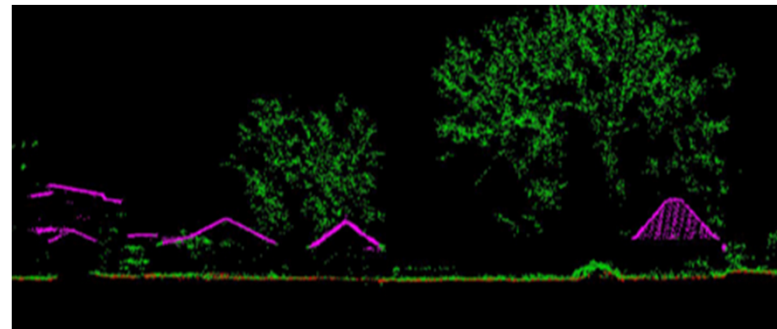
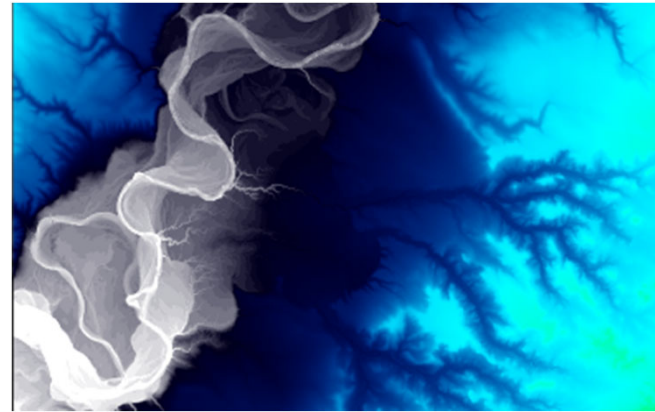


Lidar Resources at the Montana State Library

Troy Blandford and Meghan Burns

Montana State Library

*Prepared for the Montana Watershed Coordination Council Annual Meeting,
January 21, 2020*



Measure Distance

Think radar . . .

Think sonar . . .

Think rangefinder . . .

Think laser measuring tool . . .

Think self-driving car . . .

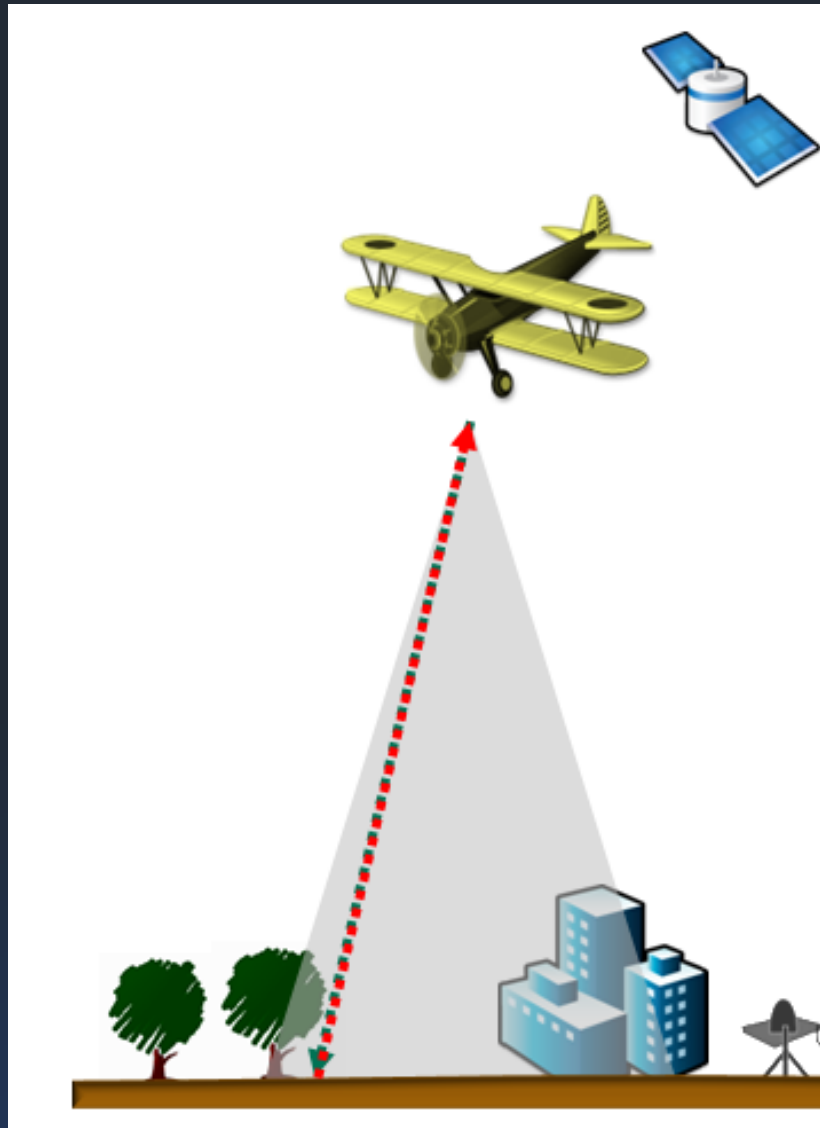
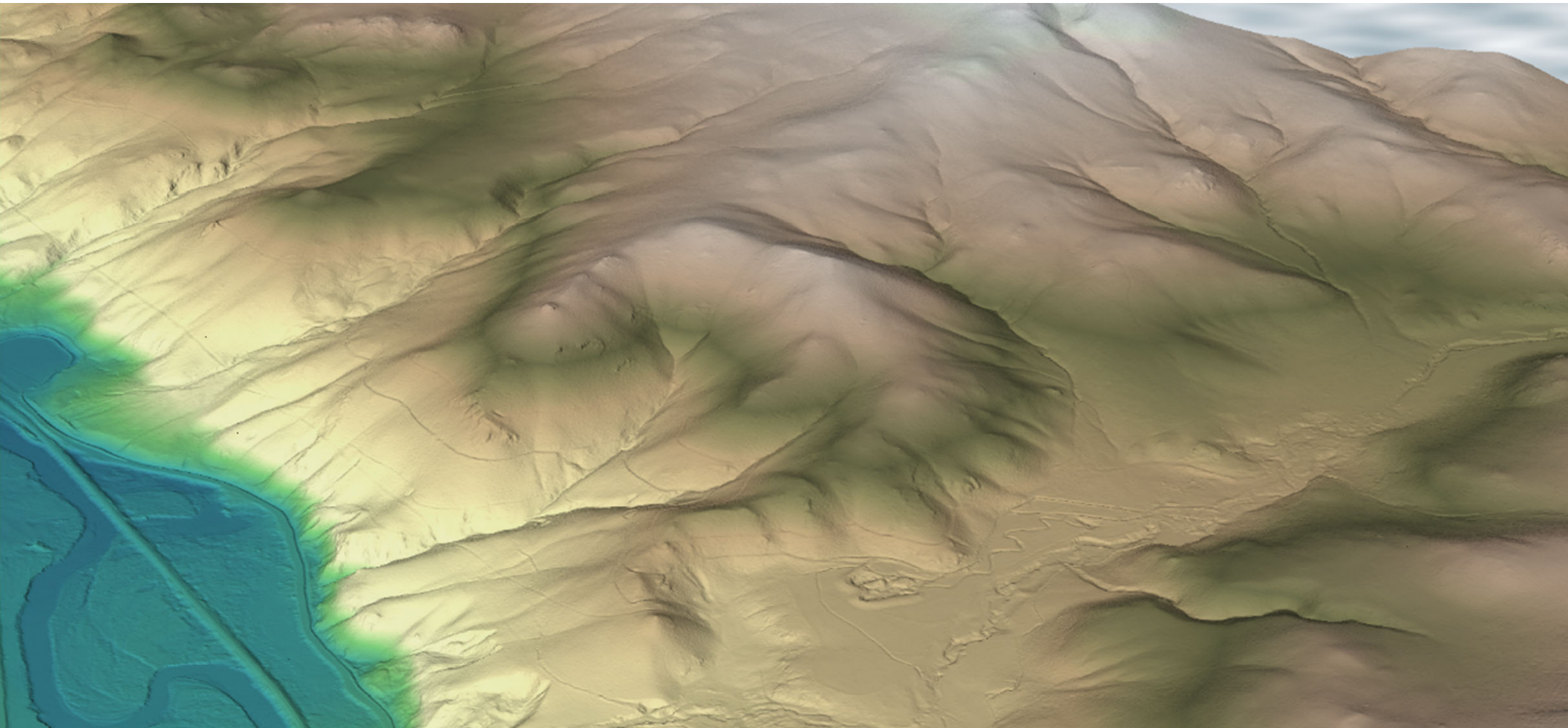
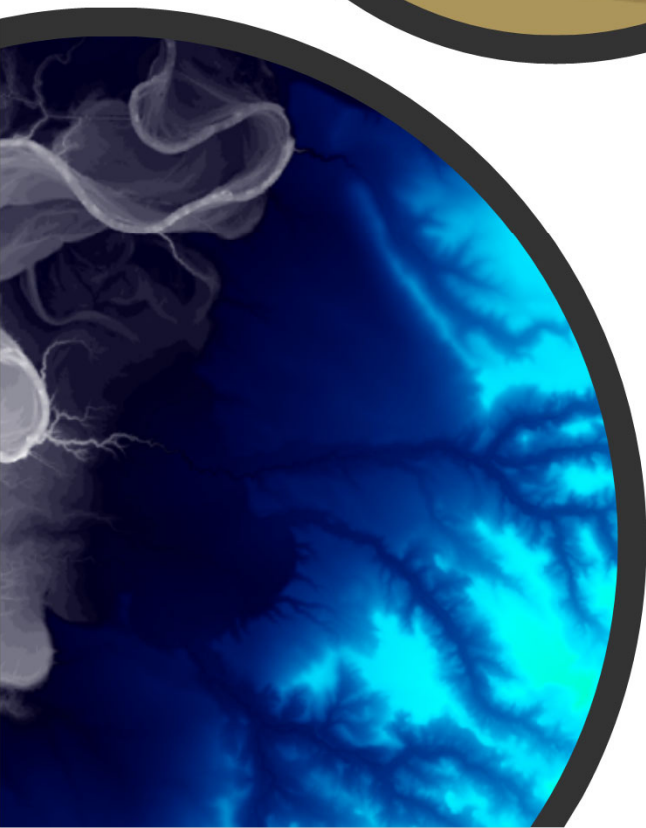
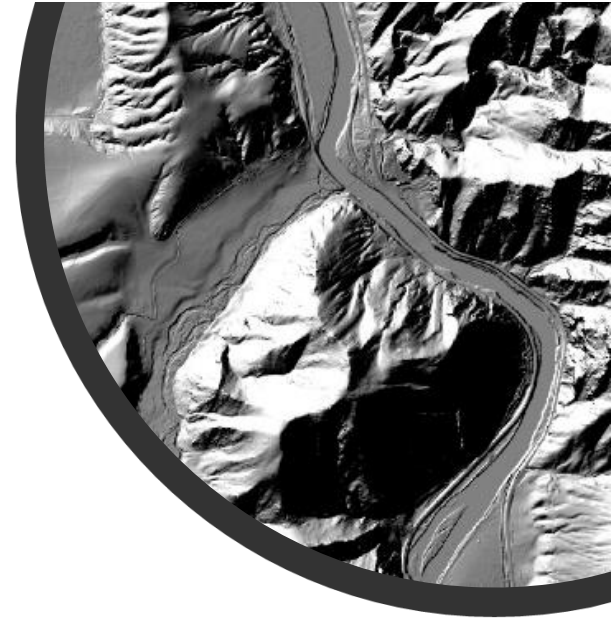
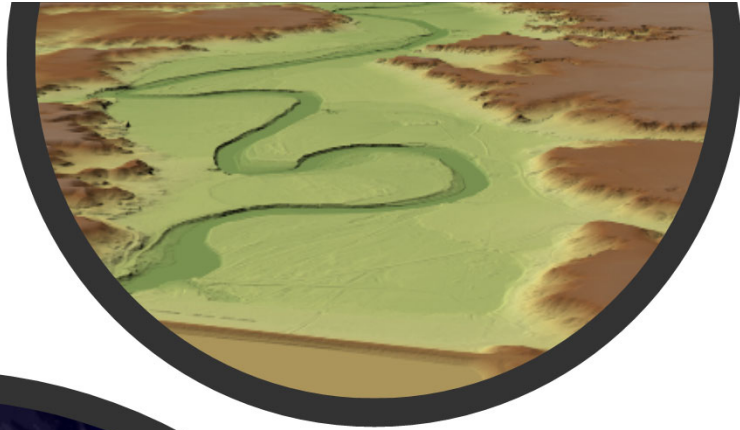


Image from ESRI ArcGIS Desktop Help



Future: Elevation values accurate to ~4-6 inches for every 1 meter across the landscape.

Current: The best available statewide elevation data for Montana is accurate to approximately 2.4 meters (94 inches) for every 10 meters.

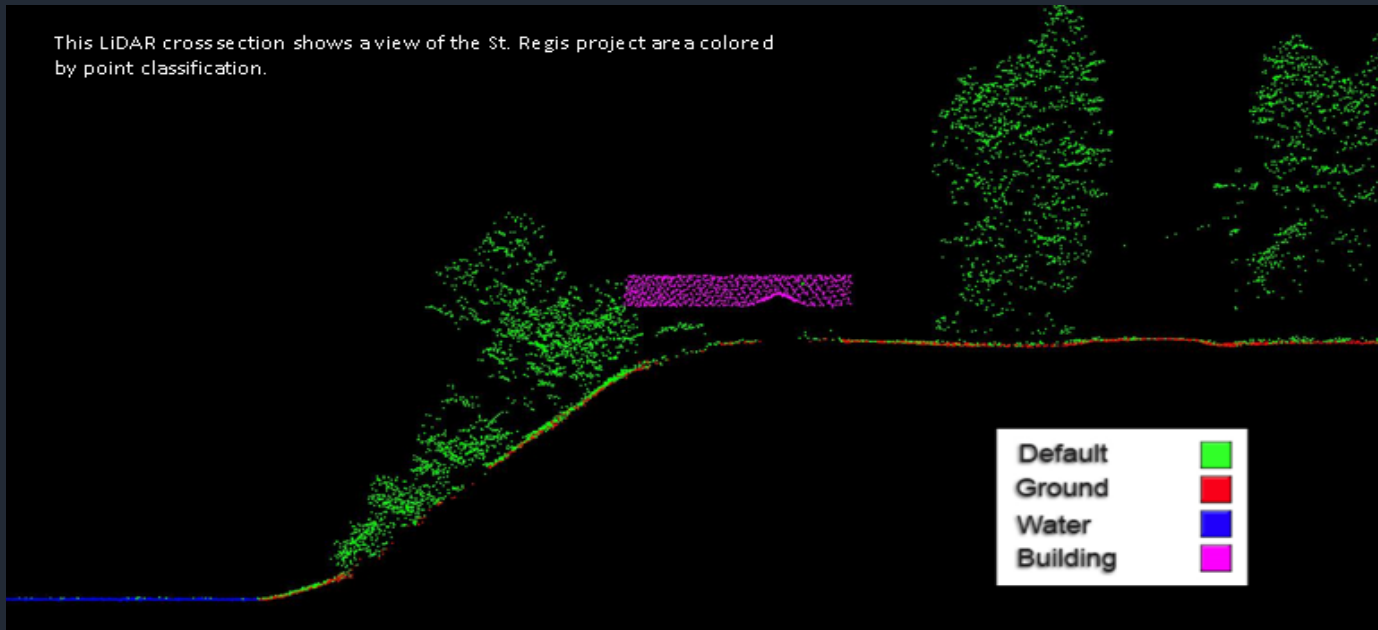


Lidar products and uses

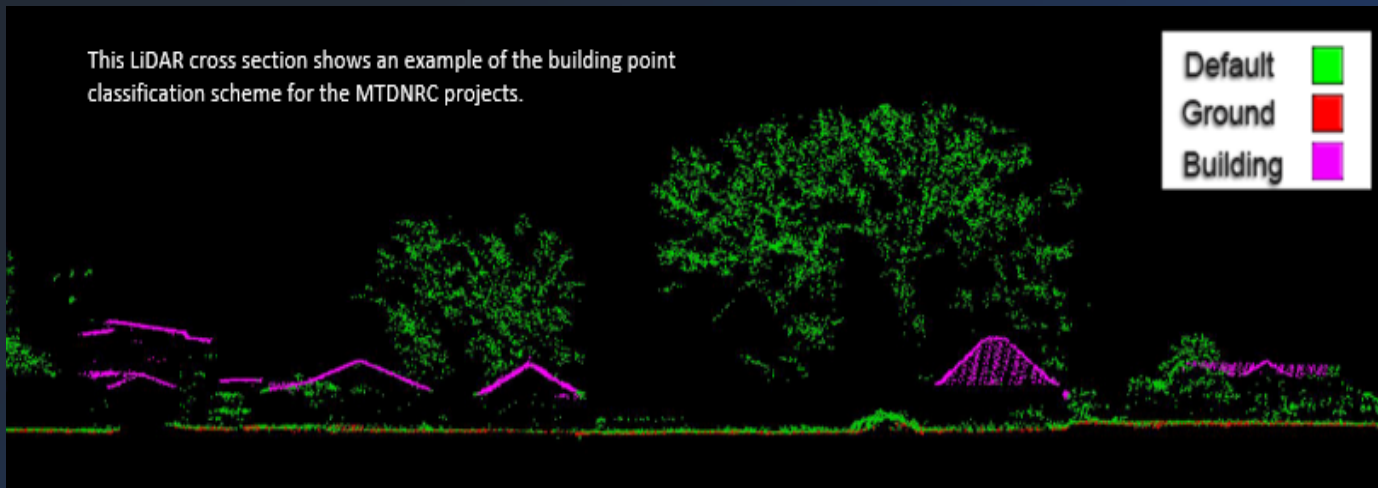


Point Cloud

This LiDAR cross section shows a view of the St. Regis project area colored by point classification.

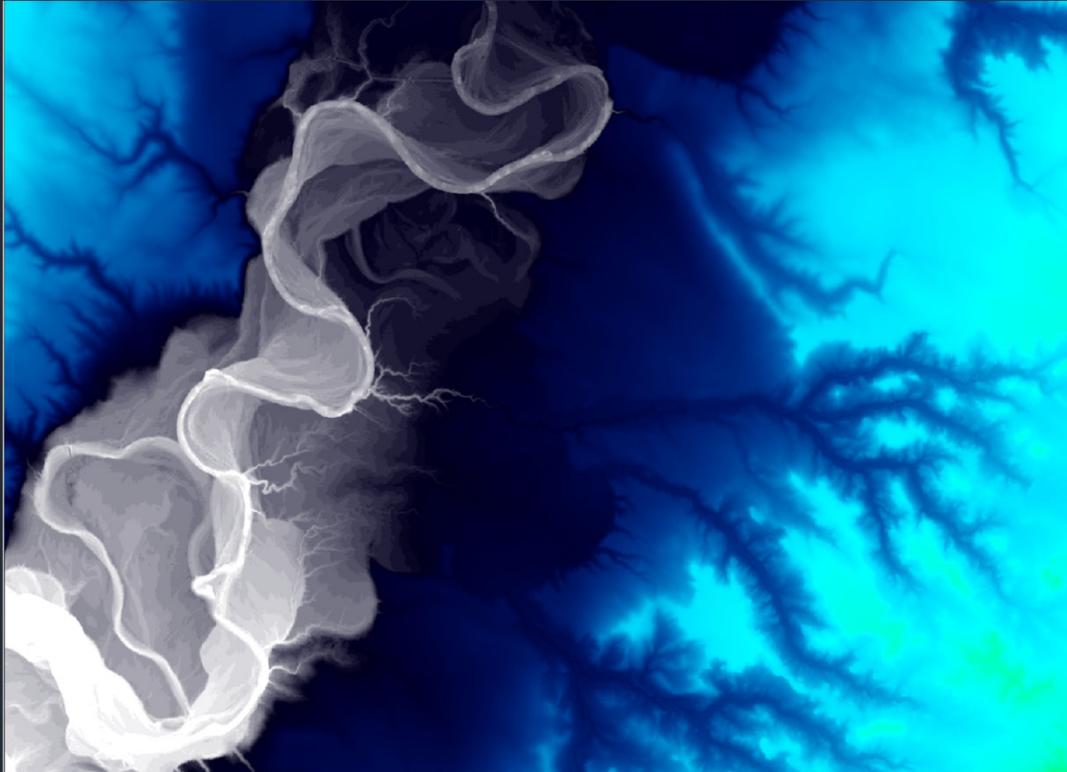


This LiDAR cross section shows an example of the building point classification scheme for the MTDNRC projects.

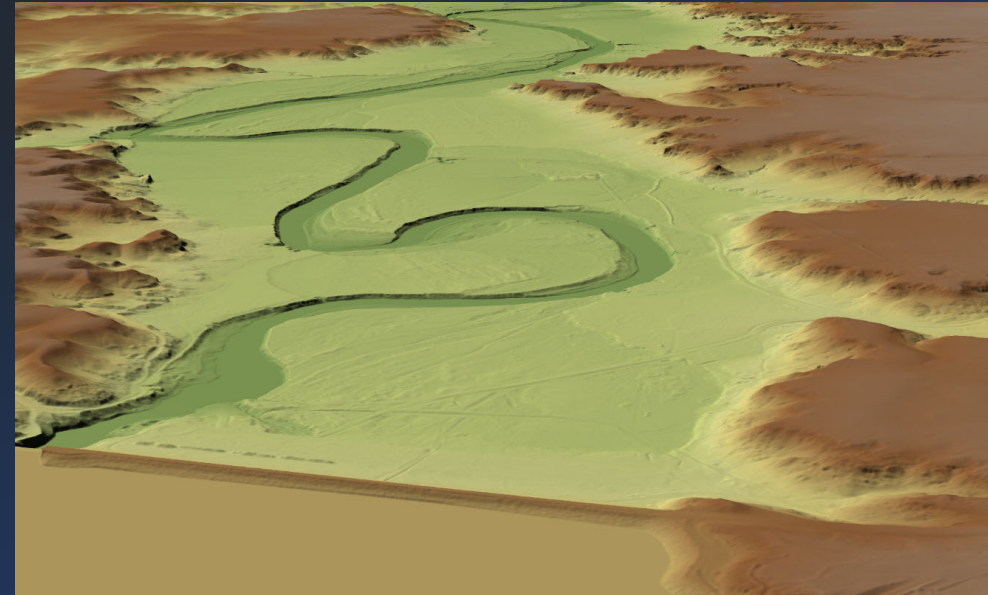


Images
courtesy of QSI

Digital Elevation Model (DEM) – Bare-earth

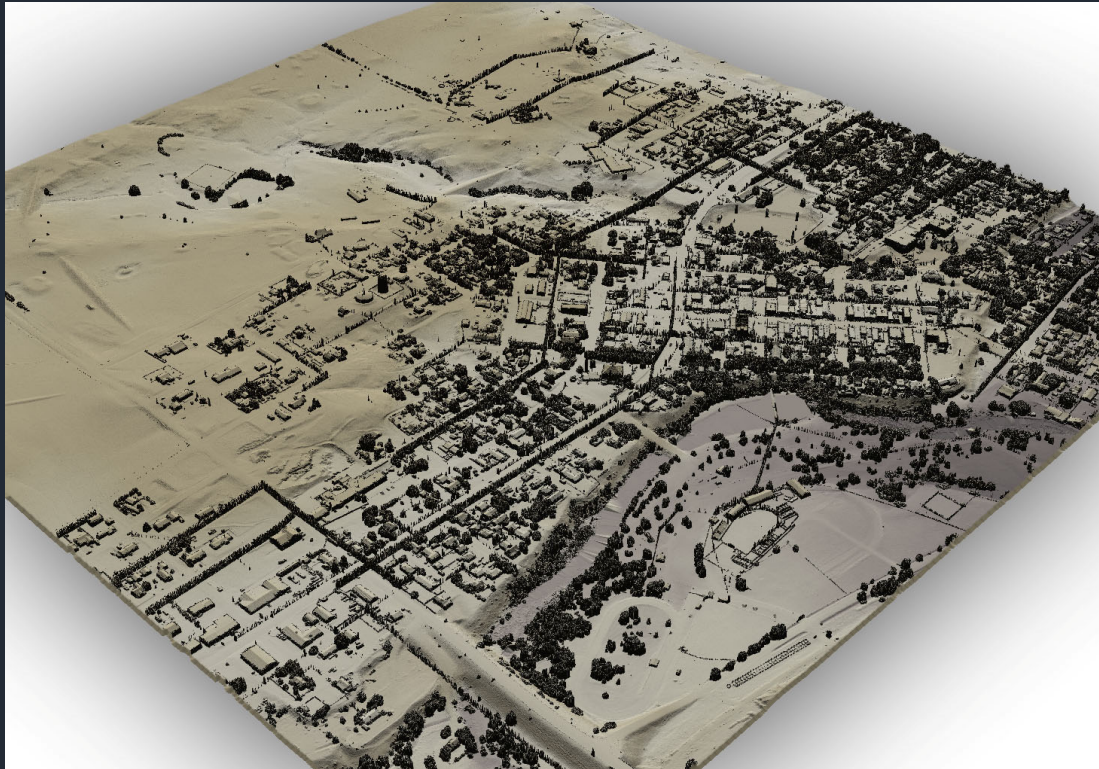


A bare-earth digital elevation model (DEM) of Rock Creek in Valley County showing meanders, oxbows, and tributaries. Image courtesy of Montana State Library.



Looking east from Fresno Dam. Image courtesy of Woolpert.

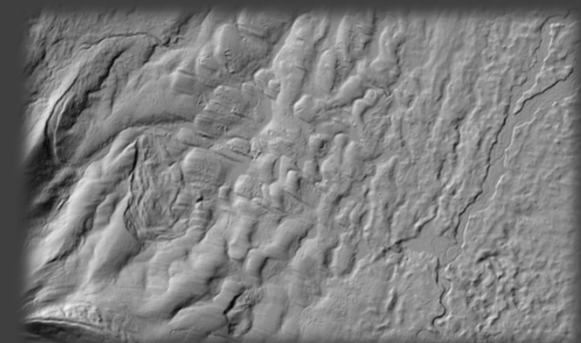
Digital Surface Model (DSM)



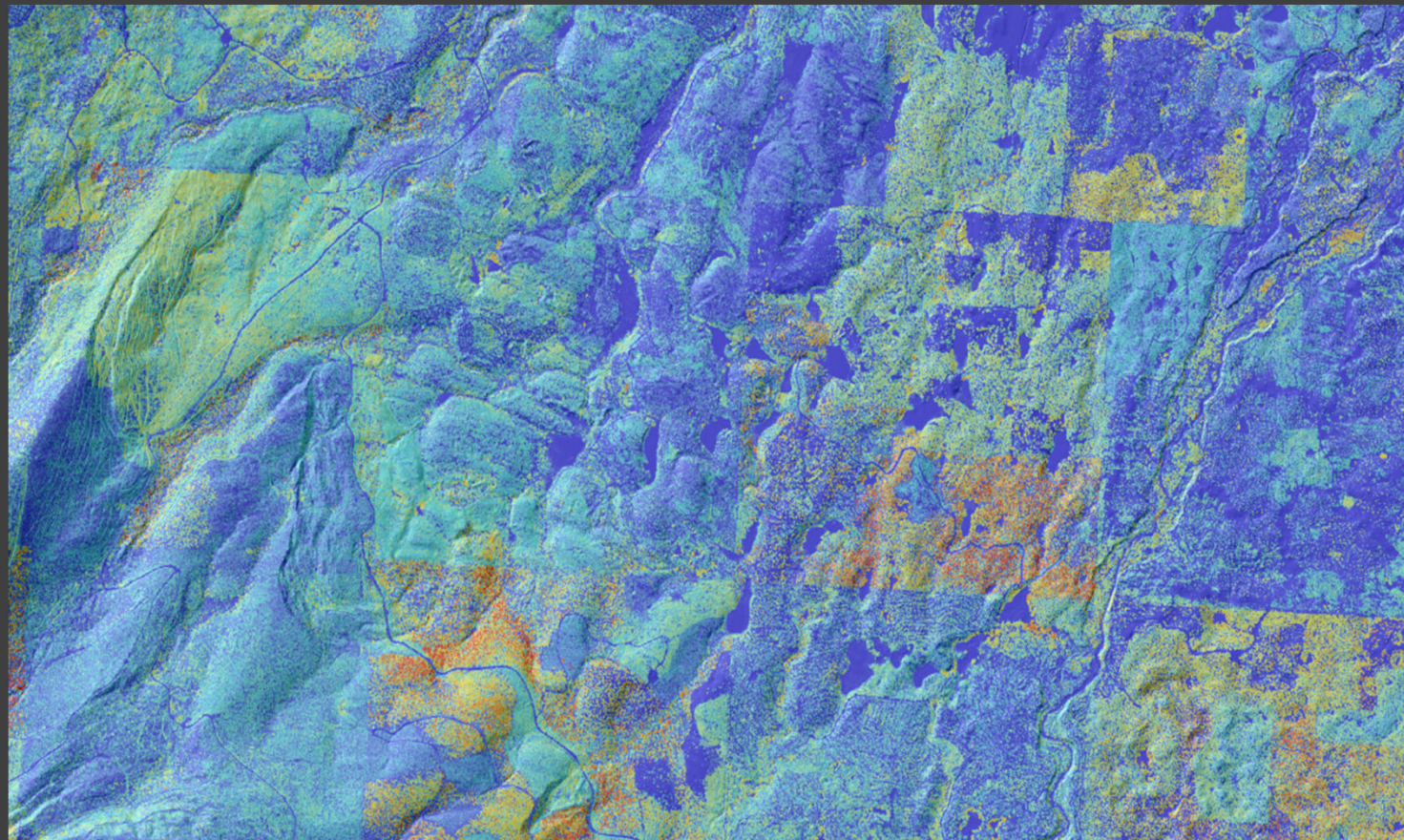
A view of downtown Harlowton, created from the gridded highest hit elevation model colored by elevation. Image courtesy of QSI.



Buildings and trees along the Musselshell River. Image courtesy of Woolpert.

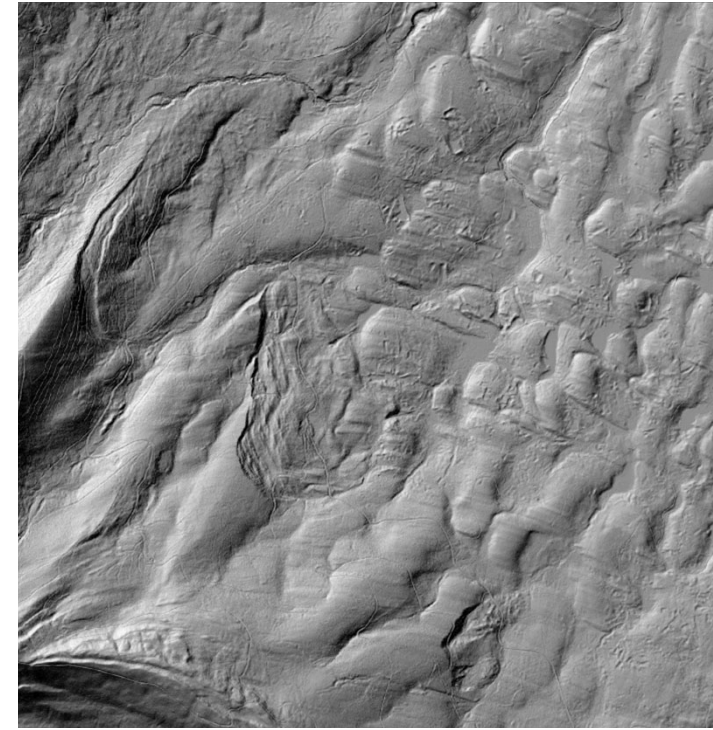
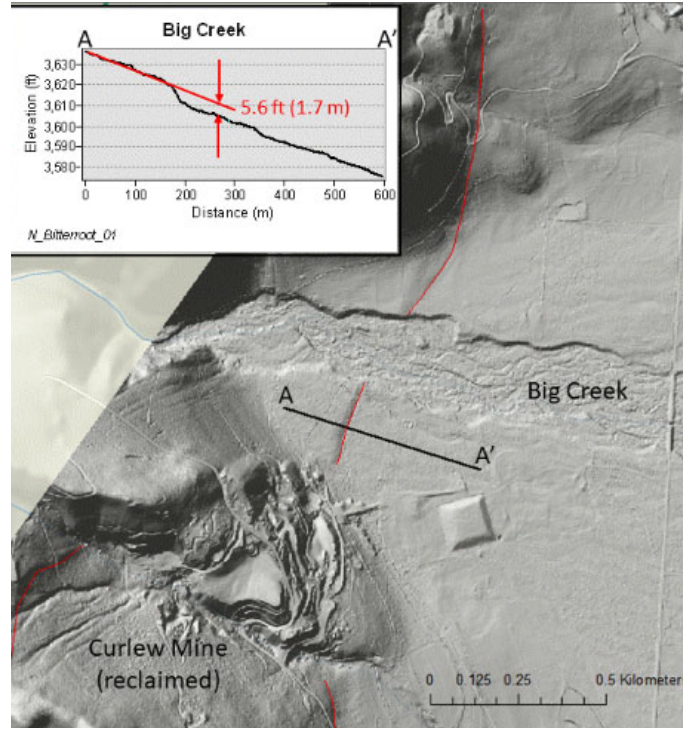
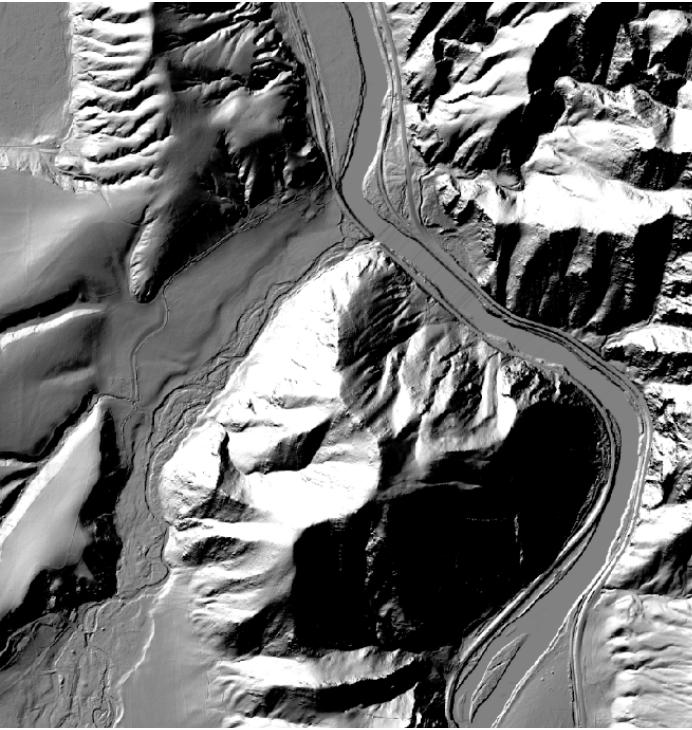


Bare-earth



Canopy Height

Images of the Hemlock Creek area of Swan Valley courtesy of Rob Ahl.



The Jefferson River along Highway 2 as it enters the canyon between LaHood and Lewis and Clark Caverns State Park. Image courtesy of Montana State Library.

The Bitterroot Fault scarp offsetting the youngest glacial outwash surface of Big Creek just north of the Curlew Mine. Image courtesy of Montana Bureau of Mines and Geology.

Hemlock Creek area of Swan Valley. Image courtesy of Rob Ahl.

Hillshade

MONTANA STAKEHOLDER LIDAR USES






1. terrain modeling, ski slopes, new ski areas
2. snow avalanche hazard mapping
3. flood risk mapping
4. better contour maps needed
5. transportation and sidewalk design
6. building footprints
7. locating/preserving cultural resources
8. hydrologic modeling
9. public works
10. inundation mapping during
11. geologic and natural hazards mapping
12. seismic analysis/risk mapping
13. modeling for groundwater development
14. water resources investigations and modeling
15. mapping surface water structures database
16. control point database
17. education and training
18. earth sciences research
19. geophysical engineering
20. landslides
21. water quality modeling
22. engineering and design
23. remediation
24. mining and reclamation
25. landfill and waste management
26. archeology and cultural resources
27. superfund sites
28. stormwater modeling
29. wetland mapping
30. disaster response
33. mapping of riverine areas
34. dam and levee safety
35. state forest health
36. fire risk/fuels
37. natural resources damage recovery and
38. geophysical properties to support river
39. transportation and infrastructure design
40. bridge design and construction
41. stormwater modeling
42. cut and fill analysis
43. fish and wildlife habitat mapping
44. land cover mapping
45. Tribal resiliency planning
46. storm water infrastructure
47. tribal transportation planning
48. surveying
49. energy siting (*assumed use*)
50. tree assessment/removal (*assumed use*)
51. vegetation structure mapping, e.g for
52. watershed boundary delineation
53. conservation planning
54. water resources management and plan
55. infrastructure design, construction, an
56. survey and ground modeling
57. water supply: municipal, rural, industr
58. renewable energy – wind
59. height, shape, and height to crown of
60. wildlife movement corridors

**NOT AN
EXHAUSTIVE LIST**

Montana Lidar Inventory

Montana Lidar Inventory

Montana State Library - MSDI Elevation   

- Introduction
- 1. Acquisition Status Map**
- 2. Request Data
- 3. Collaborate - Submit Areas of Interest
- 4. Submit missing acquisitions
- 5. Explore more and set filters

Lidar Acquisition Status

This map depicts completed, in-progress, and planned lidar acquisitions. "Completed" means the flights to acquire the lidar data are complete, and the data has been processed and delivered. "In-progress" means lidar is currently being collected or the data is being processed. "Planned" means the area is expected to be collected in the near future (~1 year). If you are interested in an area planned for collection or an area nearby, you should contact the organization listed about potentially partnering. There may be opportunities to work with the lidar vendor to maximize the areal extent that can be collected.

Much of the available data can be obtained by contacting the Montana State Library. The USDA Montana NRCS and the Montana State Library are currently collaborating on a prototype data distribution system for downloading lidar data (*in development*). In the meantime, submit requests for lidar data using "Tab 2. Request Data."

Click on a project area to view additional information, such as project name, agency name, and collection dates.

[Click here to download the lidar acquisition status map in PDF format or the project footprints in GIS format \(geodatabase or shapefile\)](#)

Last Update: November 27, 2019

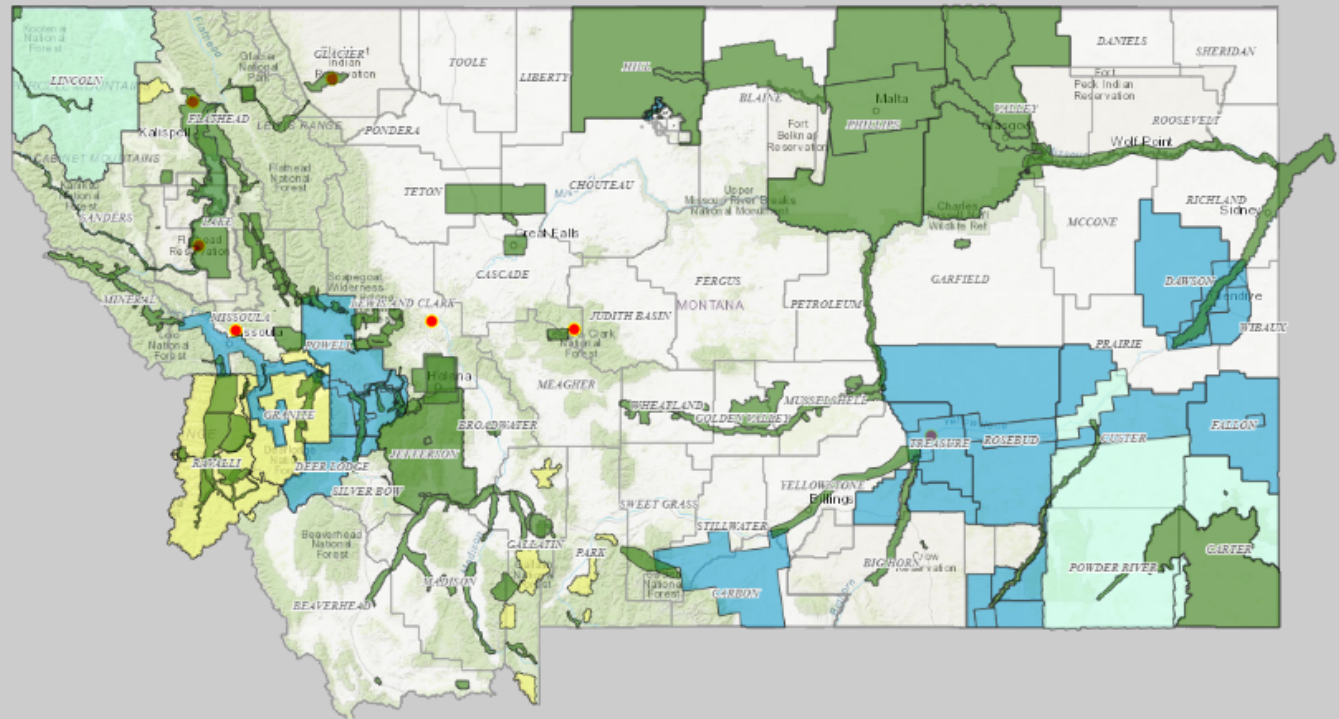
Completed Lidar Collection



In-Progress Lidar Collection



Planned Lidar Collection



What products do you need?*

Due to the data volume of lidar, please limit your request to only the products you need.

LAS (point cloud)

Bare-earth Digital Elevation Model

First-return Digital Elevation Model (e.g. surface, includes trees)

Project extent footprint/tiles (vector)

Lidar acquisition report

Breaklines

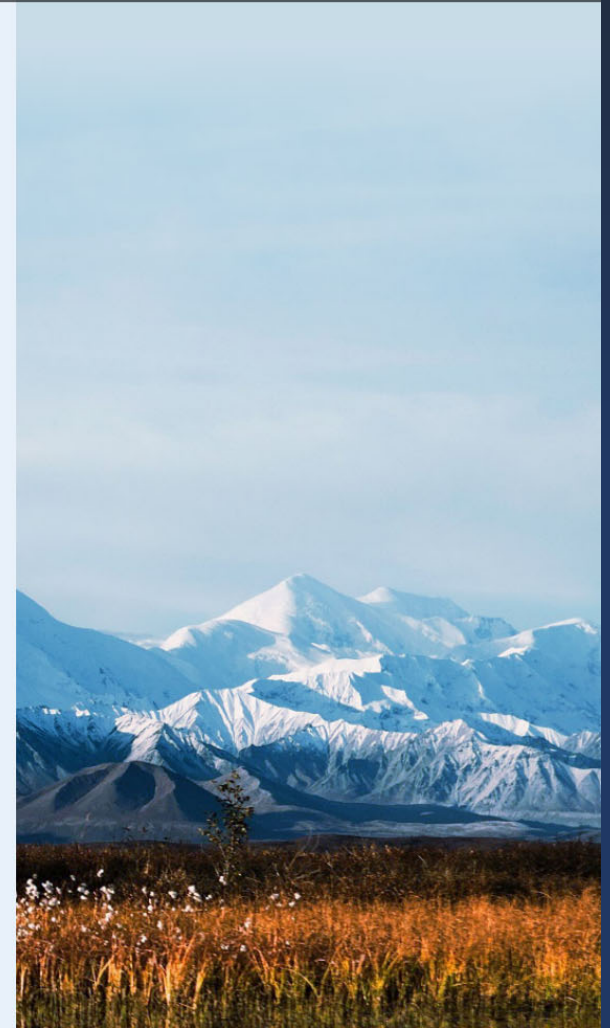
Intensity image

Contours (not available for all projects)

Original delivery (all available products)

Other (please specify)

What are your preferred file formats?*



Montana Elevation Working Group

Federal, State, County, local, and private participants (all are welcome)

❖ Let us know where lidar is needed

The screenshot shows a web browser window displaying the 'Montana Lidar Inventory' application. The browser's address bar shows the URL: `montana.maps.arcgis.com/apps/MapSeries/index.html?appid=55cc086ec7d2416d05beca68d05...`. The application header includes the title 'Montana Lidar Inventory', a status indicator 'No issues detected', an 'Edit' button, and the text 'Montana State Library - MSDI Elevation' with social media icons and the Esri logo. A navigation menu contains five items: 'Introduction', '1. Acquisition Status Map', '2. Request Data', '3. Collaborate - Submit Areas of Interest', and '4. Submit missing acquisitions'. The '3. Collaborate - Submit Areas of Interest' tab is active, showing a text panel on the left and a map on the right. The text panel contains the following text: 'Collaborate - Priority Areas of Interest for Future Lidar Acquisitions', 'The purpose of this map is to promote collaboration among organizations interested in acquiring lidar. Shapes can be drawn on the map to let others know where you would like lidar collected, what it will be used for, potential funding that may be available, and the urgency for the collection. Ideally, organizations should partner and apply for a federal grant, such as USGS 3DEP funds. The Montana Elevation Working Group led by the Montana State Library can assist with coordination. Contact: geoinfo@mt.gov.', and 'Instructions: 1. Familiarize yourself with the Legend (the icon looks like a bulleted list). By default, only priority areas are shown on the map. Planned and completed lidar'. The map on the right shows a map of Montana with various colored polygons (yellow, orange, purple) representing areas of interest. A search bar at the top of the map area contains the text 'Find address or place'. A scale bar at the bottom of the map indicates 100 miles. The bottom right corner of the map area shows the text 'Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS | Montana S'.

Annual Lidar Planning Important Dates

- **April-May** – Acquisition Planning Meeting, set priority areas for Fall proposal
- **May-July** – Funding partner identification
- **Mid-August** – 3DEP Public Webinar for Broad Area Announcement
- **September** – Proposal development
- **October** – Proposals Due

Lidar collection generally occurs in spring and fall (leaf-off) when there is no snow. Turnaround time can be up to 12-18 months.

Annual Lidar Acquisition Planning Calendar		
<u>January</u>	<u>February</u>	<u>March</u>
	1 st – State IT Budget Requests Due to SITSD (Biennial – even years) 15 th – MLIA Grant Program Applications Due (Annual) 28 th – Transmittal of General Bills in Montana Legislature to Other Chamber (Biennial – odd years) Identify Priority Areas	Identify Priority Areas
<u>April</u>	<u>May</u>	<u>June</u>
1 st – Montana Land Information Plan Grant/Funding Priority Discussions Begin Acquisition Planning Meeting for Fall 3DEP BAA Data Acquisition (no snow/no leaves)	10 th – NRCS Lidar Planning for Areas of Interest (Annual) 15 th – Announcement of MLIA Grant Funding Prioritization (Annual) Acquisition Planning/Partner Identification Data Acquisition (no snow/no leaves)	30 th – End of Montana State Fiscal Year (Annual) Acquisition Planning/Partner Identification Data Acquisition (no snow/no leaves)
<u>July</u>	<u>August</u>	<u>September</u>
1 st – Start of Montana State Fiscal Year (Annual) Acquisition Planning/Partner Identification	22 nd – USGS Public Webinar for Broad Agency Announcement (BAA) Submissions (Annual) 22 nd – USGS Issues BAA for 3D Elevation Program (3DEP) Acquisition Planning	30 th – End of Federal Fiscal Year (Annual) Acquisition Planning
<u>October</u>	<u>November</u>	<u>December</u>
1 st – Start of Federal Fiscal Year BAA Proposals Due (Annual) Data Acquisition (no snow/no leaves)	Data Acquisition (no snow/no leaves)	
Dates Vary: – Federal Emergency Management Agency/Montana DNRC Lidar Requests – USDA Forest Service Lidar Requests		



THANK YOU
QUESTIONS/COMMENTS PLEASE.



<http://msl.mt.gov/gis/lidarinventory>