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INVITED COMMENTARY: WHEN A CONSERVATION CONFLICT COMES FULL CIRCLE—THE SPOTTED OWL CONFLICT IS A WICKED PROBLEM

A PLENARY ADDRESS PRESENTED AT THE RAPTOR RESEARCH FOUNDATION

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ABSTRACT.—The conservation of the Spotted Owl (*Strix occidentalis*) has been the center of a 40-yr conflict between those who wish to conserve owls and old growth forests and those who wish to log trees as commodities. Although the Spotted Owl conflict seems unique because it has lasted so long, it is no different than many other conservation conflicts in which many scientists—and raptor biologists specifically—might find themselves engaged. Therefore, I explore the commonality among conflicts, including specific details of the Spotted Owl case, to illustrate the problems inherent in conservation conflicts and why these disputes last so long. I suggest two general motivations that I believe capture the reasons behind people's willingness to engage in conflict: money and passion. Yet the specific motivations (e.g., economic well-being and ideology) nested within these general motivations are complex and interconnected. This complexity can lead to intractable situations, such as Spotted Owl conservation, which have been defined as "wicked problems" that cannot be resolved to the satisfaction of most. But understanding these broad motivations and identifying the wide variety of specific motivations nested within them may yield opportunities to manage—rather than resolve—a conservation conflict. Accordingly, I present a conceptual overview of the owl situation as a case study, along with some guidelines for raptor biologists working in conflict environments.

KEY WORDS: *Spotted Owl*; Strix occidentalis; *conservation conflict*; *money and passion in conflicts*; *motivations for conflict*; *wicked conflict*.

COMENTARIO INVITADO: CUANDO UN CONFLICTO DE CONSERVACIÓN VUELVE AL PUNTO DE PARTIDA—EL CONFLICTO DE *STRIX OCCIDENTALIS* ES UN PROBLEMA IRRESOLUBLE

RESUMEN.—La conservación de *Strix occidentalis* ha sido el centro de un conflicto de 40 años de duración entre aquellos que desean conservar búhos y bosques maduros y quienes desean talar árboles para su explotación. Aunque el conflicto por conservar *S. occidentalis*, dada su extensión, parece único, en realidad no difiere de tantos otros conflictos de conservación en los cuales muchos científicos—y biólogos de rapaces específicamente—podrían encontrarse involucrados. En este trabajo reviso los aspectos comunes a estos conflictos, incluyendo detalles específicos del caso de *S. occidentalis*, para ilustrar los problemas inherentes y explicar por qué estas disputas duran tanto tiempo. Sugiero dos motivaciones generales que explican por qué las personas suelen involucrarse en estos conflictos: dinero y pasión. Sin embargo, las motivaciones específicas (e.g., bienestar económico e ideología) subyacentes dentro de estas motivaciones generales son complejas y están interconectadas. Esta complejidad puede llevar a situaciones inextricables, como la

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conservación de *S. occidentalis*, la que ha sido definida como "problemas irresolubles" que no pueden ser resueltos para satisfacción de la mayoría. Sin embargo, entender estas motivaciones más generales e identificar la amplia variedad de motivaciones específicas subyacentes puede dar oportunidades para gestionar—más que resolver—un conflicto de conservación. En consecuencia, presento una descripción conceptual de la situación de *S. occidentalis* como caso de estudio, junto con algunas pautas para los biólogos de rapaces que desempeñan su actividad en ambientes laborales conflictivos.

[Traducción del equipo editorial]

INTRODUCTION

The Spotted Owl (*Strix occidentalis*) conservation conflict has been ongoing for more than four decades—it is a complex conflict that has captured the attention of both scientists and the public (e.g., Yaffee 1994, Noon and McKelvey 1996, Gutiérrez 2015, Gutiérrez et al. 2020). But this conflict is similar to many other complex long-enduring conservation conflicts, because it has both antecedent and consequent causes (Table 1; see also other specific examples of conflicts in Redpath et al. 2015b). So it is fair to ask—why has this particular conflict persisted for so long and what are its deeper root causes? To understand the owl conflict (as well as other conservation conflicts), I will explore both its superficial and deeper root causes. There will always be different points of view about the root causes of any conflict—after all, that is why they are conflicts! But be advised that I am sharing my personal views on why this conflict lasted so long, views that I gained from 40 yr of involvement with Spotted Owl research and conservation. For this reason, I also encourage you to read the perspective of others about why this has become one of the enduring North American conservation conflicts of modern times.

Conservation conflicts involving other raptors are also commonplace, and many raptor biologists will encounter them at some point in their careers. Yet how are we to work within a conflict environment when we were trained neither to understand nor to manage conflicts? Hence, I here outline my interpretations of the motivating factors for this Spotted Owl conflict, some of the main actors involved, the processes involved, and some other factors that I believe underlie all conflicts. It is my hope that this knowledge may help you, as raptor biologists and conservationists, understand the broader elements of a conservation conflict in which you may find yourself involved. I also provide specific suggestions for working in conflict situations in this new age when the tenets of science and species conservation are openly challenged by the public and special interest groups (Oreskes and Conway 2010).

WHY CONSERVATION CONFLICTS BEGIN AND ENDURE

Willing Partners. The Spotted Owl conservation conflict, like all conflicts, requires "willing partners" (Redpath et al. 2013). Although we commonly refer to conservation conflicts involving wildlife as "human-wildlife conflict" (or specifically here as "Spotted Owls vs. loggers"), such characterization is both a misnomer and counter-productive (Redpath et al. 2015a, 2015b). Conservation conflicts are *always* between people—not between animals and people (Redpath et al. 2013, 2015c). Describing conflicts between people as "human-wildlife conflicts" may actually impede our understanding of the nature of conservation conflicts, because it diverts attention from the real source of conflicts—people who hold sufficiently different views about conservation or resource use that they are willing to fight about them (Redpath et al. 2015c).

In the case of the Spotted Owl, the conflict initially centered around the negative impact to the Northern Spotted Owl (*S. o. caurina*) caused by logging of old-growth forest, which was thought to be their primary habitat (Gutiérrez et al. 2020, Gutiérrez 2015). Whereas the people on one side of the conflict at its beginning seemed obvious (loggers, timber industry, and local interests [they either derived direct economic benefit from logging or supported local logging]; Fig. 1A), the people on the other side were a more broadly aligned amalgam of individuals and groups, including local-regional environmentalists, local-regional conservationists (I here distinguish between "environmentalist" and "conservationist" as between those interested strictly in preservation and those with broader views of sustainable resource use, respectively), locals who preferred undisturbed, natural environments (i.e., for reasons of esthetics and not necessarily wildlife conservation), and sport and commercial fishing interests. Thus, there were sufficiently diverse people holding different deeply held interests to

Table 1. Factors causing and prolonging the Spotted Owl conservation conflict.

SOME FACTORS INVOLVED IN THE SPOTTED OWL CONSERVATION CONFLICT
Willing partners
Broad issues that attract outside actors
Faulty assumptions used for making decisions
Substantial scientific uncertainty at beginning
Fake and agenda-driven science that undermine objective science
Lack of acceptance of "solutions"—both "top-down" and "bottom-up"[a]

[a] Top-down solutions are those imposed to "resolve" a conflict (e.g., laws); bottom-up solutions are those achieved by consensus or negotiation among the parties engaged in conflict.

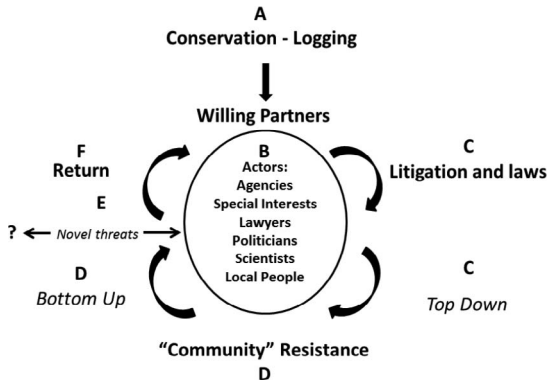

Figure 1. Schematic depiction of the original reasons for the Spotted Owl (*Strix occidentalis*) conservation conflict. Broad issues comprised the opposing goals of conserving old-growth forests and logging trees (A) held by different actors willing to engage in conflict (or be drawn into it to mediate or provide support) to achieve their goals (B). Because of incomplete scientific knowledge, faulty decision-making by federal agencies, and other reasons, litigation and laws (C) were early top-down solutions to the conflict. But imposition of top-down conflict solutions created social conflict within local communities, and resistance to external solutions that motivated community efforts to achieve mutual agreements or consensus (bottom-up solutions [D]) for achieving both conservation and logging goals. At various times new information or a new threat emerges that either prolongs a conflict or takes it in a new but unknown (indicated by ?) direction (E). In the case of the Spotted Owl conservation conflict, one area of new information was fire impacts on owls, which created new conflicts that on the surface were about fire but really were about the original reason for conflict—logging. So the emergence of a "novel" threat has returned the conflict to its original starting point (F), because a solution to the root causes of the original conflict that was acceptable to conflict parties has never been achieved. Therefore, the Spotted Owl conflict is a wicked conservation problem for which resolution seems impossible. Thus, the conflict will likely persist in a state of constant conflict management rather than be resolved. I present these broad events as a linear (or temporal) sequence, but most are interactive and occurred almost from the beginning of the conflict.

ensure that conflict over logging old-growth forest would ensue (Fig. 1B). Some of these local people had disagreements about how conservation actions to save the owl would impact their livelihoods or lifestyles. But others had deeper, fundamental disagreements rooted in personal beliefs; some of these beliefs were true (e.g., rooted in science, psychology, philosophy, and economics [see Redpath et al. 2015b]) while others were not (e.g., ideas about opposing protagonists and the consequences of conservation). Thus, the initial conflict was between local loggers (and their companies) and those interested in conservation of the owl whose involvement was ignited by early research showing owls were less abundant in logged forests, which implied a negative impact from logging old-growth forests (e.g., Forsman et al. 1977), which was then used by others to recommend forest protection.

Outside Actors. The presence of outside actors was a key factor in deepening and prolonging this conflict. In the case of the Spotted Owl, there were national groups who advocated for old-growth preservation and timber industry groups that viewed potential regulations to achieve owl protection as a broader existential threat to resource exploitation everywhere. But although these outside actors portrayed themselves as supporting local interests or specific narrow goals, they actually had much broader interests (e.g., Yaffee 1994). Therefore, what appeared to be regional conflicts (in the Pacific Northwest and southwestern USA; Gutiérrez et al. 2020) actually had broad implications for forest protection, wildlife conservation, and economic development that reached far beyond the region and local special interest groups (Thomas and Verner 1992, Gutiérrez et al. 2015). It was the presence of these many outside parties and their support groups that generated the resources to engage in prolonged conflict because of potential precedent-setting outcomes stemming from conservation measures (e.g., Gutiérrez et al. 2015, Cheng et al. 2016).

Power Imbalances. A power imbalance occurs when one group has or attains some advantage over

an opposing group, which occurred in the case of Spotted Owls. However, the reasons for power imbalances are varied and include such things as "elite capture," money, institutional resistance, legal mandates, and political influence. Thus, the dynamics of conservation conflicts can ebb and flow between or among groups depending on how effective groups are at mobilizing support. Elite capture refers to a situation in which an influential or dominant person or group of people, usually outside the local groups, exerts a controlling influence on the direction or outcome of a conflict. Although elite capture is often used in the context of institutional corruption, I broaden the concept here to consider external groups, without implying corruption, that simply have the ability to dominate a conflict dynamic (e.g., a local timber company that dominates regional or community economics). The relevance of elite capture is that the ensuing power imbalance often leads to resentment, distrust, and resistance by groups having less power, all of which undermine conflict management or resolution. Similarly, groups (or even individuals) can marshal money, lawyers, politicians, and external groups to join the fray, leading to power imbalances, such as happened with the Quincy Library Group Act, which was federal legislation intended to mandate collaboration about forest management (including Spotted Owls) between a local community and the US Forest Service (Gutiérrez et al. 2015, Cheng et al. 2016). Conversely, aggrieved parties in an elite capture dynamic can respond with grassroots efforts or recruitment of their own external forces to counter opposing external forces brought into the conflict by the other side. Thus, the more groups entering the fray, the fewer the opportunities there are to find common ground either to manage or to resolve the conflict because the dynamics have been "captured" by the elite actors. Finally, politicians or laws brought into a conflict often do not seek consensus or result in resolution, respectively, at a local level, but rather they often tend either to support one side (e.g., in the case of partisan politicians) or to mandate "resolution" based on higher-order consensus (e.g., state or national laws such as the Endangered Species Act [ESA]). Hence, these top-down approaches (i.e., imposed political resolutions and legal mandates) rarely resolve local conflicts—they simply manage, mitigate, or impose the will of the majority or the powerful on the minority or the weak.

Faulty Assumptions Used for Decision-making. Early conservation measures for the Northern Spotted Owl were based on faulty assumptions, such as the biologists' belief that high levels of forest protection, which were thought to be needed, would not be acceptable to the leaders of agencies. As a result, biologists and managers recommended lower amounts of forest protection (Thomas and Verner 1992). However, these faulty assumptions were not limited to decisions by biologists; they extended to people of all levels who had decision-making capabilities. Into this brew were mixed the personal ideologies (see below) of people who either could make decisions or represented vested interests. Other decisions were made based on either inappropriately applied theory (e.g., the 50–500 "minimum" population size required to maintain evolutionary potential) to justify a low owl population goal or the misuse of empirical information (e.g., misuse of home range estimates for owls to determine amount of habitat needed) to minimize habitat protection (see also Simberloff 1989).

Scientific Uncertainty. Successful conservation often depends upon reliable knowledge, which is gained through rigorous science (Romesburg 1981). Yet knowledge of this caliber is often lacking about the ecology of raptors, so conservation approaches are often uncertain. Moreover, the ability to collect reliable knowledge is limited by funding for research, which was the case at the outset of the Spotted Owl conflict. When faced with such uncertainty, we scientists must be conservative in our management recommendations, lest we inadvertently push a species closer to extinction or extirpation. So it is appropriate to invoke the "Precautionary Principle" (Ashford et al. 1998, Wood et al. 2020). When relevant ecological information becomes available through research, it can be minimized or even dismissed by decision-makers who approve conservation plans, as was the case of the Spotted Owl when decision-makers appeared to ignore much of the information in their own environmental review while selecting a "preferred alternative management" strategy (Simberloff 1989). Unfortunately, all the early faulty assumptions and misapplication of biological information upon which early decisions and conservation plans were made provided fuel for the ensuing conflict when these bad judgments were used as the basis for legal action (Fig. 1C). This was inevitable as more information about owl ecology was gathered by owl researchers and tremendous advances in the analyses used to

process emerging data showed that even stronger conservation measures were needed than those initially recommended (Noon and McKelvey 1996).

Fake Science, Advocacy Science, and Agenda-driven Science. Science-based decisions should be the goal of conservation if the intent is to have a positive outcome for species and ecosystems. However, it is assumed that "science-based" implies an objective, politically-neutral process. This has not always been the case for Spotted Owls because the uncertainty about owl ecology created space for exploitation by those opposed to conservation (e.g., Craig 1986, Preston et al. 1991). The first time I heard the terms "fake science" and "junk science" was when they were used by a timber executive from the California Timber Association (later part of the Western Timber Association). Yet I didn't have a clue what this meant until a booklet *The Spotted Owl and Wise Forest Use* was published by the Western Timber Association (Craig 1986) and was criticized by Simberloff (1989) as an exemplar of fake science, or as Simberloff put it, using the "cachet of science." So I was surprised to see that honest statements of scientific uncertainty, including some attributed to me, were portrayed by Craig as "authoritative evidence of ignorance" (see Appendix A in Craig 1986). Raptor biologists have also been the target of this fake science attribution for discovering the links between DDT, eggshell thinning, and raptor population declines (e.g., the articles on the website junkscience.com characterize DDT-raptor studies as junk science [i.e., fake science], but they are themselves fake science). But we know the real scientific evidence for these DDT-raptor decline links is not based on fake science; it is based on many empirical and experimental studies (see Newton 2017 for a review and references). So this broad movement to undermine the credibility of scientists including raptor biologists is a force that all of us must be aware of and consider when working within conflict situations.

Lawyers are often used by parties in conservation conflict settings in the USA (Fig. 1B). However, their role is sometimes to discredit science or scientists, while using the language of science to obfuscate its true process (e.g., Preston et al. 1991 use the language of science to falsely portray a landmark study on Spotted Owls [Thomas et al. 1990] as unscientific). They can also serve positive roles in litigation by explaining scientific roles in ways few scientists are able to do. Therefore, biologists should remember that the role of lawyers is not necessarily to seek truth as scientific process would dictate to us; rather it is to win their case for the benefit of their client.

Advocacy science is science conducted to support conservation or other objectives and has been a feature of Spotted Owl research almost since the beginning. However, unlike fake science, it can be either constructive or destructive; for example, it is destructive when results are obtained that are contrary to predictions or desired outcomes and are suppressed, but constructive when it reveals robust, novel information. Thus, advocacy science is conducted by special-interest groups (e.g., timber industry or environmental organizations in the case of the Spotted Owl) to provide evidence that might counter existing science not to their liking (e.g., whether or not Spotted Owls depend on old-growth forests). For Spotted Owls, advocacy science challenged academic and government scientists because it was sometimes used by special interests (not the people conducting that research) to try to discredit existing science or scientists. However, it was sometimes counter-productive because it diverted time from existing science endeavors to counter poorly conceived advocacy science, which led to conflicts among researchers about many other things such as appropriate processes to be followed in meta-analysis of data (Anderson et al. 2003). Nevertheless, an unintended consequence of advocacy science was that it strengthened both owl science and the tools used to analyze owl data that have benefited all wildlife researchers (Gutiérrez 2008). I also want to make clear the distinction between advocacy science described above and science advocacy. Whereas advocacy science is a motivation for doing science, science advocacy is a process meant to elucidate and demonstrate relevance of scientific information so that it can be understood and applied correctly (e.g., in the case of the Spotted Owl, scientists sometimes engaged in science advocacy to counter flawed advocacy science). Science advocacy in my opinion is essential in conservation because some special interest groups will try to distort or discredit scientific information if it is not to their liking.

Agenda-driven science in conservation is science conducted with the intention of supporting a particular conservation outcome, such as ending green tree and salvage logging on national forests (Peery et al. 2019; see also below). But there are many other problematic behaviors that characterize agenda-driven scientists, so it is essential that this

term be invoked very carefully because intent by others is very difficult to prove (Peery et al. 2019). Fortunately, this type of science in conservation is extremely rare, likely having arisen perhaps only once in Spotted Owl research, because it has the potential to undermine the credibility of objective science and scientists themselves. Therefore, it is critical that raptor biologists both recognize it and avoid it.

Top-down Solutions to the Conflict. Top-down solutions are those imposed on conflict parties by such things as outside parties, litigation, and laws (Redpath et al. 2013; Fig. 1C). But these types of solutions often meet resistance by one or both groups if they feel the solution is inadequate or is perceived to favor the other party (Fig. 1C). Nevertheless, it is not surprising given outside interests that top-down solutions, in the form of the 1976 Forest Management Act and the ESA, were invoked to protect owls—after all, Americans wanted these laws passed to protect wildlife and natural resources.

Bottom-up Solutions to the Conflict. Almost immediately in this conflict, individuals and communities began searching for solutions within and among communities—that is bottom-up solutions—as a form of resistance to top-down solutions and elite capture (e.g., Satterfield 2002; Fig. 1D). But the potential bottom-up solutions seemingly all suffered from some form of elite capture, litigious interruption, or imposition of a top-down solution. Therefore, a powerful mechanism to resolve conservation disputes was lost. For example, one local community group (Quincy Library Group [QLG]) in the Sierra Nevada tried a novel approach, which was to force the US Forest Service by congressional legislation to collaborate on local forest management (Gutiérrez et al. 2015, Cheng et al. 2016). Although this was an attempt to impose a unique type of community co-management of public lands, the effectiveness of this effort was undermined by outside forces (a form of elite capture; Cheng et al. 2016). It was clear that a miscalculation by QLG was failing to consider the depth of passion of outside groups interested in the welfare of national forests. Another example of a grassroots effort ("collaborative adaptive management") was the Sierra Nevada Adaptive Management Program, a partnership of state agencies, federal government, industry, academic institutions, communities, and environmentalists led by university scientists to understand the effect of logging treatments intended to reduce fire risk on many natural resources, including Spotted Owls (Hopkinson et al. 2017). However, because the US Forest Service appeared to be a reluctant partner, this effort did not have the desired effect of reducing tension between conflicting groups. Thus, grassroots (bottom-up) efforts, hybrid solutions, and reluctant partnerships have not fared well in quelling this conflict over how best to conserve owls. In addition, any resolution posed the possibility that the US Forest Service might lose some management control. Therefore, conservation measures for the owl might be precedent-setting well beyond the local communities and regional agencies within the range of the owl, and thus grassroots efforts might be viewed as threats to the agency.

Emergence of New Threats. A major challenge facing conflict managers is the emergence of new threats that can hinder conservation efforts because they have the potential to undermine existing negotiated agreements, to reinforce grievances among parties if new conservation measures are proposed, or to send the conflict in a new direction (Fig. 1E). We as scientists can address this challenge by (1) improving initial threat assessments, (2) developing robust conservation strategies or agreements that accommodate unexpected threats, and (3) thinking more critically about the implications of potential threats. At least two potential threats to Spotted Owls were known at the time of the Northern Spotted Owl's listing but were assessed as either not serious (effect of fire on owls and their habitat) or potentially serious (effect of invasive Barred Owls [*Strix varia*] on Spotted Owls). However, in both cases the language in various threat assessments was not dismissive (US Department of Interior 1990). Hence, two major owl conservation plans mitigated potential effects of fire (Thomas et al. 1990, Verner et al. 1992).

Over the four decades of the Spotted Owl conflict, the combined effects of climate change, unnaturally high density of trees and shrubs because of long-term fire-suppression, and human-caused ignition have led to an increase in very large, high-severity fires that were thought to be rare events in western USA forests prior to settlement by nonnative Americans (e.g., Safford and Stevens 2017). Whereas early research suggested Spotted Owls were resilient to low- and moderate-severity fires (Bond et al. 2002) and that they would forage in severely burned forest (Bond et al. 2009), later research revealed that they could be negatively affected by high-severity fires (e.g., Jones et al. 2016, 2020, Ganey et al. 2017,

Rockweit et al. 2017). A controversy erupted over these results, particularly the very strong results of Jones et al. (2016) showing that a mega-fire exacerbated long-term declines in a California Spotted Owl (*S. o. occidentalis*) population. On the surface, this conflict focused on research results, but in fact the conflict was really about how to respond to a perceived threat. Thus, the real source of conflict was the fear of some scientists that the findings of Jones et al. (2016) might be used to support US Forest Service plans to log smaller trees in forests to reduce density of vegetation as a means to reduce the risk of severe fires.

The invasion of the Barred Owl was another example of an emergent threat that resulted in two conflicts—one between agencies and the public and the other among scientists—about whether or not it is appropriate to control a native species that is also invasive and could potentially cause another native species to go extinct (Gutiérrez et al. 2007). However, the nature of these conflicts was quite different from conflicts over the effects of fire on owls. The basis of the conflict between agencies and the public was animal welfare, which was motivated by *passion* (see below), while the basis for the conflict among scientists was about differences of opinion about solutions, personal beliefs, and conservation philosophy (e.g., letting nature run its course vs. using management intervention to control an invasive species). The difference between the emergent problems of Barred Owls and fire is that the Barred Owl situation has not resulted in an acrimonious impasse because (1) the US Fish and Wildlife Service did a great job explaining to the public the need to conduct removal experiments, and (2) it simply reflected typical scientific discourse, in which disagreements are not normally viewed or intended as personal attacks for ideological (or agenda-driven) reasons. However, it remains to be seen whether larger conflicts will erupt if partial control of Barred Owls is proposed. I predict they will not.

An Enduring Conflict Comes Full Circle. The saga of the Spotted Owl conflict has been very long but has ebbed and flowed in intensity depending on what decision was being made by regulators, land managers, the courts, or Congress, or on the publication of new scientific evidence. These twists and turns have been portrayed differently depending on the actors telling the story, which has sometimes confused the public. The recent case of controversy erupting over whether mega-fires can harm owls is one such event. Yet, if we are able to uncover the root cause of this latest controversy, we see that it is not really about a simple decision by a group of scientists not to accept published results and inferences about whether these huge western mega-fires can harm owls—the evidence is overwhelming that they can (e.g., Jones et al. 2016, 2020, Ganey et al. 2017). Rather the controversy appears to me (and others) to be about whether salvage logging is conducted following these fires and whether logging can be used as a method to reduce fire risk (Peery et al. 2019). Hence, the root cause of this recent controversy is not really about fires and owls *per se*; it is a return to the issue of logging (Fig. 1F). Thus, logging, despite years of litigation, top-down solutions, and bottom-up processes to resolve the original root cause of the conflict (those who wanted logging vs. those who wanted preservation of the owl and old-growth forests), is still the motivating factor for antagonists in this most recent conflict. Only the "illusion" of fire makes it appear different.

Interactions Among Factors and Overlap of Stages. For ease of depicting the owl conflict, I have portrayed the owl conservation conflict as a linear set of events in time that are now circling back to their original roots (Fig. 1). But it must be remembered that all these actors were present almost from the beginning, with each stage varying in importance throughout the length of this ongoing conflict. Consequently, when one is thinking about conflicts in general it is important to think of them as dynamic and probabilistic rather than discrete and deterministic—it is difficult to predict which factor will prevail at any given time or what event will happen next.

WHY A LACK OF RESOLUTION?

One would think, after all the effort to resolve this conflict and the use of laws that the American people overwhelmingly supported at their passage (e.g., ESA, National Environmental Policy Act [NEPA], National Forest Management Act), this conflict would have been settled. But when I thought about this myself, I realized I did not understand the motivation for conflicts in a general sense, so I began to study conservation conflicts (e.g., Redpath et al. 2013, 2015b). As a result of this study, I have concluded that the motivations for most conflicts emerge as a result of two, often interacting, motivations that I personally term *money* and *passion* (Table 2). These motivations are not mutually exclusive—they overlap and are interactive. Under

Table 2. Some specific motivations that can induce people to engage in conservation conflicts nested within two general motivations. Note that there may also be interactions among specific and general motivations.

MOTIVATIONS FOR ENGAGING IN CONSERVATION CONFLICTS	
GENERAL MOTIVATIONS	SPECIFIC MOTIVATIONS
Money	Greed, economic prosperity, economic well-being, community stability, sustainability
Passion	Ideology, socioeconomics, culture, politics, tradition, social justice, conditioned response[a]

[a] "Conditioned response" is used here to depict a response by a conflict participant, or the willingness to engage in conflict, when the participant has been motivated to do so by listening to propaganda and misinformation repeatedly over long periods of time. Trigger words or appeals to action can elicit a response even if the participant lacks sufficient personal knowledge of the conflict to make an informed statement or take informed action.

the money label I place, for example, "greed" with "community stability" and "economic well-being of individuals" because they are influenced by the same thing (money) but possess very different philosophical and moral implications (Table 2). So greed has great potential to contribute to "wicked problems" because greed cannot be easily resolved through negotiation whereas community stability and economic well-being of individuals are less intractable because these motivations have social, moral, and philosophical bases that are more amenable to negotiation and compromise (Tonkinwise 2015). Wicked problems (i.e., wicked conservation conflicts) are those that are large, complex, have high scientific uncertainty, and divided public opinion that result in impasse among conflict parties (e.g., see Balint et al. 2011 for an example relative to the Sierra Nevada where California Spotted Owls reside). On the other hand, the motivation of *passion* likewise encompasses conditions that either overlap or interact with the motivations of money. I will discuss one aspect of *passion*—ideology—in more detail because I believe it is often foundational to conflict.

Ideology influences most conflicts, including the one over Spotted Owls and old-growth forest conservation. That word can be used either neutrally or pejoratively. I choose to use it here in a neutral way. Redpath et al. (2013) discussed the situation in which certain conflict parties are intransigent due to ideology, for example, in which case one potential strategy in conflict management would be simply to exclude them in order to make progress. However, I now think such a course of action would be appropriate only if it were individuals or minor parties that were impeding progress. For this reason, I suggest here that no major party or even minor parties that have large external or internal influence should be excluded from conflict management efforts for the Spotted Owl. Ideology is often so deeply rooted that it generally cannot be changed (Holland 2015). But by realizing the presence of ideological differences, we can work to create understanding and negotiating space that foster mediation in conflict disputes even when ideologies are deeply entrenched. Therefore, we achieve some progress by "managing a conflict" rather than trying to resolve it (Redpath et al. 2013).

Another example of the unassailable adherence to ideology that is relevant to raptor conservation is the conflict in Scotland over persecution of Hen Harriers (*Circus cyaneus*) by gamekeepers who are trying to sustain high densities of red grouse (*Lagopus lagopus scoticus*) to support driven shooting (i.e., a technique whereby lines of people flush grouse toward waiting hunters), which is a major source of income for landowners and allows for the persistence of native moorland habitat. Redpath et al. (2004) used a novel approach to understand the motivations of conflict parties and to use that knowledge to foster greater understanding between groups. Despite obvious areas of shared interest and beliefs, these groups (hunters and landowners vs. animal welfare and environmentalists) remained entrenched in their fundamental beliefs, which prevented agreement even for solutions that would lead to the end of persecution (e.g., translocation of harriers to keep them at low densities on moors)—at least in the short-term. Consequently, Redpath et al. (2013) concluded that many, if not most, conservation conflicts cannot be resolved; they have to be managed.

During a question and answer session following a banquet talk on the Spotted Owl conflict that I gave at the International Festival of Owls (https://www.festivalofowls.com/), one person asked me a simple but important question that, frankly, befuddled me. Indeed, the question is at the root of so many misunderstandings about science that we have today. That question was, "How is a lay person to know what is true or not true?" I gave an inadequate response, but the question got me thinking about "how do we

know what we know?," which is the essence of epistemology. Probably everyone reading this knows that average citizens do not have the background or inclination to research conservation issues that are of concern to them—nor should they be expected to—because the answers are mostly found in the technical literature, and if these citizens are not inclined to support conservation, they are sure to view popular conservation-type magazines as biased. So that question reinforced what I already knew: in general, scientists and science educators have done an exceedingly poor job of educating the public. In fact, this deficiency is killing us in the eyes of the public because those people aligned against conservation are far more skilled than we are in communication and in creating the illusion of science when they peddle fake science (Olson 2018). How else could people continue to doubt that DDT was responsible for the decline of raptors and therefore lobby for a return to its use? Raptor biologists need to better communicate conservation issues to the public. This is essential to working successfully in conflict situations because I believe our role as educators and biologists is not to tell people *what to think* but instead to teach them *how to think* about the scientific or biological information we share. Below I humbly extend a few more recommendations for raptor biologists today.

Advice to Raptor Biologists Working in a Time of Political Uncertainty

Things to Consider in Your Raptor Work. From my vantage point of having worked for 40 yr in a challenging, conflict-ridden study system, I here offer some ideas and suggestions that I hope you will find useful when you are helping to manage a conservation conflict or just doing your job as a raptor biologist. First, try to consider honestly the perspectives of others, because failing to consider others will result in failure to achieve understanding. For example, something that I have used as a guiding principle in my career is: the resource always comes first! But is this not simply an extension of a broader worldview? It is for me at least. Biologists sometimes actually stimulate conflict, because they allow their personal passion to influence how they apply regulations. We biologists are obliged to execute laws or regulations in a fair and impartial way even if they conflict with our own passions. So I think honestly considering the perspectives of others and learning about them helps you develop a sense of empathy, which can lead to a greater willingness to seek compromises or solutions to problems.

Second, maintain your honesty and integrity at all costs, and as a corollary, protect yourself through documentation. Unfortunately, I believe we are witnessing the greatest hostility toward science since perhaps the dark ages. Much of this hostility is directed toward conservation efforts (e.g., requirements mandated under NEPA and ESA) because, for example, they can restrict people's ability to make money (greed) even though they may not affect economic well-being and community stability as was the case in some aspects of owl conservation. Despite all the laws public servants are supposed to obey and the legal underpinnings of public service, biologists are sometimes asked to change, falsify, or ignore relevant scientific information. This places those biologists in an extremely tenuous situation. I cannot recommend what anyone should do in any particular situation, except to seek advice either from private legal counsel (remember that the agency's legal counsel's first responsibility is to the agency) or your agency's ombudsman—someone who can provide explicit, relevant advice. My advice here is to protect yourself through documentation while maintaining your integrity. As a side benefit, perceived honesty and integrity are also great forms of communication to a skeptical public.

Third, expand your reach. As raptor biologists, we are often in a better position than other biologists to engage the public because we work with such charismatic species. But we should engage the public only by advocating for truth over ideology, which can be blinding as shown above. So assuming one operates truthfully and openly, I encourage you to do what you do best to achieve the best outcome for conservation of raptors. You should also use your talent—whether it is using social media, writing articles, or speaking to the public—to educate the public, but never in an ideological manner. Conversely, do not waste your time and talents on trivial nonsense. To expand our reach to engage the public, we must communicate more clearly and more effectively. But as a scientific profession we are not trained to engage the public. So I will tell you what I did when challenged by that astute listener at my banquet talk—I tried to increase my communication skills even though I have made verbal and written presentations for 50 yr. I read books, watched videos, and took courses on communication (e.g., Olson 2018, his workshop "Story Circles," and other online courses [I note that my citation of these does

not imply endorsement by the Raptor Research Foundation]). But I avoided those devoted to "science communication." "Why," you ask? I felt that if we scientists have been ineffective in our communication thus far, why would I want to seek advice about failed methods? My plenary talk and this paper were products not only of my experiences with the Spotted Owl conflict but also of my recent effort to improve my communication skills. Please note that nowhere in this paper (other than in the preceding lines) have I referred to "science communication." Instead I have used only the word "communication." This is because the principles of communication targeting the broadest audience are the same regardless of the subject (Olson 2018). Retraining yourself to improve your communication skills is difficult—at least it has been for me. But the rewards are great. Raptors need you to do this!

Finally, as raptor biologists we can use raptors as ambassadors for conservation and science, but we must expand that message to include the broader environmental problems that harm all wildlife and ecosystems. These charismatic species we love evoke an interest and passion among people for conservation, so we should use them to engage the public. There are going to be many more conflicts involving raptors and wildlife in the future. But though these conflicts are always difficult, often making us feel alone, we should always remember that we have each other to rely on for support and guidance through difficult times!

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The Spotted Owl conservation conflict has many dimensions, some of which have been exceedingly contentious. Although I encouraged readers to read the views of others to acquire broader understanding of all perspectives, any views, including mine expressed herein, about Spotted Owl conservation can elicit criticism. Thus, I requested this invited commentary to be peer-reviewed to ensure my comments were rational, defensible, and not inflammatory. I thank James Dwyer and James Bednarz for providing signed external reviews, and Editor-in-Chief Cheryl Dykstra for contributing editorial comments. All three provided excellent comments that improved an earlier version of this commentary. The views I expressed here are my own and do not necessarily reflect those of any other member of the Raptor Research Foundation.

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