

Identifying Conditions of Hemlock Wolley Adelgid in Northeastern US

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OBJECTIVES

Hemlock Wolley Adelgid (HWA, *Adelges tsugae*) is a host specific invasive species whose hosts include hemlock species. Eastern hemlock (*Tsuga Canadensis*) are particularly important to riparian ecosystems in the Northeast US. HWA has spread rapidly since it's introduction to the US in the 1950s, where it is known to cause mortality in Eastern Hemlock

This research project aims to answer the following questions:

What are the environmental and physical conditions that HWA thrives in?

What currently uninfested stands of Eastern hemlock are vulnerable to HWA?

To answer these questions, I will use the case study of two states: Pennsylvania and New York

My final product will be a comprehensive report of the conditions where HWA thrives, and hopefully I will also identify areas matching those characteristics that may be vulnerable to HWA in the future. I will include graphical outputs and maps.

ASSIGNMENTS

Complete the following assignments. Deliverables will include pushing to your public GitHub and updating the README at every step.

Project Proposal

1. Fill in the highlighted portions of this prompt. Utilize the Group Prompts for inspiration.
 - Propose at least 5 vector datasets and 2 raster images that will address your topic.
 - What relationships will you analyze? Propose at least 3 spatial queries.
2. Create a new Final Project repository and invite Jon & Kunal to collaborate on GitHub.

Due Friday, April 5 @ 5 pm (10 Points)

Assignment 1 – Data Acquisition, Processing, & Database Setup

2. Find and Process Geospatial Data

- Acquire data for at least 5 vector layers & 2 rasters:
 - **Vector Data**
 1. Confirmed Presence of HWA for New York and Pennsylvania (impapinvasives.net)
 2. New York and Pennsylvania polygons (as study area)
 3. Roads (distance from roads as variable) – From NY and PA GIS/DOT
 - **Raster Data**
 1. Tree basal area (eastern hemlock) – 250m resolution (Barry et al., 2013)
 2. MODIS LST data- try to find high and low of the year (probably avg Dec and avg July temps- calculate in GEE?)
 3. Aspect (from USGS DEM)
 4. Slope (from USGS DEM)
 5. Annual rainfall (NOAA)
 6. Land cover (from NLCD) (possibly...)

- Be sure to provide sources, descriptions, and visualizations in your README.

3. Set Up Database Schema

- Create schema for your chosen topic.
- What attributes should you be mindful of?

4. Pre-process the Data

- Process the data to align different datasets temporally and spatially.
- Be sure to capture the details in your README.

Due Friday, April 12 @ 5 pm (10 Points)

Assignment 2 – Import Spatial Data & Normalize Tables

- 1. Import your data into PostgreSQL tables/schema created in Assignment 1.**
- 2. Normalize your tables (1NF up to possibly 4NF, depending on your data) and explain the logic in your README.**
 - Even if normalization is not required, explain why in your README.

Due Friday, April 19 @ 5 pm (20 Points)

Assignment 3 - Spatial Queries & Presentation

Perform spatial analyses to determine:

- Compute distance from roads to each HWA observation point (ST_Distance function)
- Select raster values at point where HWA has been observed (ST_value function)
- Select uninfested stands where biophysical values are similar to those in infested stands (complex WHERE queries using postGIS functions)

Spatial Analysis & Presentation are Due Thursday, April 25 @ 10:15 am (40 Points)

Final GitHub Repo & README are Due Friday, May 3 @ 5 pm (30 Points)

Total: 110 Points

NO LATE SUBMISSIONS ACCEPTED AFTER MAY 3 -- Plan accordingly.