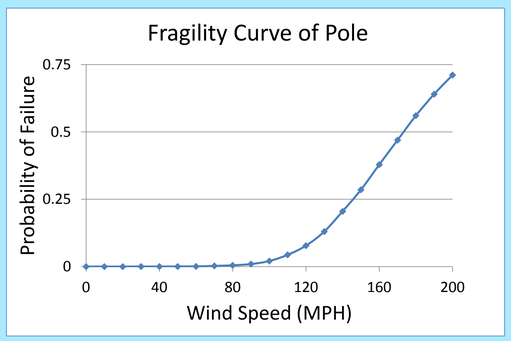
Monitoring utility infrastructure with remote sensing and structural integrity analyses

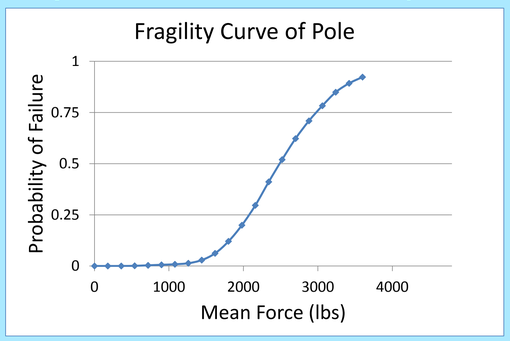
Structural modelling of the pole-wire system

Overview: Models can evaluate the structural integrity of the pole-wire system using data derived from remote sensing and from Eversource's infrastructure database. A preliminary integrity model was tested under two scenarios for a set of poles:

1) Wind load only



2) Tree/branch load only

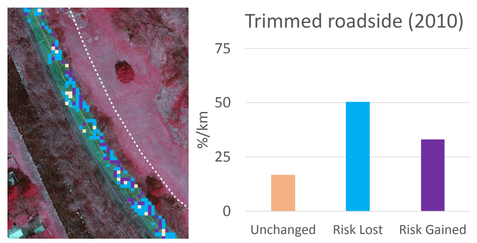


Future scenarios: will simulate combined wind and tree/branch loads.

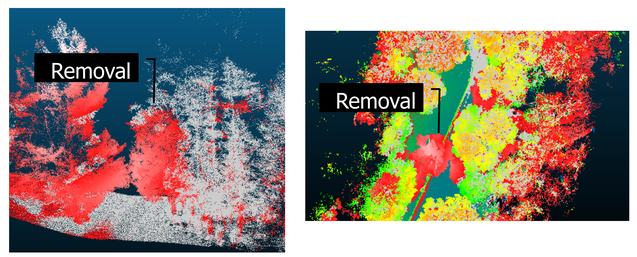
Assessing vegetation change

Overview: LiDAR data collected at multiple time periods can be used to measure change. In this study, we explored the use of mobile and aerial LiDAR data for mapping areas of vegetation change.

Low–res, aerial (2010 - 2013)



Mobile (2011-2016)



Conclusions: LiDAR data has clear potential for measuring vegetation change; however, issues with the available data limit the conclusions that can be made from the analysis. These issues include major storms during the 2010-2013 period (aerial) and poor registration quality of the 2011 mobile data. Future work will assess change using low-resolution aerial LiDAR from 2013 and 2016.

Manual mapping of utility infrastructure

Overview: Free statewide high-resolution imagery throughout Connecticut may make manual mapping of poles and wires a low-tech but cost-effective approach.

Aerial imagery:

Poles and wires are easily visible in these 2016 3" resolution leaf-off images.

Google street view:

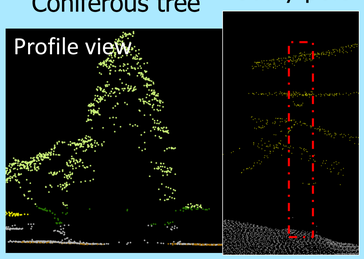
Roadside images available in much of CT can allow pole/wire mapping even under dense tree cover. Inventories of attachments can also be conducted.

Is it cost-effective? These air- and ground-based images are free and updated regularly. A pilot study, with UConn students, will explore the productivity and costs of manually mapping utility infrastructure using 2D imagery.

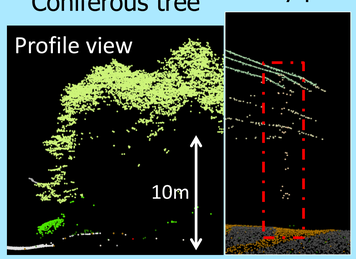
What is the best 3D remote sensing system(s)?

Overview: Multiple systems exist that provide 3D capabilities. Here we explore the capabilities of conventional LiDAR, Geiger LiDAR, and photogrammetry to map vegetation and infrastructure.

Conventional LiDAR:

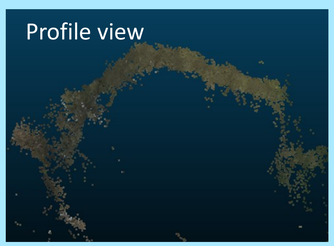


Geiger LiDAR:



Photogrammetry:

leaf-off vegetation



Conclusions: All three datasets depict canopy-top vegetation in good detail. However, only conventional and Geiger LiDAR penetrate vegetation and so are most useful for infrastructure mapping.

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