

Idaho Technology Authority (ITA)

ENTERPRISE STANDARDS – S4000 – INFORMATION AND DATA

Category: **S4XXX** – Landslide Inventory

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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 ITA Standard [S4250](#) –Geographic Information System (GIS) Data Sharing Standards.

VIII. PROCEDURE REFERENCE

The format, content, and development of this standard adhere to ITA Policy [P5030](#) - Framework Standards, ITA Standard [S4250](#) - Data Sharing Standards and ITA Standard [S4220](#) - 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

07/20/2023 – Standard Presented to the IGC-EC



STATE OF IDAHO

Idaho Landslide Inventory Data Exchange Standard

Part of the Hazards Theme

Version 1

Effective **July 20, 2023**

Developed by the Hazards Technical Working Group

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1. Introduction to the Landslide Inventory Data 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.

1.1. 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.

1.2. Relationship to Existing Standards

This Landslide Inventory Standard relates to existing standards as follows:

- No other standards apply.

1.3. 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

1.4. 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.

1.5. 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 Idaho Geospatial Council Executive Committee (IGC-EC) and the Idaho Geospatial Council (IGC) in accordance with the review and approval process described in ITA Policy [P5030](#) Framework Standards Development.

1.6. Maintenance of the Standard

This standard will be revised on an annual basis and in accordance with ITA Policy [P5030](#) - Framework Standards Development.

2. Body of the Standard

2.1. 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.

2.2. 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.

2.3. Participation in the Standard Development

The development of the Landslide Inventory Standard adheres to the ITA Policy [P5030](#) - Framework Standards Development. The Hazards Standard Team tasked with development, 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. The process will be equally broad for input on updates and enhancements to the standard. As with all Idaho Framework standards, public review and comment on the Landslide Inventory Standard is encouraged.

2.4. 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.

2.5. Technical and Operation Context

2.5.1. 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.

2.5.2. 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.

2.5.3. Global Positioning Systems (GPS)

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

2.5.4. Interdependence of Themes

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

2.5.5. Encoding

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

2.5.6. Resolution

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

2.5.7. 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 ($\frac{1}{4}$ mile x $\frac{1}{4}$ mile square) is 285 meters (Figure 1).

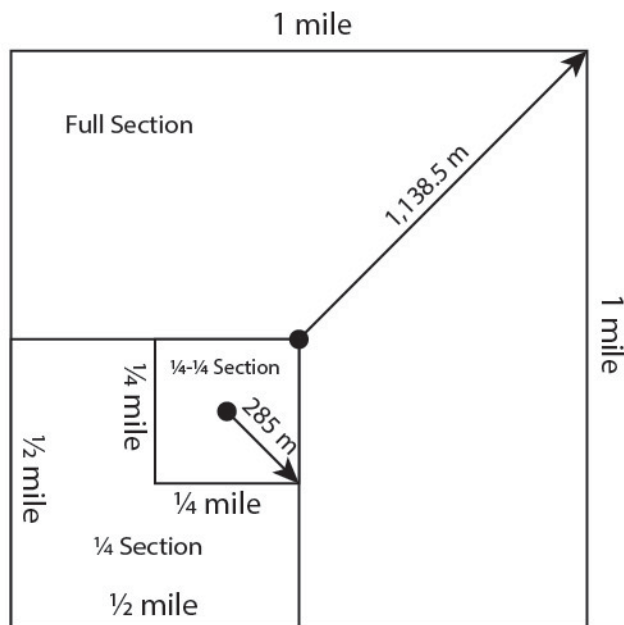


Figure 1. Schematic Diagram of Maximum Uncertainty from Center of PLSS Section and 1/4-1/4 Section.

2.5.8. Edge Matching

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

2.5.9. Unique Identifier

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

2.5.10. Attributes

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

2.5.11. 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.

2.5.12. Records Management and Archiving

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

2.5.13. 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 ITA Standard [S4220](#) Geospatial Metadata.

3. Data Characteristics

3.1. Minimum Graphic Data Elements

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

3.2. Optional Graphic Data Elements

Not applicable.

3.3. Standard Attribute Schema

Both the point and polygon representations that make up the landslide inventory have the same 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

Field Name	Data Type	Length	Description	Examples
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

Field Name	Data Type	Length	Description	Examples
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

3.4. Data Quality

Data quality considerations for Landslide Inventory include:

- a) All Landslide Inventory data should have landslide inventory IDs which is shown as 'IGS_ID' in the attribute schema.

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](#) (ITA Glossary of Terms) for definitions.