

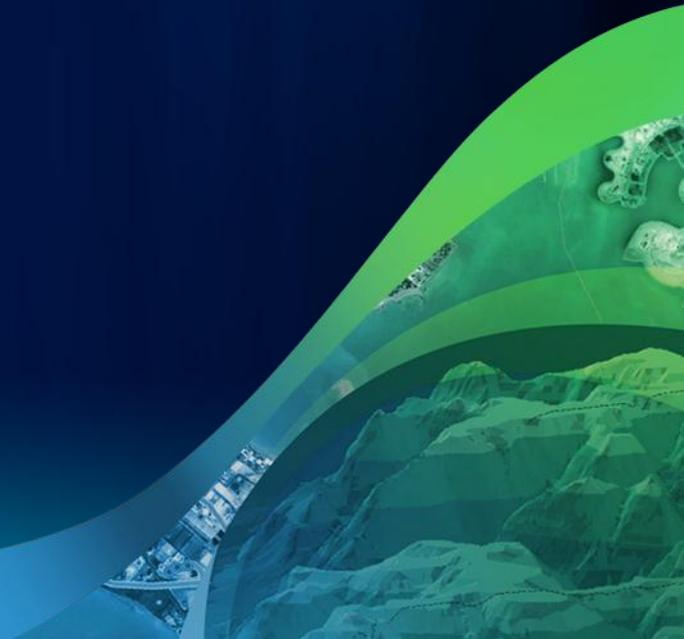


ArcGIS 10.1 Lidar Workshop

Introduction to Lidar

Gregory Brunner

Esri Professional Services



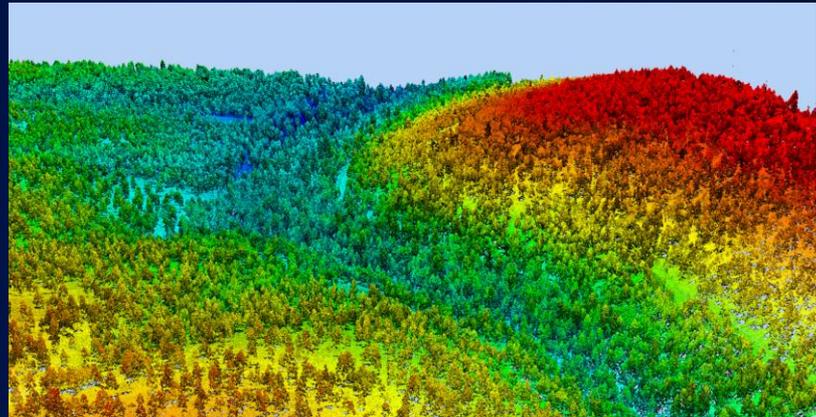
Workshop Agenda

Afternoon

- 1:00pm Introductions
- 1:15pm Introduction to Lidar
- 1:45pm LAS datasets
- 2:00pm Exercise 1
- 2:45pm – 3:00pm **Break**
- 3:00pm Mosaic Datasets
- 3:15pm Exercise 2 (Exercise #3 in the manual)
- 4:15pm Lidar and cloud publishing/serving
- 4:30pm Exercise 3 - Accessing Lidar data with web services
- 5:00pm Wrap up and questions

Introduction to Lidar and ArcGIS

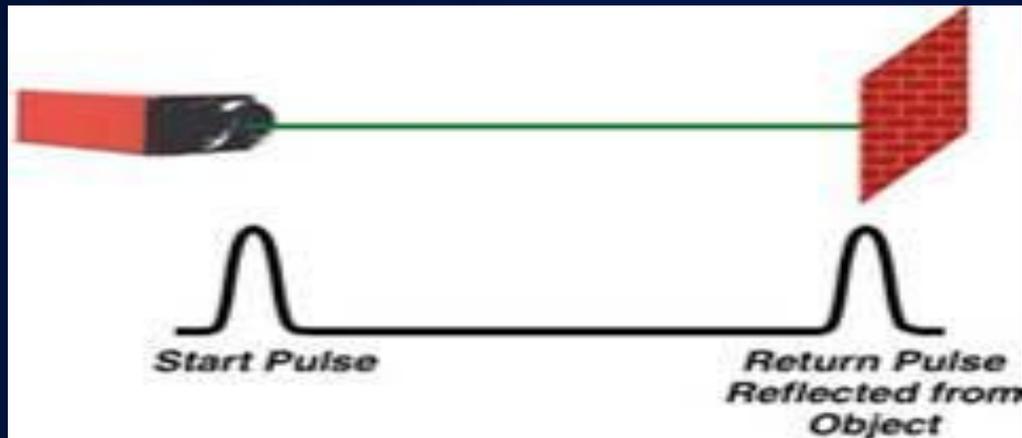
- Fundamentals of Lidar
- Challenges and user expectations
- Review existing lidar support
- ArcGIS 10.1 lidar solutions
- GIS Lidar applications
- Future possibilities
- Q&A



Lidar – Light Detection And Ranging

- Optical remote sensing technology that can measure the distance to, or other properties of a target by illuminating the target with light
- LAS—Binary file format for Lidar storage developed by the ASPRS in conjunction with private and government stakeholders
- Lidar data (LAS) is increasingly available and affordable, and many users want to leverage this data in their GIS

LiDAR – Light Detection And Ranging

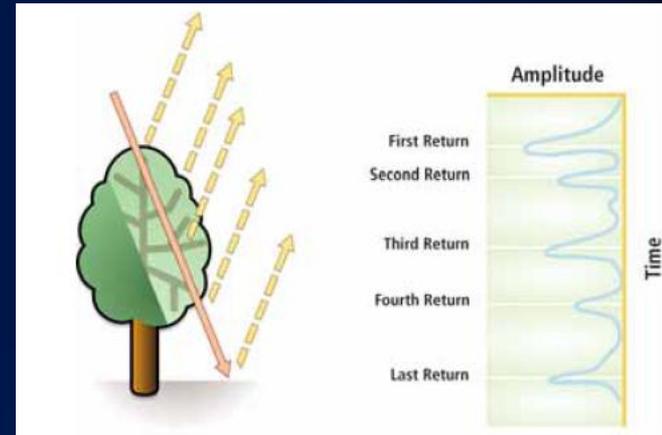


Optical remote sensing technology that measures the distance from the sensor to a target

LAS: Binary file format for LiDAR data storage developed by the ASPRS in conjunction with private and government stakeholders

LiDAR – Light Detection And Ranging

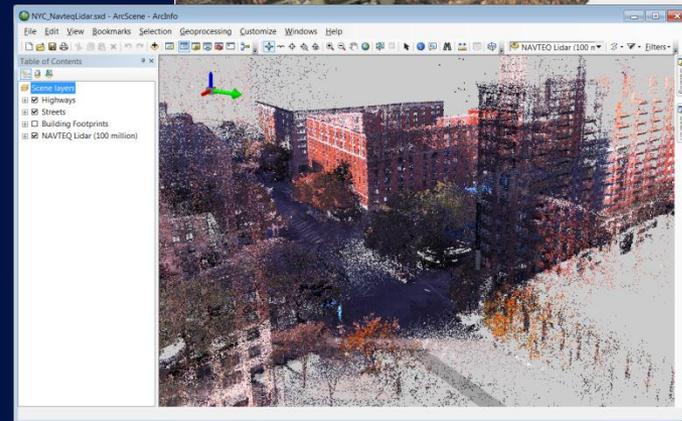
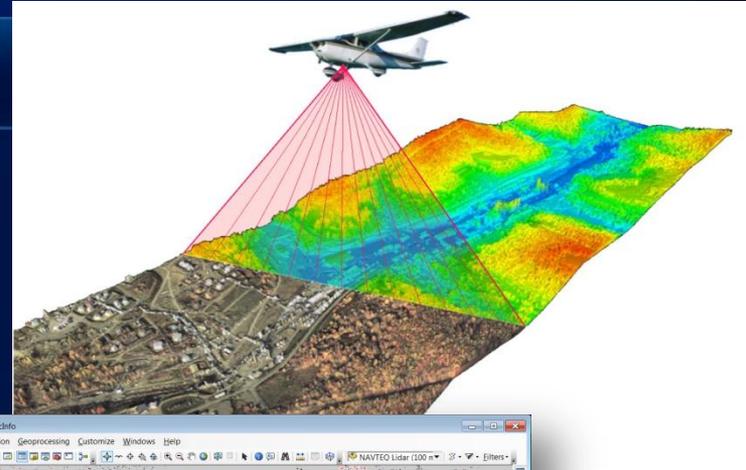
- Laser based
- High Density, High Accuracy
- Partially penetrates canopy
- Include classification



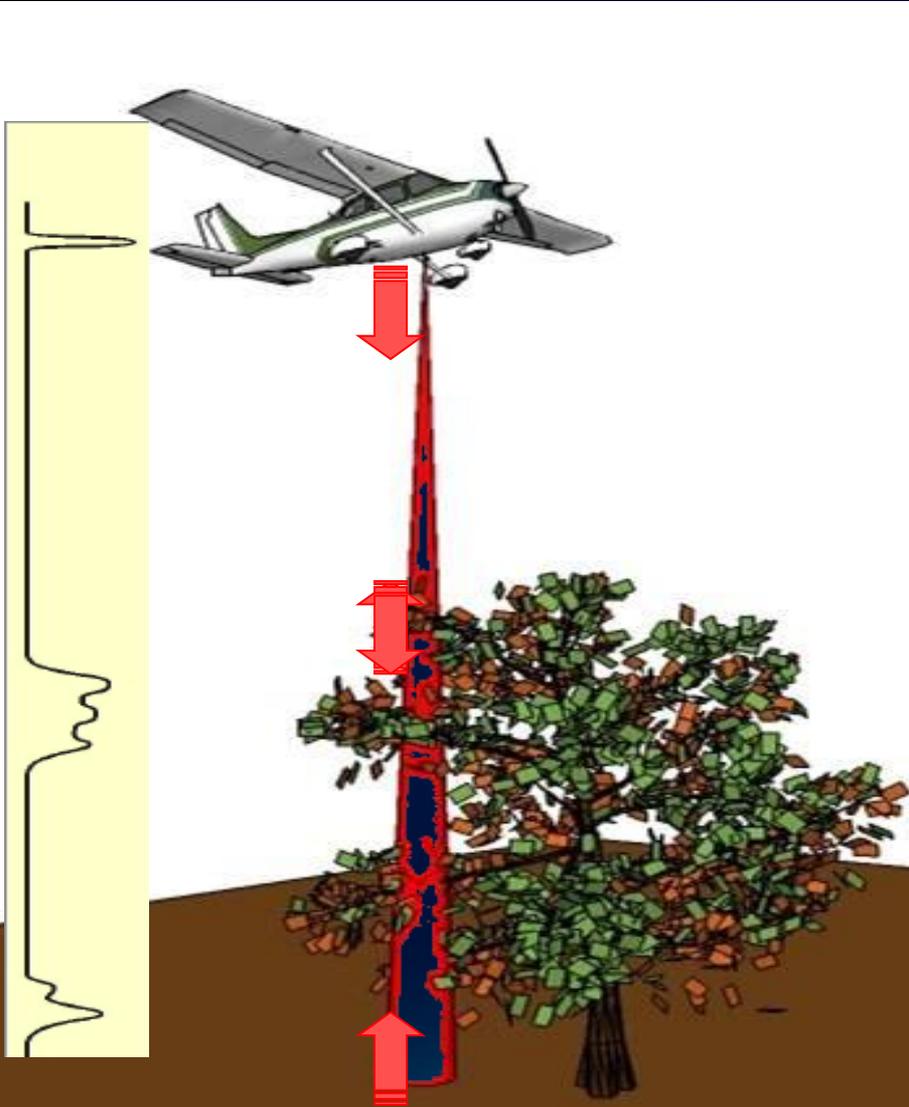
Classification Value	Meaning
0	Created, never classified
1	Unclassified1
2	Ground
3	Low Vegetation
4	Medium Vegetation
5	High Vegetation
6	Building
7	Low Point (noise)
8	Model Key-point (mass point)
9	Water

Types of LiDAR

- Airborne
 - Captured from aircraft
- Terrestrial and Mobile
 - Captured from the surface

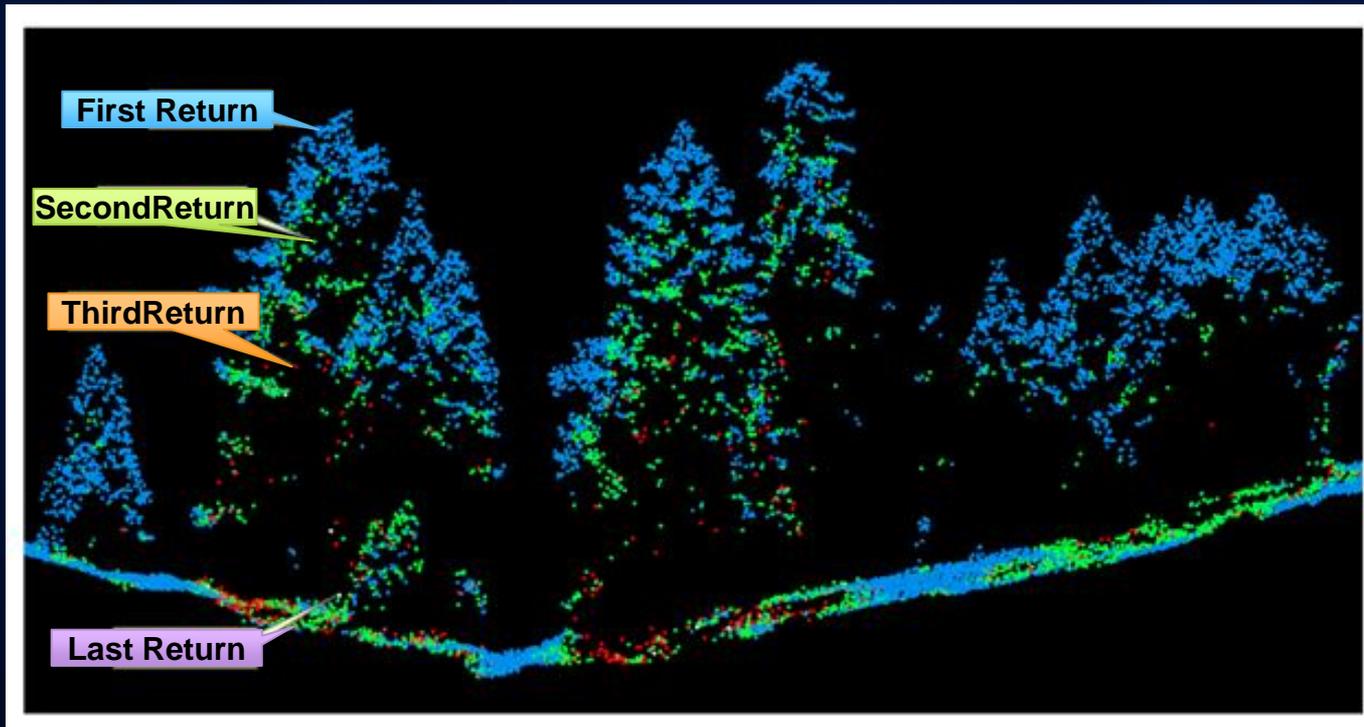


LiDAR Technology



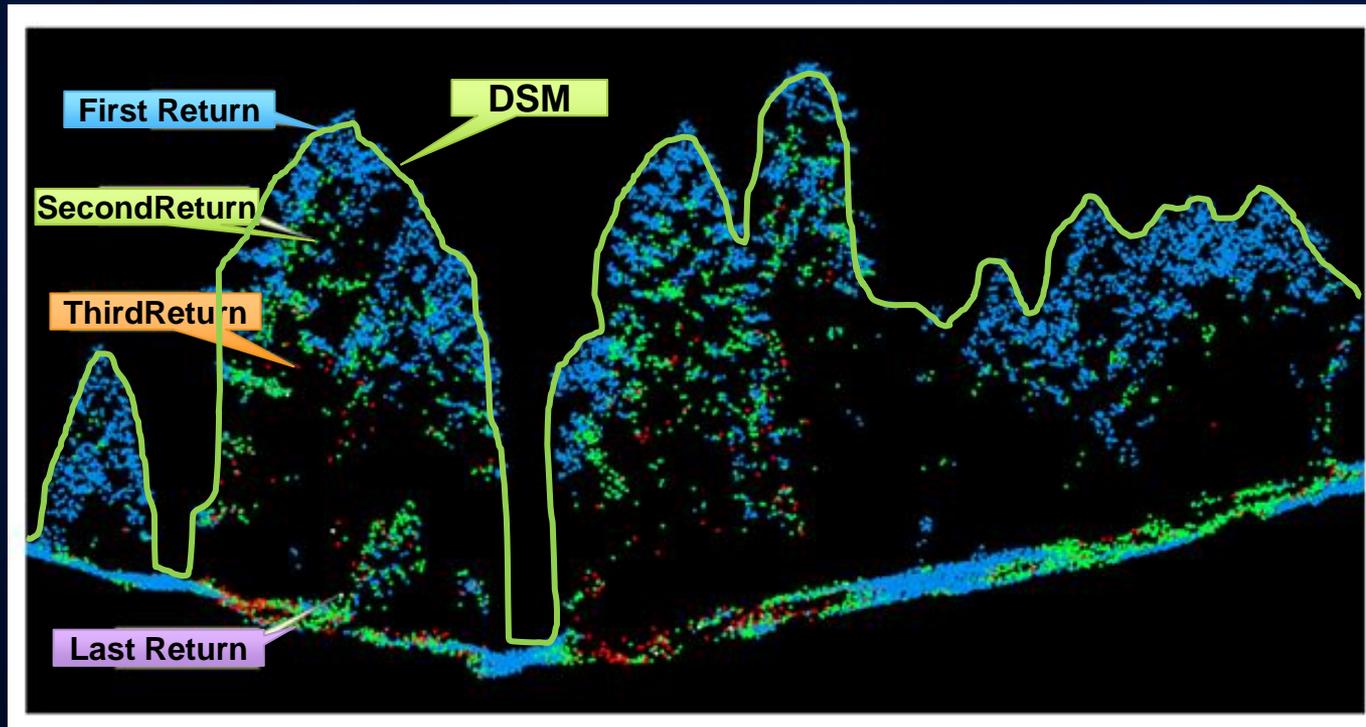
Lidar Data

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



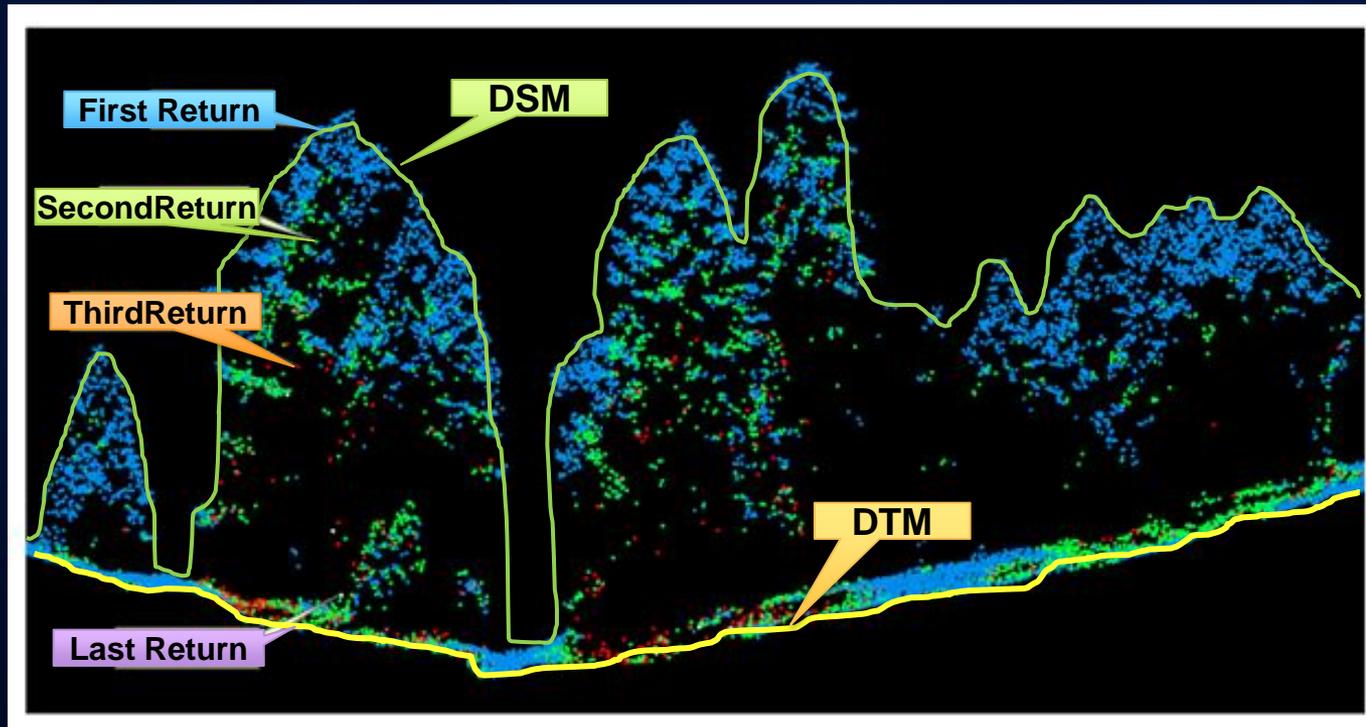
Lidar Data

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



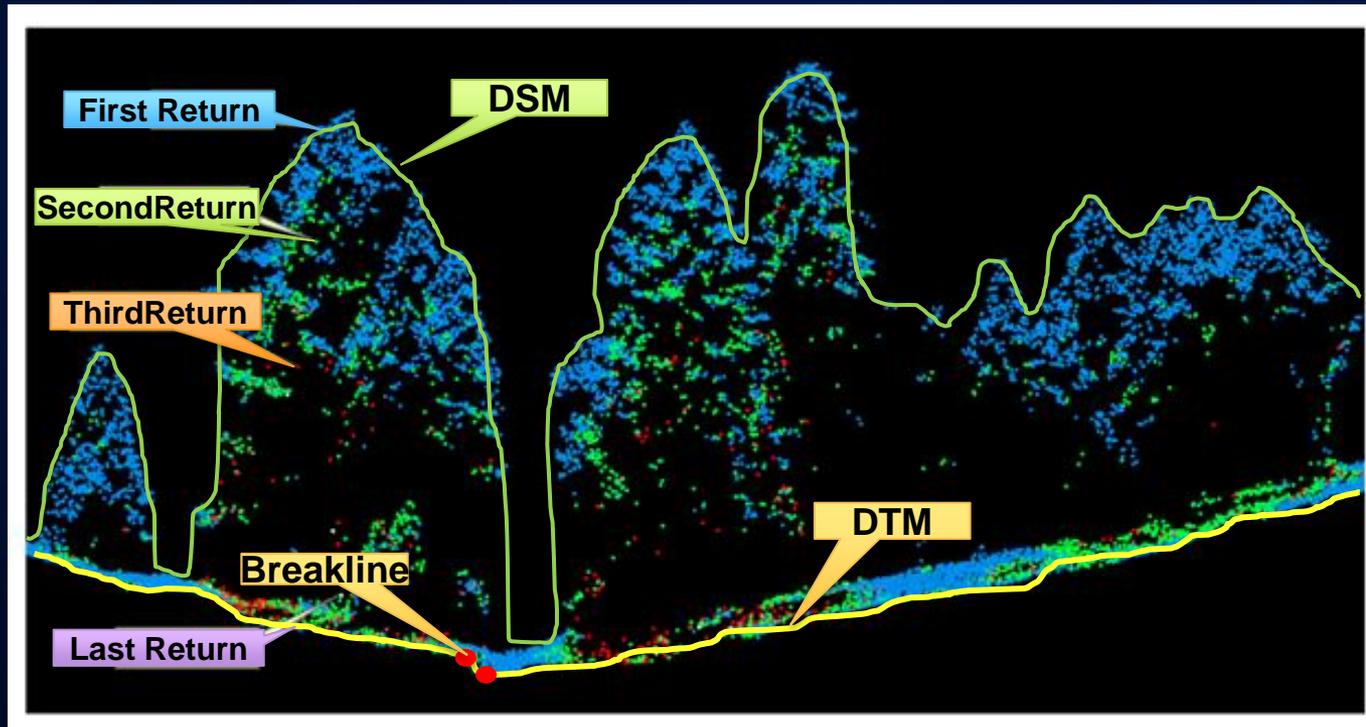
Lidar Data

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



Lidar Data

Very rich



Lidar Industry Usage

Defense and Intelligence

Utilities
Transportation

Mining
Environment
Forestry

Movie production
Hydrology

Emergency management

Gaming

Just to name a few

Lidar Users

- Users
 - States, counties, cities, government agencies
 - Military
 - Forestry, water resources, urban management
 - More...

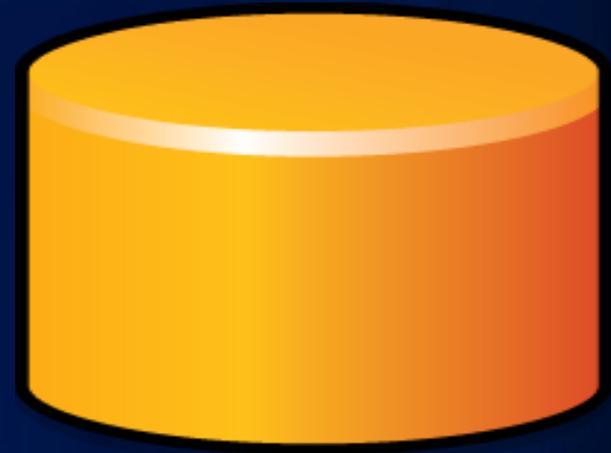
- User Roles
 - Data managers
 - Interested in managing large collections of LAS files
 - Data consumers
 - Interested in tools to analyze LAS

Key Lidar Functionality

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

Challenges of Working with Lidar Data

- Huge Volumes
 - Multiple Sources
 - Multiple Projections
 - Varying Accuracy
 - Multiple Representations
-
- How to manage?
 - How to analyze?
 - How to access?



Use of elevation data has been a challenge

Traditional Workflows

- Project based
 - Collection – Project based
 - Analysis – For specific project



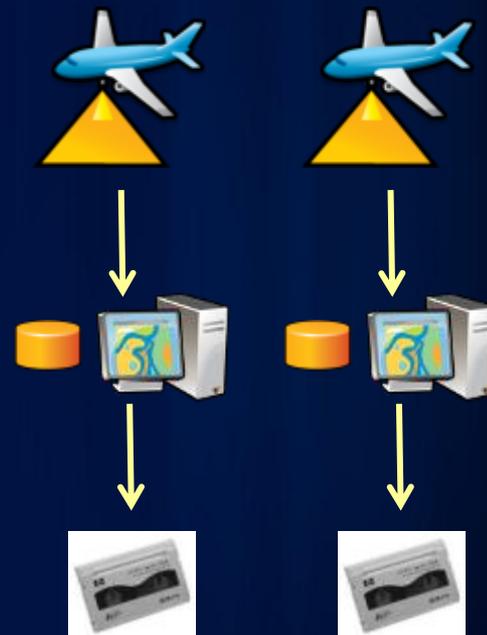
Traditional Workflows

- Project based
 - Collection – Project based
 - Analysis – For specific project
 - Archive data



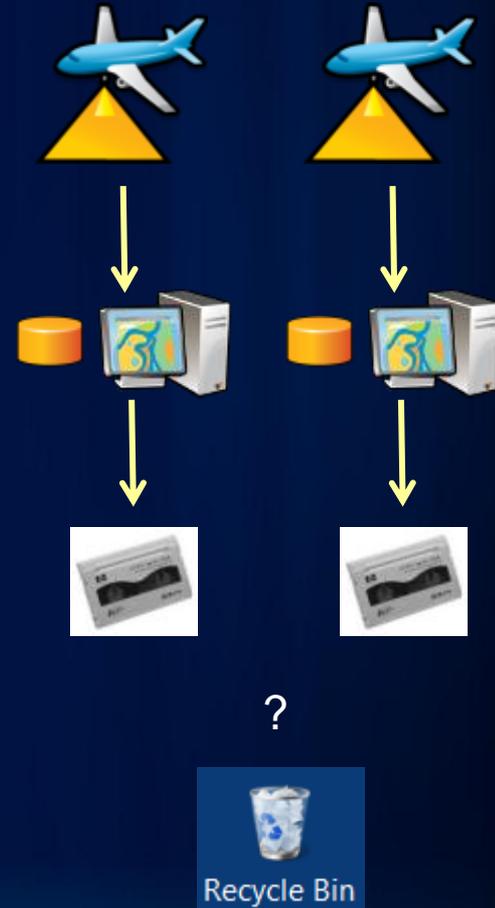
Traditional Workflows

- Project based
 - Collection – Project based
 - Analysis – For specific project
 - Archive data
 - Move on to next project



Traditional Workflows

- Project based
 - Collection – Project based
 - Analysis – For specific project
 - Archive data
 - Move on to next project
- Data not accessible to
 - Multiple applications
 - Multiple users
- Value is lost



User Expectations

End Users and Decision Makers

- Lidar lives beyond project
- Information has to be:
 - Simple
 - Accessible
 - Timely

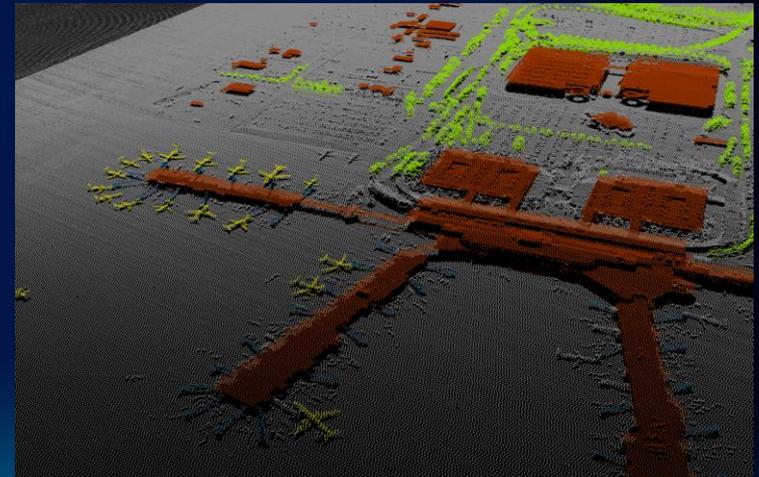
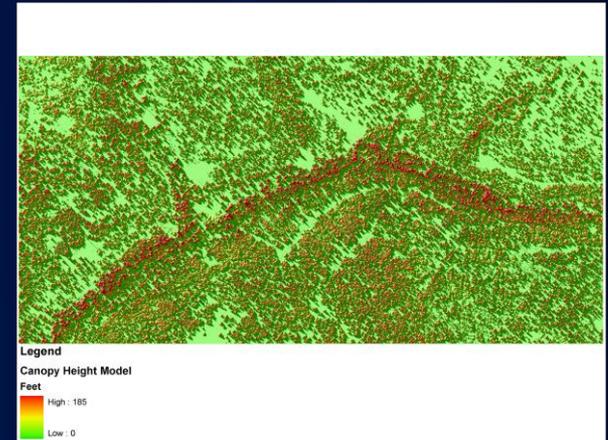


Application and data integration is critical

User Expectations: Simple

End Users and Decision Makers

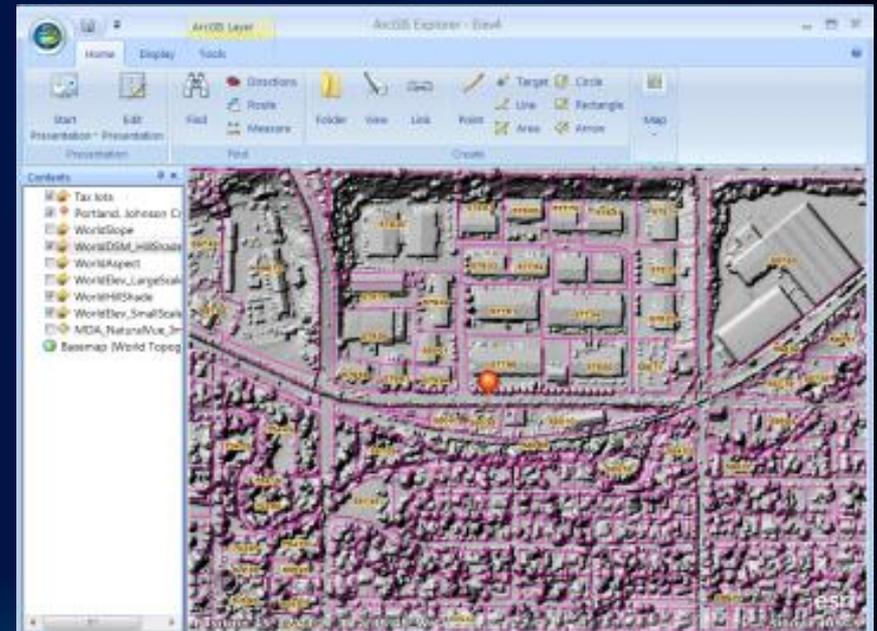
- Single interface
- Zoom/Roam/Search
- Visualize data
- Perform analysis
- Discover relevant information



User Expectations: Accessible

End Users and Decision Makers

- Accessible with other data
 - Imagery
 - Base Maps
 - Operational Layers
- Internally within your organizations and online

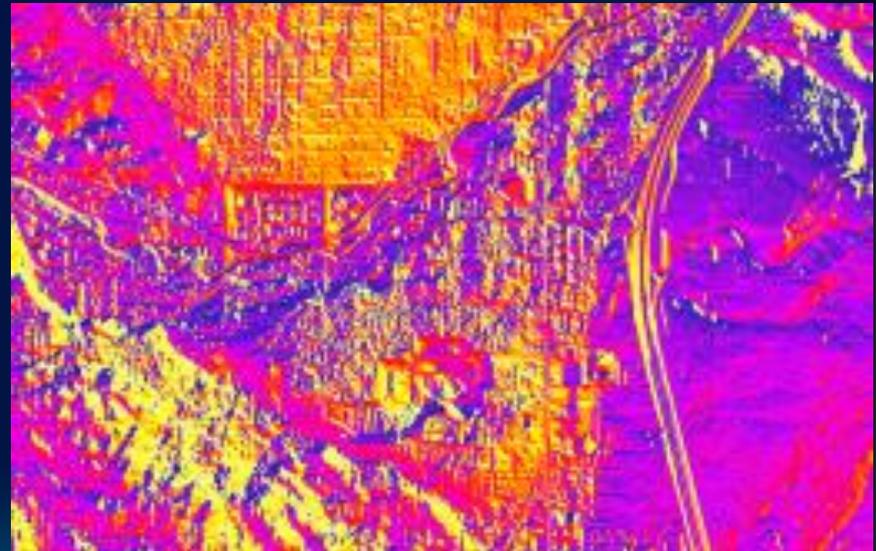


User Expectations: Timely

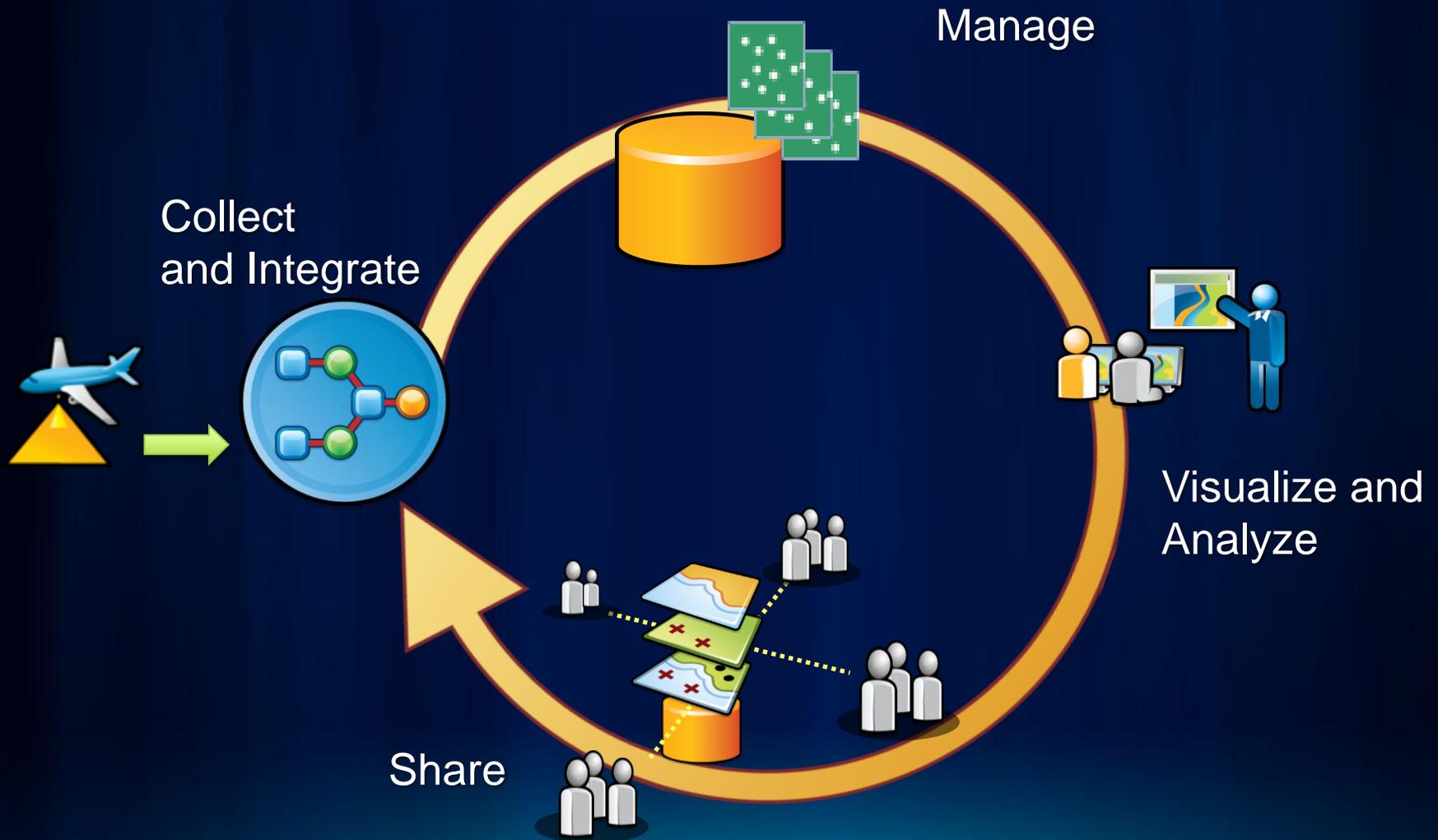
End Users and Decision Makers

ArcGIS enables timeliness by

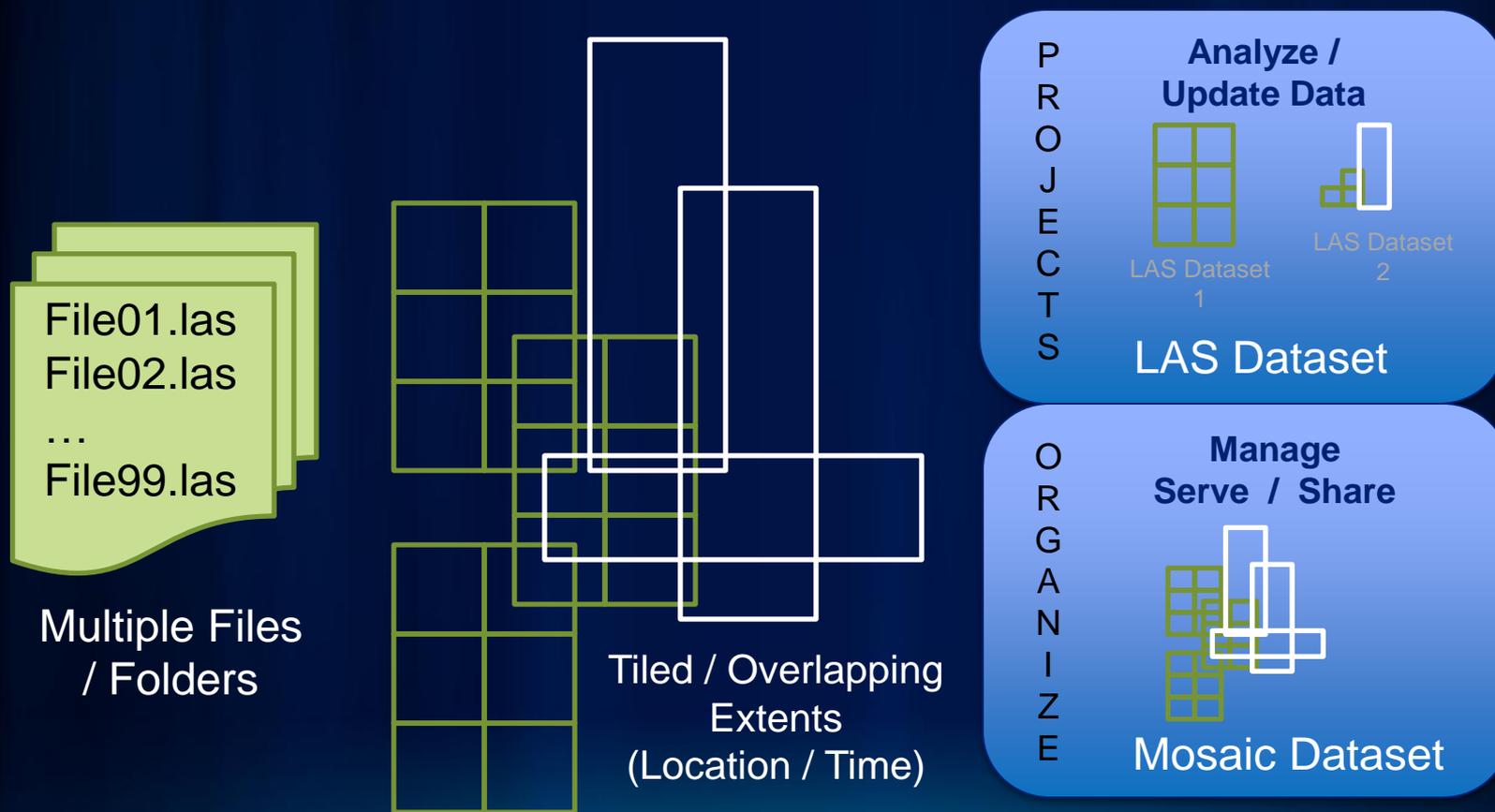
- Using server based on-the-fly processing
- Automated analysis and geoprocessing
- 2D and 3D visualization



The Lidar Workflow



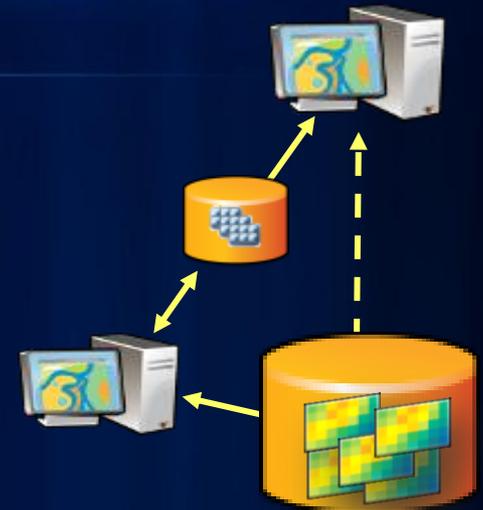
Overview of LAS Support in ArcGIS 10.1



Mosaic Dataset

Optimum Model for Image Data Management

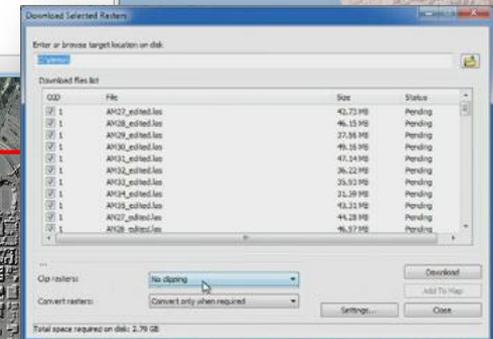
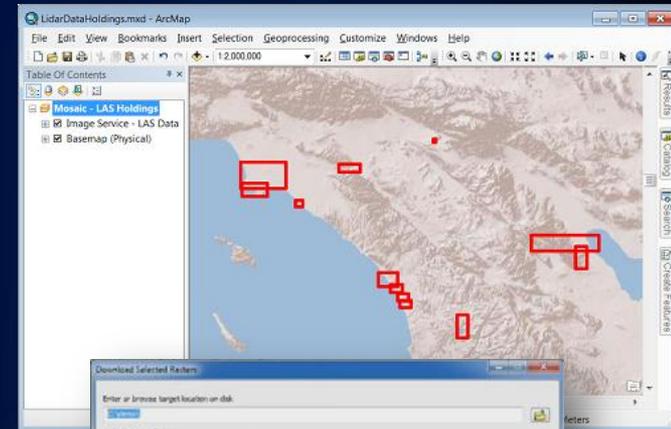
- Manage
 - Multiple projects as single dataset
 - Metadata
- Visualize
 - On the fly representation as surface or point cloud
 - View as 2D or 3D
- Share
 - As a single dataset
 - As Image Service
 - WMS/WCS



Sharing Lidar Data



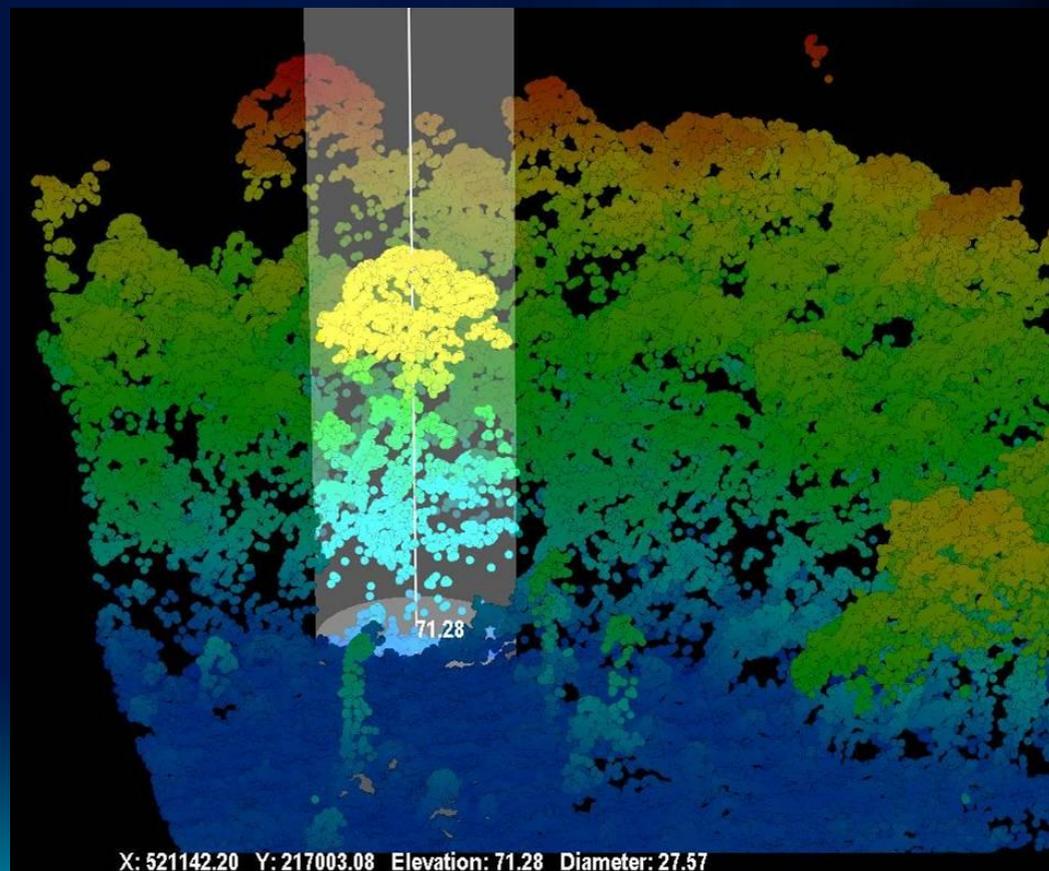
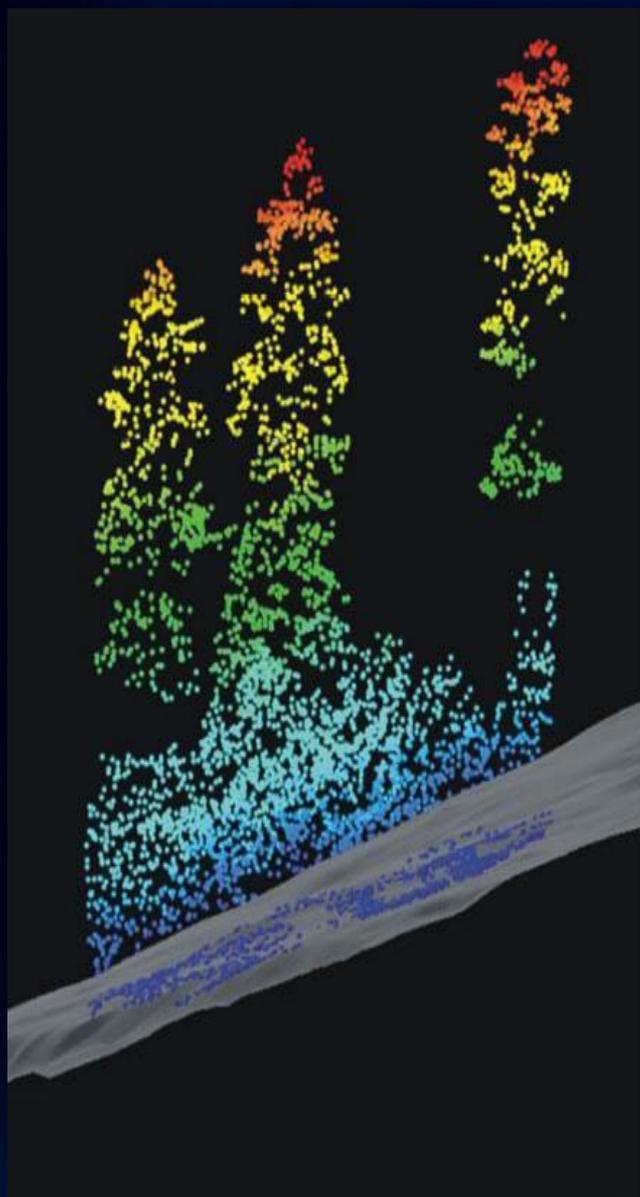
- Share via ArcGIS Server
 - An image service
 - Access
 - Discover
 - Download
 - A map service



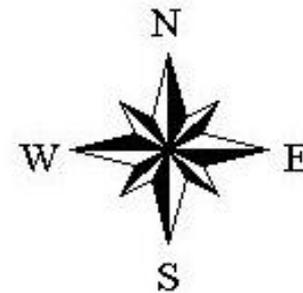
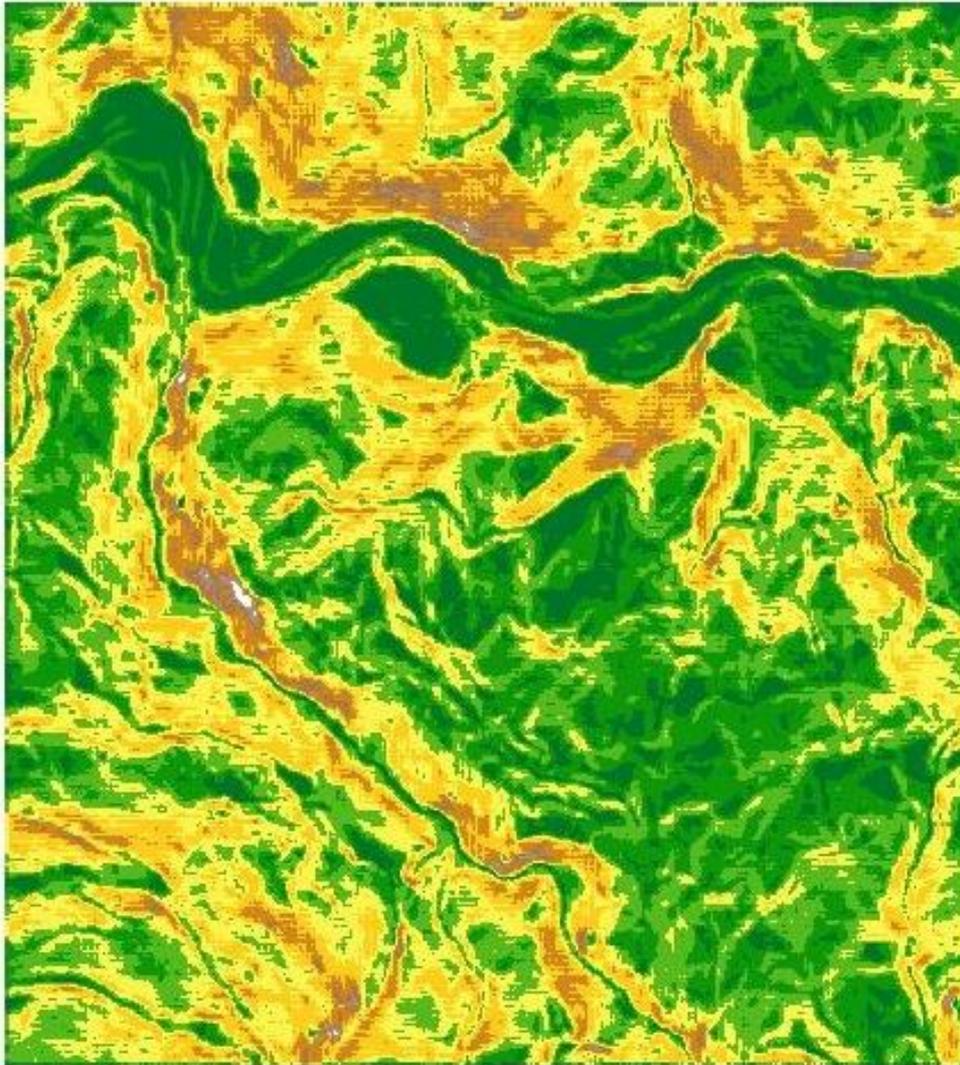
GIS LiDAR Data Applications

Natural Resource Management - Forestry

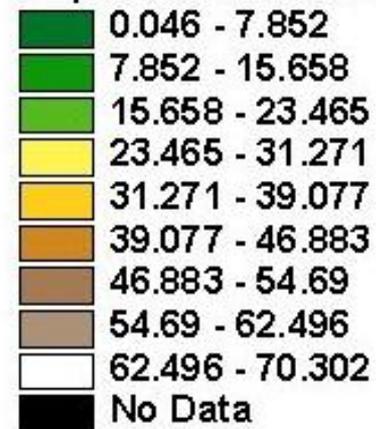
See the forest **AND** the trees



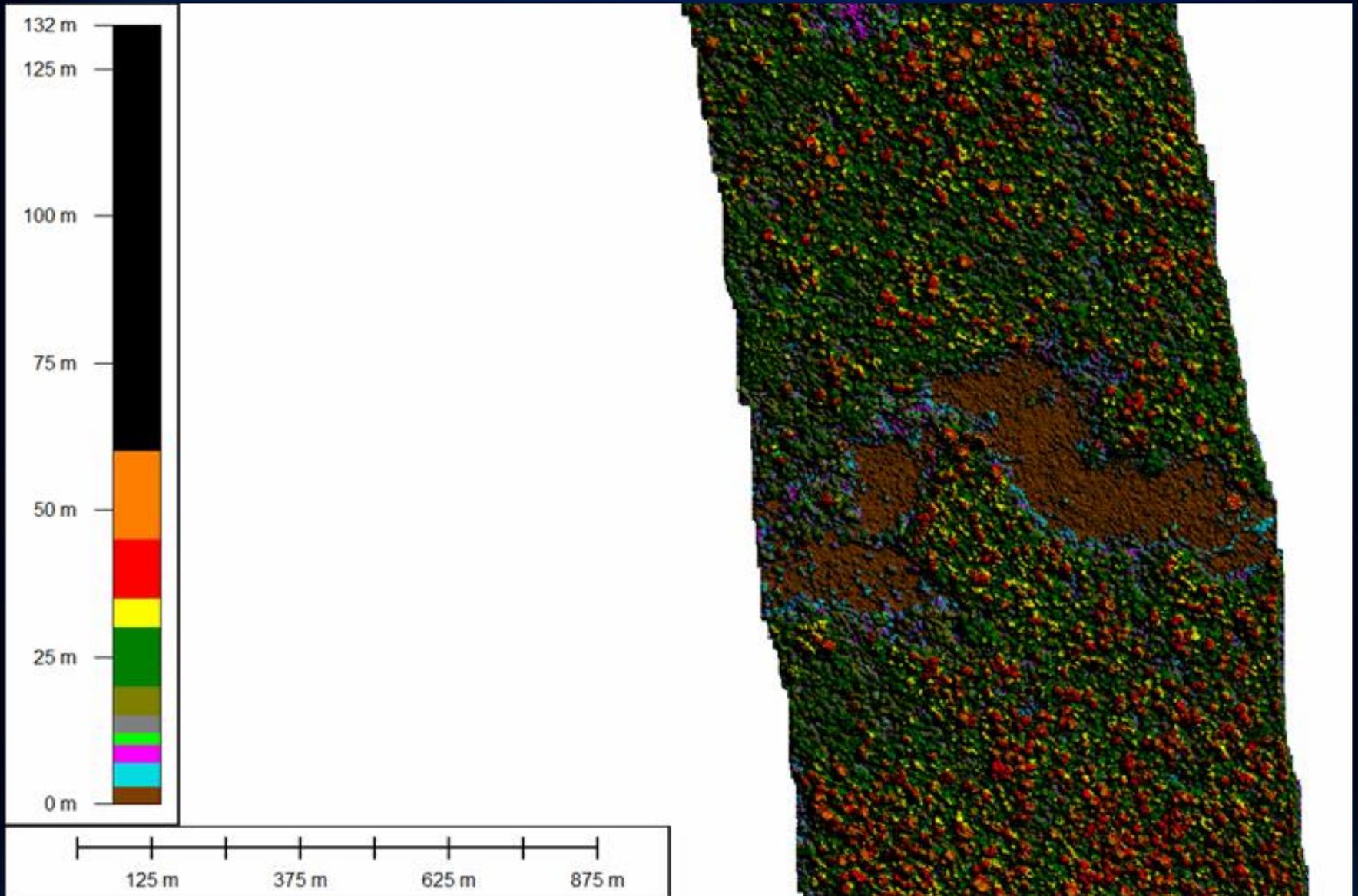
Slope Map



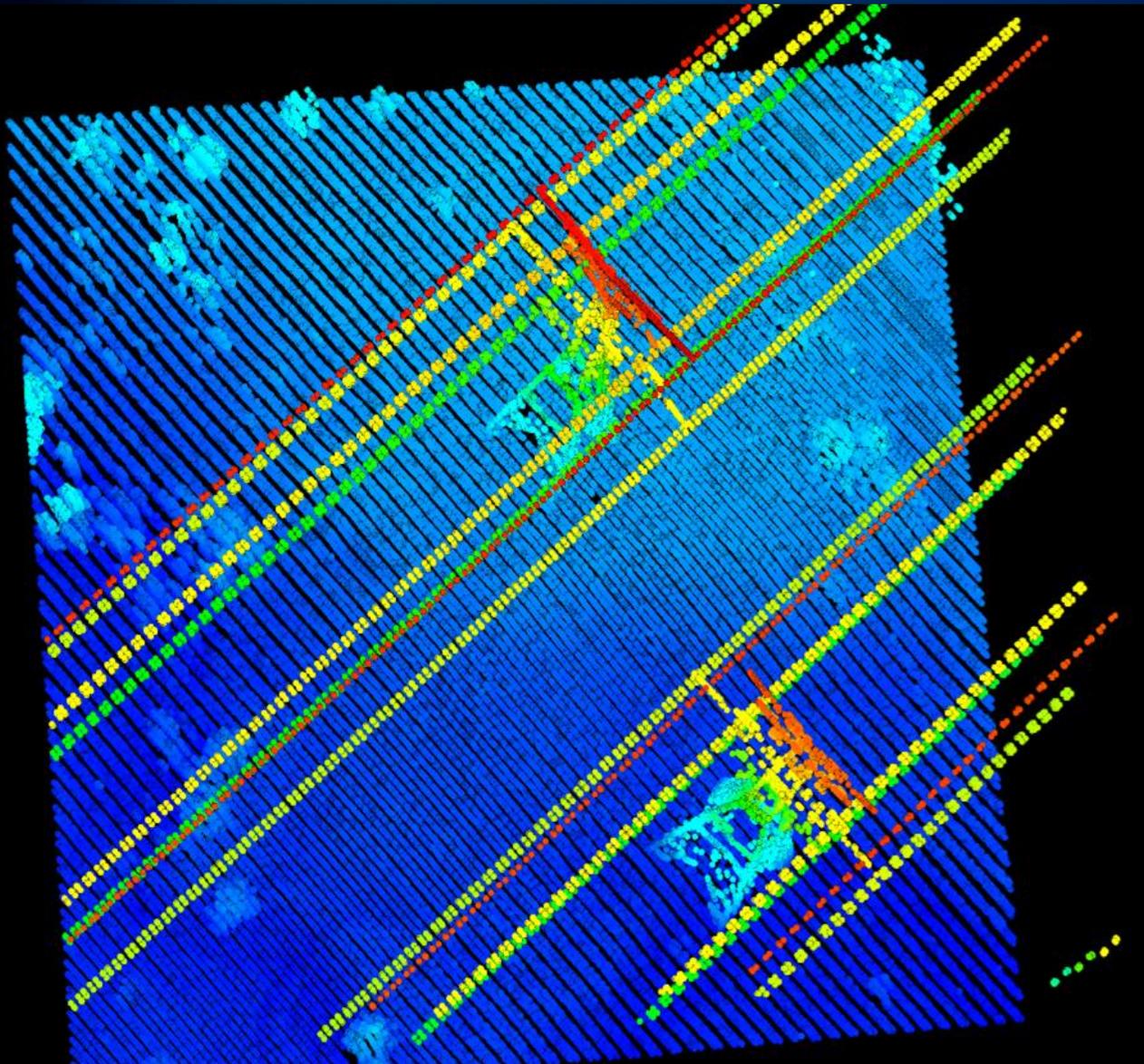
Slope of Surface from River1.shp



Canopy Height Map



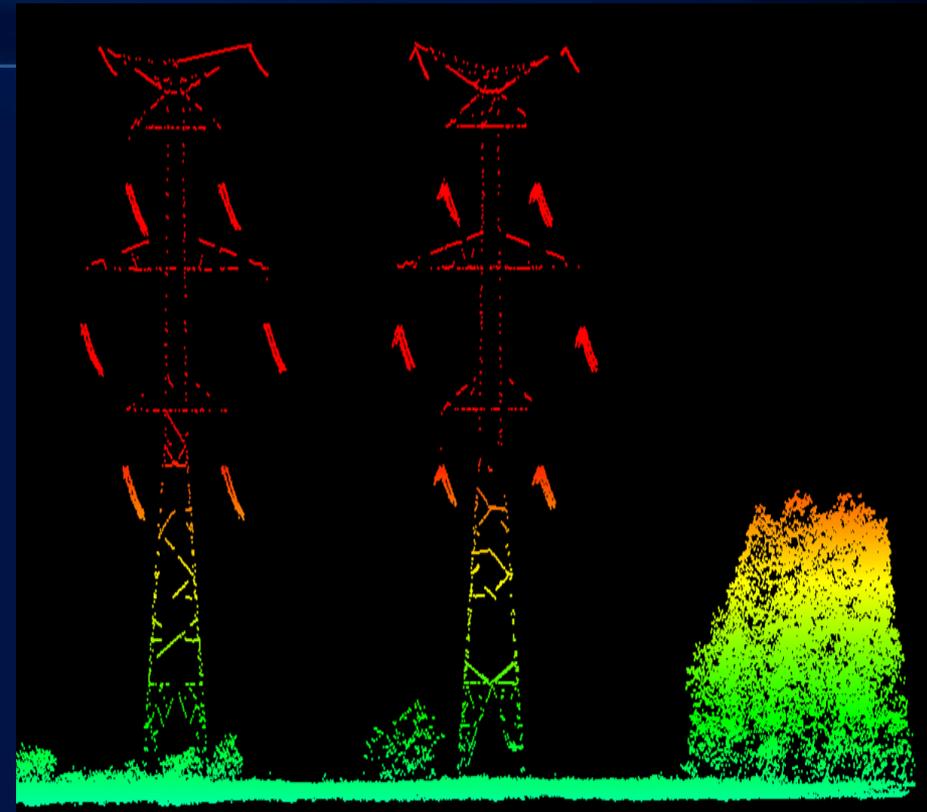
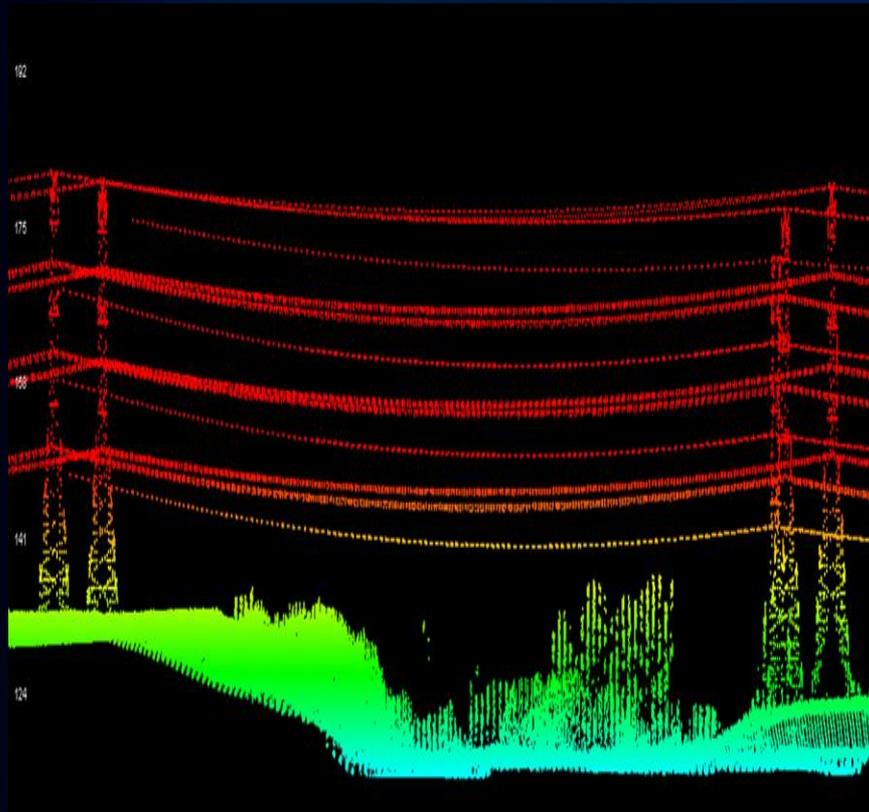
Energy – Transmission Lines



- True 3D Data

NADIR or Down Looking Perspective

Energy – Transmission Lines



Data courtesy of Optech, Inc.

- **Great detail**
- **Highly accurate**

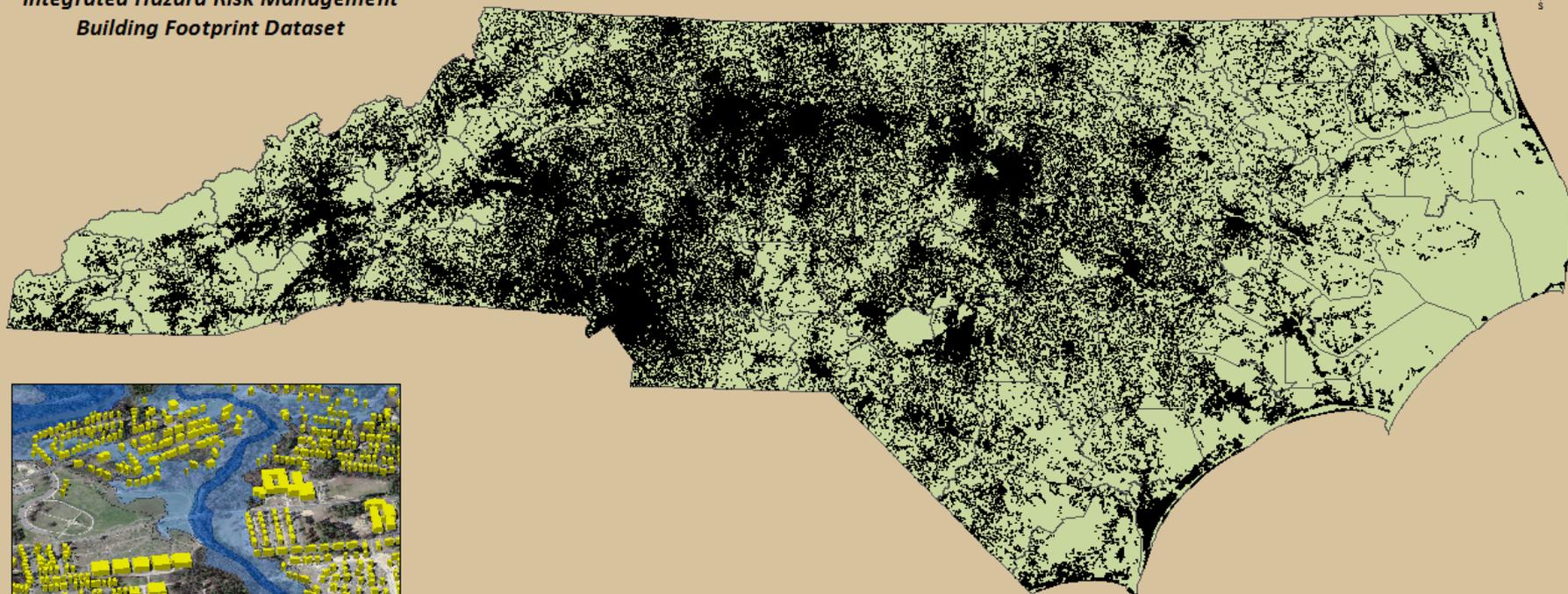
Emergency management

- **North Carolina Geospatial & Technology Information Management Office (GTM)**

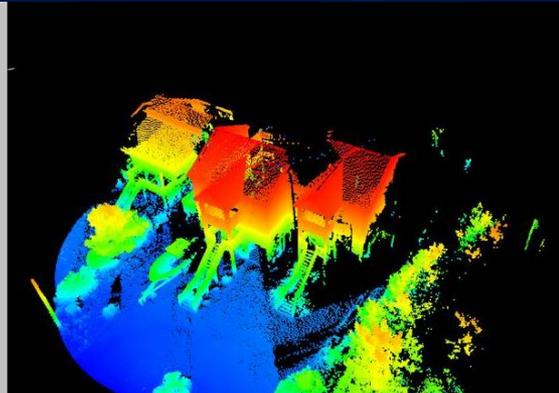
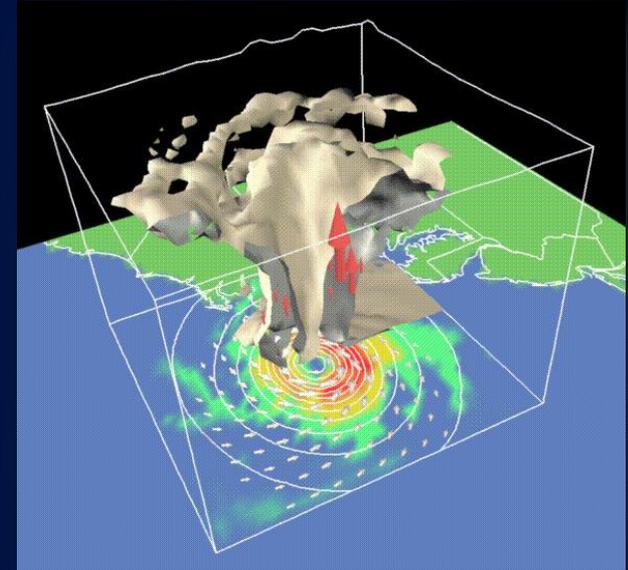
Statewide Building Footprints

- 100% Statewide Coverage
- 5.5 Million Building Footprints Collected and Quality Reviewed

*State of North Carolina
Integrated Hazard Risk Management
Building Footprint Dataset*

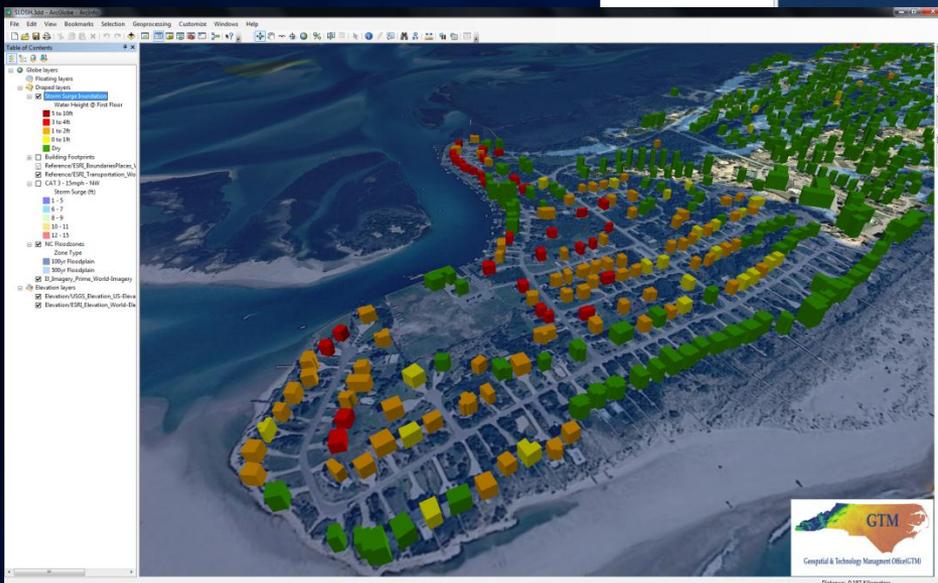
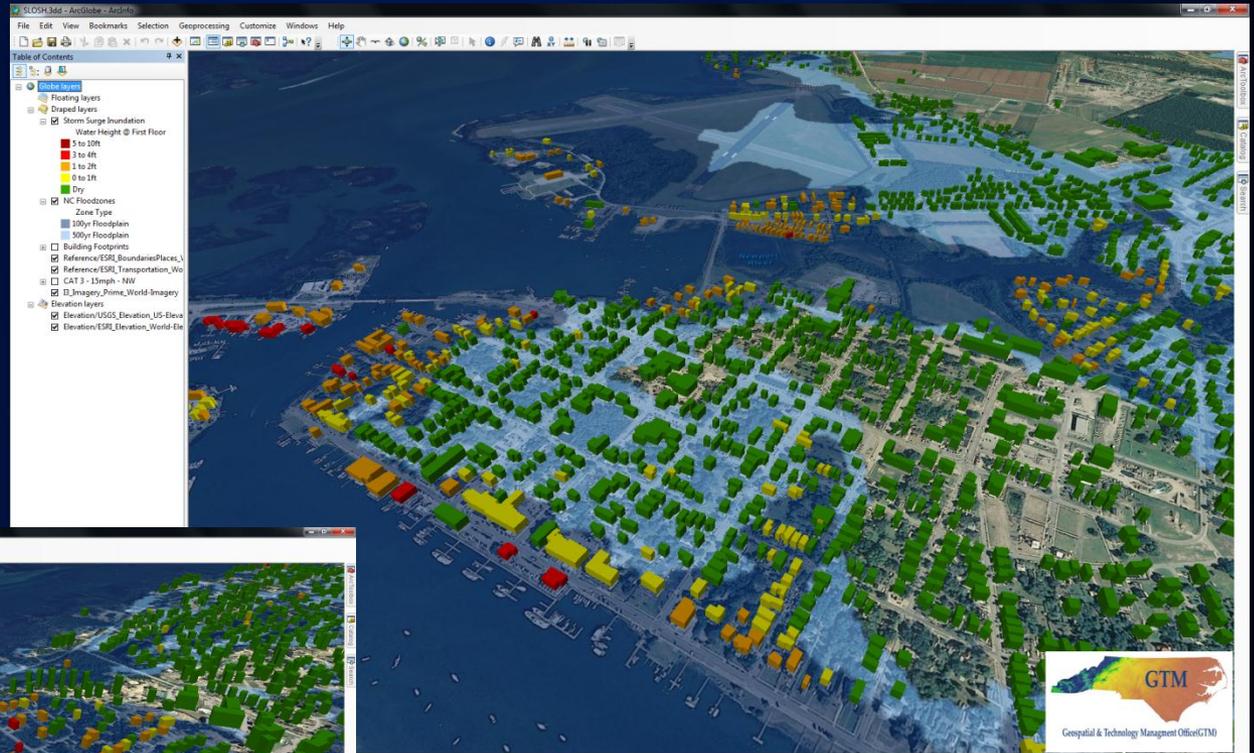


Building Footprints and Finished Floor Elevations



Geospatial & Technology Management Office(GTM)

Damage assessments



A New Vision Is Emerging for LiDAR/Imagery with GIS

Easier, Accessible and Collaborative

Enabled By

- Cloud Architecture
- Web Services
- Information Integration
- Crowd Sourcing
- Open Data Sharing
- On the fly processing
- One environment
- 2D/3D visualization
- Spatial Data Infrastructure

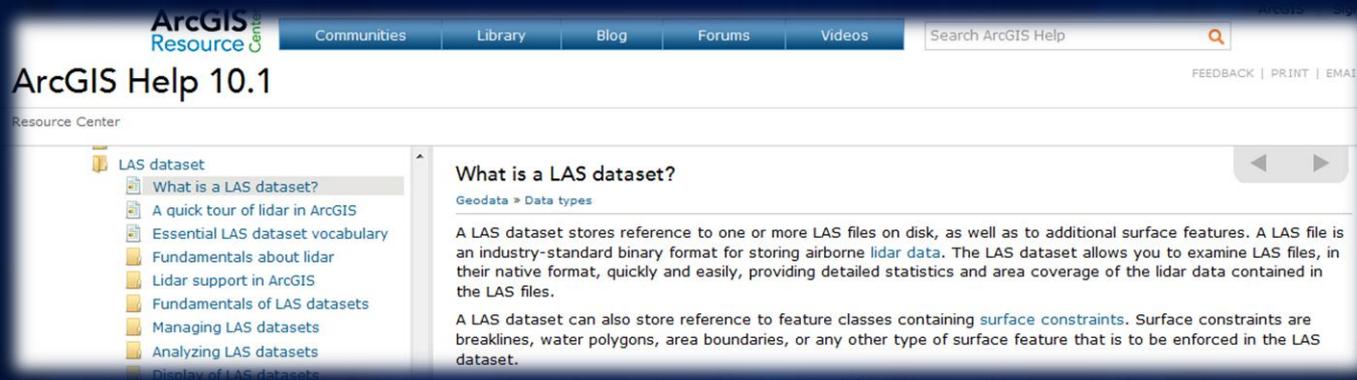


*Empowering the GIS Professional . . .
. . . And the Broader Community*

. . . . And Software

Documentation

- New LAS dataset book in the Help



- Available on the 3D ArcGIS resource center
 - <http://resourcesbeta.arcgis.com/en/communities/3d>

ArcGIS Online community

The screenshot shows the ArcGIS Online interface for a group named 'Lidar'. At the top, there is a navigation bar with 'ArcGIS', 'GALLERY', 'MAP', 'GROUPS', and 'MY CONTENT'. A search bar is present with the text 'Search this group...'. Below the navigation bar are buttons for 'Edit', 'Invite Users', 'Membership Requests', 'Delete Group', and 'Share'. The group name 'Lidar' is displayed with a small map icon. To the right, there are social media links for Facebook and Twitter. A description below the group name reads: 'Great place to find Lidar data, products, and maps for your organizations use.' The main content area is divided into 'Group Content' and 'Group Details'. The 'Group Content' section has a table with columns for 'Title', 'Owner', 'Rating', 'Views', and 'Date'. It lists several items: 'Christchurch LIDAR tiles 2003 07 06', 'DOGAMI Lidar Viewer', 'Coos County Flood and Natural Hazards Web Tool', 'Statewide Landslide Information Layer for Oregon', and 'Hazards and Assets Viewer for Mount Hood'. The 'Group Details' section shows the group owner 'stev5044', status 'public', and a list of 29 members including 'awoods', 'azuike', 'benkelman', 'brian.parsons', 'Clayton62', 'CodyBenkelman', and 'rst4667'. The Windows taskbar at the bottom shows the Start button, several application icons, and the system tray with the time '12:51 PM' and date 'Monday 6/11/2012'.

Resource Center Show: All Content▼ steve snow Notifications Help▼ Sign Out

ArcGIS GALLERY MAP GROUPS MY CONTENT Search this group...

Edit Invite Users Membership Requests Delete Group Share

Lidar

Facebook Twitter

Great place to find Lidar data, products, and maps for your organizations use. ▼

Group Content

All Results Title Owner Rating Views Date ▲

Maps Applications Tools

Christchurch LIDAR tiles 2003 07 06
LIDAR tile layout for Christchurch, 06 July 2003.
Web Map by stev5044
Last Modified: June 6, 2012
☆☆☆☆☆ (0 ratings, 0 comments, 1 view)

DOGAMI Lidar Viewer
This interactive map allows you to view 9 ft resolution lidar data for portions of the state of Oregon. Lidar (light detection and ranging) is a tool that provides very precise, ac ...
Web Mapping Application by dogami_oregon
Last Modified: May 16, 2012
☆☆☆☆☆ (2 ratings, 0 comments, 131 views)

Coos County Flood and Natural Hazards Web Tool
This web tool is part of a project to update flood hazard layers for Coos County and place them in context within a larger framework of natural hazards.
Web Mapping Application by dogami_oregon
Last Modified: May 16, 2012
☆☆☆☆☆ (0 ratings, 0 comments, 13 views)

Statewide Landslide Information Layer for Oregon
Version 2 of DOGAMI's Statewide Landslide Information Layer for Oregon
Web Mapping Application by dogami_oregon
Last Modified: May 16, 2012
☆☆☆☆☆ (1 rating, 0 comments, 28 views)

Hazards and Assets Viewer for Mount Hood
To help communities on or near Mount Hood become more resilient to geologic hazards
Web Mapping Application by dogami_oregon
Last Modified: May 16, 2012

Group Details

stev5044
Status: public
Tags:
Remote Sensing, Lidar, Bathymetry, Topo, SDI, eTOD, ICAO, Hydro, Climate, environment, survey, defense, modeling, terrain, elevation, point cloud

29 Members

stev5044
awoods
azuike
benkelman
brian.parsons
Clayton62
CodyBenkelman
rst4667

Start [Taskbar icons] 12:51 PM Monday 6/11/2012