**Idaho Technology Authority (ITA)**

**Enterprise standards – S4000 – INFORMATION AND DATA**

**Category: S4XXX – Landslide Inventory Standard**

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**I.** **Definition**

 See ITA Guideline G105 (ITA Glossary of Terms) for definitions.

**ii.** **Rationale**

A statewide landslide inventory layer and data standard, which is part of the Hazards data theme, is a critical source of information for land managers, emergency managers, transportation engineers, developers, and researchers. Standardized landslide inventory data supports those groups by providing an authoritative, centralized, statewide database.

**iii.** **APPROVED STANDARD(S)**

See Attachment

**iV.** **APPROVED PRODUCTS(S)**

Any GIS Software, either desktop or online, capable of ingesting and displaying Open Geospatial Consortium (OGC) Web Map Standard (WMS) services.

**V.** **JUSTIFICATION**

A statewide landslide inventory dataset is a critical source of information, as stated under ‘II. Rationale’ in this standard. A data exchange standard supports the use of the landslide inventory dataset to facilitate a predictable format, improve collaboration, and encourage the use of this dataset.

**VI.** **Technical and Implementation Considerations**

Any GIS Software, either desktop or online, capable of ingesting and displaying Open Geospatial Consortium (OGC) Web Map Standard (WMS) services.

**VII.** **emerging trends and architectural directions**

Data will be shared in accordance with Enterprise Standard 4250 – Enterprise

Geographic Information System (GIS) Data Sharing Standards.

**VIIi.** **Procedure reference**

The format, content and development of this standard adhere to Policy P5030 for Framework Standards, S4250 for Data Sharing Standards, and S4220 for Geospatial Metadata.

**ix. review cycle**

Review will occur at least annually.

**X. CONTACT INFORMATION**

For more information, contact the ITA Staff at (208) 605-4064.

**XI. Revision History**

XX/XX/202X – Standard Presented to the IGC-EC

 

 STATE OF IDAHO

 **Idaho Landslide Inventory Data Exchange Standard**

Part of the Hazards Theme

Version 1

Effective Month Day, 2023

Developed by the Hazards Technical Working Group

Revision History

Established by Hazards Technical Working Group

Contact

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1. Introduction to the Landslide Inventory Data Exchange Standard

A statewide landslide inventory is a critical source of information for land managers, emergency managers, transportation engineers, developers, and researchers. Those groups will benefit from this data because this standard is an authoritative, centralized, statewide landslide inventory. Many private sector and local, state, and federal government agencies have business needs for landslide inventory data.

The Landslide Inventory Standard is intended to facilitate the integration and sharing of up-to-date landslide data and enhance the dissemination and use of landslide information. This standard does not instruct on how the landslide inventory is designed for internal use.

This standard was developed by the Hazards Technical Working Group, a subgroup of the Idaho Geospatial Council – Executive Committee (IGC-EC). This standard will be reviewed at least annually and updated as needed.

* 1. Mission and Goals of the Standard

The Landslide Inventory Standard supports a statewide dataset that is consistent with applicable state and national standards. It establishes the minimum attributes and geospatial database schema for the Landslide Inventory Framework. The standard will communicate with and may have similar attributes to other Idaho Framework data standards. It encourages all Idaho-based agencies with geospatial landslide inventory data to contribute to the Landslide Inventory Framework.

The Landslide Inventory Framework will be appropriately shared and beneficial to all. The fields in the Landslide Inventory Standard will be general enough to incorporate basic information without requiring major changes in internal data models. This standard allows for expansion to a more complex data structure and schema.

* 1. Relationship to Existing Standards

This Landslide Inventory Standard relates to existing standards as follows:

* No other standards apply.

* 1. Description of the Standard

This standard describes the vision and geospatial data structure of a Landslide Inventory Framework in the state of Idaho. This standard is devised to be:

* Simple, easy to understand, and logical
* Uniformly applicable, whenever possible
* Flexible and capable of accommodating future expansions
* Dynamic in terms of continuous review
	1. Applicability and Intended Uses

This standard applies to the landslide inventory element of the Hazards theme of The Idaho Map (TIM).

When implemented, this standard will enable access to and exchange of Idaho’s landslide data. A predictable standard will support data collaboration, improve data collaboration, help identify and report errors, and allow agencies to incorporate this data into their own data products.

This standard does not consider data sharing agreements, contracts, transactions, privacy concerns, or any other issues relating to the acquisition and dissemination of landslide inventory data.

* 1. Standard Development Process

The Hazards Technical Working Group is a voluntary group of private, city, county, tribal, state, and federal representatives. In 2022 the Landslide Inventory Lead began developing the standard for the Landslide Inventory Framework using the standard development automation tools developed by the IGC-EC to generate the first draft of the standard. This standard was then reviewed and edited by the members of the Hazards Technical Working Group.

After initial development the draft standard document was shared with the IGC-EC and IGC in accordance with the review and approval process described in ITA’s Framework Standards Development Policy (P5030).

The standard was presented to the IGC-EC in <<insert month and year>> and approved by the IGC-EC in <<insert month and year>>.

* 1. Maintenance of the Standard

This standard will be revised as needed and in accordance with the ITA Framework Standards Development Policy (P5030).

1. Body of the Standard
	1. Scope and Content

The scope of the Landslide Inventory Standard is to describe a statewide layer which identifies the physical locations and attributes of mapped landslides in Idaho.

* 1. **Need**

Landslide inventory maps are a key dataset needed for land managers, emergency managers, transportation engineers, developers, and researchers. This standard provides the foundation to aggregate landslide data for centralized access and stewardship information.

Landslide inventory data is needed because it is intended to be a comprehensive inventory of mapped landslides in Idaho. This standard will allow the dataset to be hosted by the multi-disciplinary hazards portal hosted by the state.

* 1. **Participation in the Standard Development**

The development of the Landslide Inventory Standard adheres to the ITA Framework Standards Development Policy (P5030). The Hazards Standard Team tasked with developing this standard invite input and comments from private, county, state, and federal organizations. As the standard is reviewed in accordance with Policy P5030 requirements, there will be opportunity for broad participation and input by stakeholders in the development of this standard. The process will be equally broad for input on updates and enhancements to the standard. As with all Idaho Framework standards, public review and comments on the Landslide Inventory Standard is encouraged.

* 1. Integration with Other Standards

The Landslide Inventory Standard follows the same format as other Idaho geospatial framework data standards. The Landslide Inventory Standard may contain some of the same attributes as other framework standards and may adopt the field name, definition, and domain from the other standards to promote consistency.

* 1. Technical and Operation Context
		1. **Data Environment**

The data environment is a digital geodatabase with a specific, standardized set of attributes pertinent to the Landslide Inventory Framework. The landslide inventory data shared under this standard must be in a format supporting geodatabases.

* + 1. **Reference Systems**

The Landslide Inventory Framework will be published in the Idaho Transverse Mercator NAD83 (IDTM83) coordinate system, which is the State of Idaho’s single-zone coordinate system. Data is not required to be submitted in the IDTM83 coordinate system but must have a defined coordinate system clearly described in the metadata.

* + 1. **Global Positioning Systems (GPS)**

Some data provided might contain geometry from GPS methods, and the provided metadata should describe this, if applicable.

* + 1. **Interdependence of Themes**

The Landslide Inventory geometry data is not dependent on other framework data.

* + 1. Encoding

When data is imported into and exported from the Landslide Inventory Framework, encoding will take place to convert data formats and attributes.

* + 1. Resolution

No specific requirements for resolution are specified in this standard. Resolution will be documented in the metadata.

* + 1. Accuracy

The Landslide Inventory database was compiled from many sources (Lifton et al., 2021). The Idaho Geological Survey (IGS) performed an accuracy assessment of the historical landslide point data that were incorporated into the database. Each source of landslide data used different techniques, scales, and basemaps; an accuracy assessment is needed to determine the quality of the data. The assessment involved two parts. First, the maximum location uncertainty was calculated for points that were converted from their original PLSS locations. Second, 100 random landslide point records were randomly chosen from the inventory database to compare to modern satellite imagery to determine the accuracy of the original mapping. Each point was reviewed by a geologist to determine if the point was located within a real landslide as interpreted from the satellite imagery. Where original landslide mapping did not already include a measure of spatial accuracy, IGS assigned a qualitative value of “good”, “fair”, or “poor”.

The original PLSS locations from the previously published landslide inventory define a rectangular area within which the landslide is located. When the PLSS locations were converted to a modern digital GIS format, each landslide was assigned a latitude and longitude coordinate at the centroid of the PLSS township and range in which it was originally located. The maximum uncertainty within a full section (1 mile x 1 mile square) is 1,138.5 meters. The maximum uncertainty within a quarter-quarter section (¼ mile x ¼ mile square) is 285 meters (Figure 1).



Figure 1. Schematic Diagram of Maximum Uncertainty from Center of PLSS Section and ¼-¼ Section.

* + 1. Edge Matching

No edge matching is required between jurisdictions or between this and other framework layers

* + 1. Unique Identifier

The unique identifier is IGS\_ID, which is a unique reference ID assigned by the Idaho Geological Survey for this database.

* + 1. Attributes

Attributes for public and intergovernmental distribution are described in Section 3 of this standard.

* + 1. Stewardship

Perpetual maintenance and other aspects of lifecycle management are essential to the Landslide Inventory Framework. Details of stewards, their roles and responsibilities, and processes are set forth, or will be set forth in a Landslide Inventory Framework Stewardship Plan and related documents.

* + 1. Records Management and Archiving

Data are managed by the Idaho Geological Survey and hosted on ArcGIS Online.

* + 1. Metadata

The Landslide Inventory Framework metadata will describe the methods used to update and aggregate the individual landslide inventory data contributions, processes or crosswalks performed, definition of attributes, and other required information. This metadata will conform to the metadata standards as set out in S4220 – GEOSPATIAL METADATA.

1. Data Characteristics
	1. Minimum Graphic Data Elements

The geometry of the features in Landslide Inventory Framework is points and polygons.

* 1. Optional Graphic Data Elements

Not applicable.

* 1. Standard Attribute Schema

| **Field Name** | **Data Type** | **Length**  | **Description** | **Examples** |
| --- | --- | --- | --- | --- |
| IGS\_ID | Text | 255 | Unique reference ID assigned by IGS for this database | LSPY\_0001 |
| ACT\_INACT | Text | 20 | Active/Inactive landslide | active/inactive |
| LATITUDE | Double | - | Latitude of point or centroid of polygon | 43.000000 |
| LONGITUDE | Double | - | Longitude of point or centroid of polygon | -115.000000 |
| ELEVATION | Long | - | Elevation, in meters, of landslide centroid above mean sea level, mapped point or polygon centroid. | 750 |
| LS\_DATE | Date | - | Date of last slope failure or movement, if known | mm/dd/yyyy |
| COUNTY | Text | 255 | County in which landslide occurred. If landslide overlaps more than one county, choose the county in which the greatest proportion of landslide occurs | Ada |
| SLOPE | Long | - | Average slope inclination (measured in degrees at point or polygon centroid) of the slope on which failure occurred | 12 |
| ASPECT | Long | - | Azimuth (0-360 degrees) of average slope direction at point or centroid of polygon | 221 |
| CLIMATE | Text | 255 | U.S. Climate Divisions extracted from NOAA | Eastern Highlands |
| GEOL\_UNIT | Text | 255 | Geologic unit extracted from IGS Geologic Map of Idaho | QTpms |
| MATERIAL | Text | 255 | Type of material involved in landslide (e.g., bedrock, debris, talus, etc.). Can also be a description of bedrock lithology, if appropriate | Weak or sensitive materials |
| COVER | Text | 255 | Soil or regolith cover, based on field observations or NRCS Soil Survey maps (MUKEY) | 2023918 |
| LS\_TYPE | Text | 255 | Type of landslide, as defined by Varnes (1978) and Cruden and Varnes (1996). Classification is based on material type (rock, debris, or earth) and movement type (fall, topple, rotational sliding, translational sliding, and flow).  | Earth Slide |
| LNGTH | Long | - | Maximum downslope length of landslide, from toe to crown | 1235 |
| WDTH | Long | - | Maximum width of displaced mass perpendicular to length | 350 |
| AREA\_1 | Double | - | Area of landslide polygon | 8540.85909026929 |
| DEEP\_SHALL | Text | 255 | Estimated thickness of landslide | Unknown |
| VOL | Long | - | Estimate of landslide volume if length, width, and thickness are known | 6524 |
| ACTIVITY | Text | 255 | Level of activity of slope failure | Ancient |
| MOVE\_RATE | Text | 255 | Estimated rate of movement. May not be possible to determine but note if known. | Seasonal |
| LOC\_META | Text | 255 | Description of how landslide was located, e.g., aerial stereo photographs, lidar, satellite photos, field mapping, etc. If possible, note the scale of imagery used. | Idaho Geological Survey mapping methods |
| QUAD\_100K | Text | 255 | Name of 1:100:000 scale quadrangle map in which landslide is located | Sandpoint |
| QUAD\_24K | Text | 255 | Name of 1:24,000 scale (7.5') quadrangle map in which landslide is located | Laclede |
| SOURCE | Text | 255 | Original source of mapped landslide. If from a published source, cite as Breckenridge et al., 2014, for example. | Idaho Transportation Department |
| SOURCE\_ID | Text | 255 | Unique ID assigned by original source | 39 |
| SOURCE\_REF | Text | 255 | Code for reference to original source for Adams and Breckenridge (1991) database | S29 |
| SPATIAL\_ACC | Text | 255 | Estimated level of confidence in the location of landslide | good |
| COMMENTS | Text | 255 | Additional comments regarding the landslide. Can include notes on any additional contributing factors that may have influenced slope stability, such as precipitation events or human slope modification. | Colluvium with subrounded rock fragments. Appears to have very recent shallow slump cut slope failures that could partially fill the ditch. |
| DISTRICT | Text | 255 | ITD district in which landslide is located | District 6 |
| ROUTE | Text | 255 | ITD route. For example, “US-95” or “SH-55”. | US-26 |
| START\_LAT | Double | - | Latitude of the start of affected roadway | 43.237693 |
| START\_LON | Double | - | Longitude of the start of affected roadway | -115.434987 |
| END\_LAT | Double | - | Latitude of the end of affected roadway | 43.345728 |
| END\_LON | Double | - | Longitude of the end of affected roadway | -115.425678 |
| START\_MP | Double | - | Milepost of the start of affected roadway | 374.1 |
| END\_MP | Double | - | Milepost of the end of affected roadway | 374.2 |
| AFFECT\_SIDE | Text | 255 | The side of the roadway affected, as measured when looking upstation. | Right |
| ROAD\_WIDTH | Double | - | Road width | 32 |
| PSL | Long | - | Posted speed limit | 55 |
| ADT | Long | - | Average daily traffic | 1900 |
| PMF | Text | 255 | Potential for major failures | <Null> |
| DIST\_2\_SCARP | Long | - | Distance from road to landslide headscarp | 127 |
| ZIP | Text | 15 | ZIP code provided for interaction with TIGER data | 83554 |

* 1. Data Quality

Data quality considerations for Landslide Inventory include:

 a) All Landslide Inventory data should have landslide inventory IDs.

b)

# Appendix A: References

Idaho Technology Authority (ITA). *Information and Data Policy P5000, Category: P5030 Framework Standards Development Policy.* <https://ita.idaho.gov/psg/p5030.pdf>

Idaho Technology Authority (ITA). *Enterprise Standards S4000 Geographic Information Systems (GIS) Data, Category: S4220 Geospatial Metadata.* <https://ita.idaho.gov/psg/s4220.pdf>

Lifton, Z.M., Ducar, S.D., and Tate, C.A., 2021, *Landslide Inventory Database for Idaho: Idaho Geological Survey Digital Database 10*, <https://idahogeology.org/product/DD-10>.

# Appendix B: Glossary

See ITA Guideline [G105](https://nam01.safelinks.protection.outlook.com/?url=https%3A%2F%2Fita.idaho.gov%2Fpsg%2Fg105.pdf&data=01%7C01%7Cpbond%40cityofboise.org%7C2ca8b62d08b14c86824608d6d25b20ad%7Cda3e15835c884f8ea832bd79cbd319cb%7C0&sdata=Nsvlb1tLNvY1YuorWK8VNvl5P4gRou8Pk0AkKq6iNp8%3D&reserved=0) (ITA Glossary of Terms) for definitions.

|  |
| --- |
| **Landslide Inventory Nomination** |
| **Framework Data Theme:** Hazards |
| **Framework Dataset:** Landslide Inventory |
| **Proposed Framework Dataset Name:** Landslide Inventory |
| **Link to Publication Dataset of Proposed Framework Dataset:** https://idahogeology.org/product/DD-10 |
| **Link to Metadata of Proposed Framework Dataset:** tbd |
| **Authoritative Source(s) Description:** Compiled and published by Idaho Geological Survey under general statute (Section 47, Chapter 2) to provide geologic data to the public. |
| **Link to Data Exchange Standard:** <Will be added when standard is approved>  |
| **Trusted Source Description:** Compiled and published by Idaho Geological Survey under general statute (Section 47, Chapter 2) to provide geologic data to the public. |
| **Minimum Scale of Dataset:** 1:10,000 |
| **Please describe the proposed maintenance schedule for the dataset:** Data will be updated periodically by Idaho Geological Survey staff. |
| **If this dataset is not a statewide coverage, please describe the methodology for developing or incorporating other data to make a statewide coverage:** Data is statewide |