

"This is the peer reviewed version of the following article: [Conserv Biol, 2019], which has been published in final form at [<https://onlinelibrary.wiley.com/doi/abs/10.1111/cobi.13298>] This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Self-Archiving

Cautioning against overemphasis of normative constructs in conservation decision making

Esty Yanco,^{1*} Michael Paul Nelson,² and Daniel Ramp¹

¹Centre for Compassionate Conservation, University of Technology Sydney, PO Box 123, Ultimo, NSW 2007, Australia

²Department of Forest Ecosystems and Society, Oregon State University, 321 Richardson Hall, Corvallis, OR 97331, U.S.A.

Article Impact Statement: Reducing the overemphasis of normative constructs in argument construction can improve ethical decision-making and reduce conflict.

Running Head: Normative constructs

Keywords: conservation ethics, social norms, argument analysis, tragedy, Pelorus Island, *Canis dingo*, *Capra aegagrus hircus*

*email esty.yanco@student.uts.edu.au

Abstract

Questions around how to conserve nature are increasingly leading to dissonance in conservation planning and action. While science can assist in unraveling the nature of conservation challenges, conservation responses rely heavily on normative positions and constructs to order actions, aid interpretations, and provide motivation. However, problems can arise when norms are mistaken for science or when they stymie scientific rigor. To highlight these potential pitfalls, we utilized the ethics-based tool of argument analysis to assess a controversial conservation intervention, the Pelorus Island Goat Control Program. We found that the program proponents' argument for restorative justice was unsound because it relied upon weak logical construction overly entrenched in normative assumptions. Overreliance on normative constructs, particularly the invocation of *tragedy*, creates a sense of urgency that can subvert scientific and ethical integrity, obscure values and assumptions, and increase the propensity for flawed logic. This example demonstrates how the same constructs that drive biodiversity conservation can also drive poor decision-making, spur public backlash, and justify poor animal welfare outcomes. To provide clarity, we present a decision making flowchart to demonstrate how values, norms, and ethics influence one another and recommend practitioners follow three key checkpoints to improve decision making: be aware of values, as well as the normative constructs and ethical theories that those values inform; be mindful of overreliance on either normative constructs or ethics when deciding action is justified; and be logically sound and transparent when building justifications. We also recommend five key attributes that practitioners should be attentive to when making conservation decisions: clarity, transparency, scientific integrity, adaptiveness, and compassion. Greater attention to the role of norms in decision-making will improve conservation outcomes and garner greater public support for actions.

Introduction

Questions of how to engage with nature and rectify human global impacts continue to inundate the conservation community. Urgent action is needed in the face of unprecedented wildlife species extinction rates and population declines (Bellard et al. 2012; WWF 2016). The rapid and far-reaching changes taking place – driven by a multitude of processes and threats – continue to overwhelm policy makers, conservation practitioners, and the general public, leading to dissonance and confusion. Conservationists agree that action ought to be taken to conserve biodiversity, but how that should be achieved remains divisive.

While empirical information (e.g., scientific evidence, observation) can assist in unraveling global environmental changes, it cannot advise on how conservationists ought to respond. Instead, conservation decision-makers, both those in policy and those responsible for designing and implementing science-based intervention, rely on social norms (i.e., societal values, expectations, and codes of conduct) to help garner a clear conservation mandate and develop ethical conservation practices (Chew & Laubichler 2003; Lapinski & Rimal 2005; Manfredo et al. 2017; Batavia et al. 2019). These social norms are often communicated using terms that are amenable to socially constructed interpretations (Proctor 1998), also known as normative constructs. The definition and declaration of normative constructs are open to interpretation and guided by the values of decision-makers and the cultural context (Chew & Laubichler 2003; Lapinski & Rimal 2005; Estevez et al. 2014). Generally speaking, normative constructs have 3 components: a factual definition (e.g., pest: “a plant or animal detrimental to human concerns” [Merriam-Webster Dictionary 2019]); the socially constructed judgment of what fits that definition (e.g., Is this animal a pest? When? To whom?); and an implicit value statement or justification for action (e.g., pests ought to be removed) (Proctor 1998). Both social norms and

normative constructs serve as heuristics in decision-making processes, and are therefore fundamental to motivating practitioners and assisting in the prioritization of scarce resources (Lapinski & Rimal 2005). More importantly, in the conservation decision-making model we described in this study (Fig. 1), normative constructs are critical for interpreting available empirical information (i.e., normative interpretations) and initiating a call to action. Exactly how one ought to act, however, is informed by the ethical theories (e.g., deontology, consequentialism) held by the decision-makers themselves (Estevez et al. 2014). Combined, norms and ethics are important drivers of decision-making. The challenge is to be cognizant of the power of norms and ethical theories in the decision-making process.

The last few years have witnessed increasing criticism of the lack of, or selective use of, scientific evidence and strong logic to support conservation policy (Treves 2009; Vucetich & Nelson 2012; Artelle et al. 2014; Bergstrom et al. 2014). Conservation programs that violate basic principles of logic or disregard scientific evidence are commonplace and often spur public, scientific, and political controversy. Recent topical examples include Canadian wildlife agencies manipulating scientific statements against grizzly bear (*Ursus arctos horribilis*) hunting to support new hunting seasons (Artelle et al. 2014) and government officials ignoring peer-reviewed evidence that badger (*Meles meles*) culling is an ineffective method for long-term reduction of bovine tuberculosis (Jenkins et al. 2010). In such cases, evidence suggests that the normative constructs, hidden assumptions, and ideological beliefs that shape social and political agendas are overly influencing the decision-makers' reasoning (Heeren et al. 2017) to the extent that fundamentals of logic are circumvented.

We explored this worrying trend by examining how the overemphasis of the reason for acting (i.e., normative constructs) might be disrupting and delegitimizing decision-making processes.

By characterizing the relationships between values, norms, empirical evidence, and ethics in decision-making (as depicted in Fig. 1), we postulated that the overemphasis of norms may generate three primary concerns: that the acquisition of knowledge may not be pursued, either because it is deemed unnecessary or because the normative interpretations are misconstrued as empirical evidence; that clear interpretations of and adherence to ethical theories may become obfuscated; and that arguments for intervention may be increasingly susceptible to failures in logic (Chew & Laubichler 2003). Failure to acquire proper empirical evidence to support interventions can make program evaluation difficult and justifications difficult to convey (e.g., Walsh et al. 2012; Bergstrom et al. 2014). Irrespective of the support for the underlying normative positions, universal community and scientific support can be withdrawn if there is a perception of insufficient ethical consideration or transparency (Miller et al. 2011; Robinson 2011; Ramp et al. 2013; Ban et al. 2013). More problematically, decision-makers may mistakenly rely on interpretation of social norms to retroactively justify interventions, rather than articulating logical arguments supported by strong evidence and being explicit about values and assumptions.

To work through how these pitfalls manifest in contemporary conservation decision-making, we performed an ethics-based analysis of a recent topical example that attracted considerable international debate. While this example is not reflective of all conservation decisions that attract negative debate, we selected it because it clearly highlights a situation where there was a strong emphasis of normative constructs in the decision-making process. Our case study originated on Pelorus Island, Queensland, Australia, where a management plan conceived by the local council and conservation scientists was eventually abandoned after international outcry and state government intervention. We suggest that the methods proposed, and subsequently partially

taken, transgressed most rational and ethical considerations and had little support despite having goals that align with a mainstream conservation agenda, namely the removal of introduced species.

To explore our case study, we employed the ethics-based tool of argument analysis, which evaluates the degree to which decision-making adheres to the rules of informal logic and adequate transparency (Hughes et al. 2010; Vucetich & Nelson 2012). This method breaks down an argument into its two basic components – premises and conclusions – and evaluates each premise for truth and examines the construction of the argument for valid logic (a detailed introduction to argument construction and argument analysis is available in Supporting Information). This process tests whether decisions are underpinned by arguments that are clear, consistent, and sound and sheds light on the way normative constructs intersect with values and ethical positions to shape those decisions (Vucetich & Nelson 2012). We applied argument analysis to the Pelorus Island narrative as a case study for describing the importance of moral attentiveness, for detailing strategies to earn the confidence of both scientists and lay stakeholders, and for analyzing the fundamental drivers of contentious conservation decision-making. We used this process to inform a conservation decision-making toolkit, complete with a decision-making conceptual model, checkpoints, and recommendations, that we believe will help practitioners and policy makers construct robust and transparent conservation programs and prevent discord in future conservation planning.

Pelorus Island Goat Control Program

Pelorus Island lies off the coast of northern Queensland approximately 85 km north of Townsville. Dominated by littoral rainforest, the small island (~4 km²) belongs to a group of rare ecosystems with $\geq 70\%$ closed canopy cover and within 2 km of the coast (DECC 2008, Schwartz

2016a). In July 2016, elected officials from the Hinchinbrook Shire council commenced the Pelorus Island Goat Control Program (PIGCP), designed to eradicate ~300 goats (*Capra aegagrus hircus*) from the island (Cripps 2016). The goats were introduced to the island over 200 years ago as a food source for lighthouse keepers and shipwrecked sailors. Scientific evidence justifying the need to intervene is not publicly available, but the Hinchinbrook Shire council deemed removal of the goats was necessary because their presence was purportedly linked to undesirable ecological states that cause increased runoff and soil erosion (Schwartz 2016a).

The intervention planned to trap four wild male dingoes (*Canis dingo*) on the Australian mainland, castrate and vaccinate them, attach GPS collars, and then introduce them to the island to predate on the goats (Schwartz 2016a; Cripps 2016). After two years, the dingoes would be lethally shot to prevent them from predated upon other fauna. As a precaution, however, each dingo would be implanted with lethal 1080 (sodium fluoroacetate) poison capsules that would dissolve and kill them after two years if shooting proved too difficult (Schwartz 2016a; Cripps 2016). This program was approved by the Queensland Animal Ethics committee and was partially funded by the Australian Academy of Science (Townsville Bulletin 2016; Australian Academy of Science 2017). The PIGCP was intended as a test case and, if successful, would be expanded to other islands inhabited by goats (Schwartz 2016a). The program commenced in July 2016 with the release of two poison-laced dingoes.

Publicity of the intervention on *ABC Landline* prompted swift condemnation from the Royal Society for the Prevention of Cruelty to Animals (RSPCA). Likewise, the general public communicated opposition in social media posts and an online international petition that garnered nearly 200,000 signatures in protest. Positions denouncing the project cited unjustifiable consequences such as the welfare of the goats, the poisoning of the dingoes, and the potential

harm to small native animals (Schwartz 2016b; Goldman 2016; Miles 2016). Responding to the public backlash, the Queensland Minister of Environment intervened to halt the program with an Interim Conservation Order on the grounds that it endangered a threatened shore bird (Goldman 2016; Schwartz 2016b; Miles 2016).

Methods

Using argument analysis, we identified the major arguments articulated by both proponents and objectors and evaluated key reasoning and justifications. We then selected a central argument articulated by proponents and examined the premises and conclusion that compose the argument. Finally, we assessed the argument for its dependency on scientific evidence and normative constructs to understand how the decision to intervene and the actions taken were justified.

Stakeholder Reason Statements

We reviewed available newspaper articles, television programs, social media posts, press releases, and communication plans published over the seven months following the public announcement of the PIGCP in July 2016. We identified key stakeholders and collated statements made by each as pertains to the PIGCP (Table 1). We classified statements according to support or disapproval for the PIGCP and extracted reasons from these statements, which were sorted into a reason table (Table 2). The reasons provided are inferred from public statements and the PIGCP itself and are therefore not exhaustive. We assumed that primary reasons for implementing the PIGCP were publically stated, but it is possible a fundamental reason was withheld. From this table, we selected what we inferred was a central reason for supporting the implementation of the PIGCP to examine further.

The underlying motivation of conservation programs, such as the PIGCP, is to enable nature to flourish by preventing or reversing outcomes that inhibit progress. This concept largely reflects the widely accepted moral obligation to restorative justice, or repairing harm or damage we have caused. We examined the use of restorative justice as an argument supporting the implementation of the PIGCP because it invokes a sense of tragedy to nature, which can elicit a range of conservation intervention recommendations depending on the ethical theories and values held by the decision-makers. To identify fundamental flaws in logic, we transformed a key inconclusive premise of the primary argument into the conclusion of a secondary argument, and a key inconclusive premise in the secondary argument into the conclusion of a tertiary argument. This created a nested set of arguments; the tertiary argument informed the truth or appropriateness of the premise in the secondary argument, which in turn informed the premise in the primary argument (Fig. 2). We added the implicit premises required to ensure logical strength and full transparency. A detailed explanation of this process is available in Supporting Information.

Results

Primary argument

The 3 premises were anthropogenic activity (introducing goats that graze) has damaged the ecosystem of Pelorus Island (P1); we ought to appropriately respond to damage we have caused (P2); and implementing the PIGCP is an appropriate response to the damage we have caused (P3). The conclusion (C) was, we ought to implement the PIGCP.

Premise 1 demonstrates how a normative interpretation can be presented as empirical evidence rather than informed by it (Fig. 1). First, this normative interpretation would be more defensible

if grounded in scientific evidence, such as goat population estimates, vegetation indices, or erosion metrics. If scientific reports, findings, or analyses on the ecological state of Pelorus Island exist, they have not been released to the public or cited in Hinchinbrook Shire meeting minutes or biosecurity plan. A draft of the goat removal plan and communications strategy does not reference any science-based evidence of changing ecological states (Cripps 2016). Second, though this absence of evidence does not indicate evidence of absence, it does suggest that this statement overly relies on the unwavering belief in the tenets of the normative discipline of invasion biology (e.g., the mere presence of goats is evidence of harm). While the framework of invasion biology has become dominant in the last few decades, alternative scientific perspectives challenge its attempts to present empirical information as answers to questions that are based on (often anthropocentric) values and its tendencies to present values-based conclusions as empirical information (e.g., Chew & Laubichler 2003, Sagoff 2018). Ultimately the purpose of analyzing the premise here is not to argue about the ecological function of goats, but rather to demonstrate the lack of scientific transparency that can occur when ardent credence in a normative discipline downplays critical analysis of normative influence and consequently equivocates normative interpretations with fact. Because this statement takes the form of a normative interpretation specific to one discipline that is not unanimously supported, P1 is inconclusive.

Premise 2 invokes the practice of restorative justice, or fixing what we have broken. Because humans generally strive to act in ways that are virtuous, restorative justice, is a generally agreed upon social norm that is also an integral component of virtuousness.

The evaluation of P3, which suggests the appropriateness of intervening, relies on the truth of P1, which we declared as unsubstantiated. Only when the justification for intervention in P1 is

further investigated can one begin to explore whether the methods suggested in the PIGCP are scientifically robust and ethical. We were therefore able to analyze only the appropriateness of this premise under the assumption that P1 is true and could explore only the theoretical reasoning of the PIGCP method as a whole.

Secondary Argument (2°)

The appropriateness of P3 can be evaluated by converting it into the conclusion of a new argument. The construction of this argument is informed by a line of reasoning stated by the mayor of the Hinchinbrook Shire (Schwartz 2016a): predation is natural (P1 2°) ; by introducing dingo predation, the PIGCP is natural (P2 2°) (Table 1); and

SSG, reference the table so as not to repeat management interventions that are natural are appropriate responses to anthropogenic ecological damage (P3 2°). Conclusion (C1 2°): the PIGCP is an appropriate response to the damage we have caused.

The ecological statement of P1(2°) is irrefutable, if only because it is tautological. Predation is a key component of food webs and energy transfer, trophic cascades, and life on Earth in general.

Premise 2(2°) is adapted directly from the *ABC Landline* report (Schwartz 2016a), in which the mayor states that the PIGCP is nature. Such normative language evokes the age-old debate over the construct of nature. The operative definition of nature can shift considerably among various contexts of human intervention. British philosopher John Stuart Mill (1874) asserted that the frame of reference used to define nature is delineated by the perception of how humans relate to the rest of the natural world. Nature is therefore defined in two separate contexts: one includes human activity that puts forces of the natural world together and the other excludes human activity altogether. The definition of *nature* invoked by the user determines the degree to which

human intervention on Pelorus Island adheres to being natural. In this premise, however, nature is also employed in what Mill (1874:71) calls a false third definition: “some external criterion of what we should do,” which is most likely informed by a preference for either the first or second definition. The appeal to an ill-defined nature sets this argument up for a fallacy of equivocation, when an ambiguous word is used with two different meanings in an effort to meet a falsely derived criterion: *introducing* that which is *nature* in P2(2°) is inappropriately equivocated with *nature* from P1(2°). The premise also exposes a fallacy of composition, a false assumption that a quality applies to a whole because it applies to a part of that whole. Regardless of which definition of *natural* is applied, the argument required to support the truth of this premise – *an entire action is natural if one piece of it is natural* – is logically flawed.

Premise 3(2°) not only calls on Mill’s (1874) third false definition of *nature*, but also attempts to justify an intervention method based on the degree of naturalness to which the program adheres. Management of ecosystems, however, always requires some degree of human intervention. If naturalness were a criterion of the appropriateness of an intervention, then even successful programs may not be considered appropriate. Although this particular premise would benefit from additional analysis in the context of the PIGCP, a tertiary argument is not necessary here because the evaluation of P2(2°) already nullifies the argument.

Tertiary Argument (3°)

The fallacy of composition in P2(2°) clearly demonstrates weak logic, but the fundamental flaw is revealed when the premise is converted into the conclusion of the tertiary argument:

Introducing dingo predation is natural (P1 3°). If part of a plan is natural, the entire plan is natural (P2 3°). Conclusion: By introducing dingo predation, the PIGCP is natural.

Premise 2(3°) identifies the source of the fallacy of composition by suggesting that if part of something is X (e.g., if part of a birthday cake is eggs), the whole thing must then be X (then the whole cake is eggs). More importantly, when another component of the PIGCP is substituted into an alternative argument structure (A3°), the subsequent conclusion contradicts the naturalness of the PIGCP: Embedding 1080 capsules into dingoes is not nature (P1b A3°). If part of a plan is not nature, the entire plan is not nature (P2b A3°). Conclusion: By embedding 1080 capsules into dingoes, the PIGCP is not nature (C1b A3°).

The logical sequence of the tertiary argument supports the conclusion that the PIGCP is both nature and not nature. This, in turn, violates Aristotle's law of noncontradiction, which states, "it is impossible to hold the same thing to be and not to be" (Gottlieb 2015). The tertiary argument is therefore not a sound argument.

Argument Analysis Conclusions

The premises and conclusions construct one large set of nested arguments (Fig. 2), and because the tertiary argument informing the secondary and primary arguments is not sound, we concluded that the argument as a whole is not sound. Arguments are only as strong as their weakest premise, and even if our conclusion for one or more premises is refuted, sufficient uncertainties are present to warrant the examined reason (we should repair harm or damage we have caused) as insufficient justification for the implementation of the PIGCP.

Discussion

The PIGCP is an example of conservation decision-making that falls afoul of three primary concerns that result from the overemphasis of normative constructs. Using argument analysis, we highlighted a misrepresentation of normative interpretations as fact in the absence of empirical

evidence and pinpointed the weak logical construction of the entire argument. We further suggest that overreliance on norms obfuscated appropriate interpretations of and adherence to ethical theories that are pivotal in helping to justify interventions. While much of the public debate centered on the manner of the proposed actions, implicit in that outcry and the consequent cancellation of the project are the three underlining problems that we highlight.

In light of increasing debate on the merits of different conservation programs and actions, such as habitat restoration and climate change mitigation, we have attempted to highlight why it is that conservation arguments can sometimes be susceptible to these types of failures. While part of the answer may be because of a general lack of education in ethics among scientists and managers (Saltz et al. 2019), we have suggested here that a persuasive alternative answer lies in the overreliance on normative constructs (Callicott et al. 1999; Chew & Laubichler 2003). At the heart of conservation, practitioners develop policy to act in response to ecological scenarios that have unfolded contrary to normative definitions, expectations, or images of nature. This response mechanism is shaped by the desire to conserve in the face of perceived tragedy. Discussed at great lengths in the humanities, the concept of tragedy intrinsically shapes the way we perceive the world around us (Golden 1976), yet its role in conservation receives little attention. Adapting Aristotle's definition of *tragedy* as a mimicry (i.e., dramatic performance) that elicits pity and fear from the audience (Golden 1976), we define *tragedy* in the context of conservation as an ecological narrative in which nature is affected by humankind.

Tragedy can manifest at an individual, species, population, or ecosystem level. Species extinction is perceived as a fundamental tragedy that conservationists strive to prevent, as are habitat loss, pollution, the impacts of climate change, and many other repercussions of anthropogenic change. With the goal of enabling nature to flourish, conservation seeks to

mitigate or reverse tragic outcomes that alter nature. Though normative language assists with communicating narratives through linguistic representation, the socially constructed interpretation of words like *tragedy*, *nature*, and *pest* can become overinflated when invoked in scientific discourse (Chew & Laubichler 2003). When utilized, empirical science can help unravel the nature of tragedies to provide factual context and allow for quantifiable objectives to be established. But normative constructs like *tragedy* are framed by values (Manfredo et al. 2017), and together with ethical theories are used to inform effective and logical decisions required to meet those objectives (Fig. 1). The challenge is to be cognizant of the roles of norms and ethical theories in the decision-making process: disregard for strongly held normative positions or the overemphasis of only one specific ethical philosophy may override social acceptability, such as when the unwillingness of national governments to act on climate change provokes strong condemnation from the public. Meanwhile, overemphasizing normative constructs can risk clouding the adherence to moral ethical theories and as we have shown, can impede critical thought and transparency, and permit unsuccessful or unethical interventions.

Inattention to the power of norms and ethics has been implicated in the immediate response to eliminate species whose ranges have expanded through human-assisted dispersal. Considered alien and invasive, the mere presence of goats out of range conflicts with normative expectations of nature for both conservationists and laypeople alike. The power of anecdotes and norms can supersede scientific evidence and entrench perceptions that the presence of goats is intrinsically wrong, requiring control or removal under the mandate of invasion biology (Sutherland et al. 2004; Larson 2005). Inherent in this view is the tragedy of globalization: although migrants can become integral components of modern ecosystems individually or collectively (Carroll 2011; Schlaepfer 2011), their fate is nevertheless sealed by their tragic nomenclature (Simberloff 2012;

Chew 2015). In these cases, empirical information is not always presented as the foundation of a normative position, and instead the sense of tragedy triggered by the mere existence of wild goats out of range can incur further harms by inhibiting the adoption of morally attentive ethical theories, impeding logic, and incentivizing reliance on normative interpretations in place of evidence (Larson 2005).

We suggest that a key reason for the numerous uncertainties of both truth and appropriateness imbedded in a key justification for the PIGCP lies in the tragedy invoked by the program proponents: introduced species do not represent nature (i.e., the nature they value). The drive to intervene, empowered by the normative constructs of tragedy, nature, and invasive, overshadowed a critical analysis of the values, norms, and ethics driving the program; outweighed the imperative to be transparent, both in science and values; and obscured the ability of program proponents and animal ethics and funding bodies to consider the consequences of their ethical theories, such as the welfare trade-offs of the dingoes, goats, and other resident species. Moreover, the provision of a scientific and logical justification that the goats have deleterious impacts would not be sufficient to mend the examined arguments because failures in truth and violations of Aristotelian logic are committed throughout. The role of goats as actors in this global conservation tragedy creates distance between ethical discourse and conservation action (Caughley & Sinclair 1994), whereby the power of tragedy subverts ethical engagement, scientific integrity, welfare considerations, strong logic to support decisions, and transparency of norms and assumptions. Seeking to address what the council perceived to be an ecological tragedy, they inadvertently created a plan that would exacerbate the tragedy on Pelorus Island.

Our conceptual model of conservation decision-making (Fig. 1) clearly defines the interrelated inputs that direct the decision-making process. The model highlights that when normative

constructs are overly emphasized, normative interpretations can be misconstrued as empirical information and the use of science and logic in the decision-making process can become weak or omitted altogether. To combat these fundamental errors, we provide three checkpoints in the model that strategically pause the decision-making flow. First, decision-makers must be aware of values and their sources, as well as the normative constructs and ethical theories that those values inform. This checkpoint elucidates the motivations and priorities of the decision maker, and identifies those that may benefit from the decision-making process. Second, be mindful of overreliance on either normative constructs or ethics when deciding action is justified. Not only does this checkpoint recommend self-reflection by the decision-makers, it can also identify potential points of contention and therefore encourage stakeholder consideration and engagement. Third, be logically sound and transparent when building justifications. This last checkpoint ensures that decisions are thoroughly developed, are not grounded on inappropriate assumptions or poor reasoning, and are informed by relevant science. Implementation of this checkpoint requires better training in critical thinking in the conservation sciences. Equipping conservation decision-makers with tools such as argument analysis would improve recognition of values, norms, and ethical theories, improve moral attentiveness, and increase the effectiveness of conservation decision-making.

As demonstrated by this PIGCP case study, the scientific discourse around conservation decision-making process is often misconstrued as independent of the ethical frameworks and social norms that inform conservation decisions. To lay the groundwork for integrating ethics into mainstream conservation, we recommend five fundamental attributes of improved conservation decision-making: clarity, transparency, scientific integrity, adaptiveness, and compassion. Clarity requires that decision makers are explicit; they should clearly identify norms

and values driving decision-making and use sound logic (Vucetich & Nelson 2012).

Transparency ensures information, such as assumptions, motivations, scientific evidence, and methods (Dubois et al. 2017), is shared. Upholding scientific integrity is to inform decision-making with scientific evidence, to ensure that normative interpretations are not misinterpreted; to establish clear benchmarks for success and thresholds for expected outcomes (Biggs & Rogers 2003); to design methods that are appropriate for achieving, monitoring, and evaluating success; and to reassess the call to action following intervention (i.e., does the intervention need to continue?) (Dubois et al. 2017). Adaptiveness requires an open mind when engaging with stakeholders and their positions and the ability to manage wildlife in a way that appeals to a range of moral perspectives and values (van Eeden et al. 2017). Adopting the practice of stakeholder engagement informs a thorough evaluation of the values, outcomes, welfare, and trade-offs for a wide array of stakeholders and assures that benefits are maximized and harms are minimized. Lastly, having compassion means that decision makers will consider the consequences of conservation intervention on sentient individuals and evaluate whether harm is justified or is a product of overrelying on normative positions (Ramp et al. 2013).

Our intention in analyzing the justification for the PIGCP was to demonstrate the importance of harmonizing normative constructs, ethics, and logical argument construction so that conservation decision makers can design better and more successful conservation programs. We hope the adoption of this toolkit will help clarify the role of normative constructs, diminish existing contentions in conservation decision-making, and improve the success of conservation objectives in the 21st century.

Acknowledgments

We thank J. Rushing, J. Gorman, and C. Batavia for help in developing the initial arguments. We especially thank A. Wallach and Centre for Compassionate Conservation colleagues for comments and support throughout the development of this study. We express our gratitude to the handling editor and anonymous reviewers who helped improve the strength and quality of this manuscript.

Supporting Information

An introduction to the basic structure of an argument and how to perform argument analysis (Appendix S1) is available online. The authors are solely responsible for the content and functionality of these materials. Queries (other than absence of the material) should be directed to the corresponding author.

Literature Cited

Artelle KA, Reynolds JD, Paquet PC, Darimont CT. 2014. When science-based management isn't. *Science* **343**: 1311.

Australian Academy of Science. 2017. The Margaret Middleton Fund for endangered Australian native vertebrate animals. Available from <https://www.science.org.au/opportunities/research-funding/margaret-middleton-fund> (accessed October 2017).

Ban NC, et al. 2013. A social–ecological approach to conservation planning: embedding social considerations. *Frontiers in Ecology and the Environment* **11**: 194-202.

Batavia C, Nelson MP, Darimont CT, Paquet PC, Ripple WJ, Wallach AD. 2019. The elephant (head) in the room: A critical look at trophy hunting. *Conservation Letters* **12**: e12565. .

- Bellard C, Bertelsmeier C, Leadley P, Thuiller W, Courchamp F. 2012. Impacts of climate change on the future of biodiversity. *Ecology letters* **15**: 365-377.
- Bergstrom BJ, Arias LC, Davidson AD, Ferguson AW, Randa LA, Sheffield SR. 2014. License to kill: reforming federal wildlife control to restore biodiversity and ecosystem function. *Conservation Letters* **7**: 131-142.
- Biggs HC, Rogers KM. 2003. An adaptive system to link science, monitoring and management in practice. Pages 59-80 in du Toit JT, Rogers KH, Biggs HC, editors. *The Kruger experience: Ecology and management of savanna heterogeneity*. Island Press, Washington DC.
- Callicot JB, Crowder LB, Mumford K. 1999. Current normative concepts in conservation. *Conservation Biology* **13**: 22-35.
- Carroll SP. 2011. Conciliation biology: the eco-evolutionary management of permanently invaded biotic systems. *Evolutionary Applications* **4**: 184-199.
- Caughley G, Sinclair ARE. 1994. *Wildlife ecology and management*. Blackwell Science, Cambridge.
- Chew MK. 2015. Ecologists, environmentalists, experts, and the invasion of the second greatest threat. Pages 7-40 in Beattie J, editor. *International Review of Environmental History*. Volume 1. ANU Press, Canberra.
- Chew MK, Laubichler MD. 2003. Natural Enemies—Metaphor or Misconception? *Science*, **301**: 52-53.
- Cripps A. 2016. Pelorus Island goat control project: project plan and communications strategy. Hinchinbrook Shire Council, Queensland, Australia. Available from

<http://www.parliament.qld.gov.au/Documents/TableOffice/TabledPapers/2016/5516T1433.pdf> (accessed October 2017).

DECC (Department of Environment & Climate Change). 2008. Littoral rainforest. DECC, New South Wales, Australia. Available from <http://www.environment.nsw.gov.au/resources/threatenedspecies/EEClittoralrainforestlowres.pdf> (accessed October 2016).

Dubois S, et al. 2017. International consensus principles for ethical wildlife control. *Conservation Biology* **31**: 753-760.

Estévez R, Anderson CB, Pizarro JC, Burgman M. 2014. Clarifying values, risk perceptions, and attitudes to resolve or avoid social conflicts in invasive species management. *Conservation Biology* **29**: 19-30.

Golden L. 1976. Toward a definition of tragedy. *The Classical Journal* **72**: 21-33.

Goldman L. 2016. Hinchinbrook Shire council: Stop using 'timebombed' dingoes to kill feral goats. Australia. Available from <http://www.thepetitionsite.com/847/517/788/hinchinbrook-shire-council-stop-using-time-bombed-dingoes-to-kill-feral-goats/> (accessed August 2016).

Gottlieb P. 2015. Aristotle on non-contradiction. in Zalta EN, editor. *The Stanford encyclopedia of philosophy*. Stanford University, Stanford, California. Available from <https://plato.stanford.edu/archives/sum2015/entries/aristotle-noncontradiction/> (accessed September 2016).

Heeren A, Karns G, Bruskotter J, Toman E, Wilson R, Szarek H. 2017. Expert judgment and uncertainty regarding the protection of imperiled species. *Conservation Biology* **31**: 657-665.

Hughes W, Lavery J, Doran K. 2010. *Critical thinking: an introduction to the basic skills*. 6th edition. Broadview Press, Canada.

- Jenkins HE, Woodroffe R, Donnelly CA. 2010. The duration of the effects of repeated widespread badger culling on cattle tuberculosis following the cessation of culling. *PLOS ONE* **5**:e9090.
- Lapinski MK, Rimal RN. 2005. An explication of social norms. *Communication theory* **15**: 127-147.
- Larson BM. 2005. The war of the roses: demilitarizing invasion biology. *Frontiers in Ecology and the Environment* **3**: 495-500.
- Linklater W, Steer J. 2018. Predator Free 2050: A flawed conservation policy displaces higher priorities and better, evidence-based alternatives. *Conservation Letters* **11**: e12593.
- Manfredo MJ, et al. 2017. Why social values cannot be changed for conservation. *Conservation Biology* **31**: 772-780.
- Merriam-Webster Dictionary. "pest." Merriam-Webster.com. 2018. Available from <https://www.merriam-webster.com/dictionary/pest>. (accessed August 2018)
- Miles S. 2016. Rare bird blocks bizarre death row dingoes plan. Media Statements, Queensland Government, Australia. Available from <http://statements.qld.gov.au/Statement/2016/8/18/rare-bird-blocks-bizarre-death-row-dingoes-plan> (accessed August 2016)
- Mill JS. 1874. *Three essays on religion*. H. Holt and Company, New York.
- Miller TR, Minter BA, Malan LC. 2011. The new conservation debate: the view from practical ethics. *Biological Conservation* **144**: 948-957.

- Proctor JD. 1998. The social construction of nature: Relativist accusations, pragmatist and critical realist responses. *Annals of the Association of American Geographers* **88**: 352-376.
- Ramp D, Ben-Ami D, Boom K, Croft DB. 2013. Compassionate conservation: A paradigm shift for wildlife management in Australasia. Pages 295-315 in Bekoff M, editor. *Ignoring nature no more: the case for compassionate conservation*. University of Chicago Press, Chicago.
- Robinson JG. 2011. Ethical pluralism, pragmatism, and sustainability in conservation practice. *Biological Conservation* **144**: 958-965.
- Sagoff M. 2018. Invasive species denialism: a reply to Ricciardi and Ryan. *Biological Invasions* **20**: 2723-2729.
- Saltz D, Justus J, Huffaker B. 2019. The crucial but underrepresented role of philosophy in conservation science curricula. *Conservation Biology* **33**: 217-220.
- Schlaepfer MA, Sax DF, Olden JD. 2011. The potential conservation value of non-native species. *Conservation Biology* **25**: 428-437.
- Schwartz D. 2016a. Dingo Release. ABC Landline, Australia. Available from <http://www.abc.net.au/tv/programs/landline/old-site/content/2016/s4506188.htm> (accessed August 2016).
- Schwartz D. 2016b. RSPCA Seeks to stop dingo cull of feral goats on barrier reef. ABC Online, Australia. Available from <http://www.abc.net.au/news/2016-07-28/rspca-seeks-to-stop-dingo-cull-of-feral-goats-on-barrier-reef/7668268?pfmredir=sm> (accessed August 2016).
- Simberloff D. 2012. Nature, natives, nativism, and management: worldviews underlying controversies in invasion biology. *Environmental Ethics* **34**: 5-25.

- Sutherland WJ, Pullin AS, Dolman PM, Knight TM. 2004. The need for evidence-based conservation. *Trends in ecology & evolution* **19**: 305-308.
- Townsville Bulletin, 2016. Minister accused of goat cull “cover up.” *Townsville Bulletin*, Queensland, Australia. Available from <http://www.townsvillebulletin.com.au/news/minister-accused-of-goat-cull-cover-up/news-story/f7e992e40bb14c4204c2ea894106e669> (accessed October 2017).
- Treves A. 2009. Hunting for large carnivore conservation. *Journal of Applied Ecology* **46**: 1350-1356.
- van Eeden LM, Dickman CR, Ritchie EG, Newsome TM. 2017. Shifting public values and what they mean for increasing democracy in wildlife management decisions. *Biodiversity and Conservation* **26**: 2759-2763.
- Vucetich JA, Nelson MP. 2012. *A Handbook of Conservation and Sustainability Ethics*. CEG Occasional Paper Series **1**: 223-237.
- Vogler S. 2016. Self-culling dingoes could be conservation model. *The Australian*, Australia. Available from <http://www.theaustralian.com.au/news/nation/selfculling-dingoes-could-be-conservation-model/news-story/ba5c723f2ed433f34f26d1752d8f6c7d> (accessed August 2016).
- Walsh JC, Wilson KA, Benshemesh J, Possingham HP. 2012. Unexpected outcomes of invasive predator control: the importance of evaluating conservation management actions. *Animal Conservation* **15**: 319-328.

WWF (World Wildlife Fund). 2016. Living Planet Report 2016: Risk and resilience in a new era.

WWF International, Gland, Switzerland. Available from <http://awsassets.panda.org/>

downloads/lpr_living_planet_report_2016.pdf (accessed February 2017).

Tables

Table 1. Stakeholder statements supporting and opposing the Pelorus Island Goat Control Program (PIGCP)^a aggregated from news reports, articles, press releases, and petition websites in the 7 months following the announcement of the PIGCP.

hanging indent will be used as shown in first row; added footnote a is needed for context

Stakeholder	Statement or goal ^b
Mayor, Hinchinbrook Shire	<p>"...we... thought, 'well that's perfect.' This is nature. ...the dingo is a predator. The goat is a source of the dingo's affections. So, we believe ...we'll just put nature together and that'll sort out a problem."[*]</p> <p>"Look at it: it's a beautiful, pristine environment. As a council, we have an obligation as the trustees of this land, as the custodians of this land to control and or eradicate pests."[*]</p> <p>"There is a greater good here and the greater good is that we have an island that is disappearing right in the middle of the Great Barrier Reef Marine Park."^{**}</p>
Chief Pest Officer & Coordinator of PIGCP, Hinchinbrook Shire	<p>"The goats have literally taken out all the understorey species of vegetation and that has allowed all the soils to be exposed and to be washed away and to be trampled down the mountain by the goats. ... It's all washing down, straight out to the reef."[*]</p>

"We're gonna protect so many of these islands long term. Once this one's successful, it'll set the platform for many other island managers to follow through and to carry out similar projects."*

Hinchinbrook Shire
Council

On 1080 tablets: "The council said it was a 'failsafe' to ensure the dingoes did not starve or become an entrenched pest on the island."

†

PIGCP Ecologist

"And this whole island should look like a forest...and this is the reason why we're doing it so that if we can get rid of those guys, it'll stop the rest of the island looking like this and we can preserve what we've got in this Great Barrier Reef."*

"By monitoring these little guys [*Melomys burtoni*, a native grassland rat], when dingoes are released, goats are removed and the vegetation comes back, we would expect little guys like this to start to increase their numbers...we're expecting that the removal of goats is gonna have far better benefit to these guys being a grassland rat than the little bit of dingo predation." *

"The ultimate reason we are doing this is to save the flora and fauna on the island." *

"The plan is: dingoes wipe out goats, we come back and humanely shoot those dingoes 'cause they'll have tracking collars, so we can find out where they go. If for whatever reason we can't come back and shoot those dingoes, ...those little time bombs'll go off." *

“It then took 'em another 10 years to get rid of dingoes off that island and that became a great expense and a big problem and dingoes caused problems for shore birds and other things on the island. We don't want that to happen here. So, the...poison capsule...is a backup to prevent that from happening.”*

"Releasing dingoes onto this island is basically an attempt to restore this island. And the dream for me will be to see the plants and all the animals come back as a result of getting rid of goats. And if it works well here, then why not do it in some other places, including places nearby which are a lot worse off than Pelorus."*

RSPCA CEO

"By sticking some wild dogs in a situation where those goats will be eaten, partly eaten and then left to die a horrible painful death is the wrong attitude for 2016." †

"We have no problem with the control of feral animals, but we have to kill those feral animals in a humane way. We need to make sure that council uses sharp shooters or whatever other method, rather than this very cruel method." †

"We felt there were significant animal welfare issues not just for the goats but for smaller, native animals on the island and the dingoes themselves.”‡

RSPCA spokesman

"While we accept feral animals need to be controlled, we would like to see other avenues exhausted before resorting to this

‘solution’, which could inflict pain and suffering on both goats and dingoes alike." †

Petitioner Commenter

"This is a sick strategy with no thought for the suffering of the Dingo."^

"Its [sic] not remotely humane... , not only will be the goats be savaged to death the dogs reward then is also to die a slow and agonising death, disgraceful and disgusting show of humanity yet again."^

"When will humans stop killing innocent creatures, seeing as we are the ones that created the problem?!"^e

"its [sic] a great idea to introduce dingoes to assist with an ecosystem problem however killing them in such an inhumane way is not right."^

Minister for
Environment and
Heritage Protection,
Queensland

"I was shocked to learn of this cruel experiment but even more alarming is the lack of thought for the native animals on the island."‡

"Pest control should always be carried out in the most humane way possible – not by death row dingoes."‡

"I do not take this action lightly but on the advice of experts from the Department of Environment and Heritage Protection it's clear

that this misconceived program needs to stop before irrevocable harm is done to the island's population of Beach stonecurlews."[‡]

"While the control of feral goats and other pests is a responsibility of all landholders, the methods employed should not pose a risk to threatened native wildlife species."[‡]

"I will not stand by while one of the main predators of this vulnerable bird is deliberately released into its habitat."[‡]

Minister for Agriculture
and Fisheries,
Queensland

"As soon as I heard the detail of the council's plan I sought urgent advice on whether I could step in on the grounds that it is a cruel and inhumane solution."[‡]

"At the inaugural meeting of the Animal Welfare Advisory Board I asked members to consider whether such practices are in line with current community expectations on animal welfare...There has to be a more humane way to deal with a feral pest problem."[‡]

-
- a. Program plan: Introduce 4 sterilized wild male dingoes with GPS collars to the island to predate on the goats (Schwartz 2016a; Cripps 2016). After 2 years, lethally shoot dingoes to prevent them from predated on other fauna. Each dingo would be implanted with lethal poison capsules that would dissolve and kill them after 2 years if shooting was unsuccessful (Schwartz 2016a; Cripps 2016).

Sources: *, Schwartz 2016a; **, Vogler 2016; †, Schwartz 2016b; ‡, Goldman 2016; ^, Miles 2016.

Table 2. A reason table for either supporting or rejecting the Pelorus Island Goat Control Program^a constructed by extracting reasons from stakeholder statements in Table 1.^b

We should enact the Pelorus Island Goat Control Program because we should...	We should not enact the Pelorus Island Goat Control Program because we should not...
protect threatened ecosystems.	devalue the individual lives of animals.
repair the damage humans have caused. ^b	behave in ways that cause irrevocable harms.
fulfill our duties as custodians of the land.	kill or cause suffering for the sake of conservation.
protect a natural resource economy.	implement experiments that have questionable origins, outcomes, or animal welfare impacts.
eliminate non-native species (goats).	endanger the native fauna.
unknown (private reasons and motives not communicated to the general public)	use animals as a way to achieve our vision for nature.

^aDescribed in Table 1 footnote.

^bThis table is not exhaustive.

^cStatement selected for further examination with the ethics-based tool of argument analysis.

SSG and follow color-figure policies and procedures. We would prefer it if you would remove color entirely.

Figures and Legends

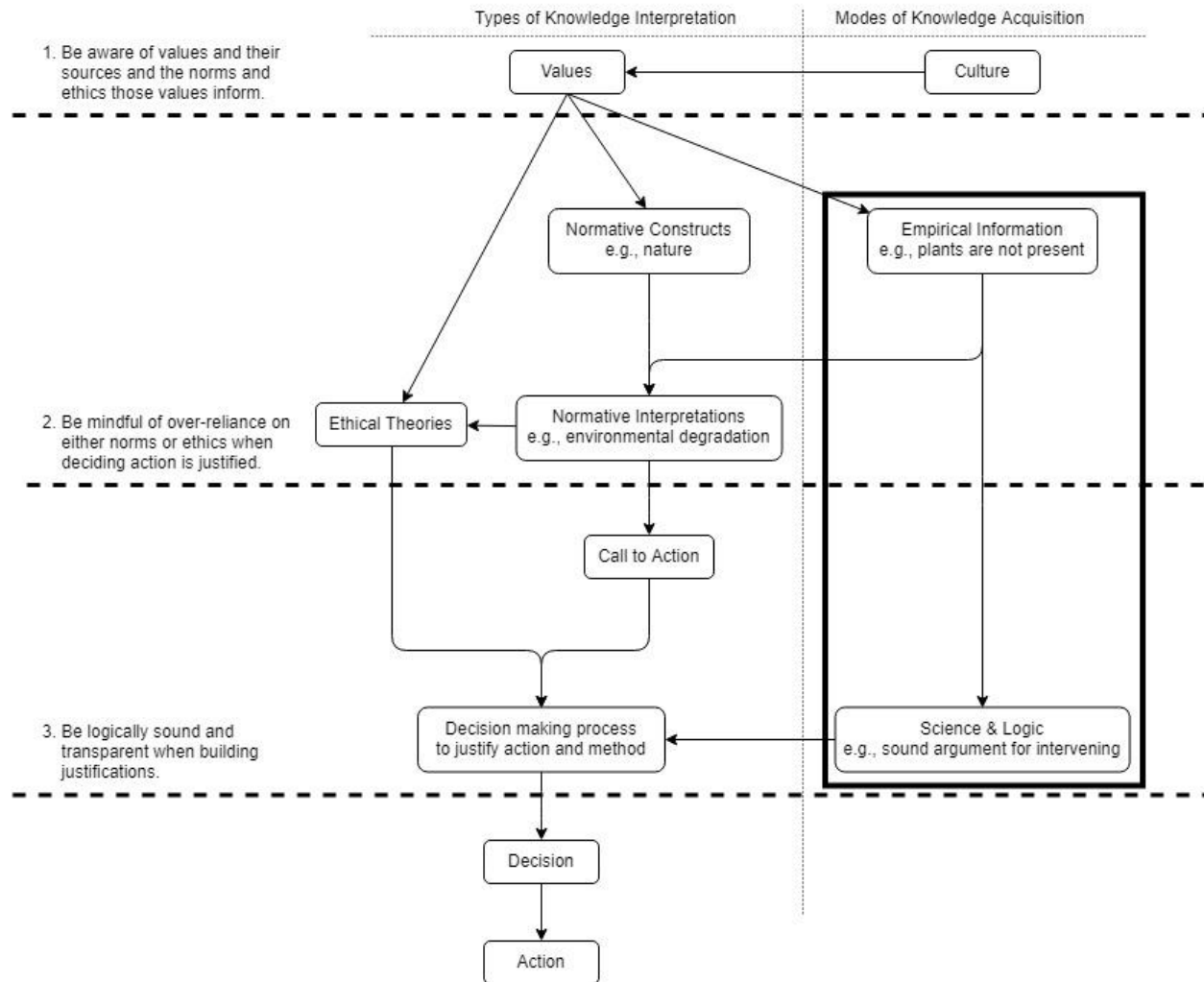


Figure 1. A conceptual model of conservation decision-making that defines the integral components of the decision-making process and thus increases the transparency of the role of values, norms, and ethics in conservation planning and decision-making. Informed by cultural values, normative constructs are critical for interpreting available empirical information, for choosing which ethical theories to follow, and for initiating a call to action. In contrast, ethical theories (e.g., deontology, consequentialism) inform how we ought to act. Bold rectangle and arrows indicate the components of the decision-making process that are omitted when normative

constructs are overemphasized; knowledge interpretations can be equated with or misconstrued as modes of knowledge acquisition, which can obfuscate ethical theories and allow the decision-making process to sacrifice rigorous scientific analysis and logical argument construction.

Dashed lines indicate checkpoints that temporarily pause the decision-making flow to avoid this truncated pathway: 1, elucidates motivations and priorities of the decision-maker and identifies those that may benefit from the decision-making process; 2, recommends self-reflection by the decision-makers, identifies potential points of contention, and encourages stakeholder consideration and engagement; 3, ensures decisions are thoroughly developed, are not grounded on inappropriate assumptions or poor reasoning, and are informed by relevant science.

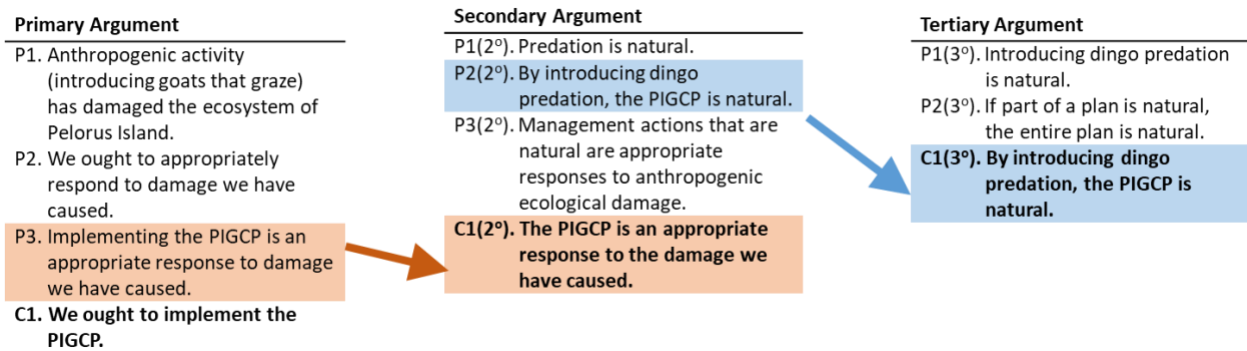


Figure 2. Example from the case study of the Pelorus Island Goat Control Program (PIGCP) of how argument analysis deconstructs a primary argument into a series of nested arguments to analyze the argument for truth and valid logic. To fully assess the soundness of the primary argument, a premise from the first argument becomes the conclusion of the secondary argument, and a premise from the secondary argument becomes the conclusion of a tertiary argument. This example is the nested argument supporting the implementation of the PIGCP.