Arizona Permittee and Land Management Agency Employee Attitudes Toward Rangeland Monitoring by Permittees

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Abstract

Ongoing conflicts over the management of western rangelands can be attributed in part to the lack of reliable information about current ecological conditions and their causes due, in turn, to insufficient monitoring. To meet the monitoring shortfall, land management agencies increasingly are enlisting permittees to monitor their grazing allotments. We surveyed grazing permittees in 5 Arizona counties and land management agency employees throughout Arizona to compare their attitudes toward permittee monitoring on public rangelands, the role of government in rangeland management, rangeland conditions in Arizona, and the credibility of information sources about rangelands. Permittees and agency employees differed in most of the attitudes measured by our survey. However, both populations agreed that permittees should participate in monitoring their allotments, and many respondents agreed with making permittee monitoring mandatory. Many respondents in both groups also agreed that collaboration can be beneficial. Joint monitoring, which can be considered a type of "joint fact-finding," may help improve agency–permittee relationships and bridge the gap in attitudes and underlying values. Permittee-monitoring programs deserve careful evaluation to determine their impacts on social relationships, management decisions, and ecological conditions.

Resumen

Los continuos conflictos sobre el manejo de los pastizales del oeste, pueden ser atribuidos, en parte, a la falta de información confiable sobre las condiciones ecológicas actuales y sus causas, debido a el monitoreo insuficiente. Para subsanar el déficit de monitoreo, las agencias de manejo de tierras cada vez mas están enlistando los permisionarios para monitorear sus asignaciones de tierras de pastizal. Examinamos permisionarios en 5 condados de Arizona y a los empleados de agencias federales a través de Arizona para comparar sus actitudes hacia el monitoreo de las concesiones en los pastizales públicos de Arizona, el papel del gobierno en el manejo de pastizales, las condiciones de los pastizales en Arizona y la credibilidad de las fuentes de información sobre pastizales. Los permisionarios y los empleados de las agencias difirieron en la mayoría de las actitudes medidas en muestro estudio. Sin embargo, ambas poblaciones acordaron que los permisionarios deben participar monitoreando sus asignaciones, y muchos de los que respondieron concordaron en que el monitoreo de las concesiones debe ser obligatorio. Muchos de los participantes de ambos grupos también estuvieron de acuerdo en que la colaboración puede ser benéfica. El monitoreo conjunto, el cual puede ser considerado como un tipo de investigación conjunta, puede ayudar a mejorar las relaciones permisionarios–agencias y cerrar el hueco en las actitudes y los valores fundamentales. Los programas de monitoreo de las concesiones merecen una evaluación cuidadosa para determinar sus impactos en las relaciones sociales, decisiones de manejo y condiciones ecológicas.

Key Words: grazing permittees, collaboration, mail survey, Cooperative Extension, joint fact-finding

INTRODUCTION

As we enter the 21st century, debate over the condition of western rangelands continues unabated (Donahue 1999; Knight et al. 2002). This dispute stems from vastly differing perceptions of current and historic ecological conditions and the processes that create or maintain them, as well as from equally disparate values held by public land grazers, land managers, and environmental interests. The gap in perceptions is fueled in part by a lack of uniform and consistently implemented monitoring standards. Poorly conceived monitoring designs, imprecise methods, and failure to collect and analyze data prevent conclusive assessment of current conditions, trends, or causal agents (NRC 1994). Monitoring has long been promoted as a cornerstone of good management and is recognized as essential to adaptive management (Elzinga et al. 1998). Indeed, public land management agencies are under increasing scrutiny from both environmental and industry interests concerned with monitoring results (NWF and NRDC 2001). Nevertheless, rangeland monitoring simply does not happen as often or as well as it must to meet our stewardship aspirations and help put an end to the western rangeland debate.

Funding for this study was provided by University of Arizona Cooperative Extension and the Arizona Agricultural Experiment Station.

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Manuscript received 29 February 2004; manuscript accepted 23 April 2005.

Shortfalls in agency monitoring are, in large measure, the result of insufficient human and financial resources. In other words, rangeland monitoring is an unfunded mandate.

In response to the monitoring deficit and associated acrimony over grazing allotment administration, some land management agencies and permittees are looking for alternative solutions, including enlisting permittees to monitor their own allotments. Agency-initiated, voluntary and mandatory permittee-monitoring programs have been tried in several locations since the early 1990s (M. Smith, personal communication, February 2004). In other areas, permittees have initiated their own monitoring programs on public or private lands, often with support and training from Cooperative Extension (Peterson 2000; Fernandez-Gimenez et al. 2005). Recently, the Public Lands Council (PLC), an advocacy organization that represents the interests of federal grazing permittees, has pressed for greater permittee involvement in monitoring, as well as more resources for agency-monitoring efforts (PLC 2003). In July 2003, a memorandum of understanding (MOU) was signed by the US Forest Service (USFS) and the PLC providing a framework for promoting voluntary, cooperative monitoring of USFS grazing allotments by permittees and the Forest Service. A similar MOU was signed between the Bureau of Land Management (BLM) and the PLC in February 2004. These documents, and recent testimony by USFS officials (Thompson 2004), support a voluntary and cooperative role for permittees in monitoring public land grazing allotments.

As interest in permittee monitoring expands, it is useful to know how permittees and land management agency staff perceive the acceptability of this approach. Given the root sources of rangeland conflict discussed above, it is also important to assess whether and to what degree the ecological perceptions and attitudes toward federal rangeland management of permittees and agency employees differ. Finally, if science or monitoring is to provide a way out of the conflict, it is useful to know how each of these groups perceives the credibility of different information sources about rangelands. Thus, our objectives in this study are to compare Arizona permittee and land management agency employee attitudes towards permittee monitoring on public lands and the management of federal rangelands, as well as their perceptions of rangeland conditions, and the credibility of different information sources about rangelands and range management.

This study is exploratory rather than analytical, so we approached our data without strong a priori hypotheses rooted in theory. However, based on our experience and understanding of these 2 populations, we expected that they would differ in their ecological beliefs and perceptions, their views of the credibility of different information sources, and their attitudes toward government management of rangelands. We expected that both groups would oppose permittee monitoring, but for different reasons; permittees would be reluctant to assume the additional workload and expense of monitoring and would perceive monitoring to be an agency responsibility, and agency employees would oppose permittee monitoring because of permittees' potential conflicts of interest and their lack of knowledge or training in rangeland monitoring.

Before describing our methods and results, we first provide brief overviews of 1) the roles of values and attitudes in resource management behavior and conflict, and 2) the role of science and technical knowledge in resolving environmental conflicts.

VALUES AND ATTITUDES IN RANGELAND MANAGEMENT

Values are stable, basic modes of thought that reveal the basis of an individual's attitudes, preferences, and opinions and are considered relatively unchangeable and difficult to influence (Decker et al. 2004; Manfredo et al. 2004). Because values are often broad beliefs, they may not be precise predictors of individual attitudes and behaviors. Nevertheless, value differences underlie many conflicts, including those over natural resource management, and extreme value differences are thought to present a severe, if not always insurmountable, obstacle to conflict resolution and collaboration (Paulson 1998; Forester 1999; Wondolleck and Yaffee 2000).

Attitudes are positive or negative judgments about specific behaviors or ideas (Trafimow 2000). The attitude concept incorporates a range of different types of evaluative views, including perceptions of environmental conditions, opinions, and preferences (Decker et al. 2004). Most people hold hundreds or even thousands of attitudes towards specific objects. Unlike values, attitudes are subject to change and are influenced by new knowledge and changing social norms. Although attitudes do not always predict behavior with complete precision, attitudes towards specific objects, together with knowledge and social norms, are important contributing factors in determining behavioral choices including resource management practices (Ajzen and Fishbein 1980; Vaske and Donnelly 1999). Research has demonstrated that environmental attitudes and values can be strong predictors of, for example, voting behavior (Vaske and Donnelly 1999). Understanding differences and similarities in attitudes and values among different groups (such as permittees and land management agency employees) may help us understand the roots of conflict and identify areas of common ground, pointing to possible pathways to more productive and cooperative relationships.

A large number of studies have been conducted on public attitudes towards the environment and natural resources generally (Steel 1996; Manning et al. 1999; McFarlane and Boxall 2003), and a growing number have also documented agency attitudes and values (primarily the USFS) (Cramer et al. 1993; Brown and Harris 2000). However, only a few studies of public (Brunson and Steel 1996) and agency (Richards and Huntsinger 1994) attitudes towards rangeland management specifically have been conducted, and none has directly compared the attitudes and beliefs of agency employees with those of grazing permittees.

Surveys of ranchers in the western United states have focused primarily on rancher characteristics, ranching motivations, and management practices (Smith and Martin 1972; Coppock and Birkenfeld 1999; Liffman et al. 2000; Rowe et al. 2001; Gentner and Tanaka 2002) and have seldom addressed rancher values or attitudes except as they relate to the respondents' reasons for ranching. Exceptions include studies of California landowners' attitudes toward the management of oak woodlands (Huntsinger and Fortmann 1990; Huntsinger et al. 1997) and research

on Forest Service grazing permittee attitudes toward the Endangered Species Act (Conley 2001).

This study addresses a gap in the literature on the human dimensions of rangelands by providing the first direct comparison of permittee and agency employee attitudes and by focusing on ecological monitoring, a key concern in rangeland management.

THE ROLE OF SCIENCE AND TECHNICAL INFORMATION IN ENVIRONMENTAL CONFLICTS

As we asserted in our introduction, rangeland conflicts, like other environmental disputes, rarely arise over technical information alone (Adler et al. 2001). However, acknowledging and addressing technical issues can help reduce conflict. Scholars and practitioners of conflict management propose that even though scientific and technical information is embedded in a political context where values often dominate the debate, clear, accessible, and credible scientific information can more fully inform value choices (Adler et al. 2001). Further, to be usable, parties in a conflict must trust the information and the methods that produce it.

The practice of joint fact-finding, defined as a "process in which parties with differing interests work together to develop shared information base for making decisions," (Andrews 2002, p 7), has been advanced as one method of generating credible technical information that adversarial interests can rely upon in negotiating a resolution to environmental conflict (Ehrmann and Stinson 1999; Andrews 2002). The potential benefits of joint fact-finding include increasing shared knowledge and understanding among the parties, improved relationships between the parties, and ultimately better agreements or decisions.

If the lack of adequate monitoring data is indeed a significant driver of rangeland conflict, then addressing this shortfall should help reduce tensions and lead to more widely acceptable management decisions. The involvement of permittees in monitoring their own allotments, proposed as a solution to the monitoring shortfall, if implemented well, also has the potential to provide the benefits of joint fact-finding. By shedding light on the acceptability of permittee monitoring, the perceived credibility of different information sources, and permittee and agency perceptions of rangeland conditions, this survey should help to determine whether joint permittee-agency monitoring may be productively implemented.

METHODS

Following a series of focus groups in fall 2001 to spring 2002, a self-administered mail survey was implemented July 2002 to September 2002. The survey questions were shaped by the focus group results, as well as the design of past rancher and agency surveys (Richards and Huntsinger 1994; Brunson and Steel 1996; Coppock and Birkenfeld 1999; Liffman et al. 2000). Survey drafts were reviewed and pretested by 4 ranchers, 3 agency employees, extension agents, and several experienced researchers, and were revised numerous times before the final version was completed.

The survey was sent to all USFS, BLM, and Arizona State Land Department (ASLD) grazing permittees and lessees in the 5 study counties (Cochise, Gila, Graham, Mohave, and Yavapai), and all USFS, BLM, ASLD, and Natural Resources Conservation Service (NRCS) employees in Arizona who conduct or supervise rangeland monitoring or who use range monitoring data to make management decisions. The survey was sent to all permittees and agency staff rather than a random sample to ensure a sufficient sample size for analysis because fewer than 700 permittees graze in all 5 counties, and we conservatively planned on a 30% response rate. The total number of agency employees in Arizona meeting our criteria was also small (177).

In accordance with the total design method for survey implementation (Dillman 2000), the survey mailing was preceded by an introductory letter and followed by a reminder postcard. Replacement surveys were sent to those who did not respond to the first survey after 4 weeks. Forty-seven percent of permittees ($n = 311$) and 73% of agency employees ($n = 129$) responded to the survey.

Because permittees who returned their surveys might differ in important ways from those who did not respond, we conducted a follow-up telephone survey of 30 randomly selected nonrespondents. Nonrespondents did not differ from respondents in their attitudes toward monitoring on public lands, the scale of their ranching operation (in deeded acres or head of cattle), the percentage of their annual income derived from livestock, the county where they reside, or the type of grazing privileges they possess (USFS, BLM, or ASLD). However, nonrespondents were older, less educated, and less likely to do formal monitoring than were respondents. These results suggest that caution should be exercised in generalizing from our results with respect to some of the variables discussed in this article. Nevertheless, the survey provides an accurate description of the views and characteristics of more than 300 Arizona permittees, who are similar in many ways to the larger population that they are intended to represent.

Bivariate relationships were assessed with contingency tables using chi-square measures of nominal association and Goodman-Kruskal gamma measures of ordinal association (Norusis 1990). Differences were considered significant at $P < 0.05$.

RESULTS

Respondent Characteristics

The average permittee respondent had managed his or her current ranch for 23 years (the range was 1–77 years) and was 59 years old. Forty-four percent of permittees had completed at least a 4-year college degree (18% had graduate or professional degrees), and only 4% had less than 12 years of formal schooling. Sixty-three percent of the permittee respondents reported their approximate gross annual income. For these permittees, the mean annual income was $107,600 (with a range of $5,000–$1,000,000). Half of the permittees owned more than 1 000 acres of deeded land, and 27% owned less than 250 deeded acres. The mean cattle herd size as of 1 May 2002 was 223 head, with a range of 1–3 500. Note that herds may have been smaller

Table 1. Agency employee and permittee attitudes toward permittee monitoring. Agency employees are staff of the US Forest Service (USFS), Bureau of Land Management (BLM), Natural Resources Conservation Service (NRCS), and the Arizona State Lands Department (ASLD) who conduct or supervise rangeland monitoring or who use monitoring data. Statistical differences were assessed using chi-square tests (X^2) ($P < 0.10$).

	Percent of respondents who agree with this statement			
Survey statement	% of Permittees	% Agency employees	X^2	*P*-value
Land management agencies should conduct all range monitoring on public lands.	27	55	26.58	<0.001
Permittees should be required to monitor their public land grazing allotments.	61	70	2.66	0.103
Monitoring data gathered by permittees is not acceptable to the public.	60	60	0.03	0.871
Monitoring data gathered by permittees is not acceptable to most agencies.	68	46	13.08	<0.001
Data gathered by permittees on public land allotments should be considered by the management agency in making management decisions.	96	86	14.19	<0.001
Grazing permittees should participate in monitoring their public land allotments.	98	94	3.26	0.071
Permittees should only monitor with agency supervision.	19	38	14.19	<0.001
Permittee data should be used by the agency only if the permittee has obtained agency-approved monitoring training.	33	78	56.06	<0.001
It is unfair to require permittees to monitor their allotments.	35	22	5.46	0.019
Permittee monitoring is like "the fox guarding the henhouse."	13	32	17.45	<0.001

than usual because of drought destocking. Seventy-nine percent of permittee respondents reported doing some type of formal monitoring, and 31% monitored rangeland vegetation.

The average agency respondent was 47 years old, had worked for his or her current employer for 18 years, and had worked as a natural resource professional for 20 years. Ninety-six percent of agency respondents had a 4-year college degree, and 34% had a graduate degree. Sixty percent of agency respondents with a college education had an undergraduate degree in range management, 11% in wildlife management, 9% each in biological sciences and forestry, 5% in soils, and 3% in business or economics. Of those agency respondents with a graduate degree, 42% were in range management; 21% in wildlife management; 14% in forestry; 12% in biological sciences; 5% in social science, education, or humanities; and 2% each in hydrology and agriculture. Ninety-one percent of agency respondents participated in at least some field monitoring.

Comparison of Permittee and Agency Attitudes

Permittee Monitoring. Permittees and land management agency employees both agreed strongly that permittees should participate in monitoring their public land grazing allotments, and agreed, though less strongly, that permittees should be *required* to monitor (Table 1). They also shared the belief that monitoring data collected by permittees is not acceptable to the public. Both groups strongly agreed that data gathered by permittees on public land allotments should be considered by agencies in making management decisions, although permittees agreed more strongly (97% vs. 86%). However, agency employees were more than twice as likely as permittees to feel that permittee-gathered data should only be used if the permittee has agency-approved training (78% vs. 33%) or should only occur with agency supervision (38% vs. 19%). Permittees were more likely to view mandatory monitoring as unfair to them (35% vs. 22%), and agency employees were more likely to agree that permittee monitoring is like "the fox guarding the henhouse" (32% vs. 13%).

Arizona Rangelands. Permittees and land management agency employees shared similar perceptions of the current conditions of Arizona rangelands, with slightly higher proportions of both groups agreeing than disagreeing that Arizona's rangelands are in the best condition they have been in since 1900. The 2 groups also held similar beliefs about the recovery potential of degraded lands, although permittees were slightly more optimistic in their views. However, permittees and agency employees differed significantly in their beliefs about all other aspects of Arizona rangelands on which they were questioned (Table 2). Notably, almost all permittees (96%) believed, to some degree, that rangelands require grazing to remain vigorous and productive, compared with 38% of agency employees. Only 5% of permittees believed that grazing harms biodiversity, whereas 40% of agency employees believed this. Similarly, permittees were less likely to believe that overgrazing occurs and that soil erosion, declining water quality, and loss of streamside vegetation are problems in Arizona.

Reliability of Information Sources. Permittees and land management agency employees differed significantly in their opinions of the reliability of all but 4 of the 18 sources of information listed in the questionnaire (Table 3). Agency employees found other agency staff, university professors, research articles, and environmental groups more reliable than did permittees, whereas permittees trusted other ranchers, friends and family, cattle growers' associations, and range consultants more than agency employees did. The 2 groups did not differ in their views of the reliability of ASLD, NRCS, Cooperative Extension, or the Society for Range Management (SRM), which were generally positive.

Table 2. Agency employee and permittee beliefs about the ecology and conditions of Arizona rangelands.

Survey statement	Percent of respondents who agree with this statement: % of Permittees	% Agency employees	X^2	*P*-value
Arizona rangelands are in the best condition they have been in since 1900.	63	66	0.31	0.579
Most Arizona rangelands are overgrazed by cattle or sheep.	9	42	52.29	<0.001
Most wildlife populations on Arizona rangelands have remained constant or are increasing.	69	53	8.53	0.003
Biological diversity is harmed by livestock grazing.	5	40	73.70	<0.001
Soil erosion is only a minor problem on Arizona rangelands.	43	14	30.56	<0.001
With proper rest from grazing, most degraded Arizona rangelands can be restored to their historic natural plant communities.	49	39	2.98	0.084
Many Arizona rangelands require grazing by large hoofed animals to maintain plant vigor and productivity.	96	38	159.98	<0.001
The quality of water from rangelands in Arizona has decreased markedly in the past 50 years.	18	43	20.78	<0.001
Loss of streamside vegetation is a serious problem on Arizona rangelands.	21	73	83.95	<0.001

Federal Rangeland Management. Permittees and agency employees both agreed strongly that collaboration among stakeholders can lead to good resource management decisions and split evenly on the question of whether collaboration leads to "lowest common denominator" decisions. However, there were large and significant differences in other attitudes of permittees and agency employees about the role of government in managing federal rangelands (Table 4). Generally, permittees agreed strongly that endangered species laws should be amended, federal rangeland management should emphasize livestock grazing, and government regulation means a loss of liberties and freedom; and agreed somewhat that the economic vitality of local communities should have highest priority, whereas agency employees disagreed. Permittees also strongly disagreed that ranchers should pay more than they do to graze livestock on federal land and disagreed that greater protection is needed for rare plants and animals on federal rangelands. Both groups disagreed with the elimination of livestock grazing on public lands, but permittees disagreed more than agency employees.

Table 3. Agency employee and permittee attitudes toward the credibility of different information sources about rangelands and range management.

Information source	Percent of respondents who find this information source reliable: % of Permittees	% Agency employees	X^2	*P*-value
USFS range conservationist	50	96	66.73	<0.001
USFS biologist	35	82	56.22	<0.001
BLM range conservationist	67	98	32.98	<0.001
BLM biologist	47	82	25.90	<0.001
AZ State Land Dept range conservationist	85	86	0.02	0.883
NRCS (SCS) range conservationist	93	91	0.47	0.494
University professor	77	89	6.42	0.011
Cooperative Extension agent	94	88	2.89	0.89
Private range management consultant	94	60	44.35	<0.001
Ranchers	91	67	30.45	<0.001
Friends and family	78	34	45.74	<0.001
College textbook	74	86	5.12	0.024
Society for Range Management	86	91	1.58	0.209
Cattle growers association	93	59	54.55	<0.001
Research article in a scientific journal	73	97	25.20	<0.001
The Sierra Club	3	19	28.38	<0.001
The Nature Conservancy	13	59	71.17	<0.001
Center for Biological Diversity	5	15	8.14	0.004

DISCUSSION

Our results demonstrate the pronounced differences in the perceptions and attitudes held by permittees who graze their livestock on public and state lands and the natural resource professionals tasked with managing those lands. Although we did not seek to identify the causes of rangeland conflict through this survey, our results support the assertion that the perceptions and attitudes of these 2 populations differ dramatically. It is reasonable to conclude that these differing beliefs and views probably play a significant role in the ongoing struggle over the management of western rangelands.

Nevertheless, several points of agreement between permittees and agency employees stand out as important. First, both permittees and agency staff agree strongly that permittees should participate in monitoring their allotments, and many also agreed that such participation should be mandatory. This suggests that permittees and agency staff share a concern for the condition of public rangelands and a belief that monitoring is a valid means of assessing the ecological state of rangelands. Furthermore, both groups agree that the resource users should be closely involved in carrying out rangeland monitoring on public lands.

Table 4. Agency and permittee attitudes toward the role of government in managing public rangelands.

Survey statement	Percent of respondents who agree with this statement: % of Permittees	% Agency employees	X^2	*P*-value
Federal land management agencies adequately seek my input on decisions that affect me.	31	82	73.99	<0.001
Collaboration among stakeholders can lead to good resource management decisions.	93	91	0.90	0.342
The economic vitality of local communities should be given the highest priority when making decisions about federal rangelands.	77	37	51.05	<0.001
Greater efforts should be made to protect rare plants and animals on federal rangelands.	13	63	83.93	<0.001
Endangered species laws should be amended to preserve ranching.	94	32	160.53	<0.001
Collaboration among stakeholders leads to "lowest common denominator" decisions.	47	49	0.12	0.731
Federal rangeland management should emphasize livestock grazing.	93	39	132.06	<0.001
Ranchers should pay more than they do now to graze livestock on federal lands.	6	70	159.45	<0.001
Government regulation means a loss of liberties and freedom.	86	33	103.56	<0.001
Livestock grazing should not be allowed on public lands.	2	13	21.04	<0.001

Second, a large proportion of both groups agreed that collaborative approaches to resource management have beneficial outcomes. This suggests a willingness of each group to engage with the other in forums where the knowledge, ideas, and concerns of all parties can be voiced and are respected. Both points of agreement indicate that agency employees may be willing to share some of their management responsibilities with grazing permittees, and that many permittees may be willing to commit their time and resources to monitoring their allotments and participating in collaborative efforts. Because the survey did not attempt to measure actual behavioral intentions with respect to participation in collaboration, this interpretation remains speculative. However, a majority of permittee respondents (76%) reported that they were willing to conduct monitoring on their public land allotments if the data were accepted and used by the agency.

The positive attitudes towards collaboration and permittee monitoring held by both permittees and agency employees are encouraging and hold out the possibility that some of the underlying differences in these groups' values and attitudes may be bridged through collaboration on monitoring, a form of joint fact-finding. Existing research on collaboration in natural resource management indicates that collaboration is less likely to succeed when there are strong and irreconcilable value differences among participants (Paulson 1998; Wondolleck and Yaffee 2000). Nevertheless, other studies (Conley 2001) have shown that many permittees are willing to work with agencies to accommodate values that they may not share, such as endangered species protection.

IMPLICATIONS FOR JOINT PERMITTEE–AGENCY MONITORING

If permittee monitoring is implemented as a joint activity involving both permittees and agency staff, it can be considered a form of joint fact-finding, and lessons from the practice of joint fact-finding may help inform the design of successful permittee–agency monitoring partnerships. Joint fact-finding is useful in situations where parties have different interpretations of data, where there is a great deal of scientific uncertainty, or where the needed information is unavailable and must be developed (Ehrmann and Stinson 1999). It is also useful in situations where there is a low level of trust between parties in a dispute, leading to distrust of opposing interests' data (Ehrmann and Stinson 1999). All of these situations apply to many public rangeland conflicts. Joint fact-finding should be avoided in situations where extreme power imbalances exist between the parties, where a fair process is impossible or unlikely, or where fact-finding is forced on participants or is tangential to the main issues at stake (Ehrmann and Stinson 1999).

Like most conflict management approaches, the design of the process of joint fact-finding is critical to its success. Ideally participants in joint fact-finding include anyone who wants to participate. In a rangeland monitoring context this could open the door to interests beyond permittees and agency staff. It is also important to ensure that appropriate technical expertise is represented on the team, and that such "experts" are credible to and agreed upon by all parties in the process. Our survey results suggest that Cooperative Extension agents and NRCS staff may appropriately fill this role in Arizona.

Key components of the joint fact-finding process are clear definitions of the issues of concern, the process for gathering information, the specific questions to be asked and methods of data analysis, and the limitations of the methods. Finally, the parties to the process must make decisions based on the data they have collected (Ehrmann and Stinson 1999). In a rangeland monitoring context, these steps point to the importance of clearly specified management objectives or uncertainties to be addressed through monitoring, as well as the need for well-

defined monitoring protocols and transparency with respect to data collection and analysis approaches.

Other keys to successful joint fact-finding that apply to joint permittee-agency monitoring include having the support of decision-makers for data and decisions based on joint fact-finding (Andrews 2002). It is clear from the survey that this is a major concern of permittees—they want to be certain that data they collect will be acceptable and used by agency decision-makers. When joint fact-finding is one aspect of a collaborative decision-making process it is important that the data gathering and analysis be well matched with the decision process, so that neither task "gets ahead" of the other (Adler et al. 2001; Andrews 2002). Most importantly, it is crucial that all parties have equal access to the information generated by the process, as well as any other expertise that is brought to bear on the decision at hand (Ehrmann and Stinson 1999; Adler et al. 2001). We stress again that if joint agency–permittee monitoring is to avoid a "dueling experts" scenario, care must be taken that the monitoring objectives or questions and data gathering and analysis methods are understood and supported by all and that the results are likewise shared and explained. Although it is possible and even likely that interpretations of the data findings may differ among parties, the basis for productive decision-making is greatly strengthened if the data and the process through which they are gathered are credible to all parties.

MANAGEMENT IMPLICATIONS

The results of our survey underscore the gap in perceptions and attitudes of public land grazing permittees and agency land managers, but they also suggest that permittee involvement in rangeland monitoring is acceptable to both groups if certain conditions are met. Permittees' main concerns are that data they collect be accepted and used by the agency. Agency employees want to be sure that permittees who monitor are adequately trained and supervised.

Further, the support of both groups for collaborative processes indicates that monitoring undertaken as a joint fact-finding activity may lead to benefits beyond an increase in monitoring data gathered. Monitoring may be an arena in which the challenge of incompatible values can be avoided, when the focus is on land health in relation to management decisions about the intensity, frequency, or timing of grazing. When decisions involve allocating land among competing uses and values, bridging the gap between permittee and agency values may pose a greater, but not necessarily insurmountable, challenge. As more agencies implement permittee-monitoring programs, these efforts should be carefully evaluated to determine whether they are affecting ecological conditions, management decisions, and the relationships between agency employees and permittees.

ACKNOWLEDGMENTS

We greatly appreciate and benefited from the support and ideas of county natural resource extension agents throughout Arizona, and especially Robin Grumbles, Chris Jones, Kim McReynolds, Susan Pater, Jeff Schalau and Jim Sprinkle. We thank Rachel Meade for compiling the sampling frames; Mitch McClaran, Mac Donaldson, Sue Chilton, Mary Miller, John Hays, Kristen Egen, Mark Hocken, and Fred Denecke for reviewing survey drafts; and Alexander Conley, Mary Hershdorfer, and John Hays for helping with survey mailings. The assistance and cooperation of the Arizona offices of the USFS, BLM, and NRCS and the Arizona State Lands Department are gratefully acknowledged as is the cooperation of the Gila County Cattlegrowers and many other Arizona ranchers.

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