West Central Regional Advanced LiDAR Workshop

Ray Fox

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National Enhanced Elevation Assessment (Dewberry, 2011)

- Sponsored by the National Digital Elevation Program (NDEP) and funded by USGS, NGA,FEMA, NRCS and NOAA to:
  - Document national requirements for improved elevation data from technologies such as LiDAR and IfSAR
  - Estimate the benefits and costs of meeting these requirements
  - Evaluate multiple national enhanced program scenarios
- 602 mission-critical activities that require enhanced elevation data were identified by:
  - 34 Federal agencies
  - 50 states
  - A sampling of local governments, tribes, private and not-for profit organizations

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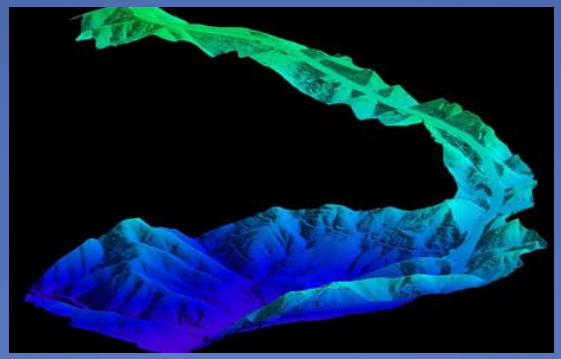
Example Functional Activities (Needs)

602 Functional Activities documented from 34 Federal agencies, 50 States and Territories and from sampled non-profit, industry, local governments and tribes

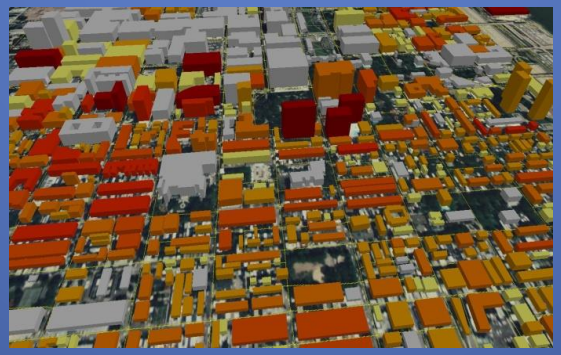
Precision Farming



Land Navigation and Safety

Geologic Resources and Hazards Mitigation

Natural Resource Conservation



Infrastructure Management

Flood Risk Mitigation

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3D Elevation Program

- Following Assessment, 3DEP initiated
- National Program to acquire high resolution elevation data
- Goal is to be operational by 2015 with complete coverage by 2022.
- Program has potential to generate 13 billion a year in new benefits

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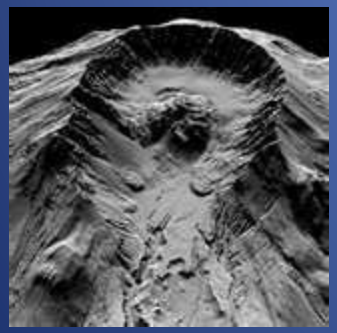
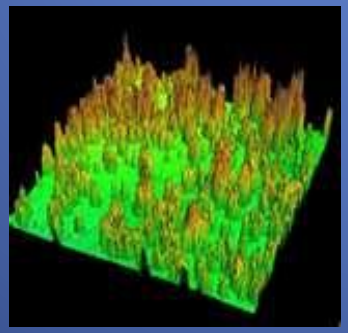
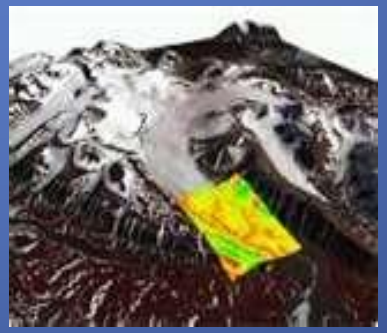
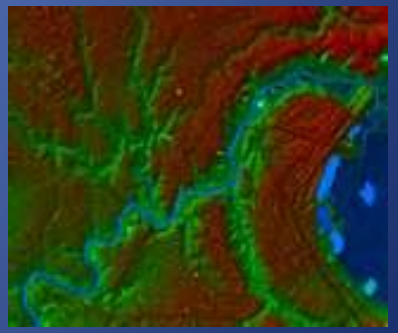
Introducing 3DEP

- Proposing a cooperatively funded national enhanced elevation program executed by USGS
- Higher quality LiDAR data for 49 states, IfSAR in Alaska
- Goal is an 8 year acquisition cycle
- Bare earth elevation, point cloud and other basic derivatives (TBD) will be distributed and archived

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Benefits of a Funded National Program

- Economy of scale- larger projects reduces costs by 25%
- Systematic Plan- Acquire at higher quality level reduces costs of “buying up”
- Higher quality level and national coverage- span State and watershed boundaries
- Increase in Federal agency contributions- reduce state and local contributions

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Quality Levels
QL 2 recommended

Quality Level	Horizontal Point Spacing (meters)	Vertical Accuracy (centimeters)	Description
1	0.35	9.25	High Accuracy and resolution LiDAR
2	0.7	9.25	Medium-high accuracy and resolution
3	1-2	<18.5	Medium accuracy and resolution – analogous to USGS specification v 1, and most data collected to date
4	5	46-139	Early or lower accuracy LiDAR and photogrammetric elevations produced from aerotriangulated NAIP imagery
5	5	93-185	Lower accuracy and resolution, primarily from IfSAR

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Consistent standard and specifications

- Cartographers want a hydro flattened elevation model
- Hydrologists want a hydro enforced elevation model
- Others want the first and second returns along with the bare earth
- Possible to satisfy all users, needs to be in the contract

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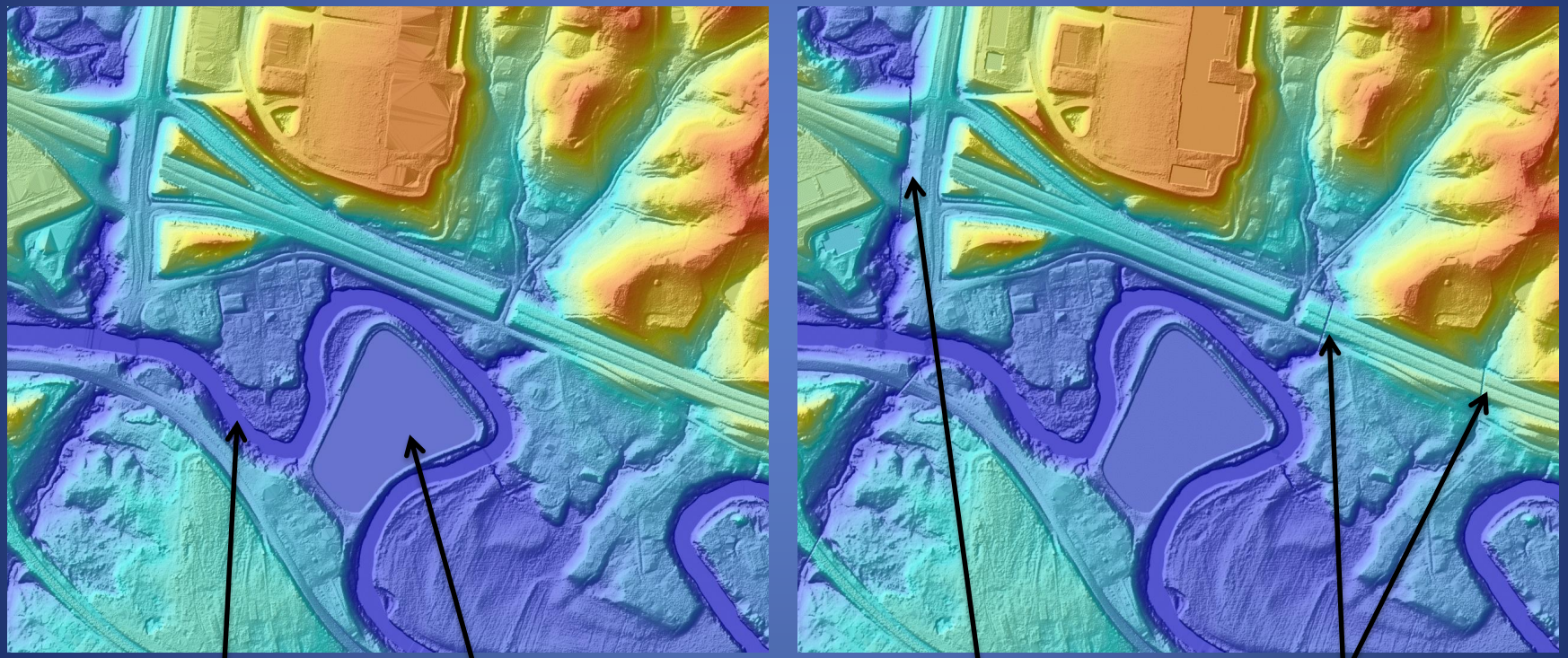
Hydro flattened, enforced

Hydro Flattened
(Topographic Surface)

Hydro Enforced
(Hydrologic Surface)



Stream

Water body

Culverts Cut Through Roads

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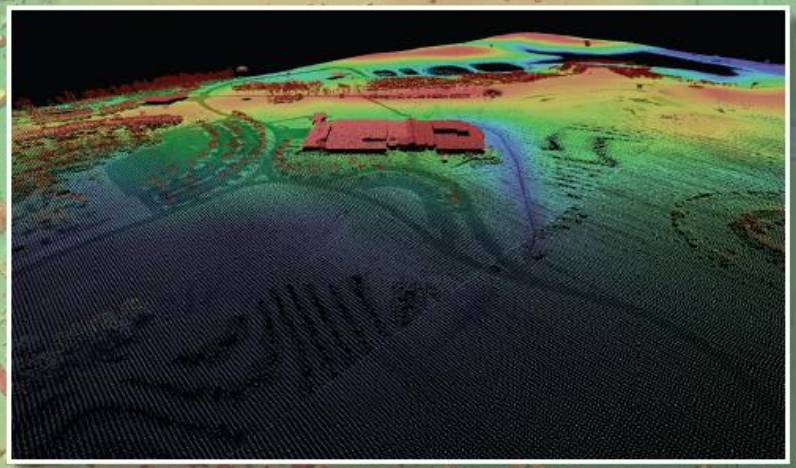
National Geospatial Program

Lidar Base Specification Version 1.0

Chapter 3 of
Section B, U.S. Geological Survey Standards
Book 11, Collection and Delineation of Spatial Data



Techniques and Methods 11–B3

U.S. Department of the Interior
U.S. Geological Survey

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Missouri Lidar Use

- Emergency response – flood prediction modeling, floodplain mapping, flood flow modeling, risk determination
- Dam breach inundation mapping
- Soil and wetland conservation
- Highway design
- Park and conservation area design
- Geologic analysis- New Madrid, heavy metal deposits, karst topography
- Urban and regional planning

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Data Development Committee

- Committee consists of Federal, State, Regional, Local, and Private Industry
- Started in 2004, initial purpose was to acquire state wide imagery
- We meet quarterly either in person or by phone bridge.

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Lidar Stakeholders Group 2009

- Came about to pool resources for LiDAR collection, economy of scale
- Those agencies that have actively acquired Lidar asked to participate
- Includes SEMA, DNR, MDC, NRCS, USACE-KC, StL, Memphis, and RI, USGS, FEMA
- Won MAGIC GIS Coordination award in 2012

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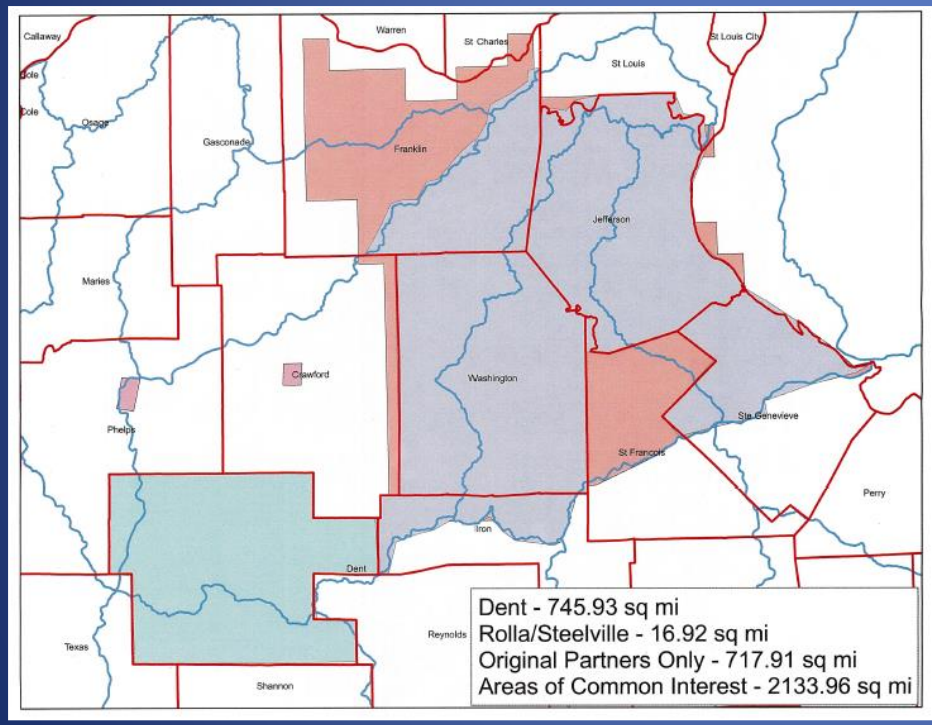
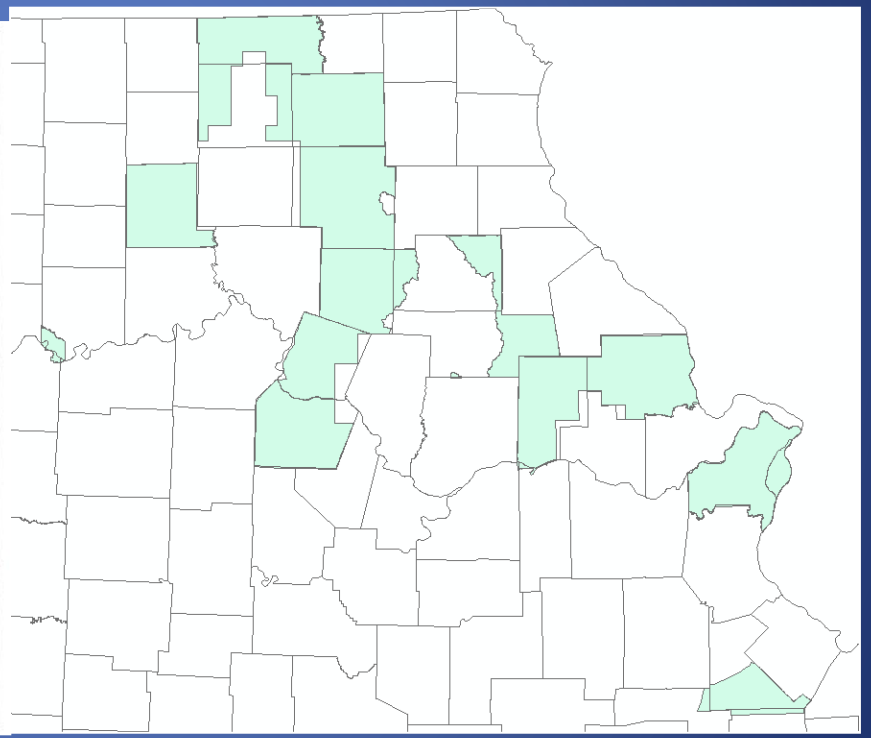
Stakeholder Projects

2011 Meramec



2012 Mo Grand



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2013

- NRCS upgraded the upper Grand watershed and Dunklin County. Both were processed for RISKMAP, reprocessed to 18.5 cm RMSE.
- Perry County, Mississippi river bluff to bluff
- Schell-Osage Conservation area in work

2014

- NW Missouri

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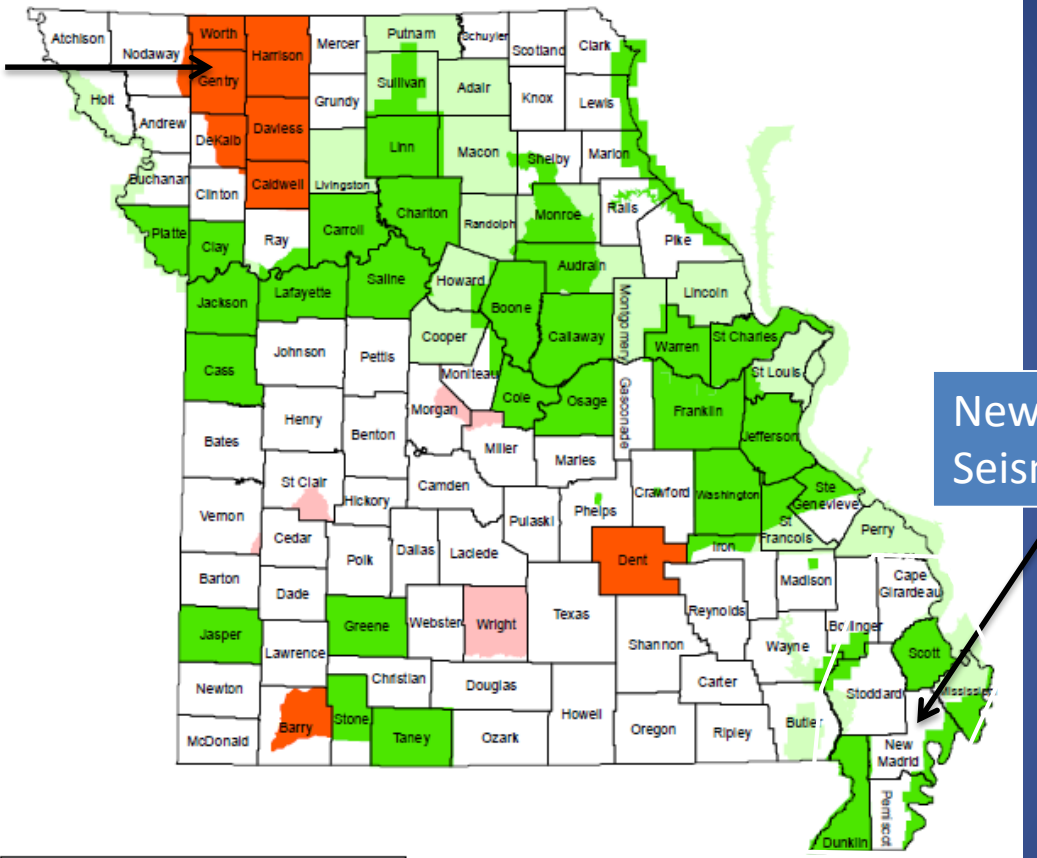
Upper Grand

Status of Elevation mapping from Airborne LiDAR in Missouri



New Madrid Seismic Area

Legend

Status

- Complete: RMSE <=18.5cm
- In Progress: RMSE <=18.5cm
- Complete: RISKMap specs
- In Progress, RISKMap specs

NOTE: RMSE (Root Mean Square Error) is the square root of the average of the set of squared differences between the modeled (DEM) elevation values and known elevations from an independent surveyed source. The overall vertical accuracy of a DEM is 1.96 times RMSE at the 95% confidence level.

RISKMap specs vary some, but generally have an RMSE of 72.6cm and only the floodplain areas are processed into DEMs. For more details on RISKMap see www.fema.gov/library/viewRecord.do?id=4345

Updated June 2012

Map provided
By Liz Cook, NRCS

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How do I get my City, County, region collected?

- Let a Stakeholder know (St Francois County added in 2012 due to local need)
- If you have funding it makes your area much easier for partnerships, otherwise it depends on our (stakeholders) having the need.
- There is an economy of scale

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Where to get data

- MSDIS website (msdis.missouri.edu/), data is available for download from their Washington University partner.
  - Go to Data tab, Lidar data
- USGS earthexplorer (earthexplorer.usgs.gov/). All Lidar data accepted by USGS is available for download here.

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Questions, Discussion

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