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Original Article

Greater Sage-Grouse in Montana: Mapping Archetype Viewpoints Across Stakeholder Groups Using Q Methodology

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ABSTRACT We conducted a Q-method-based study to examine patterns of agreement and disagreement across stakeholder groups regarding greater sage-grouse (*Centrocercus urophasianus*) management in Montana, USA, between 2010 and 2014. Tested groups consisted of government natural resource managers, advocacy groups, landowners, and concerned citizens. We asked 49 representatives of 14 different stakeholder agencies to complete a Q-method assessment of their viewpoints on greater sage-grouse management in Montana. We identified the substantively different ways that stakeholders organized their views on 2 issues: 1) What is the condition of greater sage-grouse in Montana? (i.e., the problem); and 2) What should be done about it? (i.e., the solution). We identified 3 "archetypes" (or factors in Q-method terminology): Limit Development, Local Governance, and Limit Regulation—each of which prioritized a different set of management values. We found that viewpoints toward climate change and predators were issues that created divisions among archetypes regarding sources of greater sage-grouse mortality, whereas the issues of sod-busting (breaking up new ground for cultivation) and concerns for the economic impacts of listing as an endangered species could be starting points for building consensus among stakeholder groups. Not only did Q methodology reveal the issues that divided the 3 archetypes and those issues that served as common ground, it also identified stakeholders whose viewpoints made them well-suited to act as agents of consensus or translators during contentious decision-making processes. © 2017 The Wildlife Society.

KEY WORDS Bureau of Land Management, *Centrocercus urophasianus*, endangered species, greater sage-grouse, landowners, Montana, stakeholder analysis, United States Fish and Wildlife Service.

The greater sage-grouse (*Centrocercus urophasianus*) is an indicator species of a relatively healthy sagebrush (*Artemisia* spp.) ecosystem. Therefore, greater sage-grouse abundance is a focal point in sagebrush ecosystem management plans throughout the American West (Wambolt et al. 2002, Rowland et al. 2006). In the past 2 centuries, the distribution of greater sage-grouse in the American West has declined approximately 56% (Schroeder et al. 2004).

This decline was primarily the result of loss or fragmentation of habitat (Aldridge and Brigham, 2003, Schroeder et al. 2004). In Montana, USA, greater sage-grouse numbers are down by one-third from historical levels (Montana Fish, Wildlife, and Parks 2003). Meanwhile, the discussion regarding what to do about this decline has proven to be contentious, particularly among stakeholder groups with ties to the landscapes that constitute core habitat for the greater sage-grouse (USBLM/USFS 2012).

From 1999 until 2005, 8 petitions and several lawsuits were filed to list greater sage-grouse under the Endangered Species Act (ESA; USDI FWS 2015). In response, in March 2010, the U.S. Fish and Wildlife Service (FWS), the federal agency charged with implementation of the ESA, issued a 12-month finding concluding that the greater sage-grouse did in fact warrant listing. In 2011, the FWS declared that it would issue a final decision on greater sage-grouse listing status by 30 September 2015. This prompted wildlife agencies in 10 states, including Montana, to collaborate with federal agencies such as the Bureau of Land Management for development of place-specific conservation plans to mitigate risks to greater sage-grouse populations as outlined in the FWS's 2010 ruling (Knick and Connelly 2011). Notably, a motivating factor in these experiments with collaborative management was the perception that an ESA listing would dramatically increase regulation on public and private land (Montana Fish, Wildlife, and Parks 2003, Peterson 2015, Anderson et al. 2016).

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On 22 September 2015, the FWS met their deadline and announced that, "based on the best available scientific and commercial information" the greater sage-grouse did not "at this time" warrant listing as a threatened or endangered species. The report issued by the FWS stated that this was due to "conservation efforts implemented by Federal, State, and private landowners," which "have reduced these risks [to greater sage-grouse habitat] in approximately 90 percent of breeding habitat" (USDI FWS 2015:4). The report explicitly credited the effectiveness of federal and statewide management plans for helping to prevent the listing of the greater sage-grouse.

However, a number of stakeholder groups did not agree with the 2015 ruling. Groups such as the Center for Biological Diversity argued that this ruling did little to address the regional decline in greater sage-grouse populations over the past few decades and indicated that they would explore legal options similar to those that had forced the federal agencies to take action during the 2010–2015 period. In Montana, energy industry groups, ranchers associations, and politicians voiced concern about the economic effects of the Department of the Interior's plan to maintain greater sage-grouse habitat protections on >27 million ha of public land, including 4 million ha where oil and gas production restrictions will remain and possibly increase (Daines 2015).

In other words, despite the September 2015 ruling, details regarding how greater sage-grouse management ought to be implemented remain unsettled and divisive. One thing is clear, however, implementation of greater sage-grouse management plans is dependent on cooperation between stakeholder groups and professionals (Crawford et al. 2004). This situation raises the question of how, in such a divisive context, will collaborative management of greater sage-grouse unfold? More specifically, which issues and management preferences differentiate the main points of view evident among stakeholders involved in greater sage-grouse management in Montana? Similarly, which issues appear to be noncontentious and therefore, potential building blocks upon which to forge consensus regarding greater sage-grouse governance? Following Kahan and Braman's (2006) argument that individuals' attitudes toward public policies—and, by extension, their desire to help implement them—are strongly influenced by their ideological viewpoints, we suggest that a crucial first step in addressing this question was to identify both the different points of view that exist among greater sage-grouse stakeholders in Montana and issues that distinguish these points of view from each other (see also Didier and Brunson 2004).

We present a real-world example of how to use Q method—ranking exercises paired with powerful correlation and factor analysis techniques—to explore the main, substantively different, points of view that exist among Montana greater sage-grouse stakeholders. In doing so, we effectively attempted to move beyond the assumption that professional affiliation and expertise are the only determinants of how an individual will engage with a topic such as greater sage-grouse management. Instead, following Kahan and Braman's (2006) call for "empirical testing in both the lab and field" of strategies for mapping patterns of cultural cognition, we report on findings from our Q-method study, which was designed to reveal the different configurations of values and preferences that underlie the cultural cognitions of greater sage-grouse stakeholders. We showed that Q-method and semistructured interview methodologies can be used to do 3 things: 1) identify perspectives and values that distinguish viewpoints from each other; 2) identify values that are shared across different viewpoints (i.e., common ground); and 3) identify individuals whose unique points of view make them excellent candidates to engage in the difficult translation work required by the contentious atmosphere of cross-stakeholder-group, consensus-based, environmental decision-making (Pellow 1999, Lewis and Mosse 2006).

METHODS

We used Q-method and semistructured interviews to gather data about the management preferences of Montana-based individuals who had a stake in greater sage-grouse decision-making during or before December 2014 (Fig.1). Research using Q method has been published on a range of environmental topics, including ecological economics (Johnson and Chess 2006), human geography (Robbins and Krueger 2000), integrated water resource management (Ward 2013), and global environmental change (Dayton 2000). Q methodology combines ranking exercises with factor and correlation analyses to produce quantitative models of a participant's subjective beliefs on an issue.

Statement Selection

In the first stage of the project, we developed a set of >100 statements about greater sage-grouse. Primary sources for these statements included public comments from the National Environmental Policy Act process, opinion columns published in newspapers, and informal interviews with greater sage-grouse experts. We reduced the original set to a concourse of 16 statements (Table 1) that were deemed representative of the range and intensity of the discourses surrounding greater sage-grouse mortality and management priorities (Brown 1993, Van Exel and de Graaf 2005). The text of each statement, along with a reference number, was printed onto small cards. The deck of 16 cards—one for each statement—was used during the Q-sort activity (see Data Collection section).

Participant Selection

Prior to engaging with stakeholders, the project was reviewed and approved by the Institutional Review Board at Rocky Mountain College, Billings, Montana (Protocol #IRB000117). To develop a sample of stakeholders, prior to the study, we designated the following stakeholder categories: farmer–rancher, government employee, nongovernment organization employee or affiliate, oil and gas industry representative, tribal member, or other. We created these categories in an attempt to span the diversity of greater sage-grouse viewpoints in Montana and ensure the selection of an approximately equal number of representatives from

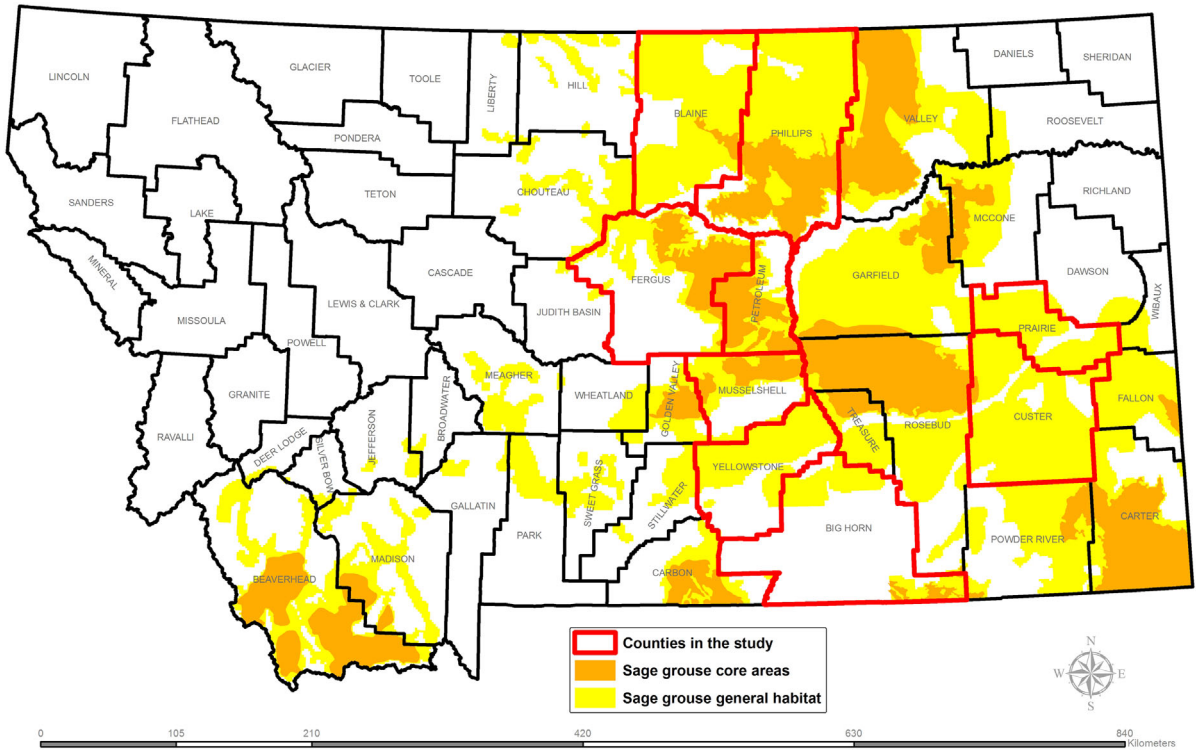

Figure 1. General and core greater sage-grouse habitat as delineated by Montana Fish, Wildlife & Parks (shaded), and counties in Montana, USA, where participants in the 2014 Q-method study of stakeholder viewpoints regarding greater sage-grouse management practices live and work (outlined in red). Created November 2014 by D. T. Peters using ArcMap 10.2. Data source: Montana State Library http://geoinfo.msl.mt.gov/. Spatial reference: NAD 1983 Montana State Plane FIPS 2500.

each group. We chose individuals in these stakeholder groups to participate in this study in the following ways: 1) using Geographic Information System mapping software (ArcMap 10.2; Environmental Systems Research Institute, Redlands, CA, USA) and cadastral data from the Montana State Library to identify landowners who owned land designated as greater sage-grouse priority habitat by Montana Fish, Wildlife & Parks; 2) using stratified sampling because each population was sampled independently from other groups; 3) mining public-comment sheets to gather information about stakeholders; and 4) using snowball sampling techniques, which gathered information about prospective study participants from stakeholders who had been previously contacted (Webler et al. 2009, Tipton et al. 2012).

We used the second technique, stratified sampling, to contact groups separately (i.e., ranchers were contacted separately from government officials), with the third technique, snowball sampling, after initial contact with these groups was made (i.e., ranchers recommended other ranchers and government officials were asked to recommend other government officials to complete the study). The goal of employing this suite of sampling techniques was to identify individuals who had well-formed opinions about greater sage-grouse and represented a stakeholder group identified above. Despite the fact that participants were initially selected using the above stakeholder categories, they were ultimately allowed to decide which group they felt most strongly affiliated with. Of the final participants, 9 self-identified as government employees (both state and federal), 6 self-identified as employees of the oil or gas industry, 15 self-identified as members or employees of a private organization, 11 self-identified as a farmer or rancher, 5 self-identified as "other," and 2 self-identified as members of a tribal nation. We recorded this affiliation on their demographic data sheet during the Q-method activity and used it during analysis. We also use these participant-defined affiliations throughout the remainder of this manuscript.

In addition to the requirement that they have professional ties to greater sage-grouse core habit areas, we selected study participants based on their public affiliation with greater sage-grouse policy-making. Not surprisingly, this led to a situation where all participants—regardless of whether they worked in the public or private sector—had strong opinions about greater sage-grouse management.

Data Collection

In a typical Q-method-semistructured interview encounter, participants first received instructions on the Q-sort exercise after hearing an explanation of the study and signing a consent form. First, we instructed participants to sort the 16 statement cards into 2 piles based on whether they agreed or disagreed with the statement on the card. Then, we instructed participants to arrange the cards from the 2 piles onto a ranking sheet containing a Likert Scale −3 to +3 in a normal distribution (Likert 1932). Participants ranked each

Table 1. Values of *z*-scores for 16 statements used to define and separate groupings of 3 archetypes: Limit Development (LM), Local Governance (LG), and Limit Regulation (LR), based on a Q-method–based study of stakeholder groups regarding the management of greater sage-grouse in Montana, USA, from May to November 2014.

No.	Statement	LD	LG	LR
1[a]	Power companies should bury power lines near sage-grouse breeding grounds, even if it increases the cost of electricity.	0.89	−0.78	−1.06
2	It seems like sage-grouse die from West Nile Virus more often than they die from predators such as other birds, foxes, and/or raccoons.	0.03	−0.18	0.46
3[a]	Currently other birds (e.g., eagles, hawks, falcons, owls, seagulls) and small predators (raccoons and foxes) kill more sage-grouse than human impacts such as roads, fences and power lines.	−0.80	0.97	0.07
4[b]	I think that livestock grazing is less disruptive to sage-grouse than recreational motorized vehicle use (e.g., ATVs).	0.81	0.46	0.69
5[a]	Too much money is going into sage-grouse conservation programs (e.g., flagging fences and putting in livestock ramps) when the reality is that sage-grouse are being eaten by predators.	−0.99	0.05	0.94
6[b]	Sod-busting (bringing new land into cultivation) is more disruptive to sage-grouse than livestock grazing.	1.72	0.97	0.93
7[a]	The main reason sage-grouse numbers are in decline is because their habitat is being broken up (fragmented) by things people build, such as power lines, fencing, roads, and subdivisions.	1.50	−0.73	−1.24
8[a]	Due to climate change, there will be less sage-grouse habitat and lower sage-grouse numbers in the future.	0.45	−1.08	−2.05
9	If the sage-grouse are put on the endangered species list, people will practice "Shoot, Shovel, and Shut Up," to keep their land from being regulated.	0.02	−0.01	0.31
10[a]	Sage-grouse conservation policies, such as planning grazing rotations around sage-grouse breeding seasons, flagging fences, and installing escape ramps, are less effective means of protecting sage-grouse than banning sage-grouse hunting.	−0.47	−0.88	0.80
11	To increase sage-grouse, core habitats should have no fences and no grazing by domestic livestock, such as cattle or sheep.	−0.10	−2.23	−1.25
12	Placing sage-grouse on the endangered species list will have a negative impact on Montana's economy.	0.23	1.17	1.19
13[a]	Cost-shares for conservation practices (e.g., paying land owners to flag fences) are more effective than placing restrictions on how landowners manage their land (e.g., restricting grazing on core habitat).	0.58	1.21	−0.71
14[a]	Policies meant to conserve sage-grouse should not interfere with mineral development (e.g., mining or hydraulic fracturing), even if development is in core sage-grouse areas.	−1.94	−0.30	1.17
15[a]	The experiences of local landholders should have more influence than scientific data when managing sage-grouse.	−1.31	−0.05	0.08
16[a]	Sage-grouse policies have been taken over by people who are not locals and therefore do not know the best management practices. There should be more local control of policies on sage-grouse.	−0.64	1.39	−0.32

[a] Statements are definitive of ≥2 archetypes—that is ≥2 archetypes had a z-score >0.6 or < −0.6, and the *z*-score was in opposition to another archetype.
[b] Statements were consensus statements, in that they did not distinguish among any pair of factors.

of the 16 statements on a scale from "most strongly disagree" (−3) to "most strongly agree" (+3). This forced normalization of rankings obligated participants to make trade-offs, which in turn created, in effect, a map of their most strongly held subjective values and beliefs (Brown 1993).

We conducted semistructured interviews after the Q-sorts were completed to elicit further qualitative information on participants' reasoning during the ranking exercises. This combination of techniques permitted us to gather both quantitative (Q-sorts) and qualitative (interviews) information about the range and structure of opinions that existed across the sample population (Webler et al. 2009). If stakeholders were not available to do the Q-sort in person, we sent the Q-sort activity and instructions to them with a return envelope. We then interviewed these participants on the phone to contextualize further their management values and Q-sort rankings.

Data Analysis

After we collected all Q-sorts, we analyzed each sort using the software program FlashQ (http://qmethod.org/forms/flashq.zip), which used statistical correlations and factor analysis to show the patterns of opinions about greater sage-grouse (Webler et al. 2009, Ward 2013, Neff and Larson 2014, Schmolck 2015). During analysis, we used factor analysis and correlation scores of the Q-sorts to identify 3 statistically significant factors that best explained—maximized—the similarities and differences between all 48 Q-sorts performed by study participants. Following Brown (1993), we chose the 3-factor/archetype solution because this best reflected the diversity of viewpoints within and among stakeholder groups and each factor was substantively different from the others (Table 1). In other words, we thought of these factors as "archetypes" that represented the substantively different ways that study participants organized the statements on greater sage-grouse mortality and management preferences.

RESULTS

At the end of the study, 48 stakeholders completed the Q-sorts and semistructured interviews. There were 3 substantively different ways in which study participants organized their views on greater sage-grouse mortality and the various management alternatives available. For ease of readability and to highlight the differences between archetype viewpoints, we hereafter refer to these as the Limit Development (LD), Local Governance (LG), and Limit Regulation (LR) archetypes (Table 1). One of the 3 archetypes correlated with 63% of participants' sorts. Approximately 70% of participants correlated with a 4 factor "solution," but 2 of those factors were not substantively different and therefore, we did not utilize a 4-factor solution. Statements definitive of ≥2 archetypes had a *z*-score of >0.6 or <−0.6, one standard deviation away from zero salience or neutral, and the *z*-score was in opposition to another archetype. The formula for the factor weight *z*-scores was

$$w_{ij} = a_{ij} / \left(1 - a_{ij}^2\right)$$

where a_{ij} is the factor loading of the ith individual on the jth factor, and w_{ij} is the weight (Schmolck 2015). For example, the Limit Development, Local Governance, and Limit Regulation archetypes all had z-scores >0.6 or <-0.6 regarding statement 1, "Power companies should bury power lines near sage-grouse breeding grounds, even if it increases the cost of electricity." Those with the Limit Development archetype agreed with this statement (z-score $= 0.89$), whereas the Local Governance and Limit Regulation archetype members disagreed with this statement (z-scores $= -0.78$ and -1.06, respectively).

Archetype: Limit Development

Participants whose Q-sorts aligned with the LD archetype adopted the general view that restricting human activity in greater sage-grouse habitat was crucial to the long-term conservation of the species (Table 1). Regarding mortality of the greater sage-grouse, LD stakeholders considered human activities, including oil and gas development (statement #14 [hereafter, statement numbers are designated by "#"]), the primary cause of greater sage-grouse decline. They also believed that natural predators had a much smaller effect on greater sage-grouse than did humans (#3). In terms of management preferences, LD stakeholders placed more value on scientific data than on the opinions of locals (#15) and they valued ecosystem services over economic gains (#1). Participants in this archetype self-identified primarily as members of nongovernment organizations, government employees, or in the category of "other."

Comments made during semistructured interviews with LD stakeholders contextualized the core values that defined this archetype. One participant (P9), who self-identified as a public lands researcher and interested member of the public, stated, "People who live and work the land make the assumption that if there isn't economic value [from conservation], it doesn't count." Another participant (P17), a self-identified environmentalist, explained that policies that conserve greater sage-grouse, specifically those that limit oil and gas extraction and preserve wild lands, are a means to achieving balance in what this person felt is an unfair system. This participant stated, "there should be a few areas we leave alone: some [land] for cows and some for grouse. Only 1% of the prairies are protected. What we have been doing [limiting wilderness designations and utilizing non-renewable resources] is wrong. The question is: Will we ever have the fortitude to do what's right?" Together, these statements expressed a belief, common to LD stakeholders, that the current regulatory environment prioritizes benefits to humans over the provision of adequate protection for the greater sage-grouse and the overall ecosystem.

Archetype: Local Governance

The stakeholders aligned with the LG archetype expressed a level of frustration with the regulatory environment similar to that found in the LD archetype (Table 1). In contrast to the LD archetype stakeholders, who appeared frustrated by lack of adequate regulations, the LG archetype stakeholders directed frustration toward regulatory interventions that they felt failed to take into account local concerns, conditions, or opinions. Participants whose Q-sorts were associated with this archetype were primarily farmers and ranchers, members of the oil and gas industry, and one government employee, who, notably, worked at the local (conservation district) level.

Local governance stakeholders believed human activities were not the primary cause of greater sage-grouse decline (#3). They believed that habitat fragmentation, oil and gas development, and climate change have negligible effects on greater sage-grouse populations, whereas nonhuman predators, such as eagles (*Aquila chrysaetos*), ravens (*Corvus corax*), and coyotes (*Canis latrans*), were responsible for the bulk of greater sage-grouse morality (#7 and #8). They very strongly disagreed that fencing and grazing should be restricted to protect greater sage-grouse (#11). Local governance stakeholders also believed the experience and knowledge of locals should have as much influence as scientific data on greater sage-grouse management decisions (#16). Finally, LG stakeholders were deeply concerned that an ESA listing of greater sage-grouse would have a negative effect on Montana's economy (#12).

Interviews with LG stakeholders helped explain the patterns evident in the Q-data. One stakeholder (P37) who self-identified as a farmer–rancher and whose sort loaded strongly on the LG archetype expressed frustration with the concept of science-based management. Although not "opposed to science" *per se*, this participant asked, "Whose science are we going to use? We [American citizens] don't have a prestigious science person [or organization] in the government; we have all these little segments that pick and choose the science they want to use ... If it [the data] came from someone who I thought was prejudiced against me, I won't agree with it." Another farmer–rancher (P11) questioned the effectiveness of the federally sponsored programs to flag fences and install wildlife escape ramps on water tanks, while notably, P11 still benefited monetarily from the funding the program provided. "We flagged our fences and put in escape ramps. I don't remember seeing dead sage-grouse on the fences or in the stock tanks ... I think it's appropriate to do some of these things, but from my own experience I don't know how much it helps." This skepticism toward scientific data carries through as a theme in the LG archetype.

Although LG stakeholders were supportive of the continued protection of greater sage-grouse, they were concerned that enacting policies designed (based on what they viewed as faulty or incomplete science) to protect the bird by regulating land use would threaten Montanans' livelihoods (#12). This and other comments by LG stakeholders made it clear that they perceived environmental decision-making power as being organized in a way that marginalized them and placed a greater value on a single species—whose status as "threatened" they questioned—than on their livelihoods. Many participants in this category

owned and worked on land that was delineated as greater sage-grouse habitat. In that context, the LG stakeholders' preference for building local knowledge and interests into greater sage-grouse policies could be interpreted as an attempt to protect property rights and a frustration toward laws they viewed as unfair or biased.

Archetype: Limit Regulation

The LR archetype was defined by disbelief in climate change and a fear of regulatory bodies prioritizing greater sage-grouse over economic advances (Table 1). Stakeholders with the LR archetype shared the LG and LD stakeholders' frustration with regulatory decisions, but solutions built around fewer regulations were more important than the LG priority of increasing local input in policymaking and implementation. The top 3 defining statements for the LR archetype were strong disagreement with ideas that mentioned or hinted at regulation. For example, the LR archetype participants rejected the statement that climate change would negatively affect greater sage-grouse (#8), expressed fear that an ESA listing of the greater sage-grouse would result in a decrease in grazing rights (#12), and did not consider anthropogenic habitat fragmentation a cause of greater sage-grouse decline (#7). Limit regulation stakeholders viewed regulations as the direct problem, rather than taking the stance (as LG stakeholders did) that lack of local input in decision-making processes caused conflicts regarding greater sage-grouse.

Interviews with stakeholders whose sorts were associated with the LR archetype confirm patterns observed in the Q-data. Limit Regulation stakeholders had very strong feelings about climate change and what they perceived to be the potential negative economic outcomes of an ESA listing for the greater sage-grouse. A self-identified rancher (P10) whose sort was strongly associated with the LR perspective expressed that, "global warming is the biggest lie of the 20th century. The politicians are using it as an excuse to take away everything they can. . . The climate is changing, but I don't believe humans are causing it." Another participant (P10) rejected the concept of climate change as an environmental problem, much less a human driven process, and instead viewed climate change as a mechanism that the federal government wielded to impose increased (and economically destructive) regulations on private property owners. Although this participant supported the conservation of greater sage-grouse, he believed enacting policies to mitigate climate would not be an effective way to increase greater sage-grouse numbers. Milfont et al.'s (2014:1) argument, that an unwillingness to see climate change as a problem that humans can solve is a result of "uncertainty, skepticism, distrust, optimism bias, [or] attention to other priorities," is useful for interpreting the LR position on climate change. In both cases, the root cause of climate change skepticism was not necessarily scientific, but instead was concern about the economic effects of policies addressing climate change on agricultural livelihoods. The fear that policies, enacted under the umbrella of climate change mitigation, or the protection of a single species (which has little direct economic value), would inflict economic damage was a defining element of the LR perspective.

We note that the LR archetype was what Q-method scholars refer to as a "bipolar factor" (Webler et al. 2009). Bipolar factors occur when one stakeholder group has a positive correlation score with the archetype and another has a negative correlation score. In this study, 3 stakeholders' sorts loaded strongly but negatively on the LR archetype. Two of these stakeholders were members of a Native American tribe and worked in the tribal environmental department as a Natural Resources Director and as a Wildlife Biologist, respectively. Their strong negative loadings on the LR archetype were primarily a result of their strong negative feelings toward statement 12, which discussed the economic effect of an ESA listing of the greater sage-grouse. One of these participants (P25) stated, "It [an ESA listing] will affect the Montana economy but the natives won't really care. We want a fair share, and they [the federal government] are stealing money from us anyways. Tribes own 7% of the state, so they should get a portion of the funds from the taxes on game and recreation items." This comment suggested that although the tribal stakeholders recognized that an ESA listing could have a negative economic effect, they rejected the idea that this will be detrimental to their [natives'] livelihoods. Unlike the participants who believed that an ESA listing would cause economic hardship, they felt that, as a Native American participant (P26) said, an ESA listing of greater sage-grouse has the potential to become "a stepping-stone to conserve other wildlife and wildlife habitat." Bipolar LR stakeholders had similar feelings to those of normally loading LR stakeholders—that is, they had strong feelings about the regulatory environment. However, they were much less supportive of the LR archetype's call for deregulation. In fact, they felt that regulation could be part of the solution.

Consensus Within Archetypes

Within the Q-analysis, 2 statements were consensus statements, in that they did not distinguish among any pair of factors. These statements, (#4 and #6), provided an insight into the potential points of agreement among stakeholder groups (Table 1). Additionally, statements #2, #9, #11, and #12, did not produce extreme opposition among $\geq$2 stakeholder archetypes—that is, one or more groups may have felt very strongly about a certain statement but other groups felt less strongly or prioritized their concerns differently because of the forced normalization technique that Q method employs. These statements may not represent consensus, but may still provide a starting point for communication between stakeholders.

Stakeholders generally shared the view that all-terrain vehicle (ATV) use did little to threaten greater sage-grouse (statement #4), although a government employee who worked with private landowners (P5) did state, "not all recreational vehicles [or ATV users] are the same." By far the most meaningful consensus statement was #6, which had a z-score $>$0.9 across all stakeholder groups. One participant (P1), a self-identified government employee at the federal

level, stated during a Q-sort interview, "30,000 acres of new ground have been farmed in Petroleum County alone over the past 5 years." This participant stated the belief that farming practices are directly linked to greater sage-grouse decline. Q-sort data indicated that this opinion was shared across archetype viewpoints—all archetypes agreed that sod-busting was an important source of greater sage-grouse mortality.

DISCUSSION

There is widespread agreement among academics and government agencies that to be valid, effective, and sustainable, environmental management requires the active participation of decision-makers, technical experts, and stakeholder groups (Henton et al. 2005). In this collaborative environment, determining how management should unfold in a particular locale (e.g., how greater sage-grouse habitat should be managed in Montana) requires a semblance of consensus among these differently positioned and interested actors regarding 1) the conditions of management (e.g., problem definition and risks of action–inaction); and 2) the desired outcomes of policy (Koontz and Thomas 2006). According to McGuire (2012), consensus decision-making focuses on building agreement among all participants, rather than the majority-vote model that subsequently dismisses the minority. Pielke (2007) pointed out that the process of cultivating consensus about environmental issues is frequently contested and fraught with political battles, particularly in instances when there is uncertainty or disagreement about what different stakeholders value. Henton et al. (2005) emphasized that for collaborative management to be executed, an allocation of the resources of many different stakeholder groups must first take place. Keough and Blahna (2005) emphasized the need for balance in collaborative management by pointing out that management policies that focus solely on one set of goals (economic, social, or ecological) will subsequently lose the benefits of other goals. Consensus regarding conditions of management is a precursor to coming up with a plan of action that, although it may not be everyone's preferred option, is something that all agree that they can live with.

Our Q-data suggested that the contours of the greater sage-grouse decision-making environment in Montana were characterized by disagreement over 1) the desirability of science-based decision-making; and 2) the degree to which government agencies have the right to intervene in the affairs of private citizens and their property. Semistructured interview data reveal the important role that opinions on the proper role and scale of government appear to play in greater sage-grouse management preferences. This raises important questions about how Montanans will proceed as they attempt to refine greater sage-grouse management arrangements.

Our findings suggested that scientific facts are only important to subsets of greater sage-grouse management stakeholders and, in many cases, lack the ability to serve as the basis for generating consensus. Indeed, environmental decision-making is a complex interaction between science and values (Pielke 2007, Neff and Larson 2014). Our study suggested that utilizing management policies that attempt to address the perceived lack of input from locals and provide alternatives to sod-busting would be key areas where shared values facilitate collaborative decision-making about greater sage-grouse management.

Q-method-based stakeholder analyses provide policymakers, and other interested parties, with a rich mix of quantitative and qualitative data that can be used to develop sound policy and anticipate stakeholder reactions to policy proposals in the American West and beyond. In the context of ongoing and increasingly contentious environmental policy reforms and complex interdependence among human and environmental systems, Q method provides an important tool for revealing patterns (archetypes) in how stakeholders understand and prioritize an entire concourse of issues. By analyzing both the archetypes and the individuals who compose those archetypes, policymakers will be better equipped to work with those who are directly responsible for applying conservation policies to the landscape.

MANAGEMENT IMPLICATIONS

Our study demonstrated a baseline upon which consensus among stakeholders in various groups might be built. Once baseline points of agreement and disagreement are established using Q method, the next step in the process is to identify individuals that are uniquely positioned to "translate" the viewpoints of each archetype into meaningful dialog and viable governance arrangements that help diverging stakeholder groups work around contentious issues—and then recruit others to do the same. This can help the policy-making and implementation processes move forward in a collaborative manner. It is through these conversations that stakeholders are able to arrive at mutually beneficial points of agreement regarding regulatory arrangements; this approach emphasizes shared power rather than antagonism (Pellow 1999, Lewis and Mosse 2006, Pielke 2007, Baber and Bartlett 2015).

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