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GS318 Advanced GIS

Final Project – GIS Needs Assessment

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Introduction

The Greater Worcester Land Trust is a 501(c)(3) non-profit organization with a mission to secure, preserve and advocate for the undeveloped natural open space in the Greater Worcester region of Massachusetts. GWLT is governed by a board of trustees and staffed by one full-time, permanent employee. Because the majority of its operating capital comes from grants and donations, GWLT relies very heavily on any interns and volunteers it can entice to help in its day to day work.

Volunteers can work in the office, but mainly work in the field, cleaning and maintaining trails and open spaces and reporting back to the office on any issues that may be found or information that may be of use to the Trust. Interns are from local colleges and universities, studying anything from urban planning to environmental science to GIS. They help with conservation efforts, research, and GIS-related tasks such as data collection, data cleaning and data visualization / map development.

The GWLT was established in 1987 by a small group of people interested in preserving the large, natural open areas in the region in an effort to prevent those open spaces from disappearing due to urban overdevelopment. The first president of the Trust, Allen Fletcher, is quoted on the GWLT website: “Our goal is quite simply the preservation of quality open space in the Greater Worcester area, with the idea that if someone doesn’t attend to it, it will go away.” (GWLT, 2019).

Potential Uses of GIS Technology

So much of GWLT’s operations involve spatial information. A comprehensive GIS is fundamental to the agency’s success in its goals. GIS would provide ease of access to spatial data, as well as detailed spatial analysis that can be customized to individual use or need. The following is a list of ways in which GIS could be used by GWLT to enhance operations:

# Data Management

GIS is a fully integrated technology which provides an organization with a single application for storing, managing, and visualizing spatial data. GWLT can store and manage the data for all of their land, create customized maps from that data, and do detailed analysis in real-time of the health and status of that land.

# Recreation

GIS provides an interactive tool for hiking trails, nature and wildlife preserves, and conservation land. GIS can be used to develop maps of recreation areas and placed physically around the recreation areas for reference or made available to download from the website. The information can be used internally for spatial analysis of the areas’ proximity to other facilities and attractions.

# Urban Planning/Zoning

GWLT can share and use GIS data layers when working with local and regional planning / zoning departments on conservations efforts as they pertain to urban planning initiatives. GIS offers a unique way for GWLT to provide visualization of spatial analysis while helping local government in making important planning decisions that could impact natural spaces.

Key GIS Datasets

|  |  |  |
| --- | --- | --- |
| Data Layer / Data | Existing / Available | Requires Development |
| Protected and Recreational OpenSpace | ✓ |  |
| Community Boundaries (Towns) | ✓ |  |
| Licensed Google Ortho Imagery | ✓ |  |
| MassDOT Roads | ✓ |  |
| Land Cover / Land Use | ✓ |  |
| GWLT Owned / Managed Properties |  | ✓ |

Each of the existing data layers can be accessed from the MassGIS website and is readily available to entities such as GWLT.

# Protected and Recreational OpenSpace

This data layer contains polygon boundaries for the conservation lands and recreation areas in Massachusetts, including all lands associated with GWLT. Attributes for this data layer consist of the Town ID for the municipality where the land is located, Site Name, Owner ID for the entity which owns the lands, Manager ID for the entity that manages day to day operations for the land, Public Access level, Protection level, information on the financial status of the land, geospatial data such as acreage and tax map data from the local Assessor’s department.

Community Boundaries (Towns)

This layer contains polygon boundaries of all towns in Massachusetts. With the first data layer laid over this one, all GWLT-associated properties would be shown within the boundaries of their host towns/municipalities. Attributes for this layer include town name and ID number, population data from the census, type (city, town, etc.), FIPS information, and spatial data such as acreage and square miles.

# Google Ortho Imagery

This layer is an aerial ortho photo image of the land. Data layers like this are used mostly to put spatial data into visual context by providing a real photographic background for other data layers to be laid over. An example of this context can be seen in the map provided later in this document.

# MassDOT Roads

This data layer is a digitized tracing of the roads and streets in Massachusetts. This would be used by GWLT to show access into and away from their properties and access to nearby facilities. Attributes for this layer include class (type of road), name, route number, town or municipality where the road is located, length in miles, and length in feet.

# Land Cover / Land Use

This layer is a combination of aerial land cover photography and digitized land use polygons. This is useful to GWLT for visualizing the land cover of their properties. Attributes for this layer include land cover classification, land use classification, the associated names of these classifications, and the town or municipality if the land use polygon occurs within a town boundary.

# GWLT Owned / Managed Properties

This data layer can be created by customizing the Protected and Recreational OpenSpace layer to include only GWLT-associated properties. This would be useful in creating a map of all GWLT properties categorized by management type and/or property type.

Future Applications and Technology

There are many potential applications for GIS use that would enhance operations for the Greater Worcester Land Trust. The most important is simply to integrate all of GWLT’s spatial data into a single legacy system, which can be accessed by all users. Applications such as ESRI’s “Citizen Science” suite of tools would be especially beneficial to this agency in light of its reliance on volunteers in the field, using their own personal phones and tablets to record spatial information who would benefit from a direct link to GWLT’s data repository. The following is a partial list of potential GIS applications for GWLT:

Real-time editing of boundary data for GWLT properties

Customizable search tool

Customizable mapping tool

Digitization of existing and potential future trails

Mobile data referencing / recording / reporting

Emergency planning and response

General inventory management

Ability to track assets in real time

GIS Application Initiatives

Among the many enhancements GIS could provide to GWLT, the following should be prioritized:

# General Integrated GIS Access

Since GWLT does not currently have a single legacy management system in place, an integrated GIS system with general access for all users is priority one. This would consist of a geodatabase for all GWLT properties, simple querying and mapping capabilities, and customization options.

# Data Recording / Reporting

Functionality for collecting field data and uploading it to a master data repository is essential for an entity such as GWLT, where the majority of users in the field are volunteers that may never physically enter the agency’s headquarters. Also key would be functionality for uploaded data to be integrated into the legacy data management system.

# Dedicated GIS Technician

It would be of immeasurable benefit to GWLT to employ a dedicated GIS specialist to handle the day to day management of the GIS application. It would be this person’s responsibility to manage the data repository, integrate data collected in the field, implement a change management system, and train and oversee volunteer / intern GIS users.

# Data Sharing

A system for sharing spatial data with local and regional urban planning agencies and developers would enhance GWLT’s relationships with those entities. The ability to provide visualization of important data points during the decision-making process for projects with the potential to impact natural open spaces would help GWLT in their overall mission.

Example of Potential GIS Application

The following is an example of how GIS can benefit the Greater Worcester Land Trust. A map has been created in ArcMap, an ESRI application, utilizing a number of the data layers listed previously in this document. The larger map starts with a Worcester County by Town data layer, overlaid with a layer of all lands owned outright by the Greater Worcester Land Trust to place the location of each property in geographic context. A distance scale in miles is shown at the bottom of the map, and a compass rose is provided in the top right of the map. An extent rectangle on the larger map shows the exact location of the area highlighted in the inset map: one of GWLT’s owned properties that features a number of hiking trails for recreational use to the public. This inset map has an orthophoto as its base layer, to provide real photographic context of the area (as stated in the previous section of this document), with the trails digitized and categorized according to GWLT’s trail names and icons. A distance scale in miles is provided at the top of the inset, and a legend is laid over the map to describe the visualization of the trails. This example also provides the basis for the usefulness of a new data layer, which would include all GWLT properties (instead of just the owned properties), categorized by type of property (owned vs. conservations rights vs. legal management rights) in the same way the digitized trails are categorized in the inset map – using colors or icons to differentiate between categories.

Citations

About GWLT. (2019, October 3). Retrieved December 24, 2019, from <http://www.gwlt.org/about-gwlt/>

A close up of a map

Description automatically generated