

Understanding and managing conservation conflicts

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Conservation conflicts are increasing and need to be managed to minimise negative impacts on biodiversity, human livelihoods, and human well-being. Here, we explore strategies and case studies that highlight the long-term, dynamic nature of conflicts and the challenges to their management. Conflict management requires parties to recognise problems as shared ones, and engage with clear goals, a transparent evidence base, and an awareness of trade-offs. We hypothesise that conservation outcomes will be less durable when conservationists assert their interests to the detriment of others. Effective conflict management and long-term conservation benefit will be enhanced by better integration of the underpinning social context with the material impacts and evaluation of the efficacy of alternative conflict management approaches.

Conservation conflicts: an increasing global problem

Across the globe, conservation is increasingly in conflict with other human activities. Although such conflicts can positively influence change [1,2] they are often destructive, costly, and not only undermine effective conservation, but also prevent economic development, social equality, and resource sustainability [3,4]. Hence, conflicts are arguably one of the most intractable problems facing conservation [5,6].

Our goal here is to define conservation conflicts, consider the conditions under which they emerge, explore strategies for their effective management, and highlight barriers that prevent effective management. Finally, we develop a roadmap to guide conservation conflict management and highlight future challenges.

Defining conservation conflicts

Conflicts are a characteristic of human society and emerge in many forms [7]. Here, we focus on conservation conflicts,

which, building on [2], we define as ‘situations that occur when two or more parties with strongly held opinions clash over conservation objectives and when one party is perceived to assert its interests at the expense of another’. This definition recognises that conservation conflicts occur fundamentally between humans.

Disagreements over conservation objectives are inevitable. The challenge lies either in preventing these disagreements from developing into damaging conflicts or seeking to manage them and minimise their destructive nature when they do. Conservation conflicts emerge either when the positions of parties representing conservation interests are threatened by the positions of those holding other views, such as those to do with agriculture [8], fisheries [9], and forestry [10], or when the objectives of conservation are imposed on others, such as when humans are excluded from protected areas [11] or when species of conservation interest have an impact on humans [12]. In this paper, we focus on the conflicts between parties over those species of conservation interest that have a direct or indirect impact on humans, although the issues involved apply across the full range of conflicts.

Conflicts involving species are commonly referred to as ‘human–wildlife conflicts’, defined as those occurring when an action by either humans or wildlife has an adverse effect on the other [13]. This term is problematic in part because it suggests that wildlife species are conscious human antagonists [14], so we partition such conflicts into their two components: (i) impacts that deal with the direct interactions between humans and other species [3]; and (ii) conflicts that centre on human interactions between those seeking to conserve species and those with other goals [2]. The distinction between these two components is essential because each will be understood and managed differently: whereas impacts can be resolved, for example, through legislation, mitigation, or technical solutions, conflicts are more challenging to resolve [2]. Here, we focus on

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the human–human dimensions of conservation conflicts arising from the interaction between humans and other species, which, for consistency with other literature, we refer to as ‘human–wildlife’ impacts.

Understanding conservation conflicts

Superficially, many conflicts appear to be about species impacts, such as the perceived impact of predators on livestock. However, the origins often go beyond material differences between stakeholders, arise from a deeper cognitive level [15], and are linked to power relations, changing attitudes, and values [16] that are rooted in social and cultural history. Six broad, non-exclusive categories of conflicts have been identified, of which only one relates to a lack of ecological information [2,17]. More commonly, conflicts arise for other reasons, such as when stakeholders differ in their understanding of human–animal relations [18], are excluded from conservation planning [19], are disadvantaged in negotiation [20,21], or when historical factors make conservation appear threatening [22].

Conservation conflicts cannot therefore be fully understood from a single paradigm, but require integration of conceptual approaches developed by many disciplines [23–25], including natural sciences, social sciences, and humanities [25–28]. One’s ability to understand and manage such conflicts is therefore dependent on a cross-disciplinary approach, challenging though this might be [29,30].

Conflict management: approaches

There is a broad literature on approaches to resolving conflicts in the environment and beyond [7,31]. We illustrate some of the key points relevant to conservation conflicts and then consider the success of attempts to manage these conflicts in practice. We use the term ‘conflict management’ throughout to draw a distinction between eliminating conflict (resolution) and reducing the negative impact of conflict (management). We start by considering how game theory can help conceptualise the problem.

Game theory and conflicts

Conflicts are inevitably challenging and emotionally charged, and views on the best approaches for resolution range from hard-line to consensual. Game theory has provided insight into conflict and cooperation and can help understand why parties adopt certain positions, the conditions under which they are likely to cooperate and form coalitions, and the likelihood that optimal solutions can be found [32]. We consider two simple cases that are appropriate to conservation conflicts: (i) zero-sum/non-zero-sum games; and (ii) Prisoner’s Dilemma games.

Once in conflict, parties commonly refuse to cooperate and possible outcomes for either side are seen as win or lose (Figure 1a). In game theory, such outcomes are termed ‘zero-sum’: one’s gain is the other’s loss. However, non-zero-sum outcomes are also possible, where both sides can lose (if, for example, costs of engagement are high), or both sides can win (Figure 1b). The aim of conflict management is to move parties away from zero-sum games to seek alternative non-zero-sum outcomes where both sides can claim victory [7]. One way to achieve this is by distinguishing the underlying values held by parties, which might be incompatible and non-negotiable, from the interests and needs, which might be negotiable [7].

The Prisoner’s Dilemma game and its variations explore self-interest and cooperative strategies. If both sides recognise the risks of conflict and are persuaded to see the conflict as a shared problem, then mutual cooperation can potentially lead to a win–win strategy. Ways to alter how parties play the conflict include building trust between groups, developing new options, assessing appropriate penalties and compensation schemes, and using adaptive management [32].

Developing shared solutions

Typically, parties in conflict become increasingly polarised and unable to have meaningful dialogue, which limits options for management [33]. This raises the question of how shared solutions can be achieved and whether such

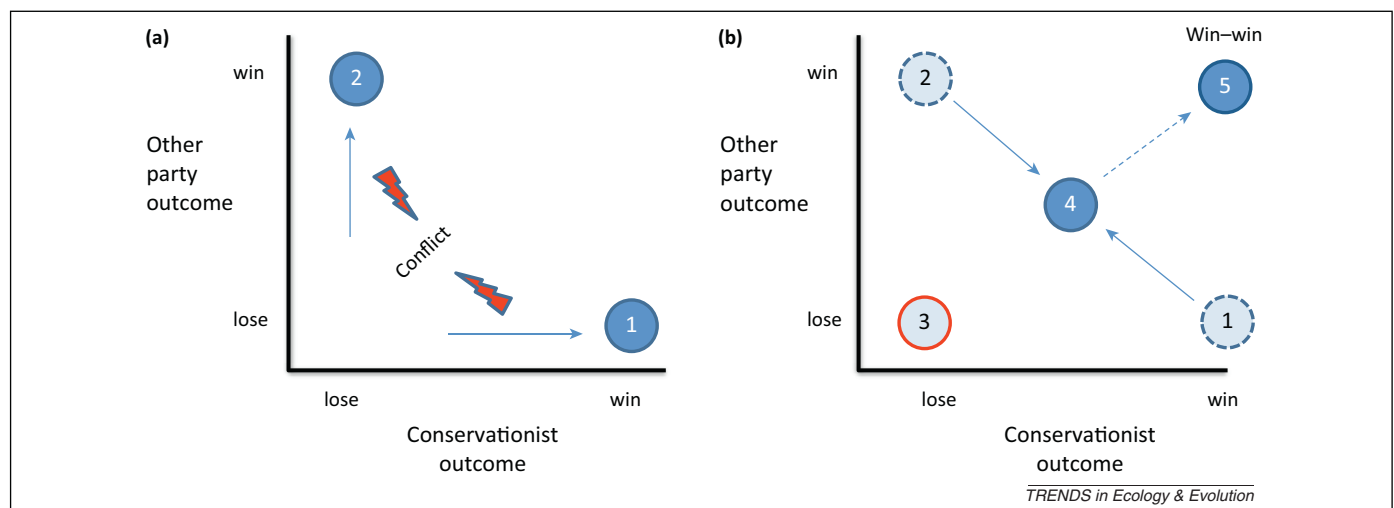


Figure 1. Conceptualising conservation conflicts. A typical situation (a) is where either conservationists (1) or the other party (2) are striving to win, with little compromise towards other interests. Where appropriate, the process of conflict resolution seeks to encourage both sides to move away from win–lose outcomes and accept that this is a shared problem (b), by highlighting lose–lose scenarios (3) and that trade-offs (4) may be required, if an elusive win–win (5) is not achievable. The social sciences can help understand why parties adopt certain positions and, together with the natural sciences, can help explore possible trade-offs and present new options for the protagonists.

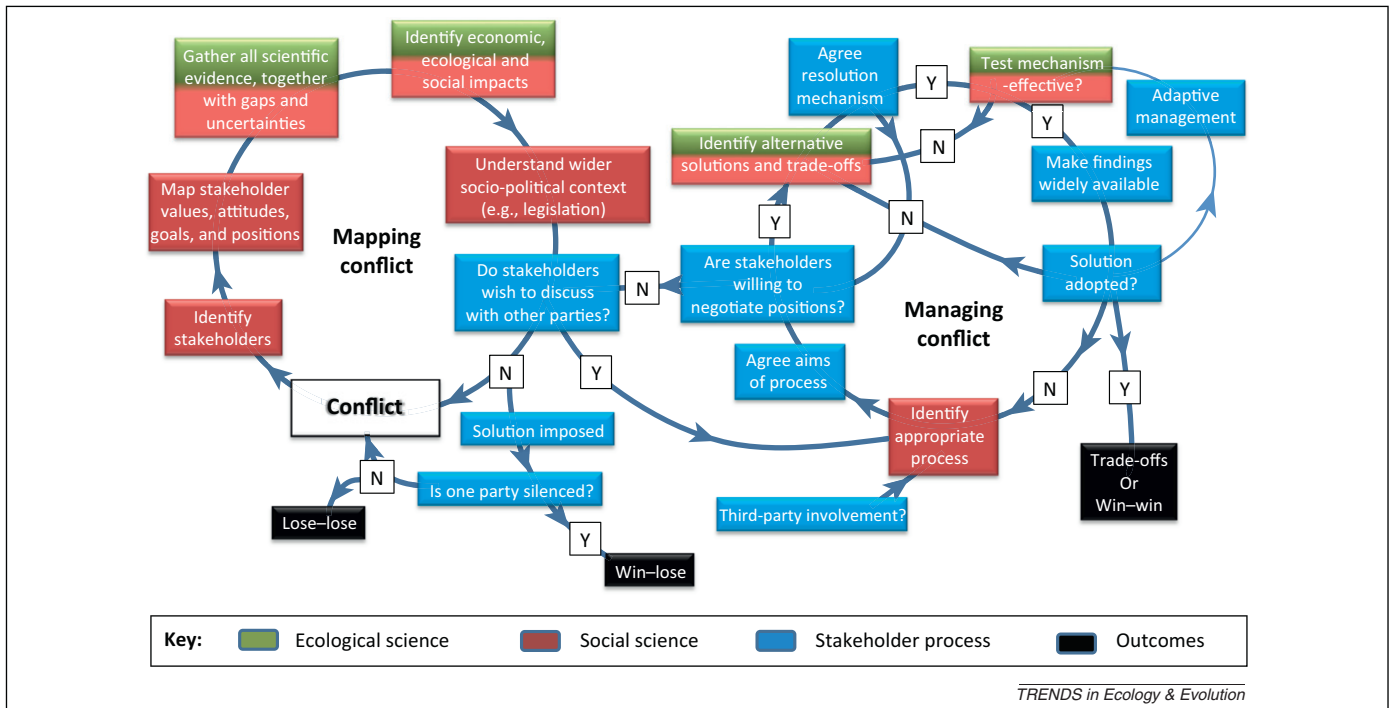


Figure 2. A roadmap to guide effective management of conservation conflicts. There are two main elements: (i) passive mapping of the conflict, garnering evidence, and considering the context; and (ii) more active attempts at conflict management involving engagement, often with a third party, exploring alternative solutions, and developing strategies within an adaptive management framework. The four outcomes relate to Figure 1 and the process involves social and ecological scientists together with stakeholders, policy makers, and usually mediators.

approaches can deliver more robust solutions that encourage coexistence.

Participatory and deliberative processes are commonly used to help parties engage and manage conflict [34]. The process typically involves the steps included in Figure 2, from identifying stakeholders to implementing solutions. There is evidence that effective participation improves relationships, increases trust, and reduces conflict [35–37]. In addition, early engagement with stakeholders is more likely to lead to high-quality and durable decisions [38], suggesting that emerging conservation conflicts should be quickly addressed before parties become highly polarised. Participation is not a panacea, however, and needs to be handled carefully to avoid it simply being a means to project implementation or even an empty process dominated by policy interests [39].

Third parties can improve engagement [29] and there are four recognised types: Type I, government representatives; Type II, unofficial mediators with no power (Box 1); Type III, internal ‘peacemakers’ (Box 2); and Type IV, scientists acting as a neutral third party to evaluate impacts (Box 3). The type of third-party involvement depends on the conflict, the balance of power between parties, and the level of incentives to participate [37]. Many conflicts involve complex combinations of parties interested in finding a solution (Box 4).

Once the appropriate conflict management processes are established, alternative solutions can be explored (Figure 2). These can be aimed at reducing impact through technical, educational, and legislative means [12,40]. Alternatively, financial incentives, such as compensation, insurance, and payments for conservation or ecosystem services, are becoming common means to mitigate costs

associated with conservation [41,42], although they can be controversial (see below).

Conflict management: challenges

Theoretically, the development of shared solutions through stakeholder engagement, as outlined above, appears relatively straightforward. However, there are many barriers that can limit its effectiveness, particularly those discussed below.

Unwillingness of parties to engage

As we have seen, a crucial factor in conflict management is the willingness of parties to consider a negotiated agreement [7]. Groups having fundamentally different values might not enter negotiations, and might even try to undermine a process [43]. For example, conservationists might not be prepared to negotiate with those involved in the illegal killing of protected species [44]. Similarly, groups might not acknowledge the legitimacy of other parties and, therefore, might not be willing to negotiate with them, or might feel that their interests can best be served through means other than dialogue, such as legislation and enforcement.

Distrust is one of the main barriers to collaboration [37]; therefore, processes that help build trust are likely to encourage engagement. Parties can be further encouraged to engage by highlighting the shared nature of the conflict, by engaging a powerful third party (e.g., government agency) to facilitate negotiation, or by marginalising extremists by building consensus with a critical mass of willing partners. If these approaches are unsuccessful, then one would expect the conflict to continue, ultimately ending in a win-lose or a lose-lose outcome (Figure 1). Even when parties

Box 1. Case study: hen harriers and gamekeepers in UK uplands

Hen harriers (*Circus cyaneus*) are protected under Annex 1 of the EC Wild Birds Directive (79/409/EEC). Together with other protected birds of prey, they are perceived to threaten red grouse (*Lagopus lagopus scoticus*) shooting interests and so are illegally killed. Initial research focused on quantifying their impact and suggested that (i) predation by harriers could, under certain conditions, make intensive grouse shooting non-viable [77]; and (ii) illegal killing was widespread [78]. Recent research has explored both variation in attitudes and alternative mitigation ideas [44,67]. There is no indication that levels of conflict have abated recently [44,79]. However, a national dialogue process started in 2006 (<http://www.the-environment-council.org.uk/projects/nature/natural-areas.html>) that seeks a mutually acceptable solution. It is run by independent mediators who hold little power and seek to hand the process over to the stakeholders at the earliest possible time (Type II). Whether it will lead to a reduction in conflict remains to be seen (Figure 1).

Factors underlying this conflict include differences between stakeholders in their value systems (primacy of nature vs freedom of decision-making), the economic value of grouse shooting, perceptions of impact, and legislation. Ecology has helped understand its impact and the probable consequences of various interventions, but there are also historical, socio-political, legal, and moral dimensions that affect the development of trust and the enthusiasm with which individuals and organisations communicate and engage in conflict management processes [63]. There are alternative possible outcomes in this conflict: currently, grouse managers are effectively winning (position 2 – Figure 1b, main text) by illegally removing harriers, but they are threatened by public and political pressure and increased enforcement, which could move the solution to position 1 or even 3 if successful enforcement ultimately led to land-use change. Stakeholder dialogue is currently seeking to find a win-win solution (5), although some compromise (4) will be inevitable.



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Figure 1. Female hen harrier at nest with food. Grouse hunters on Scottish heather moorland (Photo: Russell Cheyne).

do engage, agreement is not always possible if differences are too great. One possible way forward when this occurs is for external top-down decision-making [45]. However, although this can help reduce the human–wildlife impacts, it is unlikely to reduce the underlying human–human conflicts.

Striving for unrealistic goals

A criticism of participatory approaches is that they can focus on idealistic win–win solutions, rather than explicitly recognising the merits of arguments in a conflict [46]. Hence, goals, arguments, and trade-offs need explicit articulation when defining the conflict and seeking solutions [47,48].

Spatial and temporal scale

Conservation can often operate at different scales to the interests of other parties. For example, rare predators might be highly valued globally, but cause conflict locally [41]. Thus, local conflict management can be constrained by national or international conditions, and decision-makers need to be involved to ensure options are delimited, so that agreements are realistic and can be implemented [49]. In such cases, it is important to ensure that large-scale, top-down processes try to provide as much local-level freedom to find local solutions within the wider frames of

coordinated large-scale policy [50]. Top-down involvement might also help ensure that all local-level processes are fair, inclusive, and not subject to corruption and elite-capture by local elites [51]. Furthermore, local-level processes often need both economic and human resources from a higher level to enable and facilitate their work [52]. When dialogue occurs over larger scales, there are challenges around reduced representation among stakeholders and decreased opportunities for social learning [53]. Building sufficient time into the process is also important [2], to enable parties to develop trust, gather scientific evidence, and examine mitigation strategies.

Financial incentives

Although financial incentives can be successful in the resolution of human–wildlife impacts, they also need to satisfy the economic and cultural needs of parties involved in conservation conflict [41]. If designed incorrectly, they can lead to bankruptcy, dependency, and poverty traps [54]. Incentives might not be appropriate when stakeholders are wealthy, when the main objective is not profit, when abuse is detected, when the scale is inappropriate, when compensation will not outweigh the costs, and when they are politically unacceptable [55–57]. Therefore, schemes need to be appropriately targeted and monitored to ensure compliance.

Box 2. Case study: seals and fishermen in northeast Scotland

In the UK, there is a conflict between parties interested in the conservation of the common or harbour seal (*Phoca vitulina*) and Atlantic salmon (*Salmo salar*) fisheries. Both species are declining and protected at national and European levels. Much of the conflict revolves around the perceived impact of seals on salmon populations and fisheries. Seals have long been considered by fishermen to be a major threat to Atlantic salmon and sea trout (*Salmon trutta*) through reduction of catch and damage to fishing gear. Results from the analysis of stomach contents of seals shot near salmon nets, the identification of otoliths in faecal samples collected at haul-out sites and quantitative PCR assay approaches, indicate that salmonids form only a small part of the diet of the seals [80,81]. The effect of seal predation on salmonid fisheries remains unclear [82], especially in terms of declining salmon stocks. This uncertainty, combined with the visibility of seals as predators and their perceived impact on salmon, has led to fishermen managing seals through shooting (Figure 1).

The conflict revolves around the priorities of the different stakeholder groups involved. Seals are of interest to government as a political question; to conservationists as a nature management

question; to scientists as a biological and ecological question; to fishing communities as an economic question; to humanitarians as an animal welfare question; to the general public as a socio-cultural wildlife question; and to international agencies and non-governmental organisations (NGOs) as a trans-national question. In other words, it highlights the complexity inherent in such conflicts. Seals are a difficult species to manage [83], but not impossible. In the Moray Firth, a scientist employed by a District Salmon Fishery Board led a process whereby all relevant stakeholders were integrated on an equal footing. This process resulted in a management plan being broadly endorsed by all stakeholders, including government advisers, ecologists, and fishery stakeholders who were strongly resistant to seal conservation [49]. The management plan required compromises from all parties (position 4 in Figure 1b, main text). As a result, the Scottish Government issues licences on a yearly basis using Potential Biological Removal figures developed by ecologists; fishermen have reduced their shooting impact and are required to keep management within the boundaries set by the Government. The challenge now is to find the long-term funding needed to continue the delivery of this management plan and expand it to conflicts elsewhere.



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Figure 1. Salmon fisherman in Deeside, Scotland. Seals are killed because they are perceived to have an impact on salmon stocks.

Representations of conflict in the media

The media can present a challenge to conflict management because it might seek to highlight the conflict and sensationalise rather than educate [58]. Media relationships and support for constructive journalism are therefore an important part of conflict management [59].

Legislation

Commonly, attempts to manage human–wildlife impacts and conservation conflicts focus on enacting legislation to control the impacts of humans on wildlife. Although many legislative tools work well to reduce human–wildlife impacts, for example through proactive enforcement [40], or protecting remnant populations from extinction, in many conservation conflicts legislation can be ignored by one party (Box 1) or resisted if deemed unfair [2]. Without appropriate flexibility, strict laws can lead to a sense of disenfranchisement to those parties most directly affected, and can also reduce the number of alternative solutions that can be developed; ultimately, these factors can exacerbate conflict [3,60].

The role of scientists in conservation conflicts

Science has a fundamental role to play in understanding the root causes of conflicts, assessing human–wildlife impacts, suggesting and testing alternative mitigation techniques, and helping parties explore trade-offs (Boxes 1–4; Figure 2). Yet, scientists can be perceived as biased if they advocate conservation positions or work for an organisation involved in advocacy, so they need to acknowledge their own values [61]. Science can become politicised because stakeholders might focus solely on the research that supports their position [55] and scientists themselves might even frame questions or interpret results favourable only to one side [62]. In addition, stakeholders can have misapprehensions about science and what can be realistically achieved [63]. Thus, scientists need to consider their role and how their values might alter the dynamics of conflict management. This of course reflects a central conundrum within the value-laden field of conservation biology and the arguments about science and advocacy [64].

When scepticism about scientists appears in a conflict, developing ‘neutral third-party agreements’ to which

Box 3. Case study: spotted owls and forestry in old-growth forests in the USA

The spotted owl (*Strix occidentalis*) is an icon of conservation conflict in the USA. The species has been inextricably linked to the conservation of old-growth forests and the conflict to save those forests. The conflict is multifaceted and complex because: (i) the loss of these forests was one reason for declaring two subspecies threatened [84,85]; (ii) advocates realised that the owl could be used as a surrogate for old-growth forest protection via the Endangered Species Act [43]; (iii) logging restriction to protect owls had serious socio-economic ramifications [86]; and (iv) it pitted stakeholders with fundamentally different values against each other [43]. These factors have fuelled more than three decades of continuing conflict in the courts, US Congress, socio-political arena, and within and among communities. Science has played a crucial role in conservation planning and legal decisions. Scientists have been asked by Congress and Federal Agencies to create scientifically credible assessments, plans, and analyses, which have led to the development of novel analytical tools and approaches [87]. Moreover, advocacy stakeholders have enlisted scientists either to conduct organisation-specific research or to provide alternative reviews and interpretations

of science-based findings. This led to a general framework for conducting analyses and vetting of data when either is contentious [88]. Scientists representing stakeholders, in general, have had a positive role by forcing increased rigor of analyses [87]. Yet, the huge value of old-growth trees seemingly ensures persistence of conflict; for example, the raw log value of trees in the territory of one owl pair was estimated to be US\$16 million [89]. Solutions have been expressed as top down (legal restrictions on logging), bottom up (local grassroots efforts to increase logging [43], and hybrid [multiple stakeholders cooperating to test effects of logging (Sierra Nevada Adaptive Management Project; www.snamp.berkeley.edu)] approaches. Top-down approaches have temporally limited conflicts (e.g., regulations restrict logging), but are uncertain as long-term resolutions because they usually exclude or marginalise one or more parties. Bottom-up approaches are also exclusionary because they often represent local interests and not external stakeholders. Hence, resolution will depend on multiple stakeholders engaging in collective efforts, especially when science provides credible analyses of impacts that potential solutions might have on the owl (Figure 1).



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Figure 1. Watchful Spotted Owls near nest sites. Spotted owl territories contain timber of high value to forestry companies. Left photo by Sheila Whitmore.

scientists adhere can be useful. An example is the Sierra Nevada Adaptive Management Project (Box 3), in which scientists signed an agreement not to be involved explicitly in the conflict and created a series of mechanisms to involve stakeholders, such as field trips, public meetings, interagency partner groups, and a website where information was available for public comment. To be trusted by parties involved in conflict, scientists need to maintain transparency in their assumptions, values, and inferences.

Measuring successful outcomes

In conflict management, success occurs when the outcome is acceptable to both sides and when neither party is asserting its interests to the detriment of others (for example, Box 2). In the case of conservation conflicts, one needs to know not only how effective different approaches are for reducing human–wildlife impact, but also more importantly, how effective the process is for reducing human–human conflict and developing long-term, robust solutions.

Box 4. Case study: elephants and farmers in Kenya

In Africa, despite significant declines in range and population, crop raiding by elephants (*Loxodonta africana*) causes conflict and is a major factor in shaping public perceptions of conservation. Elephant damage to property (mostly at night), threats to human life and well-being have increased with expansion of settled agriculture onto rangeland [90]. Individual farmers cannot scare them away on their own [91]. In Kenya, legal and illegal killing of crop-raiding elephants, and loss of human life, is a constant problem [92].

In Laikipia County, Kenya, small-holder farms are surrounded by ranches, informal grazing areas, and forests containing substantial elephant populations. There are no formally protected wildlife areas, but Laikipia contains over 7000 elephants. In 2003–2004, 2429 crop-raiding incidents were recorded in southern Laikipia [93]. Stakeholders include: (i) small-holder farmers, who wish an end to crop losses and disruption; (ii) local government and politicians who wish to reduce threats to the well-being of their constituents; (iii) wildlife NGOs and the Kenya Wildlife Service, who wish to maintain wild elephant populations, but end crop loss and damage; (iv) large properties that either wish to maintain elephant populations that support wildlife tourism businesses or are indifferent to

their survival, and wish to end threats to small-holder neighbours (Figure 1).

In 2006, a project funded by the UK Darwin Initiative, grown out of a PhD study, drew stakeholders together under the Laikipia Elephant Project to devise ways to mitigate human elephant impacts. Approaches used to keep elephants away from crops included both traditional (watchtowers, fires, ditches, and loud noises) and novel deterrents (chilli grease fences, fireworks, and powerful electric lights [94]). The project also engaged farming communities, for example through a street play [95], and tried to develop elephant-compatible sources of livelihoods (e.g., honey and chilli production). These achieved some local success, but did not eliminate crop raiding.

A district-wide elephant fence has long been proposed as a more permanent solution to crop raiding. In 2007, funds were secured by a local NGO, the Laikipia Wildlife Forum, to construct 163 km of electric fence to protect small-holder farms. The first phase (84 km) was constructed by June 2008, and has reduced crop raiding, although breakages by both elephants and humans persist. The crop-raiding problem is being energetically managed in Laikipia (<http://spaceforgiants.org>), but is by no means 'solved' and remains volatile and complex.



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Figure 1. Elephants threaten life and wellbeing of local people. A 163 km fence has been proposed as a way of reducing the impact of elephants. Left photo by Max Graham

Although the former might be easier to assess, the latter is more challenging.

From a conservation perspective, however, the aim is to win. Those representing conservation might not seek to enter into dialogue with the other party, but instead see the imposition of their interests as more likely to lead to conservation success. Thus, increasing the population of a species of conservation concern (i.e., resolving a human–wildlife impact) might be considered a conservation success story, irrespective of the cost to other parties. Indeed, the main thrust of parties advocating conservation when faced with conflict and threats to species has often been to assert their interests on others through legislation and enforcement, thereby seeking to maximise conservation success rather than minimise conflict (e.g., Box 1). This might be especially the case when the risks are high, such as when a species is threatened with extinction. However, in many situations, it might also ultimately be counter-productive and lead to conservation conflict, unless parties have acknowledged and agreed to support such an outcome. For conservation, the question remains as to the

conditions under which enforcement or the development of shared solutions are more likely to deliver robust conservation outcomes.

Measuring the effectiveness of alternative processes has, as far as we are aware, not been attempted in research on conservation conflicts. However, in a recent review of 52 environmental conflicts, Emerson and colleagues [65] examined the resolution process. They found evidence that engagement contributed to the parties reaching good-quality agreements and improved relationships. Engagement is important not only in prioritising mitigation techniques [66,67], but also in the design and implementation of the whole conflict management process. The quality of information available to participants also improved the effectiveness of that engagement, suggesting an important role for science communication, so that all stakeholders understand, in their terms, what is currently known about the system in question. A similar review of the effectiveness of alternative approaches to conservation conflicts is now urgently needed.

Conflict resolution?

To our knowledge, no conservation conflict has ever been fully resolved in the sense that conflict is eliminated, although there have been varying degrees of success at managing them to minimise their destructive nature. The case studies highlight the dynamic nature of conflicts and that some level of conflict will persist over long time periods (Boxes 1–4). Given this, the question of whether the long-term management of conservation conflict is best delivered through dialogue would seem even more urgent.

Concluding remarks

We have focused on conflicts between humans over species of conservation concern. Yet, the issues discussed apply to other forms of conflict in conservation and beyond, as they are all ultimately about humans with different interests, views, and values.

At its heart, conflict management is about bringing parties face-to-face to discuss and negotiate acceptable solutions (Figure 2). At one level, this might seem trivial, yet as we have described, numerous barriers can prevent effective management. The ability of conservation and livelihoods to coexist therefore depends partly on the willingness of parties to recognise problems as shared ones and to discuss them collaboratively.

One factor that emerges repeatedly in the literature is the need for transparency in the process. In particular, there are benefits for transparency of the underlying basis for stakeholder positions [15] and their goals [48]; the values and goals of the scientists involved in the process [61]; the available evidence together with its uncertainties and gaps [68], using analytical approaches, such as Bayesian Belief Networks techniques [69] or Management Strategy Evaluation [70], so that stakeholders can participate in discussions on an equal footing and make informed decisions; and in the long-term costs and benefits associated with conservation [71] and the trade-offs associated with alternative interventions [47,72,73]. Each conservation action or inaction will often entail long-term ecological, economic, and social consequences, an understanding of which is essential to the decision-making process.

Difficult choices must be made about the most effective ways of conserving biodiversity in an increasingly crowded world, while considering the legitimate livelihoods and well-being of affected humans. Although the current ability to assess the long-term effectiveness of alternative approaches is incomplete, it seems likely that conservation will benefit most from conflict management approaches that have clear goals, recognise the values of others, and foster open collaboration between stakeholders, academics, and policy makers to consider the evidence and trade-offs involved in negotiating a way forward that all parties can live with. In addition, the monitoring and evaluation of management processes is needed to act as a feedback mechanism for improving outcomes [24,74–76].

Looking forward

It seems inevitable that conflicts over conservation will increase. There are two components that are urgently needed to help address these conflicts in the future. First, better links are needed between the social and natural

sciences, so that the underpinning social and political context can be understood and linked to understanding of human–wildlife impacts. Without such understanding, effective management will continue to be challenging. Second, a robust evidence base is required that is built on the monitoring and evaluation of the process and the outcomes, to address how engagement affects conservation outcomes and which processes are most effective in supporting coexistence. There are examples in the literature on human–wildlife impacts of apparent conservation success stories, but where these outcomes are the result of parties striving to enhance conservation asserting their interests to the detriment of others, we would hypothesise that they will ultimately be less durable for conservation.

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