

Science for Environment Policy

Protected area patrol costs could be cut with planning tool

Costs of defending protected areas from poaching and other illegal activities could be reduced through spatial planning software, finds a new study. Using the tool, the researchers devised new patrol activities in central Africa which would reduce current costs of law enforcement by 35%, as well as providing more effective protection.

'Protected areas' are designed to achieve the long-term conservation of nature. This includes natural resources, such as ecosystem services and [biodiversity](#), as well as cultural values. Previous studies have shown that poor law enforcement can lead to rapid loss of biodiversity in protected areas. However, most conservation projects have limited budgets and cost-effective ways of enforcing the law are needed.

For this study, researchers focused on the Greater Virunga Landscape (GVL), a 13 800 km² area in central Africa. It encompasses 12 protected areas across three countries: the Democratic Republic of Congo, Rwanda and Uganda. The GVL is one of the most biodiverse regions on Earth and is home to many species of conservation concern, including lions and mountain gorillas. However, it has limited resources for law enforcement.

Using the freely available spatial planning software Marxan the researchers developed a method for determining where enforcement resources would best be targeted in the GVL.

They gathered data on distributions of species of conservation concern, important habitats and sightings of illegal activities. These were then combined with estimates of the current patrol patterns and costs in the GVL.

Initially, the effectiveness of current enforcement activities was analysed. These covered around 22% of the protected landscape, mainly within 3 km of patrol stations. They were not frequent enough to deter illegal activities beyond this distance.

Sightings of illegal activities were distributed in a similar manner to patrols; 65% of sightings of illegal activities were within 5 km of patrol stations and increased in frequency up to 8 km. Beyond 8 km, sightings of illegal activity fell, presumably because these areas are more remote and therefore harder for poachers to access.

The researchers used the software to devise ways of effectively deploying patrols to deter illegal activities across a larger area while minimising associated costs. The best solution reduced the costs of protecting species by 63% relative to the estimated cost of patrolling the entire landscape (US \$5.8-9.1 million/€4.2-6.56 million) and up to 84% if patrol efforts only focus on the areas most under threat. Current budgets for law enforcement are approximately US \$3.5 million (€2.5 million) and the estimated cost of the best solution was US \$2.2-3.5 million (€1.6-2.5 million), showing the potential for savings of up to 35%.

These results show how this tool could be used to reduce the costs of managing nature reserves. However, the researchers highlight that illegal activities are dynamic, and poachers may change how they operate in response to new patrol efforts. Thus, focusing on areas most under threat may lead to the poachers changing their location. As such, they suggest that repeated data collection and analysis may be required for re-assessment, which is likely to lead to increased costs. The study's authors therefore recommend allocating patrol effort in relation to the conservation target needs, which still reduces costs by 63%.

This project has wider relevance; Europe contains more than 120 000 protected areas and effective patrolling will be critical for protecting biodiversity. Spatial planning tools, such as Marxan, could prove to be a key component of protected area management and biodiversity policies.



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