



Alien Vegetation and the Wildfire Risk

Alien invasive plants are intensifying wildfires - putting lives, homes, landscapes, and biodiversity at risk. Understanding their role in fire behavior and implementing smart management strategies is critical. As the connection between invasive species, lightning, and wildfire grows clearer, urgent action is needed to protect both people and nature.



The Threat of Alien Invasive Plants

South Africa's rich biodiversity is increasingly under threat from the spread of alien invasive plants. These species, introduced from foreign ecosystems, displace indigenous vegetation and significantly contribute to wildfire intensity. These plants contribute significantly to fuel loads, making fires burn hotter and spread more aggressively.

A study by Nelson Mandela University researcher Samukelisiwe Msweli that was published in the journal PeerJ on 11 November 2020, assessed the flammability of 30 woody species, many of which had never been studied before. *Pinus radiata*, a species not native to the Southern Hemisphere but widespread in the Eastern and Western Cape, poses the highest overall fire risk. Its rapid ignition and intense burning make it particularly dangerous.

Other high-risk species, such as *Pinus pinaster*, gum, and wattle trees, ignite quickly and burn intensely, worsening wildfire devastation in affected regions.

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), a key piece of environmental legislation, places responsibility on landowners to take proactive steps in managing invasive species. This includes reporting the presence of listed invasive plants, preventing their spread, and taking all necessary measures to control them. The Alien and Invasive Species Regulations, published in Government Gazette No. 43735 on 25 September 2020, and the National List of Invasive Species in Government Gazette No. 43726 on 18 September 2020, outline the legal requirements for controlling these species. Compliance with these regulations is vital to reducing fire risk and protecting South Africa's unique ecosystems.

The fight against invasive plants is not just about conservation; it is about protecting lives and livelihoods. As climate conditions become more extreme, informed decision-making regarding planting and removal efforts will be key to mitigating the dangers posed by these flammable species. Fire management strategies must integrate invasive plant control to prevent future disasters and ensure the resilience of South Africa's landscapes.

Lightning Strikes Compound the Wildland Fire Risk



Lightning strikes are common in South Africa, further compounding the issue of alien invasive vegetation. Lightning, a powerful force of nature, can ignite wildfires in an instant. The risk of large-scale destruction increases significantly in areas dense with invasive plants.

UNDERSTANDING LIGHTNING

South African Weather Services (SAWS) Meteorologist Morne Gijben shares that lightning occurs when an electrical charge builds up in a thunderstorm and discharges as a massive spark, either within the cloud, between clouds, or from the cloud to the ground. Thunderstorms can extend up to 10 kilometers into the sky, where ice crystals and water droplets interact to create positive and negative charges. When the electrical tension becomes too great, a bolt of lightning is unleashed, with cloud-to-ground lightning being the most dangerous in terms of wildfire risk.

“In South Africa, cloud-to-ground lightning is a significant contributor to the outbreak of wildfires, particularly in areas where the environment is dry and vegetation is highly combustible. This type of lightning occurs when a charged storm cloud discharges electrical energy directly to the ground, generating intense heat capable of sparking fires. The high temperatures generated by lightning strikes can exceed 30 000°C, igniting dry vegetation almost instantly upon contact,” said Gijben.

“Climate change is a long-term change in weather patterns. It plays a huge role in the frequency and occurrences of lightning strikes. During climate change, temperatures tend to rise, also referred to as global warming, which leads to the frequent occurrence of severe thunderstorms, which tend to be accompanied by many lightning strikes. The lightning strikes then increase the risk of runaway fires.”

Wiseman Dlamini, SAWS Meteorologist

“These thunderstorms often occur in the summer months, especially in the eastern and northern regions of the country, though lightning can occasionally strike during the winter months in certain conditions. A dry thunderstorm – one where lightning strikes occur with little or no rainfall – can still pose a substantial risk,” he explained.

An important factor influencing the likelihood of wildfires is lightning's polarity. Negative polarity lightning accounts for around 90% of cloud-to-ground strikes, while positive polarity lightning – less frequent but more destructive – occurs in about 10% of cloud-to-ground strikes. This type of lightning carries a greater electrical charge and is known for igniting fires with more intensity.

Though exact statistics on lightning-induced wildfires in South Africa are not readily available, global research indicates that lightning is a primary natural cause of wildfires. The frequency of such fires is influenced by various factors, including thunderstorm frequency, vegetation dryness, and prevailing wind conditions. Areas experiencing frequent thunderstorms and dry conditions are particularly at risk, as these conditions allow lightning strikes to spark fires that can spread rapidly across the landscape.

INVASIVE PLANTS WORSEN LIGHTNING-INDUCED WILDFIRES

Unlike native vegetation, invasive plants grow in dense, water-consuming clusters, lowering soil moisture and increasing fire risk. Their rapid accumulation of dead leaves, branches, and bark adds to the fuel load, making any spark - whether from lightning or human activity - capable of igniting a large-scale blaze.

Wiseman Dlamini, also a SAWS Meteorologist, highlighted the role of alien invasive plants in exacerbating the problem. “These plants are highly flammable due to their rapid growth and dense biomass, providing ample fuel for fires once lightning strikes. The increased fuel load from

invasive species, such as pine trees and certain shrubs, can cause fires to spread quickly and burn with greater intensity,” said Dlamini.

Even outside traditional fire seasons, these plants increase the likelihood of wildfires whenever thunderstorms occur. This makes proactive fire management, including the removal and control of invasive species, a critical step in fire prevention strategies.

CLIMATE CHANGE AND THE INCREASING THREAT OF LIGHTNING STRIKES

As global temperatures rise, weather patterns shift, leading to more severe thunderstorms. Increased atmospheric instability, combined with hotter and drier conditions, creates ideal circumstances for more frequent lightning strikes and more intense wildfires.

The impact of climate change is expected to increase both the frequency and intensity of lightning strikes, further escalating wildfire risks in areas already battling invasive plant infestations. A 2023 study conducted by Yang Song, Cangsu Xu, Xiaolu Li, and Francis Oppong, published in the open-access journal Fire (MDPI) in 2024, examined the growing global prevalence of lightning-induced wildfires. Their research found that climate change, particularly rising atmospheric temperatures and extreme weather events, has contributed significantly to the increase in lightning-triggered ignitions. Without timely and coordinated intervention, this escalating trend will intensify, placing greater pressure on fire management authorities and threatening both human settlements and fragile ecosystems.



Kishugu's Expertise in Fuel Load Reduction



Kishugu employs various techniques to manage and reduce invasive alien plants. Ground teams are instrumental in implementing fuel load reduction activities in some of the most challenging areas. Our approach is multifaceted, combining expertise in fire management, ecological restoration, and innovative methods to ensure the effective removal of these plants.

One of the core techniques used is mechanical clearing, which involves equipment like chainsaws and brush cutters to physically remove invasive species. This method is particularly effective in areas where hands-on work is practical, allowing for swift and thorough eradication of dense plant stands. For areas that are difficult to access due to rugged terrain, aerial support transports crews, enhancing their capacity to remove invasive plants in remote locations.

In addition to mechanical clearing, chemical control is used in some cases. Herbicides are strategically applied to target specific invasive species while ensuring native vegetation is not harmed. This method is often used alongside physical clearing to ensure long-term control and prevent regrowth. In some instances, prescribed burning is used to clear invasive vegetation in a controlled manner, allowing fuel loads to be managed and restore ecosystems to their natural balance.

TRAINING AND SAFETY STANDARDS

At times, work is required in difficult-to-access areas, such as steep, mountainous regions or remote forests. This

work focuses on regions that are ecologically sensitive and critical for conservation and water catchment areas. Helicopters are used to airlift teams to locations where they begin the manual or mechanical removal of plants. This work focuses on regions that are ecologically sensitive and critical for conservation and water catchment areas.

Working at high altitudes presents unique challenges, including harsh weather conditions and the physical demands of the environment. To ensure safety and efficiency, teams undergo rigorous physical and technical training, including safety protocols, high-altitude survival skills, and advanced firefighting techniques.

IMPORTANCE OF INTEGRATED FIRE MANAGEMENT SOLUTIONS

Wiseman Dlamini's winter season outlook, shared on 28 March 2025, highlights shifting climate patterns, which have significant implications for fire behaviour and fuel load management.

"Hotter days, combined with dry spells following heavy rains, create ideal conditions for rapid fire ignition and escalation. Communities in fire-prone areas must stay vigilant and adopt Integrated Fire Management strategies, which include controlled burns and vegetation clearing. Balancing rainfall benefits with proactive fire mitigation measures will be essential. Collaboration between meteorologists, land managers, and fire agencies will be crucial in adapting to these evolving climate challenges," concluded Dlamini.