

ISSUE PAPER SERIES

GIS Resources for Local Governments

June 2023



NEW YORK STATE TUG HILL COMMISSION

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The Tug Hill Commission Technical and Issue Paper Series are designed to help local officials and citizens in the Tug Hill region and other rural parts of New York State. The Technical Paper Series provides guidance on procedures based on questions frequently received by the Commission. The Issue Paper Series provides background on key issues facing the region without taking advocacy positions. Other papers in each series are available from the Tug Hill Commission. Please call us or visit our website for more information.



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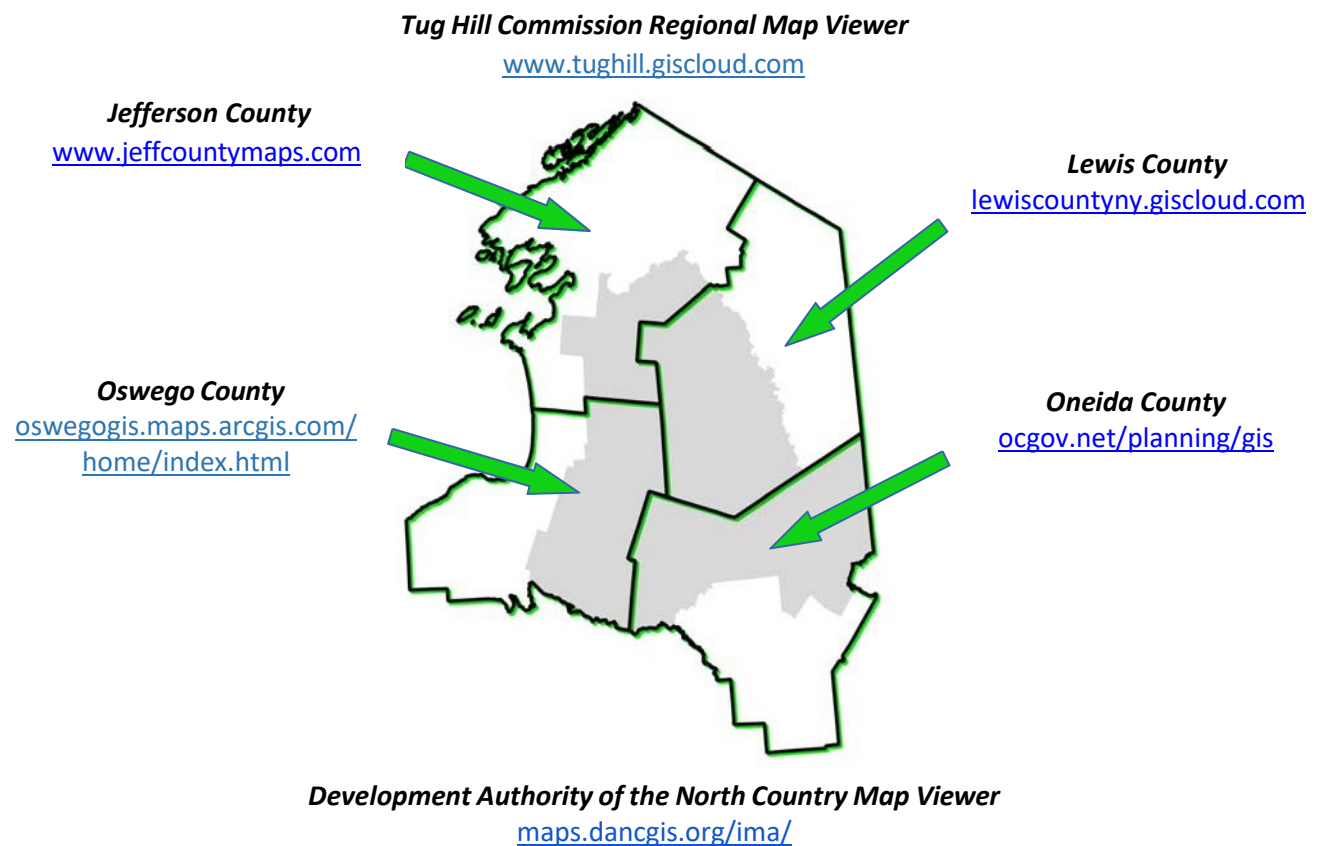
What is a Geographic Information System (GIS)?

GIS is a computer system that captures, stores, analyzes, and displays data identified according to location, such as tax parcels, water/sewer infrastructure, aerial imagery, streams, zoning, etc. GIS can help local government officials make informed decisions in projects such as:

- Planning and zoning
- Emergency response
- Recreation
- Codes enforcement
- Asset management

Map Viewers in Tug Hill Region

Many people are familiar with map viewers such as Google Maps, that provide location viewing and driving directions. There are more specific map viewers in the four county Tug Hill region that provide additional data layers that may be useful to local officials, municipal staff, and even property owners.



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Staffing a GIS Program

If a community or organization wants to go beyond just viewing data in an online mapper to developing a GIS program, identifying a lead person in the organization to implement the program is key to success. This person may be the one learning how to use GIS and GPS technologies or could simply be coordinating efforts with others to build out the program.

Interns can also be useful to collect data or assist in program implementation. There are many organizations that can help provide funding for interns, including the Pratt- Northam Foundation, county workplaces, and Fort Drum Career Skills Program. In addition, some colleges may require students to intern in their field of study, which may be paid for by the college. Check with local colleges or high schools about internship programs they can offer.



Partnerships & Assistance

Finding partners with experience in GIS can also be beneficial when beginning a new GIS program. Partners can include state agencies, county government, other local governments, non-for-profits, and regional organizations. In the Tug Hill region, the NYS Tug Hill Commission is a regional/state partner that works with municipalities and has capacity in online, mobile, and desktop GIS services, as well as map creation and printing. More recently, the Northern Oneida County Council of Governments (NOCCOG) has an infrastructure mapping program. NOCCOG owns two GPS units and pays contractors to collect data for member communities. The data is collected and displayed using Diamond Maps.

Working with a partner can provide initial cost savings as well as future savings, including:

- **Purchasing power.** If more than one community purchases a GPS receiver, may get a volume discount.
- **Shared resources.** Sharing an intern or a GPS receiver can defray costs.
- **Support.** Troubleshooting technical issues can be facilitated by more people working in the same system.

GIS allows communities to identify vulnerabilities, target effort to areas of greatest need, and support critical decisions with data. As a result, grants for financial assistance with GIS implementation have become more available. Public safety grant programs are available to help build and sustain GIS capabilities communities need. Available funding programs include FEMA grants, DHS Science and Technology Directorate grant, and more. This information can be found on [ESRI Federal Funding for GIS](#). Additionally, the Local Government Records Management Improvement Fund is a state-funded program that assists

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local governments to establish records management programs or develop new program components. More information can be found from the [New York State Archives](#).

Data Types

A GIS is only as good as the data it contains. Finding sources of data, or collecting primary data, will be a top priority. There are four primary types of data:

- **Vector data.** Vector data includes points, lines and polygons. Common vector data files include ESRI shapefiles (.shp, .dbf, & .shx), Google Map & Earth (.kml & .kmz), and GPS (.gpx).
- **Raster data.** Raster data is made up of pixels, and common raster data files include GeoTiff (.tiff), Grid (.grd), Digital Elevation Model (.dem).
- **Web services.** Web services offer data access online through an internet address. Common web services include Web Map Service (WMS) viewing data only, Web Feature Service (WFS) viewing and editing capabilities, and basemaps.
- **LiDAR data.** LiDAR uses lasers to measure distance by tracking how long a pulse emitted takes to return. The two most common LiDAR maps are Digital Elevation Models (DEM) and Canopy Height Models (CHM).

Data Repositories

Significant amounts of data are available online and available free of charge. Some places to start are listed below:

New York State

- [NYS GIS Clearinghouse](#) - some county tax parcels can be accessed here, otherwise reach out to individual county real property tax offices.
- [CUGIR](#)
- [Open Data NY](#)
- [NYS Department of State GIS Gateway](#)
- [Adirondack Park Agency](#)
- [DOT Traffic Data Viewer](#)
- [NYS Building Footprints with Flood Analysis](#)

United States

- [Data.gov](#)
- [USGS National Map Viewer](#)

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- [USGS Earth Explorer](#)
- [Census](#)
- [USGS Water Data for the Nation](#)
- [USGS Earth Resource Observation and Science Center](#)
- [Landscape Approach Data Portal](#)
- [EPA Environmental Dataset Gateway](#)

Global

- [Geolode](#)
- [World Health Organization Global Health Observatory](#)

Data Collection

The most user-friendly way to collect new data is by utilizing a Bluetooth GPS with a smartphone or tablet. Most GPS units achieve a high level of accuracy using a technique known as RTK (Real Time Kinematic). The learning curve on RTK systems is less than traditional GPS setups, and Bluetooth GPS devices are generally lower cost.

Data can be collected by existing staff, a contractor or intern. Using a contractor may make sense if a local government does not have staff with the knowledge, willingness, or time to learn how to use a GPS. Also, if the municipality does not plan to use a GPS to relocate assets after their location has been determined (for example, finding a buried shutoff in the future for maintenance), then a contractor or intern can be the better option.

However, if a town or village is interested in using GPS as a management tool for their staff, collecting the data with staff may be more effective in the long term. Also note that, if data collection is contracted out, municipal staff will need to mark the assets for collection.

For municipalities that want to purchase a Bluetooth GPS receiver, options include the companies below. Click on the logo for website links.



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Data Storage

A well-organized structure for storing data, either found online or collected in the field, is important for data users. Data should be organized in folders stored on a hard drive or on a cloud-based server. Data can also be stored in a database in a centralized location accessible online. A database structure allows the GIS administrator to control the type of access (read-only, editing, etc.) others within the organization have to the data. Data should be backed up on a regular schedule.



The commission has successfully used a database for GIS data called [PostgreSQL](#) (PostGIS). The database platform is free, but online hosting through Amazon Web Services RDS costs approximately \$250/year. Other options include: [Spatialware](#), [SpatialLite](#), [SQLite](#).

Mobile Applications

To use a smartphone or tablet to collect data, a mobile data collection application compatible with the device's operating system (i.e. Android or iOS) needs to be installed. For example, [Avenza Maps](#) allows users to see their location on a GeoPDF map. It also allows the user the ability to collect data and export that data to be used in a GIS program.

Another example is the mobile application [DiamondMaps](#), a simple cloud-based GIS for municipalities and rural utilities. It allows the user to map infrastructure and track maintenance. This application is frequently used by rural municipalities to map infrastructure.

Links to commonly used mobile applications can be accessed by clicking on the logos below.



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Desktop GIS

For advanced editing of data and map creation, a desktop GIS program is required. [QGIS](#) is a desktop GIS program that is growing in popularity because it is free and has all the functionality required to get started. There are also paid applications like [ESRI](#) and [MapInfo](#).

Training on whatever GIS desktop program chosen is important. Local governments should provide training to staff that will be the power user(s) of the desktop application. If using QGIS, training resources include:

- [QGIS Training Manual](#)
- [American Red Cross QGIS Training](#)
- [Cornell University QGIS Training](#)
- [OSGeo](#)



Online Map Viewing

An online map viewer is a user-friendly way to display data and can be accessed from any location with an internet connection. Online map viewers make information easily available to decision makers and have an easy learning curve for the non-GIS user. Some online map viewers allow maps to be shared privately, so sensitive/restricted maps cannot be publicly viewed.

Local governments may want to reach out to state, regional, or academic organizations already providing online map viewers. In the Tug Hill region, the Tug Hill Commission has an [online map](#) viewer with public and private capabilities for local governments. Other options include:



Emerging GIS Technologies

GIS technology is prevalent with the widespread adoption of smart technology and the exponential growth of spatial data. Geographic artificial intelligence (GeoAI) is a rapidly evolving technology used in planning urban infrastructure and tracking changes in an area over time. A key function of GIS is to process and interpret images such as aerial photos, satellite imagery, and drone footage. GeoAI can improve this function by enabling GIS to

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recognize and label objects, extract features, and segment images. GIS can use GeoAI to identify buildings, roads, vegetation, and water bodies from images, and create maps and datasets based on them. Drones, or unmanned aerial systems (UAS), are also becoming more prevalent. For more information about drones, see the Tug Hill Commission's issue paper.

Assistance

For more information on ways to get involved in GIS, contact one of the organizations below.

- NYS Tug Hill Commission, 317 Washington Street, Watertown, NY 13601, (315) 785-2380, www.tughill.org
- NYS GIS Program Office, Office of Information Technology Services, 10B Airline Drive, Albany, NY 12235, (315) 242-5036, www.its.ny.gov
- NYS GIS Association, www.nysgis.org