Analyzing vegetation encroachment: How we created accurate map books with encroachment details of 5000+ linear miles of transmission lines

OVERVIEW

Accurate and timely assessment of vegetation growth along power line corridors is critical for operators of electricity distribution networks and transmission facilities.

Vegetation growing close to transmission lines can add to the cost of maintenance, lead to fires during dry and windy conditions, pose safety hazards to maintenance personnel, and cause power outages when they come into contact with the power lines. Conventional ground-based scouting methods to assess risk are labor-intensive, time-consuming, and expensive.

The end-user client for this project was one of the largest energy companies in the US. They own and operate electricity distribution networks and transmission facilities that play a critical role in connecting millions of people to the electricity grid. They needed accurate and timely information on vegetation encroachment along a specific transmission corridor.
Scope of work

- Perform vegetation encroachment analysis over 5172 linear miles.
- Use existing PLS-CADD wire models and photo-generated point cloud data from aerial photographs to create map books with encroachment analysis.

PROCESS

Our team utilized aerial imagery, ground control points, Aerial Triangulation files, and in-house tools to generate DSM point cloud data along the power line corridor. They then classified the point cloud data to extract various features and performed vegetation proximity analysis.

The team delivered the results in the form of a map book with circuit-wise shape files and summary tables in Excel format. They generated a paper space layout with a scale of 1:20 and unique IDs for each proximity, and then validated the final deliverables using existing LiDAR Ground Data.
CHALLENGES

- Processing large quantities of aerial images without sufficient in-house capacity.

- Analytical challenges caused by data gaps and poorly calibrated data collection processes.

- Integrating aerial imagery, PLS-CADD wire models and photo-generated point cloud data for identification and analysis.

- Integrating disparate datasets (aerial imagery, GCP, and PLS-CADD wire models) to generate accurate results.

- Managing the proximity and density of trees along power line corridors in heavily wooded urban areas like New York City.

- Generating high-quality output within a short timeframe, as the project had set timelines.
**SOLUTION**

**Domain experts**
The team assigned to the project had in-depth knowledge and years of experience in GIS mapping, photogrammetry, remote sensing, and vegetation encroachment analysis. This domain expertise enabled them to process and analyze the data quickly and efficiently.

**Robust quality control**
We have a well-defined and robust quality control protocol for projects of this nature. Several levels of quality checks at multiple stages ensured that the final output was reliable, accurate, and consistent.

**Standardized reporting**
To streamline the decision-making process, we have developed standardized reporting formats that enable our clients to quickly analyze the findings and communicate them to internal and external stakeholders.

**Scaling up on demand**
We have a proven track record of scaling up resources to efficiently process large volumes of data and meet short turnaround times.
CONCLUSION

We scaled up our resources to meet the unique challenges posed by the project. Our team analyzed vegetation encroachment over 5172 linear miles of transmission lines and created accurate map books with encroachment detail within 90 days. Ultimately, we delivered diverse data sets that enabled our client to analyze the factors contributing to tree risks accurately.

OUTCOME

Proactive vegetation management
Our solution enabled the energy company to identify potential tree risks throughout the transmission line. This knowledge allowed them to proactively manage vegetation encroachment before it could cause outages or create safety hazards.

Increased safety and reliability
Our vegetation analysis report helped the end-user client identify and manage trees that breached the prescribed minimum clearance. This meant that the chances of power outages due to physical damage to the transmission lines, reduced capacity due to impedance, and other factors affecting safety and reliability were minimized.

Reduced maintenance costs
Efficient and proactive vegetation management will help the energy company save costs by reducing incidents of power outages and minimizing the need for repairs of the grid and equipment.

Streamlined decision-making
Our standardized report made it easy for the energy company to share information with other stakeholders and regulators, enabling faster and more efficient decision-making.