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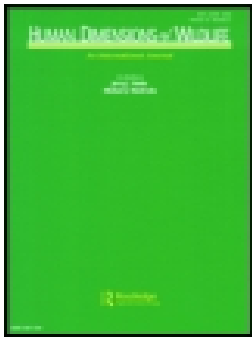


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RESEARCH ARTICLE

Michigan Mute Swan Management: A Case Study to Understand Contentious Natural Resource Management Issues

Corey Jager^a, Michael Paul Nelson^b, Lissy Goralnik^b, and Meredith L. Gore^c

^aOklahoma Department of Wildlife Conservation, Oklahoma City, Oklahoma, USA; ^bDepartment of Forest Ecosystems and Society, Oregon State University, Corvallis, Oregon, USA; ^cDepartment of Fisheries and Wildlife, School of Criminal Justice, Michigan State University, East Lansing, Michigan, USA

ABSTRACT

U.S. state fish and wildlife agencies have responded to perceived ecological and social threats posed by mute swans by implementing population control strategies. In Michigan, some stakeholder groups have vocally opposed particular control activities. To better understand and characterize key aspects of the underlying media dialogue about mute swan management in Michigan, one factor in the development of public perceptions about wildlife issues, we conducted a qualitative content analysis of Michigan-specific online news articles. Results revealed tensions between stakeholder groups about management priorities were rooted in differing ideas about healthy social and ecological systems, appropriate wildlife behavior, and the acceptability of lethal control (i.e., shooting living birds). Characterizing which stakeholder groups aligned with particular arguments might allow managers to tailor and direct messaging to specific audiences.

KEYWORDS

Content analysis; invasive species; Michigan; mute swans; news media

Introduction

Globalization has made it easier for species to be introduced into new habitats, and invasive species are now considered one of the greatest threats to biodiversity (Perry & Perry, 2008). Invasive species pose, at a minimum, substantial risks to ecosystems, economies, and human livelihoods. U.S. state fish and wildlife agencies have focused great attention on preventing exotic species introductions and establishment. However, predicting whether, when, and how a species will become invasive is difficult. As a result, rapid response to perceived invasions is prevalent and lethal eradication is perhaps the most common management activity in a post-invasion situation (Clout & Veitch, 2002). The social acceptability of lethal control methods to address human-wildlife conflict is highly variable; acceptability is often a function of a species' characteristics, the threats posed, and the surrounding social culture (Treves & Naughton-Treves, 2005; Wagner & Seal, 1992). Managers attempting to eradicate species using lethal control methods have faced challenges acquiring the broad and sustained public support believed necessary to achieve invasive species policy objectives (Perry & Perry, 2008). This social science challenge associated with invasive species management is problematic because agencies often count on local, private landowners to support management strategies, especially

CONTACT Michael Paul Nelson ✉ mpnelson@oregonstate.edu 📍 Department of Forest Ecosystems and Society, Oregon State University, 321 Richardson Hall, Corvallis, OR 97331.

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where the agency may not have the resources or jurisdiction to implement them (e.g., obtaining landowner permission to conduct lethal control on private land).

Mute swan management in Michigan

Mute swan (*Cygnus olor*) management in Michigan is a contemporary example of invasive species management that has, at times, incited contention among stakeholders and managers, particularly over the use of lethal control methods. In the late-1800s Americans imported mute swans from Eurasia to the United States to enhance the appearance of public parks and private estates (Ciaranca, Allin, & Jones, 1997). In 1919 a pair of mute swans was brought to Michigan for the same purpose. This pair eventually grew to a flock of over 40 birds by the mid-1940s (Wood & Gelston, 1972). Mute swans have since become prolific throughout Michigan and the eastern half of the United States.

Many states where mute swan populations have continued to grow and expand, including Michigan, have developed management policies aimed at greatly reducing the number of birds (MDNR, 2012). The Michigan Department of Natural Resources (MDNR) classifies mute swans as a severe threat to local ecosystems and the people interacting with those ecosystems for three reasons: (a) mute swans are aggressive toward humans, (b) they out-compete native wildlife, and (c) they destroy wetland habitat by uprooting and consuming aquatic vegetation (MDNR, 2012).

The Michigan Natural Resource Commission (a seven-member public body whose members are appointed by the governor and subject to the advice and consent of the Senate) adopted the final draft of the Mute Swan Management and Control Program Policy and Procedures (MSMP) in 2012 (approved January 23, 2012). Included in the MSMP is a statewide ban of rehabilitating injured mute swans or releasing mute swans back into the wild. The long-term MSMP goal is a 90% reduction in the mute swan population by 2030. More immediate goals are to reduce mute swan populations to zero on Michigan public lands and maintain zero population growth on all other lands in Michigan. The current and primary methods of control include culling swans by shooting, destroying or removing nests, and adding eggs (MDNR, 2012).

Mute swan management, compared to other invasive species control programs, has presented some unique challenges for U.S. state wildlife management agencies. The visibility and perceived beauty of mute swans may result in a lower acceptance rate for lethal control (Wagner & Seal, 1992; Zinn, Manfredo, & Vaske, 2000). Moreover, the MDNR manages only 12% of Michigan's total acreage (MDNR, 2015), so public support for mute swan management is particularly important for actions implemented on private lands. Other states attempting to lethally control mute swans in compliance with state-level invasive species policy have faced pushback from stakeholders. For example, mute swan management in Maryland was halted when the Fund for Animals and three local residents filed a federal lawsuit to stop the use of lethal control to reduce the State's mute swan population (Fund for Animals v. Norton, 2003). The plaintiffs maintained that mute swans should remain protected under the Federal Migratory Bird Treaty Act (MBTA), regardless of their non-native status. However, in 2004, the Migratory Bird Treaty Reform Act was revised to exclude non-native species from federal protection (U.S. Fish and Wildlife Service [USFWS], 2005). Exclusion from the MBTA allows state wildlife agencies to manage non-native populations, including mute swans, as they deem

necessary. Although to date Michigan has not faced lawsuits over mute swan management, activists have launched petitions to stop lethal control (Lawrence, 2012; Stamper, 2015) and culling was briefly delayed in some areas to provide MDNR managers time to engage with the public about the management plan and actions. Local government and conservation organizations have hosted public hearings on the issue, though mute swan management policy has remained unchanged (Hart, 2012).

Mass media effects on public perceptions of wildlife

How and where the public acquires environmental information can influence attitudes about management actions (Gore, Siemer, Shanahan, Scheufele, & Decker, 2005). Media plays a variety of roles in relaying environmental information, including: promoting or suppressing facts and opinions (Jarreau, 2012; Matthes, 2009), allowing agencies an opportunity to share information (Cox, 2013), and shaping attitudes and opinions about management decisions (Wolch, Gullo, & Lassiter, 1997). Mass media coverage of a particular issue, such as wildlife management, is often considered to be reflective of how an issue is currently playing out on the ground (Webb & Raffaelli, 2008), or how it might play out in the future (Bengston & Fan, 1999).

By choosing which issues to report and framing issues through the inclusion or emphasis of particular storylines or information, news media plays an important role in mediating the public's views about issues. According to Jönsson (2011, p. 122), "There is a relationship between the amount of attention a certain issue receives in news media, and the extent to which the public considers this issue to be of special importance—what is considered important by the news media is considered important by the public." In short, mass media remains an important source of environmental information for the general public (Corbett, 1995; Cox, 2013; Krosnick, Holbrook, Lowe, & Visser, 2006), and, because of the increased accessibility and use of online news resources (Pew Research Center, 2012), electronic news sources play a vital role.

Since mass media is one mechanism potentially impacting public opinion about wildlife (e.g., Gore & Knuth, 2009), exploring and characterizing mass media coverage associated with a contentious wildlife management issue can provide insight into public opinion on the topic (Wolch et al., 1997). Online mass media coverage, which is both prevalent and accessible to many audiences, could also be systematically reviewed to uncover aspects of the conservation ethics structures of a particular wildlife management issue (Gore, Nelson, Vucetich, Smith, & Clark, 2011; Nelson & Vucetich, 2012). This analysis can in turn be used to inform policy development, implementation, and evaluation (Gore & Knuth, 2009). To this end, we explored online mass media coverage of mute swan management in Michigan to characterize the media dialogue and describe key messenger positions. Our objectives were to (a) define and report frequencies of the reasons employed in support of and in opposition to Michigan's mute swan management policy and (b) determine which messenger groups were most engaged with the discussion and what reasons they forwarded. Because the conservation ethics process of formal argument analysis critically depends on understanding the nature and possible influence of various reasons for stakeholders' preferred policy (Nelson & Vucetich, 2012), this analysis of online mass media sets the groundwork for more formal conservation ethics argument analysis.

Methods

We conducted a qualitative content analysis ([Hsieh & Shannon, 2005](#)) of Michigan-specific online news sources to understand the content and context of the different arguments that arose directly from the text sources; we then quantified the frequency of the identified reasons for and against the MSMP, which we linked to messenger groups. Content analysis is “a systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding . . . to identify trends and patterns in documents and provide an empirical assessment of shifts in public opinion” ([Stemler, 2001](#)). Quantitative content analysis, which often uses language frequencies and word counts to classify text into categories, generally deals with manifest, or the literal, content of the text. The goal of quantitative content analysis is an objective “numerically based summary of a chosen message set” ([Neuendorf, 2002](#), p. 14). Qualitative content analysis also categorizes manifest content, but often interprets latent content, or the contextual meaning of language patterns in the text, as well. Therefore, while still rigorous and systematic, qualitative content analysis adds a researcher-imposed perspective to the coding process. In either approach, if the research is grounded in solid theory about a phenomenon, the analysis will likely be deductive, using preconceived categories to guide the coding process; if theory about the phenomenon is less developed, the coding will instead be inductive, allowing categories to arise directly from the data.

We limited our sample to Michigan-specific online news articles and letters to the editor, as well as online transcripts from television and radio news. Our sample assumed Michigan sources were most likely to cover issues relevant to Michigan wildlife, as opposed to non-local sources ([Fogarty, 2011](#); [Pauly & Eckert, 2002](#)). We did not include national blogs, newsletters, or articles on advocacy websites (e.g., Humane Society of the United States [HSUS], National Rifle Association) in our analysis because these sources can be informal, target specific audiences, lack source credibility ([Morris & Ogan, 1996](#)), and do not often include necessary geographic-specific location information ([Metzger, 2007](#)).

We analyzed every article we found in our data collection timespan that fit our criteria for inclusion, rather than select particular articles either randomly or according to some metric, such as date range, source, or newspaper section. This representative sampling approach ([Jupp, 2006](#)) both maximized the number of articles in our sample and allowed us to capture a representative sample of the media dialogue on this topic in the timespan immediately before and after a major management decision.

We obtained our sample by using the United States Google search engine and the key words keywords “mute swan” and “Michigan.” We performed an initial manual Google search in April 2012 to obtain all previously published articles related to mute swan management in Michigan. From April 1, 2012 through August 31, 2012 we set a daily Google Alert for the search terms to automate and continuously update our sample; Google Alerts return searches for the top ten items using defined criteria ([Google, 2012](#)). We conducted a final manual Google search in October 2012 to ensure our sample captured all relevant Michigan-specific online news regarding mute swans and current discussions about their management. The final sample for analysis included 55 articles with publication dates ranging from December 1, 2011 to October 31, 2012, which all directly pertained to the final 2012 MSMP. This publication timeframe allowed us to analyze data immediately leading up to the 2012 MSMP decision and following the approval of the policy. We chose to exclude mute swan news articles published prior to and during 2011 because they were unrelated to the 2012 MSMP.

Coding and analysis

Data included any content within an article body, including authored text and quoted material. We used an iterative process to code and analyze our data (Hruschka et al., 2004; MacQueen, McLellan, Milstein, & Milstein, 1998). First, the lead author independently reviewed all articles and generated preliminary codes for the data. Second, two researchers met weekly, and were joined monthly by a third researcher, to co-code articles, peer debrief inadvertent biases and assumptions in the primary researcher's analysis, and cross-validate coding procedures and interpretation (Lincoln & Guba, 1985). We used a randomly-selected sub-sample ($n = 7$, 25% of original sample collected), to evaluate our coding protocol for completeness and thoroughness (Saldaña, 2012). In this regard, the first two stages of our coding and analysis were inductive and open (Hsieh & Shannon, 2005; Thomas, 2006).

Our final codebook included 34 codes that fell into three major categories: (a) reasons in support of the MSMP, (b) reasons in opposition to the MSMP, and (c) messengers of these reasons, which included three main subcategories: (a) Michigan residents with no organizational affiliation, (b) government representatives (local, state, and federal), and (c) nongovernmental organizations (e.g., interest groups, including local and national/international organizations). We coded messengers when an individual or group mentioned in a news article could be clearly identified as having an affiliation and had a direct association with a corresponding news line or quotation.

The remaining stages of our research were deductive in that we applied the revised codebook to the entire sample and revised as necessary until our codebook was "saturated," meaning no new themes or codes emerged and data fit easily into the defined codes and categories (Miles & Huberman, 1994). We completed a final round of coding to verify our work. We then did a quantitative analysis of data by counting the frequency with which each code and category occurred.

We used Atlas.ti software to facilitate our data organization and analysis (Muhr, 2012). Qualitative software offers researchers a systematic way to analyze textual data (Weitzman, 2000). We conducted Pearson's Chi-square analyses to detect differences between stakeholder categories and their support or opposition to MSMP. Chi-square test results were considered significant at the $p < .05$ level.

Results

We obtained 55 online news articles that discussed the 2012 MSMP. The articles represent news from 33 unique sources with coverage at multiple scales: statewide ($n = 4$, 7% of all collected sources), regional, multicounty coverage ($n = 4$, 7% of all collected sources) and local, single county coverage representing 13 individual counties in Michigan ($n = 47$, 85% of all collected sources). Coverage of mute swan management in Michigan persisted for 11 months and peaked during June, July, and August.

Support for and opposition to mute swan management in Michigan

Our first objective was to describe and report the frequencies of the reasons stakeholders employed in support of and in opposition to Michigan's mute swan management policy (see Appendix 1 for code descriptions with examples). We identified eight distinct reasons

in support of mute swan control ($n = 216$ quotations) and six distinct reasons in opposition to the management policy ($n = 181$) (see [Table 1](#)). The most common reasons in support of the MSMP were: perceived mute swan (1) resource competition with other wildlife, including native Trumpeter Swans ($n = 60$, 28%), (2) aggression toward humans ($n = 51$, 24%), and (3) detrimental impacts on the ecosystem ($n = 27$, 13%). The three most common reasons in opposition to the MSMP were: (a) a distrust of expert (manager) opinions or a preference for alternative authority decision-making, for example, residents ($n = 46$, 25%), (b) a preference for alternative (to lethal measures) methods ($n = 41$, 23%), and (c) a concern that the plan was based on inadequate science ($n = 37$, 20%).

The media framed support of and opposition to mute swan management according to swan behavior. For example, while a number of messengers identified mute swan behavior as problematically aggressive, others argued that aggression was a natural and acceptable behavior for swans ($n = 19$, 11%), therefore not a problem worthy of management response. The majority of stakeholders did agree, however, that there was a mute swan problem. Within this majority, there was a consistent disagreement about which methods might be appropriate to address the problem. Opponents of the MSMP framed the use of lethal control (i.e., shooting living birds) as inhumane ($n = 41$, 23% of total opposition responses), whereas lethal control proponents framed killing mute swans as the most effective and efficient method of control ($n = 16$, 7%) compared to alternative methods. These alternative methods were generally unstated in the articles, but they are understood to be egg addling and nest destruction, which are the alternative methods being used by managers and proposed in the MSMP.

Key messengers

Our second objective was to determine and document which key messengers were most frequently represented in online media dialogue about mute swan management and to characterize their positions on the issue (see [Figure 1](#)). These key messengers of reasons in support of and in opposition to the MSMP provide insight into stakeholder values,

Table 1. Analytical coding frequency of reasons in support of and against the mute swan management and control program policy and procedures (MSMP)

	Support or against MSMP	# quotations (<i>n</i>)	% of total quotations
<i>216 quotations in support of MSMP</i>			
Resource competition with wildlife (incl. Trumpeter swan)	Support	60	28
Aggressiveness toward humans	Support	51	24
Mute swans harm the ecosystem	Support	27	13
Aggressiveness toward wildlife	Support	27	13
Efficacy of lethal control	Support	16	7
Experts think it's a good idea	Support	12	6
Value native species	Support	10	5
MSMP designed with sound science	Support	7	3
<i>181 quotations in opposition to MSMP</i>			
Distrust the experts (includes alternative expertise)	Against	46	25
Prefer alternative methods	Against	41	23
Inadequate science	Against	37	20
Aesthetic value	Against	25	14
Aggression is natural	Against	19	10
Humans, not swans, are the problem	Against	13	7

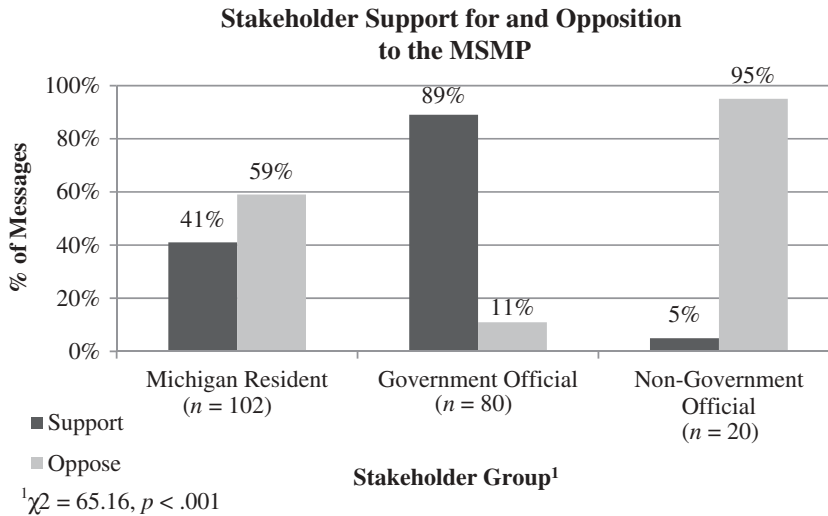


Figure 1. Comparison of stakeholder groups' messages identified in MI online news articles from December 2011 to October 2012.

engagement, and positions regarding mute swan management in Michigan. This is a useful exercise because when categorizing arguments for a conservation ethics argument analysis, it is helpful to identify which groups prefer or rely on particular arguments, so that messaging can be directed toward or tailored to specific audiences. Doing so might allow managers to address problems regarding misunderstandings or limited information directly.

The primary messengers in the media dialogue were Michigan residents unaffiliated with an agency or organization ($n = 102$ quotations, 50%); 59% of these ($n = 60$) were quoted as opposing the management policy. Government officials were the second most frequently cited messengers commenting on mute swan management ($n = 80$, 40%). Government affiliations included local township board of trustee members to state and federal agencies, among others. Wildlife managers from local, state, and federal agencies shared much of the scientific information about mute swan biology and Michigan ecology, as well as management policy details. The differences in policy support between the three identified messenger categories—Michigan residents, government representatives, and nongovernmental organizations—was significant ($\chi^2 = 65.16, p < .001$). Individuals in the government officials category were most often cited as supporting mute swan management ($n = 71$, 89%). Nongovernmental organizations were the least represented messenger category ($n = 20$, 10%) and included both national and international advocacy groups, as well as local nongovernmental organizations (NGOs). All but one of the quotations from this category included messages opposing the management policy ($n = 19$, 95%).

Discussion

Invasive species management is often contentious. To the degree that managers are interested in matching their public interactions to concerns of the public, systematically

describing media content can help managers anticipate public response to proposed management actions and more effectively structure stakeholder engagement and communication strategies for different audiences, both to include stakeholder positions in management decisions and to clarify management plans. Here, we discuss the most noteworthy findings from our content analysis.

First, we considered Michigan mute swan management as a case study (Yin, 2009) for using a qualitative content analysis methodology to explore media dialogue about the ethics of invasive species management. Although case study results are not generalizable, many attributes of mute swan management in Michigan (e.g., lethal control, invasive species management, public participation) parallel other natural resource discussions in wildlife (e.g., wolf hunting, deer baiting) or even non-wildlife (e.g., water conservation, fire suppression, hydrofracking) arenas. At the inception of our research, the mute swan issue received regular publication in Michigan news outlets. Thus, the swan provided an opportunity to use news media as a platform for understanding the central arguments being employed by stakeholders in the issue. This understanding can inform and guide managers to respond in a manner that is attentive to actual public opinions. Beyond the generalizability of our methodological approach, Michigan's discussions about mute swan control are, or have been, mirrored in other states (including New York, Maryland, Ohio, and Rhode Island); our findings and methodological process may have relevance beyond the Michigan case study.

Second, although media coverage in our sample most frequently came from Michigan residents, our analysis revealed three national or international interest groups within our NGO category of key messengers (HSUS, Michigan Audubon Society, and Friends of Animals) who were involved in the news media dialogue about mute swans and their management. Messages from these groups, reasonably representing a single wildlife management position, were opposed to lethal control as delineated in the MSMP (although not necessarily to policies writ large as delineated by the state). Importantly, messages communicated by stakeholder organizations, particularly spokespeople, may inaccurately represent individual stakeholder perspectives or the degree to which stakeholder attitudes align (Nilsen et al., 2007). When organizational messages become more prominent in management conversations over time, they can cloud the concerns that initiated the conversations in the first place. Research has shown how this issue-evolution situation has in turn resulted in policies that do not fully address the issues at stake (Triezenberg, Knuth, & Yuan, 2011).

Interestingly, our data do not align with this research exactly, in that the majority of the quotations from unaffiliated Michigan residents in the online media dialogue opposed the MSMP, as did the overwhelming majority of NGO quotations identified in the media dialogue. But the percentages of opposition messages from each messenger group do demonstrate a skewed enthusiasm by the NGO groups that does not mirror local stakeholder investment, as indicated in media messaging, in this outcome. Although 60% of the quotations from the unaffiliated Michigan residents opposed the MSMP, 95% of the NGO quotations opposed the management plan. Therefore, in addition to the legal power and mobilization these groups can contribute to wildlife conflict issues, as evidenced in the Maryland mute swan case (*Fund for Animals v. Norton*), the involvement by national and international NGOs in local wildlife-conflict issues can also increase the presence of opposition voice in the media dialogue, which can have consequences in the direction, tone, and content of subsequent media dialogue.

There was a clear entry point into the discussion by the HSUS, and the number of opposing messages in the general media dialogue increased directly following their entry. Agenda setting theory suggests the media does not necessarily tell readers what to think, but it can influence what readers think about (McCombs & Shaw, 1972; Soroka, 2002), and this is important for framing contentious conservation issues and the kinds of arguments people use, or consider, in conservation dialogue. Although this study did not directly test the theory of agenda setting, previous research shows that the entrance of certain stakeholder or interest groups to a media dialogue can change the media agenda (Huckins, 1999). Therefore, if national and international NGOs are afforded consistent media coverage, they can potentially steer the conversation and impact viewers' perceptions of issues, including those related to wildlife management. Additional work on the media dialogue around contentious management decisions can test if the entry of interest groups changes the media agenda, and to what effect. This kind of conservation communications research might offer opportunities to engage national and international NGOs more directly to address information gaps. In general, monitoring media dialogue can allow managers to stay up to speed with the changing stakeholders and dialogue and focus their media and general communications strategies appropriately (Siemer, Decker, & Shanahan, 2007).

Managers need to be able to discriminate between organizational interest group opinion and influence and the concerns of state residents—who are their immediate constituents. Managers should not assume automatically that these are the same, or that they are different. Without this distinguishing, managers run the risk of addressing organizational concerns but not those of residents, and therefore fail in their outreach efforts.

Third, our analysis suggested that we need to reflect more on what constitutes disagreement, and what might not. Arguments, which are driven by both beliefs about the way the world is and by values, underlie the discussion about whether or not, and how, to control invasive species. In our content analysis, we identified the reasons people used to defend or oppose the MSMP because reasons drive arguments. Our analysis suggested that questions about whether or not and how to manage invasive species, like mute swans, are tied to how stakeholders value the protection of native species, healthy ecosystems, and the lives of individual animals—although these values were not always made clear in the news media. The tension between prioritizing the lives of individual animals versus the health of ecological wholes, like species or ecosystems, is a classic environmental ethics problem and one not easily resolved. But explicitly identifying those values at the core of the arguments stakeholders invoke in invasive species dialogue can be useful in working toward a resolution. It can also illuminate commonality across arguments and stakeholder values, which can suggest a way forward from a contentious situation.

Based on the Michigan news media dialogue in our sample, messengers' positions often appeared to be in conflict, and on one level they were. Groups were either opposed to or in favor of the management plan. But with a closer analysis through the systematic observation of messengers' arguments, it appears that much of the underlying contention stems not from the idea of control or management in general, but rather from the particulars of the proposed methods of control. Opponents of the MSMP expressed concerns that lethal control is inhumane, though they often supported alternative control methods such as nest and egg destruction. Interestingly, each message concerning the use of lethal control says, "if we control. . .," but at no point does any message offer a reason for *why* we should control. For example, one stakeholder explained, "if the species needs to be controlled, then

control it in a humane way, such as sterilization, egg removal or piercing, or segregation of the young with same gender pairings. As a last resort thinning the number on a lake, but not wiping out their existence” (Luxford, 2011). The phrasing of these messages seems to suggest that stakeholders may support mute swan management if it did not include lethal methods. Future research might explore the extent to which the overarching issue in mute swan management is lethal control.

This content analysis approach to analyzing media content provided a means for quantifying and characterizing people’s views that justify their support or opposition for particular actions. This allows us to engage in a more formal conservation ethics argument analysis on these contentious natural resources issues (see, e.g., Vucetich & Nelson, 2014). Although we employed this analysis to an emerging issue, the framework can be implemented as a predictive or even post hoc analysis for natural resources discussions more generally. Managers can use this approach to assess the current social climate or to prepare for potential controversies over developing policies. With guidance from experts in argument analysis, managers could also take on the task of formally evaluating the soundness of the arguments seemingly influencing the public’s, and even their own, thinking. Knowing which arguments are persuading people, as our analysis did, is a necessary step in a more formal argument analysis, ultimately resulting in an assessment of actual merits of those arguments seemingly persuading us.

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Appendix 1.

Reasons in support of, and in opposition to, the mute swan management policy as identified from Michigan online news articles published between December 2011 and October 2012. Policy support and opposition codes are ordered by code frequencies. Some policy support/opposition codes are expanded into “Secondary Policy Codes” when additional context was helpful.

Primary policy support codes	Applied definition	Secondary policy support codes	Example
Aggression (<i>n</i> = 87)	Characterization of mute swans as aggressive, with the potential to harm humans, children, native species. Example behaviors include hissing, chasing, biting or killing.	Toward Humans (<i>n</i> = 51)	“Mute swans’ aggression toward humans is increasingly dangerous for people in boats and on shore” (<i>Great Lakes Echo</i>).
		Toward Wildlife (<i>n</i> = 27)	“Because of the mute swan’s aggression toward native waterfowl, the DNR has long removed mute swans from state game areas” (<i>The News Herald</i>).
		General Characterization (<i>n</i> = 9)	“They are considered the most aggressive waterfowl species in the world” (<i>Great Lakes Echo</i>).
Ecosystem Protection (<i>n</i> = 84)	Suggestions that we should manage mute swans because they cause harm to multiple trophic levels, a system, or components of an ecosystem. This code has four sub-codes.	Wildlife/ Consumers (<i>n</i> = 37)	“Mute swans have been able to out-compete native waterfowl for breeding habitats” (<i>Oakland Lakefront</i>).
		Ecosystem (<i>n</i> = 27)	“Over a period of time, it’s going to change the ecological makeup of the lake” (<i>C and G News</i>).
		Primary Producers (<i>n</i> = 22)	“Mute swans ... are capable of inflicting significant damage to aquatic habitat, by feeding heavily on aquatic vegetation” (<i>The News Herald</i>).
Efficacy (<i>n</i> = 16)	In reference to the primary method of mute swan management—lethal control—suggestions that this is the most effective method of control.		“The program will utilize a series of measures to control mute swan populations with the main focus being the elimination of adults” (<i>White Lake Beacon</i>).
Evidence-Based (<i>n</i> = 19)	References to management decisions as being well-founded in science, and endorsed by reputable organizations. This category has two sub-codes.	Expertise/ Collaboration (<i>n</i> = 12)	“We’re united with hundreds of other groups that support eradication of the mute swan on the landscape” (<i>Grand Rapids Press</i>).
		Science (<i>n</i> = 7)	“Because of all the data and research we’ve done, unless there’s something that can be shown that will refute that ... we’ll be moving forward” (<i>Mlive</i>).
Non-Nativity (<i>n</i> = 10)	Statements that refer to an interest in controlling mute swans for the sake of native species and ecosystems. Native species can be waterfowl or plants, as long as “native” is mentioned.		“The DNR has a long way to go to bring mute swan populations to within management goals, but considers it an important step in successfully maintaining other native waterfowl populations—ducks, geese and even other swans” (<i>The News Herald</i>).
Alternative Methods (<i>n</i> = 41)	Reference to more humane methods of managing mute swans, or using alternative methods other than killing adults.		“If the species needs to be controlled, then control it in a humane way, such as sterilization, egg removal or piercing, or segregation of the young with same gender pairings” (<i>The Daily News</i>).

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Primary policy support codes	Applied definition	Secondary policy support codes	Example
Distrust Expert Voice (<i>n</i> = 83)	Stakeholder interest in public votes, or a more democratic process for deciding the fate of the swans. Suggestion that the authority of the decisions has a hidden agenda or is untrustworthy for other reasons, and/or the evidence to support the policy is inadequate. This category has three sub-codes.	Science (<i>n</i> = 37) Distrust of Authority (<i>n</i> = 28) Alternative Expertise (<i>n</i> = 18)	"The DNR lacks adequate science to support its position" (<i>White Lake Beacon</i>). "Oh, there needs to be a cull all right —of the DNR and bloodthirsty state officials who sleep with the hunting lobby" (<i>The Detroit News</i>) "She wants residents to be able to decide the swans' fate in a state election" (<i>WZZM 13</i>).
Aesthetic Value (<i>n</i> = 25)	Suggestions that swans should be preserved because they are "beautiful," "graceful," and/or provide some aesthetic value.		"Most people find mute swans awe-inspiring—a bird revered for its majesty and beauty the world over" (<i>The Detroit News</i>).
Aggression Natural (<i>n</i> = 19)	Arguments that mute swan aggression is a natural defense to protect young or territory, and does not call for control.		"As for their aggressiveness, what would you do to protect your child" (<i>The Daily News</i>)?
Humanity Greater Concern (<i>n</i> = 13)	Statements that refer to humans causing greater harm than mute swans on the environment. This includes humans being the cause of swan introductions into the United States.		"The DNR is lying to the public by claiming that swans are ecologically destructive when it's humans that wreak the most havoc" (<i>The Detroit News</i>).