Environmental Data Management Best Practices

Geospatial Data Management
Metadata

As the amount of environmental geospatial data continues to grow, it is important that organizations develop metadata standards as a best data management practice. This document provides an overview of metadata for program and project managers, a list of types of metadata standards, and a list of additional resources so GIS professionals can develop standards for their organization.



Overview

Digitization of environmental data has steadily increased since 2020 (EBJ 2020). Given the availability of environmental data, it is important to document the source of the data. Proper documentation is vital to understanding of source, currency, scale, and appropriate usage of the data set.

For geospatial data, this documentation is done through metadata. Metadata typically includes information on the data source, spatial reference system, a description of the data, and the provider. It provides information on the quality of the data, the creation of data, and software that was used.

All organizations should define metadata standards. The Federal Geospatial Data Committee (FGDC) provides guidance for metadata that is outlined in this document. Many states have also developed metadata standards based on the FGDC standards. Consistent metadata standards should be followed across administrative boundaries when possible. Additionally, recipients of federal funds to create or update geospatial data are required to complete metadata for the resulting data set.

There are resources available for developing and managing metadata. The FGDC and U.S. Geological Survey (USGS) are great resources; for example, the USGS provides tools for creating metadata, including tips and tricks and a metadata wizard. The USGS website is linked in Resources.

Properly completed metadata provide keywords and phrases that are used for online geospatial data discovery searches. Stakeholders can then use metadata to review attributes of data and intended use before downloading and using environmental data published by your organization.

Components of Metadata

There are a variety of styles for metadata that are outlined in the section below. Here is a list of all the common components of metadata. (GISGeography 2022)

- **Identification**—provides a brief narrative of your data. In other words, it summarizes the purpose of your data in a succinct way.
    - Title is the name given to the data set.
    - Description defines the features that are in the data set and what they represent.
    - Keywords help categorize your data with predefined taxonomy.

- **Contact**—information on who developed and made the data available.
    - Originator is who developed the data set.
    - Publisher assists in producing, editing, and finalizing the end product.
    - Distributor focuses on making the data available.

- **Quality**—explains the accuracy and standards the data set follows.
    - Horizontal accuracy evaluates the ground position quality.
    - Vertical accuracy evaluates the quality of altitude, elevation, or depth data..
    - Description quality tests (including completeness, integrity, and inspections of the data) are documented.

- **Spatial reference**—assigns a geographic extent and coordinate system.
    - Projection information includes a projection, datum, and units.
    - Geographic extent comes in the form of a bounding box, place keyword, or thumbnail.

- **Entity and attribute—**map data type such as points, line, polygons, or grids.
    - Lists the established set of valid values and domains.

- **Lineage**—describes in detail how the data set was constructed.

- **Legal**—constraints for accessing and distributing the data.
    - This component describes the liability to ensure protection of privacy and intellectual property.
    - This component can also include a security classification (for example, confidential, restricted, sensitive, unrestricted, and unclassified) that restricts access or otherwise mitigates security concerns.

- **Temporal**—when the data were collected or updated and how long they are valid.
    - This component can also describe data progress, such as when future updates are scheduled.

- **Metadata reference**—gives a point of contact when there are uncertainties, such as how to cite information.
    - The metadata reference has a temporal component for the date it was created and when it will be revised next.

Styles of Metadata

Here is a list of common metadata styles and links to the requirements:

- FGDC CSDGM—Federal Geographic Data Committee Content Standard for Digital Geospatial Metadata
- ISO 19115—International Standards Organization (ISO)
- USEPA—Based on ISO 19115 with additional requirements
- Esri—Default metadata standard for organizations that do not need to adhere to a specific standard. (Esri also supports metadata for many of the other metadata styles listed here.)
- Inspire—Required by the European Union
- MEDIN—Marine Environmental Data and Information Network (United Kingdom)

Resources

- FGDC content standard for digital geospatial metadata (CSDGM) https://www.fgdc.gov/metadata/csdgm-standard
- FDGC download geospatial data standards https://www.fgdc.gov/resources/download-geospatial-standards
- USGS metadata fact sheet https://geology.usgs.gov/tools/metadata/tools/doc/ctc/
- USGS tools for creating metadata https://geology.usgs.gov/tools/metadata/
- Esri web page on creating standard-compliant metadata https://desktop.arcgis.com/en/arcmap/latest/manage-data/metadata/creating-standard-compliant-metadata.htm
- GISGeography web page “What is Metadata? (Hint: It’s All About the Data)” https://gisgeography.com/gis-metadata/
- USEPA Metadata Editor: https://www.epa.gov/geospatial/epa-metadata-editor