Old Lyme Land Trust Conservation Prioritization Using GIS Overlay Analysis

Alex Clippinger

College of Professional Studies, Northeastern University

GIS 6320: Use and Applications of Free and Open-Source GIS Desktop Software

Professor Michael Trust

April 10, 2021

Abstract

The Old Lyme Land Trust (OLLT) is a non-profit organization dedicated to conserving land and

water resources for the public of Old Lyme, Connecticut (Old Lyme Land Trust, n.d.). The

OLLT currently protects 70 properties covering roughly 1,100 of 16,000 acres of land in the

town and is continuously seeking new acquisitions. The objective of this analysis is to evaluate

land conservation value based on the spatial distribution of key natural resources and other

criteria. Using a GIS overlay analysis, these weighted criteria will be combined to determine

parcels that are of high priority for conservation. The goal of this research is to provide a basis

for conservation efforts and support for grant applications.

Keywords: Old Lyme, Connecticut, conservation, overlay analysis, free and open-source

software (FOSS)

Project Objectives

There are two principal questions that this analysis seeks to answer:

1. What is the distribution of key natural resources in town?

2. Which parcels contain high values of natural resources and other conservation criteria?

Project Sector

Conservation, Natural Resources

Location and Data

The spatial extent of the study area is the town of Old Lyme, Connecticut, as seen in

figure 1 and figure 2 below.
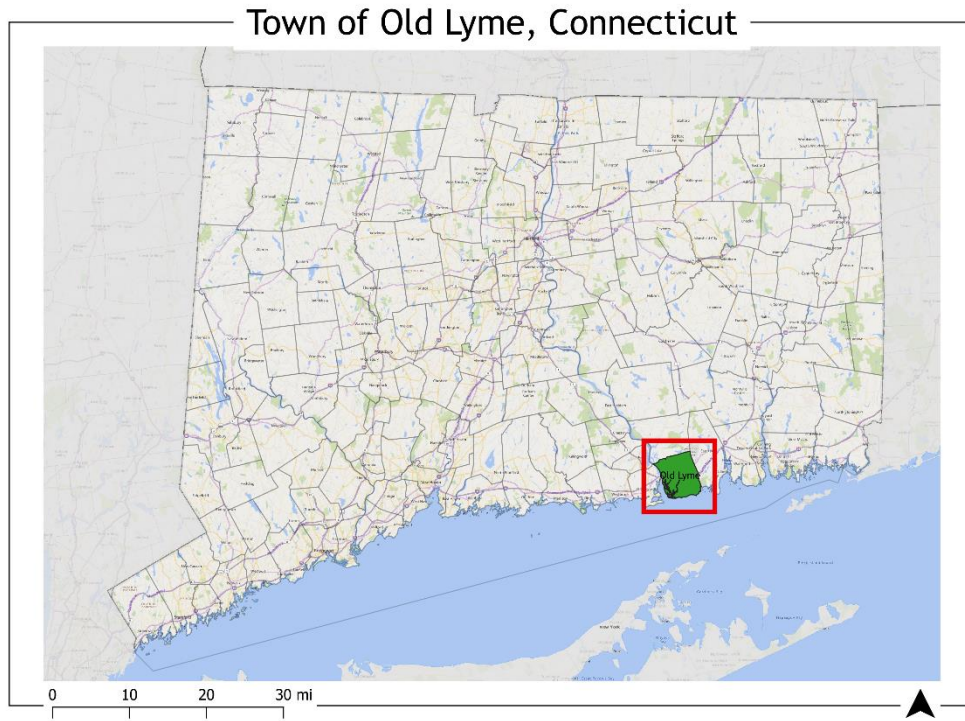
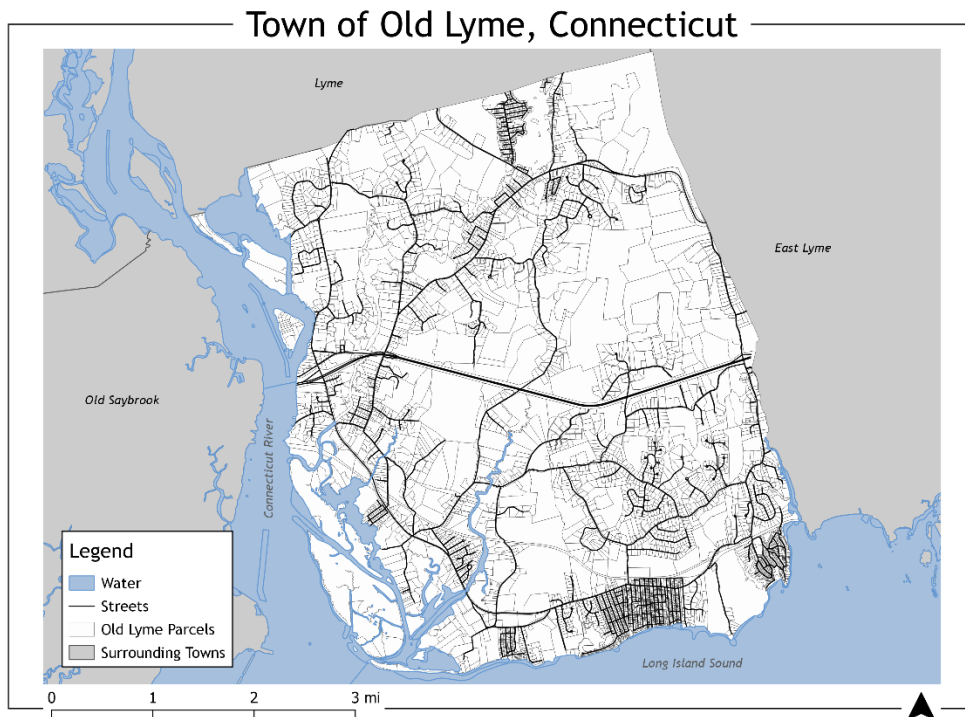Figure 1 – State of Connecticut

Town of Old Lyme, Connecticut

Figure 2 – Old Lyme, Connecticut

Town of Old Lyme, Connecticut

Legend
Water
Streets
Old Lyme Parcels
Surrounding Towns

Data for this project have been obtained from the Old Lyme Tax Assessor's Office, the

Connecticut Department of Energy & Environmental Protection (CT DEEP) GIS Open Data

Website, and the University of Connecticut Center for Land Use Education & Research

(CLEAR), as summarized in Table 1 below.

Table 1 – Summary of Data Layers

Data Source	Data Layer(s)
Old Lyme Tax Assessor's Office	Buildings; Street Centerlines; Parcels; Property Information
CT DEEP GIS Open Data Website	Critical Habitats; Inland Wetland Soils; Hydrography Line/Polygons; Natural Diversity Database Areas; State of CT Town Boundaries
UCONN CLEAR	Land Cover

Research Proposal

The study area for this project is Old Lyme, which is a coastal town in Southeastern

Connecticut. Natural resource conservation in this region relies on the grassroots support and

education efforts from local land trusts. Old Lyme and the surrounding area were identified by

the Nature Conservancy as crucial in their report titled "Resilient Sites for Terrestrial

Conservation in the Northeastern and Mid-Atlantic Region" (Burns, 2014).

The study derives many data sources and methodology from the Lower CT River and

Coastal Region Land Trust Exchange's (LTE) Natural Resource Based Strategic Conservation

Plan (ibid). Whereas the LTE's plan is a regional model prioritizing larger corridor connectivity,

this study will focus on Old Lyme at a parcel level of detail. In addition, numerous studies

provide contextual support for this style of GIS overlay analysis. In particular, Kuru and Terzi

demonstrate the ability of a weighted matrix of criteria overlayed using GIS as an effective

method of site selection and suitability analysis (Kuru & Terzi, 2018).

This paper aims to inform the land trust on parcels with a high priority for conservation

efforts. Currently, acquisition efforts by the Old Lyme Land Trust are primarily placed on

parcels that are adjacent to existing preserves or town open space. The OLLT has an ultimate

goal of linking these properties to create town-wide trail systems and wildlife corridors. Taking

these priorities into consideration, the analysis will incorporate key natural resources to assist

with further acquisition strategy.

The study will follow the GIS overlay analysis methodology outlined by Esri (Esri, n.d.).

This includes creating sub models, determining data layers for each sub model, reclassifying

layers, weighting based on importance, and combining them into a single layer. The criteria to be

considered are summarized in Table 2 and Table 3 below.

Table 2 – Natural Resource Methodology

Criteria #	Criteria Description	Data Source	Weight
1	Core Forest Area	UCONN CLEAR	2 or 0
2	Large Natural Area	UCONN CLEAR	1 or 0
3	Early Successional Habitat Area	UCONN CLEAR	1 or 0
4	Surface Hydrology	CT DEEP GIS	2 or 0
5	Critical Habitats	CT DEEP GIS	2 or 0
6	Natural Diversity Database Areas	CT DEEP GIS	1 or 0

Table 3 – Parcel Prioritization Methodology

Criteria #	Criteria Description	Data Source	Weight
1	Proximity to existing preserve/open space	Old Lyme Tax Assessor's Office	1 or 0
2	Parcel size	Old Lyme Tax Assessor's Office	1, 0.5, or 0
3	Ownership Information	Old Lyme Tax Assessor's Office	1 or 0

Using this approach, each parcel will receive a value between 0 and 12 representing their prioritization for conservation and targeting by the land trust. This will improve upon the trust's existing acquisition strategy and provide support for decision making in this area.

References

Burns, M. (2018, September). *The Lower CT River and Coastal Region Land Trust Exchange Natural Resource Based Strategic Conservation Plan.* Retrieved from https://lcrclandtrustexchange.org/InformationDocuments/LTE_Strategic_PlanFINAL091 814.pdf

Center for Land Use Education & Research. (n.d.). Retrieved from http://clear.uconn.edu/

CT DEEP GIS Open Data Website. (n.d.). Retrieved from https://ct-deep-gis-open-data-website-ctdeep.hub.arcgis.com/

Esri. (n.d.). *Understanding Overlay Analysis*. Retrieved from

https://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-analyst-toolbox/understanding-

overlay-analysis.htm

Galliher, Anne, & Kiernan, Michael. (2021, March 19). Old Lyme Land Trust Board of

Directors. Personal Communication.

Kuru, Azem, & Terzi, Fatih. (2018). *Determination of New Development Area in Kırklareli by

GIS Based Weighted Overlay Analysis*. International Journal of Environment and

Geoinformatics (Online), 5(3), 244–259. Retrieved from

https://doi.org/10.30897/ijegeo.427330

Old Lyme Land Trust. (n.d.). *Old Lyme Land Trust*. Retrieved from www.oldlymelandtrust.org/

Old Lyme Tax Assessor's Office. (n.d.). *Assessor.* Retrieved from https://www.oldlyme-

ct.gov/assessor

Expected Deliverables

There are three expected deliverables to be displayed visually and disseminated to the

Old Lyme Land Trust Board of Directors:

1. Raster layers for each of the six natural resource criteria showing their individual
   spatial distributions.
2. Raster layer representing the weighted combination of natural resource criteria.
3. Vector layer with parcel polygons and corresponding values after consideration of the
   parcel prioritization criteria.