

Perceptions Regarding Elk in Northern Arizona

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Abstract

Since 1970 controversy has surrounded the status and management of Rocky Mountain elk (*Cervus elaphus*) in northern Arizona. Concerns focused on effects of elk on private and public land, size of the elk population, interactions between elk and cattle, and interactions between elk and humans. Currently, there is no primary literature regarding human perceptions of elk-related damage on ranches in Arizona. In 2001 we surveyed to document perceptions of stakeholders regarding elk management in northern Arizona. A majority of non-rancher stakeholders did not experience conflicts with elk. The public knew little about elk management in Arizona but wanted more information. Ranchers incurred monetary losses due to elk damage and 30% viewed Rocky Mountain elk as an exotic species. We documented a few similarities between ranchers and agency biologists as to reported effects of elk on ranchers' property. This may provide a platform for resource agency managers to facilitate discussion and communication strategies to optimize elk management among ranchers and the general public. (WILDLIFE SOCIETY BULLETIN 34(1):27-35; 2006)

Key words

attitudes, *Cervus elaphus*, elk, managers, public opinion, survey.

Arizona is one of the fastest growing states in the nation, and the population is becoming increasingly urban (United States Bureau of the Census 1991, Kamman and Ingley 2000). A consequence of this growth is increased human-wildlife conflicts (Decker et al. 2001). Agricultural producers experience a reduction in profitability due to wildlife damage and over the past few decades, the problem has increased (Conover and Decker 1991, Conover 1998).

One highly visible example of this controversy involves the status and management of elk (*Cervus elaphus*) in Arizona (Lane et al. 2001). Human encroachment into elk habitat is occurring at an accelerating rate throughout the West (Long 1996, Thompson and Henderson 1998). Concomitantly, public concerns about effects of elk on private and public land, size of the elk populations, interactions between elk and cattle, and interactions between elk and humans have increased (Lane et al. 2000, Lee and Miller 2003). Currently, there is no primary literature regarding human perceptions or understanding of these issues.

Unregulated elk hunting and competition with livestock caused the extinction of the native Merriam's elk (*Cervus elaphus merriami*) by 1906 in eastern Arizona (Bryant and Maser 1982, Hoffmeister 1986, Wisdom and Cook 2000). In 1913, 86 Rocky Mountain elk were translocated to the Sitgreaves National Forest resulting in the population found in Arizona today (Arizona Game and Fish Department [AGFD] 1972, Bryant and Maser 1982, Witmer 1990). The successful reintroduction to Arizona was attributed to the availability of elk habitat and the low human population density (Witmer 1990). As elk densities increased, so did elk use of croplands and rangelands (Thompson and Henderson 1998, Van Dyke et al. 1998, Lane et al. 2001).

Arizona wildlife managers employed by state and federal agencies (i.e. AGFD, Bureau of Land Management [BLM], United States Forest Service [USFS], Arizona State Lands

Department [ASLD], Native American wildlife agencies [NA-WA]) attempted to increase elk populations on public land while reducing the time the animals spent on private land. Common elk management goals shared by other western wildlife managers was to reduce forage competition between elk and cattle, consumption of crops by elk, and damage to fences (Gerrans 1982, Wisdom and Cook 2000). However, elk continue to use private land, often resulting in conflicts with livestock operators and local residents.

Because livestock and elk occupy many of the same landscapes, their interactions are an important concern for natural resource managers and livestock operators (Adams 1982, Skovlin 1982, Alt et al. 1992, Torstenson et al. 2002). In the United States, farmers and ranchers operate on 401,000,000 ha of land; this accounts for 45% of the nation's surface area (U.S. Bureau of the Census 1991, Conover 1998). Because of the magnitude of their operations, agricultural producers directly impact wildlife resources (Kellert 1981, Conover 1998). When wildlife causes economic losses to agricultural producers (e.g., property damage, crop consumption) negative attitudes towards wildlife develop by the producers (Conover 1998). Understanding how ranchers perceive elk in Arizona and elsewhere could help wildlife managers develop and implement management plans that conserve elk while optimizing the array of benefits and minimizing costs of interactions with humans.

Elk are one of the most highly valued wildlife species in North America (Potter 1982, Wisdom and Cook 2000). Thousands of visitors are attracted to areas to see elk, and wildlife agencies in the western United States receive millions of dollars from the sales of elk permits and hunting licenses each year (Potter 1982, Loomis et al. 1988, Wisdom and Cook 2000). Few studies have compared public opinions regarding wildlife management to those of public wildlife managers (Enck and Decker 1997, Phillips et al. 1998, Mankin et al. 1999, Freddy et al. 2004). No such studies have been conducted in Arizona.

Making decisions in wildlife management is difficult given the conflicting needs and desires of different stakeholder groups (Enck

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and Decker 1997, Freddy et al. 2004). Decisions are improved, however, when opinions, attitudes, and perceptions of stakeholders involved are better understood (Harris et al. 1995, Enck and Decker 1997). Wildlife management has evolved to rely on the ability of managers to consider the entire scope of human values associated with wildlife rather than focusing solely on a particular group (Decker et al. 2001). To ensure that management is responsive to public values, it is imperative to understand and examine values of key stakeholders when making management decisions (Decker et al. 1996). Our objectives were to compare the perceptions of the general public, ranchers, and wildlife managers regarding elk management in Arizona. These data will have important implications for natural resource managers and livestock operators throughout landscapes shared by elk and livestock. An understanding of the attitudes by all groups should foster enhanced communication that leads to better management.

Methods

We identified areas in Arizona where elk and people were likely to interact based on distribution and estimated density maps of elk for 1999 (Arizona Game and Fish Department, Phoenix, Arizona, unpublished map). The study area included north central Arizona east and south to the New Mexico border (Fig. 1). We identified 3 groups that we hypothesized to have different attitudes and beliefs regarding elk management: the general public, cattle ranchers, and wildlife managers or biologists employed by state, Native American, and federal agencies (AGFD, BLM, USFS, ASLD, NAWA). We developed and mailed questionnaires to identify perceptions of the general public, ranchers, and wildlife managers or biologists from towns and cities in and adjacent to elk habitat

(Heydlauff 2003). Questionnaires addressed, in part, how long respondents lived in Arizona, changes observed on the landscape and how landscapes should be used, types of outdoor activities in which they engaged, wildlife seen and their experiences with all wildlife (and elk, specifically), and interactions and responses of agencies to human–elk issues.

We used a random number listing and telephone directories from Prescott, Payson, Pine, Strawberry, Winslow, Holbrook, Joseph City, Show Low and surrounding areas, and Flagstaff and surrounding areas (Fig. 1) to draw a sample of individuals from the general public. We obtained names and addresses of ranchers in areas with elk from the Arizona Cattlemen's Association and the Arizona Beef Council; these were the only organizations with names and addresses of ranchers that we could obtain. We surveyed all ranchers on these lists. Agency personnel involved with elk management were selected from each of the relevant state and federal agencies. We obtained this list by asking a wildlife management professional in each agency to identify the individual in their organization who was most actively involved in elk issues. We checked each list available to ensure that participants only received a single questionnaire.

Survey Methodology

To construct and implement the questionnaire, we used the total design method (Dillman 1978). The questionnaire was comprised of fixed- and multiple-response questions, plus short unstructured response questions (Heydlauff 2003). We assured respondents that their responses would be anonymous.

Nonresponse bias.—Because of the high response rate for the ranchers and natural resource agency personnel (>70% for each group), we did not check for nonresponse bias in these groups (Conolly et al. 2000, Base 2001). We addressed nonresponse bias only for the general public. Ten percent of the general public who received the questionnaire but did not respond were contacted by telephone and the questionnaire was completed via telephone (Base 2001).

We compared respondents with nonrespondents to determine if nonresponse bias existed. For these comparisons and for the comparisons made between and among groups with multiple and binomial response data, we used the Likelihood Ratio chi-square tests. Response frequencies for group comparisons were considered significant at $P < 0.05$. We used analysis of variance (ANOVA) to compare group means (Sokal and Rohlf 1981, Reading et al. 1999).

Other potential biases.—We used telephone directories to obtain our sample of the general public residing in elk habitat. Because certain socio-demographic groups may be more or less likely to have listed phone numbers, this sample may not perfectly represent the general public. Also, our sample of ranchers is from a list of all ranchers in the study area provided by the Arizona Cattlemen's Association and Arizona Beef Council. We have no reason to doubt the accuracy of these lists but could not verify their accuracy.

Results

We mailed questionnaires to the general public ($n = 610$), ranchers ($n = 160$), and individuals in natural resource agencies ($n = 90$). The general public returned 207 of 359 (58%) questionnaires that could be used; 16 questionnaires were returned without data, and

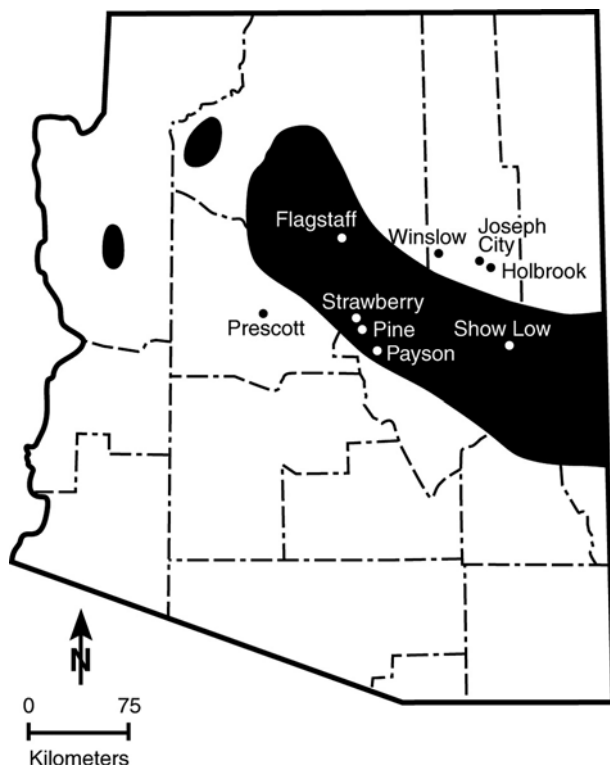


Figure 1. Elk distribution in Arizona, (Hoffmeister 1986) (i.e., shaded) and towns adjacent to elk habitat.

235 were returned by the post office as undeliverable due to inaccurate addresses, deaths, and relocations. The undeliverable questionnaires were from throughout the study area. Ranchers returned 107 of 152 (70%) questionnaires (3 respondents left ranching, and 5 returned the questionnaire without data). Agency personnel returned 62 of 87 (71%) questionnaires; 3 were returned without data (Heydlauff 2003).

Only 2 differences were documented between respondents and nonrespondents in the general public group. None of the nonrespondents and 23% of the original respondents contacted resource agencies concerning elk ($\chi^2_1 = 8.46, P < 0.0036$). Respondents and nonrespondents also differed in how they rated agency management of elk ($\chi^2_4 = 12.96, P < 0.0115$). The majority of the nonresponse group (71%), compared to 36% of the original respondents had no opinion about the way elk were being managed because not enough was known about the situation. This nonresponse bias suggests information obtained from the general public about the frequency of contacting agencies concerning elk, and their rating may not be representative of the general public.

Comparisons Among the General Public, Ranchers, and Resource Agency Personnel

Respondents from the general public lived in northern Arizona an average of 18 years. Natural resource agency personnel lived in

northern Arizona for 16.5 years. Ranchers and their families lived and ranched in northern Arizona an average of 59.4 years. Respondents for all groups were asked to identify changes observed while living in northern Arizona. Results differed for some observed changes, including reductions of wilderness and wildlife, and an increase in recreational opportunities (Table 1). At the end of this question in an open-ended format, we asked respondents to document any other observed changes that did not appear on the questionnaire. Respondents from all 3 groups reported that elk numbers had increased; however, only 2% of the public and 7% of agency biologists reported this increase compared to 13% of the ranchers ($\chi^2_2 = 28.84, P < 0.0001$). The general public and agency personnel reported that recreation and tourism were the best-suited land uses on public land, followed by ranching, farming, housing development, mining, and industry (Table 1). Agency personnel were more involved in outdoor activities than the other 2 groups (Table 1). In the open-ended category of 'other', 16% of the ranchers reported they did not take part in any of the listed activities, nor did they provide other activities in which they might have taken part.

Ranchers observed elk more frequently ($\bar{x} = 131$ days) than agency personnel ($\bar{x} = 85$ days), and the public ($\bar{x} = 27$ days) in the last year. All 3 groups were asked to indicate the time of year they observed

Table 1. Proportions of respondents reporting selected changes in land use, land use types best suited, and outdoor recreational activities participated in northern Arizona, 2001.

Changes seen	Respondents by group ^a						χ^2	P
	Public (n = 201)		Rancher (n = 106)		Agency (n = 60)			
	%	n	%	n	%	n		
Increase in housing development	97	194	93	99	97	58	2.28	0.3196
Increase of human inhabitants	90	181	92	97	90	54	0.84	0.6567
Increase in property value	83	167	34	36	90	54	2.08	0.3541
Reduction of wilderness	63	127	42	45	13	8	51.1	<0.0001
Increase in recreational opportunities	32	64	87	92	93	56	132.9	<0.0001
Reduction of wildlife	50	100	32	34	38	23	8.69	0.0130
Increase in public service	28	56	34	36	40	24	3.54	0.1701

Best suited land uses ^a	Public (n = 201)		Rancher (n = 106)		Agency (n = 59)		χ^2	P
	%	n	%	n	%	n		
	Recreation and tourism	88	176	79	84	100		
Ranching	75	151	99	105	66	39	51.3	<0.0001
Farming	39	78	42	45	20	12	9.3	0.0096
Housing development	35	70	27	29	27	16	1.9	0.3960
Mining	17	34	42	45	19	11	24.3	<0.0001
Industry	13	27	25	27	24	14	7.9	0.0198
Timber harvest	1	3	18	19	49	29	28.8	<0.0001

Outdoor activities	Public (n = 201)		Rancher (n = 96)		Agency (n = 60)		χ^2	P
	%	n	%	n	%	n		
	Hunting	39	79	55	53	83		
Fishing	53	107	47	45	75	45	13.1	0.0014
Hiking/backpacking	62	125	24	23	82	49	61.6	<0.0001
Camping	59	119	39	37	90	54	44.9	<0.0001
Wildlife photography	32	65	20	19	47	28	12.7	0.0018
Bird watching	33	66	21	20	48	29	12.9	0.0016
Cycling	19	39	6	6	43	26	31.4	<0.0001

^a >1 response could be provided so % \neq 100.

Table 2. Proportions of respondents rating how well natural resource agencies manage elk in northern Arizona, 2001.

Rating	Respondents by group ^a			
	Public (n = 206)		Rancher (n = 105)	
	%	n	%	n
Excellent	16	33	0	0
Good	25	52	4	4
Fair	15	31	24	25
Poor	8	16	59	62
No opinion / do not know	36	74	13	14

^a Test response difference between public and ranchers ($\chi^2_4 = 135.65$, $P < 0.0001$).

elk. A majority (72%) of ranchers reported elk were on their property throughout the year. The majority of agency personnel (81%) and 28% of the public saw elk all year. When asked to estimate the largest number of elk seen at one time over the past year, the groups differed ($F_2 = 30.09$, $P < 0.0001$). Ranchers estimated seeing the largest mean group size (180 elk), compared to agency personnel (122 elk) and the general public (37 elk).

General Public

Rabbits and jackrabbits (Leporidae) were the animals most commonly seen by the general public (80%), followed by deer (*Odocoileus* spp.; 74%), coyotes (*Canis latrans*; 73%), elk (71%) and rodents (58%). Most respondents (80%) never had a negative experience associated with seeing wildlife; of the 20% who did, elk (34%), coyotes (22%), and deer (20%) were the cause for those experiences. In a separate question, we asked the general public if elk created any problems for them of which the majority (85%) answered no. Those that did experience problems indicated that elk were a road hazard (56%), and ate trees and ornamental gardens (47%). A majority of the general public respondents (54%) were aware of ways elk might conflict with other people in the state; road hazards were listed as the primary reason for conflicts (89%), followed by competing with cattle for forage (52%), eating ranchers' crops (46%), feeding on ornamental gardens (37%), and eating trees, mainly aspens (*Populus tremuloides*) (28%).

Only 23% of the general public respondents had ever made contact with agencies regarding elk; of those who contacted the AGFD, 89% did so to purchase a hunting permit. Twenty-eight percent contacted the USFS for unknown reasons. Differences existed between the general public and ranchers in their rating of agencies concerning elk management. Forty-one percent of the general public ranked agencies as good or excellent compared to only 4% of the ranchers (Table 2).

The majority of general public respondents (80%) reported they benefited in some way from elk in Arizona. Of those who reported benefits, most respondents (64%) reported that benefits were derived from the aesthetic value associated with elk; other benefits were knowing elk existed in the wild (18%), being able to hunt elk (10%), actively searching to view elk (10%), eating elk (7%) and believing that elk symbolized an open, healthy environment providing for an overall better wilderness experience (7%). Those not experiencing any benefits explained that there were no elk in the area (30%), they did not hunt elk (13%), elk were a safety

Table 3. Changes observed by ranchers (n = 43) in their land use from 1992–2001, effects of elk hunters observed by ranchers on their property in 2001 (n = 78), and ranchers reporting annual losses in dollars from elk-related damage (n = 77) in 2001, northern Arizona.

	% Response n	
Changes in land use		
Decrease in cattle grazing numbers	28	12
Increase in elk	16	7
Sold land to developers	16	7
Increase in recreational use by the public	14	6
Increase in public coming onto land to view elk	14	6
Increase in government regulations	9	4
Increase in elk hunters causing more damage	9	4
Effects of elk hunters		
Range damage from all terrain vehicles	78	61
Reduced elk competition with cattle	60	47
Disturbed cattle by not keeping gates closed or open	69	54
Trespassing	56	44
Vandalism	51	40
Reported damage and assisted with repair	21	16
Losses in dollars		
≤\$100	1	1
\$101–\$1,000	19	15
\$1,001–\$5,000	42	32
\$5,001–\$10,000	22	17
>\$10,000	17	13

hazard on highways (10%), there were too many elk (5%), and 3% did not know that elk were in Arizona.

Ranchers

Ranchers owned an average of 5,722 ha and leased an average of 17,356 ha. The majority of ranchers (55%) reported that use of their land had not changed over the past decade. The most common changes reported were decreased cattle numbers, increased elk numbers on ranches, and land sold to developers (Table 3). Most ranchers (94%) reported elk conflicted with other land uses by competing with cattle (98%), reducing crops (82%), reducing trees (47%), and competing with mule deer (12%) (Table 4).

The majority of ranchers (78%) reported that elk hunters used their property. Most viewed that as being a negative effect associated with elk. However, more than half of the ranchers reported that the presence of hunters reduced elk competition with cattle (Table 3). Most ranchers (96%) did not receive monetary benefits from elk hunters using private property, but those who did (4%) served as guides for hunters, rented cabins, and received meat in return for assistance to retrieving downed game.

Over the past decade, 73% of ranchers reported an increase in elk on their property and elk affected the majority of ranchers' property (76%). Negative effects included elk feeding on ranching land meant for cattle (100%), tearing down fences (96%), feeding on trees (65%), damaging crops (47%), drinking water (20%), eating salt and minerals meant for cattle (14%), and transmitting disease to cattle (13%). Positive impacts of elk included adding to the aesthetics of the ranch (24%) and providing additional income due to tours (3%). The majority of ranchers (67%) responded that intensity of damage and not type of damage had changed over time. For most ranchers (88%), elk-related damage occurred from July

Table 4. Proportions of respondents reporting how elk conflicted with other land uses in northern Arizona, 2001.

How elk conflict with land uses	Respondents by group				χ^2	P
	Rancher (n = 94)		Agency (n = 41)			
	%	n	%	n		
Compete with cattle	98	92	100	41	21.59	<0.0001
Reduce farmers' crops	82	77	59	24	24.12	<0.0001
Reduce numbers of trees	47	44	59	24	0.22	0.6379
Prevent further development	3	3	4	2	0.02	0.9007
Prevent industry growth	4	4	4	2	0.04	0.08350
Compete with mule deer	12	11	21	9	0.57	0.4508

through December but 66% of ranchers reported experiencing elk problems all year. Most ranchers reported financial losses >\$1,000/year as a result of elk damage (Table 3). When asked what negative effects cattle had on their ranch, the majority replied that cattle had no negative effects (52%), but others replied that cattle damaged fences (42%), fed on trees (15%) and damaged crops (12%). Cattle also added aesthetic value to the ranch (39%).

The majority of ranchers (63%) had contacted the AGFD (95%), or the USFS (82%) regarding elk. Main reasons for contact were to file a complaint due to a problem with elk (56%) and to purchase hunting permits (41%). Twenty-seven percent of ranchers filed <5 nuisance complaints and 30% had filed <5 depredation complaints. No ranchers ranked agencies as excellent and most ranchers reported agencies were doing a poor job managing elk (Table 2).

The majority of ranchers (69%) indicated other wildlife species posed as much a problem as elk to their ranch. Other species identified as causing problems were coyotes (74%), mountain lions (*Puma concolor*) (59%), rodents (47%), bears (*Ursus americanus*) (26%), rabbits and jackrabbits (16%), prairie dogs (*Cynomys* spp., 8%), javelina (*Pecari tajacu*, 7%), songbirds (Passeriformes, 7%), birds of prey (Falconiformes, 7%), pronghorn (*Antilocapra americana*, 5%), deer (5%), gophers (Geomysidae, 3%), wolves (*Canis lupis*, 3%), bats (Chiroptera, 1%), rattlesnakes (*Crotalus* spp., 1%), and crows (*Corvus brachyrhynchos*, 1%).

Sixty-two percent of ranchers compared to 20% of the general public did not report that they benefited from living near elk in any way ($\chi^2_1 = 52.69$, $P < 0.0001$). Benefits were not derived because ranchers reported they did not receive any relief from damage elk caused in the form of monetary compensation or hunting tags (36%), elk ate feed meant for cattle (24%), elk were a detriment to their ranch and lifestyle (21%), and some ranchers reported elk only attracted elk hunters who caused more damage than elk (10%). The ranchers who reported benefits (38%) derived them from elk aesthetically (35%), from hunting (32%) and viewing (16%) elk, reported elk helped support the local economy (16%), and others reported elk added to an overall better wildlife experience (10%).

The majority of ranchers (63%) reported elk were important to Arizona, but 39% added that elk were important only if numbers were controlled. Others reported elk hunting was important to them (37%) and to the local economy (20%). Reasons why elk were not important were that Rocky Mountain elk were exotics (30%), elk caused too much damage (15%), too many elk exist to consider them important (15%), and elk only benefited tourism

and hunters (7%). When asked: "If you could, would you keep all elk on or off your land?" 4% did not respond; 11% reported that some elk would be tolerated; the majority (63%) wanted to keep all elk off of their land.

Agency Personnel

Agency personnel we sampled were mainly wildlife biologists (36%), wildlife managers (15%), and rangeland management specialists (11%). On average, agency respondents worked for their agency 16.4 years. Respondents' primary responsibilities were providing information and education (61%), involvement with habitat partnership committees (18%), enforcing state wildlife laws (16%), dealing with wildlife conflicts (15%), and issuing grazing permits (13%). Most agency respondents (66%) dealt with elk-human conflicts. More than one-third (35%) had personally met with landowners to discuss elk issues and solutions.

When asked what the general public said to them regarding elk, respondents said the general public wanted to see more elk (31%), and some received complaints about fence, garden, and riparian damage (14%). Agency personnel reported hearing from ranchers that there were too many elk (52%), elk competed with cattle for forage (26%), and elk economically affected ranchers (12%). Only 5% of personnel received positive feedback from ranchers concerning elk management.

In an open-ended question, we asked personnel the status of the elk population: 57% indicated elk were doing very well, 17% said elk numbers were being reduced, 7% reported the population was decreasing, 12% reported that elk were expanding into new ranges and riparian areas, and 8% believed elk were overpopulated.

Agency respondents reported elk damage fences (93%), feed on grazing land (91%) and trees (73%), damage crops (43%) and riparian areas (31%), cause auto collisions (18%), and transmit diseases to cattle (2%). A majority of agency respondents (62%) and ranchers (67%) reported an increase in intensity of damage in the past 10 years ($\chi^2_1 = 0.32$, $P = 0.5734$). Personnel noted the type of damage has changed over time with more riparian areas being affected (19%). This change was not reported by ranchers. Agency personnel also reported cattle feeding on trees (63%), damaging fences (55%), degrading riparian areas (39%), damaging crops (31%), and transmitting disease to wildlife (13%).

Most agency personnel (90%) and ranchers (94%) reported that elk conflict with other land uses ($\chi^2_1 = 0.85$, $P = 0.3568$) with agency personnel reporting elk compete with cattle (Table 4). In the open-ended section of this question, personnel again reported (32%) that elk damaged riparian areas, an effect not reported by

ranchers. Most personnel (90%) reported cattle also conflicted with other land uses by competing with wildlife (100%), reducing the number of trees (37%) and damaging riparian areas (30%).

More agency personnel (94%) reported elk were important compared to ranchers (63%: $\chi^2_1 = 22.25$, $P < 0.0001$). Agency personnel reported the importance of elk was mainly financial because the species brought in money through tourism and recreation (55%). Some agency personnel reported elk were aesthetically important (36%) and were part of the ecosystem (36%).

Discussion

Our findings support the work of others (Langenau and Peyton 1983, Peyton and Langenau 1985) that portray a need for effective communication between resource agencies and differing sections of society (in our case to manage elk conflicts). Agencies need to be aware of the knowledge, attitudes, perceptions, and behaviors of groups that share a vested interest in elk. We found considerable differences between the general public and ranchers in relation to their participation in outdoor activities, their perceptions of elk, and their view of how well agencies manage elk. Comparisons also revealed disparities between perceptions of agencies and ranchers related to effects of elk and cattle. Importantly, we documented similarities between ranchers and agencies as to the effects of elk on ranchers' property. As reported by Freddy et al. (2004: 925), "The credibility of information used by natural resource agencies to manage public resources will be challenged by citizens when conflicts in values, use, or perceptions arise."

We found the general public takes part more extensively in nonconsumptive forms of outdoor recreation than ranchers or agency personnel. The majority of the public reported many benefits derived from elk. The words 'majestic' and 'beautiful' were often used when describing elk indicating an emotional response to the animal, and numerous respondents indicated they moved to the area to be around wildlife, including elk. The public was pleased with how elk were being managed because they thought elk numbers were increasing. People who value elk prefer healthy populations (Wisdom and Cook 2000). The majority, however, did not have an opinion about elk management because they did not have enough information. Numerous respondents expressed interest in learning more about the issue, and they wanted to know where to find information about elk and the agencies involved in elk management.

The public considered elk on the road at night to be a major safety hazard although none of the respondents had ever been involved in a collision involving the animal. According to the Arizona Department of Transportation (ADOT), 2 human fatalities occurred since 1992, due to an elk–auto collision (ADOT, Phoenix, Arizona, unpublished data). Cattle–elk competition was the second-largest conflict reported by the general public. Differences in public and rancher perceptions regarding elk management can be explained by the amount and type of elk damage experienced and time spent in elk habitat.

Agency personnel indicated the general public often complained that less forage should be allocated to cattle and more should be allocated to wildlife on public and state lands. Ranchers indicated

they sold land to developers, were grazing less cattle, and AGFD personnel were unresponsive to their concerns. However, the public and agency personnel reported ranching as the second-best land use for the region after recreation.

Ranchers saw elk more frequently and in larger groups than the general public and agency personnel. Only 24% of ranchers reported elk added to the aesthetics of their ranch. Of the 3 groups, only ranchers indicated seeing elk dramatically increase on their property. Ranchers incurred financial losses due to elk-related damage. An abundance of wildlife, in this case elk, often comes with financial costs even though many enjoy hunting or simply viewing wildlife on their land (Conover 1994, 1997, 1998). More than half the ranchers hunted, and this was the main outdoor activity in which they participated. However, because no monetary compensation is available for elk-related damage in Arizona and most ranchers (96%) did not make money from elk on their property from hunting or guiding, the majority of ranchers did not report they benefited from elk in any way. Farmers and ranchers with high intensities of wildlife damage experience a lack of tolerance for the species responsible for the damage (Conover 1997, 1998). More than half the ranchers reported that they did not experience negative effects of cattle on their property indicating damage can be tolerable and is therefore species-specific. Other species, mainly predators, were indicated to create as much of a threat to their ranch and lifestyle as elk.

Ranchers also reported they are not tolerant of elk damage because they view elk as an exotic species. Exotic species often are referred to as pest species and are mostly undesirable (Vitousek et al. 1996). This perception of elk could possibly shape ranchers' attitudes in this study. This finding suggests the need for education about the history of elk in northern Arizona, why Merriam's elk became extinct, why the Rocky Mountain elk were translocated, and their benefits to the ecosystem.

Ranchers, overall, had negative experiences with elk hunters who, in certain situations, created unacceptable amounts of damage. Hunting was the primary cause of mortality for the Rocky Mountain elk throughout the last century, and many elk have learned to avoid hunters by using areas with little to no hunting (Knight 1970, Thompson and Henderson 1998). Elk use national parks, refuges, private farms, ranches, and residential areas to avoid hunters. By employing such a strategy, elk might be increasing their chance of survival (Thompson and Henderson 1998). Managers in other areas have tried persuading landowners to allow hunting on their property as a means to reduce wildlife damage (Conover 1998). We found only a few ranchers used habitat partnership committees where the AGFD provided fencing materials, seed, and fertilizer to assist with wildlife-damage control. Considering the negative effects that ranchers incurred from hunters, including range damage from all-terrain vehicles, leaving gates open or closed, trespassing, and vandalism (Table 3), allowing hunters onto private property does not seem a viable option unless the negative effects of hunters decrease or benefits, such as reimbursement for damages caused by elk hunters, are made available.

Ranching interests historically dominated public land management in the West. However, other interests such as conservation, consumptive use, and nonconsumptive use have competed with

ranching (Culhane 1981, Reading et al. 1999). This can create conflicts and possibly explain why a majority of ranchers we surveyed ranked agencies as poor elk managers. We found no differences between ranchers and agency personnel regarding the increase in elk numbers since 1993, effects of elk on the land, and the amount of damage. However in the “comments” section of the questionnaire, ranchers indicated a belief that agencies were unaware of the effects of elk. However, we found that agency personnel were aware of the effects of elk.

Reasons provided by agency personnel why elk were important and by ranchers why elk were not important were financially based. Agency personnel reported elk were important as a source of revenue for their agency and stimulus for local economies from hunters, tourists, and recreationists. Ranchers saw elk as undesirable because of financial losses elk caused. Ranchers also were frustrated that recreationists and hunters benefited from elk while they saw themselves providing elk habitat and benefits for others and not themselves.

Management Recommendations

Sixty percent of ranchers indicated hunters reduced elk–cattle competition on their property. However, elk hunter–rancher relations appeared strained due to damage caused by elk hunters on ranches (Table 3). Elk hunters could play a vital role in reducing elk damage and alleviating elk–cattle competition. We suggest that strategies be developed to strengthen relationships between hunters and ranchers to the benefit of both hunter and

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rancher. Co-management as discussed by Chase et al. (2000) is an approach that could be beneficial.

We documented common ground between ranchers and agency personnel. Both groups agreed there has been an increase in elk numbers, elk conflict with other uses of the land (especially ranching), and there are negative impacts caused by elk on the livestock industry. This agreement creates a platform for further discussion between these groups.

The general public showed interest in wanting to learn more about elk and elk management in Arizona. Even though the AGFD holds public meetings regarding elk, different advertising strategies for group meetings could be implemented to target a general public whose interests in elk are more than consumptive. Because a large portion of the public wants to see more elk, meetings could be structured to educate the general public about where and when they can view elk and hear elk bugle, how and why elk are managed, and the role and importance of private land and rancher support of elk. Wildlife programs, focus groups, and meetings can be tailored to specific groups based on stakeholder attitudes, knowledge, and behavior (Mankin et al. 1999).

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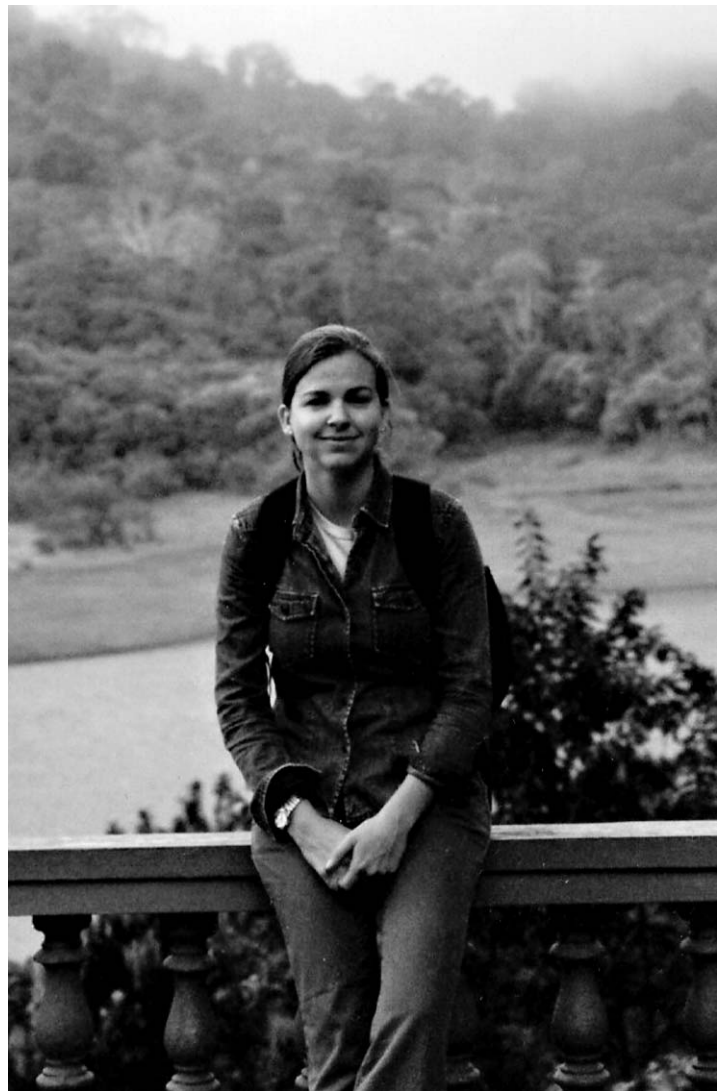
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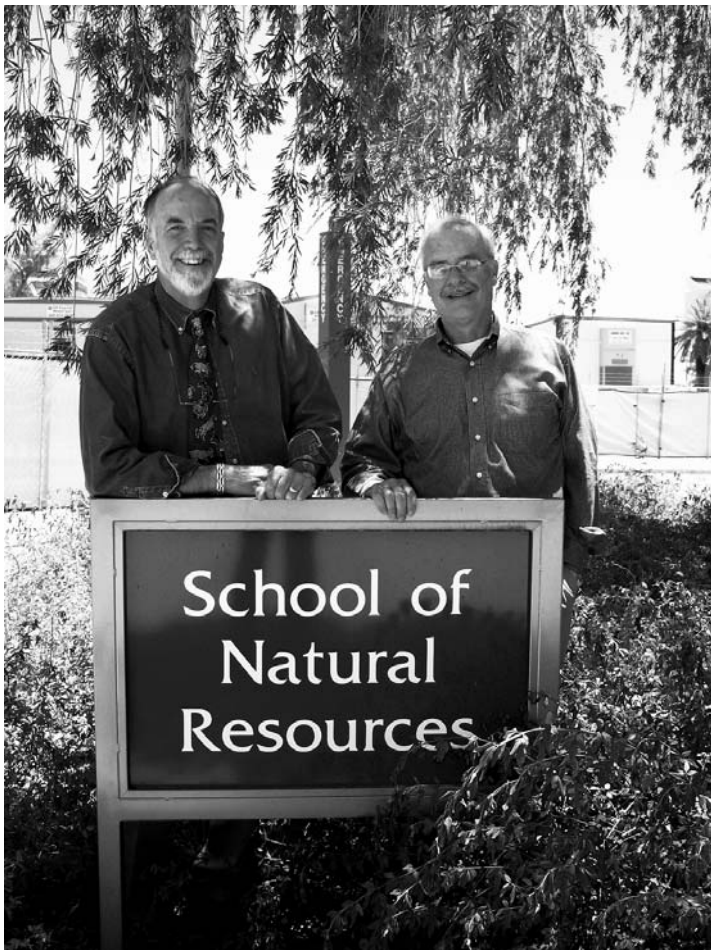
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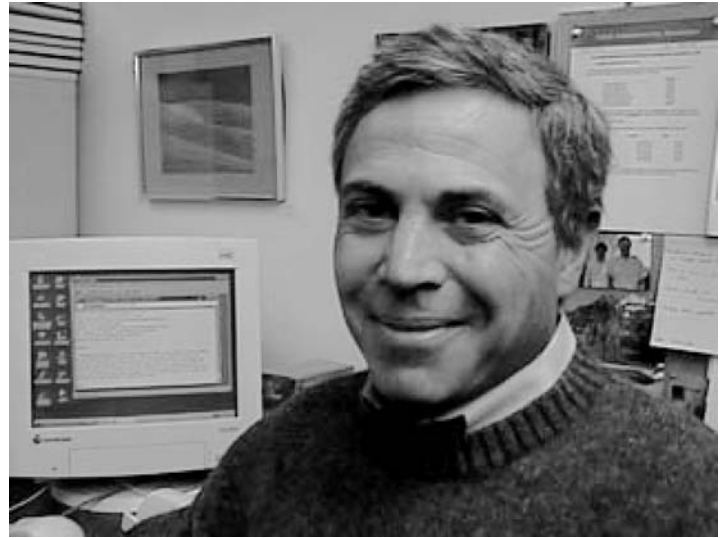


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