TRANSMISSION VEGETATION MANAGEMENT PROGRAM

N|V|5

ACQUIRE
ANALYZE
ANSWER

NV5 EDGE
NV5 completely evaluates, characterizes, and monitors all vegetation and vegetation encroachments that can impact the safe and reliable operation of your electrical transmission system.

WHY NV5?

NV5 has extensive experience delivering aerial lidar, orthophotos, oblique imagery, and HD video; as well as providing mapping services, products, and analytics in support of vegetation management. Our team offers a comprehensive Transmission Vegetation Management Program (TVMP) for our utility customers seeking regulatory compliance and Integrated Vegetation Management (IVM) best practices. NV5 has developed a thorough understanding of data quality, format, and specifics. With expertise in utility vegetation management, engineering-grade as-built surveys, PLS-CADD modeling, thermal line rating analysis, data-synchronized full motion HD video, clearance reporting tools, and interactive software, NV5 has resources and experience unmatched in our industry. Further, we have earned a reputation for developing client-centric solutions that promote maximum utilization of the data we deliver. Having completed over 75,000 miles of electrical transmission surveys for as-built, reconductoring, siting & new construction, re-rates, NERC clearance detections and ROW management, our professionals have the expertise to provide accurate, cost efficient, and timely results.
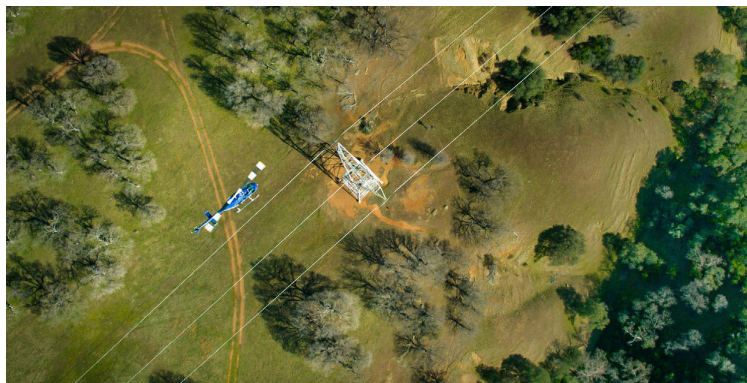
ASSET MODEL

Knowing the precise 3D location of transmission assets is the only way to fully understand vegetation encroachment issues. NV5 uses remotely sensed data to determine the exact spatial relationships between transmission infrastructure and encroaching vegetation, reducing or eliminating the need for traditional field verification. Each remote sensing survey creates a snapshot in time that serves a permanent record of system status which can be referenced for planning, mitigation, review, and restoration.

Acquire

Sensors & Cameras
Aerial Lidar
Digital Orthophotos
High Definition Video
Oblique Imagery
Multispectral/Hyperspectral
Meteorological

Platforms
Airborne: Fixed wing, Rotary wing, UAV
Ground: Vehicle, In-Situ

Analyze

PLS-CADD Model
Light Detection and Ranging Point Clouds
Image-derived Point Clouds
Wire Vegetation Clearance
Tower Vegetation Clearance
Orchard Vegetation Clearance
Tree Health
Vegetation Species

Answer

Programmatic Vegetation Mitigation
Integrated Vegetation Management
Vegetation Change Quantification
Vegetation Risk Analysis
INSITE Geospatial Data Management

OBSTRUCTIONS & DETECTIONS

NV5 created a system for identifying varying levels of severity for vegetation grow-in and fall-in analysis. Encroaching vegetation clearance points are identified in the lidar point cloud for wires of ambient temperature and standard loading, and for maximum operation conditions. Obstructing vegetation is associated with an individual treetop point and crown polygon and attributed with the most severe of each detected lidar point cloud cluster comprising a single tree. MGCC, or Minimum Ground to Conductor Clearance, indicates the minimum ground clearance distance at any point along a wire catenary and the results can be infinitely sampled for analytic use.

CAGE CLEARANCES

Lidar point cloud data is analyzed to identify areas of vegetation encroachment around transmission structures; this process is referred to as cage clearance analysis. Cage clearance is reported by zone, with zones based on distances from the structure and determined by tower design. All surrounding vegetation near the tower base or legs is spatially identified at its bounds.

VEGETATION HEALTH & SPECIES

The NV5 TVMP solution incorporates both vegetation health and species into its analysis results. It is understood that certain tree species in certain geographic regions are responsible for a majority of vegetation-related outages. Whether it's Pines and Oaks in the western US or Ash on the East coast, we single out the species of highest concern and identify whether the tree is diseased or dead in order to preserve the reliability of the transmission system. Hyperspectral and traditional orthographic imaging sensors are both used in identifying species and tree health. In instances where a utility already has a robust model of catenaries, NV5 can employ Structure from Motion (SfM, commonly known as PhoDAR) technology using stereographic- or multidirectional-imagery to generate point clouds that can be imported into preexisting PLS-CADD models in order to run vegetation clearance reports.
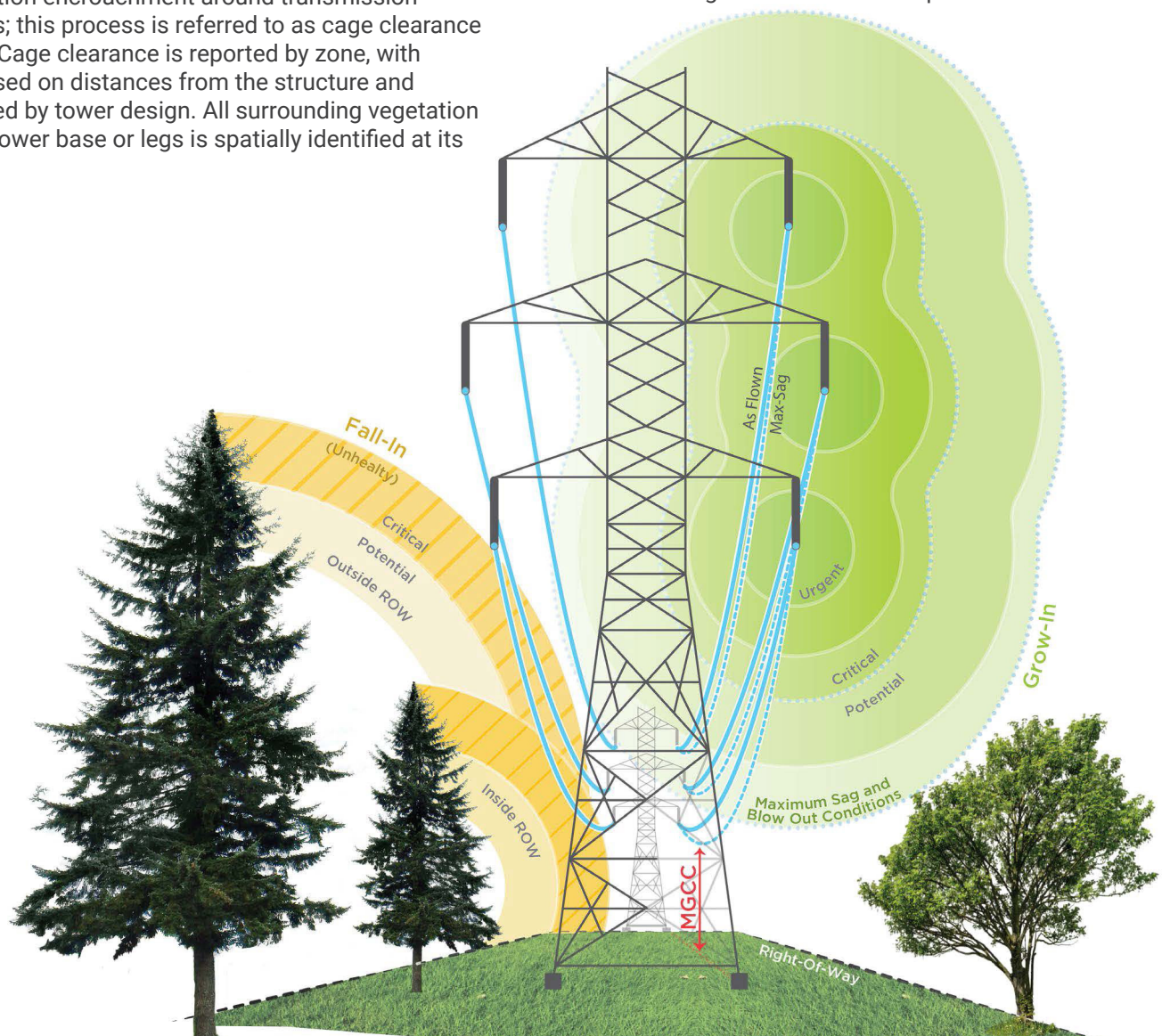
PROGRAMMATIC VEGETATION MITIGATION

Vegetation within the lidar point cloud is classified as such, which then allows for the extraction of tree crown polygons and identification of treetops. A vector model of transmission poles and wires is used to test the 3D distance between vegetation-classed points and conductors. Tree health is assessed with the aid of orthophotography utilizing the Near-Infrared band to highlight chlorophyll. Alternately, hyperspectral data can be used for the same purpose. Tree-level analytics are provided that define the distance and severity of vegetation encroachments. Hyperspectral signatures are collected for species and genus-level identification of problem vegetation. The combination of all of the above analysis allows a utility to manage its vegetation with confidence from end to end.

INTEGRATED VEGETATION MANAGEMENT

Vegetation between 18 inches and 6 feet are analyzed to identify potential areas of Integrated Vegetation Management (IVM). The US Environmental Protection Agency defines IVM as "the practice of promoting desirable, stable, low-growing plant communities—that will resist invasion by tall-growing tree species—through the use of appropriate, environmentally sound, and cost-effective control methods." (EPA's IVM Fact Sheet). NV5 creates IVM candidate polygons for areas of IVM-classified points larger than 1/10 of an acre (4,356 square feet). While lidar analysis alone cannot confirm IVM, the IVM polygons produced through NV5's analysis delineate areas that are highly likely to meet IVM criteria. In addition, species identification with hyperspectral data can be assessed within IVM areas. IVM analysis makes it possible to track changes over time and show marked improvement and environmental stewardship in Right-of-Way management.

VEGETATION CHANGE QUANTIFICATION

Change detection can isolate any identifiable features captured by remotely sensed data year-over-year. Vegetation growth and maintenance effectiveness can be evaluated each year or season if desired. The high degree of absolute accuracy of our data (~5-10cm) allows for detailed vegetation change detection at the branch level. NV5 couples this precise change detection analysis of the lidar point cloud with proprietary "tree tracking" methods for detailed comparisons of individual trees year after year.

VEGETATION RISK ANALYSIS

Vegetation management can be performed more efficiently and effectively with the use of lidar analytics. Identification of all tree crowns and treetops on or near transmission lines, paired with health and species attributes, identifies potential risk. Lidar-based clearance, health, and species analysis provides a "prioritization prescription" that is applied to identified vegetation encroachments. The combination of all TVMP analysis and analytics is best consumed in INSITE for Vegetation Management, where risk can be evaluated, reported, and converted into actionable work orders.

Transmission cage clearance zones identifying vegetation encroachments for a lattice tower (left). Segmented vegetation crown polygons are created from lidar point cloud geometries. CIR photos are falsely colored to display near infrared as red. Bright tones represent healthy vegetation producing chlorophyll, an unhealthy tree is distinct (right).

: Engineering grade accuracy of spatial rectification

: Software-specific deliverable files of all poles and wire spans

: Access or line-of-sight issues avoided with remote sensing, when compared to boots on the ground or terrestrial-only data collection

: Desktop tools save trips to the field and provide faster customer service for the utility

: Client-owned data can be leveraged to local entities with jurisdictions coincident with data coverage

: Ability to track changes over time and show improvement and environmental stewardship of Right-of-Way management

: NV5 creates the same transmission line CADDmodels as major electrical engineering firms,saving the client tremendous cost and time

WHY NV5?

N|V|5

NV5 is the geospatial pioneer pushing the boundaries of data and analytics to deliver actionable intelligence to those who need to map, model, and manage their world.

We lead the nation as the only end-to-end geospatial solutions provider with the capability to deliver thehighest quality data and geographic insights. We combine unmatched expertise and experience with the latest technology and proprietary software to map and analyze all types of terrain. But we are so much more than what we measure. We lead our peers in innovation and are active participants in the research community, constantly exploring new and novel ways to solve our client's greatest challenges.

Anchorage

Vancouver

Portland
Corvallis

Sheboygan
Sun Prairie
Naperville

Denver/
Broomfield

Lexington

Dulles
Suffolk
Newport

St. Louis

Los Angeles
San Diego/
Carlsbad

Birmingham

North America's most comprehensive, most capable, and most innovative geospatial services firm.

St Petersburg

Tree ID T31042
38.520459, -122.807122

77.41 ft