ASPRS Workshop Demo #2

Open Source Utilities for Working with Lidar Data

Open Source Utilities

- libLAS - http://liblas.org/ or http://trac.osgeo.org/osgeo4w/
- LASTools - http://www.cs.unc.edu/~isenburg/lastools/
- GRASS - http://grass.itc.it/
  - Tutorial at: http://grass.osgeo.org/wiki/LIDAR#Micro-tutorial
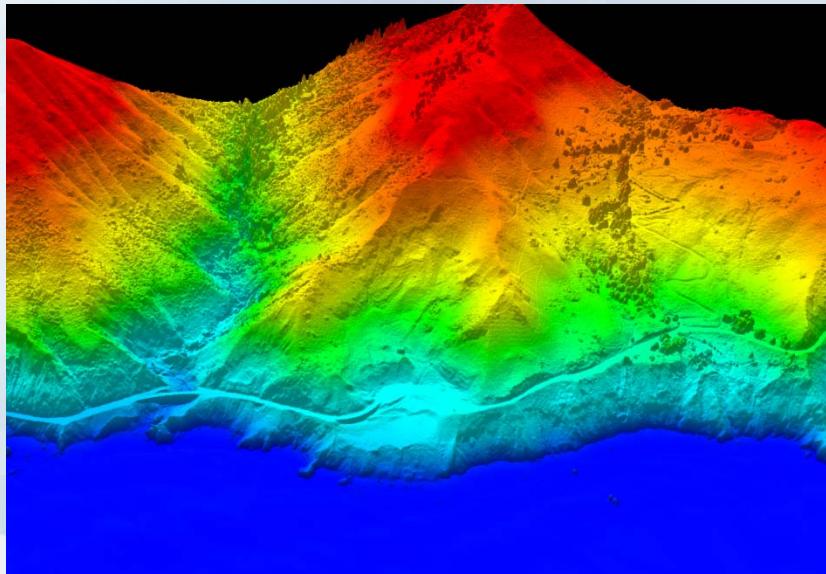
1 m Lidar DSM
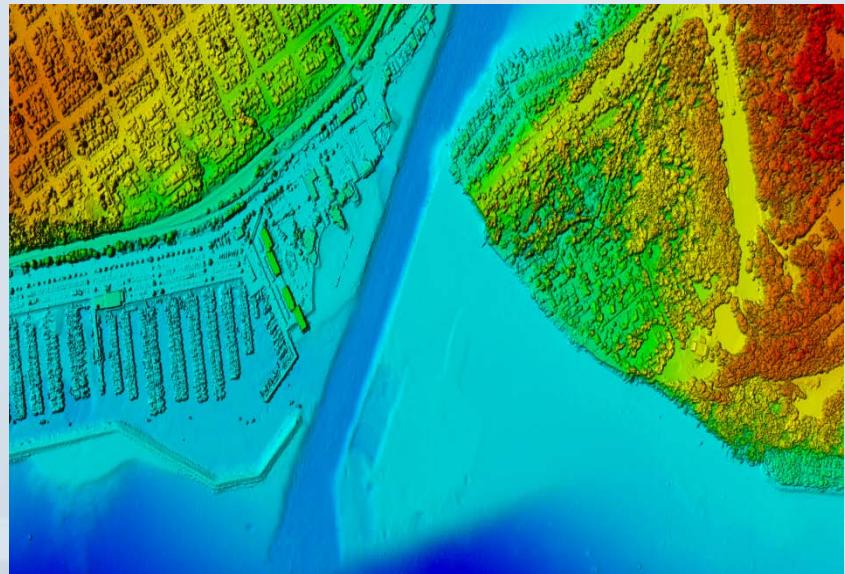
Topo/Bathy Lidar Combined

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Python Programming Language

- High level object-oriented scripting language
- Free, portable and powerful
- Runs interactively or as executable scripts (*.py)
- Works as a nice "glue" language to string together various processes even those from other languages (C, FORTRAN,etc.)
- Large user community with tons of freely available "snippets"
- Relatively easy to learn and read
- Full documentation at http://www.python.org/

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libLAS 1.0/1.1

- Open source library for reading/writing binary LAS formatted files commonly used to store lidar data
- Contains Python, C, C++, and .NET application programming interfaces
- Cross platform (Windows, Linux, OS X, Solaris)
- Support for LAS 1.0 and 1.1 with 1.2 just released
- Initial development was supported by the Iowa DNR for use in its state-wide LIDAR project
- More info at: http://liblas.org/
- Development team:
  – Howard Butler
  – Mateusz Loskot
  – Phil Vachon
  – Martin Vales
  – Frank Warmerdam

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libLAS Demo

- Working interactively in the Python shell
- Import the libLAS module

>>>from liblas import *

- Open a LAS file for reading

>>>data=file.File('C:\\\\asprs_workshop\\\\liblas_demo\\\\ demo.las', mode='r')

- Loop through the LAS file
- Find points with elevations 50 meters or greater
- Print them to the screen

```
>>>for p in data:
        if p.z >= 50.00:
                print p.x, p.y, p.z
```

libLAS Demo cont.

- Loop through the LAS file again
- Find points with laser intensities greater than 50 and less than 255
- Print them to the screen

```
>>>for p in data:
        if p.intensity > 50  and p.intensity < 255:
            print p.x, p.y, p.z, p.intensity
```
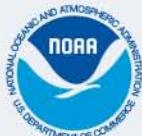
libLAS Demo cont.

- Create a new LAS header

>>>**h = header.Header()**

- Open a new LAS file for writing

>>>**newdata=file.File('C:\\asprs_workshop\\liblas_demo\\ demo_nadir.las', mode='w', header=h)**

- Loop through the LAS file
- Find all nadir points (Scan angle of 0)
- Write the nadir points to a new LAS file
- Close the LAS files

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libLAS Demo cont.

```
>>>for p in data:
        pt = liblas.point.Point()
        if p.scan_angle == 0:
            pt.x = p.x
            pt.y = p.y
            pt.z = p.z

            newdata.write(pt)


>>>newdata.close()
>>>data.close()
```

New LAS file should contain only points with a scan angle of 0

libLAS & Python

- When coupled with Python modules such as Numpy, Matplotlib and MayaVi libLAS offers great functionality for working with LAS files

- A few simple examples are:

  - Inspect and edit a LAS header file

  - Create a height histogram plot

  - Use MayaVi visualization tools to view LAS point cloud

  - Create lidar flight coverage KML/KMZ for display in Google Earth

  - Create lidar binned images

Edit LAS Header

Input   Output

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Elevation Histogram

View LAS Points with MayaVI
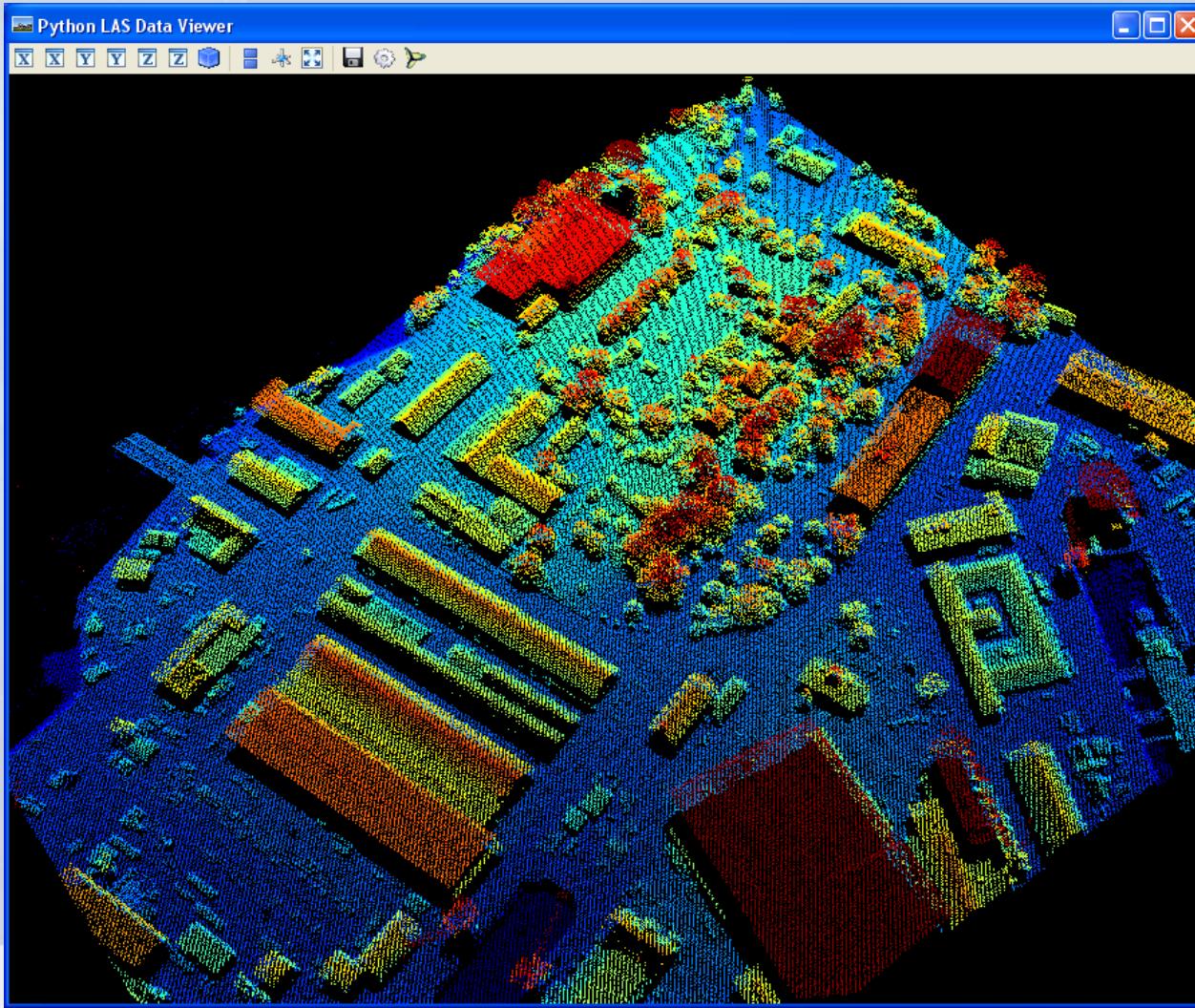
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View Lidar Flightline Coverage in Google Earth
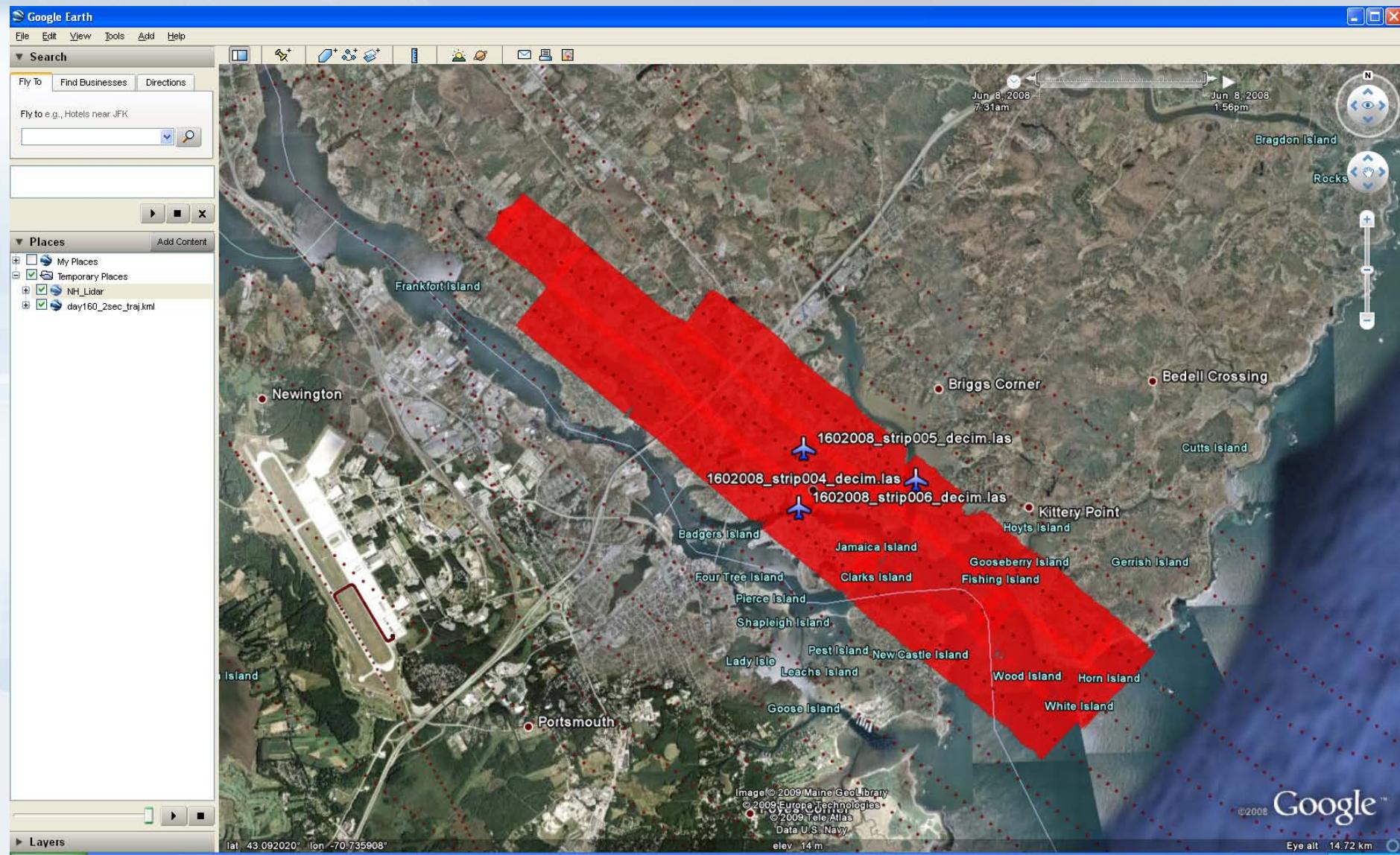
View Lidar Coverage in Google Earth

Create Binned Images from Lidar Using Python

Input can be ASCII x,y,z or LAS format using liblas

Generates mean, min, max and count (number of hits) images

Lidar data viewed in 1x1 meter bins
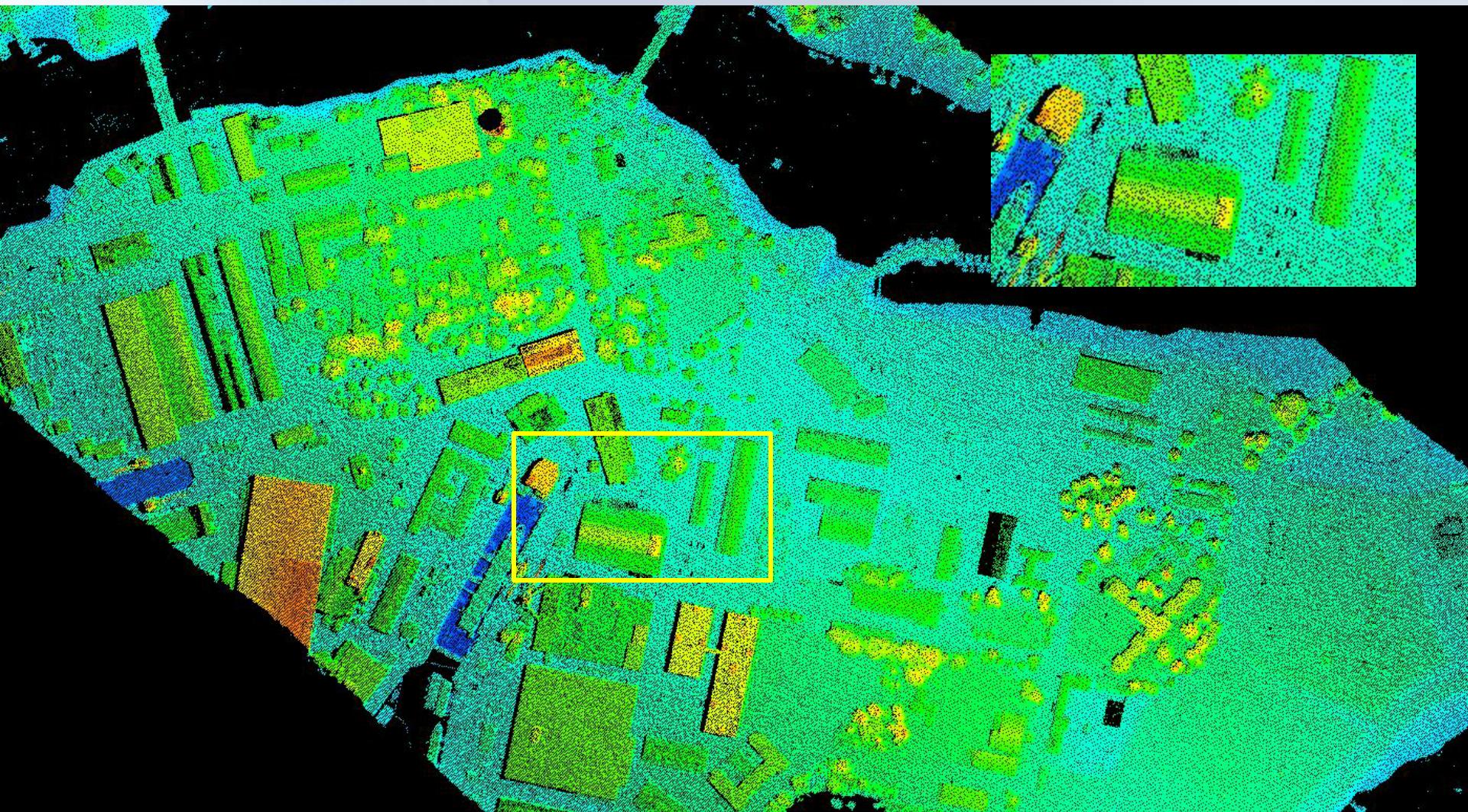
Python (x,y)

- Free scientific-oriented Python distribution
- Collection of science and engineering related Python modules and development environment tools all under one hood
- Easy installation and setup
- Install additional modules from a single location
- More info at: http://www.pythonxy.com

LASTools

- Open source utilities for working with LAS files
- Command line driven
- Source code and C++ classes LASreader and LASwriter for reading and writing the LAS format are also available
- More info at:
  http://www.cs.unc.edu/~isenburg/lastools/
- Development team:
  - Martin Isenburg
  - Jonathan Shewchuk

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LASTools

- lasinfo
- lasmerge
- las2las
- las2txt
- txt2las
- lasthin
- las2ogr

lasinfo

- Displays header information and LAS file point summary

Usage: *lasinfo sample.las*

lasmerge

- Merge two or more LAS files into a LAS single file from the cmd line

Usage: *lasmerge -i nh_line1.las -i nh_line2.las -i nh_line3.las -i nh_line4.las -o C:\asprs_workshop\lab2\merged_data\nh_merge.las*

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las2las

- Basic LAS file processing from the cmd line (clip by bounding box, clip by height, clip by class, several other options)

Usage: *las2las -i sample.las -clip_z -60 70 -o sample_edited.las*

Usage: *las2las -i sample_edited.las -clip 358100 4771200 358700 4771700 -o subset.las*
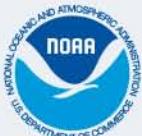
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las2txt

- Convert LAS file to user specified ASCII text format

Usage: *las2txt –i sample_edited.las –o sample_edited.txt –parse xyz*

- This example converts LAS file to a x,y,z ASCII format

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txt2las

- Convert ASCII text file to LAS format

Usage: txt*2las –i sample_edited.txt –o sample_demo.las –parse xyz*

- This example converts x,y,z formatted ASCII to LAS

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lasthin

- Simple point thinning algorithm
- Places a user specified uniform grid over the points and keeps the lowest z coordinate in the grid cell

Usage: *lasinfo –i subset.las –o subset_decim.las -grid_spacing 10.0*

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las2ogr

- Converts LAS file to vector formats supported by OGR/GDAL

Usage: *las2ogr –i subset_decim.las –o subset_decim.shp -f "ESRI Shapefile"*