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Trust in science: a critical review of the complex interactions between credibility and trust associated with conservation science

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The credibility enjoyed by natural science and scientists during most of the 20th Century has been challenged in the 21st Century. Philosophers of science have noted waning trust in science as an appropriate foundation for sociopolitical decisions. Conservation science literature explores credibility-trust relationships to understand how these interactions contribute to or detract from scientific legitimacy. We conducted a content analysis of professional literature to determine how credibility was framed in conservation science as it relates to trust. We discovered that the literature has limited recognition of credibility's multidimensionality and the emergent nature of credibility and trust. Both were framed as static entities, thereby restricting understanding that these constructs are co-created within each situation to create a set of expectations that, when met, increases message effectiveness and enhances trust. Scientists' credibility is an essential precursor (i.e., antecedent) to establishing trust. We suggest that conservation scientists could more effectively enhance their credibility through the recognition that it develops along the dimensions of expertise, goodwill, and honesty and that trust involves mutual vulnerability. Armed with a more nuanced understanding of credibility's multidimensionality and an increased understanding that credibility and trust interactions are sociopolitical processes, conservation scientists are enabled to deconstruct existing terminologies and reframe them in ways that better meet and fulfill stakeholders' expectations to enhance trust and mitigate its erosion.

KEYWORDS

communication, conservation science, content analysis, credibility, trust

1 Introduction

The credibility enjoyed by natural science and scientists during most of the 20th Century has been openly challenged in the 21st Century. Philosophers of science have noted the waning of trust in science as an appropriate foundation for socio-political decisions (Haack, 2012). This situation is amplified when scientific evidence needed to support personal decision-making and action is undermined by politicians, news media, and social media influencers' claims that scientific findings are conflicting and uncertain (Dobson, 2022). As the public vacillates on trusting science, their willingness to base their decisions on scientific evidence is further complicated when trust is eroded by scientists' actions such as failure to reveal funders

of their scientific research or to guard scientific work from personal and political biases (Lupia et al., 2024).

As ecological landscapes continue to shift and respond to these uncertain, complex, and sometimes controversial political and socioeconomic conditions, conservation scientists have struggled with navigating the relationship between scientific objectivity and political advocacy without damaging their scientific credibility (Horton et al., 2016). They practice a crisis discipline (Soulé, 1985, 1986) and “seek to preempt irreversible impacts on species, ecosystems, and social-ecological systems, requiring efficient and timely action even when data and understanding are unavailable, incomplete, dated, or biased (Burgman et al., 2023, 1). Therefore, these professionals must often act before they are certain in the sufficiency of their data because biodiversity is at risk and time is of the essence (Brussard and Tull, 2007; Soulé, 1986). This intensifies scientists’ concerns about whether their scientific credibility engenders trust from others’ (i.e., policymakers, agencies, natural resource managers, natural resource users, etc.) Given that trust is considered a “social lubricant” (Dasgupta, 2000, 64; Hamm et al., 2020) that influences interpretation of scientific information and facilitates relationships among scientists and others, these scientists increasingly seek guidance to better understand the credibility-trust relationship in their study of the natural world (Slagle et al., 2021).

In this article, we build on Horton et al. (2016) content analysis of scientific credibility-advocacy debate in conservation science literature, focusing on the complex interactions between credibility and trust. First, we discuss the nature and dynamics of credibility and trust. Second, we describe our methods. We then explain our results. Finally, we discuss what these results indicate as possible means whereby conservation scientists could enhance trust and mitigate its erosion by deconstructing existing terminologies and reframing them to better meet and fulfill stakeholders’ expectations.

2 Nature and dynamics of credibility and trust

Aristotle’s *Rhetoric* provided a systematic study of the credibility-trust relationship to examine how a communicator’s credibility could help build trust with listeners, thereby increasing listeners’ receptiveness of the message (Kennedy, 1991; Aristotle, 2013). Interactions between credibility and trust are complex. To better understand the credibility-trust relationship, we discuss how credibility and trust are subject to patterns of language or terminologies that reflect preexisting values and beliefs. These provide meaning to new experiences, which then modify those values and beliefs. This iterative process leads to expectations that people use to judge future messages or actions within any situational context and determine socially acceptable ways to represent and constitute reality (Burke, 1966; Peterson et al., 2013, 94). For example, recovery of the endangered Florida panther (*Puma concolor coryi*) depends upon habitat conservation on private rangelands. This requires cattlemen (i.e., relevant stakeholders) and scientists from U. S. Fish and Wildlife Service (USFWS) and Florida Wildlife and Fish Conservation Commission (FWC) to interact. If cattlemen hear contradictory scientific information or feel patronized by scientists when expressing concerns about panthers’ depredation, they are more likely to question the credibility of both organizations and are less likely to trust their claims. Based on these interactions, cattlemen will judge the social

acceptability of the scientists’ future actions, which may limit their willingness to cooperate with future practices and programs instituted by either agency (Pienaar et al., 2015).

2.1 Credibility

Aristotle described credibility as emerging from the dimensions of expertise, goodwill, and trustworthiness (Kennedy, 1999; Aristotle, 2013). Expertise is typically embodied in credentials or special skills obtained from education or training and refers to specialized knowledge a person possesses on a subject. Goodwill describes caring for others’ welfare. It is often demonstrated by empathy developed by direct interaction with others. Trustworthiness [hereafter honesty] refers to the person’s honesty; a trustworthy person is unbiased and demonstrates integrity.

Credibility is more of a relational property than a static entity (Rhee and Fiss, 2014), attaining relative stability only when it functions as an “attitude toward a source of communication held at a given time by a receiver” (McCroskey, 2015, 87). The most productive credibility emerges from situationally appropriate combination of expertise, goodwill, and honesty (Burke, 1966; Kennedy, 1999; Aristotle, 2013). Building upon the earlier Florida panther (*Puma concolor coryi*) example, scientists’ expertise (i.e., PhD, publication record, etc.) may be less important to their credibility than demonstrating honesty and goodwill. Inclusion of cattle producers early in the decision-making process affords scientists opportunity to (a) demonstrate honesty through open and transparent discussions and (b) validate cattle producers’ views by incorporating those perspectives into recovery management plans, thereby demonstrating goodwill (Pienaar et al., 2015). In other situations, such as determining whether to list a species as endangered, scientists’ expertise and impeccable credentials may be the most important factors in credibility.

Credibility is often associated with perceptions of a person’s character. However, it does not exist within an individual or an organization; instead it is co-constructed (Moon and Blackman, 2014). Thus, credibility, in all its dimensionality, may be interpreted differently, depending on who is participating in the communicative event (Horton et al., 2016). As a perceptual construct, credibility is based on social relations and is co-constructed within each situation, which creates a set of expectations. For example, when ranchers are told they cannot trap or kill wolves to minimize livestock predation, much of their anger comes from their expectations about private property rights being violated (Niemiec et al., 2020; Pate et al., 1996). For these reasons, decisions about which credibility dimension or dimensions is most effective in preventing the violation of expectations requires careful assessment of each situation (Pornpitakpan, 2004; Cronkhite and Liska, 1976). What is generalizable across situations is that participant expectations vary according to cultural, economic, and political aspects of a situation and the credibility that participants attribute to an individual or organization emerges largely from whether their expectations are fulfilled (Burke, 1966; Cronkhite and Liska, 1976; Horton et al., 2016).

2.2 Trust

Similar to credibility, trust is more of a relational property than a static entity (Hardin, 2001). Simply stated, trust involves a jointly

constructed, “tripartite relationship” (Rapp, 2020, 2; Mayer et al., 1995) that involves a trustor (A), the one who is trusting; a trustee (B), the one who is being trusted; and a context in which the relationship between A and B occurs. Changes in the trustor, trustee, or the context, fundamentally changes the trust at issue. Therefore, trust is often “understood to be specific to not only the individuals involved but also to the specific context in which their relationship is situated” (Hamm et al., 2020, 2; Hardin, 2001; Slagle et al., 2021).

For trust to be pertinent, a perceived or real interdependent relationship exists between trustors and trustees. They depend on each other for a desired outcome since neither can achieve it on their own. This interdependence causes degrees of uncertainty about the outcomes thereby, creating some risk about whether the interests of the trustors and trustees will be realized. Interdependency combined with uncertainty create vulnerability. Thus, the “degree of trust held by a trustor is determined by their assessment regarding their willingness to accept the vulnerability that may result from the trustee’s actions” (Toman et al., 2021, 2). For example, ranchers’ trust of the U. S. Fish and Wildlife Service (USFWS) may be influenced by their concerns about how the Endangered Species Act (ESA) and ESA-listed species impact land use and their potential income. These ranchers may hesitate to trust USFWS scientists or agency’s programs that designate their pastureland as critical habitat for the endangered species, Golden-cheeked warbler (*Setophaga chrysoparia*) and restrict them from implementing land management practices for cattle grazing (Peterson and Horton, 1995).

Stern and Coleman (2015) explain that aspects of trustors, trustees, and specific contexts contribute to different forms of trust (i.e., dispositional, rational, affinitive, and procedural). Dispositional trust is based on trustors’ characteristics. It is a person’s tendency to trust and serves as a foundation to establish initial levels of trust in uncertain situations. Rational and affinitive trust are based on assessments of the trustee. Rational trust is grounded in predicted trustees’ behavior and the expected utility of trusting them. Affinitive trust is grounded in the perceived shared values, benevolence, and integrity of the trustee. Procedural trust is based on the “system” and is grounded in beliefs of fair, transparent, and legitimate rules and procedures. These forms highlight the importance of how participants’ expectations and fulfillment of those expectations vary according to cultural, economic, and political aspects of a situation.

The emergence of trust is influenced by nuances of trustors, trustees, and context aspects. Trustors’ characteristics include their predisposition to trust, degrees of tolerance for uncertainty and risks (i.e., vulnerability), and saliency of specific issues (Stern and Coleman, 2015). Trustors’ perceptions of trustees’ characteristics (i.e., antecedents) contribute to the emergence of trust. Conservation science scholars have offered varied and different antecedents to explain how trust emerges. Stern and Coleman (2015) and Toman et al. (2021) note trustees’ honesty is important to trustors. Hamm et al. (2020) focus on honesty and motivation. Ford et al. (2020) offer seven antecedents (reputation, communication, service quality, shared norms and values, negative past behaviors, fairness, and cooperation/support) to examine the connections between antecedents and trust. Antecedents are impactful, determining factors on trustors’ perceptions that others are worthy of their trust. Additionally, context characteristics potentially influence the emergence of trust. Context factors such as preconceived ideas or previous history with trustees and “control systems” (i.e., rules, regulations, and procedures),

influence how trust relationships function in specific contexts (Stern and Coleman, 2015). For example, conservation scientists had to re-build trust with *tortugueros* in El Salvador communities known for nesting sites of Hawksbill turtles (*Eretmochelys imbricata*), after the Government of El Salvador declared a permanent moratorium on the collection of sea turtle eggs. The untimely absence of the lead scientist, who had developed positive relationships with *tortugueros*, coupled with the public announcement of the moratorium, led some locals to believe that scientists had betrayed their trust regarding locals’ opinions about sensitive topics of sea turtle egg consumption and conservation policies (Liles et al., 2015).

3 Methods

3.1 Data collection

To examine how conservation scientists define credibility and trust, explain its emergence, and acknowledge benefits and risks associated with the credibility-trust relationship, we searched for refereed journal articles that focused on credibility-trust relationships contributing to or detracting from scientific legitimacy. One co-author used the Web of Science for an initial search of journal articles that discussed the credibility-trust relationship and its significance in conservation science. The initial search terms included: credible, credibility, scientific credibility, trust, distrust, conservation, and conservation science. This search resulted in 25 articles. The co-author read each one to remove those articles irrelevant to the discussion of trust and credibility interactions with scientific legitimacy. This process yielded 9 articles. Next, the co-author read each of these articles closely (Leff, 1980) to identify other key terms to guide an expanded search. Six additional search terms were chosen: ecosystems, marine biodiversity, wetlands, biodiversity, species, fisheries. Two co-authors used the terms to search Google Scholar, Web of Science, and Wiley Online Library and found 83 articles. Duplicate articles from the initial search were eliminated. Both co-authors examined titles, keywords, and abstracts of the remaining articles for two or more of the search terms. The introductory or concluding paragraph was used if the publication did not have keywords or an abstract. The co-authors eliminated articles that did not (1) specifically discuss both credibility and trust and (2) focus on protection and management of biodiversity and ecosystems with emphasis on scientific method and conservation. The third co-author functioned as a tiebreaker. Overall, this process resulted in a total of 31 publications.

A grounded theory approach (Corbin and Strauss, 2014) guided our content analysis of the conservation science literature. This approach enables the theoretical framework to develop from the data (Peterson et al., 2010). We built on Horton et al. (2016) analysis of scientists’ perspectives on credibility and advocacy. Categories emerged by identifying common themes (Peterson et al., 2010; Peterson and Silvy, 1994) across the conservation science literature that embodied the concepts used to examine credibility-trust relationship’s role in the protection and management of biodiversity and ecosystems. We used constant comparison (Corbin and Strauss, 2014) between preexisting and emerging categories. We raised questions regarding formulation of categories, documented and analyzed ideas about categories as they were refined. We reached saturation (no new categories emerged) after two categories and seven

subcategories. The two categories included: credibility and risk. The credibility category was divided into 3 subcategories to capture the dimensions of expertise, goodwill, and honesty. The risk category embodied what conservation scientists are most worried about. We divided this category into four subcategories: Two subcategories captured scientists' concerns about biodiversity and sustainability (i.e., ecological and conservation concerns), and two subcategories captured scientists' concerns about scientific credibility and trust (i.e., co-constructed relational properties) (Table 1).

3.2 Data analysis

Our methods and results were iteratively linked (Corbin and Strauss, 2014). Each category and subcategory that emerged during the analysis refined already existing categories. When credibility was discussed, we examined the sentence to determine the relative emphasis on expertise, goodwill, and honesty. When the authors explicitly discussed trust, we examined the sentence to determine the relative emphasis on vulnerability. A codebook was developed to define categories and subcategories. It was used to train coders and assess intercoder reliability (Krippendorff, 2018). We entered the publications' abstracts into NVivo 15.0 qualitative software (Lumivero, Denver, Colorado, USA) to create a searchable database and to analyze abstracts' content. Our unit of analysis was individual sentences. The same sentence was coded in multiple categories if it fit more than one category. For example the sentence, "Effective conservation of aquatic resources can be undermined by distrust and disagreement between resource users, scientists, agencies, and even among academicians..." (Sallenave and Cowley, 2006, 203) can be coded credibility-honesty, risk-sustainability, risk-scientific credibility, and risk-trust. Two people independently coded abstracts to establish intercoder reliability (ICR). ICR was calculated with a weighted Cohen's kappa, $\kappa = 0.89$ (Cohen, 1968). We used the database to conduct a word

TABLE 1 Categories and sub-categories used for content analysis of conservation science publications ($n = 31$) discussing credibility-trust relationship's role in the protection and management of biodiversity and ecosystems.

Category	Subcategory	Definition
Credibility	Expertise	Conservation scientists' specialized knowledge
	Goodwill	Conservation scientists' care for natural resources and society
	Honesty	Conservation scientists' integrity
Risk	Biodiversity	All aspects of variety in the living world
	Sustainability	Ecosystems and their functions
	Scientific credibility	Conservation scientists' believability and standing
	Trust	Vulnerability (uncertainty and interdependency)

search to discover the frequent use of the terms, credibility, and trust, in the professional literature and to run queries to determine the frequency at which authors discussed dimensions of credibility and various risks. We then cross-referenced codes to examine intersections of themes.

4 Results

All of our findings related in some way to the role of credibility and trust enhancing or detracting from scientific legitimacy. When authors discussed credibility, 74% of the texts evaluated, on average ($n = 31$ publications) addressed two or three dimensions (48 and 26% respectively); the remaining 26% of the evaluated texts addressed one dimension. When authors discussed risks, 55% of the texts evaluated, on average ($n = 31$ publications) addressed three or four risks (42 and 13% respectively) and 45% of the evaluated texts addressed one to two risks (10 and 35% respectively). The terms "credibility" and "trust" were used in the texts, 44 and 42 times, respectively.

4.1 Credibility and trust

Of the three subcategories, most often emphasized was credibility-expertise, followed by credibility-honesty and credibility-goodwill. Fifty percent (50%) of the references describing credibility focused on scientists' specialized knowledge (credibility-expertise). References describing credibility as scientists' integrity (credibility-honesty) and care for natural resources (credibility-goodwill) were 36 and 14%, respectively.

Authors referenced the value of conservation scientists' specialized knowledge as a means to enhance credibility through expertise (credibility-expertise) (Table 1). Examples include, "principles of science should be introduced early in the decision-making process" (Sallenave and Cowley, 2006, 203) and "use tested methods that can withstand public scrutiny" (Freddy et al., 2004, 916) illustrate this sentiment. Recommendations that conservation scientists should care for natural resources and society indicates importance of credibility as it relates to goodwill (credibility-goodwill). For example, "efforts should be made to build social capital and trust by engaging influential cattlemen in pather conservation actions" (Pienaar et al., 2015, 577). Authors sometimes refer to conservation scientists' credibility as it relates to integrity (credibility-honesty) as illustrated in the statement, "trust due to transparency will be one the main factors that determines the success of IPBES (Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services)" (Vohland et al., 2011, 1188).

When authors made statements about trust, the term was usually paired with credibility. For example, "collaborative processes can change the ways decision makers think about scientific evidence, enhance mutual trust and credibility..." (Rudd et al., 2011, 477) and "trust and credibility are identified as driving informant views of resource protection policy." This pairing seems to suggest that the existence of one guarantees the presence of the other. When trust was not paired with credibility, the term was typically treated as an entity. Authors noted the importance of "building trust" (Schindler et al., 2016; Tinch et al., 2018) or were concerned about "eroded trust" (Campos et al., 2023), "absence of trust" (Baker and Constant, 2020), and "lack of trust" (Glenn et al., 2012).

4.2 Risks

Authors discussed various risks associated with the credibility-trust relationship (Table 1). Risk to scientific credibility was emphasized the most (60%), followed by risk to trust (18%), risk to sustainability (15%), and risk to biodiversity (7%).

Statements referring to conservation scientists' loss of standing or believability demonstrate awareness of risks to scientific credibility (risk-scientific credibility). For example, the statement "At a time when society appears mistrustful of science, it is critical to understand how scientific credibility is evaluated" (Runnebaum et al., 2019, 163). Authors' statements referring to vulnerability demonstrate awareness of threats to trust (risk-trust). For example, "Unfortunately the 'trust' necessary for effective stakeholder cooperation and participation within current fisheries science is currently somewhat lacking" (Glenn et al., 2012, 54). The phrase, "These unique ecosystems are vulnerable to multiple stressors" (Hart and Calhoun, 2010, 258) exemplifies conservation scientists' concern for sustainability of ecosystems functions (risk-sustainability). Finally, the phrase "accelerated loss of biodiversity" (Vohland et al., 2011, 1188) indicates an emphasis on risk to biodiversity (risk-biodiversity).

4.3 Interconnections between categories

When authors discussed credibility and risks, there were identifiable interconnections between dimensions of credibility and risks they emphasized (Table 2). First, we discuss the interconnections between dimensions of credibility and risks to scientific credibility, sustainability, and biodiversity. Second, we discuss the interconnections between dimensions of credibility and risk to trust.

Among authors who emphasized credibility as expertise (credibility-expertise), most (67%) expressed concern about risk to their scientific credibility (risk-scientific credibility). Many (24%) expressed concern that their loss of standing would impact ecosystems and their functions (risk-sustainability). The statement, "Scientists often feel powerless to affect policy on natural resource conservation [aquatic resources]" (Sallenave and Cowley, 2006, 203) illustrates this concern. Although risk-biodiversity was referenced less frequently (9%), the statement "Sportsmen challenged the credibility of methods used to estimate numbers of mule deer (*Odocoileus hemionus*) in Colorado" (Freddy et al., 2004, 916) illustrates that scientific expertise, when questioned could impact biodiversity. Authors who emphasized concern for society and natural resources (credibility-goodwill) also emphasized (89%) risk to their scientific credibility (risk-scientific credibility). Some (11%) directly connected scientists' standing with

ecosystem survival (risk-sustainability). For example, "ensuring the survival of native species in the valley rested on [biologists'] ability to catalyze institutional relationships that were compatible with their scientific practice" (Goldstein, 2010, 268). Finally, authors who discussed credibility as integrity (credibility-honesty), also tended (78%) to emphasize risk to their scientific credibility (risk-scientific credibility). Some (11%) worried that loss of scientists' believability would negatively impact ecosystem functions (risk-sustainability). The statement, "effective conservation of aquatic resources can be undermined by distrust and disagreement between resource users, scientists" (Sallenave and Cowley, 2006, 203) illustrates this concern. They (11%) also expressed concern that loss of scientists' standing could increase the risk of biodiversity loss (risk-biodiversity). For example, one study that focused on "risks associated with relying solely on images for documenting new species records" cautioned that this practice could encourage oversimplification that would encourage novices to mistrust more nuanced descriptions proffered by conservation scientists (Campos et al., 2023, 135).

As noted in Section 2 (Nature and Dynamics of Credibility and Trust), credibility is an essential, yet always fluid, precondition for trust. Further, accepting the vulnerability associated with trusting another individual or group likely strengthens the powerful relationship between credibility and trust. Thus, the degree of trust held by trustors is determined by their willingness to accept the vulnerability that may result from trustees' actions. When authors discussed credibility and vulnerability (risk-trust), credibility-honesty (60%) was emphasized. The statement that, "trust due to transparency will be one the main factors that determines the success of IPBES (Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services)" (Vohland et al., 2011, 1,188) demonstrates the belief that trust in conservation scientists' honesty is fundamental to successful conservation policy. Some articles explicitly mention the value of conservation scientists' expertise, or specialized knowledge (24%) in enhancing credibility, and building trust. For example, the statement "these challenges are exacerbated by the scientific community's capacity [or inability] to consistently distinguish between reliable and unreliable evidence..., which may threaten the credibility of research, including harming trust" (Burgman et al., 2023, 1) illustrates that trust in conservation science also depends on scientists' perceived expertise and scientific rigor. Finally, other statements highlight the importance of conservation scientists' demonstrated goodwill toward both natural resources and human society (16%) as a means of enhancing credibility and, encouraging trust. The statement, "efforts should be made to build social capital and trust by *engaging influential cattlemen in panther conservation actions* [italics added], thereby lending credibility to conservation initiatives" (Pienaar et al., 2015, 577) demonstrates that trust is influenced by conservation scientists' concern for both the well being of people and species whose existence depends on their choices.

TABLE 2 Interconnections between credibility and risks.

Risks	Credibility		
	Expertise	Goodwill	Honesty
Scientific credibility	67%	89%	78%
Sustainability	24%	11%	11%
Biodiversity	9%	0%	11%
Trust	24%	16%	60%

5 Discussion

We found similarities in conservation literature's treatment of credibility and trust. First, the literature provides no clear definition of credibility or trust. Some authors offer pairings of the term credibility, such as *scientific credibility* (Schindler et al., 2016, 1315; Tinch et al., 2018, 1690) or *competence credibility* or *safety credibility*

(Goggin et al., 2019, 224). Trust was described as *social trust* (Johansson et al., 2017, 284). Occasionally, the literature defines both terms. Brauman et al. (2022, 135) defines credibility as “quality of information.” Trust is defined as “a position of vulnerability” (Tinch et al., 2018, 1694) or “willingness to rely on those who are formally responsible for developing policies and taking measures” (Johansson et al., 2017, 284). However as noted in the Introduction, these terms and definitions are incomplete characterizations of credibility and trust. Although some credibility research uses a two-dimensional model of credibility that combines honesty and goodwill into a single item for measurement purposes (Rieh and Danielson, 2007), the distinction between the two dimensions is important when considering credibility in conservation science. In some cases, a scientist’s perceived honesty may be the primary contributor to her or his credibility, however, in other situations it may be far more important to demonstrate that the scientist cares about human welfare as well as biodiversity (Horton et al., 2016). Additionally, credibility-trust interactions are grounded in people’s expectations that shift based on situational aspects such as political, cultural, and economic concerns. Participants’ decision to trust an individual or organization emerges largely from whether their expectations about the participants and the situation are fulfilled (Toman et al., 2021).

Similar to findings in Horton et al. (2016) analysis of credibility-advocacy in conservation literature, we found the literature we analyzed for credibility-trust does not present a multidimensional picture of credibility as a social construct. These publications demonstrated a lack of awareness that credibility develops along the dimensions of expertise, goodwill, and honesty described by Aristotle (Aristotle, 2013; Kennedy, 1999) and further studied by contemporary social scientists (Rhee and Fiss, 2014; McCroskey and Teven, 1999; Mikkelsen et al., 2024). These dimensions are either absent or listed as entities that exist separately from credibility (e.g., Brauman et al., 2022). We suggest that conservation scientists could more effectively enhance their credibility by emphasizing appropriate combinations of these dimensions in response to situational demands. For example, when discussing potential changes in the legal status of the critically endangered Texas Blind Salamander (*Eurycea rathbuni*) with decision makers, conservation scientists would most likely need to emphasize their expertise. However, they should also recognize and respond to situations that call for a different combination of the dimensions. For example, if conservation professionals are interacting with ranchers concerned about a wolf reintroduction program in their county, conservation scientists should consider demonstrating goodwill and honesty with less emphasis on expertise, as they address ranchers’ concerns about potential threats to their livestock.

Additionally, these professional publications typically represent credibility as a static entity, rather than a social construct that depends on real and sometimes tenuous social relationships (Burke, 1966; Kennedy, 1999; Aristotle, 2013). Conservation scientists can improve their ability to discover the most important dimensions of credibility in each situation if they remember that people understand the world through preexisting values and beliefs. These provide meaning to new experiences, which then modify those values and beliefs. This iterative process leads to expectations that people use to judge any message, action, or policy that influence credibility in any sociopolitical context (Horton et al., 2016). For example, if butterflies have been involved in successful citizen-science Monarch (*Danaus plexippus*) projects, they tend to expect goodwill from conservation scientists, thus

allowing scientists to concentrate on demonstrating their honesty and expertise. Because credibility is a perceptual construct, conservation scientists only exercise partial control over credibility. They can increase their credibility by engaging with stakeholders to determine what it means to be credible, striving to achieve that credibility, and then behaving as credibly as possible based on the demands of each situation (Horton et al., 2016).

This somewhat simplistic and unidimensional framing of credibility in the conservation literature limits the value of advice about credibility and trust relationships. Recognizing the multidimensionality of credibility and the voluntary vulnerability central to trust can aid conservation scientists to make appropriate choices about which dimensions of credibility to emphasize when striving to enhance trust. Scientists’ credibility is an essential precursor (i.e., antecedent) to establishing trust. When conservation scientists decide to emphasize honesty, they must behave in ways that lead stakeholders to believe in scientists’ integrity. Let us return to the example of damaged trust among conservation scientists and *tortugueros* in Salvadoran communities. The lead conservation scientist’s transparency about his absence (i.e., in the United States for an education program) and lack of advance knowledge regarding the moratorium encouraged the locals to work with him again because he fulfilled their expectations of what it meant to be honest or reaffirmed their judgments about his integrity. This was the basis upon which trust began to be rebuilt among the scientist and local residents.

We also suggest that conservation scientists should consider multiple possibilities for combining credibility dimensions to navigate the mutual vulnerability of situational demands. We return to the example of conservation scientists and ranchers whose private land holdings include Golden-cheeked warbler (*Setophaga chrysoparia*) habitat. Conservation scientists should recognize the fluidity of credibility dimensions in this potentially contentious situation. They could use this recognition to guide their conversations about the potential of ranchers’ land being designated as critical habitat for the endangered warbler. To foster the emergence of trust, scientists could effectively use a combination of expertise, goodwill, and honesty. For example, conservation scientists could downplay their expertise to signal respect for ranchers’ local experiential knowledge; demonstrate goodwill by incorporating stakeholders’ views into management plans; and being honest that there may be real value differences between the scientists and ranchers when it comes to the development of management plans. As conservation scientists emphasize the combination of these dimensions, they have behaved in such a way that stakeholders’ expectations have been pleasantly, and perhaps unexpectedly, fulfilled. This increases the likelihood that stakeholders grant credibility to scientists thus, paving the way for the emergence of trust. This process is especially important if the ranchers are feeling nervous about potential inroads into their property rights (Peterson and Horton, 1995). Recognizing that credibility develops along the dimensions of expertise, goodwill, and honesty and trust involves mutual vulnerability further enhances conservation scientists’ perspectives on how to deal with various risks. For example, although conservation scientists are alarmed about risks to sustainability and biodiversity, these concerns are surpassed by concern with risks to their professional credibility. This more

nuanced understanding of credibility would provide a means for their assessment of which dimensions of credibility are most important in each situation to encourage the emergence of trust so that they may concentrate more of their attention to lessening the loss of biodiversity and sustainability as was illustrated in examples provided earlier in the discussion.

Our analysis offers insight on ways conservation scientists can manage the conundrum of credibility and trust interactions. Conservation science is more than a material reality. Its “crisis” existence depends on symbolic realities that emerge and reemerge from socially constructed values (Moon and Blackman, 2014; Naess, 1986; Soulé, 1986). A more nuanced understanding of credibility’s multidimensionality and an increased awareness of the sociopolitical processes that inform interactions between credibility and trust, may enable conservation scientists to deconstruct existing terminologies and then reframe them in ways that better meet and fulfill stakeholders’ expectations to enhance trust and mitigate its erosion.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

CH: Writing – review & editing, Writing – original draft. RL: Methodology, Software, Writing – original draft, Writing – review & editing. TP: Writing – original draft, Writing – review & editing.

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