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Editorial

Detecting and understanding non-compliance with conservation rules

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ABSTRACT

This paper establishes the context for the special issue, "Detecting and Understanding Violations of Conservation Rules". Illicit or non-compliant human behaviors may occur in all ecosystems and range from subsistence illegal resource collection to poaching by organized criminal syndicates. Such acts have an enormous impact on social–ecological systems, but monitoring non-compliance is challenging, primarily because the topic is sensitive and victims are voiceless. The future of many conservation areas depends upon compliance with conservation rules. However, with a growing human population, consumptive societies, and rapid expansion of business opportunities fueled by new technology, there is little doubt that demand will remain steady or increase for many of our natural resources. We outline major conservation compliance issues and impacts, and review models and methods used to monitor and respond to the problem for both subsistence and commercial non-compliance.

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1. Non-compliance with conservation rules

Human behavior, particularly compliance, is a central component of conservation programs (Gore, 2011). Compliance with conservation rules (e.g., no hunting, no firewood extraction) is critical to the success of any conservation project, regardless of the scale of the conservation actions, the categories of biodiversity the project focuses on, or the means of conservation governance (Kahler and Gore, 2012). Non-compliance with conservation rules (i.e., rule violations) can undermine conservation goals, and have wide-ranging impacts on the social–ecological systems in which all conservation actions are embedded.

Non-compliance in biodiversity conservation is a global challenge, one that is growing increasingly complex and attracting the attention of a wider array of scholars and practitioners from the conservation field. For example, the United Nations identified the current magnitude and scale of illegal and illicit exploitation of natural resources as an environmental crime crisis (Nellemann et al., 2014). Current research and practice on reducing non-compliance and increasing compliance draws on diverse disciplines, including economics, psychology, ecology, political science, risk and decision sciences and sociology. Some disciplines use the terms conservation criminology (Gibbs et al., 2010), green criminology (White and Heckenberg, 2014) or environmental crime (White, 2009). However, regardless of the disciplinary orientation, more applied research is needed (Arias, 2015; Gavin et al., 2010; Gore, 2011).

Non-compliance with conservation regulations can constitute a threat to conservation goals in every biome on the planet (Gavin et al., 2010), and impacts conservation programs ranging from protected areas (Hilborn et al., 2006; Yonariza and Webb, 2007) to endangered species (Burton, 1999; Dinerstein et al., 2007; Koch et al., 2006). The biological impacts of non-compliance range from genetic to ecosystem scales. For example, the illegal stocking of fish (i.e. the placement of fish into aquatic ecosystems against regulations), may result in negative impacts, such as the spread of zoonotic disease or impacts on genetic diversity via hybridization and introgression (Canonico et al., 2005; Johnson et al., 2009). In addition, the global illegal trade in natural resources, or noncompliance with international policy agreements such as the Convention on International Trade in Endangered Species (CITES), is among the world's most profitable illicit activities (Haken, 2011; White and Heckenberg, 2014; Wyatt, 2013). Illegal trade affects hundreds of millions of individual plants and animals from tens of thousands

of species (Wyatt, 2013) and contributes to the well-documented endangerment of flagship species such as elephants and rhinoceroses. Non-compliance can also result in negative impacts to ecosystems. For example, illegal and illicit logging in protected forest areas has been linked to half the deforestation in tropical countries (Lee et al., 2015).

Non-compliance with conservation rules can have substantial socio-economic impacts. Although many populations rely upon illegal extraction of resources for their livelihoods, others receive substantial income from illegal poaching and trade (Pratt et al., 2004; Tacconi, 2008; Yonariza and Webb, 2007). Illegal resource users may also deplete opportunities for legal users to benefit from natural resources (Kahler et al., 2013), for example through reduced access to food to meet dietary needs and reduced legally harvestable resources available for subsistence, commercial, cultural, or recreational purposes (Sethi and Hilborn, 2008). Non-compliance with conservation rules has also been linked to social conflicts both over access to resources and as a means for financing war (Brashares et al., 2014).

2. Measuring, monitoring and managing non-compliance

Conservation occurs within complex and dynamic social–ecological systems (Liu et al., 2007). Numerous factors interact to influence the location, timing, and scale of non-compliant behaviors (Arias, 2015; Gavin et al., 2010; Kahler and Gore, 2012). In turn, adaptive management approaches may provide one effective means of encouraging increased compliance with regulations (Keane et al., 2008). Adaptive management frameworks allow for experimentation with a variety of interventions aimed at bolstering compliance; and, via learning and feedback, can adjust management actions over time as managers gain a better understanding of the factors contributing to non-compliance, or as the key drivers of these behaviors change (Salafsky et al., 2001).

Designing conservation interventions that encourage compliance and monitor the impacts of management actions requires at a minimum accurate data that tracks what non-compliant activities occur, where they occur, when they occur, who is involved, and why they undertake these activities (Gavin et al., 2010). The last of these questions, why non-compliance behavior occurs, is critical (Arias, 2015) for conservation interventions, just as is understanding why compliance occurs. Understanding the drivers of non-compliance and compliance contributes insight into the design of more effective management interventions. It is important to note that drivers and motivations for non-compliance may be different than those for compliance (Arias, 2015; Kahler and Gore, 2012). The range of motivations of an individual's conservation behavior is wide and complex, can vary from one individual to another, and, even within the same individual, may change across different contexts and for different behaviors (Kahler and Gore, 2012; Kollmuss and Agyeman, 2002). In addition, drivers manifest at different levels, including the individual level (e.g. attitudes towards resources or regulatory agencies can influence behavior), the group level (e.g., social norms), and the institutional level (e.g., the effectiveness of an agency to enforce regulations) (Manfredo et al., 2014). In attempting to unravel the web of causality of non-compliant behaviors, conservation researchers and managers can benefit from the long history of relevant research from the diverse disciplines discussed above. Each of these fields has developed a unique set of theories and methodological approaches for the study of sensitive and often illicit activities. However, conservation has only recently begun to recognize many of the existing tools and lessons of the past are not wholly applicable to the contemporary study of compliance and non-compliance with conservation rules.

Obtaining reliable answers to the sensitive questions surrounding non-compliance presents unique challenges (Solomon et al., 2007). The sensitive nature of non-compliant behavior, including fear of retribution, often reduces the likelihood that rule violators will self-report, and increases the chance that violators will refuse to answer questions about non-compliance or will withhold or misreport information (Solomon et al., 2007). Gavin et al. (2010) reviewed eight different approaches to gathering information on non-compliance in conservation: law-enforcement records, indirect observation, self-reporting, direct observation, direct questioning, indirect questioning (e.g., the randomized response technique), forensics, and modeling. Each of these methods offers advantages, but also pose distinct shortcomings, particularly for the analysis of drivers of non-compliance. For example, direct questioning and self-reporting tend to suffer from under-reporting and heavy biases, whereas indirect evidence, forensics, and enforcement records do not provide any information regarding the potential drivers of behavior. In recent years, much of the research on non-compliance in conservation has focused on the development of new or integrated methodological approaches.

Obtaining accurate answers to the what, who, where, when, and why of non-compliance can help guide the design of more effective conservation interventions. A diverse set of possible interventions exists, and choosing the intervention that best addresses the main drivers of non-compliant behavior will increase the chances of success. For example, a communication-based intervention may be effective when rules are not understood or to increase knowledge about the environmental impact of particular behaviors (Leisher et al., 2012). However, when social norms are a critical driver of behavior, social marketing campaigns may better influence behavior (McKenzie-Mohr et al., 2012). Managers also turn toward coercive interventions, such as changing key enforcement variables, including the chance of being caught, the probability of prosecution and conviction, or the size of the penalties (Arias, 2015). Rule violators may be acting based on their perceptions of the legitimacy of the rules in place, which can be affected by several factors, including the degree to which resource users have been involved in rule formation (Pollnac et al., 2010). To date the literature evaluating the effectiveness of different interventions for curbing non-compliance in conservation has been very limited (Gore et al., 2008), perhaps because evaluation requires both a means of accurately assessing non-compliance and longitudinal data. This special issue examines a few different interventions aimed at increasing compliance, and these studies may provide a template for future work on this topic.

Overall, a complex suite of possible interventions exists, each suited to address a different set of drivers of compliance behavior. In many instances, interventions may also lead to unpredictable outcomes (Gore et al., 2008). For example, increased enforcement may also increase resentment and undermine the perceived legitimacy of authorities, or the provision of alternatives or incentives may draw more resource users to a location. As each context is unique and in flux, no one approach permanently resolves non-compliance issues in conservation (Ostrom, 2007). In turn, continuous innovation and monitoring of progress with compliance will be needed to achieve conservation objectives. This special issue profiles some of these efforts.

3. This special issue

Our motivation to pursue a special issue on non-compliance in conservation resulted from the organized session entitled "Detecting, Understanding and Deterring Conservation Crime" held during the 26th International Congress for Conservation