

GIS & Mapping Resources

Use this guide as a reference when creating maps, working with spatial data, and continuing to build GIS skills beyond this workshop.

1. Thinking About Your Map

Start With a Clear Purpose

A map should answer a focused question.

Design each map to communicate one main idea rather than showing everything at once.

- What am I trying to explain?
- Who is the audience?
- What decision or insight should this support?

Make sure the geographic scale of your data matches the question.

Neighborhood data should not be used to answer regional questions, and vice versa.

Provide the Right Amount of Context

- Include enough background information to understand the issue, but not so much that the message is lost.

Review Before Sharing

Before publishing a map, ask:

- Is the message clear?
- Are symbols and colors understandable?
- Is the map readable at different scales?
- Does it support interpretation without explanation?

2. Working With Data

Understanding Metadata

Metadata explains what a dataset represents and how it should be used.

Always review:

- Source and author
- Date of collection or update

- Geographic coverage
- Definitions of variables
- Resolution and limitations

Understanding metadata is fundamental to responsible GIS work. It also helps confirm that datasets use compatible coordinate systems and spatial references before combining them.

Common GIS File Types

- **Shapefile (.shp)**
Standard vector format for boundaries, roads, and features. Keep all associated files together.
- **GeoJSON (.geojson)**
Lightweight format commonly used for web mapping and open data.
- **CSV with Coordinates (.csv)**
Spreadsheet data with latitude and longitude fields for mapping locations.
- **Raster (.tif, .img)**
Grid-based data such as temperature, elevation, or imagery.
- **Web Layers**
Hosted datasets added directly from platforms like ArcGIS Online.

Finding GIS Data

Some Options::

- ArcGIS Living Atlas
- Government open data portals (for example NYC Open Data)
- Census and environmental datasets
- Research institutions

Always review documentation before using data.

3. Mapping and Design Principles

Keep It Simple and Intentional

- Effective maps prioritize clarity over complexity.
- Use only the layers needed to answer the question
- Avoid visual clutter
- Emphasize what matters most

Use Visual Hierarchy

- Guide the reader's attention through contrast, size, and placement.
- Highlight key information first
- Reduce background detail

- Make relationships between layers easy to see

Use Color Thoughtfully

- Color should communicate meaning, not decoration.
- Use a limited palette
- Choose colors that reflect the subject matter
- Avoid overly saturated colors
- Apply colors consistently across layers

Match Symbology to the Data

Choose visualization styles that reflect how the data behave.

- Continuous data → gradual color changes
- Categories → distinct symbols or classes
- Density or magnitude → size or intensity differences

Appropriate symbology prevents misinterpretation.

Design for Accessibility and Inclusion

Maps are tools for shared understanding. They should be usable by as many people as possible.

- Do not rely on color alone to communicate differences
- Avoid red and green combinations that are difficult for many users to distinguish
- Combine color with labels, shapes, patterns, or size
- Ensure content can be understood across formats, including assistive technologies

Inclusive design is central to creating maps that communicate clearly, respectfully, and responsibly.

4. Continuing Your Practice

- You build GIS skills by doing:
- Revisit and refine your map
- Apply the workflow to a new question
- Expand into a StoryMap and other GIS Tools
- Use maps in papers, presentations, or portfolios

Keep a simple record of your data sources and steps so your work can be repeated or updated later. Practice strengthens both technical skills and spatial thinking.

5. Tools, Learning, and Support

Learn and Get Help

- Training and Tutorials
<https://www.esri.com/training>
- Documentation and Help
<https://doc.arcgis.com>

Columbia GIS Support

- CIESIN GIS Service Center
<https://ciesin.columbia.edu/gisservicecenter>
<https://ciesin.columbia.edu/gisservicecenter/resources>

Consultations and guidance for coursework and research.

Columbia Libraries GIS Guides

- GIS Data Sources
<https://guides.library.columbia.edu/GIS>
- ArcGIS / ESRI Tools Guide
<https://guides.library.columbia.edu/geotools/ESRI>

Open-Source GIS Tools

- **QGIS**
<https://qgis.org>
Free desktop GIS for spatial analysis and cartographic design.
- **GeoPandas**
<https://geopandas.org>
Python-based workflows for spatial analysis.
- **OpenStreetMap**
<https://www.openstreetmap.org>
Open geographic data commonly used for basemaps and features.