

The USGS Center for Lidar Information Coordination and Knowledge (CLICK)

Jordan Menig

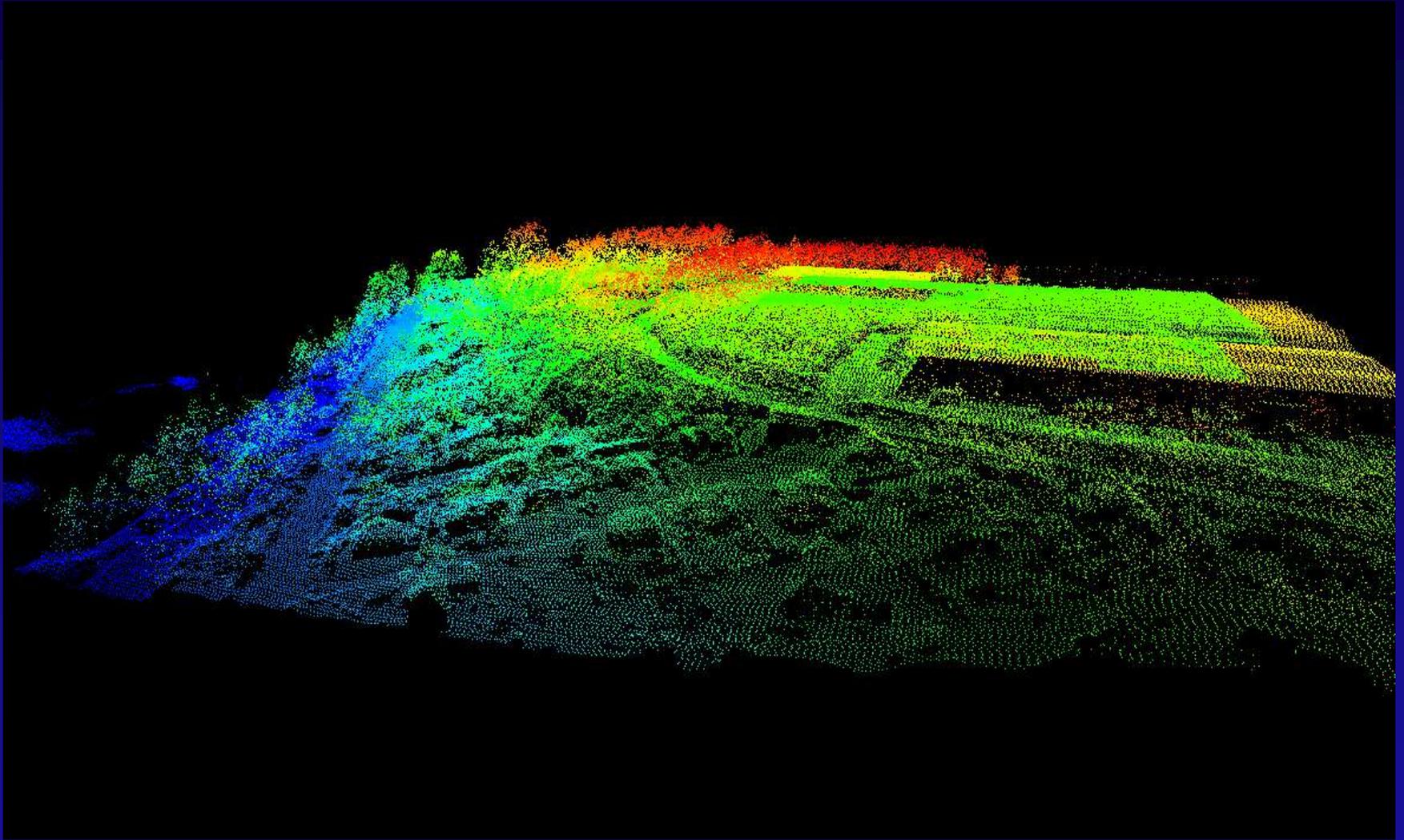
SGT Inc., Contractor to the U.S. Geological Survey
Earth Resources Observation and Science (EROS) Center
47914 252nd Street, Sioux Falls, SD 57198

Lidar Vocabulary

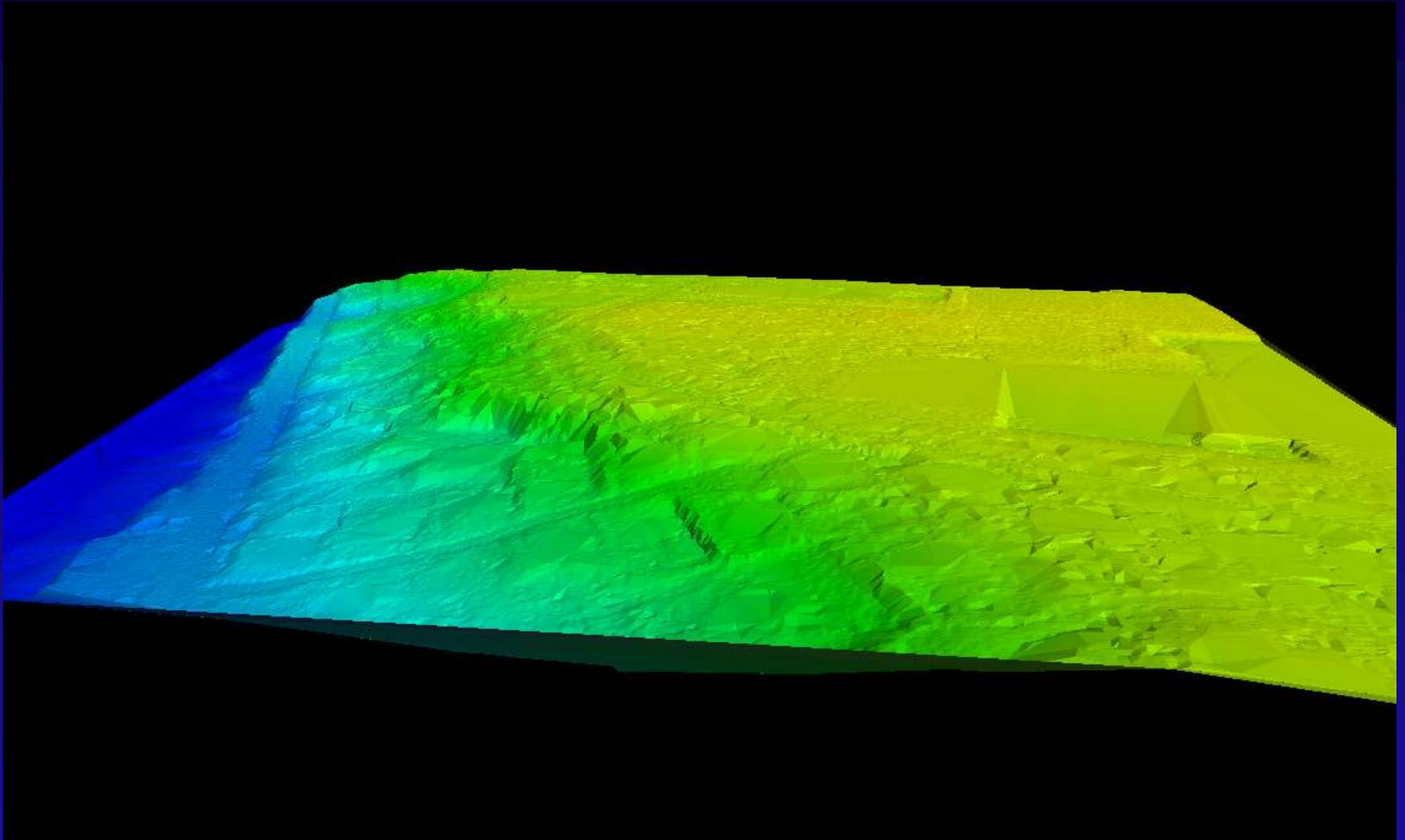
- ☀ **Lidar:** Point data representing the X-Y-Z location, with other attributes, of any terrestrial target reflecting the laser pulse.
 - ☀ Not necessarily limited to bare-earth points
 - ☀ Not a surface such as raster DEM or TIN
- ☀ **DEM:** Digital Elevation Model of the bare-earth surface, almost always raster.
 - ☀ DEMs created from lidar point data are still just DEMs
- ☀ **DSM:** Digital Surface Model of any surface (typically 1st- or All-Return, most often raster).
- ☀ **Masspoints:** A photogrammetry term for ground points measured from stereo photography. Often misused to mean lidar points classified as bare-earth.



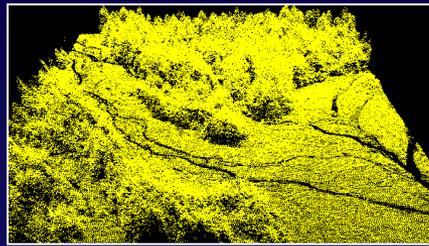
All-Return Lidar (Point Cloud - CLICK)



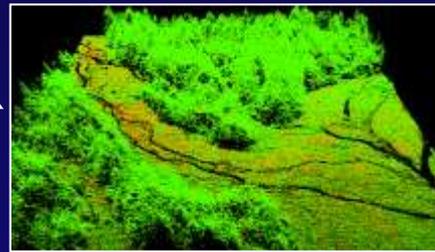
Bare-Earth DEM (Surface - DEM)



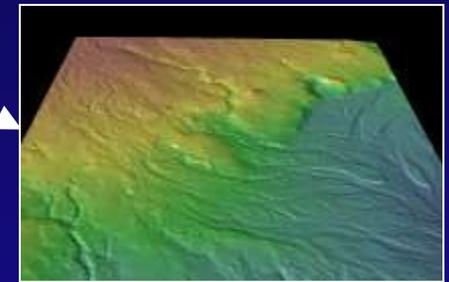
Typical Lidar Data Process Flow



Raw Points



Processing



Bare Earth

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Discrete-return point clouds

Find out more about discrete-return lidar. See if public-domain lidar is in your area of interest, ask and answer questions about the data, processing, derivatives and more on our bulletin board, look for articles and other resources about lidar.

Bare Earth

Find out more about the USGS bare earth derivatives from lidar. To view National Elevation Dataset (NED) page, NED contains bare earth elevation data created by lidar and other sources.

NASA EAARL

Find out more about NASA's Experimental Advanced Remote Sensing Lidar (EAARL) system, and how it is being used. View and download data collected by EAARL lidar as well as imagery.

Research and Derivatives



NED



CLICK: The USGS Center for Lidar Information, Coordination, and Knowledge

- ☀ lidar.cr.usgs.gov
- ☀ Launched in FY06
- ☀ Locate and collect as much publically available lidar as possible, nationwide, for scientific (non-mapping) applications
- ☀ Help foster collaborations, educate and train users on lidar
- ☀ Data to be processed & input into NED



CLICK Mission

There has been increasing demand for research utilizing all information generated from lidar remote sensing data and not just bare earth digital elevation models (DEMs). While this technology has been a proven mapping tool, effective for generating bare earth DEMs, research on using the entire point cloud of this remote sensing data for scientific applications have been slowed by:

- The high cost of collecting lidar
- A steep learning curve on research and understanding involving utilizing the entire point cloud

The goal of CLICK is to facilitate data access, user coordination and education of lidar remote sensing *for scientific needs.*



The Need for Source Data

- ☀ Depending on the system, recording method, and cover type, between 20 and 90 percent of the raw source data could be filtered out to generate a bare earth DEM.
- ☀ Large amounts of discarded data can be used for other purposes.
- ☀ “Data Dumpster Diving”



The CLICK Lidar Portal



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Bulletin Board

Data Viewer

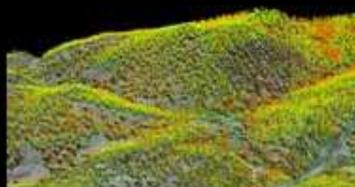
Websites/References

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CLICK

Center for LIDAR Information Coordination and Knowledge

Discrete-return point clouds



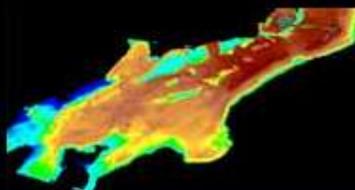
Find out more about discrete-return lidar: See if [publicly-available lidar](#) is in your area of interest; [ask and answer](#) questions about the data, processing, derivatives and more on our bulletin board; [look for articles](#) and other websites about lidar.

Bare Earth

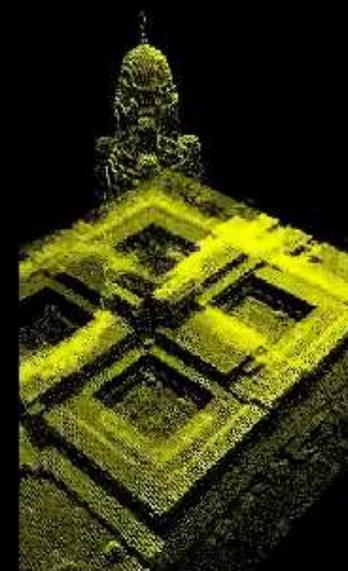


Find out more about the USGS bare earth derivatives from lidar: Go to our [National Elevation Dataset \(NED\)](#) page. NED contains bare earth elevation data created by lidar and other sources.

NASA EAARL



Find out more about NASA's [Experimental Advanced Airborne Research Lidar \(EAARL\)](#) system, and how it is being used. View and download data collected by EAARL- lidar as well as imagery.



CLICK: Coordination

Bulletin Board

- ☀ Heart of the virtual center
- ☀ Place for users from ALL disciplines to ask and answer lidar-related questions
- ☀ Users must register to ask and answer questions
- ☀ Has become a great place for users in the lidar community to communicate



CLICK: Coordination

IPB	<p>Welcome! Welcome to the USGS Center for LIDAR Information Coordination and Knowledge (CLICK). Our goal is to help facilitate understanding, coordination, data access, communication and knowledge concerning lidar data for scientific needs. We hope you can use the tools we have provided to the fullest to help create information out of lidar data. We encourage you to register to keep abreast of new information posted here! Registering will allow you to post topics and replies, as well as subscribe to a forum to get emailed updates.</p>	3	0	<p>May 24 2006, 08:03 AM In: CLICK is June's PE&RS ... By: Jason Stoker</p>
IPB	<p>General LIDAR and/or CLICK Questions Questions about light detection and ranging technology- the who's, what's where's and why's. Any lidar-related question can be posted here.</p> <p>You can also post questions concerning how to use the bulletin board as well as questions about the board's functionality here. <i>Forum Led by: Jason Stoker</i></p>	36	131	<p>Feb 7 2008, 12:54 PM In: Systematic roll bias? By: Ken Hudnut</p>
IPB	<p>Available / Wanted Data Questions A place to inform and describe to others about point cloud data you have available to share, or data you are looking for. CLICK is interested in collecting all quality publicly available datasets. Subforums: Looking for data, Looking for Collection Partners <i>Forum Led by: Jordan Menig</i></p>	38	61	<p>Jan 17 2008, 08:51 AM In: Fernley, Nevada data? By: Crosby</p>
IPB	<p>Software / Hardware Solutions A place to ask and answer questions regarding how tos: on processing algorithms, software, and hardware. Subforums: Bare Earth Questions, Training Opportunities, Official Terrasolid Support Forum, ESRI Lidar Support Group, Official Applied Imagery Support Forum, Official ITT ENVI LIDAR Forum <i>Forum Led by: Jason Stoker</i></p>	221	398	<p>Today, 09:07 AM In: flight line info loss By: miketheman11</p>
IPB	<p>File Format Questions A place to discuss file formats- ASCII, .las, .ebn, .bin, etc... Subforums: LAS Discussion Forum <i>Forum Led by: John Kosovich</i></p>	23	60	<p>Feb 7 2008, 08:23 PM In: Spatial Reference descriptions... By: Howard Butler</p>
IPB	<p>Application Specific Questions Have a question about how to use lidar in, on or for your particular application? Post it here. Discipline experts will do their best to answer them! Subforums: LIDAR for Geologic Applications, LIDAR for Forestry, LIDAR for Urban Applications, LIDAR for Hydrologic Applications, LIDAR for Coastal Applications, LIDAR for Hazards, Atmospheric LIDAR <i>Forum Led by: Jason Stoker</i></p>	59	58	<p>Feb 4 2008, 11:00 PM In: Piercing the sky with LIDAR By: CLICK News</p>
IPB	<p>Regional Groups Allows users to provide announcements and information for regional lidar consortiums and forums. Subforums: North Carolina, Puget Sound Lidar Consortium, New York Metro Lidar, LRS Lidar working group, YNP LIDAR Consortium, Idaho Regional Group, California Regional Group, Hawaii and Pacific Basin Regional Group, Northern Gulf of Mexico (NGOM), Shenandoah Valley, Alaska Regional Group <i>Forum Led by: Jordan Menig</i></p>	20	14	<p>Jan 21 2008, 03:28 PM In: AGDC Lidar/IFSAR subcommittee ... By: Hans-Erik Andersen</p>



CLICK: Knowledge

Websites & References

- ☀ Dynamic list of LIDAR-related Web pages, along with a growing list of peer-reviewed articles.
- ☀ Users may also submit their own LIDAR-related web pages or peer-reviewed journal articles if they do not see it on the list.



CLICK: Knowledge



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LIDAR References

Search the references on the following criteria:

Keyword(s):

Title:

Journal Title:

Author:

- 3 D laser sensing at F01 - Overview and a system perspective
- 3-D measurement of trees using a portable scanning lidar
- 3D Building Modelling with Digital Map, Lidar Data and Video Image Sequences.
- 3D building profiles: Comparison and fusion of LIDAR and IFSAR data
- 3D vegetation structure extraction from lidar remote sensing
- 3D-Visualization of Buildings for the Urban Warfare
- A 32bit, high resolution, asynchronous time to digital converter for space instruments
- A comparison between photogrammetry and laser scanning
- A comparison of geoid undulations for west central Greenland

LIDAR Websites

3001

<http://www.3001data.com/newsite3001/index.php>

3D Laser Mapping

www.3dlasermapping.com

AAMHatch

<http://web.aamhatch.com.au/>

Advanced LIDAR Technology, Inc.

<http://www.advlidar.com>

AeroMap U.S.

<http://www.aeromap.com/lidar.htm>

Airborne 1 Corporation

<http://www.airborne1.com>

Airborne Imaging Inc

<http://www.airborneimaginginc.com/>

Department of Geology

http://www.beg.utexas.edu/environment/remote_sensing



CLICK: Information

- ☀ All submitted lidar data is available for public download through the CLICK site
- ☀ CLICK data is voluntarily contributed and is posted AS-IS
 - ☀ Verification that data is all-return
 - ☀ Verification of data's Coordinate Reference System
- ☀ Data format, condition, and quality vary widely
 - ☀ ASCII (variable content/structure) or LAS (maybe compliant?)
 - ☀ All-Return or First/Last (early legacy datasets)
 - ☀ Classified or “raw”
 - ☀ With overlap or trimmed (for swaths, tiles, and swaths within tiles)
 - ☀ Wide range of accuracy, density, and “cleanliness”



CLICK: Data Download

Light Detection and Ranging (LIDAR) Viewer provides free online data with NED, SRTM, Landsat, maps, orthoimagery, elevation and more. - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://lidar.cr.usgs.gov/LIDAR_viewer/viewer.php

Light Detection and Ranging (LIDAR)...

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Light Detection and Ranging (LIDAR) [Go to viewer Intro](#) [Back to CLICK Webpage](#)

Zoom

Out In XY

Query

Y Z X

Tools

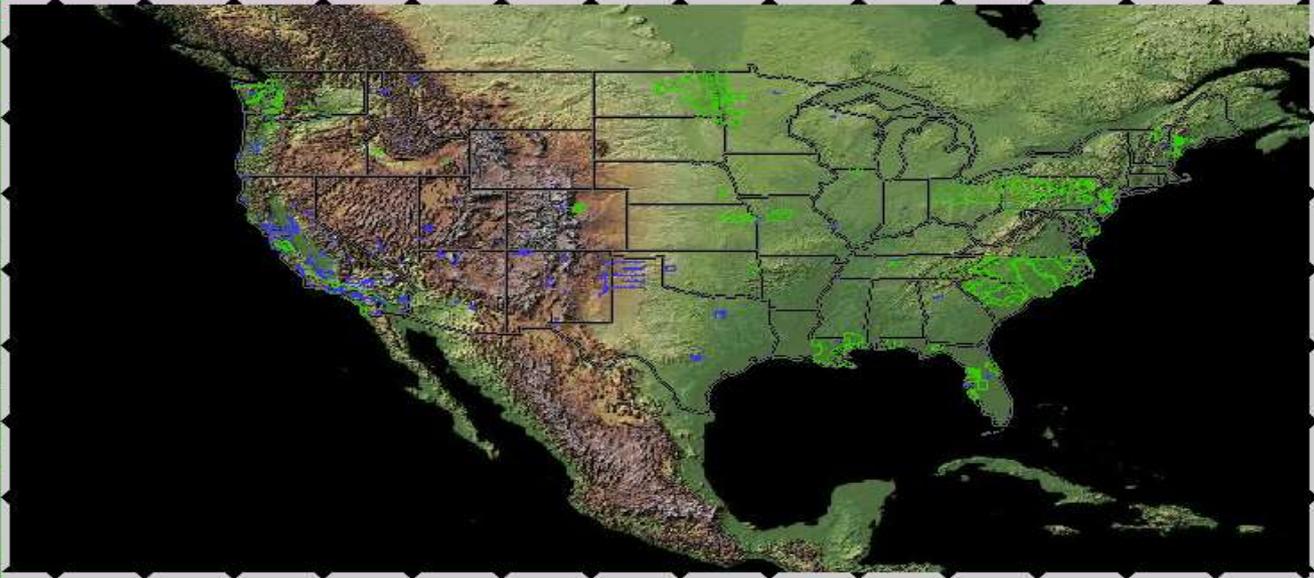
Hand Print Erase

Downloads

Download

Documents

Documents



Scale Information

Out In

Scale = 1:43,698,628

Layers

- Transportation
- Boundaries
- Hydrography
- Orthoimagery
- Land Cover
- Elevation

U.S. Department of the Interior | U.S. Geological Survey | USGS for Earth Resources Observation and Science (EROS)
URL: /Lidar_viewer/ | Last Update: May 4, 2004 || Maintainer: [Comments and Suggestions](#) | [Disclaimer](#)

Transferring data from toposervices.cr.usgs.gov...



CLICK Tidbits

- ☀ Currently have 1,375 members from 65 different countries.
- ☀ Official TerraSolid Support forum.
- ☀ Official Applied Imagery Support forum (QT Modeler)
- ☀ Official ITT ENVI LIDAR forum.
- ☀ Highlighted and on front cover of the June 2006 edition of PE&RS.



CLICK versus NED

CLICK

- Lidar point clouds
- All-return (some first-last)
- Tiled delivery (few swaths)
- Original format (ASCII, LAS)
- Zipped with metadata
- No bulk delivery
- Condition: As-Received

NED

- Raster DEMs
- 3 resolutions
- Seamless delivery
- ArcGRID format
- Zipped with metadata
- Bulk delivery available
- Consistent USGS standard

Orphaned Data (not yet available)

- Extracted point sets (ie, bare-earth, 1st-Return, etc.)
- Breaklines



Questions?

jmenig@usgs.gov

CLICK email: lidar@usgs.gov

