

IMPROVE DECISION MAKING WITH DECISION TREE

**ACQUIRE
ANALYZE
ANSWER**

A predictive modeling approach to Vegetation Management prioritization that leverages lidar & historic outage data to generate Risk Scores, quantifying the risk potential of vegetation-related outages or damage to assets.

VEGETATION MANAGEMENT CHALLENGE

Outages caused by vegetation are widespread for above-ground electrical grids. Even as utilities maintain compliant clearances within their Right of Way, it doesn't exclude them from all the potential risk they need to manage.

In recent years, vegetation managers have been issued a challenge to enhance their cycle-based vegetation management programs with risk-based planning and assessments. Tools & technologies such as lidar are being used to describe vegetation risk to utility infrastructure. Still, there has remained a gap between these often-simple GIS deliverables and implementing the results into complex & multi-faceted vegetation management programs.

5 years of NERC VM Related Transmission Sustained Outage Reports states that 98% of outages were compliant with FAC-003. These incidents were all Category 3- Fall-ins: Sustained Outages caused by vegetation falling into applicable lines from outside the ROW.

DECISION TREE

NV5 has developed Decision Tree, A method to quantifiably prioritize vegetation management activities that accounts for both the risk posed by any individual trees and operational constraints & priorities.

Decision Tree combines strong data science and modeling practices to assign risk scores to individual trees. The risk score analysis works to identify the relative risk of any given tree by correlating various physical measurements from new or existing lidar with outage data from the Utility, to correlate characteristics of trees that have historically failed and apply those correlations to generate risk-based trim assessments.

DECISION TREE WILL...

IMPROVE DECISION MAKING

- Data-driven Understanding of Assets and the Environment
- Defined Criteria for Prioritizing Work
- Proactive Planning
- Accurate Work Forecasting
- Change Detection
- Temporal Growth Rate Analysis

DRIVE EFFICIENCIES

- Persistent Data
- Traceable & Verifiable Inspection
- Faster Acquisition & Analytics
- Planning Inefficiencies
- Quantifiable Risk Reduction
- Data-driven Assessment of Risk Tolerance

THE DECISION TREE APPROACH

Identifying relative risk is an essential factor and decisive rationalization for prioritizing vegetation management to mitigate future outages while maximizing operational efficiency.

PHASE 1: LIDAR DERIVED VARIABLES

By investigating vegetation-caused outages and collaborating with vegetation management experts, NV5 has identified several key attributes that can be modeled directly from high-density lidar data and used to generate a combined lidar risk score. Risk Scores do not represent a likelihood of failure, but rather they represent risk relative to the population of trees surveyed.

PHASE 2: UTILITY SPECIFIC VARIABLES

NV5 can further enhance the applicability of the combined Lidar Risk Score by incorporating client-specific data where sufficient information exists. This additional analysis aims to characterize the influence of other attributes specific to a client's service territory. Some sources include outage databases, historic tree failure information, and/or expert knowledge.

This comprehensive list of factors are quantified on a normalized basis, combined, and then applied to the previously described lidar-risk scores. The final risk scores provide a quantitative assessment of the combined risk. The relative risk could be an important factor in prioritizing vegetation management mitigation efforts while maximizing operational efficiency.

PHASE 3: Decision Tree

Once relative Risk Scores are quantified, they can be included in actionable work plans. Constraints to achieving maximum risk protection include specific trim cycles, budgets, the volume of work to complete, the scale of work (tree/span/feeder/grid), geographic sensitivities, and overall risk aversion. NV5 Geospatial employs a contextual design approach to ensure the risk profile and prioritization align with how an end-user in the field would also determine risk and priorities.

For one of the nation's largest electric utility companies, NV5 delivered 840k+ VM routine 2020 trees with associated risk scores. Of those trees within high fire threat districts, only 12,900 were within a threat tolerance the utility deemed actionable (aka trees had scores > 95th percentile). So when decisions are being made, only a subset of trees are most critical for managing risk and optimizing resources.

Trim Optimization vs Standard VM

Actionable Trees are 2% vs
Client Requested Trees

