Using LiDAR to Improve a Vegetation Management Plan

Created by:
Jarrod Harper
CADD/GIS Manager
jharper@velco.com

Jeff Disorda
Supervisor of Right of Way Management
jdisorda@velco.com
NERC Vegetation Management Reliability Standard

FAC-003
To improve the reliability of the electric transmission systems by preventing outages from vegetation located on transmission rights-of-way (ROW) and minimizing outages from vegetation located adjacent to ROW, maintaining clearances between transmission lines and vegetation on and along transmission ROW, and reporting vegetation-related outages of the transmission systems to the respective Regional Reliability Organizations (RRO) and the North American Electric Reliability Council (NERC).

Create a Vegetation Management Plan, Execute the Plan, Document the Work and No Vegetation Outages or Else!
Electrical Clearances for a 115 kV Transmission Line

Electrical conductor clearances are required to keep the public safe and to prevent power interruptions.
This is what we are trying to prevent.

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http://www.tva.com/power/rightofway/cost_single_tree.htm
Pre 2010 Vegetation Management Plan

- Vegetation inventory was entered into ruggedized field computers via a custom GIS application
- All data entered was based on field observations
- Degreed foresters evaluated the condition of the vegetation and its proximity to transmission infrastructure
- Laser range finders were used to get more accurate vegetation heights and distances to conductors

**Nothing has changed in the last two years, except…**

- LiDAR is a new tool in the “toolbox”
- The LiDAR data helps the vegetation team to identify areas where extra time should be spent evaluating the vegetation
- Evaluating contractor use of mobile GIS to sign off on completed work
Difference between LiDAR flights

2010 Deliverables:
• **PLS-CADD Line Models**
• RGB Ortho-Rectified Imagery
• Vegetation Clearance Report
• Survey Point Clearance Reports
• GIS Data, including:
  • Infrastructure Geodatabase
  • Vegetation Polygons
  • Vegetation and Infrastructure Interactions

2012 Deliverables:
• **PLS-CADD Line Models**
• Vegetation Clearance Report
• GIS Data, including:
  • Vegetation Polygons
  • Vegetation and Infrastructure Interactions
PLS CAD Example
Difference between LiDAR flights

**2010 Deliverables:**
- 51 PLS CADD Models
- 794 Point Cloud Files
- 5,107,204 Vegetation Interaction Polygons
- 1,909 Color Ortho-Rectified Images
- 57.2 Gigabytes of data
- 585 Circuit Miles Flown
- $974 per mile

**2012 Deliverables:**
- 2 PLS CADD Models
- 4,033,204 Vegetation Interaction Polygons
- 6.41 Gigabytes of data
- 322 Circuit Miles Flown
- $390 per mile

A custom ArcPad application was used to field verify and document their findings.
Difference between LiDAR flights

2010

2012

600'
**Difference between LiDAR flights**

- **2010 LiDAR, Vegetation work completed in 2011**
- **2012 LiDAR**
  - Pink – Trees will contact the line if they fall
  - Blue – Trees will fall within the minimum electrical clearance
  - Tan – Future growth areas to inventory
Vegetation Maintenance Work in 2011
Issues With Data: Danger Trees
Process to Remove a Danger Tree

1. VELCO forester identifies a danger tree and enters it into the field computer

2. Contract tree crew removes the tree and enters it into the field computer

3. VELCO forester confirms that the tree has been removed
Locating Crews While Foresters are in the Field

Field crews’ locations can be synched to field computers remotely which assists the VELCO foresters in locating the crews.

Field crews’ locations entered by VELCO system operators into a web mapping system.
Please feel free to contact us

Jarrod C. Harper  
CAD/GIS Manager  
(802) 770-6223  
jharper@velco.com

Jeff Disorda  
Supervisor of Right of Way Management  
(802) 770-6240  
jdisorda@velco.com

https://webgis.velco.com/InfoNet