

Modern technological approaches to predator management for improved livestock protection and environmental monitoring

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Predator management presents a multifaceted challenge that balances conservation with the needs of local communities and livestock farmers. Current methods include fencing, kraaling, deterrents (lights, sounds, smells, frightening devices), guard animals, and lethal methods. These traditional methods are increasingly supplemented by advanced technological tools designed to mitigate human-predator conflicts and support environmental management. This study explores the integration of emerging technologies into predator management strategies, emphasizing their role in improving effectiveness, sustainability, and ecological balance. Recent advancements include the development of robotic "guard dogs" that simulate natural predator behaviour to deter wildlife, and the deployment of GPS collars, and remote cameras for real-time predator tracking. Early warning systems incorporating motion sensors, infrared cameras, and drones now alert farmers and conservationists to predator presence, allowing for proactive management. Artificial Intelligence and machine learning are leveraged to analyse extensive monitoring data, identify trends, and predict potential conflicts. Additionally, wearable devices on livestock track physiological parameters, such as heart rate and temperature, offering early signs of stress or predation. Geographic Information Systems (GIS), satellite imagery, and remote sensing techniques are employed to map predator movements, monitor land cover changes, and analyse spatial data related to livestock depredation. These tools provide insights into predator behaviour, prey dynamics, and environmental changes, informing more targeted management practices and supporting broader environmental management goals. Technological advancements also extend to community education through virtual reality and interactive applications, which enhance public understanding of wildlife behaviour, environmental impacts, and conflict mitigation strategies. Integration of these technologies (and others) aims to foster a balanced approach that supports both ecological health and agricultural livelihoods. This approach not only advances predator management techniques but also contributes to the broader objective of integrating environmental management with wildlife conservation and livestock protection in South Africa.