ISA

Geographic Information Systems 2025/2026

Lesson 19 – Metadata in GIS

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- Why is metadata important?
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- How to build metadata in ArcGIS Pro and QGIS

What is metadata?

Metadata is "data about data"

It is structured information that describes, explains, and gives context to the map or its underlying geographic data.

Key elements of map metadata

Metadata Element	Description
Title	Name of the map or dataset
Abstract	Brief summary of content and purpose
Creator/Author	Who created or published the map
Date	Creation, publication, or revision date
Geographic Extent	Area covered by the map
Projection Information	Coordinate system and map projection
Keywords	Searchable terms
Data Quality Statement	Accuracy, reliability, and lineage of the data
License/Restrictions	Usage rights and sharing restrictions
Attribute Definitions	Explanation of data fields and values
Purpose	Intended use or objectives
Maintenance Information	Update frequency
Related Resources	Links to other relevant data

Why is metadata important?

Metadata for maps provides essential information about the map's/layer's **origin**, **accuracy**, **purpose**, and **usage**, which helps users interpret the map correctly and use it responsibly.

Metadata is the backbone of trustworthy, usable, and shareable maps. Without it, a map is just a pretty picture with unknown reliability or origin.

In line with the **FAIR Guiding Principles** for scientific data management and stewardship:

Findable: make it easy to find the data
Accessible: to know how to access the data (including authentication and authorisation)
Interoperable: make the data able to interoperate with applications or workflows for analysis, storage, and processing
Reusable: to optimise the reuse of the data

Why is metadata important?

- **Identification**

It helps users quickly understand what the map shows and whether it is **relevant to their needs**, **reliable**, and **current**.

Metadata tells us:

- Who created the map
- When it was created or last updated
- Why it was made (its intended purpose)

Why is metadata important?

- **Evaluation**

Allows users to assess the suitability, accuracy, quality, and limitations of the map for their purpose

Metadata:

- Shows the scale, projection, and coordinate system
- Indicates data accuracy (spatial and attribute)
- Details limitations (e.g., generalizations, missing data)

Why is metadata important?

- **Discovery**

Makes maps easier to find through search tools by providing searchable fields like title, keywords, and abstract

- **Ensures Legal and Ethical Use**

This protects both the map creators and users from legal issues

Metadata includes:

- licensing, copyright, and usage restrictions

Why is metadata important?

- **Supports Reuse and Long-Term Value**

Ensures the map can be trusted and reproduced

Metadata explains:

- What tools were used
- How the data was processed
- What the original parameters were

- **Interoperability**

Facilitates data sharing and integration across different systems by adhering to metadata standards.

Metadata standards

When metadata records are formatted to a common standard, It facilitates the location and readability of the metadata by both humans and machines

Main metadata standards:

ISO 19115 – International Standard (ISO 19115: Geographic Information – Metadata)

Developed by: ISO/TC 211 (International Organization for Standardization)

Purpose: Provides a comprehensive schema for describing digital geographic data.

Used by: National mapping agencies, international organizations (like UN, INSPIRE, etc.)

Key Features: Describes who created the data, spatial reference, lineage, quality, and distribution.

Widely adopted globally; often used in conjunction with ISO 19139 (XML schema for ISO 19115).

Metadata standards

INSPIRE Metadata Standard – European Union (Infrastructure for Spatial Information in the European Community)

Developed by: European Commission

Purpose: Ensures standardized geospatial metadata for EU-wide spatial data infrastructure.

Used by: EU countries and organizations handling geospatial data.

Key Features: Based on ISO 19115 but tailored to EU directives.

Mandates metadata for data discovery, evaluation, and use in environmental policy.

FGDC CSDGM – U.S. Federal Standard (Federal Geographic Data Committee Content Standard for Digital Geospatial Metadata)

Developed by: FGDC (U.S. government)

Purpose: Standardizes metadata for geospatial data used in federal agencies.

Used by: U.S. federal, state, and local government agencies, academia.

Key Features: Includes sections on identification, data quality, spatial data organization, spatial reference, etc.

Predecessor to ISO 19115 in the U.S.; still in use in legacy systems.

Metadata standards

Dublin Core

Developed by: Dublin Core Metadata Initiative (DCMI)

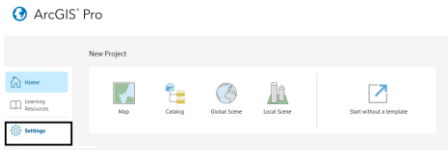
Purpose: General-purpose metadata standard, often used in digital libraries and web resources.

Used by: Some lightweight GIS applications, web mapping services.

Key Features: Simple set of 15 metadata elements (title, creator, date, etc.)

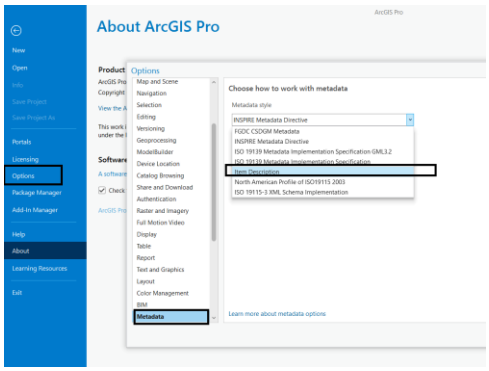
Not geospatial-specific but can be extended for use with maps.

Metadata standards - ArcGIS Pro



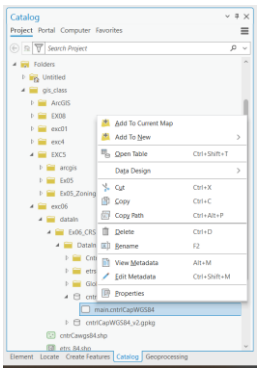
By default, ArcGIS Pro uses the **Item Description** metadata style, which allows you to view and edit a small portion of the metadata that provides essential information about an item.

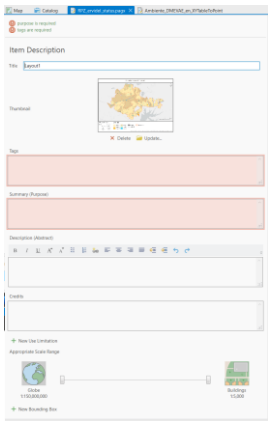
- It fits on one page.
- It allows you to provide the information used by the ArcGIS system.
- It's indexed and available for searching.
- It's visible on the item details page when published to ArcGIS Online or an ArcGIS Enterprise portal.



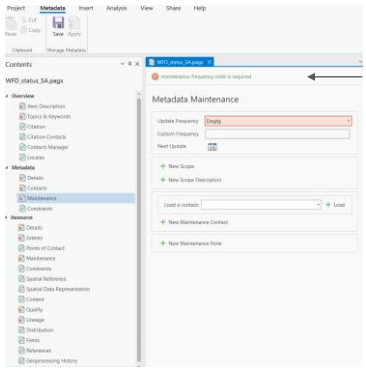
Metadata standards - ArcGIS Pro

You can view and edit the metadata of an item from the Catalog Pane or Catalog View



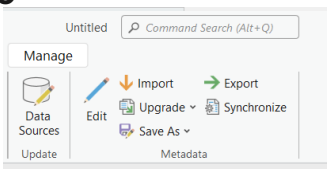


Item description metadata style



ISO 19115-3 XML Schema Implementation

Metadata standards - ArcGIS Pro



Import tool:
You can copy metadata from one map to another, from a feature class to a map layer that symbolizes those features, and so on

Synchronize tool:

It updates the item's metadata to include the current properties of the item. For example, when a feature class's metadata is synchronized, the current extent of the data, the number of features it contains, its spatial reference, and the fields in its attribute table are all recorded.

We can combine these tools to import and synchronize the metadata of an item based on an XML metadata file, converting the specification to the metadata standards of the XML file.

https://www.youtube.com/watch?v=ic8Vf62bWIk

Metadata standards - QGIS

QGIS maintains its own internal metadata schema for both layers (QgsLayerMetadata) and projects (QgsProjectMetadata).

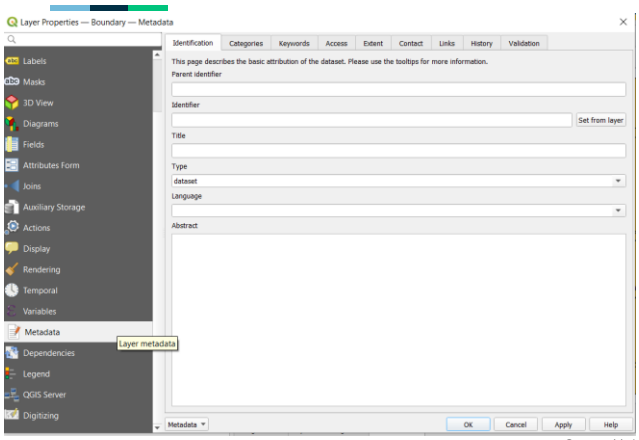
This schema provides a unified structure for metadata storage and access within QGIS.

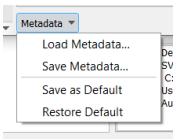
The internal schema is designed to be compatible with the **Dublin Core metadata standard.**

Using plugins (Metatools) can support ISO 19115/19139, FGDC.

Exported metadata files (such as .qmd XML files) can conform to the **INSPIRE ISO 19139 standard**, particularly for European data requirements

Metadata standards - QGIS





It saves the metadata into .qmd format