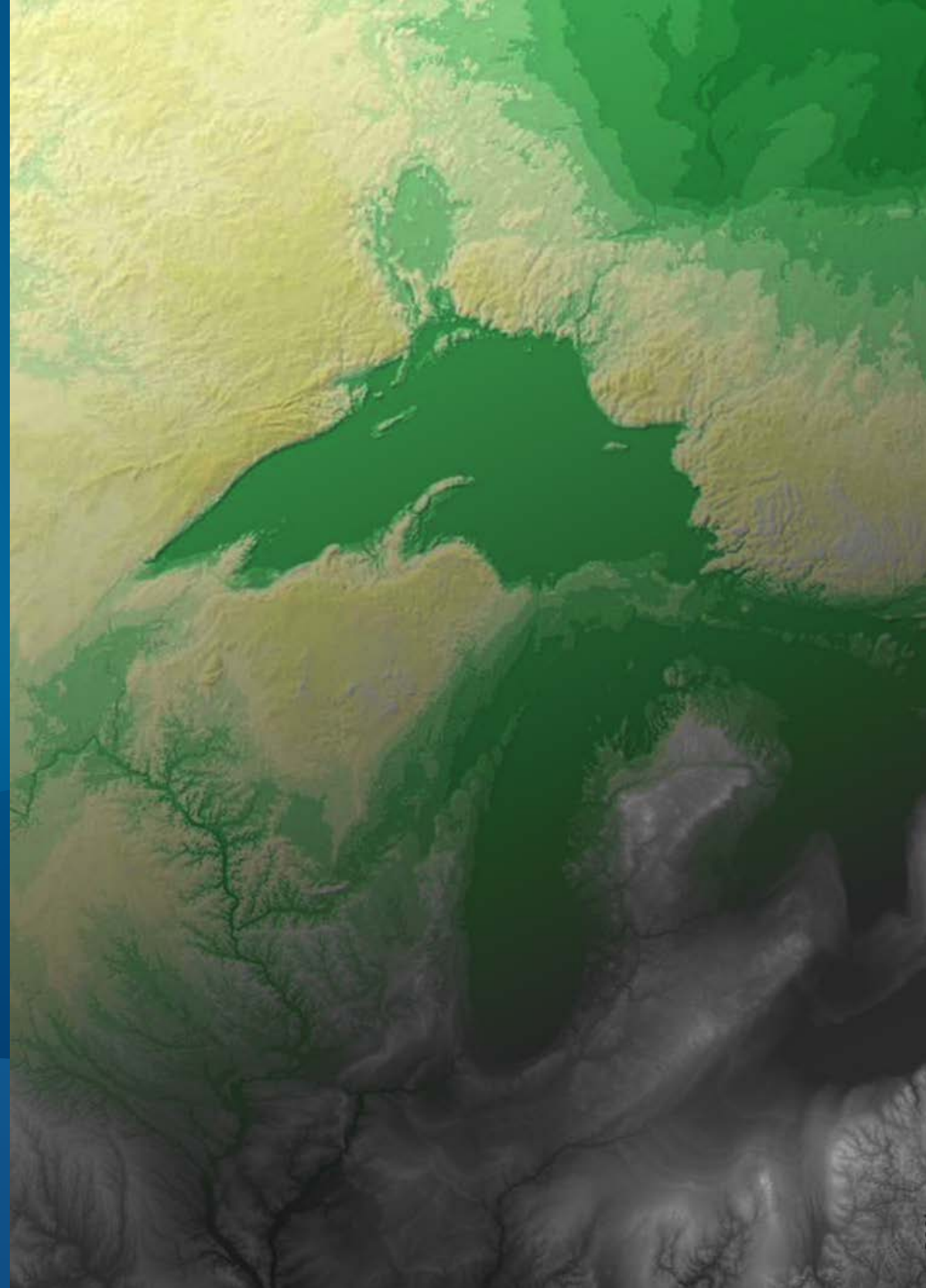
- Share as image services
- Easy to
  - Access
  - Discover
  - Download



# Elevation Service – Download



# Demo: Mosaic Datasets



esri
Understanding our world.