Idaho Statewide Lidar Plan
Version 2.0

Authors

The Elevation Technical Working Group (Elevation TWG) of the Idaho Geospatial Office, State of Idaho and the Idaho Lidar Consortium (ILC) first developed the State of Idaho Lidar Plan in 2018. This plan was reviewed by members of the Elevation TWG in June 2025. Iterative revisions were made based on feedback given by August 2025. The plan was submitted to the Idaho Geospatial Council - Executive Committee in January 2026.

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IDAHO STATE LIDAR PLAN

1. Executive Summary

Lidar is one of the most important geospatial innovations of the 21st century. Providing a detailed picture of the earth's surface and everything on it, elevation and surface data derived from lidar are the foundation for disaster assessment and mitigation efforts, agriculture techniques that save time and resources, and siting of new transportation infrastructure. These are just three examples of the many well-documented benefits that lidar has for the State of Idaho. Although lidar has been collected for the entirety of the state, the land is always changing, and lidar must be updated on a recurring basis. Moreover, the funding of statewide lidar collection has been a patchwork effort in the past, resulting in inconsistent lidar coverage with quality disparities and age gaps. This revised plan has calculated that based on a 5-year refresh rate, the total cost to acquire lidar would be approximately $29 million. However, with a cost-share agreement, the **total cost to Idaho would be $2.97M per year, and $14.9M over five years**.

When the Idaho Lidar Plan 1.1 was released in 2018, lidar was a newer technology, and many lessons were still being learned about Idaho's unique needs for lidar collection. The Idaho Lidar Plan 2.0 includes revised recommendations based on the previous seven years of lidar use, represents a call to funding at the State level, and provides a road map for the next generation of lidar collection in Idaho.

Drawn from this report, the **State of Idaho Lidar Plan 2.0**, are **key recommendations and conclusions**:

- Lidar provides critical three-dimensional (3D) elevation data for a wide range of applications, including agriculture, infrastructure, emergency response, and environmental monitoring. Its accuracy and versatility surpass traditional remote sensing technologies, making it an essential foundation for modern mapping and planning efforts.

- Unlike many other states, Idaho currently has no legislated or dedicated funding stream for lidar data acquisition, coordination, or maintenance. This results in fragmented, piecemeal data collection that limits statewide utility and long-term value. The absence of sustainable funding, long-term storage capabilities, and coordinated data access platforms threatens to undermine the value of lidar datasets, even when collected. Without investment in these areas, Idaho risks falling behind peer states in digital geospatial capacity. To secure predictable, match-ready funding and maximize Idaho's eligibility for federal cost-share grants through the U.S. Geological Survey's 3DEP, FEMA, and other agencies, the State should consider funding a portion of the total lidar acquisition costs through a dedicated funding stream (**discussed in Section 14**).

- High-resolution lidar data supports sustainable land and water use, particularly in Idaho's agriculture-intensive and hazard-prone environments. Repeat lidar data offers immense value for monitoring landscape change, planning infrastructure, and evaluating human and natural impacts over time.

- We propose maintaining statewide lidar coverage by prioritizing areas of need (**discussed in Section 8**) and leveraging partnerships whenever possible.

- We also recommend considering training and outreach as an integral part of effective lidar collection for Idaho (**discussed in Section 12**).

- We recommend considering airborne and UAS lidar only, as the spatial coverage and coarseness of spaceborne lidar and the vertical uncertainties and lack of vegetation penetration from photogrammetry-derived datasets are likely insufficient for uses outlined in this document.

This document should be updated as new technologies become available and key economic drivers change. The E-TWG recommended specifications and suggested derivative products should also be updated as technologies are updated.

2. Introduction

Light detection and ranging (lidar) is a laser-based technology that provides three-dimensional (3D) data to develop bare earth, canopy, and other models of the earth's surface necessary for mapping applications. Lidar's capabilities to derive fine-scale, 3D data across relatively large swaths of the landscape make it unique from other Earth surface mapping technologies such as optical imagery (e.g., airborne-based National Agriculture Imagery Program (NAIP) imagery or satellite-based Landsat imagery). Lidar is most commonly collected via airborne platforms where large swaths of data are needed. Nationally, lidar has been collected by local, state, and federal agencies, tribal governments, private sector, universities, and non-governmental organizations (NGOs), often in overlapping areas and/or in "postage-stamp" acquisitions. Until the United States Geological Survey (USGS) developed the 3D Elevation Program (3DEP) in 2010, there was no nationally-coordinated lidar acquisition program (USGS, 2025). Whereas 3DEP provides seed funding and funds-matching for data collections, additional funds and partnerships are needed to acquire lidar data wall-to-wall (nationally) and on a repeat basis.

High-resolution elevation data from lidar provides tremendous opportunity for the State of Idaho by providing baseline landscape information for emergency management, transportation infrastructure, natural resources, education, environmental health, and many other disciplines and strategic areas. More discussion regarding these opportunities is presented below. Numerous states have already acquired statewide lidar data (e.g., Washington, North Carolina, Virginia, Pennsylvania, Maryland, Iowa, Louisiana, Minnesota, Massachusetts, North Dakota, Indiana, Delaware, Connecticut, and Ohio) or have plans in place to acquire statewide lidar (e.g., Oregon, Vermont, New Mexico, Tennessee, Kentucky, Utah, Kansas, and Florida).

2.1 Quality of Lidar

Lidar is an active remote sensing technology that functions similarly to a virtual tape measure, using laser pulses instead of physical tape. An airplane with a laser sensor pointed at the ground flies over an area, and as it scans the ground, the laser beam continuously pulses at a high frequency (millions of times per second). As the laser beam bounces off each object above the ground and then finally, the ground itself, and returns to the sensor, the sensor records each return, along with high-precision global positioning system (GPS) data and other metadata, to accurately generate a single point with real-world spatial coordinates (x and y) and elevation (z). Together, the millions of points created in a single flight form a dense point cloud, which provides a highly detailed three-dimensional representation of the Earth's surface and any features encountered by the laser, such as vegetation, buildings, and terrain. The same basic principle is found in hand-held laser rangefinders often used in golf, hunting, and construction to measure distances.

The resolution and accuracy of airborne lidar data are categorized by the USGS Topographic Data Quality Levels (QL), with QL0 representing the highest density and accuracy, and QL5 the lowest (**Table 1**). USGS 3DEP has set their nationwide baseline at QL2, with QL5 in Alaska (Sugarbaker et al., 2014).

Table 1. Nominal pulse spacing and pulse density (from USGS Lidar Base Specification 2025 rev. A)

Quality level	Data Source	Vertical accuracy RMSEz (cm)	Nominal pulse spacing (meters)	Nominal Pulse Density: points per square meter	DEM cell size (meters)
QL0	Lidar	5 cm	$\leq$ 0.35	$\geq$ 8 pts/m^2	0.5 m
QL1	Lidar	10 cm	$\leq$ 0.35	$\geq$ 8 pts/m^2	0.5 m
QL2	Lidar	10 cm	$\leq$ 0.71	$\geq$ 2 pts/m^2	1 m
QL3	Lidar	20 cm	$\leq$ 1.41	$\geq$ 0.5 pts/m^2	2 m
QL5	IfSAR (for Alaska)	185 cm	N/A	N/A	5 m

2.2 Statewide Lidar Management and Organization

Lidar management at the state level is the result of interagency efforts and is largely accomplished on a volunteer basis. The Idaho Lidar Consortium (ILC) is the technical lead for lidar and the state lidar champion. The Elevation Technical Working Group (E-TWG), Boise State University Boise Center Aerospace Laboratory (BCAL), Idaho State University GIS Training and Research Center (GISTReC), and Idaho Geospatial Office (IGO) assist in plan development. A list of projects and metadata links are available at idaholidar.org.

As of 2025, the Idaho Lidar Consortium team consists of:

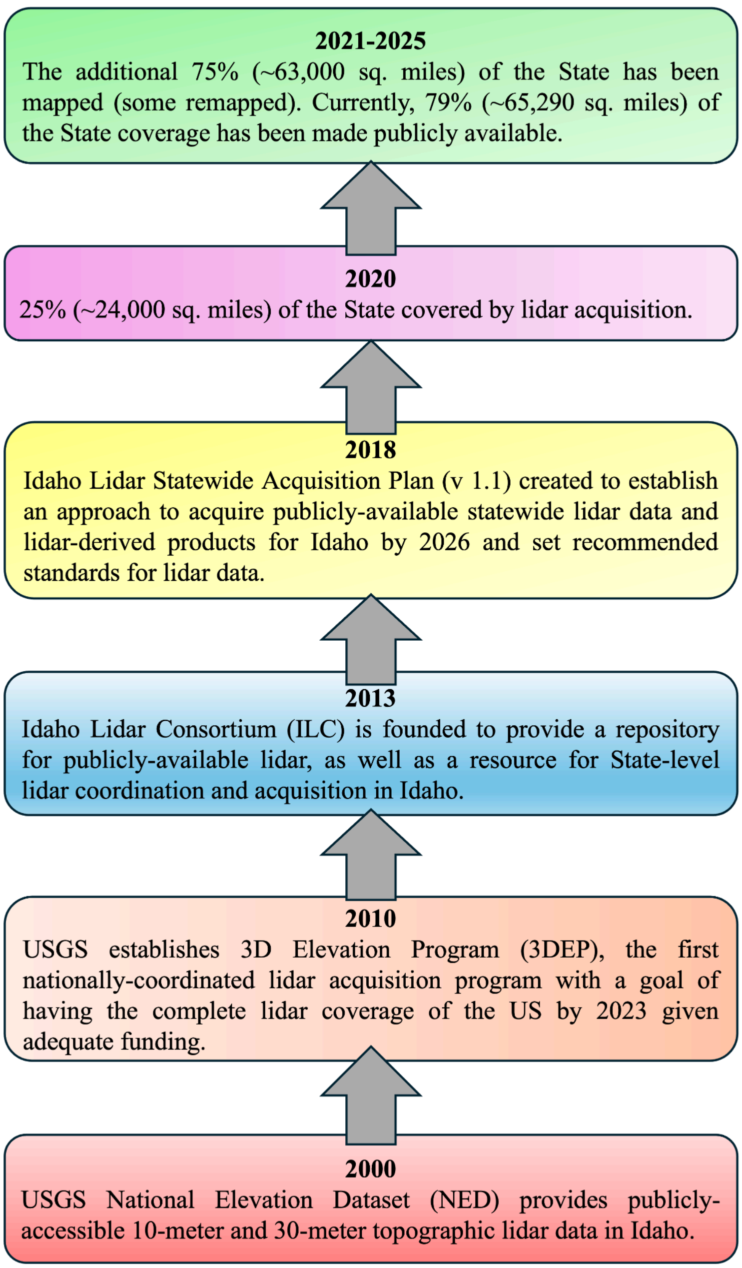
- Dr. Ashley Bosa, The Resilience Institute at Boise State University (formerly: Hazards and Climate Resilience Institute)
- Josh Enterkine: Boise State University, ILC Manager, E-TWG Chair, and State Champion
- Keith Weber: GIS Director Idaho State University, Globus Online Manager, and State Champion
- Bradley Bean: Idaho Geospatial Office
- Marshall Rivers; Rynn Lamb; Christopher Bryant: FEMA Region X
- Shawn Nield: USDA NRCS
- Elaine Guidero: USGS National Map Liaison
- Megan Wheatley: Idaho Fish and Wildlife Game, Contributors at Large

Partners are critical to the development of this plan and will be key to its successful implementation. Partners participate in several meetings a year, assist with establishing priorities, identify funding options, provide feedback about the plan, and advocate for lidar in their agencies/regions. These partners represent a variety of state, local, federal, and tribal entities.

3. Objective

3.1 First-Generation Lidar Collection

Historically, publicly-available lidar data had been acquired in Idaho through various interested parties (e.g., Nez Perce County, U.S. Forest Service (USFS), Federal Emergency Management Agency (FEMA), and USGS). The ILC was first established in 2013 and has been paramount for the initiation and upkeep of continued lidar data acquisition throughout the State of Idaho. Continuous statewide lidar data for Idaho is publicly shared through the ILC website (idaholidar.org). The 2018 Lidar Plan 1.1 outlined recommendations of the steps necessary to acquire, store, and serve these data, along with the specifications associated with these data acquisitions and their derived products.



History of lidar acquisition in Idaho (modified from Pozzi et al., 2021).

3.2 Updated and New Lidar Collection

While the entire state of Idaho has lidar coverage (as of writing, lidar has been collected but is not yet available for some locations), each collection represents only a snapshot in time on the landscape, and quality level and currency vary widely. Best practices in lidar collection are adopted to generate highly accurate elevation data, both in terms of relative age of the data and of positional accuracy. Some of the lidar in the State of Idaho is nearly a decade or more old, and in many cases cannot provide a reasonably current depiction of the Idaho landscape. Heavy rain events, landslides and other mass wasting events, large wildfires, new land use management practices, infrastructure development, and construction have fundamentally changed the landscape, rendering data products based on this lidar out of date and of limited utility. The age and poor quality of some of these products fail to meet a growing amount of elevation-dependent business and management needs across the State. Additionally, the patchwork nature of coverage means that although there is complete lidar coverage for areas, certain uses may be precluded due to temporal or other differences between collections. Therefore, this plan also acts to facilitate the acquisition of new lidar data for purposes of updated best practices, new derivative products and distribution of data, educational and end-user outreach, and to support ongoing and evolving lidar procurement to ensure the most accurate information is presented.

The ultimate intent of this plan is to include as many users and uses of lidar as possible, and to find opportunities for data collectors, users, and practitioners of lidar to work together for the benefit of the State of Idaho.

4. Uses and Opportunities for Lidar in Idaho

4.1 Business Uses for Lidar Data

The 3D Nation Elevation Requirements and Benefits Study sponsored by USGS and NOAA identified 30 business uses (BUs) for high-resolution elevation data, with future benefits to the nation estimated in excess of $13.5B (Dewberry, 2022). Annual benefits for each business use were compiled in the study and have been used to assist in ranking or prioritizing data collections. Idaho's top ten BUs are shown in **Table 2,** with agriculture and precision farming ranked as the business use with the highest estimated annual benefit from new lidar acquisition (Dewberry, 2022). Government, industry, and research represent the primary sectors of lidar BUs in Idaho for the top 10 BUs for Idaho (**Table 3**). The majority of lidar datasets collected and shared by the Idaho Lidar Consortium were funded by FEMA for the purpose of flood risk mapping. Highlighted BUs for Idaho are noted below.

Table 2. Top 10 business uses and annual benefits of the 3DEP program for the State of Idaho (Dewberry, 2012, pg. 345-347)

Rank	Business use	Annual benefits ($ millions)
1	Agriculture and precision farming	1.71
2	Natural resources conservation	1.63
3	Infrastructure and construction management	1.03
4	Geologic resource assessment and hazard mitigation	0.62
5	Flood risk management	0.46

6	Forest resources management	0.41
7	Aviation navigation and safety	0.08
8	Renewable energy resources	0.06
9	River and stream resource management	0.05
10	Water supply and quality	0.04
	Other	0.03
	Total	**6.12**

4.1.1 Precision Agriculture Uses

Lidar presents significant opportunities to advance precision agriculture practices in Idaho, a state with over 11 million acres of farmland and diverse crop production systems. High-resolution elevation data can support improved irrigation design, more efficient water use, and the identification of subtle topographic variations that affect soil health, crop yield, and erosion risk (Zhang, 2012; Farhan et al., 2024). For example, lidar-derived surface models enable producers to map micro-drainage patterns and slope gradients with precision, informing variable-rate seeding and fertilization strategies (Farhan et al., 2024). Additionally, lidar-derived elevation products are extensively used in hydrologic modelling including snow accumulation predictions and snowmelt patterns, which are critical for irrigation and water management (discussed below). These applications are especially critical in semi-arid regions of Idaho where water conservation and soil stewardship are top priorities (Office of the Governor, State of Idaho, 2024; Idaho State Soil and Water Conservation Commission, 2020).

Integrating lidar into Idaho's state lidar funding opportunities will also enhance decision-making for both private agribusinesses and state-level conservation programs. Publicly accessible lidar datasets lower the barrier to precision agriculture adoption for small- and medium-scale farmers, while also supporting state and federal programs such as the NRCS Environmental Quality Incentives Program (EQIP) and local watershed improvement initiatives. Coordinated outreach and data delivery mechanisms help agricultural stakeholders harness lidar data for real-time planning and long-term sustainability, driving productivity while safeguarding Idaho's natural resources.

4.2 Other Important Uses and Opportunities of Lidar

4.2.1 The 3D Hydrography Program: Hydrography from USGS 3DEP

For over 30 years, the USGS National Hydrography Dataset (NHD) was the authoritative standard for hydrographic data over the United States, and the source for all flowlines and waterbodies in the US Topo digital topographic map series. The NHD was originally digitized from topographic maps made in the 1960s and 1970s, and was maintained by a network of stewards, one in each state. Individual states made their own decisions about what to include in the NHD and how often to update it. While this data sufficed for 1:24,000-scale maps, in the age of highly accurate mapping at extremely large scales, the inconsistent feature density and often low relative accuracy of NHD no longer hold water (**Figure 1**).

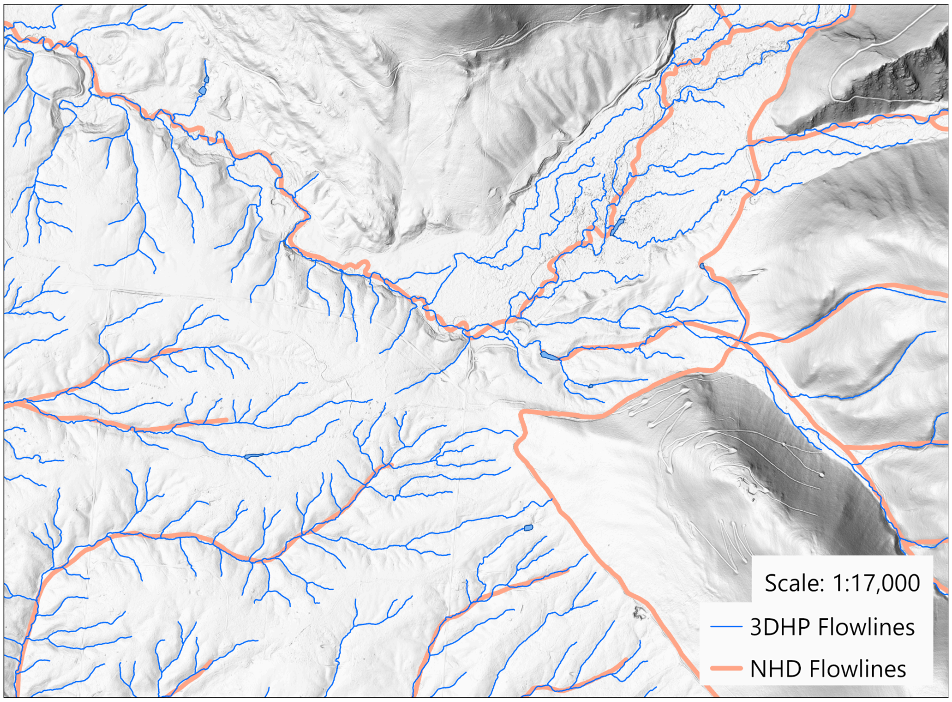


Figure 1. A comparison of the National Hydrography Dataset (orange lines) with new 3D Hydrography Program data (blue lines), Lower Clark Fork, Montana.

The 3D National Topography Model (3DNTM), is a vision and long-term initiative created by USGS for an integrated network of topographic, bathymetric, and hydrographic data that builds on new data collection technologies and USGS leadership in topographic mapping. In the 3DNTM Call to Action Part 1, Anderson et al. (2024) outlined how the high-resolution elevation data gained by 3DEP will be used to derive new hydrography in the 3D Hydrography Program (3DHP), an analog to 3DEP.

3DHP is defined by an entirely new set of standards and processes for hydrography mapping. All 3DHP hydrography is derived exclusively from lidar-sourced elevation data, yielding hydrographic networks that align vertically and horizontally with existing 3DEP data. 3DHP also includes connections that were not present in NHD such as culverts. In short, 3DHP hydrography shows where water can flow across the landscape. New value-added attributes are being created for 3DHP that include flow permanence values, allowing individual users and agencies to determine what level of flow constitutes permanent or intermittent streams for them. The high accuracy and *z*-enabled attribution of 3DHP means it can be used for flood modeling and prediction, stormwater management and many other applications.

3DHP is built from one-meter resolution DEMs, requiring QL2 or better lidar that meets 3DEP quality standards. This highly detailed data is still subject to age issues; it is only as good as the lidar behind it. Using old lidar, even if it is QL2, means that changes to the landscape and thus changes to the path of water flow will not be captured in 3DHP. While Idaho has complete QL2 or better lidar collection, much of it is old, and new lidar needs to be collected to ensure a highly accurate 3DHP dataset. At the time of this writing, no 3DHP acquisition is yet planned or funded within the State of Idaho.

4.2.2 Flood Risk Management

Flooding remains one of the most frequent and damaging natural hazards in the United States (FEMA, 2020; Pralle, 2019), and Idaho is no exception. Accurate and up-to-date topographic data is essential for assessing and managing flood risk across the state.

Lidar technology provides high-resolution elevation data that enables state, tribal, and local agencies to better understand flood hazards within their jurisdictions. This data supports the development of precise flood models, hazard maps, and risk assessments—tools that are critical for effective mitigation planning, emergency response, and long-term community resilience.

4.2.2.1 U.S. Army Corps of Engineers: Idaho Silver Jackets

The U.S. Army Corps of Engineers Silver Jackets is a nationwide group of flood management professionals, with a chapter in each state. The Idaho Silver Jackets serve as a catalyst in developing comprehensive, coordinated, and sustainable solutions to Idaho's flood hazard challenges. This includes advancing mitigation planning, flood hazard mapping, risk reduction strategies, and response and recovery efforts. Lidar plays a key role in achieving this mission—informing policy, mapping, strategic planning, and resilience-building.

4.2.2.2 Idaho Department of Water Resources

The Idaho Department of Water Resources employs lidar data to support several critical functions, including determining drain elevations for groundwater modeling, conducting flood hazard mapping, and performing flood investigations. Additionally, the Idaho Water Resource Board uses lidar to evaluate and plan for water infrastructure projects.

4.2.2.3 County Emergency Managers

Ada County Emergency Management (ACEM) also relies on lidar to support its Multi-Hazard Mitigation Plan, which addresses many hazards. As part of this effort, ACEM has utilized bathymetric lidar to model flooding scenarios on the Boise River, develop accurate flood maps, and support both public outreach and emergency response planning (USGS, 2023).

Use Case Study: Pocatello, ID Floodplain

The following use case represents best practices in how lidar has been used by agencies for floodplain mitigation efforts.

Prior to the availability of Lidar data for Pocatello, the Portneuf River floodplain covered 1,709 acres and many residents were unable to purchase homeowner's insurance. With the availability of lidar data, the floodplain was more accurately modeled and as a result, the area of the floodplain was reduced to 1,164 acres (a reduction of 545 acres or 32%). Subsequently, many of the same homeowners were able to insure their homes while others saw their insurance rates cut in half.

4.2.3 Wildfire Management, Planning, and Response

4.2.3.1 Idaho Department of Lands

The Idaho Department of Lands (IDL) is responsible for managing the State's Trust Lands and providing regulatory oversight of forestry and, in some cases, mining practices on these lands. IDL also administers statewide forestry programs and delivers fire protection on State lands.

Since 2015, IDL has been actively collecting and applying lidar data to support forest management decisions on endowment lands. According to IDL Program Manager Geoff Klein (USGS, 2023), lidar is used to:

- Support forest road engineering and access planning for timber harvests
- Generate forest canopy height models
- Improve estimates of stand volume and other key forest inventory metrics

Lidar continues to be a critical tool in IDL's efforts to enhance sustainable forest management and resource planning across Idaho's public lands.

4.2.3.2 Ladder Fuels and Wildfire Mitigation

Researchers at Idaho State University's GIS Training and Research Center are completing development and validation of a ladder fuels model derived from lidar data. This model identifies areas where understory shrubs and saplings exist (ladder fuels) that would permit a wildfire to climb from the forest floor into the canopy of mature trees. Validation of this model should be completed in 2025, with results indicating areas identified with low ladder fuel density (<40%) are reliably differentiable from areas with high ladder fuel density (>45%). Furthermore, areas with up to 70% ladder fuel density were identified by the model and identified in the field. This application of lidar data can be used for fuel reduction treatments and reduce wildfire hazards across the state.

4.2.3.3 Post-Wildfire Debris Flows and Landslide Impacts

Understanding the conditions that lead to landslides following wildfires is critical due to the significant risks they pose to public safety, infrastructure, and natural systems. Post-fire landslides can occur when vegetation loss and soil destabilization reduce slope stability, creating hazardous conditions during rainfall or snowmelt events (Idaho Geological Survey, n.d.).

Beyond their immediate hazards, landslides play a major geomorphic role in shaping Idaho's mountainous landscapes. They are a primary source of coarse sediment to river channels—material that is essential for bedrock channel erosion and long-term channel evolution. The movement of sediment from landslides also directly affects downstream channel morphology and sediment budgets over time.

As wildfires in the region become more frequent and severe, driven by climatic changes and land-use patterns, research into the timing, triggers, and sediment dynamics of post-fire landslides is increasingly important. Improved understanding of these processes will enhance hazard assessments and inform emergency response.

4.2.4 Dam Failure Modeling

The high horizontal and vertical spatial resolution of lidar supports reliable modeling of flood inundation following potential dam failures under various scenarios. According to the US Army Core of Engineers (USACE, 2020), there are 406 total dams in Idaho, with approximately 97% of them evaluated at a high hazard risk, principally due to their age (average age of 75 years; USACE, 2020). While simulations can be run using coarser topographic data, the uncertainty inherent in that data dramatically reduces the reliability of output models. Lidar is essential for dam failure planning because the accurate landscape detail in the lidar allows a more precise understanding of where water will flow and how deep floodwaters can be at any level of dam failure or breach. It is also essential for post-dam failure analysis to show the before-and-after effects of dam failure in ways that aerial imagery alone cannot quantify, such as sediment deposition, stream bank erosion, and stream capture (Martin et al., 2024).

Table 3. Sectors involved in lidar business uses in the State of (Dewberry, 2012, Appendix G, pg. 2559)

3DEP Business Use	Specific Application	Sector	Comment
Agriculture and precision farming	• Fertilizer application • Erosion • Topography	Agribusiness	No current datasets for this use presently in public domain, however datasets are in private domain
Natural resources conservation	• Riparian habitat/wetlands recovery and watershed restoration • Weeds/invasive species assessment • Erosion studies • Wildlife habitat management and protection • Land cover mapping • Archeological site identification	State agencies including Idaho Fish and Game, Idaho Department of Lands (IDL); Federal agencies including US Forest Service (USFS), Bureau of Land Management (BLM), Idaho State University, Boise State University, University of Idaho	
Infrastructure and construction management	• Transportation corridor planning, for highways, rail lines and connective services • Location of utilities, power lines, telephone poles, cell phone towers	Agencies including Idaho Transportation Department (ITD), USFS, counties, cities; Public utilities	Mobile ground-based lidar is also used by ITD
Geologic resource assessment and hazard mitigation	• Geologic mapping • Active faults • Landslide inventory and susceptibility mapping • Abandoned mines, prospects, tailings • Soil Surveys	Idaho Geological Survey (IGS), IDL, USGS, Idaho Bureau of Homeland Security (IBHS), Idaho Department of Water Resources (IDWR), Idaho Department of Environmental Quality (IDEQ), ITD, mining, oil & gas industry, counties, cities, timber companies, USFS,	

3DEP Business Use	Specific Application	Sector	Comment
		BLM, USDA NRCS	
Flood risk management	• Floodplain mapping • Debris flow mapping • Urban storm water flow analysis • Dams, levee and canal failures	FEMA, IDWR, IBHS, counties, cities, US Bureau of Reclamation (USBR), US Army Corps of Engineers (USACE), tribal governments	Most public domain lidar in Idaho from FEMA floodplain mapping
Forest resources management	• Wildfire • Forest inventory, canopy analysis, and operations planning and management	USFS, BLM, IDL, ITD, IBHS, NRCS, USACE, counties, cities, universities, timber companies, tribal governments, Idaho State University, Boise State University, University of Idaho	
Renewable energy resources	• Wind turbine siting	Utilities	Use cases unknown
River and stream resource management	• Riparian habitat recovery and watershed restoration	USFS, BLM, IDL, timber companies, tribal governments, NGOs	
Water supply and quality	• Surface water storage	IDWR, USBR, USACE	

5. Coordination

The Idaho Lidar Consortium (ILC) and the Elevation Technical Working Group (E-TWG) are part of the State of Idaho's Geospatial Framework, and together enable data discovery, sharing, and coordination. The ILC was initiated as a concept to analyze what Idaho was doing with lidar statewide. The ILC is a university-led clearinghouse around growing lidar data and lidar access. The most frequently used webpage of the ILC website (http://idaholidar.org) is the map of existing lidar collections, as well as where one or more parties have expressed an interest in collecting data.

NOAA maintains a U.S. Mapping Coordination site where federal and state agencies can contribute their acquisition priorities for each year (https://iocm.noaa.gov/maps/USMappingCoordination). Priority information allows the ILC to leverage group buy-ups of future lidar acquisitions, which considerably drives down the per-area acquisition costs. The reader is encouraged to visit the ILC website and become familiar with planned acquisition areas.

The ILC accepts submissions of new lidar data collections of any size and at QL2 or better spatial resolution and enables data discovery and sharing. To share new lidar to the ILC for public distribution, people are encouraged to email Josh Enterkine, the manager of the Boise Center Aerospace Laboratory at Boise State University, at joshenterkine@boisestate.edu to coordinate the necessary information and distribution. Coordination of planning for new lidar data collections can also start with this email, and are usually facilitated ad-hoc with announcements on the State of Idaho's Geotech list-serv (http://admws.idaho.gov/mailman/listinfo/geotech), Idaho Geospatial Council (IGC) meetings, and email notifications.

The E-TWG is a volunteer group that coordinates lidar acquisitions and dissemination, but other sources of elevation, and meets on an as-needed basis to discuss and coordinate Idaho elevation data products, and comprises geospatial professionals who volunteer their time and represent state, federal, tribal, private, and university interests.

There is no formal membership in the E-TWG and communication takes place primarily using the Geotech list-serv. Any and all interested parties are welcome to join the E-TWG and thus the ILC. The best mechanism to get involved with both organizations is to subscribe to the Geotech list-serv, attend meetings announced on the Geotech list-serv, or contact the E-TWG Chair (Josh Enterkine, joshenterkine@boisestate.edu).

6. Status of Lidar in Idaho

Lidar technology has advanced tremendously over the past decade. Furthermore, flooding, fire, landslides, and other events have altered Idaho's topography and vegetation over this same time period. As of 2025, the State of Idaho has 79% coverage of at least quality level 2 (QL2) resolution (at least 2 points per m^2), freely-available, public lidar data that was collected within the last ten years (2015–2025) (**Figure 2**). Where QL2 or better lidar and lidar-derived DEMs are not currently available in Idaho (approximately 30% of the state), users must rely on the USGS National Elevation Dataset (NED) DEMs, which have a ⅓-arc-second, or approximately 10 m, spatial resolution.

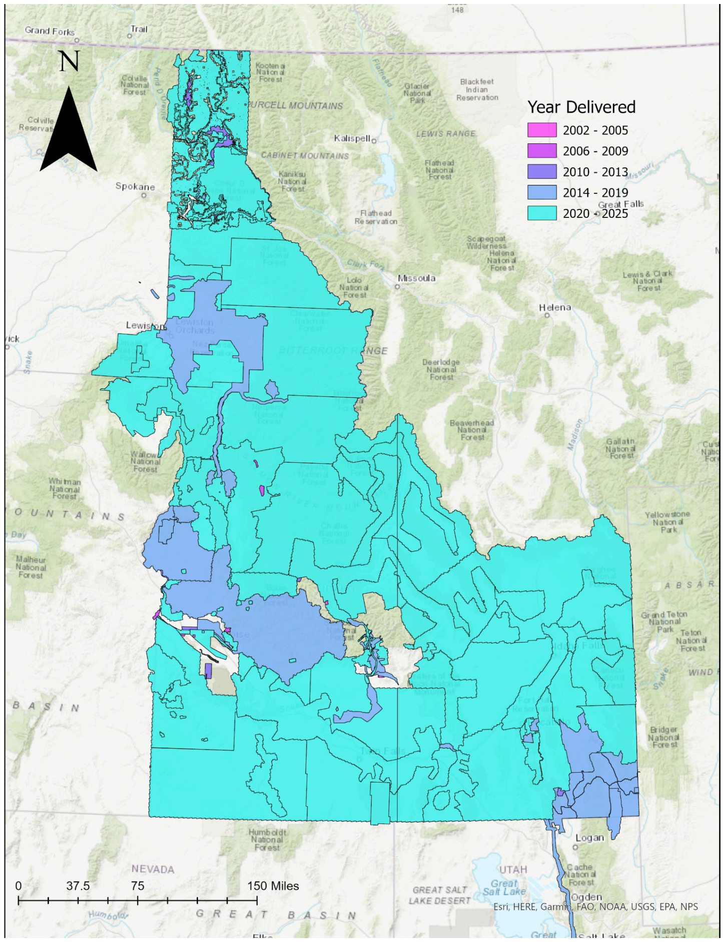


Figure 2. Existing lidar coverage in Idaho as of January 2026. All datasets shown here were collected between 2002-2025. Datasets prior to 2002 are not considered given their inadequate resolution and registration.

7. Planned Lidar Projects

Idaho's dynamic and changing landscape requires continuous and repeated lidar collection in order for it to be accurate and useful for data collectors, users, and practitioners of this resource. At the time of this writing, one recollection is under way for Latah and Lewis Counties, but there are no known additional planned lidar recollection campaigns.

7.1 Benefits of Repeat Lidar Collection

Repeat lidar collection serves many benefits to Idaho. These benefits include:

1. **Capturing Landscape Changes Over Time:** Idaho's landscape is shaped by erosion, vegetation growth, development, and natural events like landslides and wildfires. Repeat lidar captures these changes, enabling up-to-date and accurate modeling of terrain and surface features.
2. **Ensures Data Accuracy and Relevance:** Outdated lidar data may no longer reflect current conditions. Repeating collection ensures that datasets stay accurate and useful for decision-making across sectors like infrastructure planning, resource management, and emergency response.
3. **Supports a Wide Range of Users and Applications:** From scientists to land managers and engineers, many depend on lidar for diverse applications (see Lidar Products section). Continuous updates allow each

group to rely on the data for timely and informed insights.

4. **Improves Hazard Detection and Monitoring:** Repeat lidar can help identify and track natural hazards such as flood risk zones, landslides, or wildfire-affected areas, offering better predictive modeling and faster response.

5. **Assists in Evaluating Human Impact and Land Use:** Regular lidar scans make it possible to assess the impact of development, agriculture, or conservation efforts, providing objective data on how land is being used or altered over time.

6. **Enables Long-Term Monitoring:** Continuous collection creates a historical record that supports research, trend analysis, and natural and anthropogenic impact studies showing how the landscape evolves. over years or decades.

8. Priority Areas

A phased statewide lidar acquisition plan requires prioritization of areas to be collected. There are many approaches to determine priority areas, including risk to population and natural resources and availability of funding. Acquiring large blocks is the most economical (see **Section 13**) and efficient method for statewide acquisition, and thus we propose either HU-8 watersheds and/or administrative boundaries for planning in order to balance economics with natural landscape divisions. HU stands for Hydrologic Unit, and is a system of nested divisions of the USGS Watershed Boundary Dataset (WBD) (**Figure 3**). HUs show the boundaries of water drainages, or watersheds, and the WBD has HUs from the very large, HU-2, to the very small, HU-16 (USGS, n.d.). HU-8 watersheds can range from 300 to 6,000 mi^2, but are usually about 1,000 mi^2. USGS recommends collection by HU boundaries to prepare for and seamlessly integrate with future 3DHP data collections.

Figure 3. The Watershed Boundary Dataset (USGS, n.d.).

Previously, the ILC developed a survey to evaluate priority ranking of HU-8 watershed areas across the State of Idaho. This survey was distributed in 2017 to state and federal agencies as well as organizations that expressed interest in lidar. There were 50 respondents, and their condensed rankings are shown in **Figure 4**. We acknowledge that this is just one method to determine priority areas of lidar coverage for the state.

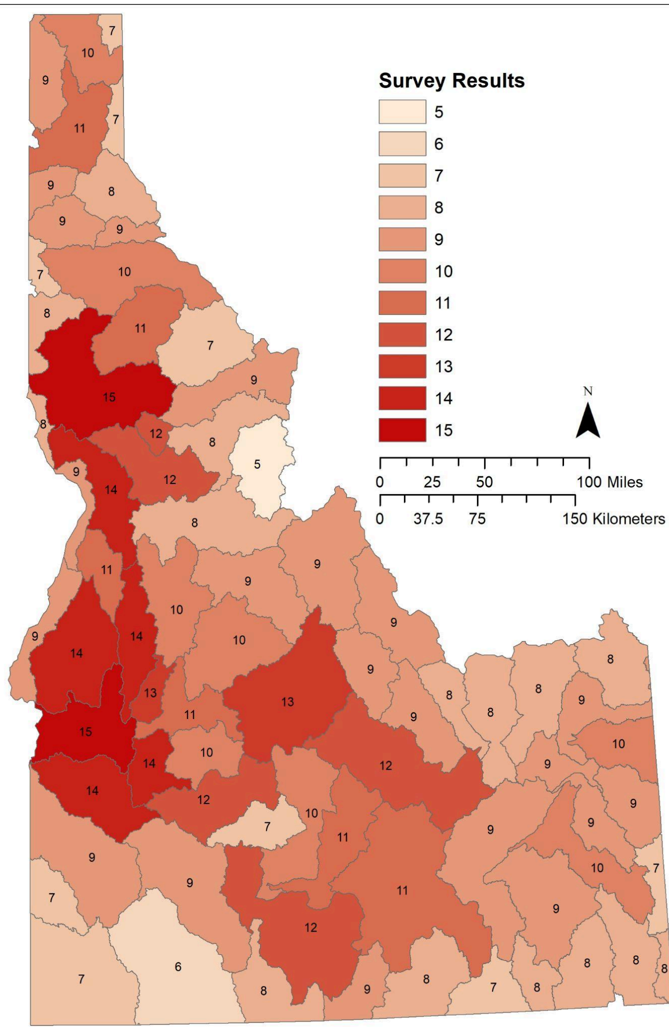


Figure 4. Priority HUC-8 watersheds based on survey. Survey results indicate the number of user requests.

8.1 Prioritization Criteria for Elevation Data Acquisition

To ensure strategic and cost-effective elevation data collection, the following criteria should be considered when identifying and prioritizing Areas of Interest (AOIs) across Idaho:

1. **Landscape Change Detection**

Priority should be given to areas that have undergone or are expected to undergo significant landscape change. This includes regions affected by wildfires, flooding, landslides, urban development, and resource extraction. High-resolution elevation data in these zones supports post-disturbance assessment, land use planning, and hazard mitigation.

2. **Outdated or Low-Quality Data**

Regions where existing elevation datasets are outdated, inconsistent, or of insufficient resolution should be prioritized for new acquisition. Replacing older datasets with modern lidar or topobathymetric surveys enhances the accuracy of models used for water resource management, infrastructure planning, and ecological assessments.

3. **Leaf-Off & Low-Flow Lidar Acquisition**

Whenever possible, lidar data should be collected during leaf-off and low-flow conditions, particularly in riparian areas. Leaf-off lidar acquisition enhances the ability to capture bare-earth elevations by reducing interference from canopy cover, and low-flow (i.e. at the end of the water season) ensures that more river and stream channels can be collected with topographic lidar. Although this combination can be difficult to achieve in Idaho given the small amount of time between fall and snow accumulation in many areas, it is worth consideration. This improves the accuracy of terrain models used in floodplain mapping, landslide risk assessment, fire behavior modeling, and vegetation management.

4. **Expansion to Natural Boundaries**

Whenever feasible, AOIs should be extended to align with natural geographic boundaries, such as watersheds, mountain ridgelines, or ecoregions, rather than geopolitical boundaries. This approach ensures the integrity of hydrologic and ecological analyses. In Idaho, where county and jurisdictional boundaries often span large and topographically diverse areas, aligning data collection with natural systems provides more coherent and usable datasets.

5. **Stakeholder-Driven Areas of Interest**

Elevation data should also reflect the needs and priorities of local, state, tribal, and federal stakeholders. This includes municipalities, counties, state resource agencies, federal land managers, and emergency responders. Incorporating diverse input ensures that data collection efforts have broad utility and support multi-jurisdictional planning efforts.

6. **Topobathymetric Priorities**

Where inland lakes, reservoirs, rivers, and stream corridors intersect with planning or ecological needs, topobathymetric lidar should be used to capture both above- and below-water terrain. These data are essential for flood modeling, habitat restoration, aquatic connectivity studies, and sedimentation analysis.

9. State of Idaho Specifications for Airborne Lidar Data

The ILC developed a guide on specifications and considerations when acquiring lidar data, which are intended to provide the widest community use of lidar data while being cost-effective. The ILC recommended specifications apply to lidar data acquisition, LAS files, LAS file header information, metadata, and control point survey information.

To ensure the best data quality for a range of business uses in the State of Idaho, the E-TWG and ILC recommend as a statewide standard that all lidar data be collected as 3DEP Quality Level 1 (QL1; 8 pts/m^2) with the add-on of 50% swath overlap. This recommendation is based on 1) previous experience where agencies have acquired coarser data only to find their features of interests (e.g., streams and topography) are not sufficiently captured; 2) the need for a statewide coverage standard to ensure consistency; 3) industry expertise with lidar collection over rugged and varied terrain; and 4) the need to improve the cost-benefit ratio by catering to a larger user base that needs very high density lidar. QL2 data will neither provide long-term data usability nor enable multi-agency use, thus negating cost benefits gained by the lower acquisition costs of QL2 or worse collection standards. Information on quality levels can be found in the USGS Lidar Base Specification 2025 Rev. A (USGS, 2025).

10. Data Storage and Distribution

Publicly available Idaho lidar data are currently distributed through the Idaho State University's GIS Training and Research Center (GIS TReC) via Globus Online and links from the ILC. University of Idaho's INSIDE Idaho Geospatial Data Clearinghouse also distributes lidar data. Current lidar and derivative products amount to 25 terabytes of data, and as lidar acquisitions increase and with a higher quality level, infrastructure to support storage and data distribution will need to be assessed and potentially supplemented, requiring financial outlay.

11. UAS Elevation Data

11.1 UAS Lidar

The adoption of Unmanned Aerial Systems (UAS) for geospatial data collection has grown significantly in recent years, driven by advances in autonomous navigation, sensor technology, and the increasing affordability of drone platforms. Support from the Federal Aviation Administration (FAA), including streamlined pathways for remote pilot certification, has further reduced regulatory barriers, making UAS technology more accessible to public agencies, local governments, and land managers.

In Idaho, where rugged topography and remote landscapes often limit access by ground crews or traditional aircraft, UAS platforms offer a practical and safe means of acquiring high-resolution data. Regions such as the central mountains, the Salmon-Challis National Forest, and Hells Canyon particularly benefit from UAS deployment, enabling detailed assessments in otherwise inaccessible areas (Wallace et al., 2012).

These systems also support rapid response in the aftermath of wildfires, floods, or other natural hazards by providing critical information on damage extent, erosion risk, and topographic changes (Wing & Kellogg, 2017). For example, UAS lidar enables precise mapping of vegetation within defensible space zones (0–100 feet from structures), a key factor in identifying high-risk parcels and assessing compliance with fire-safe regulations (e.g., Miller et al., 2020). This detailed structural data supports local governments and fire departments in prioritizing fuel treatments and targeting public outreach and defensible space improvement programs.

In addition, the fine-scale resolution of UAS lidar—often at the sub-meter level—allows for the quantification of ladder fuels, crown base height, canopy bulk density, and horizontal and vertical fuel continuity around homes and infrastructure (See **use case study example below**; e.g., Guo et al., 2017). These metrics are essential inputs for modeling flame lengths, ember transport potential, and defensible space effectiveness, particularly in fire-prone communities located in Idaho's expanding wildland-urban interface (WUI).

Use Case Study: Wildfire Risk Assessment and Vegetation Mapping in Ashland, Oregon

The following use case represents best practices in using UAS lidar for hazard purposes, as examples of how Idaho agencies and officials may implement UAS lidar collection in the future.

Rogue Reconnaissance conducted a comprehensive aerial lidar survey of 4,300 acres in the City of Ashland, capturing data at 250 feet above ground level with high-density point clouds. Despite limited 50% overlap, the team successfully generated detailed deliverables, including digital elevation models, canopy height models, classified point Clouds, and vegetation and ladder fuel polygon layers. These data products enabled the identification of coniferous versus deciduous tree species with over 95% accuracy in a sample of 2,000 trees, as well as precise canopy coverage, including analysis of vegetation over building rooftops and within 10-foot defensible space zones. Structural identification was accurate, although the data suffered from noise under 6 inches, necessitating omission of low points.

The project was intended for fire mitigation planning, especially identifying ladder fuels near structures and hazards along city evacuation routes and around utility poles. Results were integrated with slope data to assess fire behavior potential on inclines and required setbacks. Field teams used an evolving interactive map to ground-truth the data and plan treatments in real-time. The dataset also provides the foundation for future integration of fencing type detection and budgeted prioritization of high-risk zones for targeted intervention and funding allocation.

Similar applications in Idaho could enhance local planning and mitigation efforts by providing actionable data to support fire-adapted community strategies.

Beyond emergency response, UAS lidar and imagery play an important role in Idaho’s agricultural and rangeland monitoring. Applications include mapping field drainage, monitoring erosion, assessing crop canopy structure, and detecting invasive species—all made possible by the fine-scale, three-dimensional structural data captured by UAS-mounted sensors (Zhou et al., 2020). The flexibility and precision of UAS data acquisition make it a valuable tool for resource management, land use planning, and climate adaptation efforts across the state. However, UAS cannot be used for the wide scale of lidar collection needed for the majority of the state, and is only usable for small area collection.

12. Outreach Plan

Support for outreach via the Idaho Lidar Consortium is crucial. Outreach initiatives ensure that the lidar data being collected is understood and accessible to a broad range of stakeholders, including state and local agencies, tribal governments, planners, researchers, and the public. By actively engaging these groups, the state can promote practical applications of lidar in areas like floodplain mapping and hazard mitigation, infrastructure planning and transportation, forest and wildfire management, and agricultural and environmental monitoring. The broad use of lidar leads to greater return on investment for public funds used to acquire the data.

12.1 Identifying Stakeholder Needs and Priorities

Outreach opportunities to new business partners, including city and county administration is needed. This allows the state to collaboratively define Areas of Interest (AOIs) and prioritize data collection based on input from end users. This also ensures that lidar acquisition is not only scientifically sound, but also responsive to real-world needs. A recent imagery survey conducted by the Idaho Geospatial Office (IGO) of 77 various agency entities across the state—including 9% federal, 28% state, and 43% county-level—found that 60% of respondents (61 out of 101) expressed interest in discussing lidar needs and usage. However, only 64% of those interested (39 respondents) currently work in organizations that use lidar (IGO, 2025). This highlights a gap between interest and current lidar adoption, underscoring the need for expanded outreach, training, and interagency coordination.

12.2 Current Outreach Initiatives

Outreach initiatives are generally undertaken as part of grants or on a volunteer basis. Grant funding has provided opportunities for interstate (ID, OR, WA, CA) collaborations and presentations via the E-TWG and through presentations and workshops through Idaho State University GIS TReC. Such initiatives included:

- Invited talk by Washington Geological Survey Landslide Hazard Program to discuss lidar use across Washington State for landslide detection and cataloging (Elevation TWG and Hazard TWG members).
- Invited talk by Washington Geological Survey Post-Wildfire Debris Flow Program for monitoring post-wildfire hazards (Elevation TWG and Hazard TWG members)
- Invited talk by NV5 to present on high-density lidar and its uses (coordinated with Idaho State University's GIST TReC Tech Talks and Elevation TWG members)
- Invited talk by Ashland, OR Fire & Rescue on UAS lidar uses for wildfire vegetation and ladder fuel corridors for city analysis (Elevation TWG and Hazard TWG members)

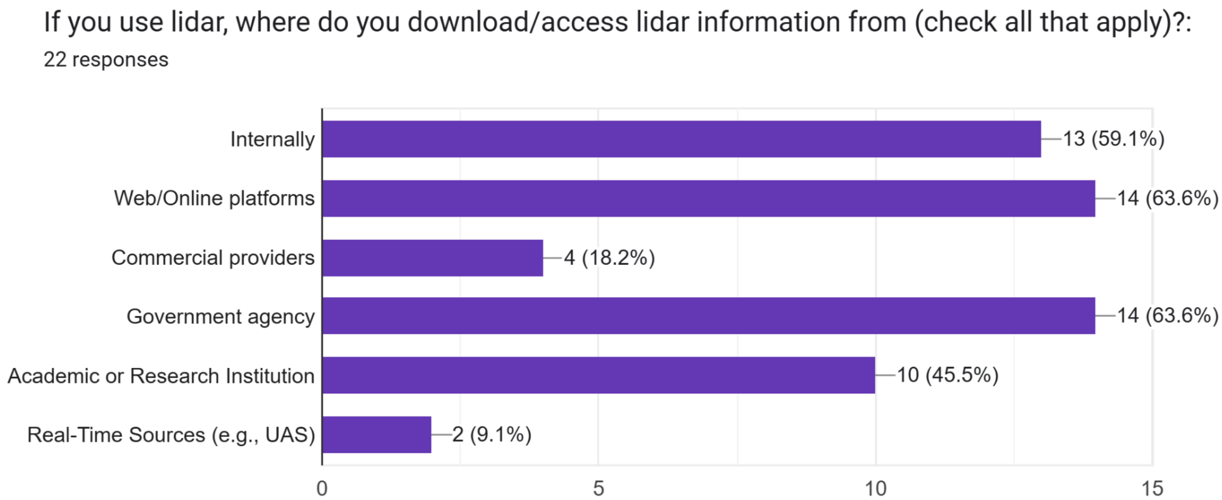
The E-TWG has also provided some opportunities for focus group studies (see **Section 12.2.1**) on stakeholder needs and usage in order to ascertain end-user derivatives that are both easy to produce, and accessible and useful for the public.

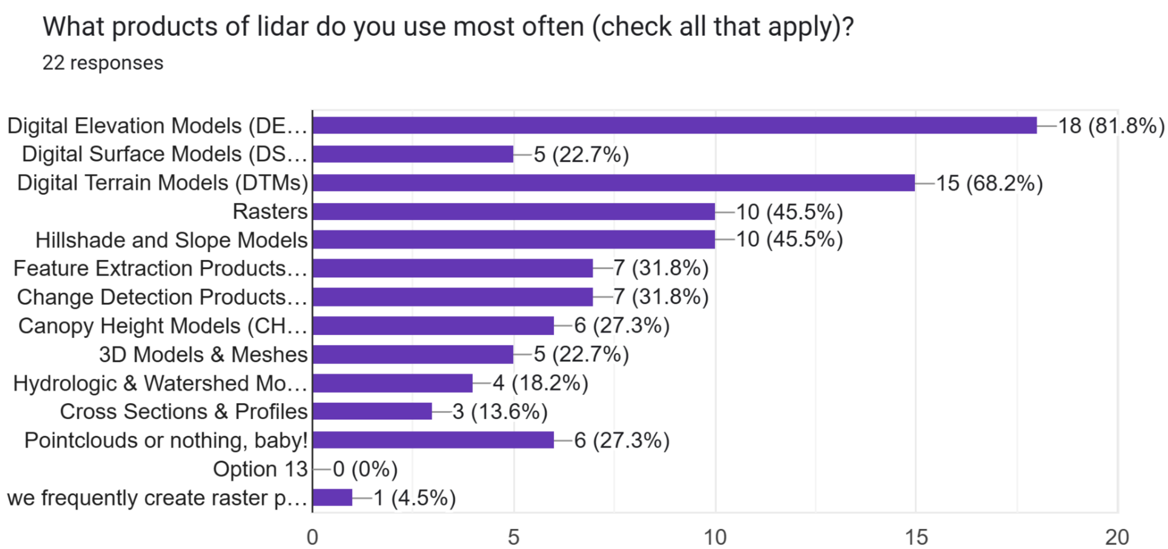
Outreach initiatives to support lidar collection in Idaho are a low-cost yet high-impact investment for the State. These efforts—such as hosting informational webinars, developing outreach materials, engaging with local and tribal governments, and presenting at regional meetings—require minimal resources but play a critical role in building partnerships and securing funding for lidar projects. By raising awareness about the value of lidar data and its many applications across natural resource management, infrastructure planning, emergency response, and conservation, outreach efforts help expand the pool of potential collaborators and cost-share partners.

Continued funding for these outreach initiatives is essential to maintaining momentum and ensuring that lidar collection in Idaho remains strategic and well-supported. A relatively small annual budget of $15,000-$20,000 can sustain outreach coordination, travel for in-person engagement, and the production of communication materials that help stakeholders understand how lidar can meet their specific needs. These efforts contribute directly to the success of statewide acquisition planning and are instrumental in ensuring that Idaho's lidar program remains inclusive, efficient, and collaborative.

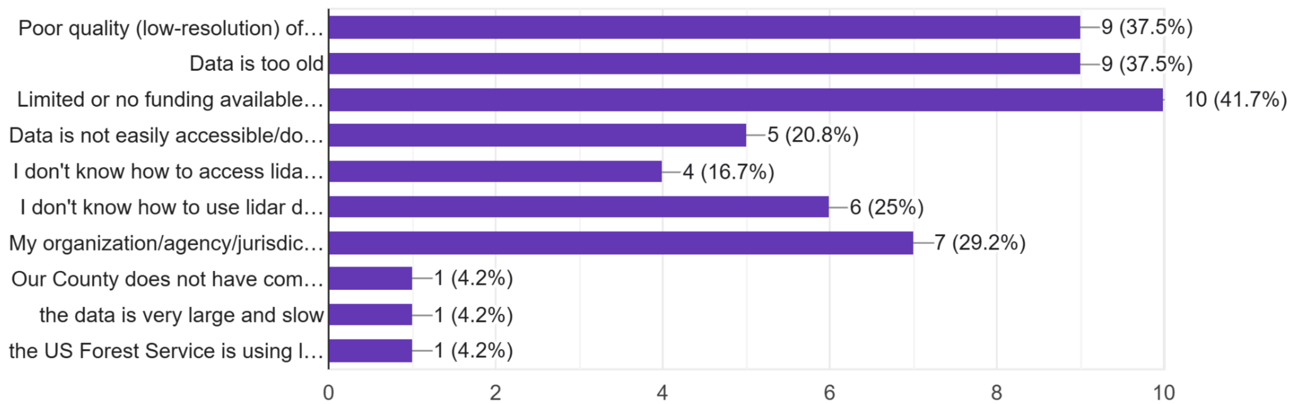
12.2.1 Stakeholder Needs and Usage Focus Groups

As part of outreach efforts, and in addition to the imagery study conducted by IGO and Boise State Students (**see Section 12.1**), the E-TWG held 6 focus group sessions to assess how lidar is accessed, the most commonly used derivative products of lidar, and where stakeholders would like to see lidar data, products, and information held for Idaho in the future. At the time of writing this Plan, the following data has so far been collected from 24 of the 61 respondents from the imagery study who said they are interested in lidar products:





What are limitations to your agency/organization/jurisdiction not using lidar (check all that apply)?
24 responses



In addition to the last graph on limitations, we asked respondents to provide details. The following is a select few quotes from the answers:

★ "Our initial forestry data was flown in 2002 and is old. Flights flown years apart make meaningful change detection difficult."

★ "Collection is patchy and inconsistently collected—some areas have very current data, while others are outdated."

★ "Lidar helps us pinpoint the Ordinary High Water Mark where line-of-sight is limited, but coverage over Idaho's waterbodies is incomplete, limiting its use."

★ "Keeping lidar current and achieving full coverage of our national forests remains a challenge."

★ "We only receive contracted lidar services every five years, so the data quickly becomes outdated. UAS flights are our only alternative, and those rely on photogrammetry rather than lidar."

★ "Our county does not have complete lidar coverage."

★ "A couple of limitations still exist: not all GIS technicians have lidar processing skills, and the number of people trained is limited—though knowledge and availability are improving."

★ "We would love to use lidar for building heights and ADA compliance, but we lack the money, time, and software to process it."

★ "No coverage is the biggest obstacle, and when the only option is coarse 10m USGS data, the quality is too poor for many applications."

★ "Lidar file sizes are large; using LAZ files and investing in bigger hard drives and faster internet would help."

★ "We occasionally use lidar available through ISU's GIS TReC/Globus Online, but we have no funding for additional purchases."

★ "I use lidar as part of my GIS work for recreation access, but without dedicated GIS staff, this remains an ad hoc, out-of-pocket effort."

It is clear from focus group surveys and discussions that having the necessary resources such as staff, access, and funding is critical to the successful use of lidar in the State of Idaho. Outreach initiatives are an essential tool for identifying these needs, capturing local perspectives, and understanding the on-the-ground challenges that agencies, counties, and other partners face. By engaging directly with stakeholders through workshops, surveys, and one-on-one conversations, the State can uncover gaps in coverage, technical capacity, and data accessibility that might otherwise go unreported.

Continued outreach not only helps document these limitations but also builds the relationships needed to coordinate funding, training, and data acquisition. It creates a feedback loop where stakeholders can share successes, highlight emerging applications, and advocate for priorities that will guide future lidar planning. In this way, outreach serves as both a listening mechanism and a driver for action, ensuring that Idaho's lidar initiatives remain responsive, collaborative, and aligned with the real needs of the communities and agencies that depend on this data.

13. Cost, Funding Approach, and Budget Overview

Currently, no state funding is budgeted through the Idaho legislature for acquiring lidar data. Other states (e.g., Oregon, Washington, and California) have lidar programs or funding established through legislation. For example, in Oregon, "[a]n initial $2 million seed capital investment by the Oregon Legislature has since been leveraged into more than $19 million of lidar acquisition" (Oregon Department of Geology and Mineral Industries, n.d.). Washington "has a set funding amount per biennium dedicated to lidar collection, which is identified as the primary 'core' funding for the State" (Washington Geological Survey, 2023, p. 17). In addition, the infrastructure necessary to support storage and data access requirements for statewide lidar is substantial and cannot be assumed without financial support.

Sustainable and strategic funding for lidar acquisition is essential to supporting Idaho's long-term goals in land management, infrastructure planning, agriculture, wildfire resilience, and natural resource conservation. Funding needs vary widely based on the location, size, and complexity of each project area as well as the stakeholders involved. In many cases, shared cost agreements through programs like the USGS 3DEP Data Collaboration Announcement can help offset acquisition costs, but even with partnerships, smaller or fragmented projects tend to be more expensive on a per-acre basis.

13.1 Mechanism for Lidar Acquisition and Processing

One major pitfall in Idaho's lidar planning is the lack of a consistent funding mechanism that can accommodate both large statewide acquisitions and small targeted efforts. Additionally, as data quality improves, the resulting datasets become significantly larger, driving up long-term costs for storage, management, and dissemination. Without adequate infrastructure and budgeting for high-volume data storage and cloud-accessible platforms, these large datasets risk being underutilized. Coordinating acquisition schedules, aligning stakeholder priorities, and building flexible funding models that anticipate these costs, including the post-processing and data lifecycle, are critical to ensuring that Idaho's lidar investments deliver lasting public value.

Establishing a permanent mechanism for collecting and distributing statewide lidar data is essential to the long-term success of Idaho's lidar program. A state-recognized entity would ensure that lidar is collected regularly and would serve as a centralized hub through which stakeholders, agencies, and contractors could coordinate their lidar-related efforts.

The E-TWG recommends the creation of a dedicated state position—either within the Idaho Geospatial Office (IGO) or another agency—funded at approximately $70,000 annually including salary and benefits.

In addition, the E-TWG recommends forming a Lidar Advisory Committee, led by this new lidar coordination position. The committee would include representatives from state, local, federal, and tribal entities. Its responsibilities would include identifying partners and interested stakeholders, facilitating advisory meetings, gathering input, and drafting and updating the State Lidar Plan. The committee would also review annual data acquisition plans each spring.

Partnerships
Partnerships across the State play an important and critical role in the ability to extend State funding and consistently collect large areas. Funding amounts from partners are currently only identified on a per-project basis and are subject to funding cycles and availability. A lidar collection mechanism is essential to ensure partners are (1) aware of areas that need data collection and (2) involved in the Idaho E-TWG along with other agencies and participate in the annual planning process. It is also essential that partners understand the estimated costs and resource requirements for lidar collection to incorporate it into their planning processes.

Grants
Federal grant programs have been essential for Idaho, particularly the USGS 3D Elevation Program (3DEP) and FEMA, which offers federal matching opportunities for lidar collection. E-TWG plans to continue working with the USGS 3DEP, FEMA, and other Federal agencies and apply for funding for the priority areas as needed. Other state, local, and tribal agencies can also apply to various Federal agency programs for lidar acquisition. The lidar collection mechanism will be critical to ensuring Federal grants and funding continue to support statewide lidar coverage.

Contractors
Developing a lidar contract that Idaho partners and agencies can utilize would require going through the State procurement process and selecting a pre-vetted vendor. Such a contract would benefit groups with smaller areas of interest or shorter project timelines by allowing them to acquire lidar data outside of large-scale, wide-area mapping efforts. It would also provide flexibility for partners needing data more frequently than the recommended five-year refresh cycle. In addition, this contract would promote consistency across projects and support targeted data collection in areas where existing lidar needs to be updated due to high levels of disturbance (see **Section 14.1.2.2**). Under this arrangement, the lidar collection mechanism would be responsible for ensuring that all collected data is released into the public domain and published on a public platform, such as The Idaho Map.

13.2 Proposed Funding and Phased Approach for Acquisition

The cost to acquire statewide airborne lidar data for Idaho is approximately $30M. This estimate is based on a single statewide acquisition campaign to collect Quality Level 1 (QL1) lidar (USGS Lidar Base Specification 2025 rev. A; USGS, 2025) with the additional recommendation for 50% swath overlap (see **Section 10**; NV5 Innovate! Team, 2025), and to store and distribute lidar and the derivative products most useful to the community. Although costs vary depending on the project and terrain, QL1 with 50% swath overlap acquisition estimates range from $250–$450 per square mile, with the higher cost for rugged terrain and the lower cost for flat areas (Dewberry, 2022). Complete statewide acquisition within a single year is nearly impossible for Idaho due to funding constraints, the large area of the state, and difficulties with timely collection in mountainous and northern areas, where bad weather and early or late snowfall can delay acquisition. The most cost-effective strategy for Idaho that minimizes errors arising from myriad small collections is to acquire statewide lidar in as few very large acquisitions as possible (Lukas et al., 2025). Small, piecemeal projects will drive the lidar acquisition cost per square mile higher than $450. Therefore, we propose a five-year phased approach to statewide data acquisition (**Table 4**). This phased approach will ideally repeat the acquisition process one time to refresh these data. To accomplish the phased approach, we will leverage partnerships and funding available through the USGS 3DEP program, FEMA, and numerous other participating agencies as opportunities arise.

Table 4. Proposed budget for phased approach to lidar acquisition in Idaho through 2033. Acquisition cost is a rough estimate based on an average of $350/mi^2 plus 6% contract overhead. Data management costs include storage, equipment maintenance, hosting and bandwidth, and overhead.

Description	Area (mi^2)	Percent of Idaho land area	Averag e age	Cost
Existing QL2 lidar coverage	36,017	43.1%	10 years	--------------
Existing QL1 lidar coverage	61,092	73.1%	7 years	--------------
Suggested acquisition 2026	16,714	20%	----------- ---	$ 5,850,000
Suggested acquisition 2027	16,714	20%	----------- ---	$ 5,850,000
Suggested acquisition 2028	16,714	20%	----------- ---	$ 5,850,000
Suggested acquisition 2029	16,714	20%	----------- ---	$ 5,850,000
Suggested acquisition 2030	16,714	20%	----------- ---	$ 5,850,000
Data management	---------- ----	--------------	----------- ---	$ 132,890
Total	83,571	100%	----------- ---	$ 29,382,890

14. Supplemental Budget Recommendations

14.1 Recommendation Summary Text

A wide range of Idaho's state, federal, tribal, and local partners depend on consistent, high-quality lidar data to monitor landscape changes, assess risk, and support science-based resource management. Continuous funding would ensure predictable data availability for critical applications such as wildfire risk reduction, floodplain mapping, infrastructure planning, agricultural management, and post-disaster recovery. While some lidar efforts have been supported in the past through one-time or project-specific funding, a sustained state investment is needed to ensure long-term planning and coordination.

14.1.1 Challenges

Since the development of the Idaho State Lidar Plan and establishment of the Elevation Technical Working Group (E-TWG), Idaho has made significant progress in acquiring lidar data to support a wide range of geospatial, planning, and natural resource management applications. The E-TWG, composed of state, federal, tribal, local, and academic partners, has identified lidar as a foundational dataset for infrastructure development, hazard mitigation, agriculture, forestry, water management, and emergency response.

However, demand for lidar in Idaho continues to grow, and existing funding is insufficient to meet statewide needs. Many decisions in Idaho related to wildfire risk reduction, forest and rangeland management, post-fire landslide hazard assessment, floodplain mapping, and land use planning now rely on up-to-date lidar data. Without consistent funding and a mechanism by which to disseminate lidar data, Idaho will be unable to keep pace with partner requests for updated or expanded lidar coverage.

14.1.2 Proposed Solutions

The Elevation Technical Working Group recommends that the State of Idaho identify and secure a permanent mechanism and ongoing funding to support a coordinated lidar refresh cycle. This would ensure lidar data is collected efficiently and predictably, reducing duplication of effort and expanding access to essential geospatial data across all Idaho counties and jurisdictions.

14.1.2.1 Refresh Cycle and Repeat Lidar

To meet Idaho's long-term data needs, the E-TWG recommends a predictable, statewide lidar refresh cycle of five years (see **section 13.2**). This will provide a consistent, high-resolution baseline for agencies and partners to track landscape change, comply with regulatory requirements, and implement adaptive management strategies. Similar to successful models in other states, dedicated funding will allow Idaho to accelerate collection and avoid patchwork data gaps that currently hinder regional planning and analysis.

High Disturbance Areas

During this five-year refresh cycle, lidar acquisition priority should also be given to areas that experience high disturbance events, such as wildfires, flooding, and landslides, where topographic changes can occur rapidly and significantly alter hazard profiles, natural resources, and infrastructure risk. These events can reshape landscapes by removing vegetation, depositing sediment, eroding slopes, altering drainage patterns, and destabilizing terrain. Updated, high-resolution elevation data in these areas is critical for accurately assessing post-disturbance conditions, modeling secondary hazards (e.g., debris flows, flash floods), and guiding mitigation and recovery efforts. Prioritizing lidar collection in such high-change areas ensures decision-makers, emergency managers, and resource planners have the most current and reliable data to protect lives, property, and the environment.

With a committed state investment, Idaho could shorten the lidar refresh cycle to five years or fewer through leveraged federal funds—allowing faster updates for priority areas such as post-wildfire hazard zones, flood-prone watersheds, and rapidly developing communities.

14.1.2.2 Supplemental Recommendations

Ongoing, the plan requires approximately **$5,940,00 per year,** or **$29,832,890 over five year**s (**Table 5),** to cover lidar acquisition, data processing, one full-time employee (FTE), storage and IT infrastructure, and agency administrative costs. This investment would align lidar efforts with state enterprise data systems, expand access to high-quality elevation data, and support collaborative distribution platforms.

Table 5: Projected total costs for five-year refresh cycle for lidar program in Idaho

Description	Cost per year	Total Costs Over 5 Years
Lidar Acquisition and Data Management (Table 4)	$5,850,000	$ 29,382,890
Lidar Staff Position (see Section 13.1)	$70,000	$350,000
Outreach and Education Initiatives (see Section 12)	$20,000	$100,000
TOTAL	$5,940,000	$29,832,890

Idaho's continued participation in the U.S. Geological Survey's 3D Elevation Program (3DEP) makes this proposal especially cost-effective. Through 3DEP, federal cost-share grants can substantially reduce the State's share of lidar acquisition costs, particularly if Idaho positions itself as a strong partner with predictable, match-ready funding. Consistent lidar collection would also ensure that all 44 counties receive 100% coverage during acquisition, increasing the likelihood that participating counties will contribute funding toward these projects. **Thus, total cost to Idaho could be $2.97M per year, and $14.9M over five years** (**Table 6**).

To maximize Idaho's eligibility for federal cost-share grants through the U.S. Geological Survey's 3DEP, FEMA, and other agencies, the State should consider funding a portion of the total lidar acquisition costs. **Table 6** shows an example breakdown of potential state funding commitments at 25%, 33%, and 50% cost-share levels. Each option demonstrates how a relatively modest state investment can leverage significant federal and partner contributions while ensuring a sustainable five-year refresh cycle for statewide lidar coverage.

A multi-year state commitment at any of these levels would provide stability for acquisition planning, enable more strategic partnerships, and ensure that all counties benefit from updated lidar data, regardless of local budget constraints.

Table 6: Potential state funding commitments with cost-sharing levels*

State Cost-Share Level	Annual State Contribution	Five-Year Total State Contribution	Potential/Partner Match Leveraged*
25%	$1,485,000	$7,458,223	~$22.4 million
33%	$1,960,200	$9,844,853	~$20.0 million
50%	$2,970,000	$14,916,445	~$14.9 million

*Estimates assume that remaining costs are covered through federal cost-share funding and local/partner contributions.

14.1.3 Status Quo Outcomes

Without this investment, Idaho's lidar coverage will continue to develop in a fragmented, project-by-project manner. Collection will be driven primarily by short-term priorities or federal funding availability rather than a coordinated statewide vision. Under current funding levels, which are zero, a complete refresh of statewide lidar would take at least 10 years or longer as any project would be completely dependent on external funding, leaving large gaps in data and undermining the ability of agencies, local governments, and Tribes to make informed decisions.

Missed opportunities to align with federal programs like 3DEP could leave Idaho behind in regional and national coordination efforts. Inconsistent or outdated data will hinder post-fire landslide mapping, floodplain updates, vegetation modeling, and other critical workflows. Furthermore, the lack of centralized coordination may lead to redundant data purchases by individual agencies or local entities at a higher cost and with reduced public value.

A fully funded lidar program would not only provide a cost-effective and sustainable solution, but would also deliver predictable, high-quality elevation data to all Idahoans, supporting economic development, public safety, natural resource management, and climate resilience.

15. Training and Support

Training, support, and outreach are necessary components to successfully implement and use statewide lidar. While there are opportunities for training by private industry and universities, additional training and support opportunities are needed based on the 2017 ILC survey results. Specifically, statewide training needs include: downloading lidar data, introduction to lidar, lidar data processing, contracting lidar acquisitions, best practices, and using lidar data products. Idaho State University, University of Idaho, and Boise State University provide courses in remote sensing with lidar as a major focus. However, these semester-long courses are not ideal for professionals. Periodic lidar training has occurred by all the universities as well as by private industry, but is not offered regularly. Coordination needs to occur between ILC, private industry, and the universities to host regular short-courses and/or webinars throughout the state.

16. Recommendations & Conclusions

Based on the provided information, here are **key recommendations and conclusions** for a **State of Idaho Lidar Plan**:

- Lidar provides critical 3D elevation data for a wide range of applications, including agriculture, infrastructure, emergency response, and environmental monitoring. Its accuracy and versatility surpass traditional remote sensing technologies, making it an essential foundation for modern mapping and planning efforts.

- Unlike many other states, Idaho currently has no legislated or dedicated funding stream for lidar data acquisition, coordination, or maintenance. This results in fragmented, piecemeal data collection that limits statewide utility and long-term value. Without investment in these areas, Idaho risks falling behind peer states in digital geospatial capacity. To secure predictable, match-ready funding and maximize Idaho's eligibility for federal cost-share grants through the U.S. Geological Survey's 3DEP, FEMA, and other agencies, the State should consider funding a portion of the total lidar acquisition costs (**discussed in Section 14**).

- High-resolution lidar data supports sustainable land and water use, particularly in Idaho's agriculture-intensive and hazard-prone environments. Repeat lidar data offers immense value for monitoring landscape change, planning infrastructure, and evaluating human and natural impacts over time.

- We propose maintaining statewide lidar coverage by prioritizing areas of need (**discussed in Section 8**) and leveraging partnerships whenever possible.

- We also recommend considering training and outreach as an integral part of effective lidar collection for Idaho (**discussed in Section 12**).

This document should be updated as new technologies become available and key economic drivers change. The E-TWG recommended specifications and suggested derivative products should also be updated as technologies are updated.

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- Idaho Department of Water Resources
- Idaho Geospatial Office
- Idaho Geological Survey
- Idaho Natural Resources Conservation Service, U.S. Department of Agriculture
- Idaho State University
- Idaho Transportation Department
- U.S. Forest Service
- U.S. Geological Survey

Additional Resources

Oregon Lidar Consortium and Lidar Specification -UPDATED
http://www.oregongeology.org/lidar/DAS-Quantum_7525Amendment7.pdf

Minimum Lidar Data Density Considerations for the Pacific Northwest (PDF) - UPDATED
https://www.oregon.gov/dogami/lidar/Documents/minimum-lidar-data-density.pdf

USGS Lidar Base Specification 2025 rev. A
https://www.usgs.gov/3DEP/lidarspec

Lidar Division
https://www.asprs.org/Divisions/Lidar-Division.html

ASPRS Guidelines LAS
http://www.asprs.org/Committee-General/LASer-LAS-File-Format-Exchange-Activities.html

Vertical Accuracy Reporting of Lidar Data V1.0, (ASPRS, 2004)
http://www.asprs.org/a/society/committees/lidar/Downloads/Vertical_Accuracy_Reporting_for_Lidar_Data.pdf

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