Anticipating the impacts of the COVID-19 pandemic on wildlife

The spillover of the coronavirus SARS-CoV-2 placed the relationship between humans and wildlife under a global spotlight. The subsequent fallout of the COVID-19 pandemic is now affecting wild animal populations and habitats through multiple pathways, with feedbacks that further impact human health and livelihoods. By disentangling these complex and interacting pathways, we can better understand the socio-ecological dynamics linking the people, wildlife, and ecosystems experiencing this shock. Such an understanding will facilitate the development and implementation of more effective responses to the current crisis, in part by informing the design of targeted policy interventions.

In a study published in *Frontiers in Ecology and the Environment* (Gaynor et al. 2016), we developed a framework for understanding how armed conflict affects wildlife populations and habitats through myriad pathways. While producing a range of unique environmentally destructive outcomes, armed conflicts can also create dynamics similar to those which have been seen during the COVID-19 pandemic: namely, profound disruptions to human communities, wildlife populations, and their interconnections. Here, we revisit our findings on these pathways, emphasizing relevant analogs and lessons that may be transferable from war to the current COVID-19 pandemic, including the limitations of pathways leading to positive wildlife outcomes, concerns regarding weakened institutional support, and impacts of shifting wildlife use (Figure 1).

Positive outcomes of the COVID-19 pandemic for wildlife may occur when people cease their normal activities, as wild animals often flourish in areas that people avoid. This “refuge effect” has been documented in areas of armed conflict, such as North Korea’s demilitarized zone (Kim 1997). During the current pandemic, media accounts have documented cases of increased wildlife activity in national parks and urban green spaces as people have remained indoors (Zellmer et al. 2020), and there is evidence of reductions in wildlife–vehicle collisions in several states in the US (Nguyen et al. 2020). However, as we found in the case of armed conflict, the effects of the pandemic’s widespread institutional, social, and economic disruption on wildlife are likely to be overwhelmingly negative in most contexts. While benefits to wildlife are often transient, many of these negative impacts can persist over extensive temporal and geographic scales, compounded by interactions across pathways.

The COVID-19 pandemic is already weakening institutional support for conservation by interrupting funding streams, eroding protection of parks and vulnerable species, and forestalling vital monitoring and research activities that make these impacts visible (Lindsey et al. 2020). As people reduce activity (including travel) to avoid or minimize transmission of SARS-CoV-2, reductions in tourism have led to critical revenue losses for parks around the world (Knorovsky 2020), and reductions in enforcement and human presence in protected areas have contributed to a rise in illegal activities like logging and hunting (Humphrey 2020). Conservation efforts may be further hampered by the economic downturn and associated withdrawal of governmental and philanthropic financial support, alongside the weakening and dismantling of environmental regulations under the guise of economic recovery (Davenport and Friedman 2020; Gonzales 2020). In our 2016 study, this weakening of conservation institutions represented the most important set of pathways linking armed conflict to wildlife, leading to marked wartime declines in animal populations (Daskin and Pringle 2018). The pandemic has reiterated – in the starkest terms – the lessons learned from previous catastrophes, including armed conflict: conservation and natural resource management efforts that invest in locally managed institutions are best situated to mitigate the negative impacts of the pandemic and foster resilience to future shocks.

Patterns of human migration and economic disruption associated with the COVID-19 pandemic are also likely to shift patterns of natural resource use, as

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**Figure 1.** Diverse pathways link the COVID-19 pandemic, and its political, economic, and social fallout, to outcomes for wildlife. While some pathways benefit wildlife (+), most have detrimental consequences (−). Adapted from Gaynor et al. (2016).
have proven successful in post-conflict scenarios (Bruch et al. 2016). As the pandemic continues to unfold, highlighting the pathways through which it is affecting wildlife and habitats may inform more holistic and context-dependent approaches to recovery that address the interlinked health of wildlife and people.

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