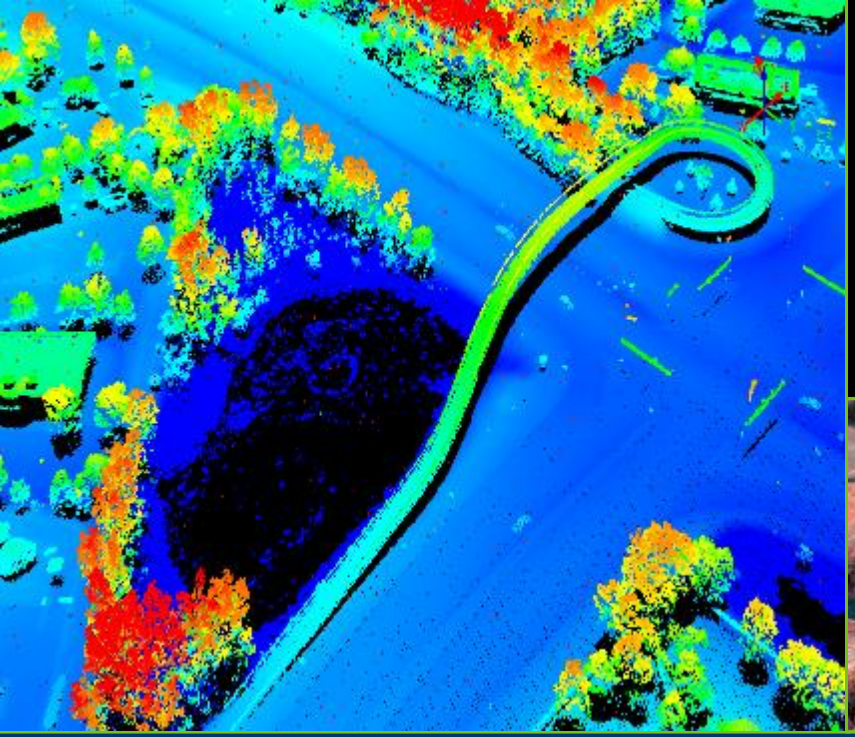
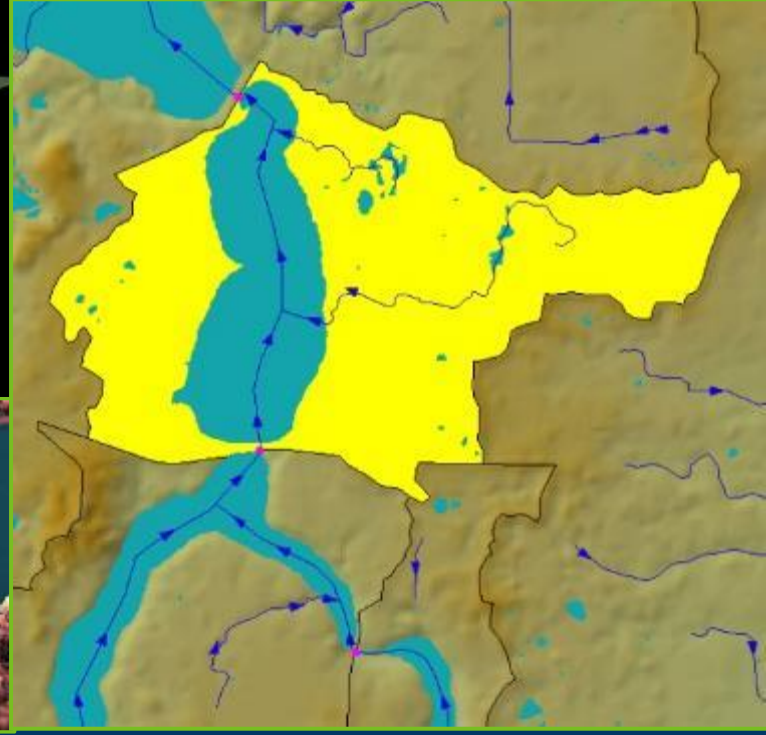


3DGeo Stakeholder Coordination: Stevens County

Red River South LAB - Discussion

Tuesday June 15th, 2021 - 10:00 – 10:30

Presented by the Geospatial Advisory Council (GAC) - 3D Geomatics Committee's Data Acquisition Workgroup

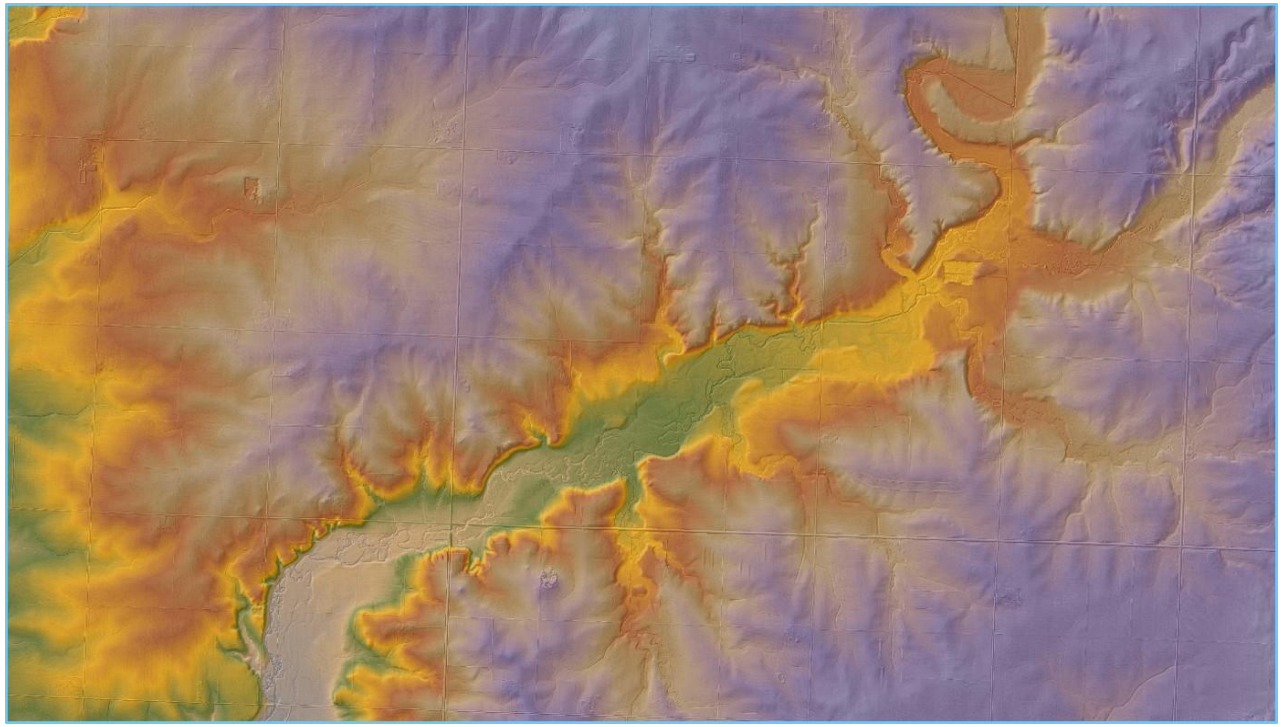
Dan Ross

Sean Vaughn

MINNESOTA GEOSPATIAL ADVISORY COUNCIL

Goals for today

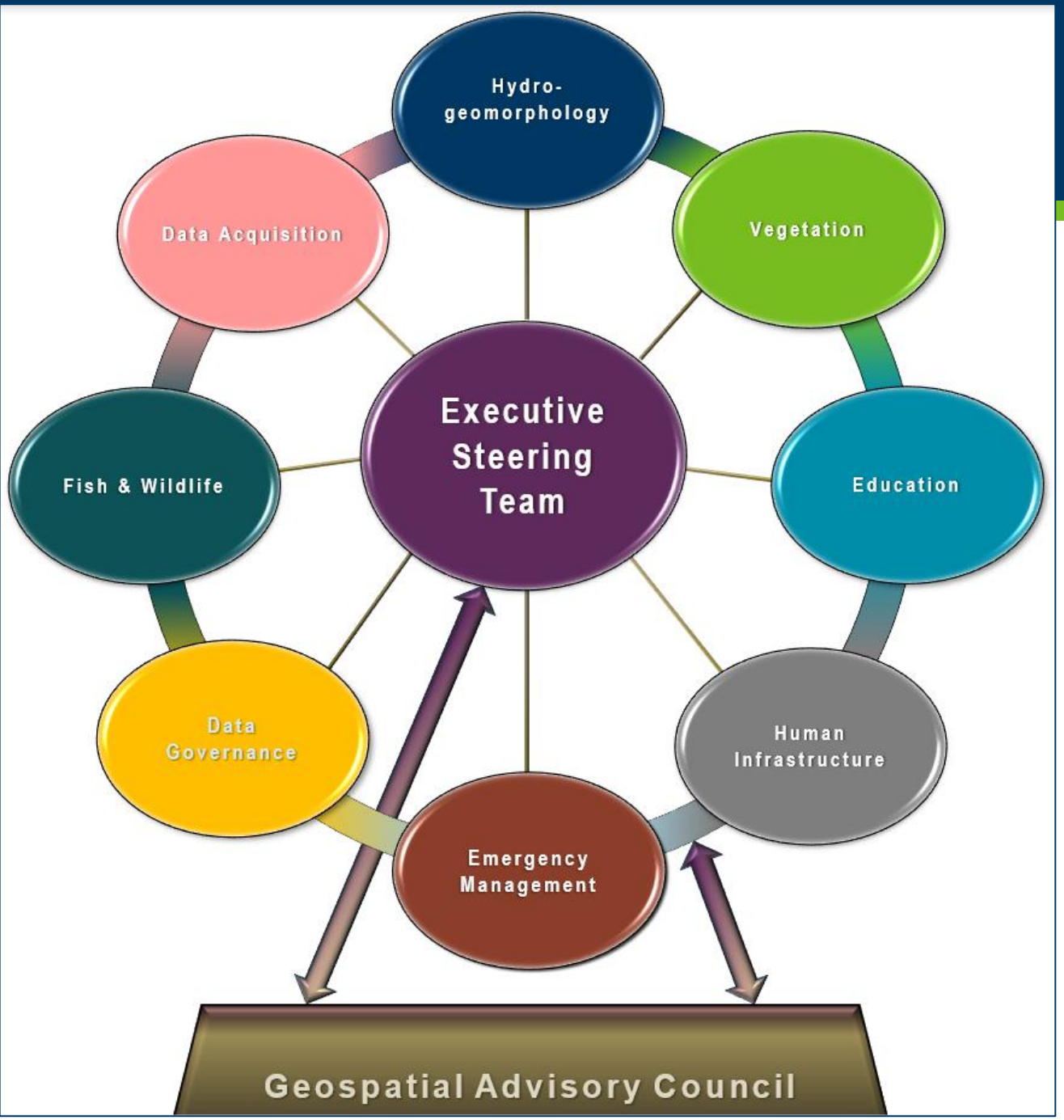
- Who is 3D Geomatics (**3DGeo**)?
- What is the **Minnesota Lidar Plan**?
- 3DGeo Outreach and status
  - Where are 3DEP **lidar acquisitions** going currently and planned?



Acronyms

✓	3DGeo	3D Geomatics
✓	3DEP	USGS 3D Elevation Program
✓	BAA	Broad Agency Announcement
✓	IGCE	Independent Cost Estimate

Coordinating Minnesota's Lidar Acquisition



3DGeo Workgroups

3D Geomatics Committee?

- The ***3D Geomatics Committee*** (**3DGeo**) is a committee under GAC that works to identify and promote the need for planning, funding, acquisition, and management of three-dimensional geomatic data and derived products.

Data Acquisition Workgroup

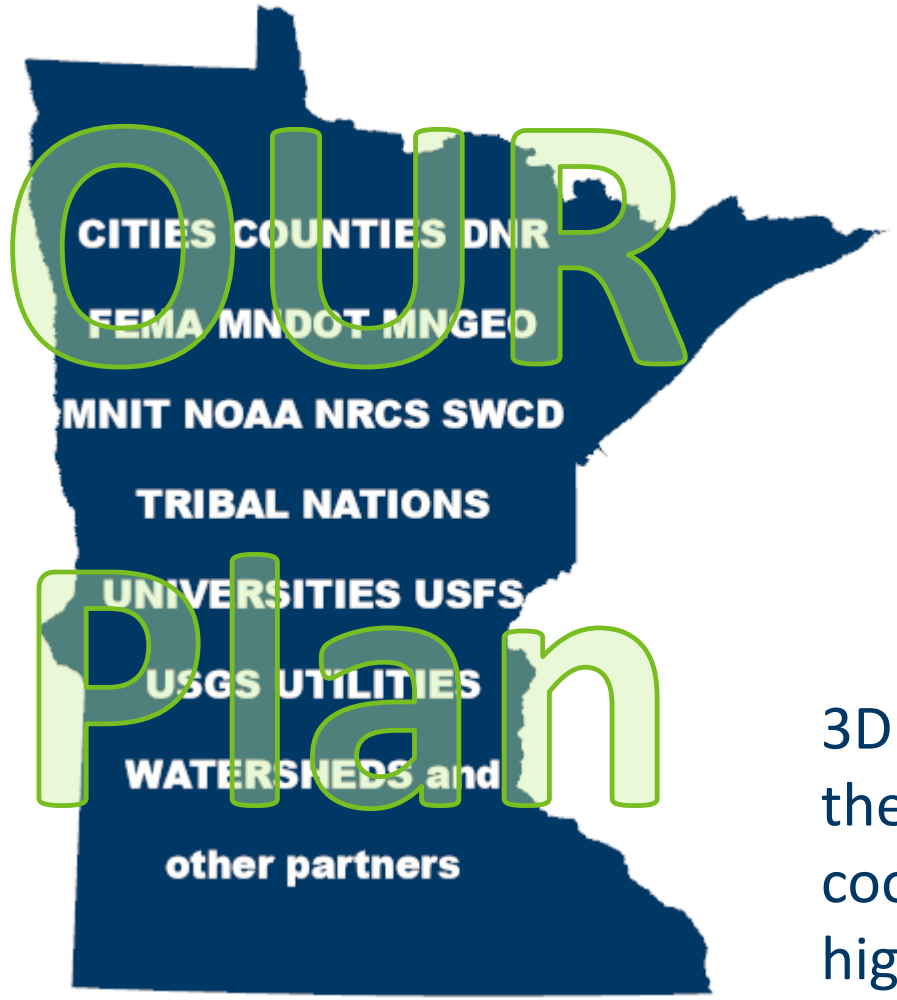
- Promotes procurement of foundational 3D data (Lidar) for Minnesota.

Co-Chairs
Sean Vaughn, Alison Slaats, and Gerry Sjerven

Executive Liaisons
Dan Ross and Tim Loesch

Minnesota Lidar Plan

Minnesota Lidar Plan - Our Plan – Your Plan – One Plan

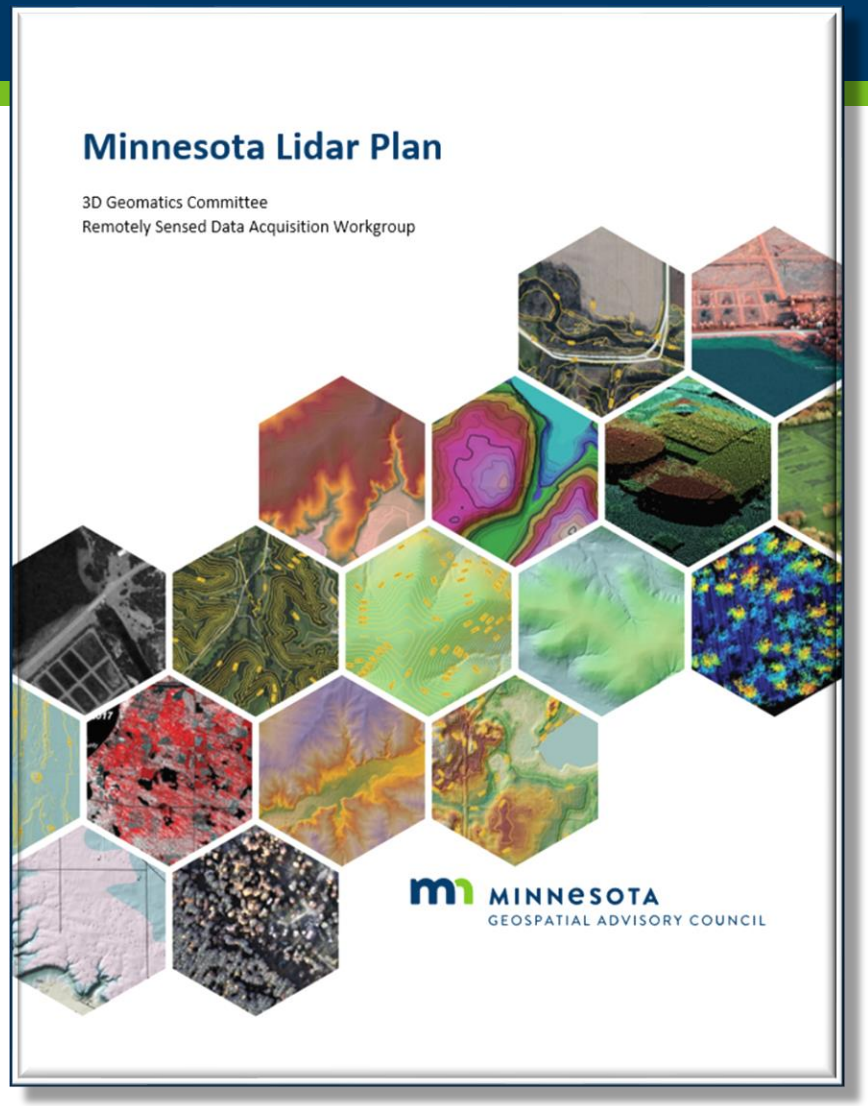


The Minnesota Lidar Plan

- **One** plan for Minnesota
- **Committee** led plan, not a state agency plan
- **Collaboration** of the geospatial community
- **Coordination** of lidar acquisition in Minnesota leverages federal match dollars

3DEP grant success is built on a guiding plan that pulls the community together to foster collaboration and coordinate funding to achieve the common goal of high density lidar acquisition across Minnesota

Minnesota Lidar Plan and StoryMap



https://www.mngeo.state.mn.us/committee/3dgeo/acquisition/Minnesota_State_Lidar_Plan.pdf

http://bit.ly/MnLidarPlanStoryMap

Lidar Planning – Background

- Lidar acquisitions are coordinated by the GAC's **3DGeo Committee**
- Minnesota's Lidar Plan divides up the state into **lidar acquisition areas** (LAA) based on political (county) and watershed boundaries
- **Grant funds** are available from USGS for lidar acquisition because there is a local-to-national scale need for a seamless nationwide DEM elevation layer
- 3DGeo is working to coordinate lidar acquisition with local, federal, and state **partnerships**
  - Leveraging **USGS federal funding opportunity**
- **Economies of scale** are achieved when partners collaborate across landscapes
  - The bigger the collection footprint, the lower the cost

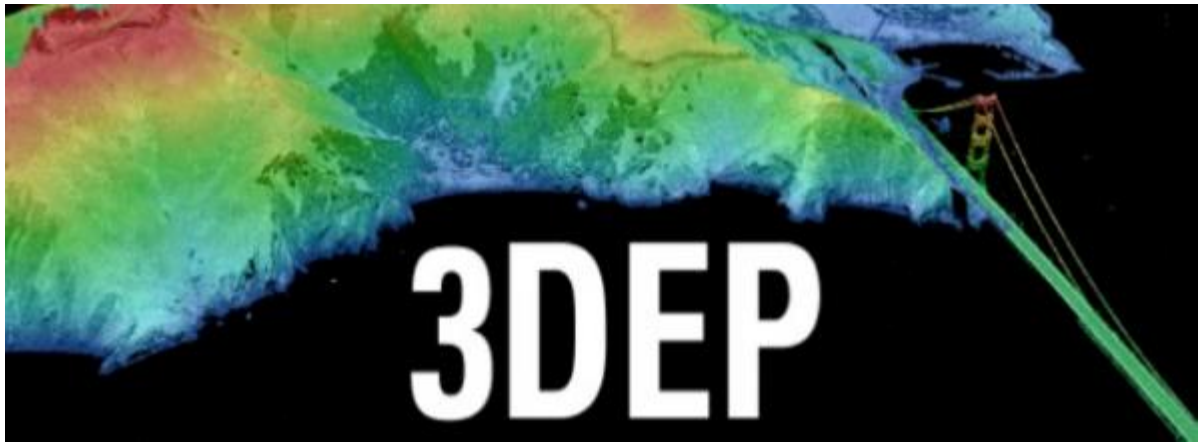
3DEP

(Federal Coordination and Grant)

USGS 3D Elevation Program (3DEP)

3D Elevation Program (3DEP)

- **Systematically** guiding the collection of 3D elevation data in the form lidar data for the United States, and the U.S. territories
- Goal: elevation dataset for the nation **by 2023**
- The first-ever national baseline of **consistent** high-resolution elevation data
  - Both bare earth and 3D point clouds – collected in a timeframe of less than a decade.



USGS 3D Elevation Program (3DEP) - BAA

3DEP uses Broad Agency Announcement (BAA)

- **Grant coordinating** mechanism 3DEP, Guides partnerships between the USGS and other Federal
- Grants through "BAA" process – **deadlines** are every fall (Oct/Nov)

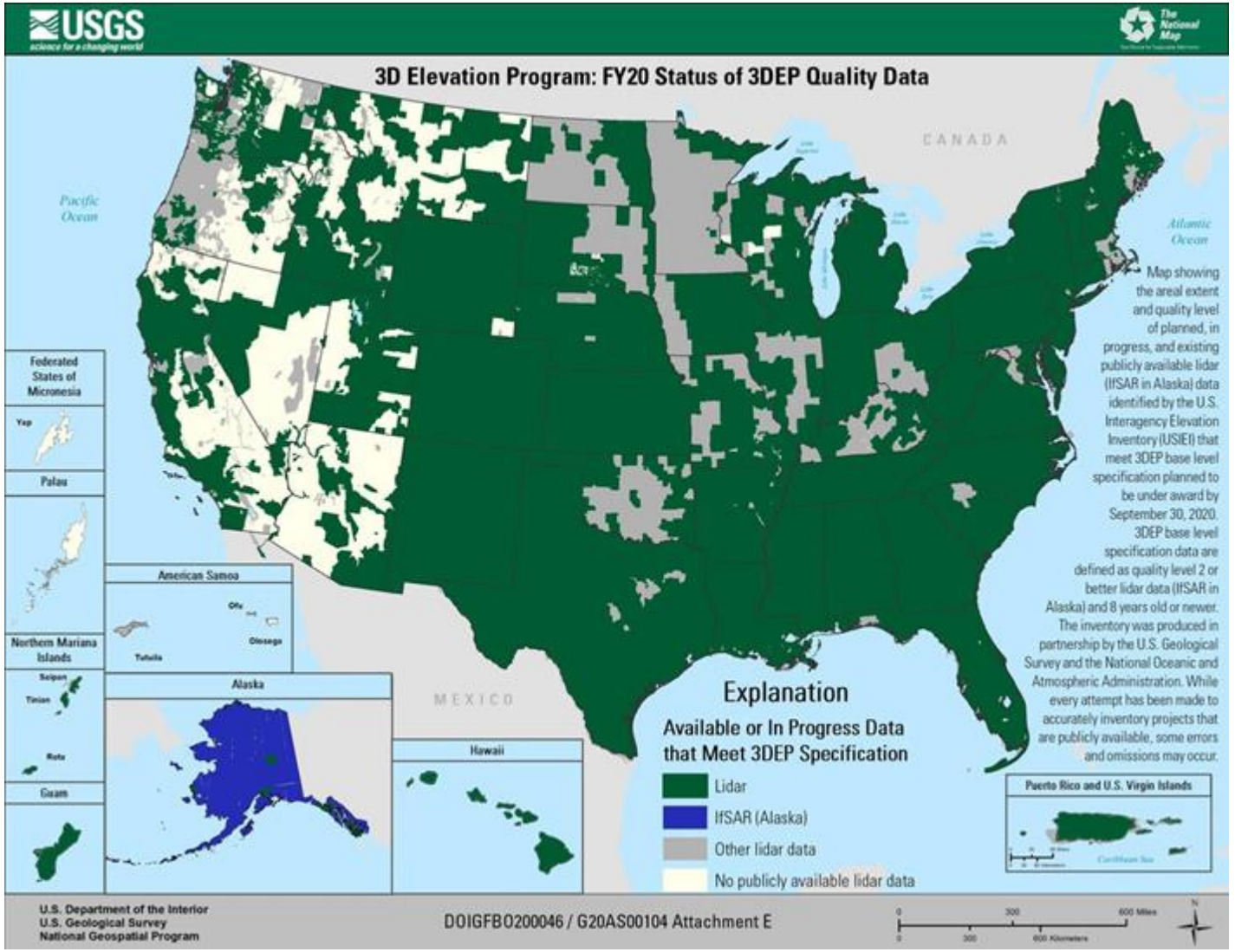
USGS Cost-sharing

- Contributing 60% to 75% to our efforts

Contributions to Minnesota (millions)

- Minnesota Partners: $3.15
- USGS 3DEP: $6.18
- Other Federal $0.448

Total: $**9.77**M



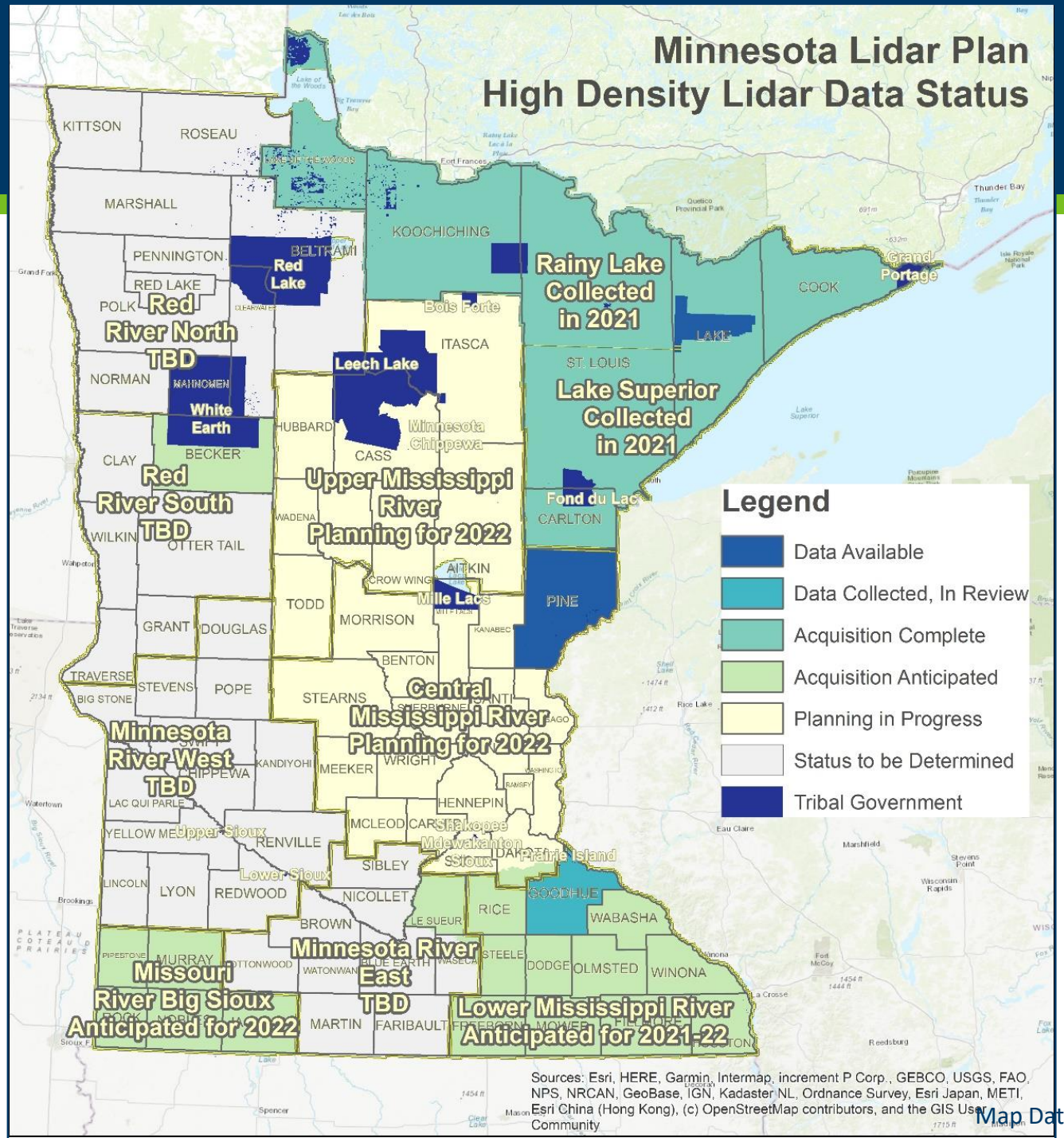
3DGeo Funding Timeline

3DGeo timeline for 3DEP funding is:

- **October**
  - Counties and other partners indicate their interest and fill out an “Attachment D” form to indicate the funds they are willing to contribute.
- **November**
  - Grant request (BAA) submitted (assuming enough partners participate to make a grant proposal feasible)
- **Late December/January**
  - USGS notifies the team whether the grant application was successful
- **January/February**
  - JFAs/JPAs are organized and signed (ideally USGS would like JFAs/JPAs to be complete 90 days before lidar acquisition occurs)
- **February onwards:**
  - Invoices are sent and partners send funds.

Lidar Activities

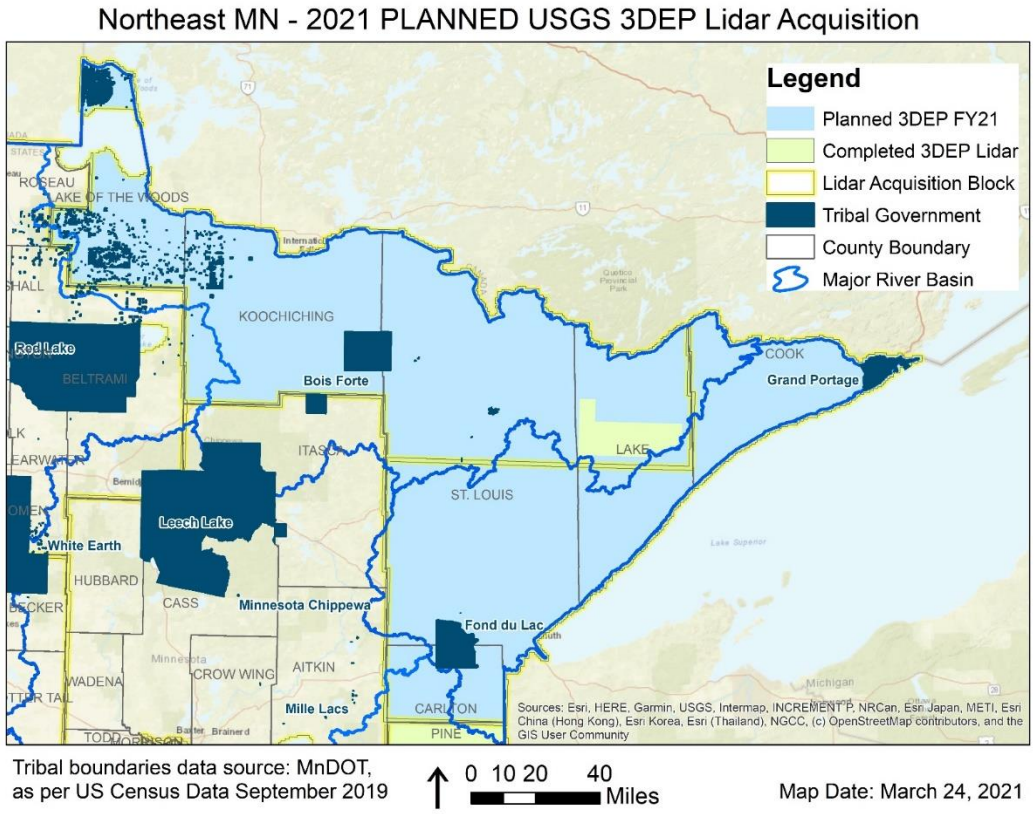
3DGeo Lidar Acquisition Blocks (LAB) of Interest

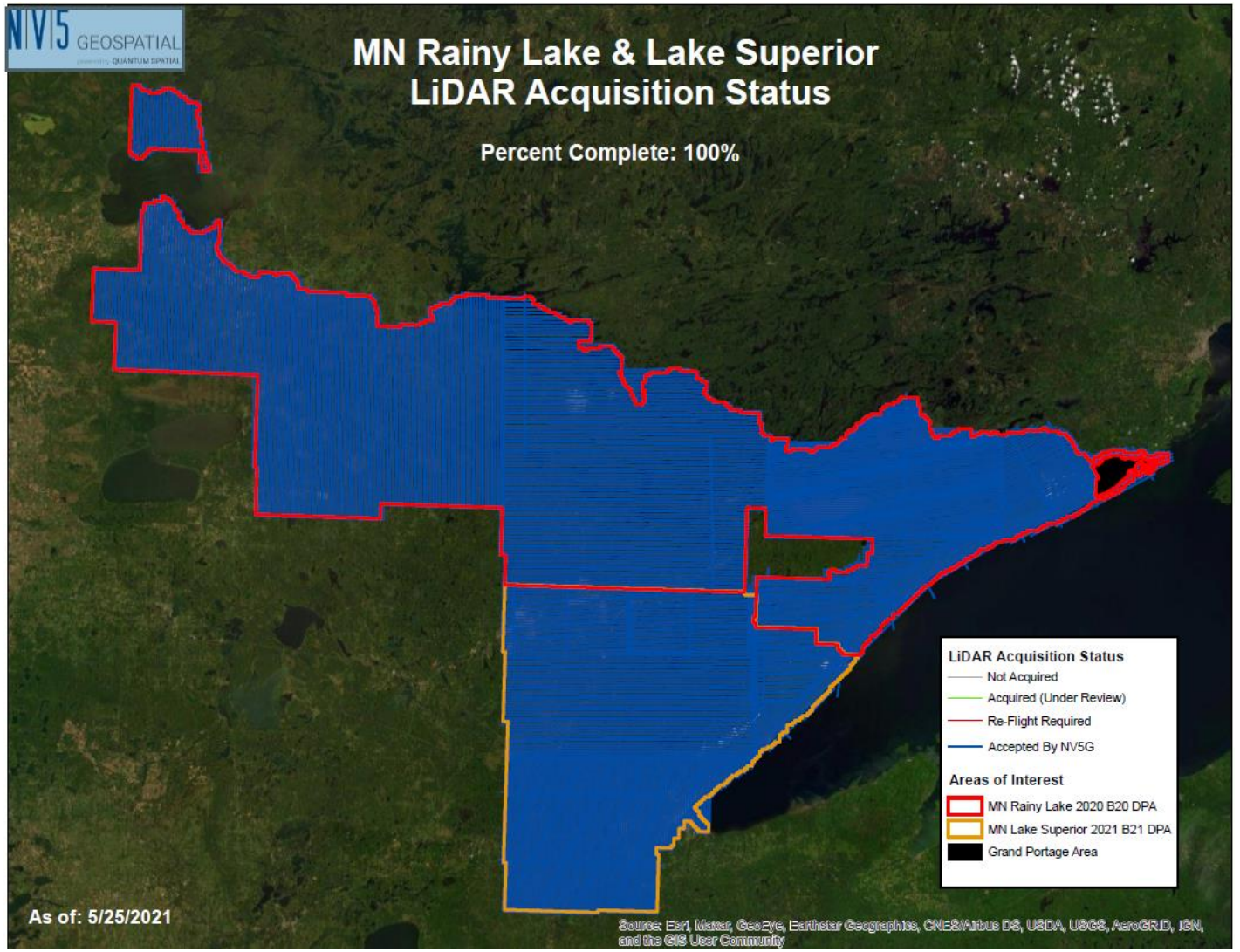


Map Date: May 2021

Lidar Acquisition: *Northeast – Rainy Lake & Lake Superior Block*

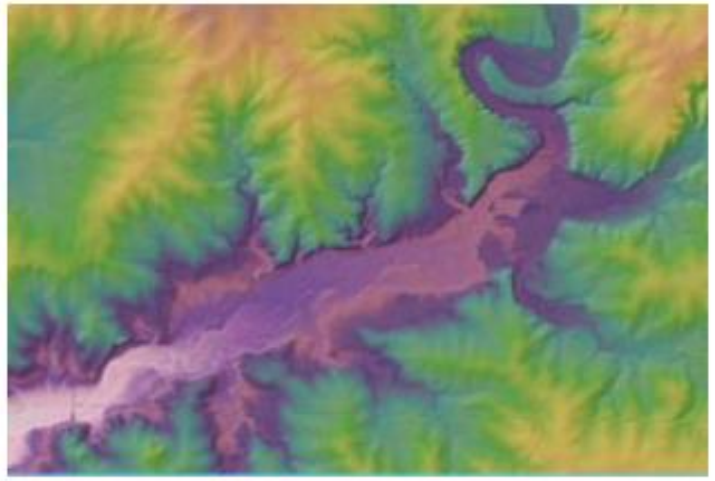
- Rainy Lake and Lake Superior Block data collections are complete!





3DGeo Outreach: *LAA Coordination for BAA Submission*

Reminder: Upcoming Minnesota Lidar Plan Meetings

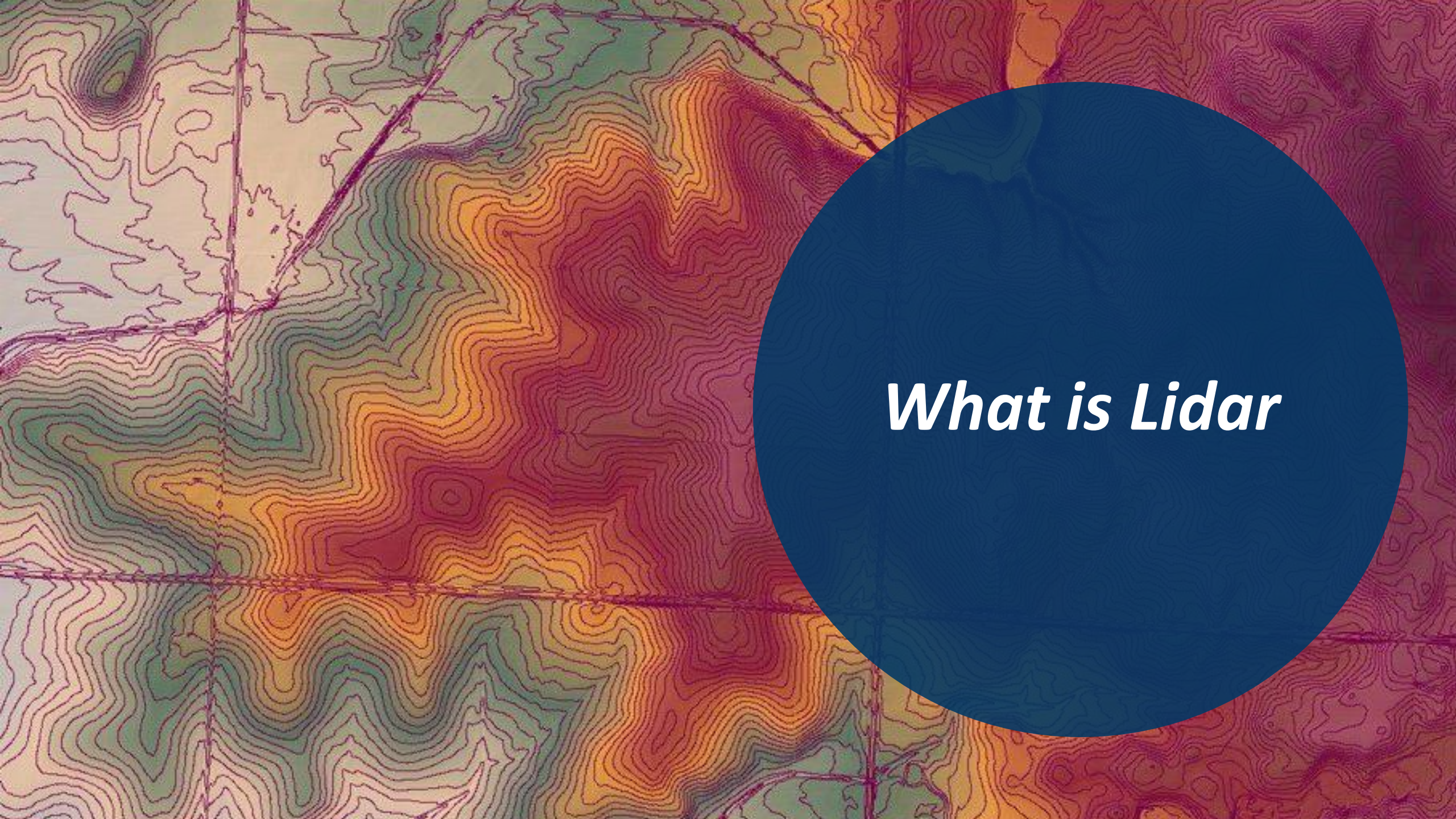


The Geospatial Advisory Council's 3D Geomatics (3DGeo) Data Acquisition Workgroup is working toward the collection of **new high density lidar data for Minnesota**. The Lidar StoryMap and the Minnesota Lidar Plan provide background information, and additional resources including Lidar Acquisition Area maps can be found on the Data Acquisition Workgroup webpage.

3DGeo will offer several online lidar meetings over the next few weeks. The upcoming meetings will focus on lidar acquisition planning and funding in specific Minnesota regions. See the map of lidar acquisition blocks to find your area:

- Upper Mississippi River: **Tuesday May 11, 2:00 pm - 3:30 pm**
- Central Mississippi River: **Thursday May 20, 9:00 am - 10:30 am**
- Minnesota River East and West: **Tuesday May 25, 2:00 pm - 3:30 pm**
- Red River North and South: June meeting, date/time TBD

To join any of these meetings, please RSVP to lidar@state.mn.us. Let us know which meetings you'd like to attend and we will send the WebEx invitations.


What is Lidar

What is lidar?

Lidar stands for light detection and ranging

- It is a **mapping technology** that uses a **pulsed laser** to measure the time it takes for emitted light to travel from a sensor to the ground or other objects and back.
- The sensor can **pulse** a laser beam hundreds of thousands of times per second
- Millions of returns ("**points**") are captured, resulting in a "point cloud" of three-dimensional measurements.

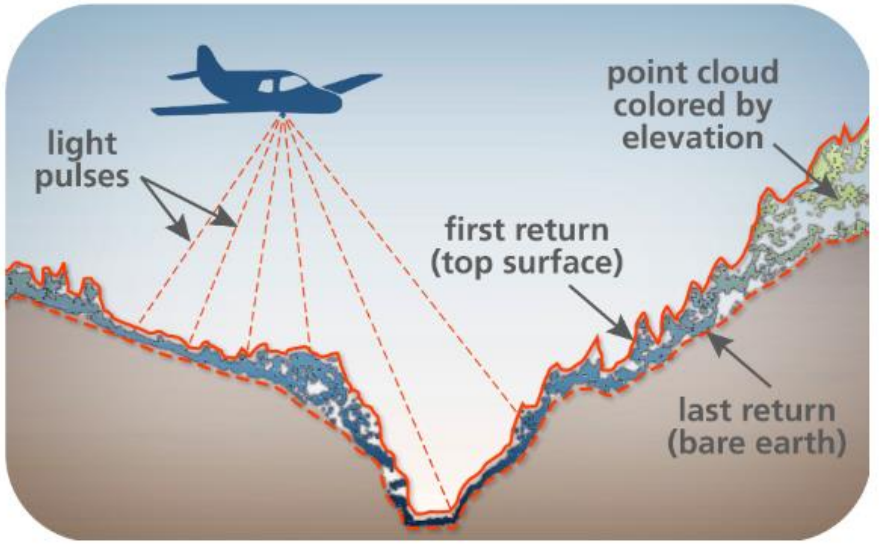
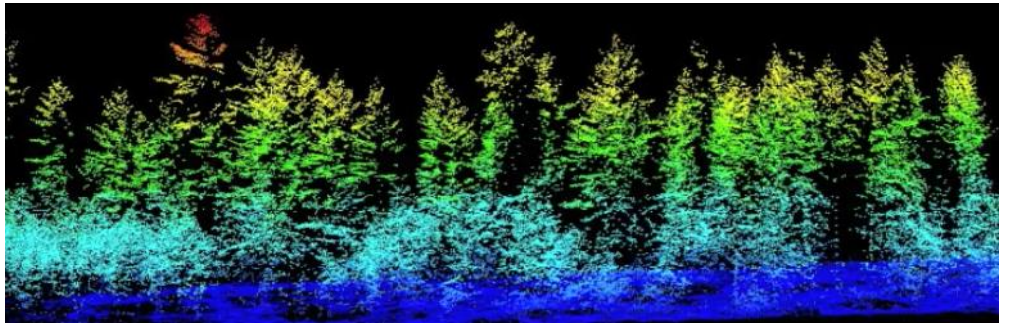
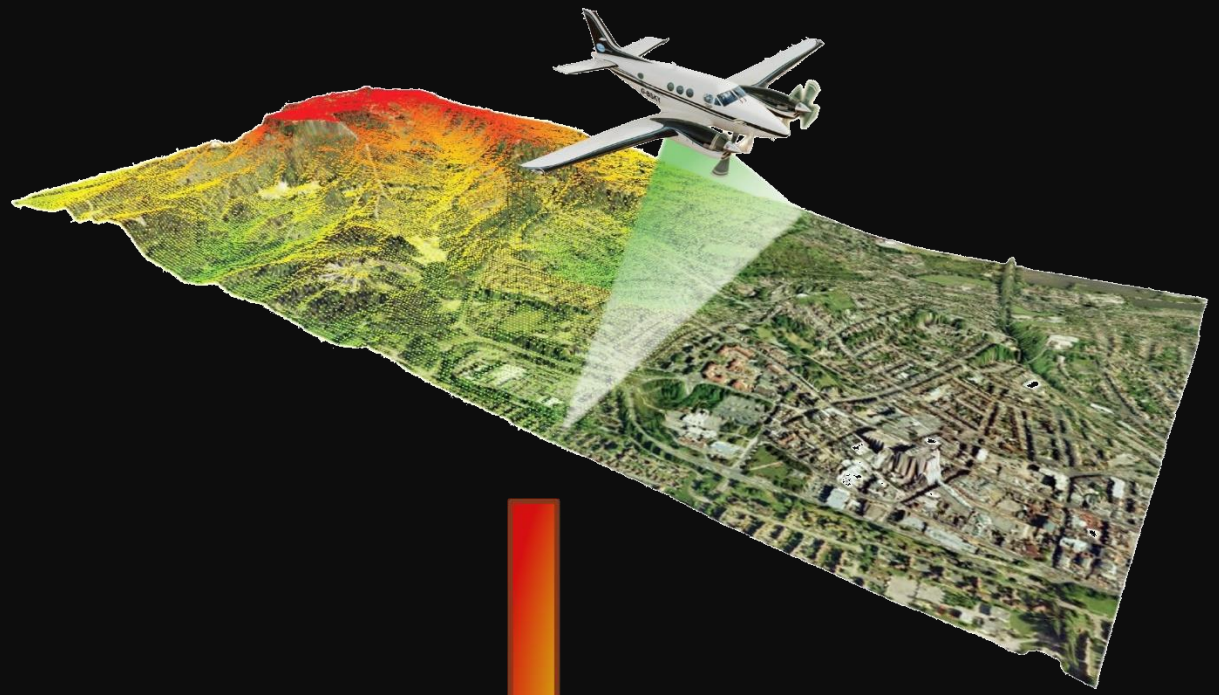


Image from the Washington Geological Survey



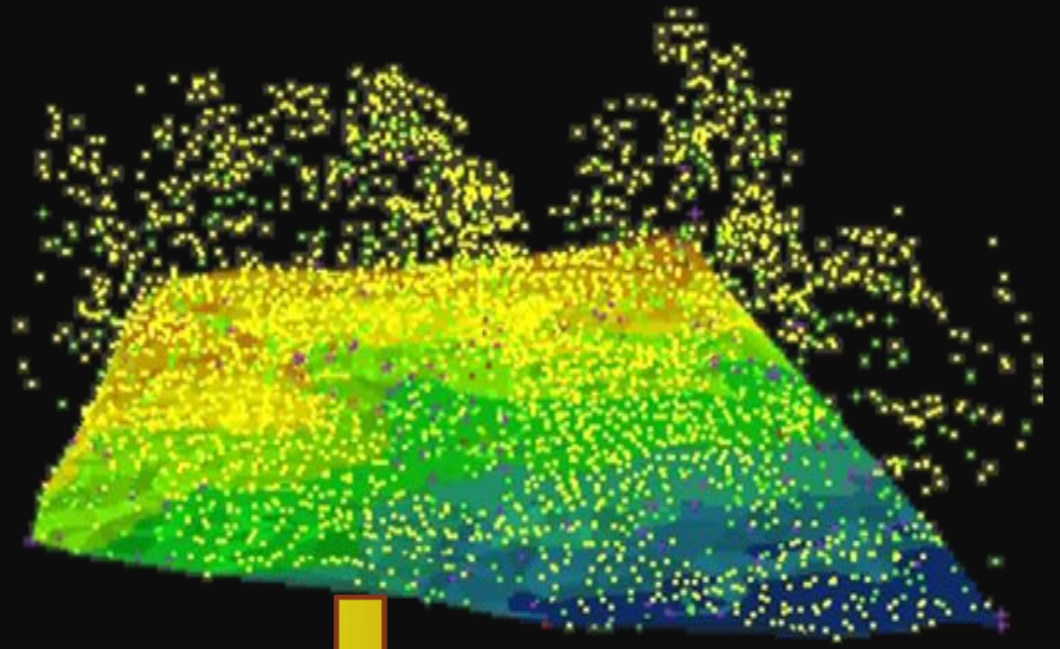
What is lidar? Lidar Acquisition → Point Cloud

Lidar Acquisition



Lidar Point Cloud

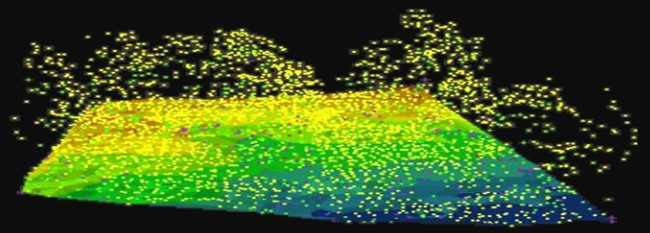
3D Rendition of Natural and Built Environments



Lidar Classification

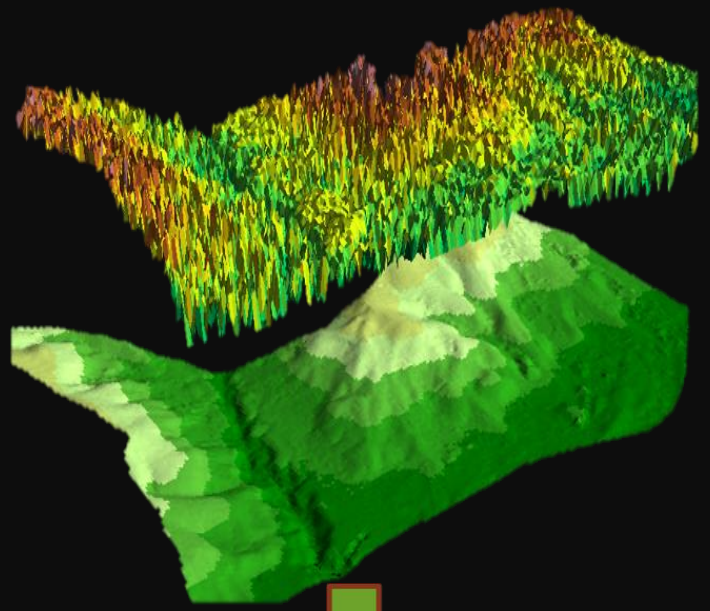
Painting the Lidar Point Cloud Elevation Values

What is lidar? Lidar Acquisition → Point Cloud → Classification → DEM

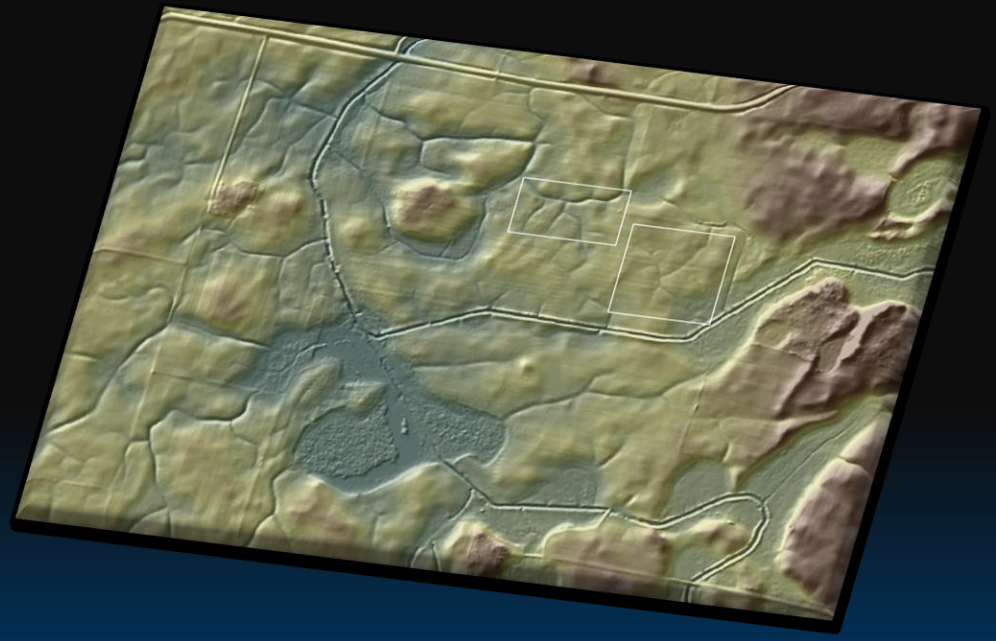


Lidar 3D Point Cloud

- Point Cloud Classification – Feature Identification and Separation of Data for Sector Application

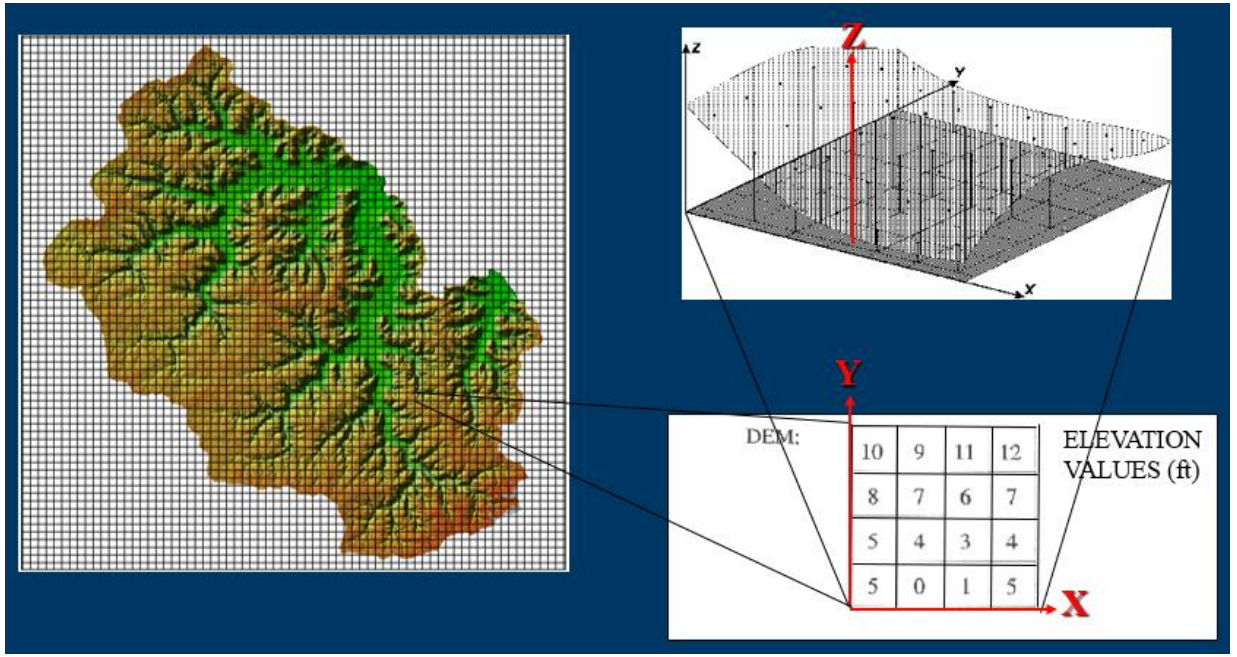


LiDAR-derived 3D Digital Elevation Model (DEM)



What is lidar? - DEM & Contours

- **DEM** stands for digital elevation model
  - A **digital representation** of the land surface.
- The DEM is a **derived product**
  - Represented as a gridded tessellation of the landscape built from Lidar-derived points with **elevation values** (Z).
- Topographic contours are a **derived product** (usually from the DEM)
  - Lines represent equal intervals **elevation values** (Z).



What is Lidar?

To Some Users Lidar Is:

- A 3D Point Cloud

To Some:

- 2-ft Contours
- Digital Elevation Model (DEM)

Note: The two most downloaded authoritative lidar-derived products from MnTOPO are the 2-ft Contours and the DEM.

To Some:

- Hydro-modified DEM & Hydrography
- High resolution contour dataset
- Human/built infrastructure: Buildings
- Vegetation: Forests and Trees
- Intensity, Digital Surface Model (DSM)
- And Many other products

Regardless what lidar is to you and your business needs, “lidar” begins with **collection of the lidar data** as part of a data procurement project, within a 3D Geomatics lidar acquisition block (LAB).


Examples:
High-density
Lidar

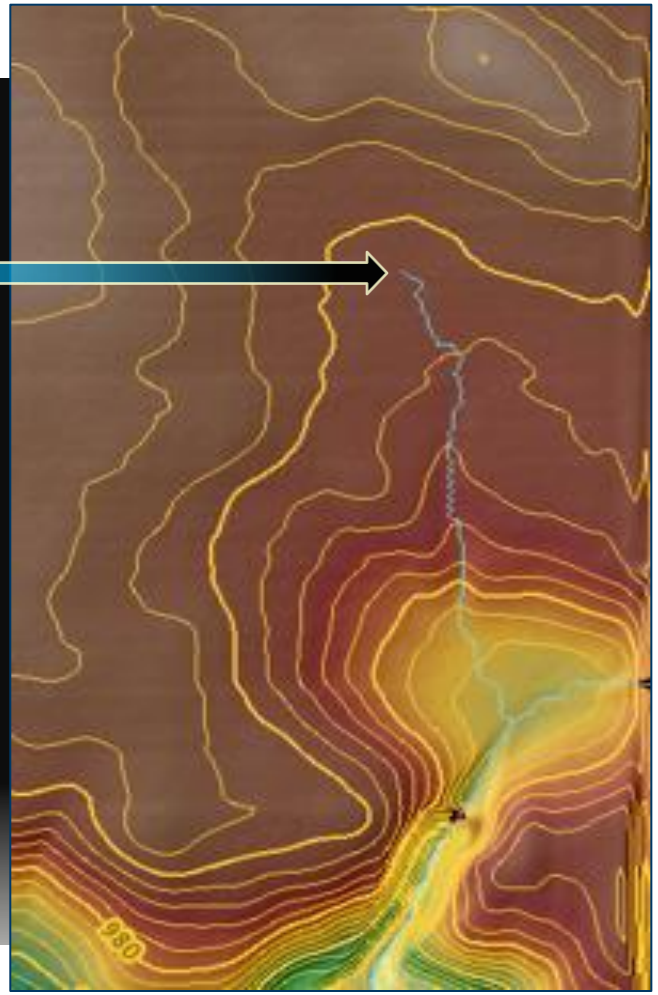
HD Lidar – Derived Products - Hydrography Example

WATER CONVEYANCE LANDFORMS

Mapping the Unmapped Hydrography

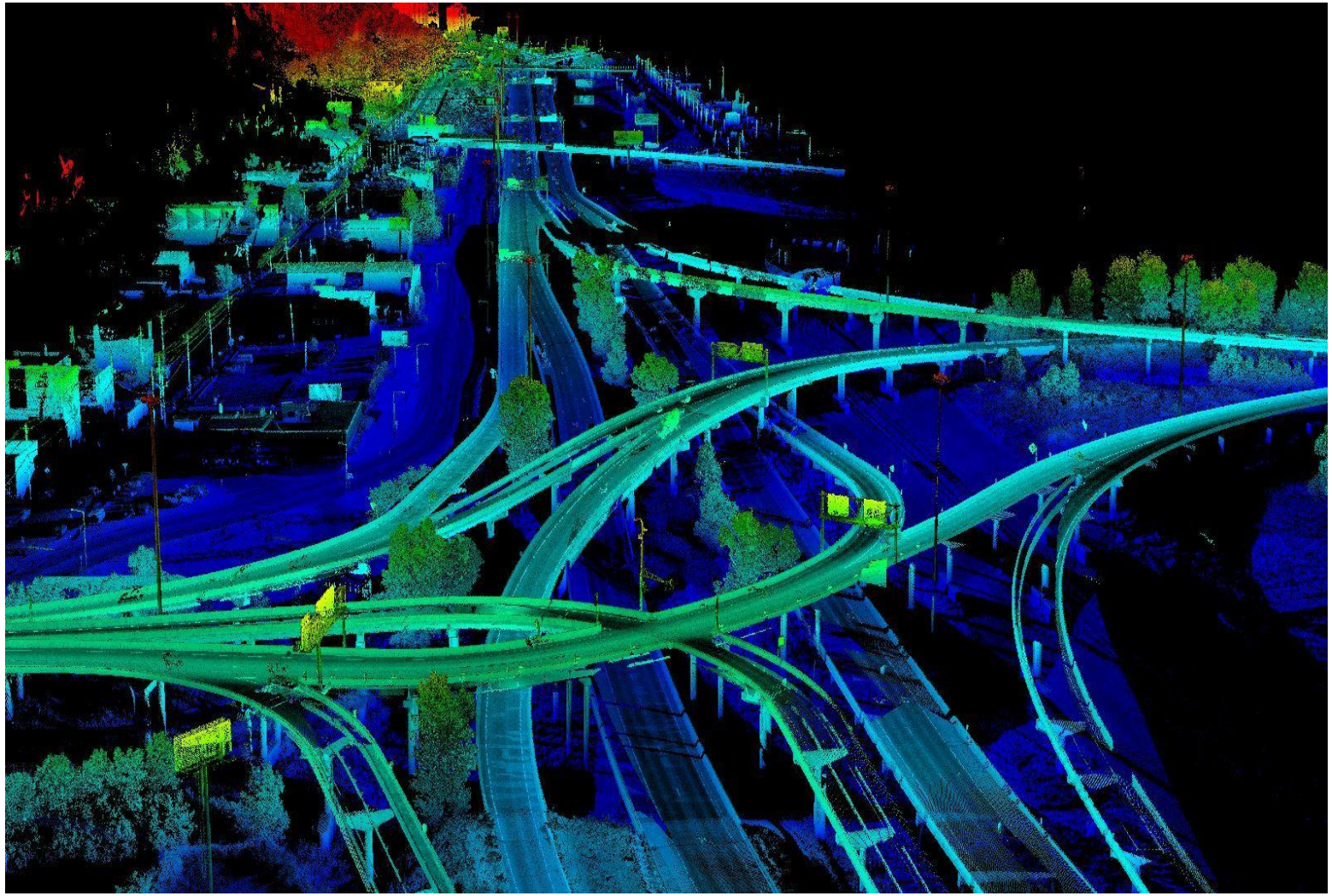
- Features of hydrologic Significance.
  - Nickpoint
  - Fluvial Processes
  - Soil Degradation
- Where does the watercourse begin ?
  - Where concentrated flow begins. LiDAR captures these landform.

We Model this with DEMs



HD Lidar Examples: MnDOT Infrastructure

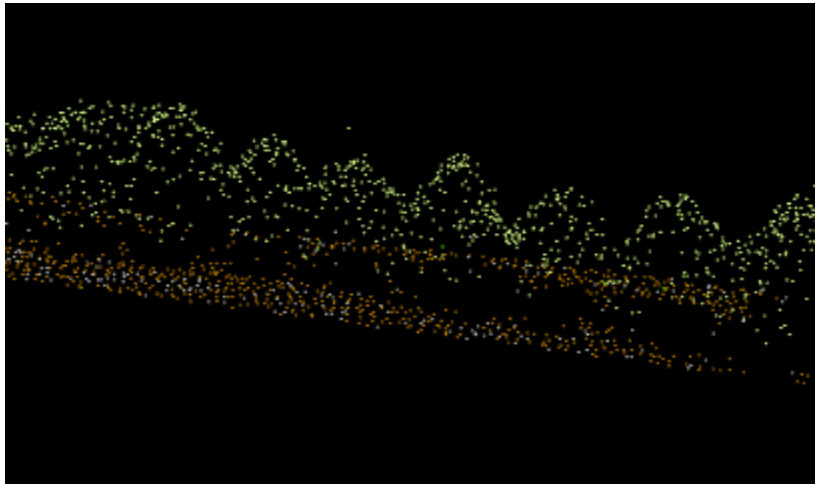
- Transportation
  - 3d Design
  - Traffic operations
  - Signing and striping
  - Highway safety
  - Maintenance
  - Asset management
- Energy
  - Traditional
  - Renewable/Alternative
- Cultural/Historical Resources

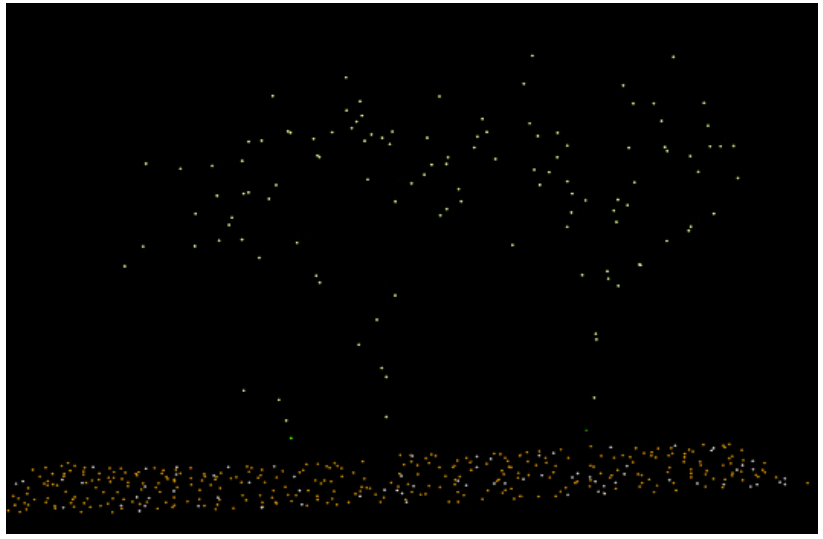


The I-35/Highway 53 interchange in Duluth, MN (known locally as the "Can of Worms")

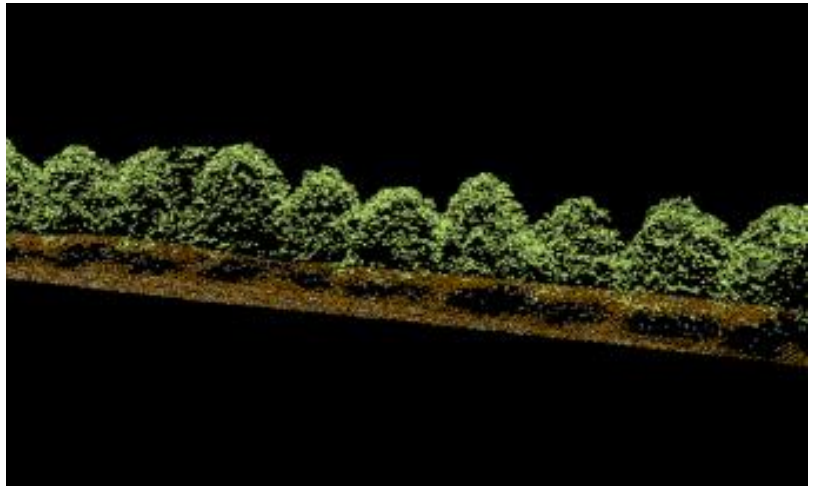
HD Lidar Examples: **Vegetation Mapping**

Low Density (QL3, 1ppm)





High Density (QL1, 8+ppm)



HD Lidar Examples: Floodplain Mapping
(Hydro, Infrastructure & Forest)

2021 - Progressive Approach

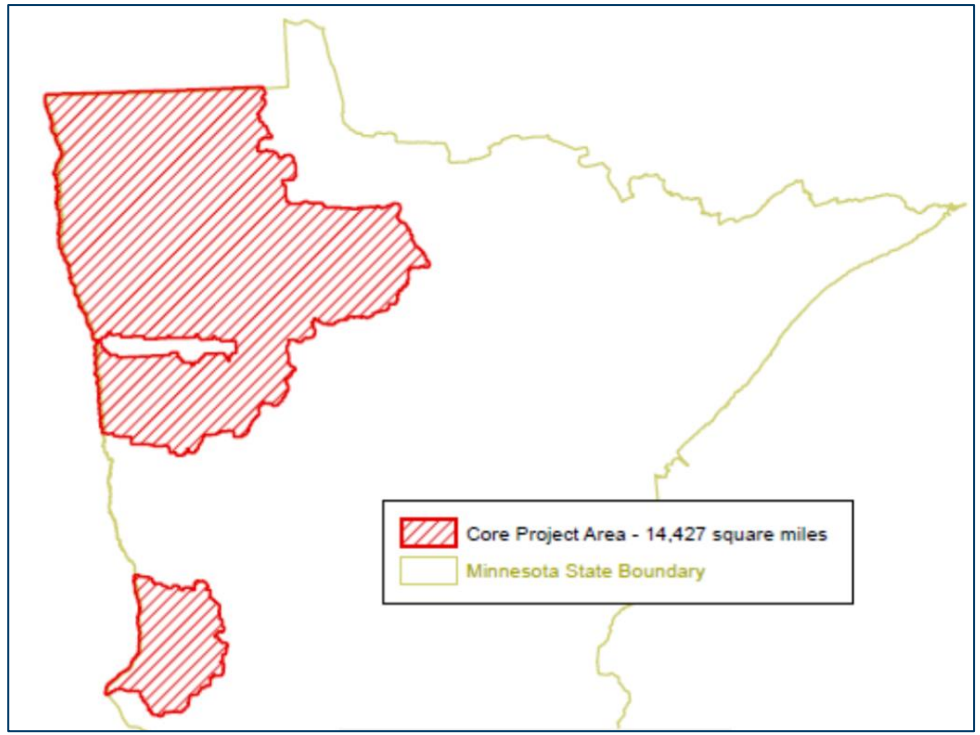
- Picture of a Red River Basin flood
- New high density lidar not only maps this area of flood inundation but it **maps all the infrastructure assets** in the image.
- We have an opportunity to be **proactive** and map this entire scene.

3DGeo & RRWMB Topics

What 3DGoe Knows:

- RRWMB is moving ahead with their lidar acquisition initiative for their Core Project Area
  - 14,427 sq miles (see map)
  - They have identified they are seeking QL1
- The RRWMB has assured 3DGeo that they will receive the cost per square mile shared with stakeholder in their outreach
  - $115 /$m^2$ Plus 25% for third party quality assurance, data storage/dissemination, and project management (RRWMB Lidar Update Meeting May 18, 2021).
- RRWMB will be doing a fall acquisition later this year.

RRWMB Core Lidar Project Area



3DGeo & RRWMB Topics

What are the advantages or disadvantages partnering with 3D Geomatics vs. the Red?

- We can't speak to advantages or disadvantages partnering with 3D Geomatics vs. the RRWMB because the RRWMB is early in its process of establishing their initiative and there are still unknowns.

The RRWMB has presented an invite for others to join their initiative.

- If you have budgeted for a lidar acquisition, and you are ready to partner with an acquisition project now, and you are comfortable with the RRWMB project criteria, there is an opportunity to move ahead with an invite from RRWMB for local county partners to join.

- If you are not ready to go forward with a budget and are unable to join the RRWMB this year, 3DGeo will happily work with you as part of the 3DGeo lidar acquisition block (LAB) coordination for acquisition in your geographic area of the state.

3DGeo & RRWMB Topics

3DGeo Activities and Outreach

- 3DGeo Committee will be working with stakeholders around the RRWMB project boundary to fill in gaps between counties, watersheds, and 3DGeo LABs not included in the RRWMB initiative.
- 3DGeo will continue with their 3DEP-based funding mechanism for this lidar acquisition in 3DGeo Lidar Acquisition Blocks.

The 3DGeo Costs

- Non-federal partner costs for QL1 under the 3DGeo – 3DEP model have ranged from about $100-$140 per square mile depending on the LAB terrain and vegetation involved.

Meeting Questions and Answers

Follow-up Questions

3D Geomatics

- Minnesota Lidar Plan
- USGS 3DEP funding

Dan Ross, CGIO
dan.ross@state.mn.us
Sean Vaughn
sean.Vaughn@state.mn.us

Red River Management Board (RRWMB)

Rob Sip, Executive Director
rob.sip@rrwmb.org
218-474-1084 (Cell)