# Optimally managing threats to biodiversity across large scales

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## Abstract

Biodiversity is impacted by anthropogenic threats. These threats are myriad, including agriculture, energy production, mining, pollution, and roads. Since resources are limited, plans for conserving biodiversity need to be cost-effective. Yet little guidance exists for prioritizing conservation efforts to manage threats—especially at national and continental scales. Here we examine strategies for managing threats to biodiversity across such large scales. Using Europe as a case study, we obtained spatial distribution, habitat affiliation, and threat data for the majority of imperiled vertebrate species. We also obtained maps for eight threatening processes. By combining these datasets, we modeled how abating combinations of threats in particular places would improve species’ habitat availability. To minimize anthropogenic conflicts, we also parametrized opportunity costs. After compiling these data, we generated optimized conservation plans to (i) manage threats inside and outside existing protected areas, (ii) manage threats only within existing protected areas, and (iii) establish protected areas without abating threats. Our results reveal priority areas for abating threats to improve biodiversity conservation. Not only do our results help identify the most cost-effective locations for conservation efforts, they also identify which threats are important to manage at each of these locations. We found that managing threats both inside and outside existing protected areas provides much greater conservation benefits than only within existing protected areas. Moreover, even when optimized, simply establishing protected areas without abating threats did not substantially improve biodiversity conservation. Our findings highlight the importance of carefully considering threats in conservation assessments and planning.

## Presenter biography

Jeffrey Hanson is a postdoctoral scientist at Carleton University, Canada. His research focuses on helping practitioners and policy makers make better conservation decisions. His work explores how optimization algorithms (e.g., integer programming), novel datasets (e.g., genomic data), and data collection programmes (e.g., ecological surveys, monitoring) can help identify priority areas for conservation management. To make his research accessible, he also develops data processing and decision support tools (e.g., prioritizr, raptr, oppr, wdpar R packages). For more information, see his website: http://jeffrey-hanson.com.