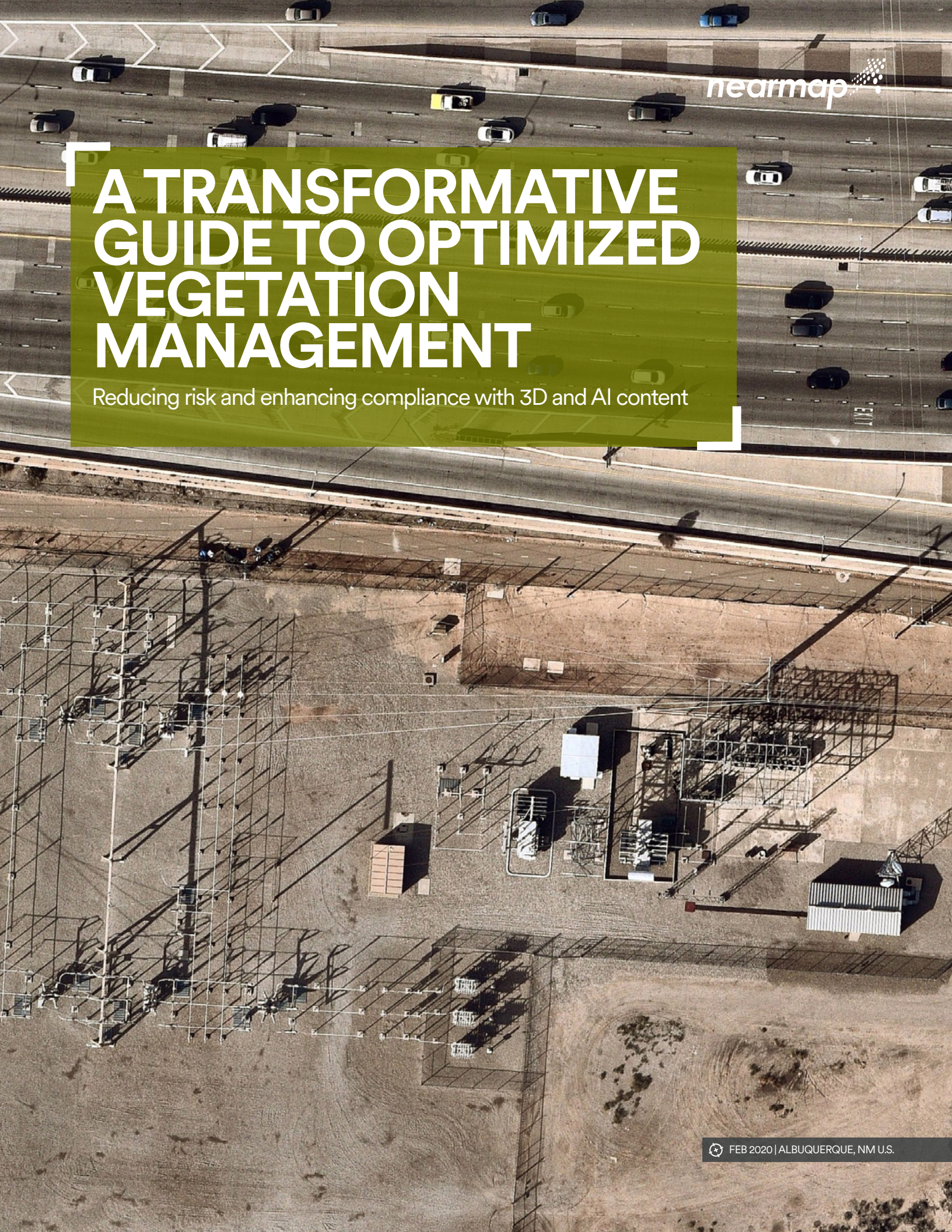

A TRANSFORMATIVE GUIDE TO OPTIMIZED VEGETATION MANAGEMENT

Reducing risk and enhancing compliance with 3D and AI content

FEB 2020 | ALBUQUERQUE, NM U.S.

INTRODUCTION

Vegetation coming into contact with overhead power lines poses a severe hazard to people, wildlife, and the surrounding environment, with increased potential for bushfires, property damage, personal injury, and disruptive power outages. A safe and reliable energy network depends on the management of vegetation around the overhead power lines that make up those networks.

Extreme weather events can also significantly impact utilities, resulting in lower efficiency, higher expenses, and increased power outages. And if such events become more common and intense, the price will be even higher as has been predicted. Considering the physical replacement of utility poles costs approximately $4,500-$6,500 per pole depending on the installation's location and complexity, utilities are continually looking at ways to prevent damage before it occurs.

Utilities are also under pressure from shareholders, who expect ever better financial performance, and regulators pushing for safer delivery and improved compliance. With escalating costs, reduced budgets, heightened focus on climate change, and an increasingly distributed network, mitigating the risks associated with vegetation is more challenging than ever before.

Managing vegetation under these problematic financial and environmental conditions call for innovative and cost-effective solutions. Nearmap content supports those solutions with accurate and useful AI, surface models, and imagery that provide a proactive and compelling picture of the risks posed to your network's interaction with vegetation. In this guide, we'll explore some of the emerging technology options available to utilities and how they're helping introduce new efficiency and accuracy to vegetation management.

THE PROBLEM

Traditional Approaches to Vegetation Management are Unsustainable

The conventional approach to managing vegetation for many operators has remained virtually unchanged for decades. Primarily a manual, contractor-driven process, it typically requires field crews inspecting the network to assess the probability of encroachment, collect data, secure permissions, and issue work orders.

Network operators have used a cyclical, time-based approach to vegetation management, inspecting and trimming areas around their lines on a five- or seven-year cadence. Often this decades-old method is inefficient, expensive, and dangerous, generating a lack of meaningful data and leaving utilities with few options by which they can address inefficiencies in the process.

Utilities are looking for new and innovative ways to execute vegetation management to maintain safe clearances between vegetation and power lines. But with limited budgets, extensive networks, and diverse terrain and operating environments, efficiently gathering and applying intelligence at scale has been elusive.

Technology Unlocks Efficiencies but is Cost Prohibitive

Utilities are continually experimenting with new technologies that provide rapid and accurate vegetation modeling. Light detection and ranging (LiDAR) solutions have commonly been applied to this problem, but this technology carries a hefty price tag with long turnaround times. Satellite imagery, InSAR and aerial imagery have also been used to manage vegetation, but they often lack the required resolution, attributes and frequencies needed to make decisions for a vegetation management program effectively.

While these technologies improve efficiency, most utilities find them expensive to apply to their entire networks. Optimizing whole networks is undoubtedly the goal, however, gathering data at that scale and frequency only works if it's cost-effective and is supported by technology that can process the data fast enough and in context to be understood. To get around this, they focus on optimizing areas with the best opportunity to mitigate risk. A workable solution must combine value across multiple use cases, scale, frequency and cost.

USE CASE 1
Early vegetation instrusion detection

For an electrical utility to stay ahead of nature, it must be smart about pre-empting risk. Early detection of vegetation growth around powerlines is crucial for utilities to mitigate the risk of encroachment. However, many vegetation management programs that rely on manual processes are slow and expensive and don't give you the information needed to act before vegetation becomes a risk. By identifying vegetation encroachment often and early, utilities have time to assess and efficiently plan interventions before damage occurs. Our high-resolution 3D content can be flown multiple times a year, providing the intelligence needed to help you identify and target vegetation that grows into an asset's clearance profile before it becomes a risk. With such frequent refreshes modeling growth becomes far more accurate and valuable when managing large areas.

MAY 2020 | BELLEVUE, WA U.S.

USE CASE 2
Identifying and mitigating risks

Traditional vegetation management programs have used ground-based foot patrols and primarily rely on a subjective evaluation from field staff or contractors. This imprecise method often results in either over-or under-management of vegetation along utility corridors and an unnecessary cost and unaddressed risks.

The three most significant consequences of vegetation induced failure are:

- **Fire:** The leading cause of fires ignited by utility infrastructure is contact between electric equipment and an object, without equipment failure as a contributing factor. And more than 50 per cent of those incidents are due to vegetation.
- **Outages:** Contact between electrical utilities and vegetation is the leading cause of outages nationally, resulting in increased costs, decreased revenue, and a spike in dissatisfied customers.
- **Fatalities:** Tree trimming in proximity to electric lines is one of the leading causes of injuries and fatalities related to the electric system.

A critical first step to addressing vegetation risk is to assess the spatial proximity of vegetation to the network, considering multiple weather-related and load parameters. This type of analysis allows you to catalog and map potential threats of electric reliability caused by tree fall, grow-in, and spark-over risk.

Nearmap content can model the volume and proximity of vegetation to property or infrastructure to manage these risks better. Our remote sensing technology gives you highly-accurate location information for individual trees along the utility networks. By combining 3D geospatial characteristics of individual trees concerning utility infrastructure with species and health information, vegetation management programs have a powerful new way to assess current and possible future risks to the network.

USE CASE 3
Optimizing vegetation management programs

Electrical operators often manage hundreds or thousands of kilometers of rights of way (ROW), making for a massive number of vegetation units to assess and plan to cut for every season and presents a significant challenge for operators who have limited resources.

Nearmap vegetation modeling content is a powerful tool to estimate and optimize cutting programs by accurately forecasting requirements. Frequent recapture rates provide auditing of programs on a set cadence, and cutting efforts can be efficiently audited at a higher frequency and lower cost than LiDAR.

THE SOLUTION

Next Generation Remote Sensing Technology

Amongst modern remote sensing solutions, one is particularly well suited to the budgetary and technical requirements of vegetation management: photogrammetric technology with regularly refreshed high resolution images from which rich, geospatially accurate content can be derived — enabling utilities to proactively respond to and remediate natural threats as they emerge.

Technological innovations from Nearmap's camera solutions, our rapid advancements in AI for describing vegetation, and expanded capture capacity are unlocking efficient ways for utilities to manage vegetation at a lower cost. Nearmap generates a massive amount of 3D content derived from our proprietary camera solutions.

That content includes;

- High resolution vertical RGB orthophotography
- High resolution oblique imagery
- High resolution 3D data distributed in multiple formats that are derived from source imagery photogrammetrically
- AI vectors that utilize all the above content with enhanced attribution for vegetation and a library of supporting features

A combination of Nearmap content above can be used to generate accurate representations of vegetation. With a high refresh rate, these models can then iteratively detect and monitor change in that vegetation. Combining all this content and a high refresh rate opens the door to accurate tree modeling from typical canopy level down to single tree features. Volumes and center of gravity, along with estimations of trunk location, can also be extracted and applied to speed up decision making and planning.

The vegetation attributes derived from our imagery can be further applied to a wide variety of use cases. The ability to accurately model vegetation volume over vast areas serves to analyze risk and fuel loading analytics. Overlaying those models or deriving wire locations from data enables the estimation of vegetation intrusion for cutting program planning. Estimating volumes for efficient deployment of cutting resources can also improve interaction with private and government entities, ensuring compliance, boosting relationships, and demonstrating progressive compliance to regulators.

Sophisticated photogrammetry applications are delivering actionable intelligence at a previously unprecedented speed and scale. While these advanced remote sensing technologies offer a promising solution for managing vegetation management at scale until recently, they have been cost-prohibitive for the majority of T&D networks. Nearmap's proactive approach to refreshing geospatial data enables the creation of reporting and analytics that service the needs of a utility's vegetation management program.

MAR 2019 | MALIBU, CA U.S.

USE CASE 4
Fire Hazard Reduction

The leading cause of fires ignited by utility infrastructure is contact between electric equipment and an object, and more than 50 per cent of incidents are due to vegetation (as opposed to vehicles, animals, balloons, etc.). As such, vegetation management is critical for fire hazard mitigation, especially in areas (but not limited to) of the western United States and Australia.

Australia has just endured one of the worst bushfire seasons in history. The Black Summer of 2020 burned an estimated 18 million hectares, destroyed over 5,900 buildings and killed at least 33 people. It had a devastating impact on many communities around Australia, affecting both residential properties as well as critical infrastructure.

Wildfire mitigation has also become a particular focus for California's utilities, after a series of catastrophic fires caused by their power lines over the last three years. Their wildfire mitigation programs are forecast to cost around $2.6 billion per year until 2022.

Around the world, there is an increased pressure on utilities to improve fire mitigation plans to reduce the risk that utility infrastructure might cause another catastrophic wildfire. With Nearmap content, accurate modeling of those risks over wide areas is fast and accurate. This content can help utilities evaluate and monitor the risk against their entire network.

OCT 2018 | ALBUQUERQUE, NM U.S.

CONCLUSION

Can you still afford an inaccurate picture of how vegetation is affecting your network?

Shrinking vegetation management budgets in expanding shareholder and consumer expectations mean utilities are under pressure to mitigate vegetation risks in their network. And with severe weather incidents such as drought, fires and cyclones becoming more frequent and more prolonged, vegetation management is becoming more critical than ever for global utilities world.

Utilities are looking for new ways to replace traditional, time-consuming and often expensive methods of assessment, and it seems technology, as ever, is the answer.

Emerging technologies are giving utilities renewed methods to predict and prepare for failure caused by vegetation interactions within their networks. And next-generation remote sensing technology deployed by Nearmap is allowing them to do this at a much lower cost, opening up cutting-edge technology to more than just the biggest operators.

Regularly updated high resolution imagery and data enables utilities to pinpoint areas that require additional survey efforts, understand access issues, and evaluate the complexity of the network before cutting. Vegetation attributes can be assessed quickly and accurately, limiting the need for truck rolls.

The benefits are clear: accurate geospatial data affords the ability to accurately model vegetation without sending crews into the field, whilst keeping tabs on the network regularly to mitigate risk rather than simply responding to damage after the fact. This enables a more efficient and safe workforce, the potential for millions of dollars saved in repairs, and not least, satisfied regulators and customers.

USE CASE 5
Emergency and Post-Catastrophe Support

Extreme weather events such as hurricanes, wildfires, floods and cyclones can have a devastating effect on communities, causing widespread damage and loss of life. They also have far-ranging impacts on utilities and can leave them exposed and liable in the wake of a catastrophe.

You only need to look at the U.S. utility Pacific Gas & Electric (PG&E) to know that vegetation management can have severe consequences. Following destructive fires caused by their power lines, Pacific Gas & Electric (PG&E) were eventually pushed into bankruptcy. Blame was attributed mainly to poor vegetation management practices and unsuitable asset design.

Utilities are understandably worried about the impact on their business following a catastrophe. The ability to rapidly assess and understand the implications and liability that your utility may face after a disaster is crucial. Nearmap's technology provides verifiable and accurate liability assessments, using pre- and post-catastrophe image capture.

OCT 2018 | PANAMA CITY, FL U.S.

ABOUT US

Global technology pioneer, Nearmap provides easy, instant access to up-to-date and historic geospatial data that organizations depend on as their source of truth for the livable world.

Nearmap proactively captures wide-scale urban areas in the USA, Canada, Australia and New Zealand multiple times each year, with patented plane-mounted camera systems that provide superior detail, and a proprietary, automated processing pipeline that ensures rapid availability.

Customers rely on Nearmap for consistent, high-quality content that enables remote capabilities and unlocks productivity for profound change: crystal-clear high-resolution vertical, oblique and panoramic aerial imagery; a vast library of historic captures; frequently updated city-scale 3D datasets on demand; and verified pre-processed property insights at unmatched scale with Nearmap AI.

Founded in 2007, Nearmap was named as one of the world's 10 Most Innovative Companies of 2020 by Fast Company magazine.With offices in the United States and Australia, Nearmap has a global customer base including government agencies and enterprises for whom current, reliable and truthful data is essential to critical decision making and operational workflows.

Nearmap's parent company, Nearmap Limited, is a publicly traded company listed on the Australian Stock Exchange and one of the 200 largest ASX-listed stocks in Australia.

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