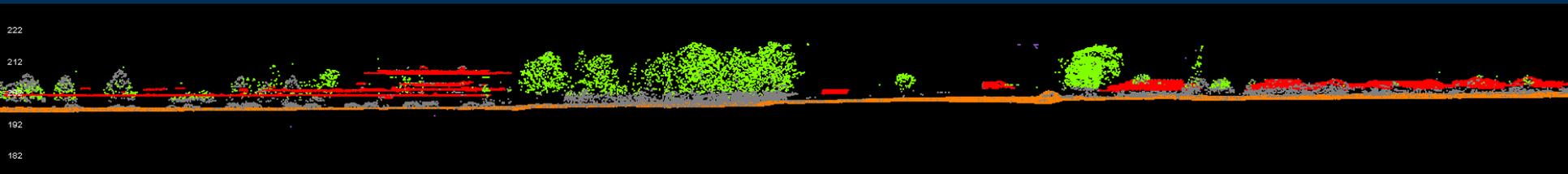




# Lidar Quality Assurance in the National Geospatial Technical Operations Center Elevation Unit

Amanda Lowe

Presented by Lori Phillips



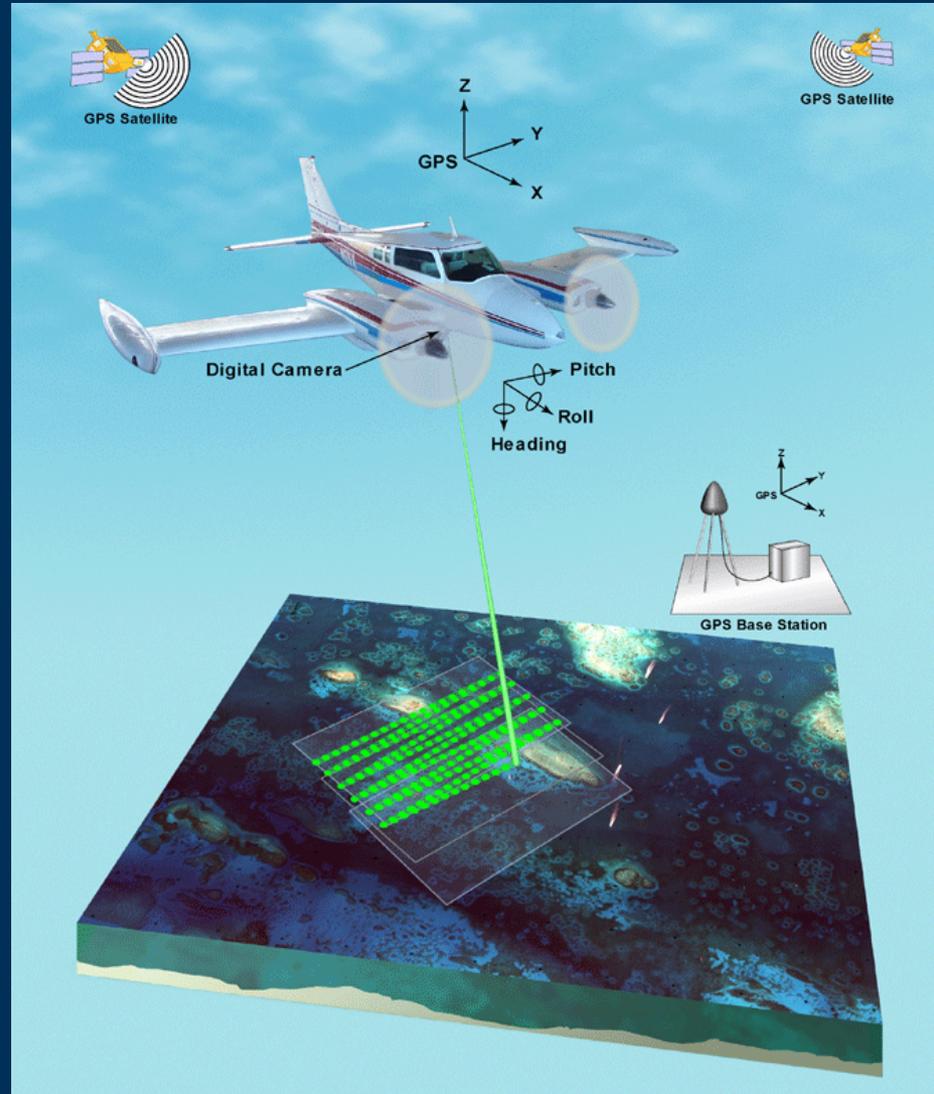
# Outline

- I. What is lidar?**
- II. Where do we receive lidar data from?**
- III. What do we do with it?**
- IV. What happens to it after we review it?**
- V. Common errors**

# What is Lidar?

- Lidar = Light Detection And Ranging
- Active system (as compared to passive)
- Either terrestrial or airborne platform
- Can be used any time of day or night
- Not an “all weather” system
- Quick, accurate collection
- Can provide data in areas not accessible

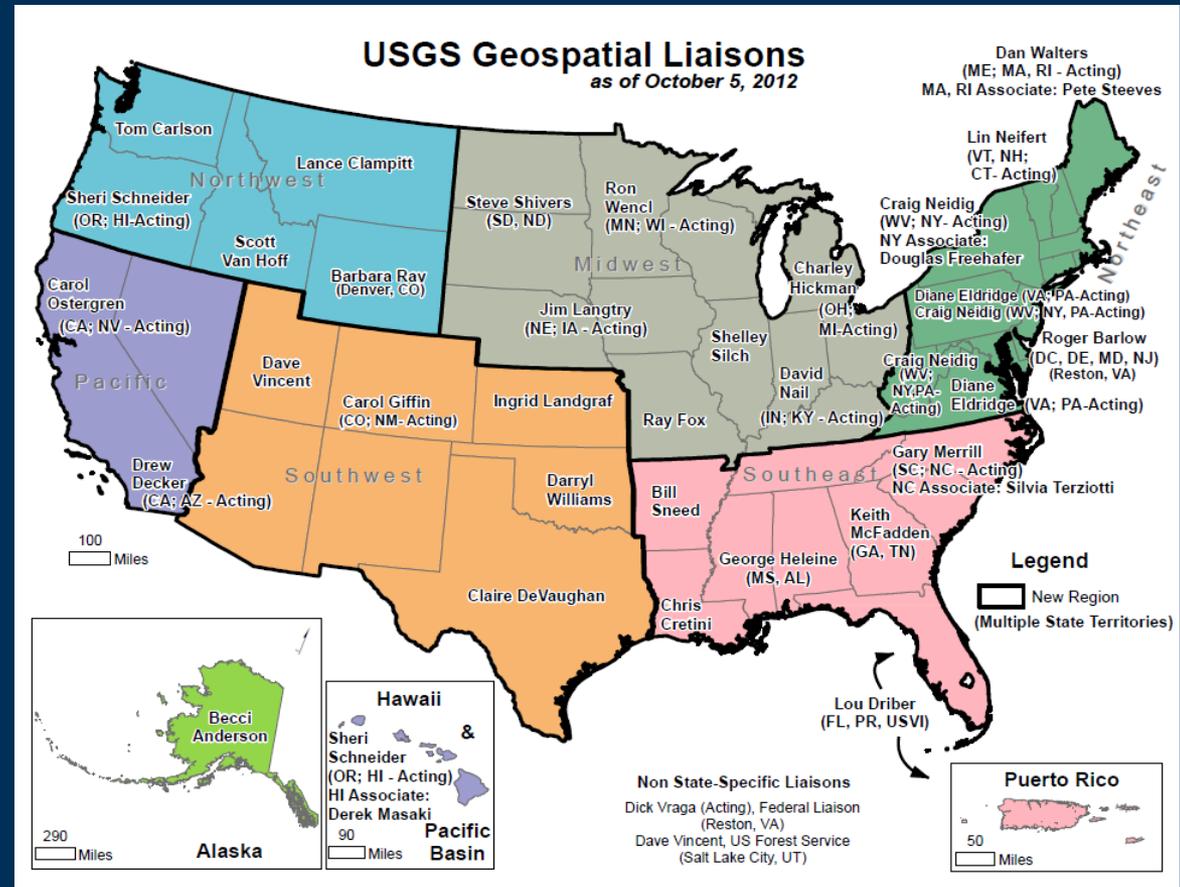
# What is Lidar?



Experimental Advanced Airborne Research Lidar (EAARL)  
<http://ngom.usgs.gov/dsp/tech/eaarl/images/Eaarl1.gif>

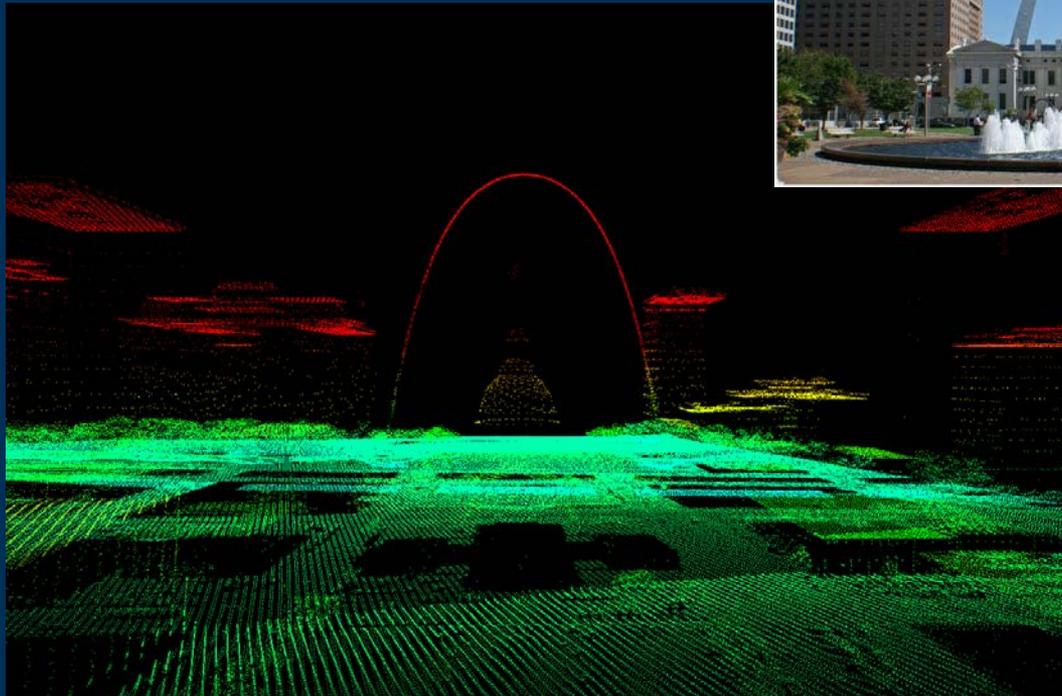
# Where does NGTOC receive Lidar data from?

- **USGS Commercial Partnership Team (CPT)**
  - **Geospatial Product and Service Contract (GPSC)**
- **USGS Geospatial Liaisons**
  - **Partnerships**
  - **Contributed data**



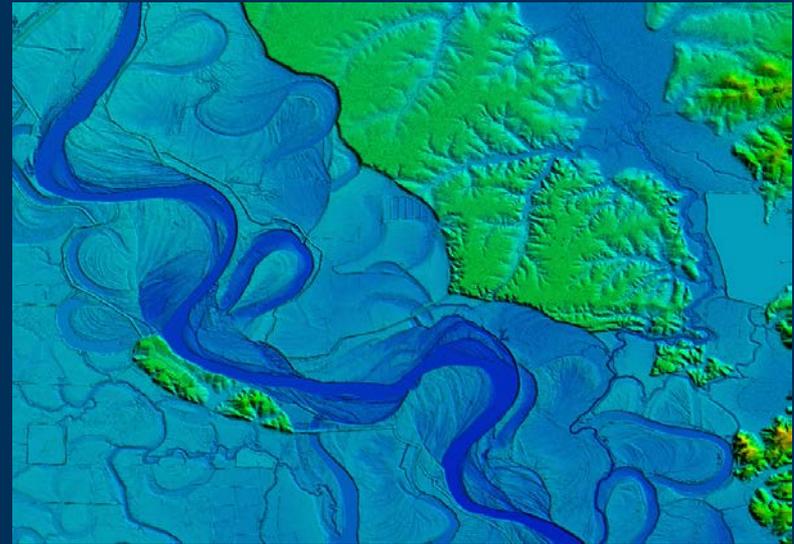
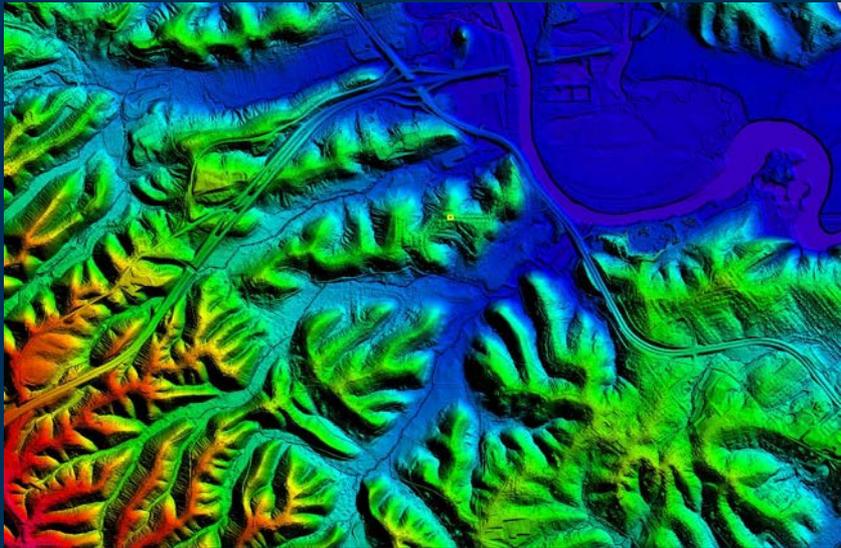
# What do we do with it?

- **Quality Assurance**
  - **Verify all deliverables are provided**
  - **Quantitative review**
  - **Qualitative review**



# What do we do with it?

- **Primary Deliverables**
  - Point cloud data in LAS file format
  - Bare-Earth Digital Elevation Model (DEM)
  - Vertical accuracy checkpoints
  - Various reports and other metadata



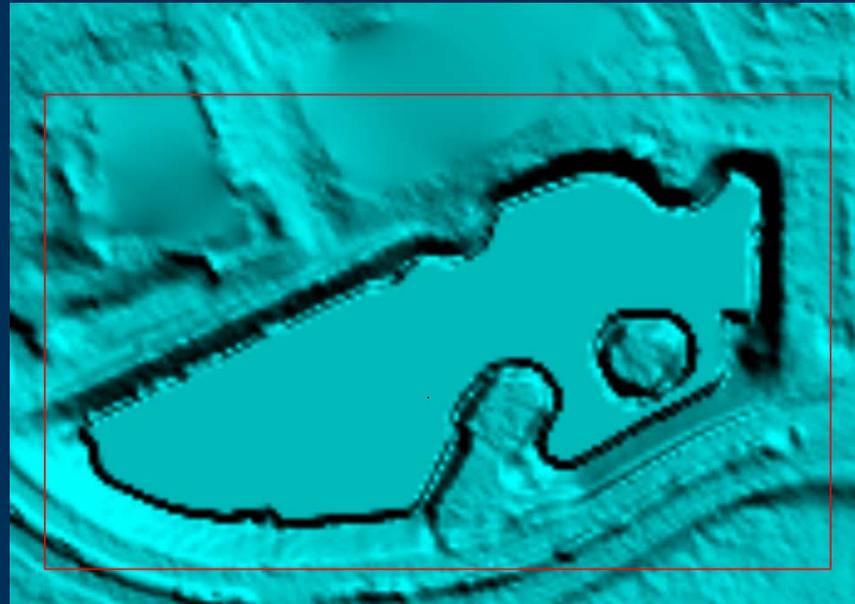
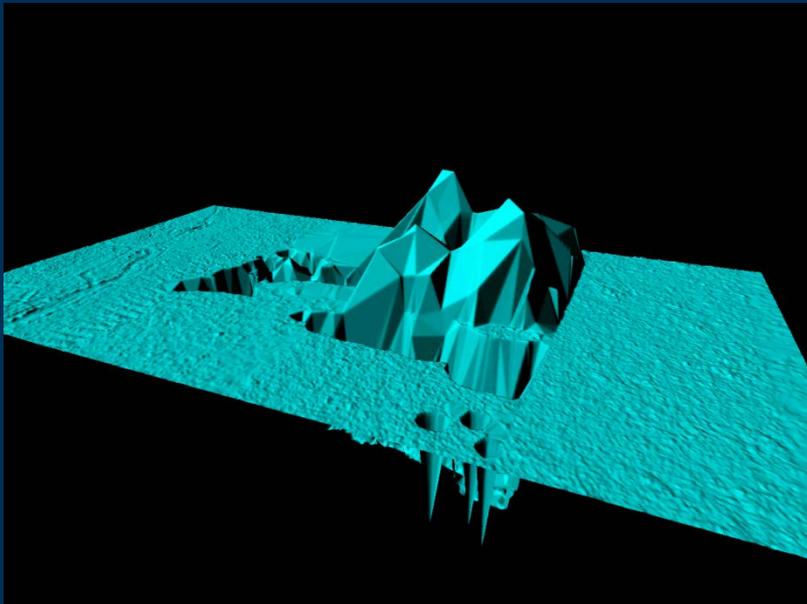
# What do we do with it?

- **Quantitative Review**
  - Point cloud statistics
    - Classification
    - Collection parameters
  - Vertical accuracy
    - Raw point cloud
    - Digital Elevation Model (DEM)



# What do we do with it?

- **Qualitative Review**
  - **Visual inspection of the DEM**
    - Verify elevation values
    - Record errors



# What happens to it after we review it?

- **Earth Resources Observation and Science Center (EROS)**



# What happens to it after we review it?

## ■ National Elevation Dataset (NED)



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### National Elevation Dataset

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The National Elevation Dataset (NED) is the primary elevation data product of the USGS. The NED is a seamless dataset with the best available raster elevation data of the conterminous United States, Alaska, Hawaii, and territorial islands. The NED is updated on a nominal two month cycle to integrate newly available, improved elevation source data. All NED data are public domain. The NED is derived from diverse source data that are processed to a common coordinate system and unit of vertical measure. NED data are distributed in geographic coordinates in units of decimal degrees, and in conformance with the North American Datum of 1983 (NAD 83). All elevation values are in meters and, over the conterminous United States, are referenced to the North American Vertical Datum of 1988 (NAVD 88). The vertical reference will vary in other areas. NED data are available nationally (except for Alaska) at resolutions of 1 arc-second (about 30 meters) and 1/3 arc-second (about 10 meters), and in limited areas at 1/9 arc-second (about 3 meters). In most of Alaska, only lower resolution source data are available. As a result, most NED data for Alaska are at 2-arc-second (about 60 meters) grid spacing, Part of Alaska is available at the 1- and 1/3-arc-second resolution, and plans are in development for a significant improvement in elevation data coverage of the state.

The NED serves as the elevation layer of The National Map, and provides basic elevation information for earth science studies and mapping applications in the United States. Scientists and resource managers use NED data for global change research, hydrologic modeling, resource monitoring, mapping and visualization, and many other applications.

[The Seamless Data Distribution System \(SDDS\)](#) offers seamless data for a user-defined area, in a variety of formats, for online download or media delivery.

[Historic Digital Elevation Models \(DEMs\)](#) are now available.



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 Page Contact Information: [webmapping@usgs.gov](mailto:webmapping@usgs.gov)  
 Page Last Modified: August 2006




# What happens to it after we review it?

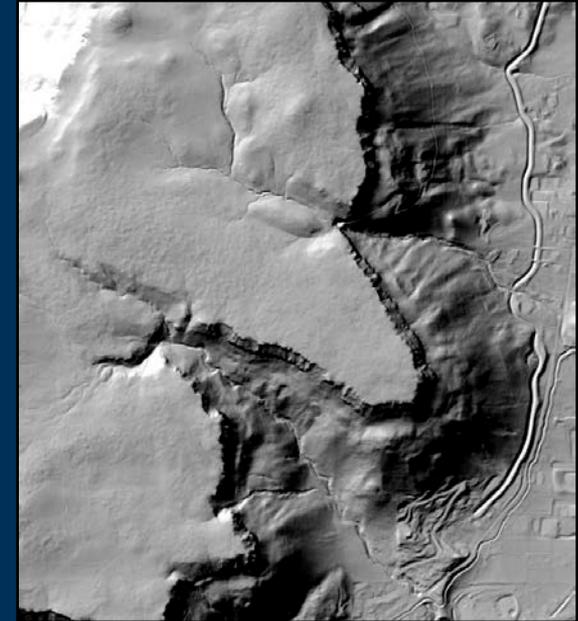
- National Elevation Dataset (NED)



1 arc-second  
~ 30-meter  
resolution

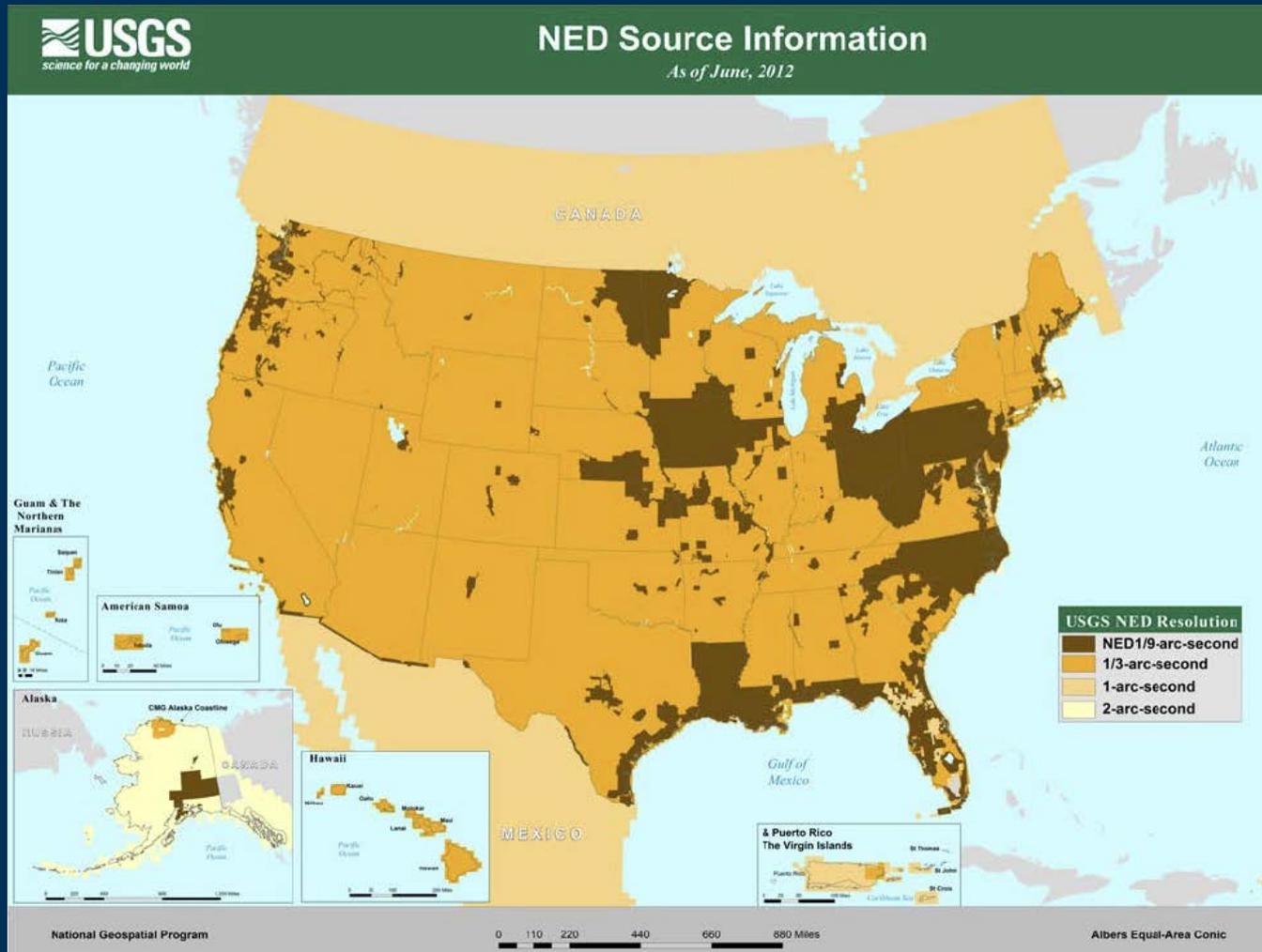


1/3 arc-second  
~ 10-meter  
resolution



1/9 arc-second  
~ 3-meter  
resolution

# What happens to it after we review it?



# What happens to it after we review it?

## ■ Earth Explorer



The image shows a screenshot of the USGS Earth Explorer web application. The interface includes a search criteria summary, a list of data sets, and a map view. A red circle highlights the "LIDAR" data set in the list, and a red arrow points from this circle to a larger, magnified view of the "LIDAR" data set options on the right side of the image.

**Search Criteria Summary (Show)**

2. Select Your Data Set(s)  
Check the boxes for the data set(s) you want to search. When done selecting data set(s), click the *Additional Criteria* or *Results* buttons below. Click the plus sign next to the category name to show a list of data sets.

Use Data Set Prefilter ([What's This?](#))

Data Set Search:

- Aerial Photography
- AVHRR
- CalVal Reference Sites
- Commercial
- Declassified Data
- Digital Elevation
- Digital Line Graphs
- Digital Maps
- EO-1
- Forest Carbon Sites
- Global Fiducials
- Global Land Survey
- HCM
- JECAM Sites
- Land Cover
- Landsat Archive
- Landsat CDR
- Landsat Legacy
- Landsat MRLC
- LIDAR**
- NASA LPDAAC Collections
- Orbview-3
- Radar
- Vegetation Monitoring

**Search Criteria Summary (Show)**

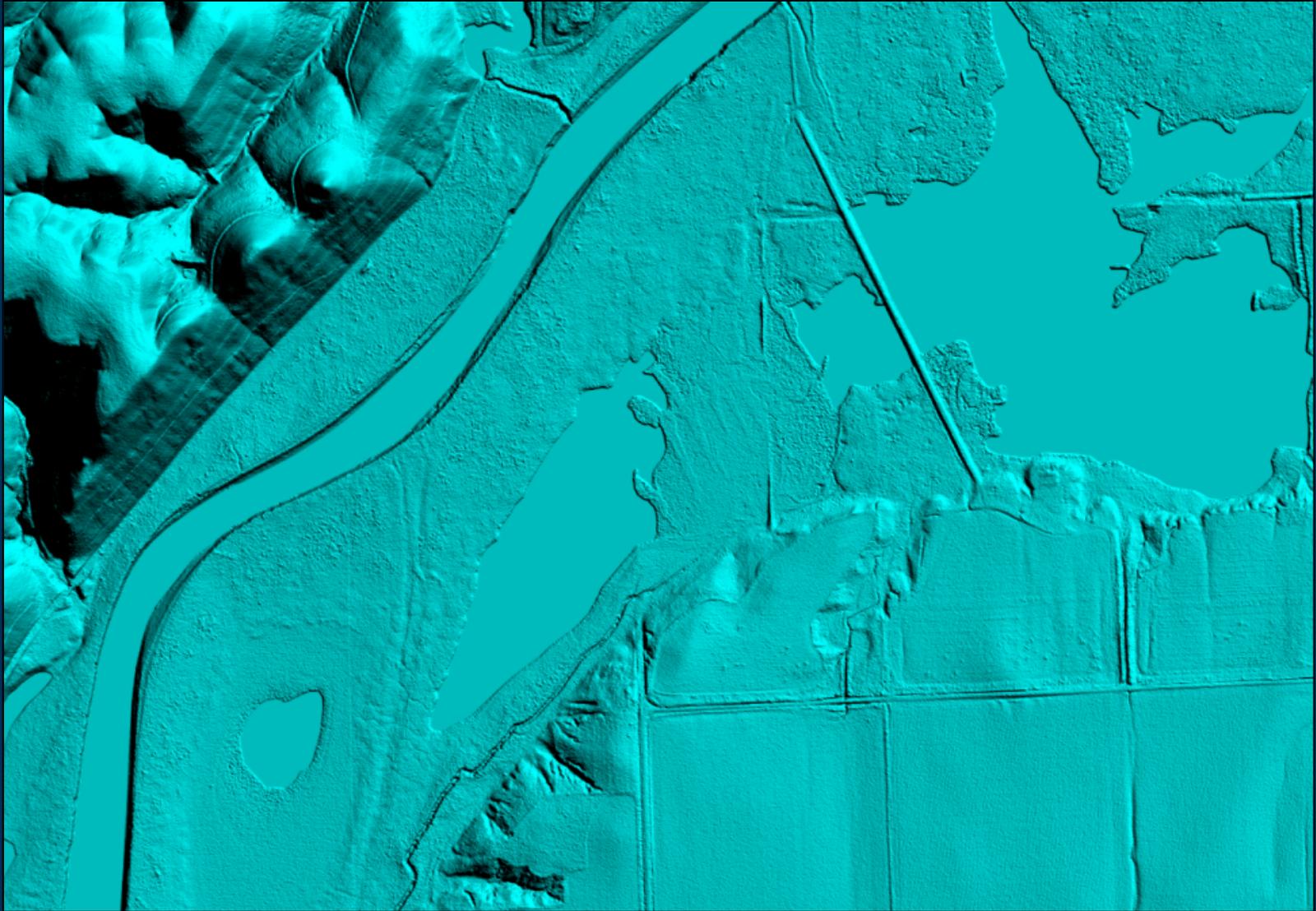
- Landsat Legacy
- Landsat MRLC
- LIDAR**
- LIDAR**
- NASA LPDAAC Collections
- Orbview-3
- Radar

The map view shows a satellite image of the North Pacific Ocean and surrounding landmasses, including Alaska, Canada, and the United States. The map is overlaid with a grid and includes a search bar and navigation controls.

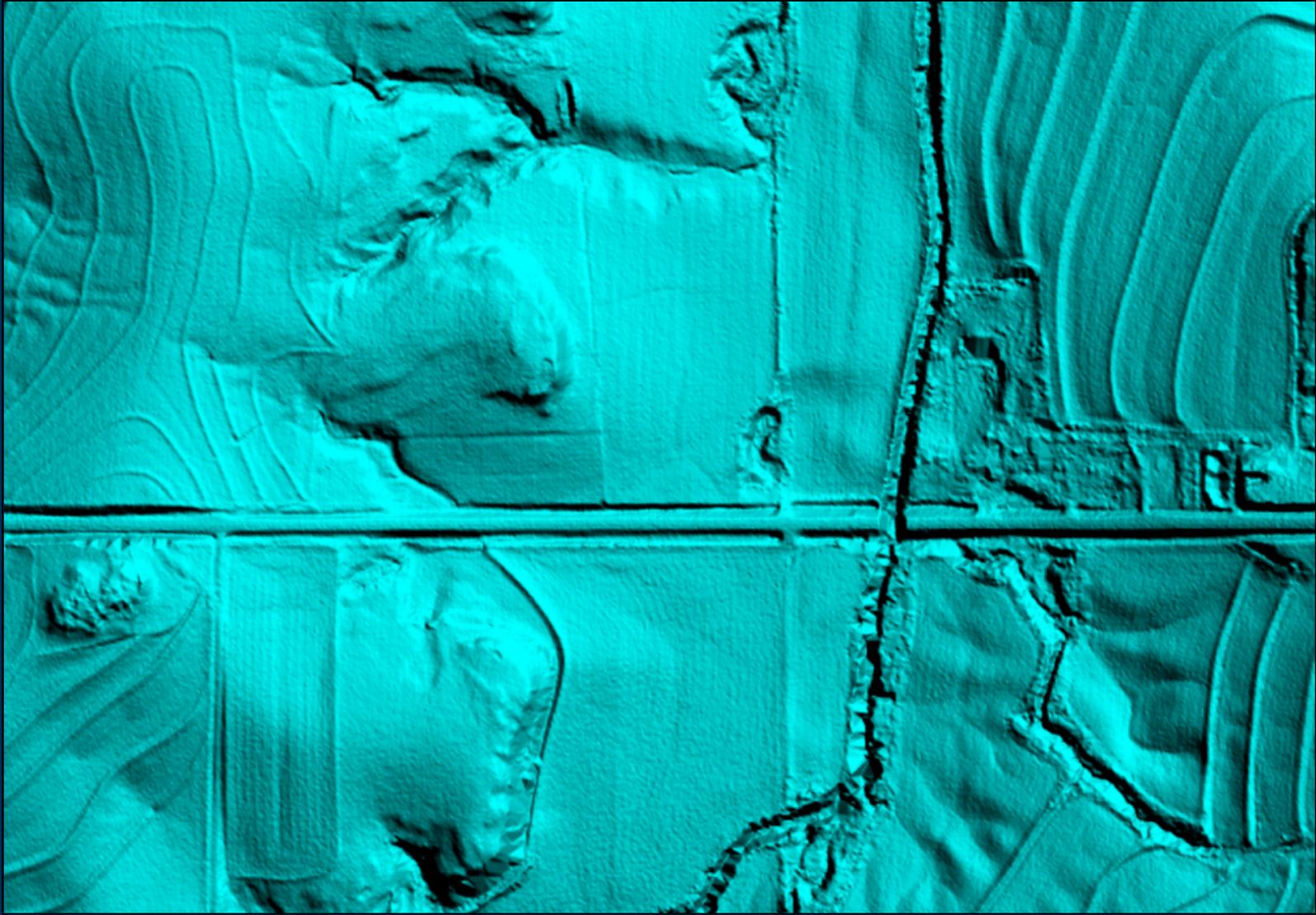
# The Good, the Bad and the Ugly



# The Good



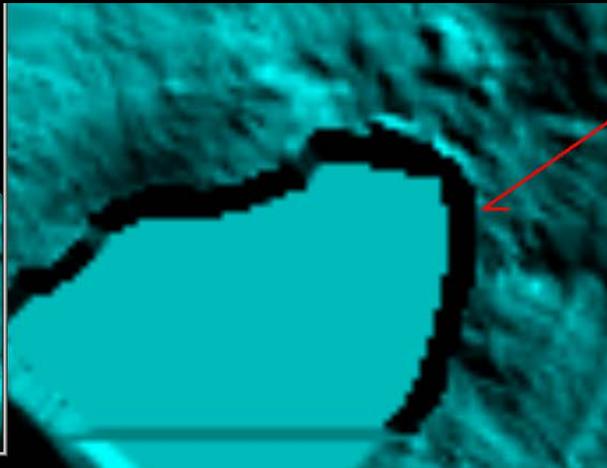
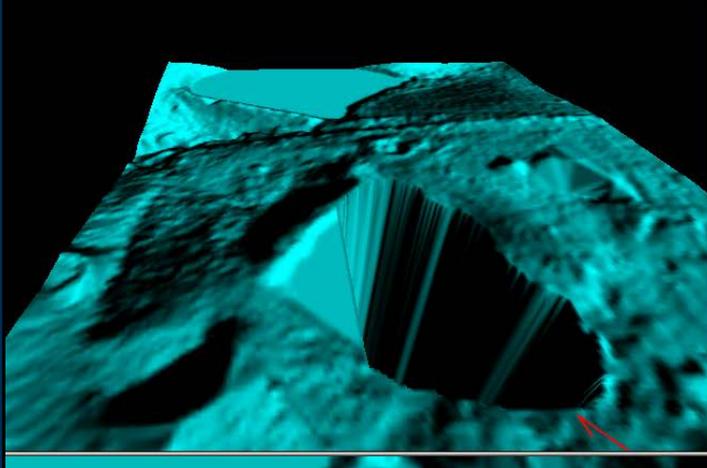
# The Good



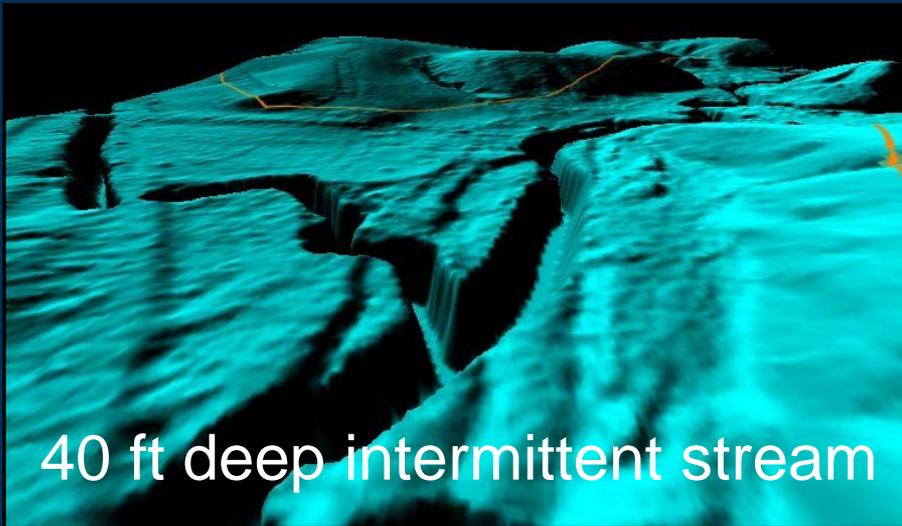
# The Good



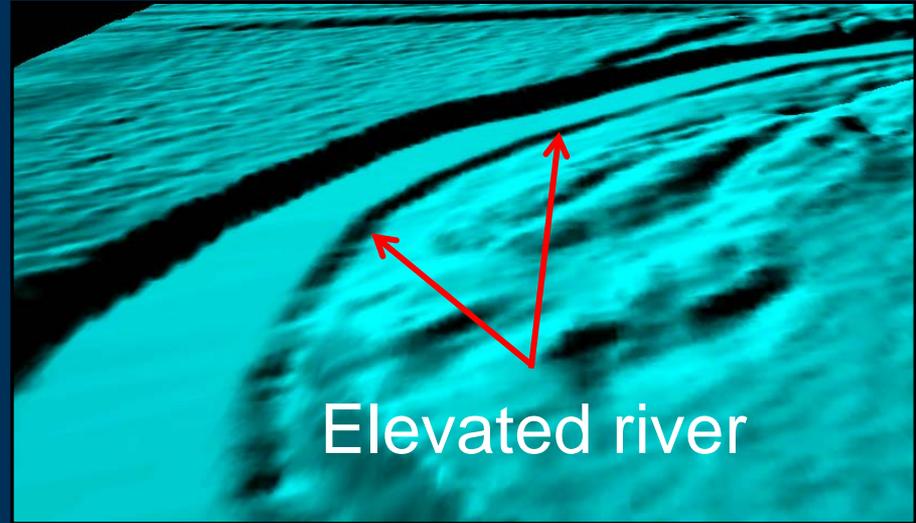
# The Bad



Breakline  
related water  
body problems

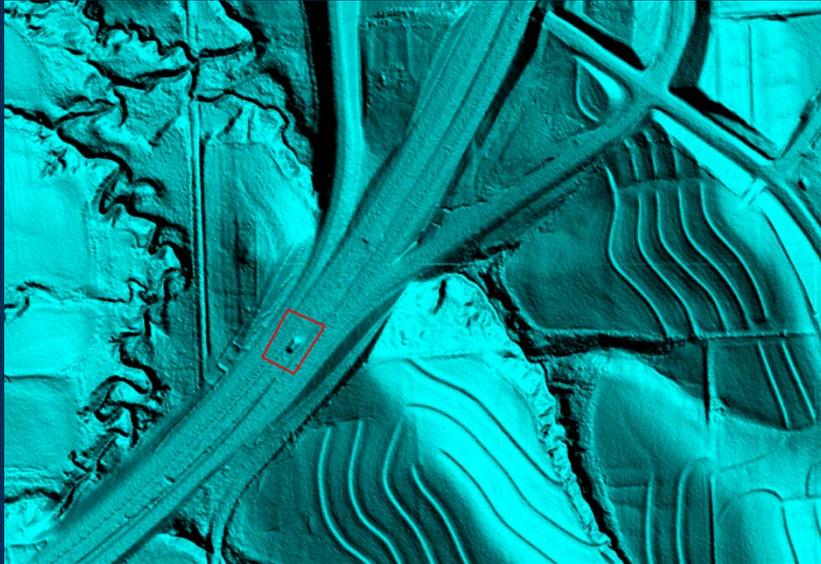


40 ft deep intermittent stream

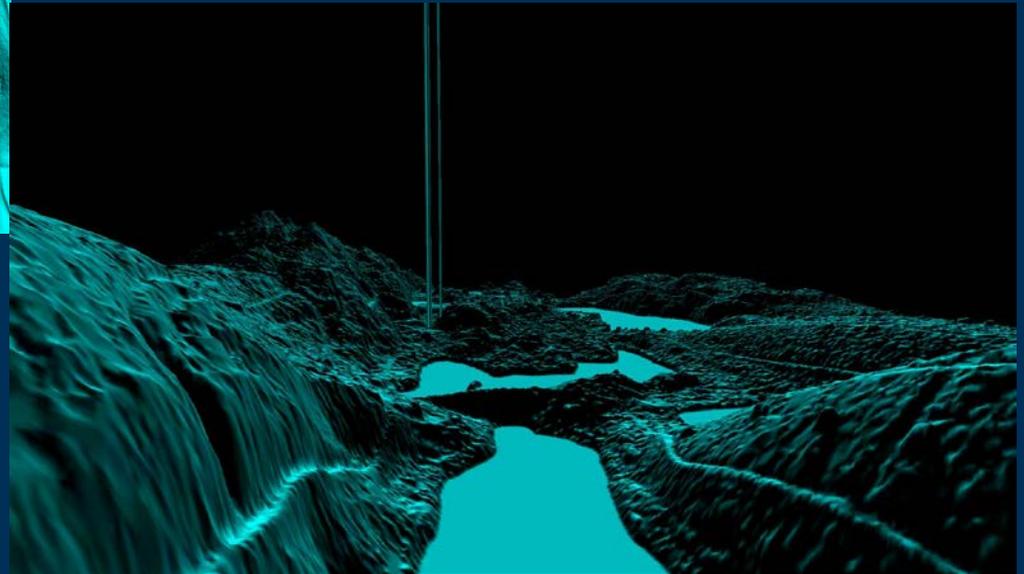


Elevated river

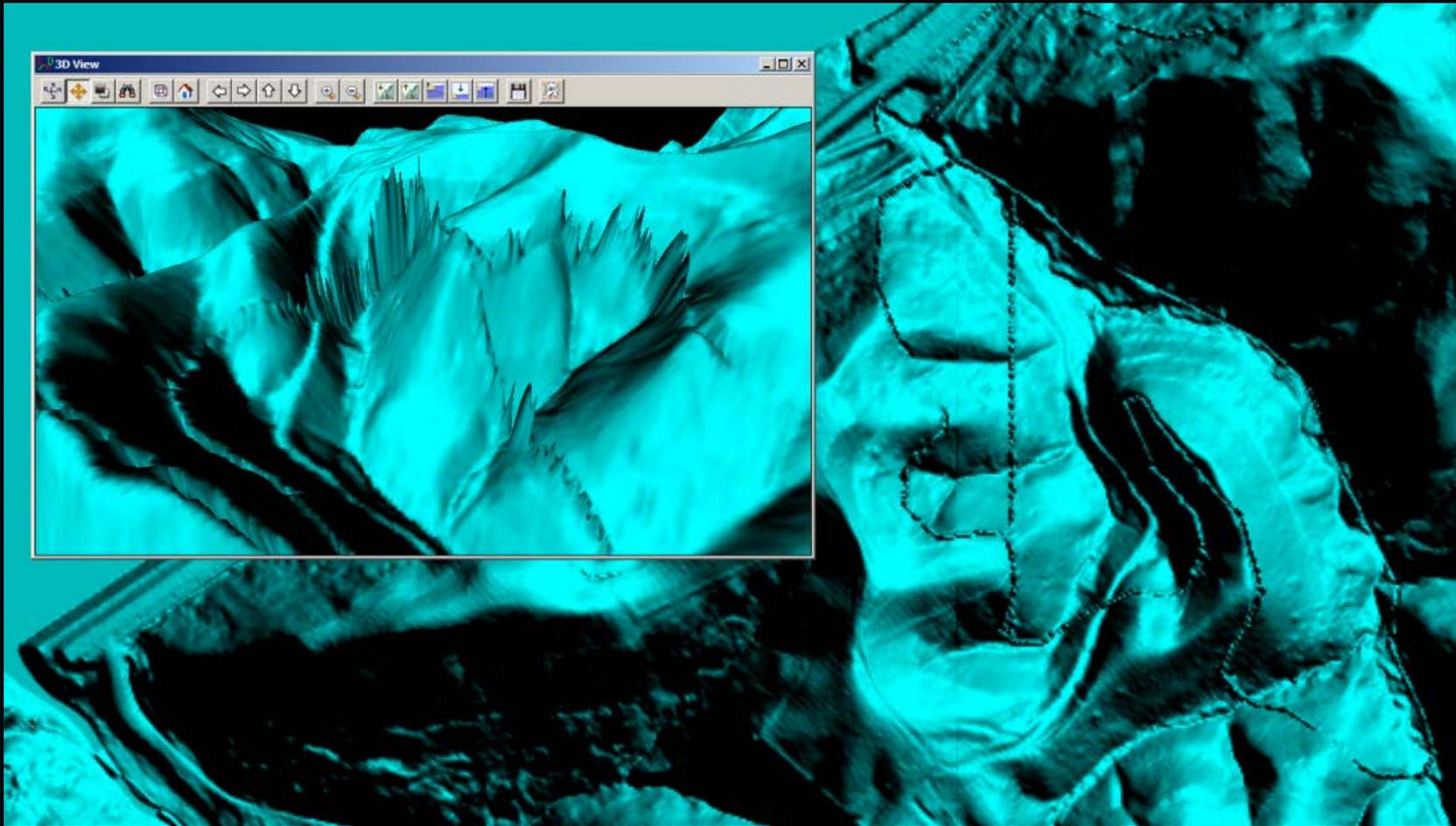
# The Bad



Unusual  
artifacts

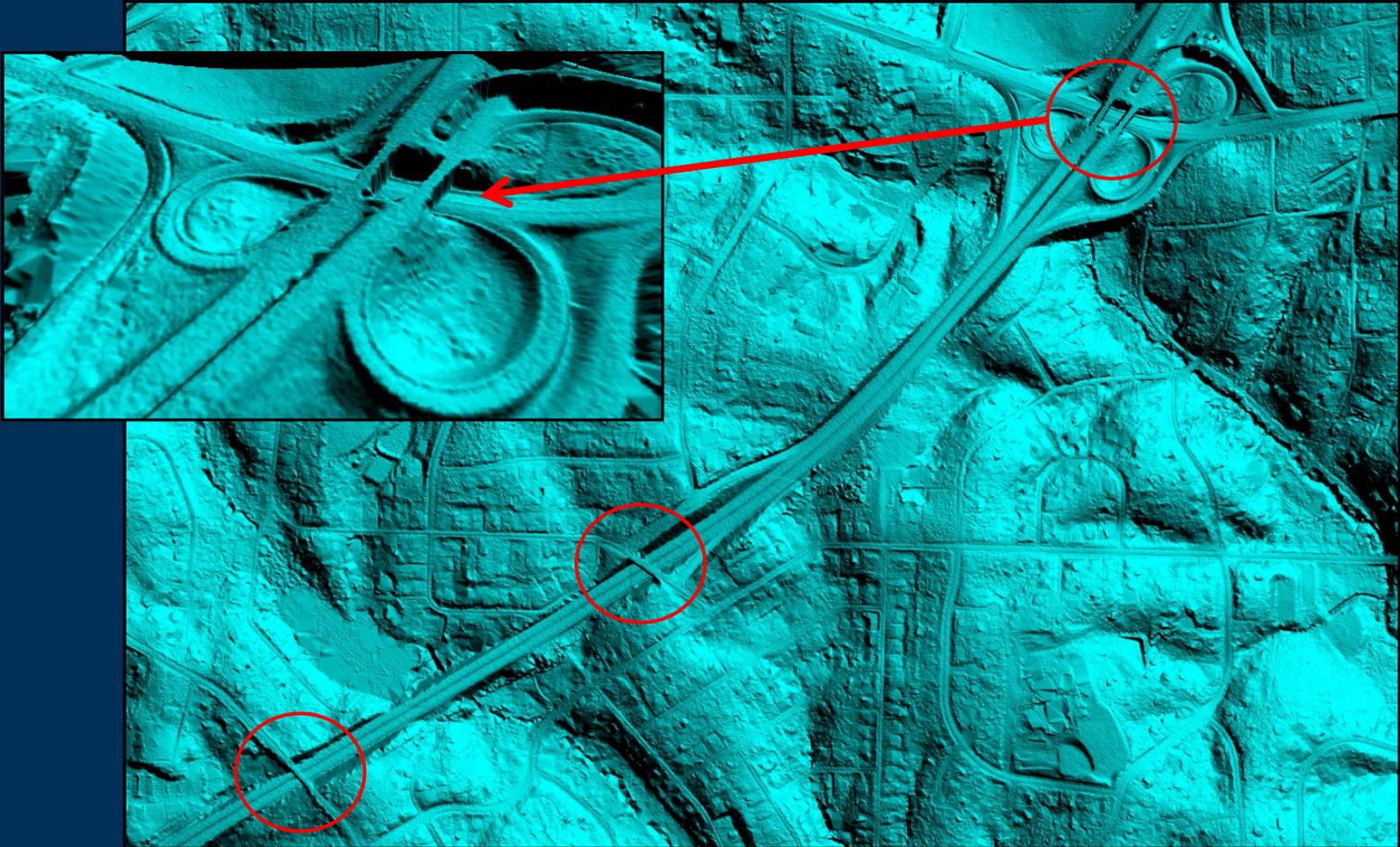


# The Bad



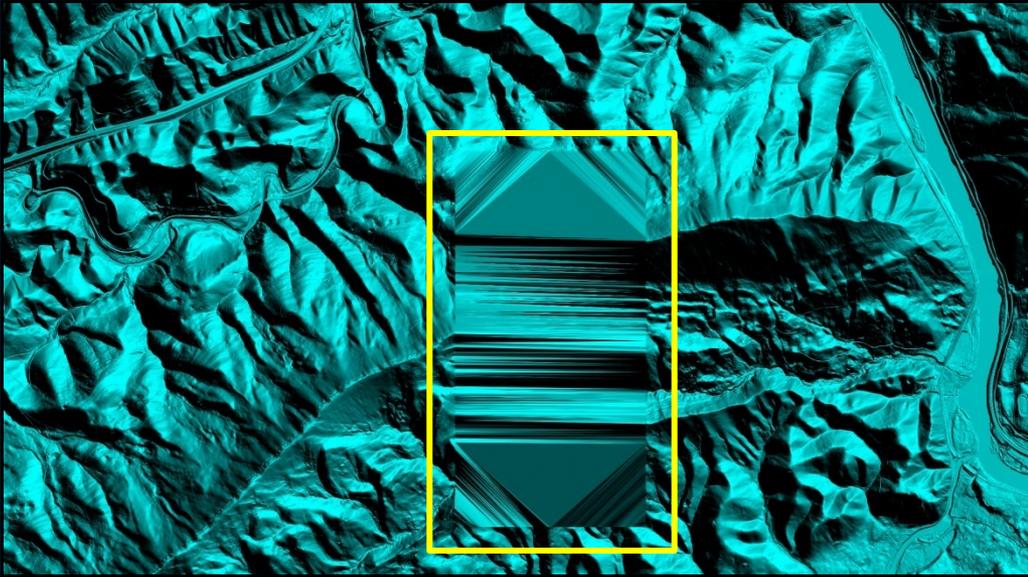
Spikes caused by 'obscure-area' breaklines

# The Bad



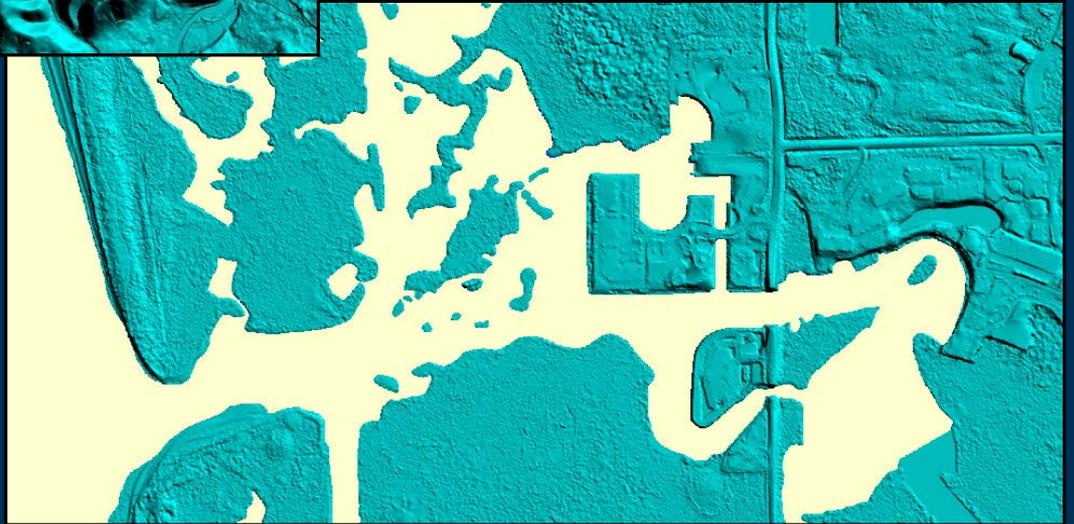
Bridges not removed

# The Bad

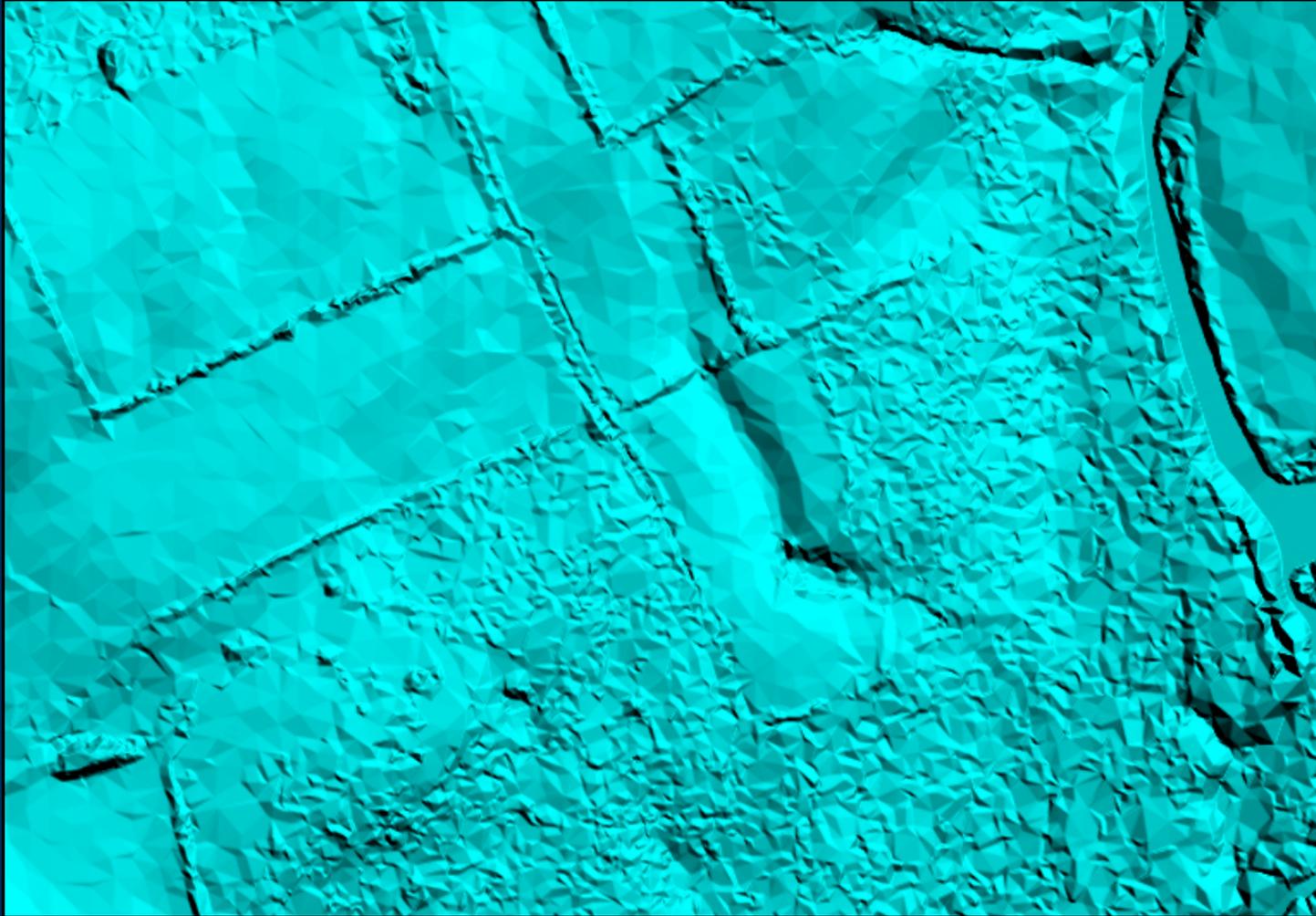


Missing data in LAS files

Water voids



# The Ugly



Improper bare-earth filtering

# The Ugly

