Oak Wilt Risk Map
Technical Documentation

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Input layers

US Forest Service BIGMAP

The U.S. Forest Service's FIA BIGMAP Tree Species Aboveground Biomass raster dataset was used to estimate oak tree biomass across Connecticut. The BIGMAP measures aboveground biomass in tons/acre. The biomass data for the following red oak species: black oak, northern red oak, scarlet oak, pin oak; and white oak species: chestnut oak, eastern white oak, swamp white oak, chinkapin oak, and bur oak were derived from the FIA BIGMAP dataset. Original data can be accessed at https://data.fs.usda.gov/geodata/rastergateway/bigmap/.

Digital elevation model (DEM)

The 2023 Connecticut Digital Elevation Model (DEM) is a statewide dataset by CT ECO as a part of the Connecticut Statewide GIS Services LiDAR project. The data represent bare-earth ground surface elevation, excluding buildings and vegetation, and the raster has a pixel resolution of 2 feet. The data are derived from QL1+ Lidar point cloud with a minimum

of 15 points per square meter inland and 20 points per square meter along the coast. The bare earth elevation from the points were averaged to get the elevation value for each pixel in the DEM. Original data can be accessed at https://www.arcgis.com/home/item.htmlid=f9bb656ee9f74544bcdac9c8831d122d.

Percent sand

The percent sand layer comprises data derived from the Web Soil Survey, which was developed and is operated by the USDA Natural Resources Conservation Service (NRCS). It depicts an estimated representative ratio of sand in the dominant soil condition in the uppermost 50cm of the soil profile. Sandy soil is distinguished by a mineral particle diameter of 2mm or less, and the original pixel size is 10m. The original data can be accessed at https://websoilsurvey.nrcs.usda.gov/app/.

Analysis methods and map creation

Because oak wilt can spread through damage to trees, ridges were included as an oak wilt risk factor as damage-causing high winds are more likely in these areas. Sandy soils allow for greater transmission of the oak wilt pathogen through root grafts, so sandiness of soils was also included as a variable.

Geospatial data were compiled in ArcGIS Pro and standardized to a shared cell size of 43.75m and shared projection (WGS84 Web Mercator, EPSG:3857). The "nearest neighbor" approach was used for resampling categorical/integer rasters, and the "bilinear" approach was used for continuous rasters, as needed.

The DEM was used to create a map of ridgelines using the hydrology toolkit; this involves inverting the elevation values, filling sinks, and selecting areas where hydrologic flow would accumulate on the inverted map. A cutoff value of 100 was used to identify ridges.

To identify areas at risk for oak wilt, we created composite maps using the following raster calculator formulas. All AGB maps were normalized to a 0 to 1 scale before calculations were performed:

Key

- TO: Total oak AGB (0 to 1 scale)
- PR: Proportion of all oak that is in the red oak group, by AGB (0 to 1 scale)
- R: Ridges (0 or 1)
- PS: Proportion of soil that is sand (0 to 1)
    - *Note that the percent sand raster provided is given in %, so was divided by 100 to be included in below formulas*

Map based on ridgetop location

TO + PR + 0.5*R

This weighted ridges as half as important as either oak variable

Map based on sandiness of soil
TO + PR + 0.5*S

This weighted the amount of sand in soil as half as important as either oak variable

Map combining both of the above risk factors
TO + PR + 0.5*S + 0.5*R

Three maps showing highest priority sites based on each of the risk maps were created by taking the original risk map and assigning all locations in the top 10% of values a value of 1, and all other locations a value of 0. For each map, the threshold values were as follows:

"Top 10% of values" map based on ridgetop location
Values >= 1.355771 classified as 1, all other values classified as 0

"Top 10% of values" map based on sandiness of soil
Values >= 1.640150 classified as 1, all other values classified as 0

"Top 10% of values" map combining both of the above risk factors
Values >= 1.658429 classified as 1, all other values classified as 0