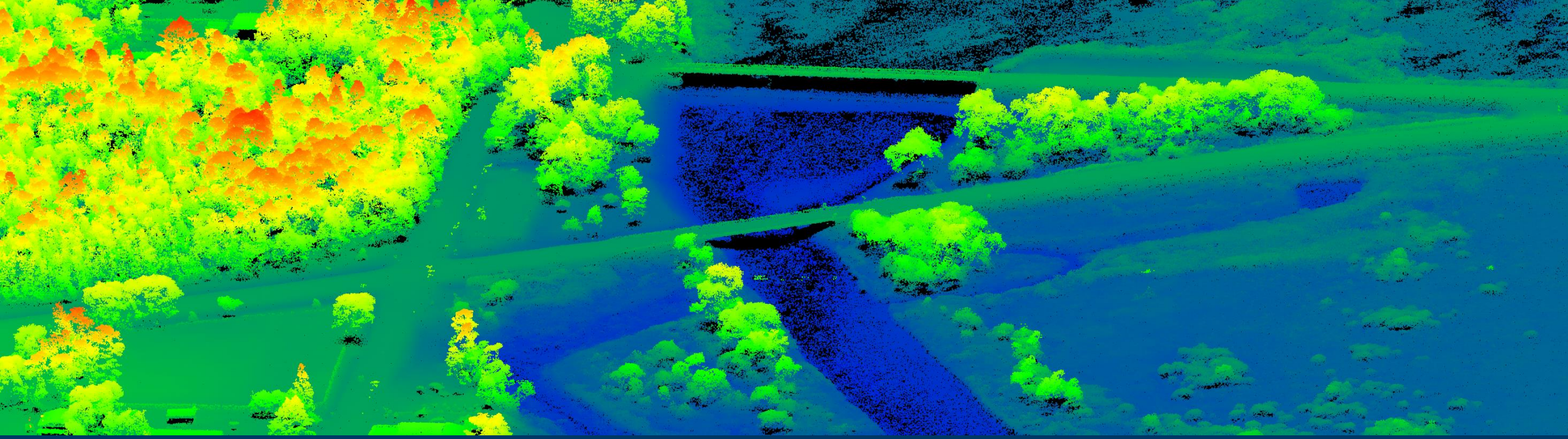


3DGeo Stakeholder Coordination: State Lidar Plan

Southern MN - USGS 3DEP Grant Application Discussion

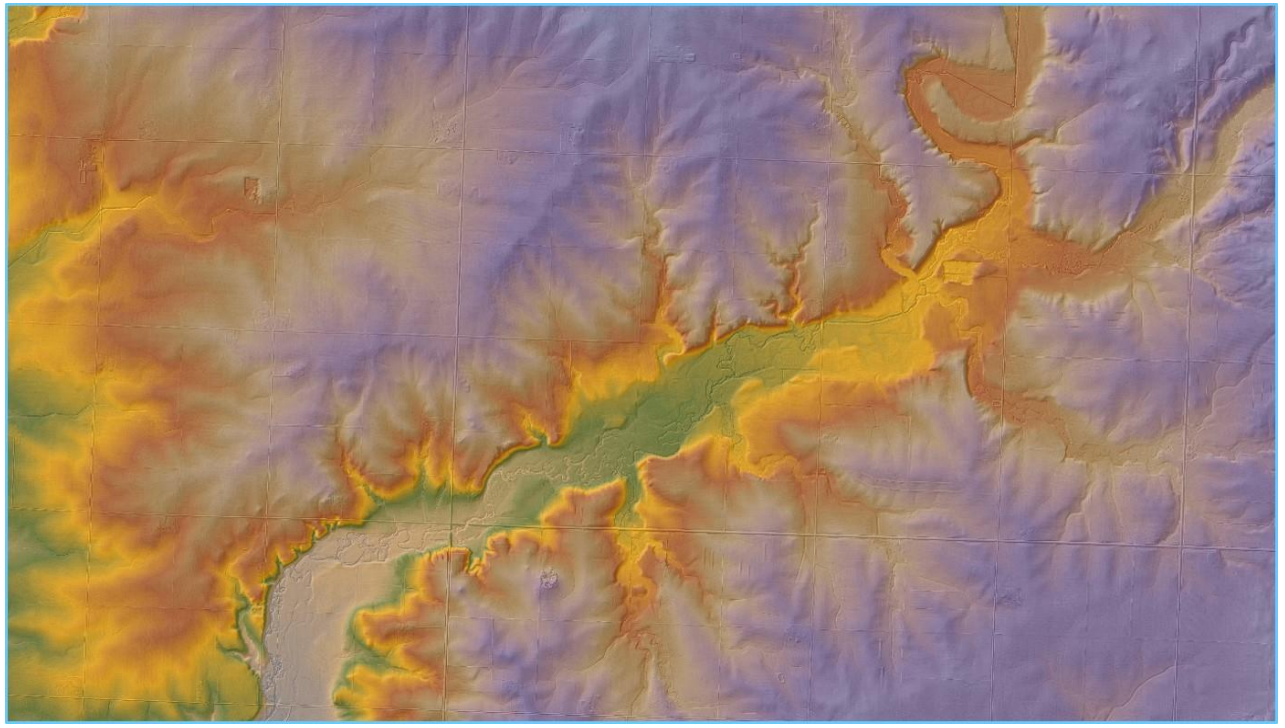
October 7, 2020 11:00-12:30

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

MINNESOTA
GEOSPATIAL ADVISORY COUNCIL

Goals for today

- Quick review of overall lidar acquisition plan in Minnesota
- Review potential grant requests for acquisition in southern Minnesota
- Review local partners and funds
- Provide ample time for discussion and decision on whether to submit grant



Agenda

Time	Topic	Presenter
11:00-11:10	Welcome and agenda overview	Dan Ross
11:10-11:30	Background review of lidar plan, acquisition areas and USGS grants	Sean Vaughn
11:30-11:45	Review of potential grant application, local partners and funds	Jennifer Corcoran & Matt Baltes
11:45-12:30	Discussion and decision on whether to submit grant	Dan Ross

Background

- Lidar acquisitions are coordinated by the GAC's **3DGeo Committee**
- Minnesota's State 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 national need for a nationwide elevation layer
- 3DGeo is working to organize lidar acquisition so that Minnesota can take advantage of this **USGS federal funding opportunity**
- **Economies of scale** are achieved
  - The bigger the collection footprint to lower the cost

Coordinating Minnesota's Lidar Acquisition

Geospatial Advisory Council (GAC) - 3D Geomatics Committee

Geospatial Advisory Council (GAC)

- **Coordinating body** for the Minnesota geospatial community.
- **Cross-section of organizations** that include counties, cities, universities, business, nonprofit organizations, federal and state agencies, tribal government, and other stakeholder groups.

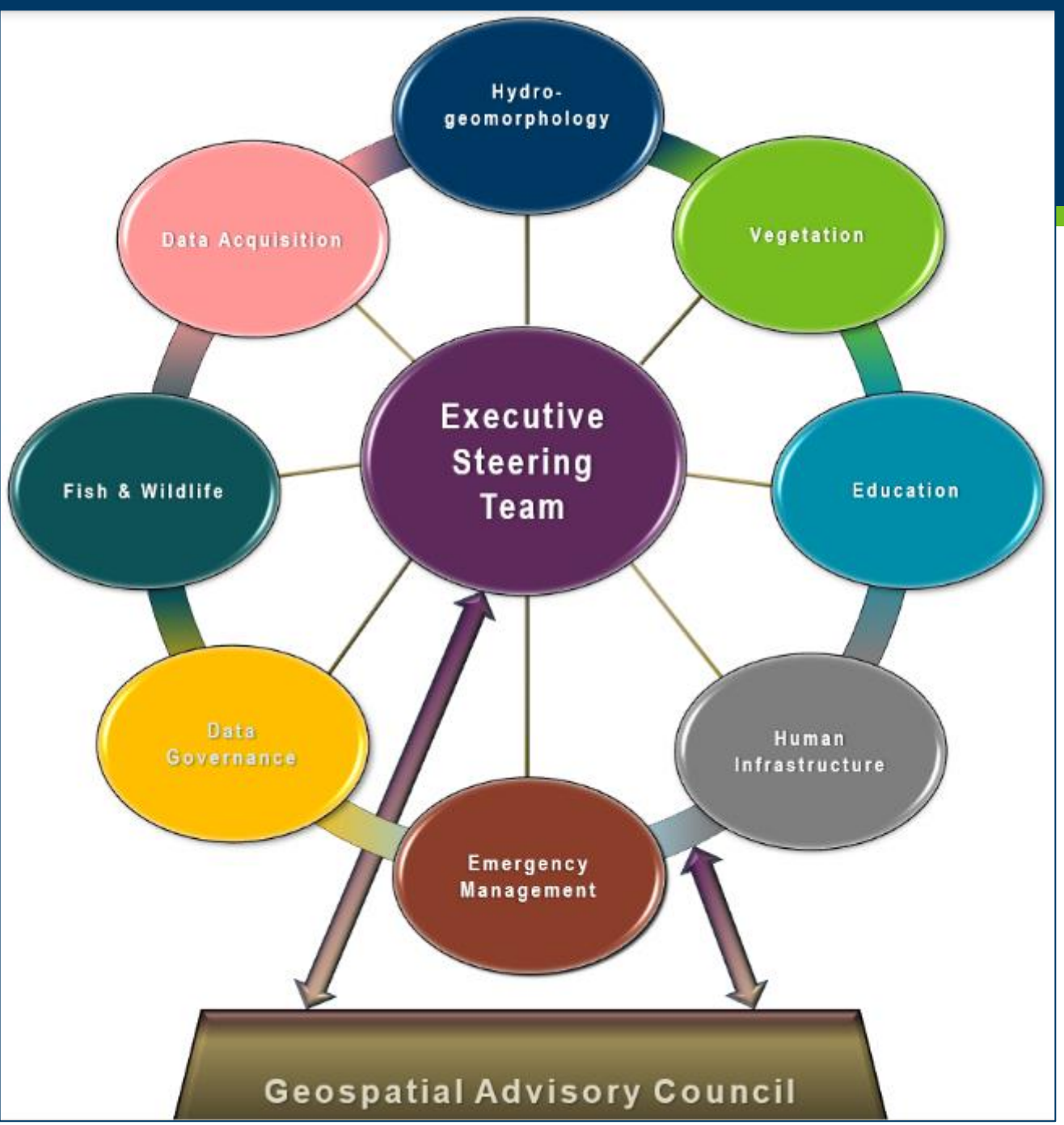
3D Geomatics Committee (3DGeo)

- Committee **under the GAC**
- Works to identify and promote the need for planning, funding, acquisition, and management of three-dimensional geomatic data and derived products.
- Lidar acquisition led by a team with **dedicated time** working to bring new high-definition lidar to Minnesota.

MINNESOTA
GEOSPATIAL ADVISORY COUNCIL

GAC Rank	Project or Initiative Name
1	All public geospatial data in MN to be free and open to everyone
2	Updated and aligned boundary data from authoritative sources
3	The implementation of an archive for Minnesota geospatial data
4	Statewide publicly available parcel data
5	Improvements to the MnGeo Imagery Service, such as Web Mercator support, tiling, and complementary options such as "composite of latest leaf off imagery", and downloading options
6	Accurate hydro-DEMs (hDEM) that serve modern flood modeling and hydro-terrain analysis tools, and the development of more accurate watercourses and watersheds
7	Statewide publicly available road centerline data
8	New LiDAR data acquisition across Minnesota for use in developing new derived products guided by committee developed standards
9	An emergency management damage assessment data standard to provide an accepted specification to support a request for State or Federal assistance after a disaster
10	Statewide publicly available address points data
11	Maps, procedures, templates and other materials to help all levels of government implement the U.S. National Grid
12	A parks and trails data standard
13	A forum (committee, workgroup, etc.) for MN geospatial professionals to discuss and share best practices, standards, lessons learned, etc. for implementing and supporting the geospatial components of NG9-1-1

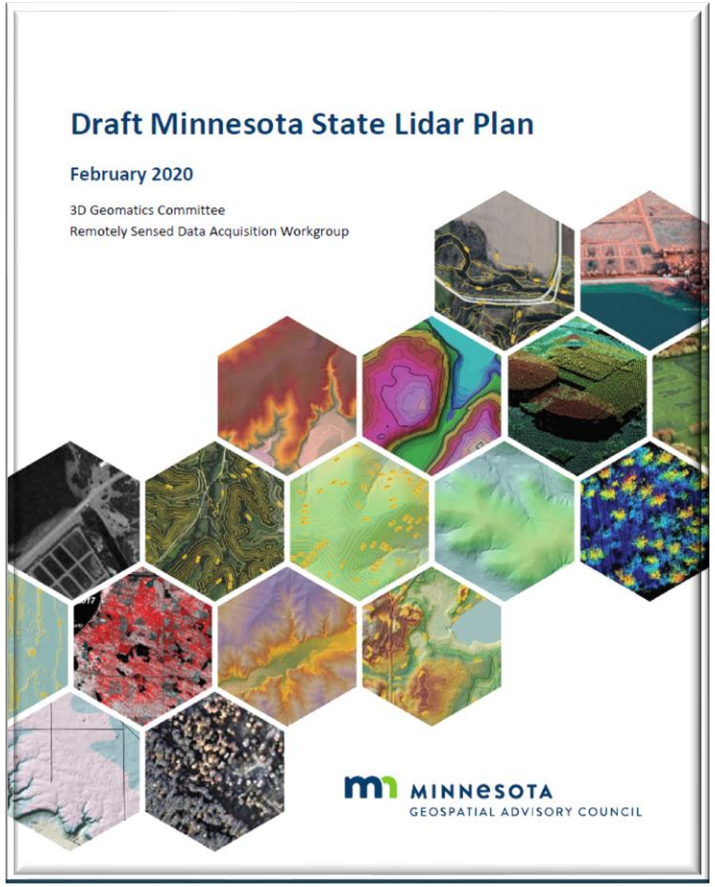
3DGeo Committee



3DGeo Executive Steering Team

- Workgroups/Subgroups
  - Hydrogeomorphology
    1. Data Catalog
    2. Foundational Hydrography Data Stewards
    3. DEM Hydro-modification
  - Vegetation
  - Education
  - Human Infrastructure
  - Data Acquisition

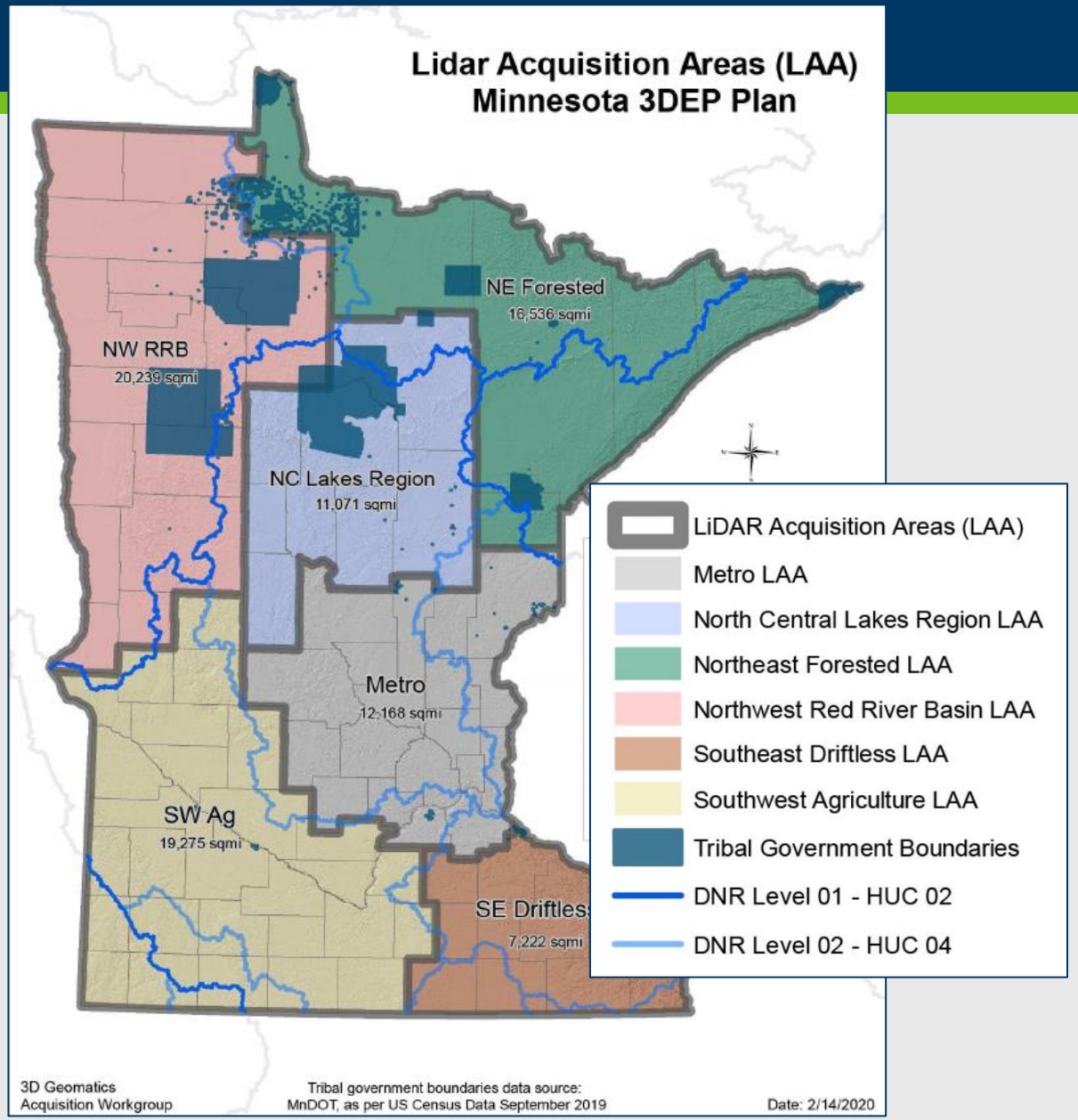
Minnesota State Lidar Plan and Story Map

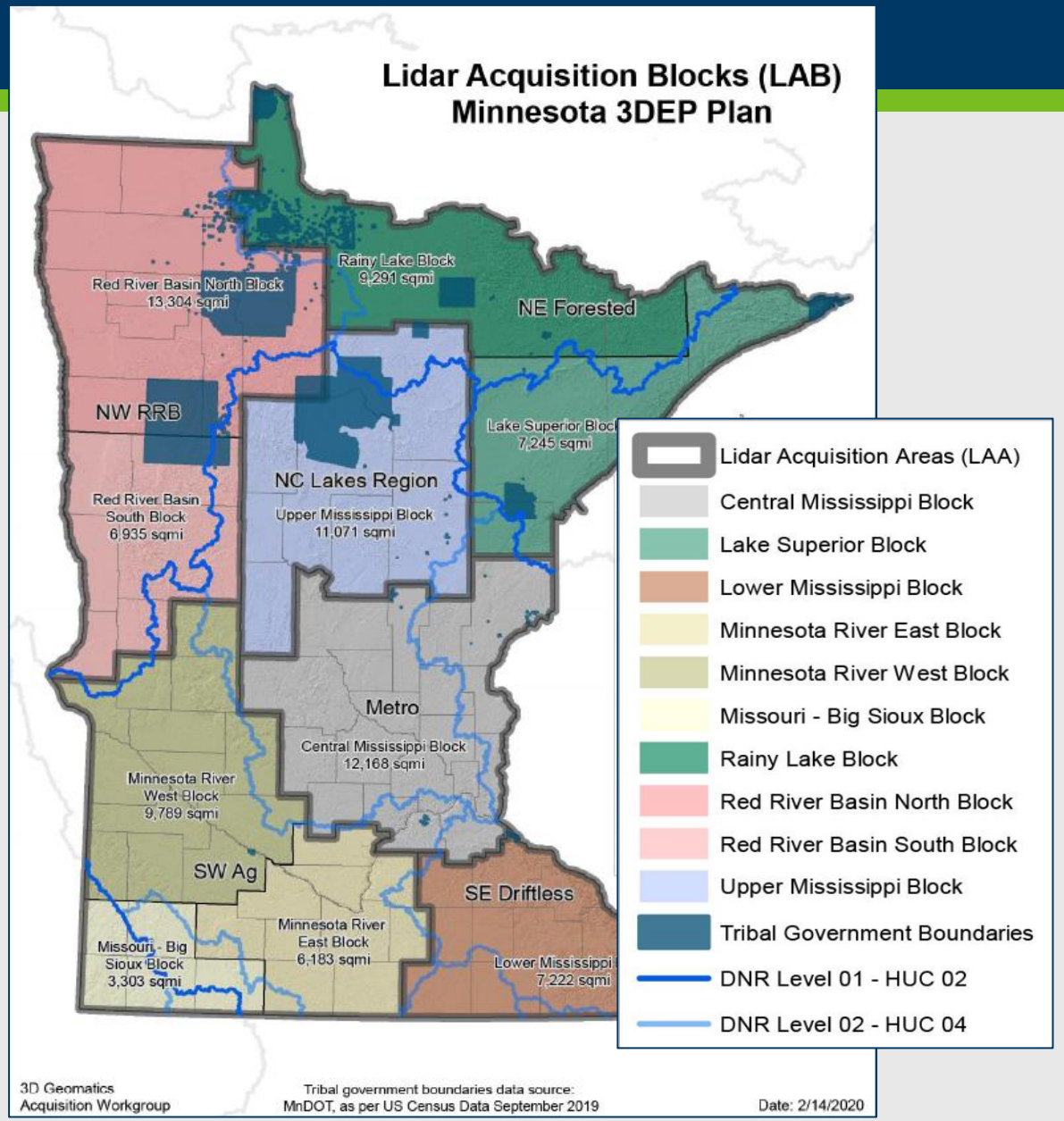


https://www.mngeo.state.mn.us/committee/3dgeo/acquisition/Minnesota_State_Lidar_Plan.pdf

http://bit.ly/MnLidarPlanStoryMap

Lidar Acquisition Areas of Interest



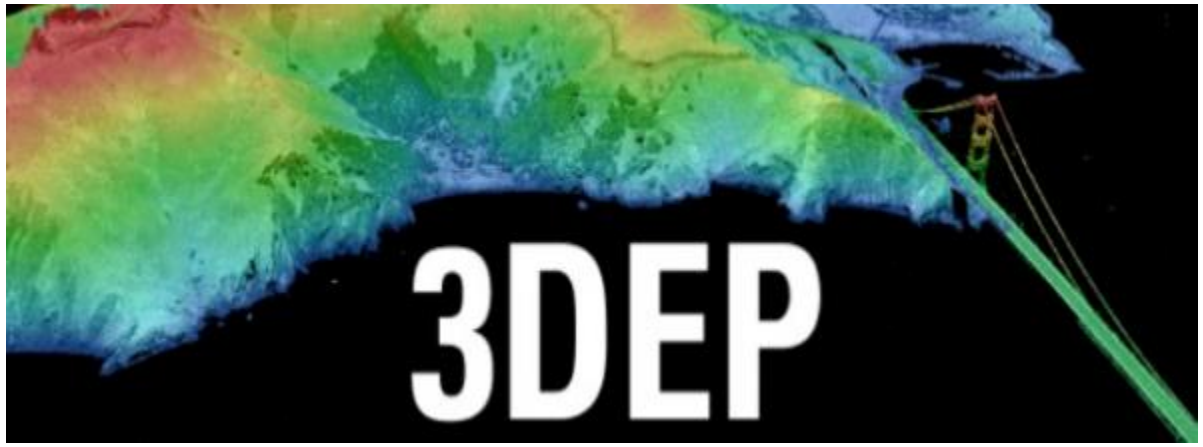


3DEP
Funding Coordination

USGS 3D Elevation Program (3DEP)

3D Elevation Program (3DEP)

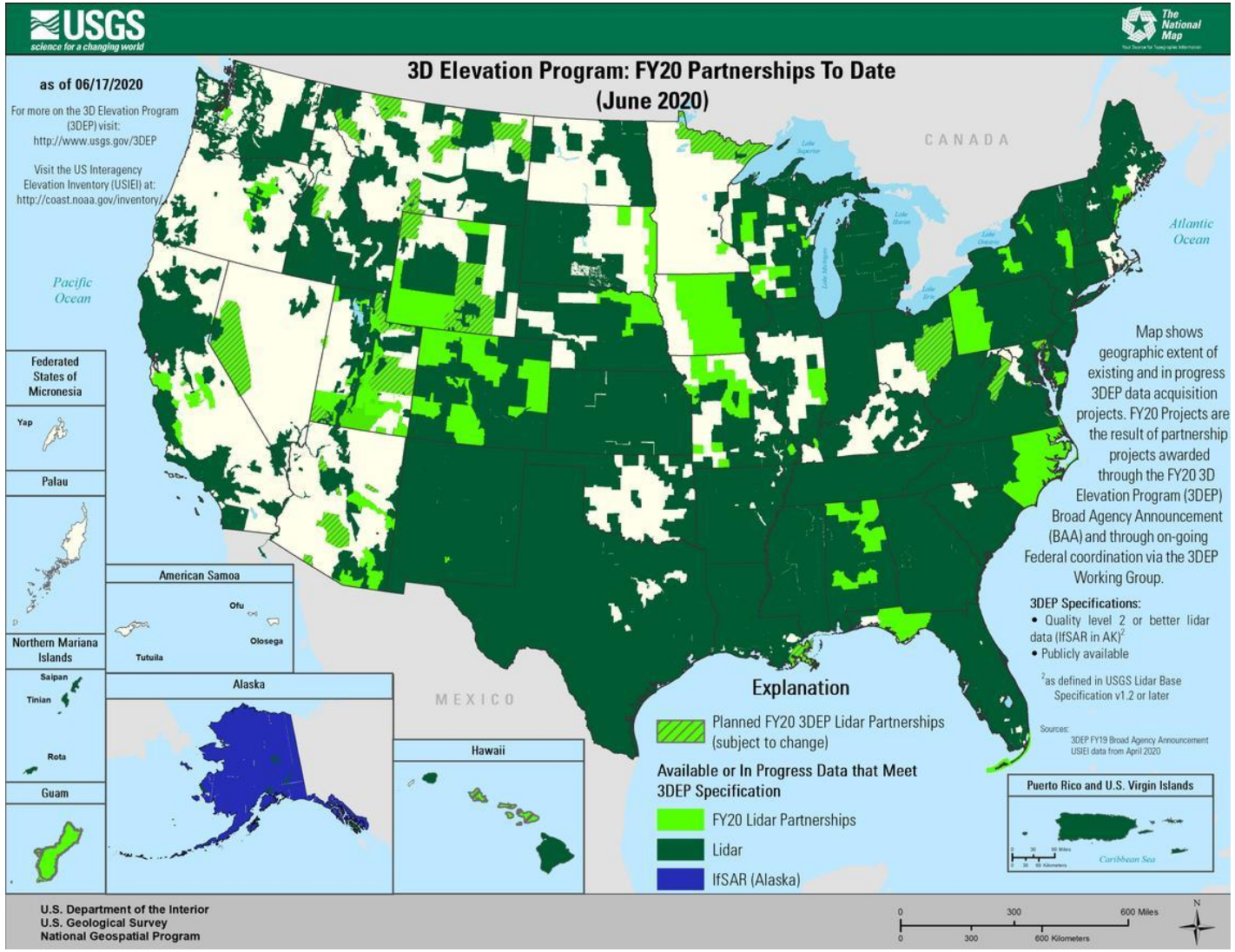
- **Systematically** guiding the collection of 3D elevation data in the form lidar data for the United States, and the U.S. territories
- Goal: elevation dataset for the nation **by 2023**
- The first-ever national baseline of **consistent** high-resolution elevation data – both bare earth and 3D point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



USGS 3D Elevation Program (3DEP)

Broad Agency Announcement (BAA)

- **Grant coordinating** mechanism 3DEP
- Guides **partnerships** between the USGS and other Federal agencies with other public and private entities seeking high-quality 3D lidar elevation data acquisition.
- USGS is **cost-sharing** via grant funds for QL2 or greater
- Grants through “BAA” process – **deadlines** are every fall (November 13)



What is: High-density Lidar

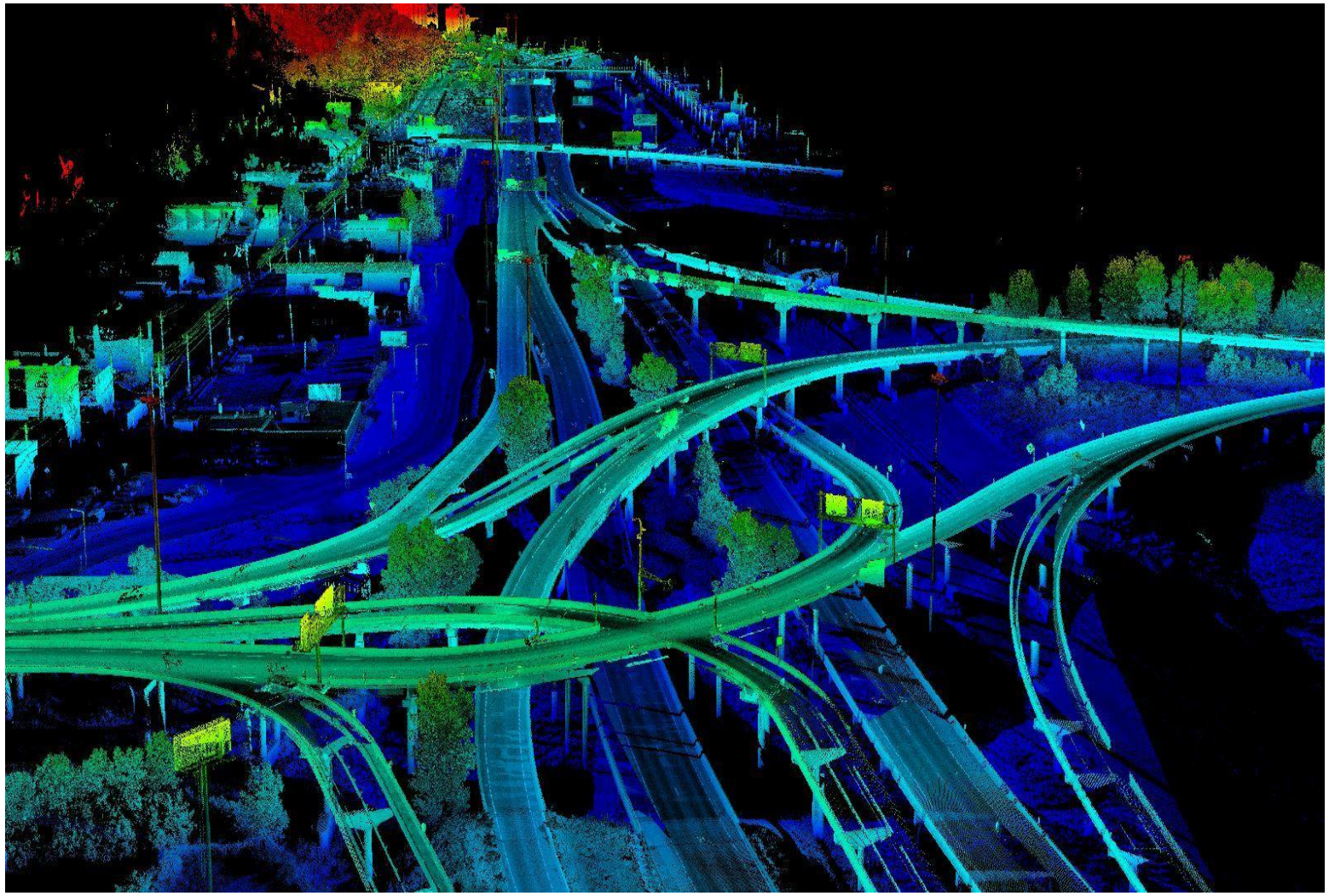
Need for High-density Lidar

- Higher-resolution, higher-quality, and higher density lidar dramatically **improves** our ability to analyze the landscape in Minnesota, map assets, and assess resources
- Provides the foundation for development of authoritative **derived products** use to analyze and plan for current and future scenarios, and make better informed decisions
- Enables practitioners, managers, and researchers to be more **proactive** than reactive.

Lidar Point Cloud Colorized by Photo

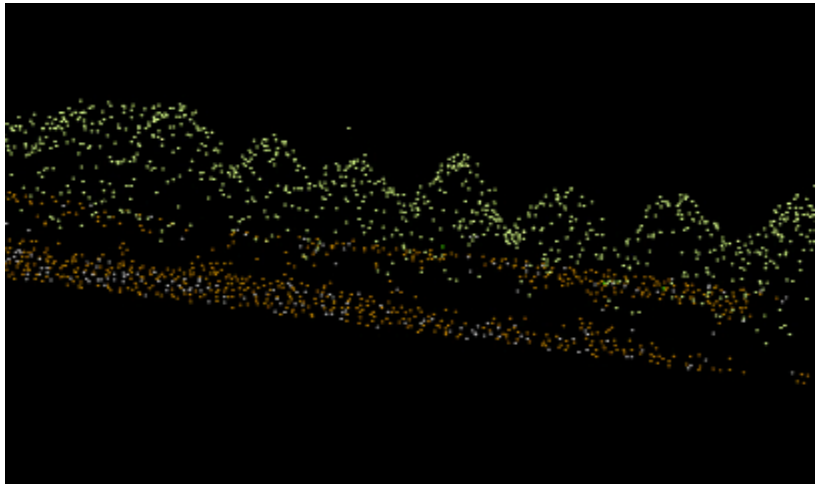
HD Lidar Examples: **Infrastructure**

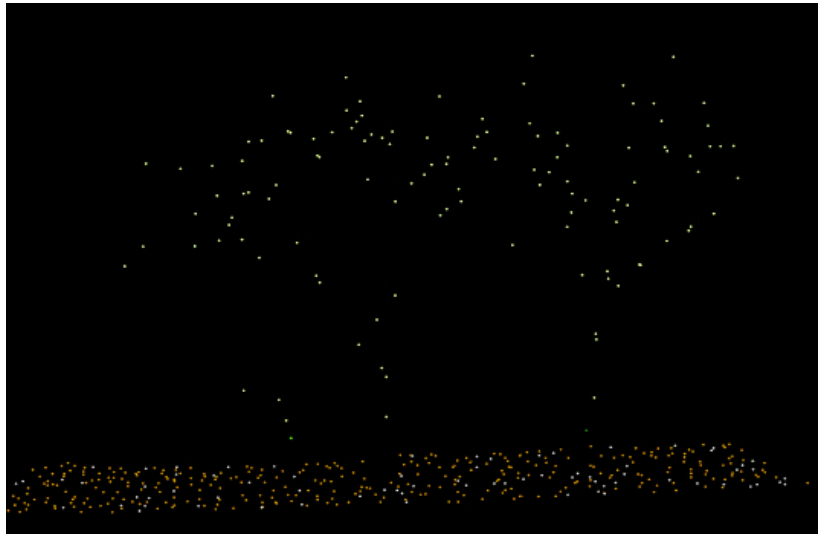
- Transportation
  - 3d Design
  - Traffic operations
  - Signing and striping
  - Highway safety
  - Maintenance
  - Asset management
- Energy
  - Traditional
  - Renewable/Alternative
- Cultural/Historical Resources



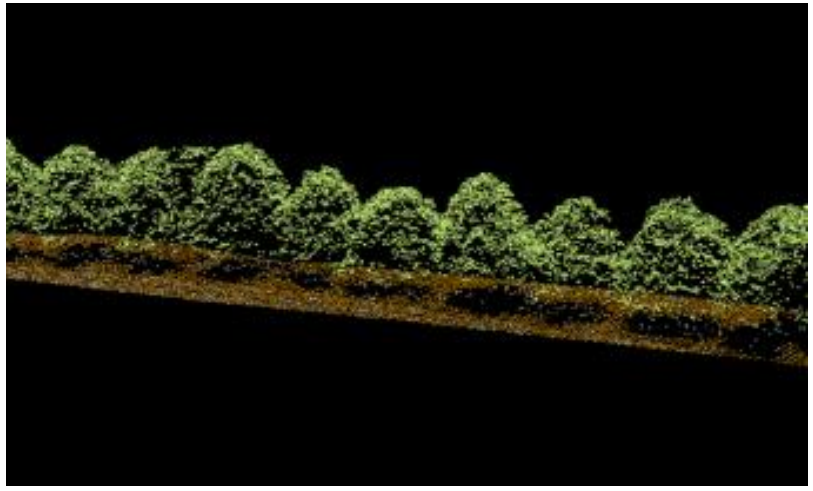
HD Lidar Examples: **Vegetation Mapping**

Low Density (QL3, 1ppm)





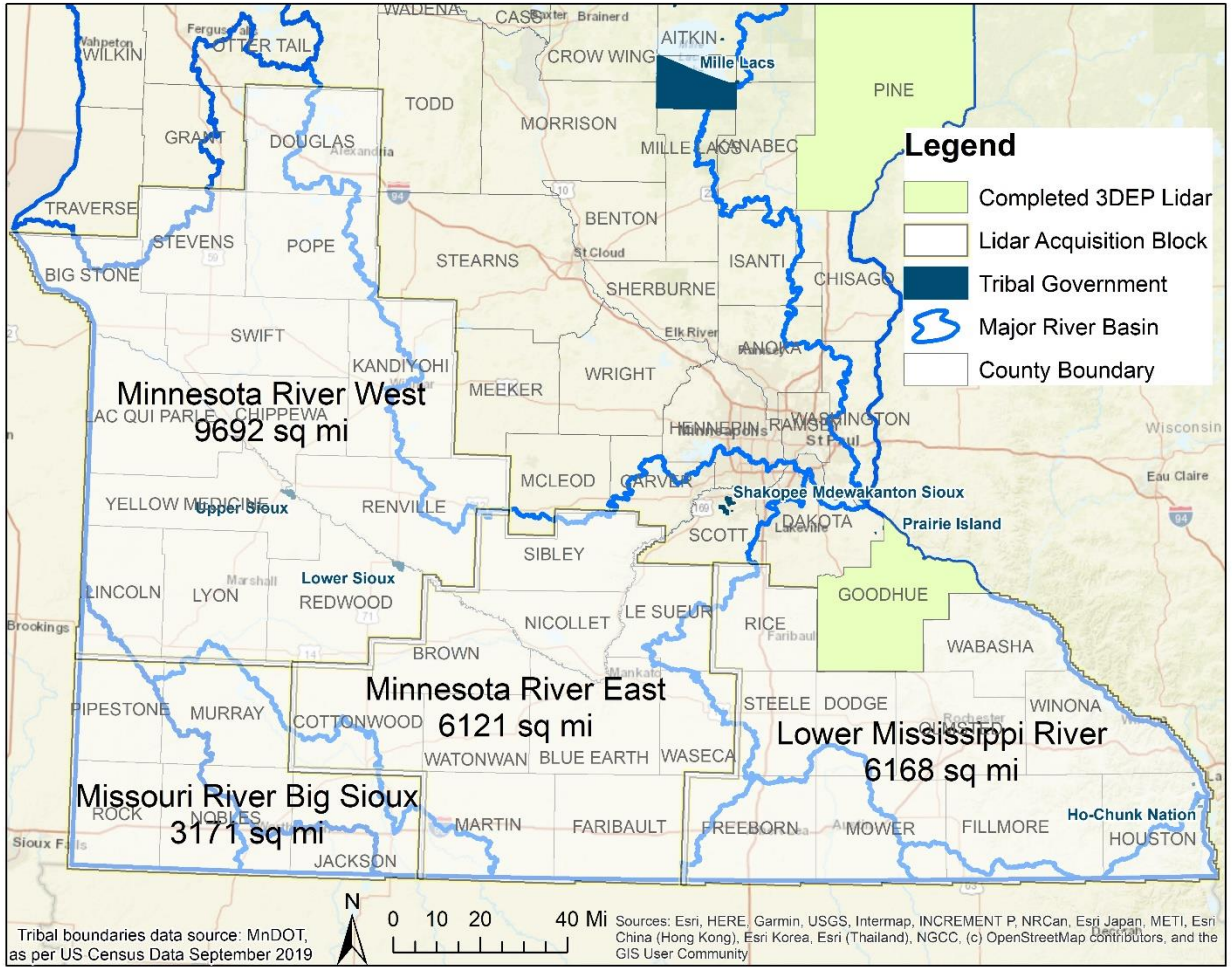
High Density (QL1, 8+ppm)



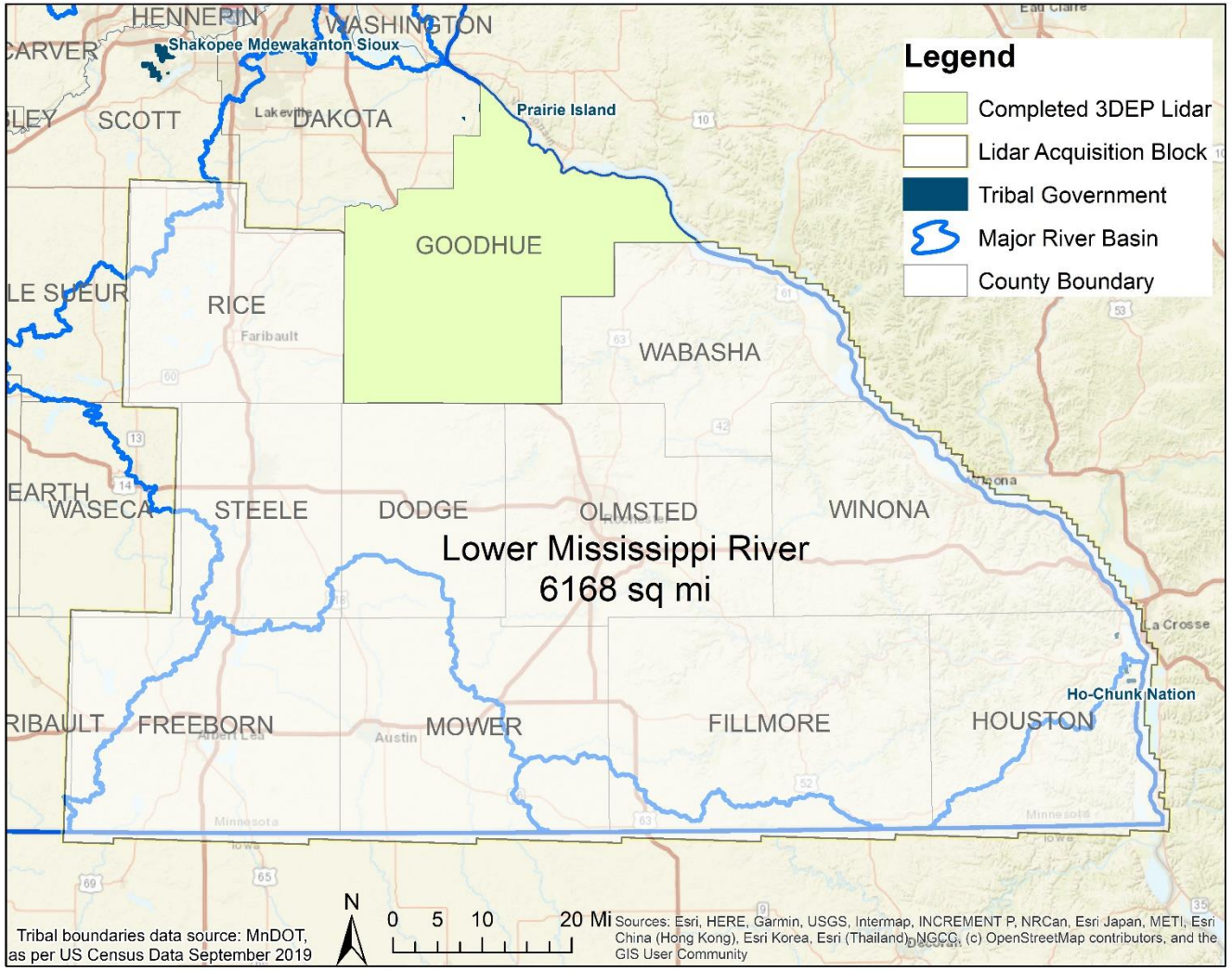
Lidar Acquisition Coordination in Southern Minnesota

What is happening now?

- Goodhue County successfully collected QL0 in Spring 2020!!
- Potential Lidar Acquisition Blocks:
  - Lower Mississippi River
  - Minnesota River East
  - Minnesota River West
  - Missouri River Big Sioux
- Expressed interest in Nobles and Washington Counties, others??



Partners and Funds Needed: Remaining Southeast Lidar Acquisition Block



Estimated USGS 3DEP Contribution		Total Partner Contributions Needed	
%	$	%	$
40%	$986,880	60%	$1,480,320

6168 square miles at $400 per square mile = **$2,467,200** TOTAL

Partners and Funds Needed: Remaining Southeast Lidar Acquisition Block

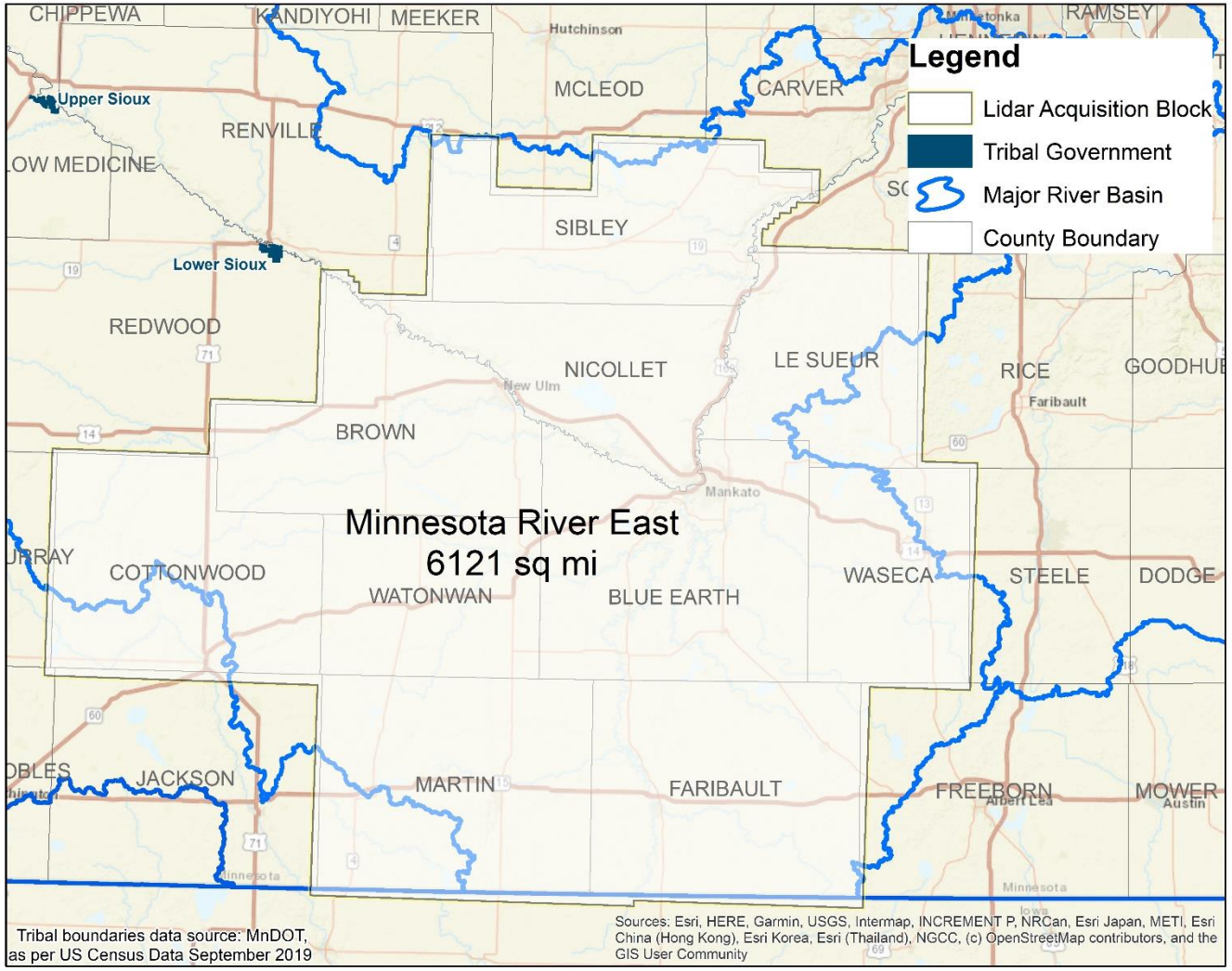
- TOTAL Funds Needed: $ 2,467,200
- Estimated using $400 per square mile for QL1
- 10 Counties* - 6,168 square miles (range 440 – 862 mi^2)

Contributors	%	*Average Per County*	$
USGS	**40**		**986,880**
Partners	**60**		**1,480,320**
LAB Counties	*~ 30***	*$74,016*	*740,160*
All Others	*~ 30***		*740,160*
Grand TOTAL	**100**		**2,467,200**

*Dodge, Steele, Rice, Wabasha, Houston, Winona, Olmstead, Mower, Freeborn, Fillmore

**This is an estimate, up to 30% of the TOTAL, and dependent on the Lidar Acquisition Block

Partners and Funds Needed:
Minnesota River - East Lidar Acquisition Block



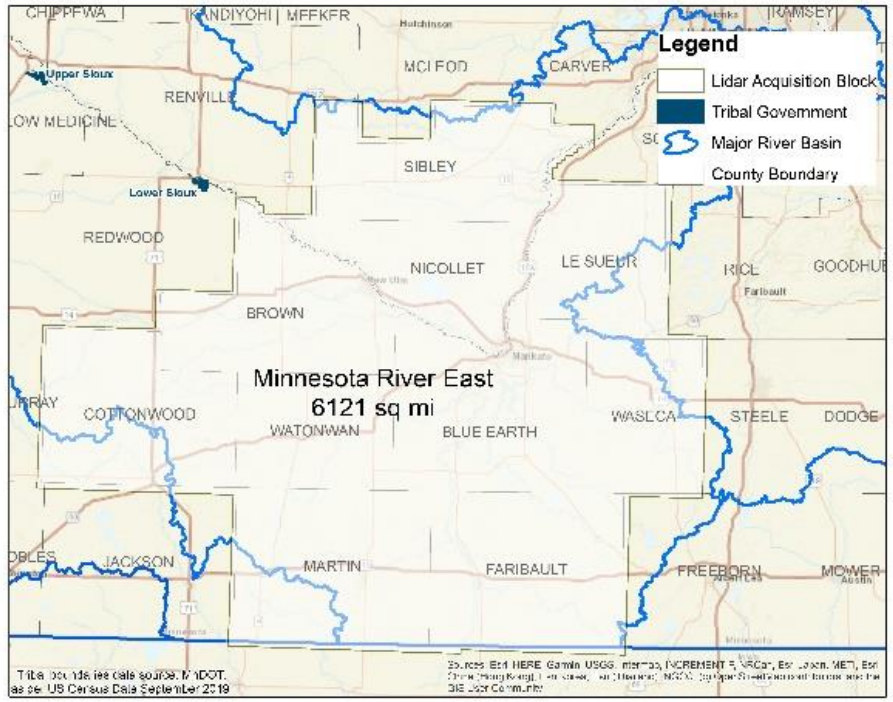
Estimated USGS 3DEP Contribution		Total Partner Contributions Needed	
%	$	%	$
40%	$979,360	60%	$1,469,040

6,121 square miles at $400 per square mile =
$2,448,400 TOTAL

Partners and Funds Needed:
Minnesota River - East Lidar Acquisition Block

- TOTAL Funds Needed: $ 2,448,400
- Estimated using $400 per square mile for QL1
- 10 Counties* - 6,121 square miles (range 440 – 766 mi^2)

Contributors	%	*Average Per County*	$
USGS	**40**		**979,360**
Partners	**60**		**1,469,040**
LAB Counties	*~ 30***	*$73,452*	*734,520*
All Others	*~ 30***		*734,520*
Grand TOTAL	**100**		**2,448,400**



*Watonwan, Waseca, Nicollet, Le Sueur, Brown, Sibley, Cottonwood, Faribault, Martin, Blue Earth

**This is an estimate, up to 30% of the TOTAL, and dependent on the Lidar Acquisition Block

Partners and Funds Needed:
Minnesota River - West Lidar Acquisition Block

Estimated USGS 3DEP Contribution		Total Partner Contributions Needed	
%	$	%	$
40%	$1,550,720	60%	$2,326,080

9692 square miles at $400 per square mile =
$3,876,800 TOTAL

Partners and Funds Needed: Minnesota River - West Lidar Acquisition Block

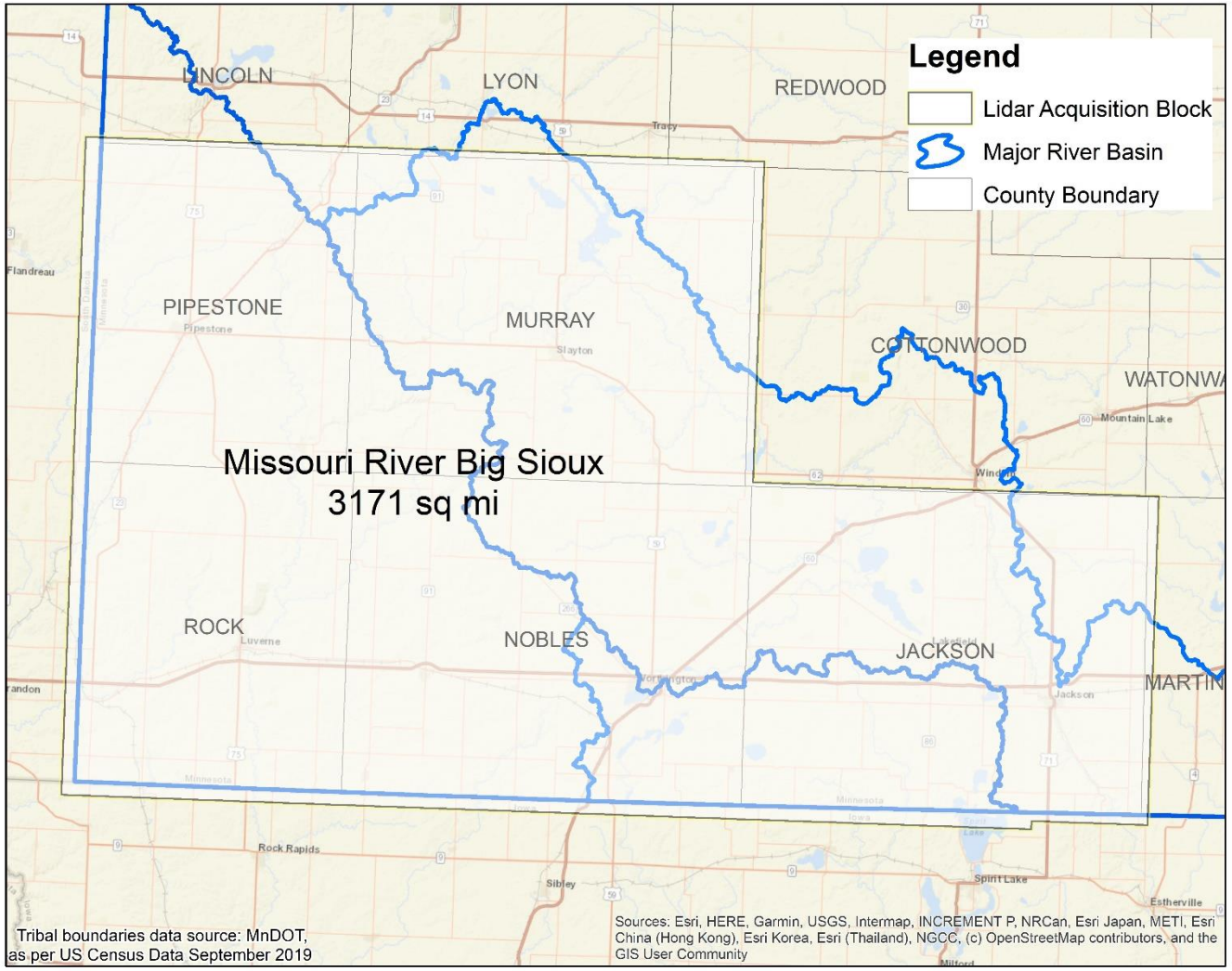
- TOTAL Funds Needed: $ 3,876,800
- Estimated using $400 per square mile for QL1
- 13 Counties* - 9,692 square miles (range 546 – 1033 mi^2)

Contributors	%	*Average Per County*	$
USGS	**40**		**1,550,720**
Partners	**60**		**2,326,080**
LAB Counties	*~ 30***	*$89,465*	*1,163,040*
All Others	*~ 30***		*1,163,040*
Grand TOTAL	**100**		**3,876,800**

*Big Stone, Lincoln, Chippewa, Stevens, Pope, Lyon, Swift, Yellow Medicine, Douglas, Lac Qui Parle, Kandiyohi, Redwood, Renville

**This is an estimate, up to 30% of the TOTAL, and dependent on the Lidar Acquisition Block

Partners and Funds Needed:
Missouri River - Big Sioux Lidar Acquisition Block



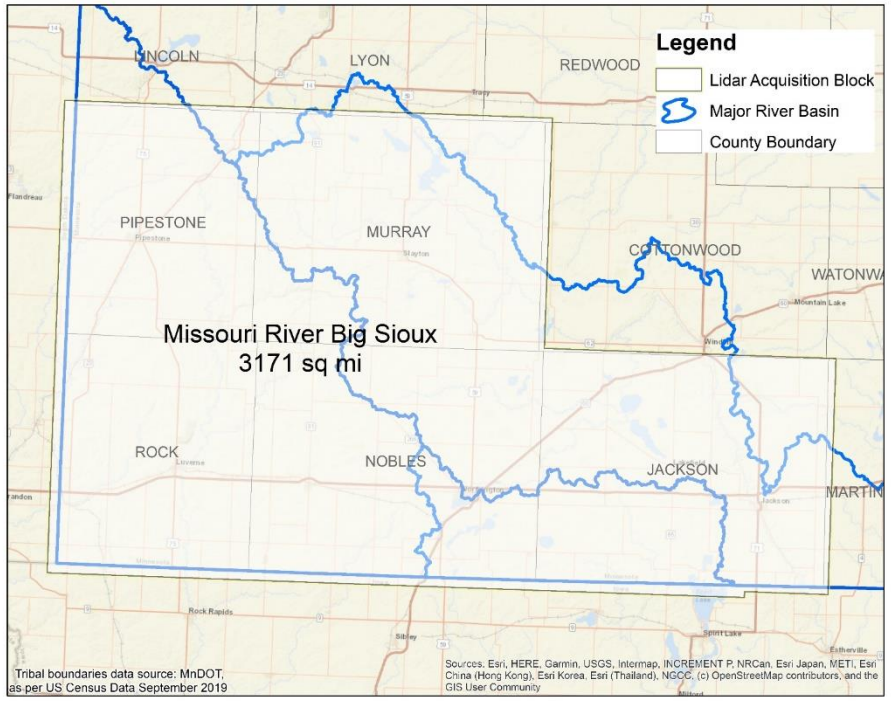
Estimated USGS 3DEP Contribution		Total Partner Contributions Needed	
%	$	%	$
40%	$507,360	60%	$761,040

3171 square miles at $400 per square mile =
$1,268,400 TOTAL

Partners and Funds Needed:
Missouri River - Big Sioux Lidar Acquisition Block

- TOTAL Funds Needed: $ 1,268,400
- Estimated using $400 per square mile for QL1
- 5 Counties* - 3,171 square miles (range 474 – 750 mi^2)

Contributors	%	*Average Per County*	$
USGS	**40**		**507,360**
Partners	**60**		**761,040**
LAB Counties	*~ 30***	*$76,104*	*380,520*
All Others	*~ 30***		*380,520*
Grand TOTAL	**100**		**1,268,400**



*Pipestone, Rock, Nobles, Jackson, Murray

**This is an estimate, up to 30% of the TOTAL, and dependent on the Lidar Acquisition Block

NRCS Partners for Lidar Acquisition

NRCS Goals

- Partner with multiple entities to leverage maximum federal funding for lidar acquisition
- Support and help implement the State Lidar Acquisition Plan
- Meet the lidar data needs of all partners within the state through collaboration and partnerships
- Commit to funding contributions until the state is complete

USDA United States Department of Agriculture

NRCS Lidar Acquisition

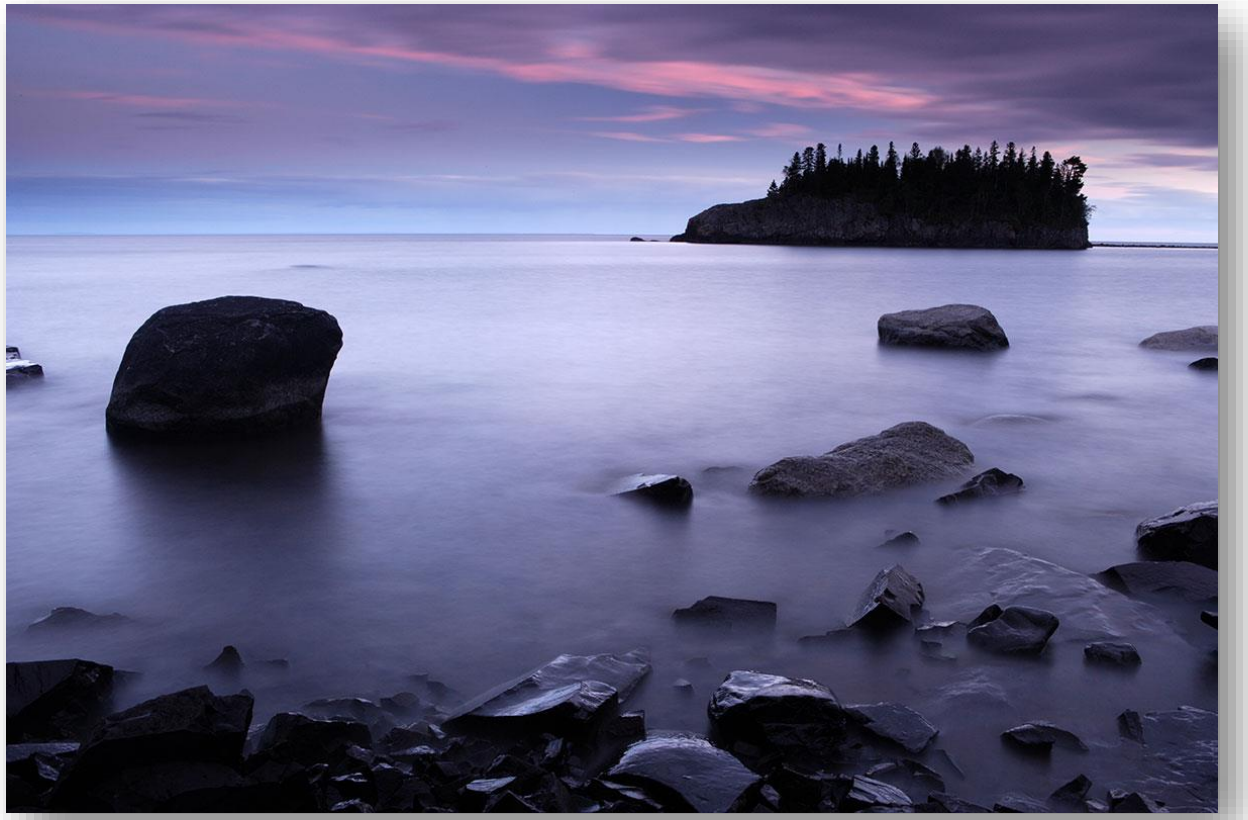
NRCS Fiscal Year 2020 Funding

- MN NRCS has dedicated $1,000,000 dollars towards lidar acquisitions
  - Looking to partner and fund projects in the Southern Blocks as outlined in the State Lidar Plan.
  - Open to funding projects anywhere in the state we have partners ready to move forward and commit funding through the BAA process (e.g., Rainy Lake Block in the NE Forested LAB).
  - We are anticipating to leverage even more NRCS National Office Funds with these dollars.
  - The more partners that come together, the more contiguous data we can collect, and the more money we can save the taxpayers.

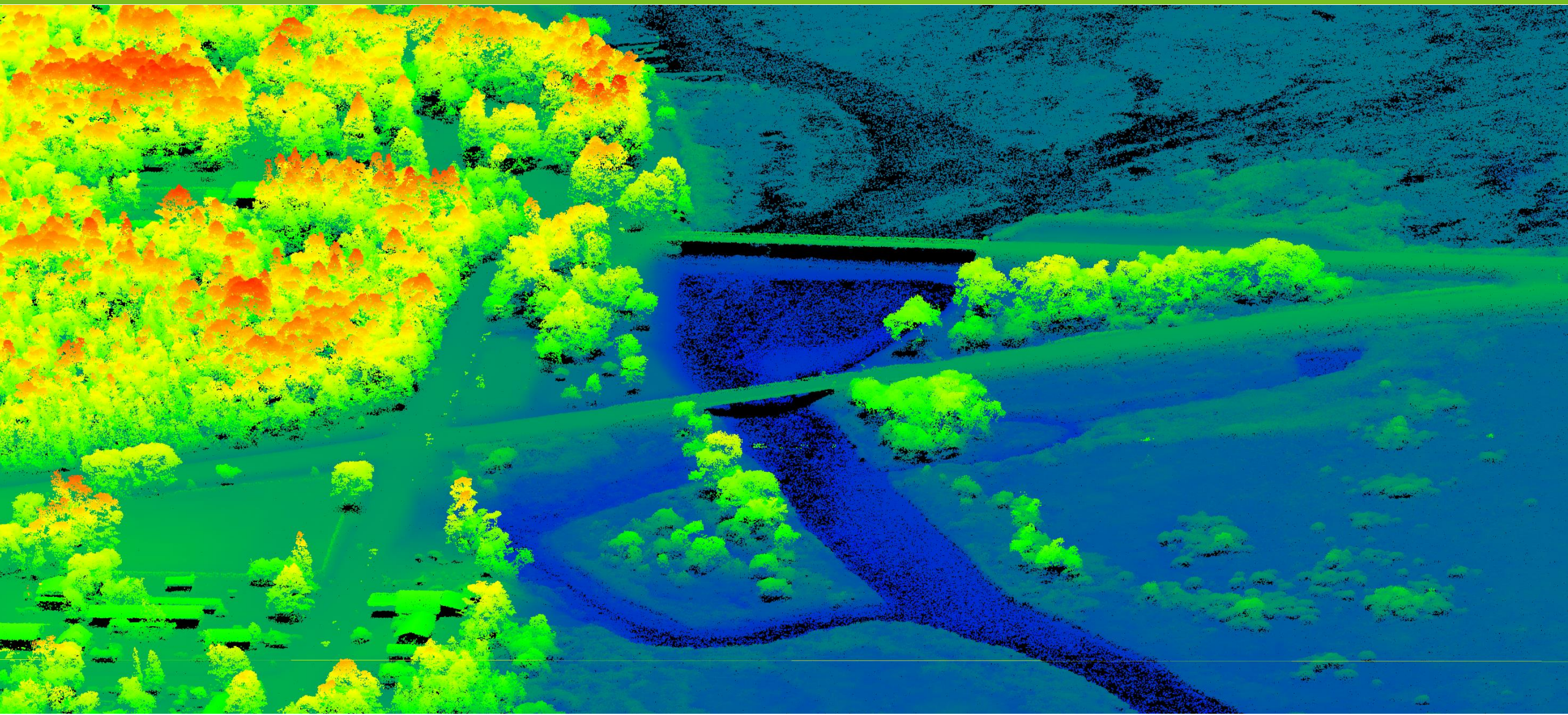
USDA United States Department of Agriculture

Discussion & Decision

- We are currently looking for partners to help fund lidar acquisition and take advantage of the federal funding opportunities
- We would like feedback by October 23
- lidar@state.mn.us



Thank you!



3DGeo & 3DEP – *Estimated* Timelines

Phase 1 – Planning & Grant Application

- Outreach and Planning (ongoing) – May/June/July
- Plan Revisions, 3DEP Webinar – August
- BAA application preparation – September
- BAA application due – October/November
- BAA announcement – December/January

…continues on the next column (the next year)…

Phase 2 – Data Acquisition & Delivery

- Funding Agreements, Statements of Work – Feb/March
- Survey in the field – March/April
- Acquisition – April/May (leaf off, snow free)
- Initial QA/QC – April/May
- Data Calibration and processing – 3-6 months
- Data QA/QC & Data distribution – 3-7 months

Total turnaround for an AOI = 20–26 months (from planning phase to data in-hand)

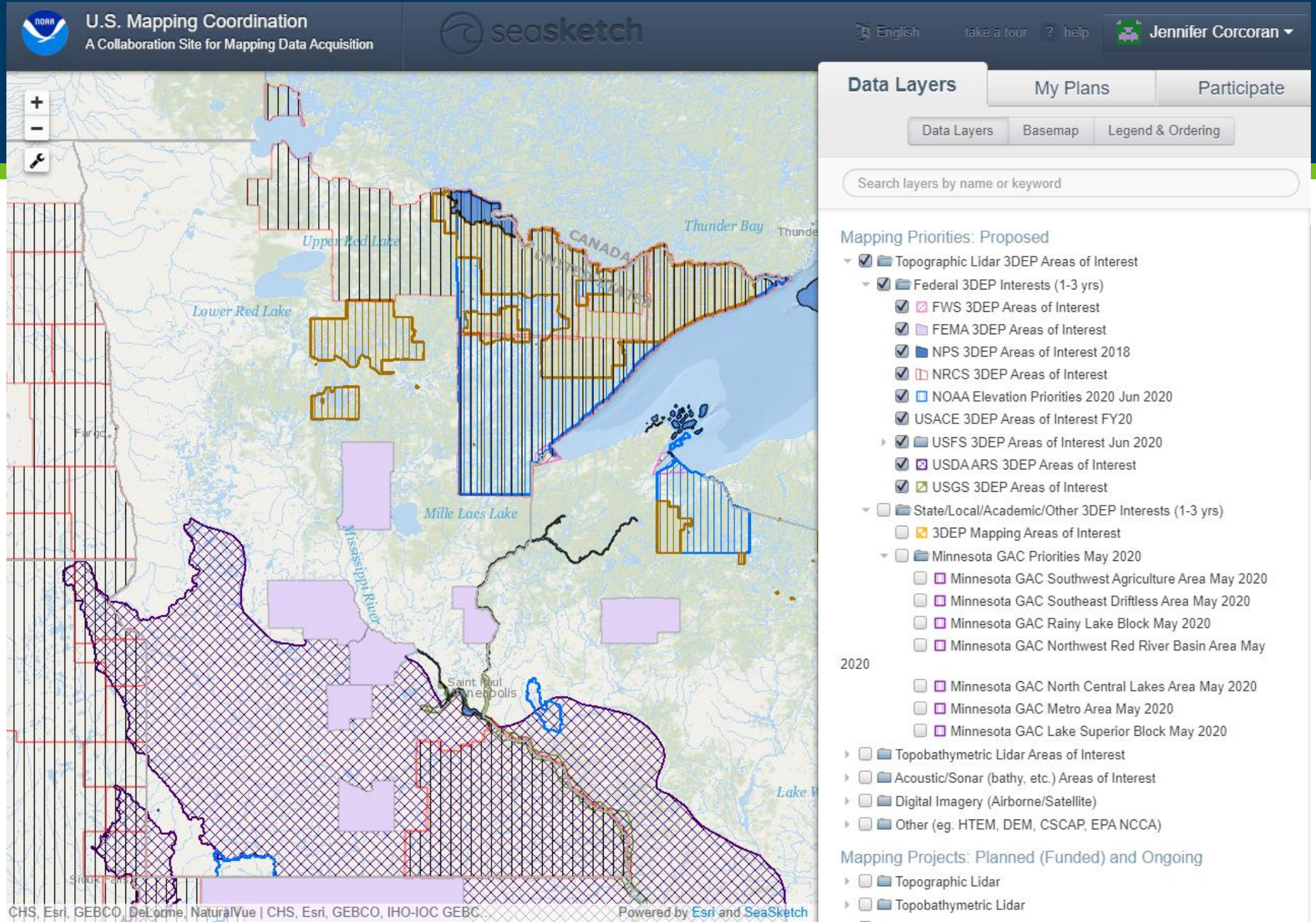
3DEP Program - Lidar Products

3DEP standard deliverables

- Classified Point Cloud
- Bare-Earth Surface Raster (Digital Elevation Model)
- Lidar Swath Polygon
- Product metadata & Metadata Tags
- Reports
  - Survey
  - Collection/Mission
  - Processing
  - QA/QC

Possible added deliverables

- Improved hydrographic products
- 1-ft contour dataset
- Bare Earth point cloud
- Classification of high vegetation and buildings
- Intensity imagery, GeoTIFF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English
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My Plans
Participate
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Federal 3DEP Interests (1-3 yrs)
FWS 3DEP Areas of Interest
FEMA 3DEP Areas of Interest
NPS 3DEP Areas of Interest 2018
NRCS 3DEP Areas of Interest
NOAA Elevation Priorities 2020 Jun 2020
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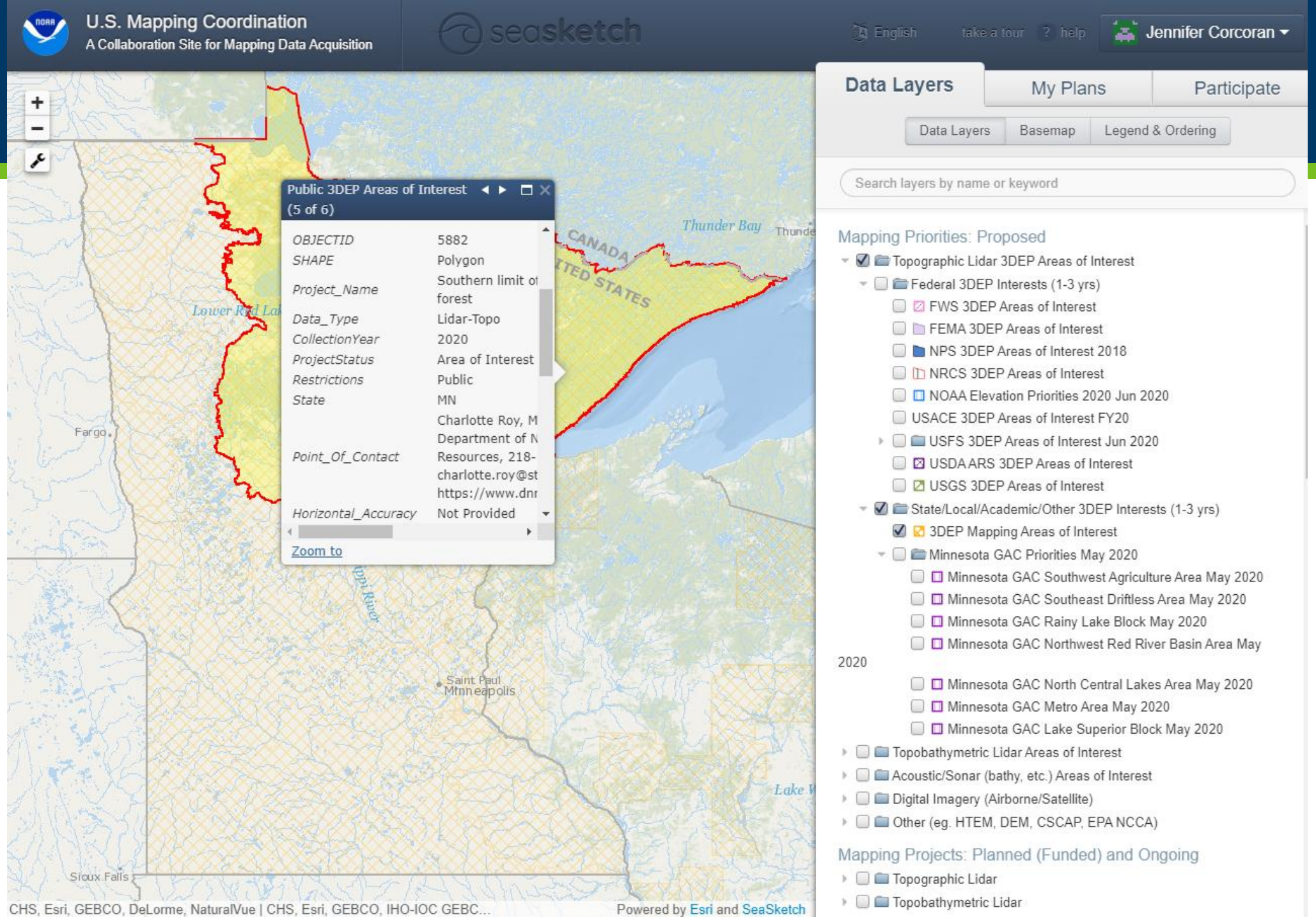
Topobathymetric Lidar Areas of Interest
Acoustic/Sonar (bathy, etc.) Areas of Interest
Digital Imagery (Airborne/Satellite)
Other (eg. HTEM, DEM, CSCAP, EPA NCCA)
Mapping Projects: Planned (Funded) and Ongoing
Topographic Lidar
Topobathymetric Lidar
Upper Red Lake
Lower Red Lake
Thunder Bay
CANADA
UNITED STATES
Mille Lacs Lake
Mississippi River
Fargo
Saint Paul
Minneapolis
Sioux Falls
CHS, Esri, GEBCO, DeLorme, NaturalVue | CHS, Esri, GEBCO, IHO-IOC GEBC...
Powered by Esri and SeaSketch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Basemap
Legend & Ordering
Search layers by name or keyword
Public 3DEP Areas of Interest
(5 of 6)
OBJECTID 5882
SHAPE Polygon
Project_Name Southern limit of forest
Data_Type Lidar-Topo
CollectionYear 2020
ProjectStatus Area of Interest
Restrictions Public
State MN
Point_Of_Contact Charlotte Roy, M Department of N Resources, 218- charlotte.roy@st https://www.dnr
Horizontal_Accuracy Not Provided
Zoom to
Thunder Bay
CANADA
Fargo
Saint Paul
Minneapolis
Sioux Falls
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Topobathymetric Lidar
CHS, Esri, GEBCO, DeLorme, NaturalVue | CHS, Esri, GEBCO, IHO-IOC GEBC...
Powered by Esri and SeaSketch

Outreach and educational materials

USGS science for a changing world

The 3D Elevation Program—Summary for Minnesota

Introduction

Elevation data are essential to a broad range of applications, including forest resources management, wildlife and habitat management, national security, recreation, and many others. For the State of Minnesota, elevation data are critical for agriculture and precision farming, natural resources conservation, flood risk management, infrastructure and construction management, water supply and quality, coastal zone management, and other business uses. Today, high-quality light detection and ranging (lidar) data are the sources for creating elevation models and other elevation datasets. Federal, State, and local agencies work in partnership to (1) replace data, on a national basis, that are (on average) 30 years old and of lower quality and (2) provide coverage where publicly accessible data do not exist. A joint goal of State and Federal partners is to acquire consistent, statewide coverage to support existing and emerging applications enabled by lidar data. The new 3D Elevation Program (3DEP) initiative (Snyder, 2012a,b), managed by the U.S. Geological Survey (USGS), responds to the growing need for high-quality topographic data and a wide range of other three-dimensional representations of the Nation's natural and constructed features.

Figure 1. Map of Minnesota showing the areal extent and quality levels of planned and existing publicly available light detection and ranging (lidar) data in November 2012. No lidar data that meet 3DEP requirements for quality level 2 or better are publicly available for Minnesota. See table 2 for quality levels.

3D Elevation Program Benefits for Minnesota

The top 10 Minnesota business uses for 3D elevation data, which are based on the estimated annual benefits of the 3DEP initiative, are shown in table 1. National Enhanced Elevation Assessment (NEEA; Dewberry, 2011) survey respondents in the State of Minnesota estimated that the national 3DEP initiative would result in at least $13 million in new benefits annually to the State. The cost for such a program in Minnesota is approximately $28 million, resulting in a payback period of 2.1 years and a benefit-to-cost ratio of 3.9 to 1 over an 8-year period. Because monetary estimates were not provided for all reported benefits, the total benefits of the 3DEP to Minnesota are likely much higher. On the basis of the NEEA survey results, all levels of government and many organizations in Minnesota could benefit from access to statewide high-resolution elevation data.

The NEEA evaluated multiple data-collection programs to determine the optimal data quality and data replacement cycle relative to cost to meet the stated needs. For Minnesota, approximately 76 percent of the total benefits are realized in agriculture and precision farming and natural resources conservation uses alone, as shown in table 1. The status of publicly available lidar data in Minnesota is shown in figure 1. By enhancing coordination between the 3DEP and the various government and private organizations in Minnesota, it may be possible to meet a higher percentage of the needs.

3DEP in Minnesota by the Numbers

Expected annual benefits	$13.64 million
Estimated total cost	$28.15 million
Payback	2.1 years
Quality level 1 buy-up estimate	$17.91 million

3D Elevation Program

3DEP is a national program managed by the USGS to acquire high-resolution elevation data. The initiative is backed by a comprehensive assessment of requirements (Dewberry, 2011) and is in the early stages of implementation. 3DEP will improve data accuracy and provide more current data than is available in the National Elevation Dataset (NED). The goal of this high-priority cooperative program is to be operational by January 2015 and to have complete coverage of the United States by 2022, depending on funding and partnerships. The new program has the potential to generate $13 billion/year in new benefits through improved government services, reductions in crop and homeowner losses resulting from floods, more efficient routing of vehicles, and a host of other government, corporate, and citizen activities (Dewberry, 2011).

Benefits of a Funded National Program

- Economy of scale—Acquisition of data covering larger areas reduces costs by 25 percent.
- A systematic plan—Acquisition of data at a higher quality level reduces the cost of "buying up" to the highest levels needed by State and local governments.
- Higher quality data and national coverage—Ensure consistency for applications that span State and watershed boundaries and meet more needs, which results in increased benefits to citizens.
- Increase in Federal agency contributions—Reduces State and local partner contributions.
- Acquisition assistance—Provided through readily available contracts and published acquisition specifications.

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By William J. Carswell, Jr.

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Minnesota Lidar Acquisition Plan Fact Sheet

Background

The 3D Geomatics Committee (3DGeo) of the Minnesota Geospatial Advisory Council (GAC) is working closely with the Minnesota Geospatial Information Office (MnGeo) under Minnesota IT Services (MNIT) to engage the geospatial community in developing, promoting, and funding a statewide high-density (HD) lidar acquisition plan for Minnesota. Higher-density and higher-quality lidar will dramatically improve our ability to analyze the landscape in Minnesota, inventory public and private infrastructure and assets, and plan for current and future scenarios, in support of better decision making for our natural, cultural, and built environments.

- This will be a 5 year or longer effort with a grant request to the federal government each year.
- The plan covers acquisition of all lands within the state boundary - 86,943 square miles
- We are engaging partners in, state, federal, regional, and local government, tribal nations, academia, non-profit, and private sectors to contribute to the plan and funding.
- We will be seeking funding from the federal government through a US Geological Survey (USGS) grant program called a broad agency announcement (BAA) managed under the USGS 3D Elevation Program (3DEP).
  - Federal cost share averages about 38% of the cost but can cover as much as 75% depending on needs of federal agencies
- MNIT/MnGeo is the principal for this year's grant application and would likely be the aggregator and distributor for the data products generated over the course of this project and beyond.

Additional resources that can provide more information about upcoming plans for lidar in Minnesota:

- Minnesota State Lidar Plan
- Story Map about the Minnesota State Lidar Plan

Benefits

Expected annual benefits are $13.64 million. Based on an estimated total acquisition cost of $34.8 million for quality level 1 data, the payback would be 2.6 years. The top 10 Minnesota business uses for 3D elevation data, which are based on the estimated annual benefits of the 3DEP initiative, are shown in the table-1 below.

Rank	Business use	Annual benefits (millions)
1	Agriculture and precision farming	$8.90
2	Natural resources conservation	3.38
3	Flood risk management	1.10
4	Infrastructure and construction management	0.64
5	Water supply and quality	0.47
6	Coastal zone management	0.41
7	Forest resources management	0.33
8	Geologic resource assessment and hazard mitigation	0.15
9	Aviation navigation and safety	0.14
10	Renewable energy resources	0.07
	Other	0.03
	Total	13.62

Table 1 - Estimated Annual Benefits of Lidar, Source: National Enhanced Elevation Assessment for Minnesota (Dewberry, 2011)

As customers of government agencies, citizens expect spatial data mapping of building placement, flood modeling, and water features are in harmony with the imagery on their phone. When agency data is out of date and at lesser resolution the bond of trust between the citizen and the agency providing services is broken.

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Minnesota State Lidar Plan – Announcement

Overview

The Minnesota 3D Geomatics Committee and the State Geospatial Information Office, MnGeo, have developed a draft Lidar Plan for the State of Minnesota that will help guide the acquisition of new statewide lidar data over the next five years.

The State Lidar Plan seeks to outline collection timelines, standards, end user needs, products, and storage/dissemination methods.

Call to Action

Please contact us for more on the State Lidar Plan.

- Identify and share requirements and business use cases
- Provide your desired areas of interest and product needs
- Let us know if you can help provide matching funds
- Check out the draft State Lidar Plan and StoryMap on the web

Get involved: Contact
https://www.mngeo.state.

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Funding Oppo

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Nationwide. This program has been successful in our region, but our current lidar data does not meet the new specifications.

Every fall, the USGS has a call for proposals to apply for grant funding to match local partnerships. To receive federal funding, we must provide a non-federal funding match. We are currently reaching out to
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State Lidar Plan

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The Minnesota 3D Geomatics Committee and the State Geospatial Information Office, MnGeo, have developed a 5-year draft plan to help guide the acquisition of new statewide lidar data.

Deliverables proposed include a lidar point cloud, digital elevation model, canopy height model, and more depending on stakeholder needs and funding.

www.mngeo.state.mn.us/committee/3dgeo/

Get Involved!

- Let us know if you can help
- Share requirements and business use cases
- Provide areas of interest and product needs

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http://bit.ly/MnLidarPlanStoryMap