

# Knowledge and opinions of stakeholders of black bear management in Virginia

Nelson W. Lafon<sup>1,3</sup>, Steve L. McMullin<sup>1</sup>, and David E. Steffen<sup>2</sup>

<sup>1</sup>Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0321, USA

<sup>2</sup>Virginia Department of Game and Inland Fisheries, Vinton, VA 24179, USA

**Abstract:** Development of the Virginia black bear (*Ursus americanus*) management plan provided opportunities to examine stakeholder knowledge and opinions about bears and bear management as well as wildlife professionals' opinions about key bear management issues and public involvement in decision making. We mailed self-administered questionnaires to members of 3 nongovernmental stakeholder organizations and Virginia Department of Game and Inland Fisheries (VDGIF) professionals. Professionals believed greater stakeholder involvement is needed in decision making regarding bear management. Eighty-four percent of bear hunters belonging to an association of houndsmen agreed that VDGIF manages bears well. Members of a beekeepers association and the Virginia Chapter of The Nature Conservancy (TNC) who expressed an opinion were 2.5 and 9 times, respectively, more likely to agree than disagree VDGIF manages black bears well. Knowledge about bear ecology and management in Virginia varied widely among surveyed stakeholders and likely depended on their sources of information and activities relating to bears. Ninety-six percent of surveyed hound hunters and 53% of surveyed TNC members agreed VDGIF should increase bear populations in all habitats that are biologically suitable. Although <50% of beekeepers agreed bear populations should be increased, more beekeepers agreed than disagreed. Sixty-five percent or more of stakeholders and professionals agreed lethal methods should be used to address bear problems only when nonlethal methods are ineffective. Bear hunting, especially with dogs, continues to be an important and divisive bear management issue in Virginia. Sixty-five percent or more of all stakeholders and VDGIF professionals considered the input of agricultural producers who experience bear damage and individuals primarily concerned with preserving bears and their habitat to be important in making management decisions. However, <50% of beekeepers and TNC members considered input of bear hunters to be important in making decisions.

**Key words:** black bear, knowledge, management, opinions, professionals, stakeholders, survey, *Ursus americanus*, Virginia

*Ursus* 14(1):55–64 (2003)

---

Black bear management in the United States is complex due to a profusion of contentious issues regarding bear hunting (Beck et al.1994), human–bear conflicts (Decker et al. 1985), bear habitat conservation (Black Bear Conservation Committee 1992), and trade in bear parts (Garshelis 1997). Resolution of issues will require concerted efforts to understand both bears and stakeholders in bear management. Effective wildlife

management provides for meaningful stakeholder participation in decision-making while maintaining the important technical role of wildlife professionals in management processes (McKinney 1991, McMullin 1996). Stakeholders are more likely to make meaningful contributions to the decision-making process, and wildlife managers are more likely to be satisfied with public input, if stakeholders are well informed (McMullin and Nielsen 1991).

Numerous studies since the 1980s focused on the ecology of black bears in Virginia (Carney 1985, Hellgren and Vaughan 1989, Vaughan 1998). However, research relating to knowledge, attitudes, and opinions of black bear stakeholders in Virginia is scarce. Limited

---

<sup>3</sup>Present address: Virginia Department of Game and Inland Fisheries, Powhatan, VA 23139, USA, email: nlafon@dgif.state.va.us

information has been obtained through an annual survey of licensed hunters in Virginia (Wright et al. 2001). Human dimensions work pertaining to black bears in Virginia (Davenport 1951, Dubrock et al. 1978) and elsewhere (Peyton 1989, El Hamzaoui et al. 1994, Grise 1994) focused primarily on characteristics, attitudes, and perceptions of bear hunters. Surveys of visitors in Shenandoah (Baptiste 1977) and Great Smoky Mountains National Parks (Burghardt et al. 1972, Petko-Seus 1985, Hastings 1986) provided data primarily applicable to bear management in national parks. Research on stakeholder attitudes about nuisance black bear activity and management outside of national parks has been conducted almost exclusively in several northeastern (Decker et al. 1981, 1985; Jonker et al. 1998) and western states (McIvor and Conover 1994).

Throughout development of Virginia's first comprehensive black bear management plan, we focused stakeholder involvement on making value choices and professional involvement on making technical choices. The public involvement process provided an opportunity to assess knowledge and opinions of key stakeholders of bear management. We involved varied stakeholders in numerous opportunities for public input, including an advisory committee, focus groups, regional input meetings, surveys, and review of a draft management plan. We were especially interested in examining how stakeholder concerns affect success of the planning process and in assessing the philosophy of VDGIF professionals regarding public involvement in the planning process.

Goals of this study included: (1) improving VDGIF bear managers' knowledge of stakeholders in the management process and (2) identifying potential problems arising from differences between the public and professionals regarding management issues and philosophy of public involvement in management decision-making. Specific objectives included:

1. Assessing the knowledge and opinions of representatives of 3 groups of stakeholders in black bear management in Virginia;
2. Comparing opinions expressed by VDGIF professionals and stakeholders about black bear management issues such as population levels, nuisance management, and the importance of considering input from various bear stakeholders; and
3. Examining VDGIF professionals' opinions about relative roles of professionals and stakeholders in developing goals, objectives, and strategies and evaluating progress toward goals for black bear management in Virginia.

## Methods

### Questionnaire administration

During spring 2000, we designed 2 questionnaires to investigate key issues in black bear management in Virginia. One questionnaire assessed knowledge and opinions of external stakeholders; a second assessed opinions of VDGIF professionals.

We mailed a self-administered questionnaire to all VDGIF Wildlife Division biologists and managers with bear management responsibilities ( $N = 22$ ), to all members of the Virginia Bear Hunters Association (BHA,  $N = 459$ ) and the Virginia State Beekeepers Association (Beekeepers,  $N = 442$ ), and to a random sample of the Virginia Chapter of The Nature Conservancy (TNC,  $n = 500$ ). Although members of the BHA hunted almost exclusively with hounds and, therefore, likely had different interests from bow hunters and rifle hunters, we assumed they had more in common with other hunters than they did with agricultural producers or general environmental interests. Beekeepers represented agricultural stakeholders and TNC members represented broad interests in biodiversity and the environment. Limited financial and personnel resources precluded sampling all stakeholder groups; however, these 3 groups were believed to be representative of the 17 stakeholder groups who served on a stakeholder advisory committee that assisted VDGIF in developing a statewide black bear management plan. Using a modification of Dillman's (1978) total design method, we sent a postcard reminder and up to 2 follow-up mailings to stakeholders who did not respond to previous mailings.

### Data analysis

**Data assumptions.** We used both parametric tests and their nonparametric analogs to evaluate location differences when data were not normal. Both types of tests provided similar  $P$ -values and led to identical decisions to reject or fail to reject null hypotheses at  $\alpha = 0.05$  in all cases. Large, homogenous samples and robust parametric methods led to consistent results even with departures from normality. Only statistics from parametric tests are presented to avoid redundancy.

**Analysis of stakeholder knowledge about bears.** Stakeholder questionnaires contained 15 multiple-choice questions to assess knowledge of black bear ecology and management in Virginia. Questions pertained to basic life history of black bears (size, diet, reproduction, home range, denning ecology, population growth) and specific bear management issues in Virginia (bear attacks, population trends and distribution, harvest allocation, nuisance complaints). The number of survey

items answered correctly served as a knowledge score for each survey respondent. Responses marked “Not Sure” were counted as incorrect. Two-way analyses of variance (ANOVA) followed by Tukey’s pair-wise comparisons were used to examine differences in mean knowledge scores among the 3 organizations. We tested for differences in knowledge scores between those respondents who, during 1996–2000, had versus had not: (1) hunted any species of game, or (2) attempted to observe or photograph a wild black bear in Virginia. We tested for interactions between organization and the effect of hunting any game or observing bears.

A  $\chi^2$  test for homogeneity was used to assess: (1) respondents’ primary sources of information about black bears, and (2) frequencies of responses about information sources for members who scored below versus above the mean on the knowledge test for their organization. We collapsed categories for a contingency table if >20% of cells had expected frequencies <5 and performed a new test.

**Analysis of stakeholder opinions about bear management.** We used a  $\chi^2$  test for homogeneity to detect differences among the 3 organizations for responses to each Likert-scaled item on the questionnaire that addressed stakeholder opinions about important black bear management issues or VDGIF management and decision-making. The “no opinion” category was excluded for all tests except those that addressed VDGIF management and decision-making. We collapsed categories for a contingency table if >20% of cells had expected frequencies <5 and performed a new test. Collapsing categories changed the degrees of freedom for tests and led to variable degrees of freedom for  $\chi^2$  tests throughout the analysis.

**Analysis of VDGIF professional opinions.** Because the entire population of VDGIF professionals who had some responsibility for management of black bears was sampled, data from their survey are presented without statistical comparisons. An exception was comparison of VDGIF respondents’ opinions of current roles of stakeholders in making decisions for black bear management and roles professionals thought stakeholders *should* have in decisions. For this analysis, we computed mean responses to a series of Likert-scaled survey items and examined differences between scores corresponding to current and normative roles using paired *t*-tests.

**Interpretation of qualitative results.** Transcripts from 5 focus groups, written comments provided by survey respondents, summaries from 5 regional input meetings, and stakeholder advisory committee meeting notes aided interpretation of survey results. During

December 1999 and January 2000, we conducted focus group interviews with (1) personnel from agencies other than VDGIF with interests in black bear management, (2) individuals who had experienced problems associated with bears, (3) individuals with primarily non-consumptive interests in bears, (4) bear hunters who used dogs, and (5) bear hunters who did not use dogs. Focus group results were instrumental in both designing questionnaires and interpreting results.

## Results

Results are based on original data presented in Lafon (2002). Effective response rates (useable returns, excluding undeliverable questionnaires) were 100% ( $n = 22$ ) for VDGIF professionals and 61% ( $n = 302$ ), 76% ( $n = 326$ ), and 61% ( $n = 261$ ) for TNC, Beekeepers, and BHA, respectively.

### Stakeholder knowledge

Mean knowledge score for BHA ( $\bar{x} = 10.6$ ) was much higher than knowledge scores for Beekeepers ( $\bar{x} = 5.7$ ) and TNC ( $\bar{x} = 4.1$ ;  $F = 146.6$ ; 2, 865 df;  $P < 0.001$ ). All 3 means differed according to Tukey’s pair-wise comparisons ( $P < 0.05$ ). More members of TNC (61%) and Beekeepers (47%) chose “Not Sure” for any given knowledge question than did BHA (11%).

Among members of all 3 organizations, greater knowledge about bear ecology and management in Virginia was associated with reliance on personal experience or observation and literature sources for information about bears, whereas lower knowledge was associated with reliance on television and friends or family. A larger percent of BHA members (72%,  $n = 244$ ) relied on personal experience or observation as a source of information about black bears than did Beekeepers (10%,  $n = 279$ ) and TNC members (5%,  $n = 257$ ). A larger percent of Beekeepers and TNC members relied on popular literature (24% and 45%, respectively) and television (32% and 27%, respectively) than did BHA members (literature: 3%; television: 1%;  $\chi^2 = 448.4$ , 14 df,  $P < 0.001$ ). Beekeepers, and especially TNC members, frequently added written comments on their questionnaires that indicated their lack of knowledge of black bears resulted from little exposure to them. Beekeepers with above-average knowledge for their organization ( $n = 153$ ) reported greater use (29% vs. 17%) of popular publications and less use of television (26% vs. 39%) and friends or family (9% vs. 18%) compared to members ( $n = 126$ ) with low knowledge scores ( $\chi^2 = 16.6$ , 5 df,  $P = 0.005$ ). We found no

significant differences between TNC members or BHA with above or below average knowledge scores.

Knowledge scores for survey respondents in all 3 organizations who attempted to observe or photograph black bears in Virginia during 1996–2000 ( $\bar{x} = 9.3$ ) were higher than scores for those who did not ( $\bar{x} = 5.1$ ;  $F = 22.8$ ; 2, 865 df;  $P < 0.001$ ). Likewise, members of TNC and Beekeepers who reported that they had hunted any species of game in Virginia during 1996–2000 had higher knowledge scores ( $\bar{x} = 7.2$ ) than nonhunting members ( $\bar{x} = 4.2$ ;  $F = 56.7$ ; 1, 613 df;  $P < 0.001$ ). Because >99% of the BHA hunted in Virginia during 1996–2000, we did not compare knowledge scores within this group. There were no significant interactions between organization and either observing bears ( $P = 0.40$ ) or hunting game in Virginia ( $P = 0.72$ ).

### **Stakeholder opinions about VDGIF bear management and decision-making**

Eighty-four percent of BHA members ( $n = 259$ ) agreed and 9% disagreed that VDGIF is managing bears well (7% were neutral or expressed no opinion). Although 80% of TNC members ( $n = 289$ ) and 55% of Beekeepers ( $n = 321$ ) were neutral or expressed no opinion, more agreed (19% and 32%, respectively) than disagreed (2% and 13%, respectively) that VDGIF manages bears well ( $\chi^2 = 362.8$ , 10 df,  $P < 0.001$ ). In comments written on questionnaires, many TNC members and Beekeepers noted that they lacked sufficient knowledge of VDGIF to evaluate its bear management and decision-making. Eighty-three percent of BHA members ( $n = 260$ ) agreed and 9% disagreed that VDGIF adequately considers bear biology when making management decisions (8% were neutral or expressed no opinion); although 73% of TNC members ( $n = 290$ ) and 56% of Beekeepers ( $n = 323$ ) were neutral or expressed no opinion, more agreed (24% and 36%, respectively) than disagreed (2% and 8%, respectively) that VDGIF adequately considers bear biology ( $\chi^2 = 291.3$ , 10 df;  $P < 0.001$ ). Similarly, 67% of BHA members ( $n = 260$ ) agreed and 22% disagreed that VDGIF fairly considers concerns of all interested parties when making bear management decisions (11% were neutral or expressed no opinion). Although 76% of TNC members ( $n = 290$ ) and 45% of Beekeepers ( $n = 323$ ) were neutral or expressed no opinion, more agreed (20% and 38%, respectively) than disagreed (4% and 17%, respectively) that VDGIF fairly considers concerns of all parties ( $\chi^2 = 270.4$ , 10 df,  $P < 0.001$ ).

Opinions about VDGIF bear management and decision-making was related to prior contact with VDGIF.

Types and amount of contact with VDGIF personnel during 1996–2000 differed among the 3 organizations ( $\chi^2 = 421.4$ , 16 df,  $P < 0.001$ ). Eighty-nine percent of BHA members ( $n = 261$ ), 57% of Beekeepers ( $n = 326$ ), and 28% of TNC members ( $n = 302$ ) reported contact with VDGIF during 1996–2000; 69% of BHA members, 29% of Beekeepers, and 6% of TNC members reported contact with VDGIF personnel at an organizational meeting; 40% of BHA members, 7% of Beekeepers, and 4% of TNC members reported interacting with VDGIF personnel at a public meeting held by VDGIF. Members of TNC and BHA who reported contact with VDGIF personnel during 1996–2000 agreed more frequently (33% vs. 14%, 87% vs. 62%, respectively) that the agency manages bears well and expressed no opinion less frequently (41% vs. 69%, 0% vs. 10%, respectively) than their counterparts lacking prior contact ( $\chi^2 \geq 16.5$ , 2 df,  $P < 0.001$ ). Beekeepers who reported prior contact also expressed no opinion less frequently (29% vs. 41%) but disagreed more frequently (19% vs. 7%) than those without prior contact that VDGIF manages bears well ( $\chi^2 = 11.4$ , 5 df,  $P = 0.05$ ). We observed similar relationships between prior contact and respondents' opinions (i.e., more BHA and TNC agreement and more Beekeeper disagreement) about how well VDGIF considers both bear biology and stakeholder concerns in bear management decisions (Lafon 2002).

### **Stakeholder and professional opinions about bear management issues**

Members of the 3 stakeholder groups and VDGIF professionals differed in their opinions about increasing or decreasing bear populations, assisting landowners who experience bear damage, using lethal methods to control problem bears, and considering input from different parties interested in bear management. Ninety-six percent of BHA members ( $n = 257$ ), 53% of TNC members ( $n = 298$ ), and 47% of Beekeepers ( $n = 324$ ) supported an increase in black bear populations in all biologically suitable areas of Virginia; 1%, 13%, and 31%, respectively, disagreed that populations should be increased; 4%, 34%, and 22%, respectively, were neutral or expressed no opinion ( $\chi^2 = 294.4$ , 8 df,  $P < 0.001$ ). Unlike stakeholder groups, more VDGIF professionals ( $N = 22$ ) disagreed (50%) than agreed (32%) that bear populations should be increased in all suitable habitats (18% were neutral). Professionals expressed mixed opinions regarding whether bear populations should be decreased in areas where conflict with humans

is common (41% agreed, 45% disagreed, and 14% were neutral). Twenty-two percent of BHA members ( $n = 260$ ), 37% of TNC members ( $n = 295$ ), and 49% of Beekeepers ( $n = 324$ ) agreed that bear populations should be decreased in such areas; 67%, 40%, and 32%, respectively, disagreed that populations should be decreased; 12%, 23%, and 19%, respectively, were neutral or expressed no opinion ( $\chi^2 = 117.9$ , 8 df,  $P < 0.001$ ).

Sixty-one percent of BHA members ( $n = 260$ ), 47% of TNC members ( $n = 295$ ), and 67% of Beekeepers ( $n = 323$ ) supported compensating agricultural producers for black bear damage; 23%, 27%, and 18%, respectively, disagreed that producers should be paid for damage; 17%, 26%, and 16%, respectively, were neutral or expressed no opinion ( $\chi^2 = 107.4$ , 10 df,  $P < 0.001$ ). Eighty-seven percent ( $n = 52$ ) of Beekeepers who had sustained bear damage during 1996–2000 agreed that producers should be compensated for losses due to bears versus 63% ( $n = 265$ ) of those who had not sustained damage ( $\chi^2 = 22.9$ , 4 df,  $P < 0.001$ ). None of the VDGIF professionals ( $n = 22$ ) believed agricultural producers should be compensated for bear damage (91% did not support and 9% were neutral). Ninety-two percent of BHA members ( $n = 259$ ), 81% of TNC members ( $n = 296$ ), and 90% of Beekeepers ( $n = 324$ ) agreed that VDGIF should provide free trapping services to remove black bears causing damage to agricultural or residential property; 4%, 7%, and 4%, respectively, disagreed that VDGIF should freely trap nuisance bears; 5%, 12%, and 16%, respectively, were neutral or expressed no opinion. VDGIF professionals were less supportive of providing free trapping services for bear damage (50% supported, 35% did not, and 14% were neutral).

Sixty-nine percent of BHA members ( $n = 258$ ), 69% of TNC members ( $n = 294$ ), 81% of Beekeepers ( $n = 323$ ), and 100% of VDGIF professionals ( $N = 22$ ) supported use of lethal methods when bears jeopardize human safety; 18%, 19%, 10%, and 0%, respectively, disagreed that lethal methods should be permitted when human safety is jeopardized; 12%, 12%, 10%, and 0%, respectively, were neutral or expressed no opinion ( $\chi^2 = 62.7$ , 8 df,  $P < 0.001$ ). Forty-four percent of BHA members ( $n = 246$ ), 46% of TNC members ( $n = 291$ ), 24% of Beekeepers ( $n = 316$ ), and only 9% of VDGIF professionals ( $N = 22$ ) agreed that lethal methods should never be used to control agricultural damage; 37%, 32%, 61%, and 91%, respectively, disagreed that lethal methods should be totally excluded in controlling agricultural damage; 19%, 22%, 15%, and 0%, respectively, were neutral or expressed no opinion ( $\chi^2 = 95.0$ , 8 df,  $P < 0.001$ ). Seventy-one percent of BHA

members ( $n = 254$ ), 69% of TNC members ( $n = 291$ ), 66% of Beekeepers ( $n = 320$ ), and 73% of VDGIF professionals ( $n = 22$ ) agreed that lethal methods of controlling agricultural damage should be used only when nonlethal methods have been tried, but were not effective; 17%, 19%, 20%, and 18%, respectively, disagreed with this strict conditional use of lethal methods; 13%, 12%, 14%, and 9%, respectively, were neutral or expressed no opinion ( $\chi^2 = 13.9$ , 8 df,  $P = 0.085$ ). Only 12% of BHA members ( $n = 244$ ), 9% of TNC members ( $n = 286$ ), 27% of Beekeepers ( $n = 316$ ), and 14% of VDGIF professionals ( $n = 22$ ) agreed that lethal methods of controlling agricultural damage should be used regardless of whether nonlethal methods have been tried; 71%, 77%, 58%, and 77%, respectively, disagreed that lethal methods should be used regardless; 17%, 14%, 16%, and 9%, respectively, were neutral or expressed no opinion ( $\chi^2 = 84.5$ , 8 df,  $P < 0.001$ ).

Opinions about black bear hunting in Virginia varied considerably among the 3 stakeholder groups we surveyed. All BHA members ( $n = 260$ ) and 73% of Beekeepers ( $n = 325$ ) supported bear hunting in Virginia in general, whereas 43% of TNC members ( $n = 296$ ) opposed bear hunting (34% supported and 23% were neutral or expressed no opinion;  $\chi^2 = 445.4$ , 10 df,  $P < 0.001$ ). Whereas all BHA members ( $n = 257$ ) supported use of dogs to hunt bears in Virginia, 73% of TNC members ( $n = 296$ ) opposed use of dogs to hunt bears (10% supported and 18% were neutral or expressed no opinion); Beekeepers were split regarding use of dogs (38% supported, 39% opposed, and 23% were neutral or expressed no opinion;  $\chi^2 = 599.3$ , 10 df,  $P < 0.001$ ). Fifty-seven percent of Beekeepers ( $n = 322$ ) supported archery hunting of bears in Virginia (26% opposed and 18% were neutral or expressed no opinion); 51% of TNC members ( $n = 293$ ) opposed use of bows to hunt bears (29% supported and 21% were neutral or expressed no opinion); BHA members were split regarding use of bows (41% supported, 44% opposed, and 15% were neutral or expressed no opinion;  $\chi^2 = 77.0$ , 10 df,  $P < 0.001$ ).

Most members of BHA (>65%) and VDGIF professionals (>85%) placed importance on considering input from all stakeholders in bear management, whereas relatively few TNC members (17%) and Beekeepers (31%) placed importance on input from bear hunters who use dogs (Table 1). All stakeholders placed importance on input of people primarily concerned with preserving bears and their habitat ( $\chi^2 = 71.3$ , 8 df,  $P < 0.001$ ) and people who experience bear damage ( $\chi^2 = 102.1$ , 8 df,  $P < 0.001$ ). Nearly all BHA members placed

**Table 1. Opinions concerning importance of input from stakeholders in bear management, as expressed by respondents to surveys conducted in Virginia during 2000.**

Stakeholder	Group <sup>a</sup>	n	Frequency of opinion (%)					
			VI <sup>b</sup>	I	N	U	VU	NO
Habitat interests <sup>c</sup>	TNC	296	51	37	5	1	0	5
	Beekeepers	320	26	42	13	9	5	5
	BHA	261	44	32	9	8	5	2
	VDGIF	22	41	46	10	5	0	0
Agricultural producers <sup>d</sup>	TNC	295	28	51	8	7	1	5
	Beekeepers	321	51	34	8	2	2	4
	BHA	260	18	48	15	7	7	5
	VDGIF	22	64	36	0	0	0	0
Hunters with dogs <sup>e</sup>	TNC	296	4	13	11	13	54	6
	Beekeepers	321	13	18	18	13	30	8
	BHA	261	81	17	2	0	0	1
	VDGIF	22	50	41	0	9	0	0
Hunters without dogs <sup>f</sup>	TNC	296	7	24	14	16	32	6
	Beekeepers	321	19	25	22	11	15	8
	BHA	259	36	32	12	8	9	4
	VDGIF	22	50	46	0	5	0	0

<sup>a</sup>TNC: The Nature Conservancy; Beekeepers: Virginia State Beekeepers Association; BHA: Virginia Bear Hunters Association; VDGIF: Virginia Department of Game and Inland Fisheries.

<sup>b</sup>VI = very important, I = somewhat important, N = neutral, U = somewhat unimportant, VU = very unimportant, NO = no opinion.

<sup>c</sup>Individuals primarily concerned with preserving bears and their habitat.

<sup>d</sup>Agricultural producers who experience bear damage.

<sup>e</sup>Bear hunters who use dogs.

<sup>f</sup>Bear hunters who do not use dogs.

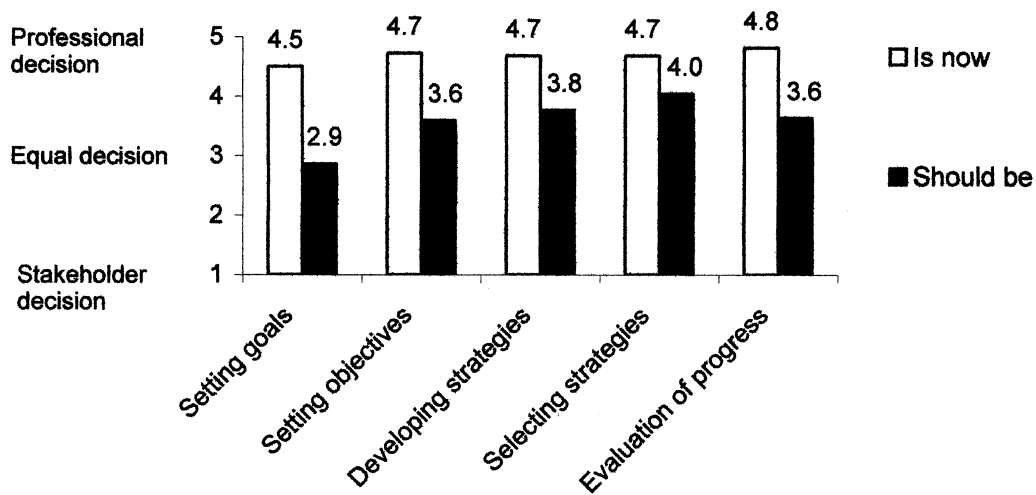
importance on input from hunters who use dogs, but BHA members also considered the input of other hunters important. Thirty-one percent of TNC members and 44% of Beekeepers placed importance on input from hunters who do not use dogs ( $\chi^2 = 122.0$ , 8 df,  $P < 0.001$ ); even fewer (17% and 31%, respectively) placed importance on the input of hunters who use dogs ( $\chi^2 = 521.6$ , 8 df,  $P < 0.001$ ).

### **Opinions of professionals regarding roles in decision-making**

Professionals in the VDGIF indicated that stakeholders should have greater influence in making all types of decisions that affect bear management than they currently do, particularly in setting goals for management ( $t \leq 3.3$ ,  $P \leq 0.003$  for all 5 tests; Fig. 1). Professionals indicated that stakeholder opinions should weigh equally with professional opinions in setting goals, but that professional opinion should outweigh public opinion in developing objectives, developing and selecting specific strategies, and evaluating progress toward goals for bear management. For all 5 types of decisions, VDGIF respondents indicated current decision-making processes rely almost entirely on professional opinions.

### **Discussion**

Findings of our research concerning bear hunting, resolution of human–bear conflicts, and the value of informed stakeholders are applicable to bear managers nationwide. As Loker and Decker (1995) noted following a 1992 Colorado referendum banning bear hunting in spring or with dogs, few people lack opinions about bear hunting, regardless of their knowledge about the issues. As managers expand their attention to human–bear conflicts beyond agricultural producers to urban environments, their success or failure may be determined by how well they understand the growing realm of stakeholders. Just as managers learn about stakeholders through interaction, our results suggest that stakeholders become better-informed participants in planning and management by interacting with agency personnel and other interested parties. The practical value of informed stakeholders was demonstrated by our finding that stakeholders who knew enough about VDGIF to express an opinion tended to be supportive of the agency. The low importance TNC members and Beekeepers placed on input of traditional hound hunters in making management decisions indicated a lack of tolerance for the views of some important stakeholders in bear management.



**Fig. 1.** Opinions of VDGIF professionals about current and desired roles of professionals and stakeholders in 5 types of decisions about black bear management in Virginia. Data labels represent mean responses ( $N = 22$ ) to 10 Likert-type survey items scaled 1 = mostly a stakeholder decision, 2 = shared decision, stakeholder opinion more important, 3 = shared equally, 4 = shared decision, professional opinion more important, 5 = mostly a professional decision.

We urge caution in interpreting results given possible non-response biases. The response rate for Beekeepers (76%) exceeded the 65% threshold of concern for non-response bias identified by Dolsen and Machlis (1991), and the responses of BHA and TNC members (both 61%) fell slightly below that threshold. Dolsen and Machlis (1991) found few significant differences among items assessed in a mail-back questionnaire and an identical survey conducted during face-to-face interviews (with nearly 100% response) when the questionnaire response rate exceeded 65%. Increased responses from TNC members likely would have increased the incidence of “no opinion” and “neutral” responses, given the preponderance of these responses among returned questionnaires. We did not assess non-response bias among BHA members for several reasons: (1) both Virginia Tech researchers and VDGIF personnel had frequent contact with members of the organization and felt confident that they understood its members well; (2) leaders of the organization had assisted in notifying members about the survey and had encouraged members to respond; and (3) because ours was the third survey of the membership in 4 years, we were concerned that aggressive follow-up with non-respondents would alienate members who, heretofore, had strongly supported all research efforts related to black bears. Responses of BHA members were unified, relative to the other groups, and held no surprises based on our prior experiences.

Therefore, it is likely that non-respondents would have responded similarly to respondents.

Our surveys corroborated the polarization of dog hunting issues documented elsewhere in the United States (Bissell 1993, Beck et al. 1994, Loker and Decker 1995, Peyton 1998). Bear hunting may be as controversial among hunters as between hunters and non-hunters (Dubrock et al. 1978, Peyton 1989). Members of BHA indicated, in this survey and during focus groups, the only means of bear hunting they fully support is use of dogs (BHA is an organization of hound hunters). During focus groups, we found that hunters who use bows or otherwise hunt bears without dogs in Virginia often are opposed to bear hunting with dogs, a finding consistent with previous research (Dubrock et al. 1978).

The VDGIF professionals and focus group participants were more aware of constraints on assisting landowners with bear damage than were stakeholder survey respondents. Focus group participants who had experienced bear problems preferred managing problem bears to paying compensation for damage they caused—a sentiment documented in other states (McIvor and Conover 1994, Wagner et al. 1997). Further examination is needed to determine if known or perceived problems associated with compensation programs (Hynstrom and Hauge 1989) and bear relocation (Fies et al. 1987, Comley 1993) led VDGIF professionals to show less support for those methods than stakeholders.

According to our results and findings of others (Baptiste et al. 1979, Robinson et al. 1993, McIvor and Conover 1994), a majority of professionals and nonprofessionals agree that lethal measures should be used to control problem bears only as a last resort. Perhaps this sentiment testifies to the appeal of black bears (Rolston 1987, McMullin et al. 2000). In our case, BHA members likely were motivated by more utilitarian reasons (i.e., lethal control reduced the number of bears available for harvest).

In addition to enhanced stakeholder awareness of bear damage, hunting, and other important management issues, education about bear ecology enables productive interactions among stakeholder groups and professionals. Previous studies have shown that the public lacks basic knowledge about black bear ecology (Burghardt et al. 1972, LeCount and Baldwin 1986). Among our most significant findings were TNC members' lack of knowledge about black bears and lack of awareness about VDGIF management efforts.

Knowledge of bears appeared related to the source of learning. Survey results suggest that those stakeholders who rely on personal experience (e.g., hunting any game or attempting to observe or photograph bears) and literature may gain more knowledge about black bears than those who learn from television or friends and family. Perhaps wildlife-related activities are as much a catalyst to learn about bears through other means as educational experiences themselves (e.g., BHA frequently collaborated with VDGIF and Virginia Tech bear researchers). Relatively high knowledge of BHA members about black bear ecology and management may relate to their exposure to and interest in black bears. Dubrock et al. (1978) noted that members of the Virginia BHA were more familiar with bear management than were other hunters. Bear hunters, especially those who use hounds and belong to bear-hunting organizations, place importance on quarry and sport (Davenport 1951, Grise 1994). Surveys of visitors to Great Smoky Mountains National Park also suggested that hunters had more knowledge about bears and other game animals but knew no more about a variety of other wildlife species in the park than nonhunting participants (Burghardt et al. 1972, Hastings 1986).

Our results suggest that stakeholders' understanding of each other is necessary for acceptance and collaboration. As compared to the other groups, a higher percentage of TNC members placed importance on input of those with concerns about preserving bears and their habitats, a higher percentage of Beekeepers placed importance on agricultural producers' input, and a higher

percentage of BHA members placed importance on input of bear hunters who use dogs. However, BHA members were more tolerant of input by other interests in decision-making than either TNC members or Beekeepers. Few TNC members and Beekeepers placed value on input from BHA members, stakeholders who have demonstrated the most interest in bear management. Thus, a potential barrier to effective collaboration is lack of tolerance for views of primary stakeholders by others who generally have less interest in bear management. Views of TNC members and Beekeepers may demonstrate that stakeholders translate likes or dislikes of another stakeholder's activities (e.g., hunting with dogs) to the value of the latter stakeholder's input. Second, stakeholder groups develop their opinions about others in relative isolation, whereas VDGIF professionals interacted with diverse groups regularly. Recognition that polar interests can be legitimate often comes through personal interaction (Ritter 1967, Landre and Knuth 1993).

Support for VDGIF management of bears apparently depends on stakeholders' awareness of the agency, particularly their prior interaction with VDGIF personnel. Other researchers have reported similar findings (Landre and Knuth 1993, Stout et al. 1996). Members of BHA interacted more with agency personnel and expressed greater approval for VDGIF bear management than did either TNC members or Beekeepers. Interactions between Beekeepers and VDGIF personnel frequently occur under negative circumstances (e.g., agency responses to bear damage complaints). Thus, lower approval of VDGIF bear management by Beekeepers with prior contact may reflect unhappiness with bear damage more than with the agency's management.

Studies of effectively managed agencies show that one of the reasons they enjoy strong public support is they balance public concerns and scientific management of resources (McMullin 1993). Our survey of VDGIF professionals defined setting goals as a process of determining broad general directions for management programs (e.g., increasing the distribution of bears in Virginia). Thus, setting goals requires an understanding of stakeholder values but little technical expertise. On the other hand, setting specific, measurable objectives (e.g., maintaining a population density of 1 bear/100 hectares) and developing strategies to attain those objectives requires great technical expertise. Professional wildlife managers believed they should have greater involvement in making those decisions. Selecting strategies is often contentious because professionals have traditionally adopted a "we are the experts, so we should make

the decisions” attitude, whereas stakeholders expect a role in making decisions. Professionals who recognize that more than one right answer usually exists and who avoid personal investment in a single strategy are less likely to have adversarial relationships with stakeholders. Evaluating progress toward goals requires both professional and public input. Evaluation nearly always involves both technical measures of progress (e.g., percent reduction in nuisance complaints) and assessment of public satisfaction with progress (e.g., percent of producers who are satisfied with the way VDGIF has handled their problems).

Wildlife managers in Virginia recognized the need to proactively engage diverse stakeholders in decision-making processes related to bear management. This challenge is not unique to VDGIF (McMullin 1996). The agency appears to be effective in reaching out to traditional stakeholders (hunters), who were both knowledgeable and supportive of the agency and its management efforts. A challenge remains for VDGIF and other agencies to reach out to those constituencies, like TNC, who now demand a greater voice in wildlife management but who are less familiar with resources and management than traditional stakeholder groups. Traditional stakeholders will remain important, but agencies must embrace nontraditional groups to be effective managers in the future (McMullin et. al 2000).

## Acknowledgments

This project was funded by Virginia Department of Game and Inland Fisheries (VDGIF) as sponsored research at Virginia Polytechnic Institute and State University. We thank R.W. Duncan and R.W. Ellis for administrative support and contributions to the project. M.R. Vaughan and J.A. Parkhurst assisted with survey revisions and manuscript reviews. We improved surveys based on comments provided by R.S. Schulman, R.A. Gray, B. O’Neill, and L.R. Lafon. J. Snyder, B. Snyder, A. Harman, and B. Thompson provided mailing lists. M. Turpin assisted with data entry. We thank the 889 stakeholders and 22 professionals who responded to surveys.

## Literature cited

- BAPTISTE, M.E. 1977. A survey of visitor knowledge, attitudes, and judgment concerning black bears at Shenandoah National Park. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.
- , J.B. WHELAN, AND R.B. FRARY. 1979. Visitor perception of black bear problems at Shenandoah National Park. *Wildlife Society Bulletin* 7:25–29.
- BECK, T.D.I., D.S. MOODY, D.B. KOCH, J.J. BEECHMAN, G.R. OLSON, AND T. BURTON. 1994. Sociological and ethical considerations of black bear hunting. Proceedings of the Western Black Bear Workshop 5:119–131.
- BISSELL, S.J. 1993. Ethical issues in state wildlife policy: a qualitative analysis. Dissertation, University of Colorado, Denver, Colorado, USA.
- BLACK BEAR CONSERVATION COMMITTEE. 1992. Black bear management handbook for Louisiana, Mississippi and East Texas. First edition. Black Bear Conservation Commission, Baton Rouge, Louisiana, USA.
- BURGHARDT, G.M., R.O. HIETALA, AND M.R. PELTON. 1972. Knowledge and attitudes concerning black bears by users of the Great Smoky Mountains National Park. *International Conference on Bear Research and Management* 2:255–273.
- CARNEY, D.W. 1985. Population dynamics and denning ecology of black bears in Shenandoah National Park, Virginia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.
- COMLEY, L.M. 1993. Survival, reproduction, and movements of translocated nuisance black bears in Virginia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.
- DAVENPORT, L.B., JR. 1951. The economic importance of the black bear in Virginia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.
- DECKER, D.J., T.L. BROWN, D.L. HUSTIN, S.H. CLARKE, AND J. O’PEZIO. 1981. Public attitudes toward black bears in the Catskills. *New York Fish and Game Journal* 28:1–20.
- , R.A. SMOLKA, JR., J. O’PEZIO, AND T.L. BROWN. 1985. Social determinants of black bear management for the northern Catskill mountains. Pages 239–247 in S.L. Beasom and S.F. Roberson, editors. *Game harvest management*. Caesar Kleberg Wildlife Research Institute, Kingsville, Texas, USA.
- DILLMAN, D.A. 1978. *Mail and telephone surveys: the total design method*. John Wiley and Sons, New York, New York, USA.
- DOLSEN, D.E., AND G.E. MACHLIS. 1991. Response rates and mail recreation survey results: how much is enough? *Journal of Leisure Research* 23:272–277.
- DUBROCK, C.W., A.R. TIPTON, AND J.B. WHELAN. 1978. Evaluation of a bear hunter survey and its implications on black bear management in Virginia. Proceedings of the Southeast Association of Fish and Wildlife Agencies 32:202–207.
- EL HAMZAOU, R., K. BOYLE, C. MCLAUGHLIN, AND J. SHERBURNE. 1994. Black bear hunting in Maine: Do hunter characteristics affect opinions regarding hunting regulations. *Maine Agricultural and Forest Experiment Station, Bulletin* 839. University of Maine, Orono, Maine, USA.

- FIES, M.L., D.D. MARTIN, AND G.T. BLANK, JR. 1987. Movements and rates of return of translocated black bears in Virginia. *International Conference of Bear Research and Management* 7:369–372.
- GARSHELIS, D. 1997. The arrogance of ignorance—a commentary on the bear trade. *International Bear News* 6:4–6.
- GRISE, L.D. 1994. Assessing stakeholder preferences regarding current and future bear management options. Thesis, Michigan State University, Lansing, Michigan, USA.
- HASTINGS, B. 1986. Wildlife-related perceptions of visitors in Cades Cove, Great Smoky Mountains National Park. Dissertation, University of Tennessee, Knoxville, Tennessee, USA.
- HELLGREN, E.C., AND M.R. VAUGHAN. 1989. Demographic analysis of a black bear population in the Great Dismal Swamp. *Journal of Wildlife Management* 53:969–977.
- HYNGSTROM, S.E., AND T.M. HAUGE. 1989. A review of problem black bear management in Wisconsin. Pages 163–168 in M. Bromley, editor. *Bear–people conflicts: proceedings of a symposium on management strategies*, 6–10 April 1987. Northwest Territories Department of Natural Resources, Yellowknife, Canada.
- JONKER, S.A., J.A. PARKHURST, R. FIELD, AND T.K. FULLER. 1998. Black bear depredation on agricultural commodities in Massachusetts. *Wildlife Society Bulletin* 26:318–324.
- LAFON, N.L. 2002. Evolution of stakeholder knowledge, attitudes, and opinions throughout a participative process to develop a management plan for black bears in Virginia. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.
- LANDRE, B.K., AND B.A. KNUTH. 1993. Success of citizen advisory committees in consensus-based water resources planning in the Great Lakes Basin. *Society and Natural Resources* 6:229–257.
- LECOUNT, A.L., AND K.L. BALDWIN. 1986. The bear in the classroom. *International Conference on Bear Research and Management* 6:209–217.
- LOKER, C.A., AND D.J. DECKER. 1995. Colorado black bear hunting referendum: what was behind the vote? *Wildlife Society Bulletin* 23:370–376.
- MCIVOR, D.E., AND M.R. CONOVER. 1994. Perceptions of farmers and non-farmers toward management of problem wildlife. *Wildlife Society Bulletin* 22:212–219.
- MCKINNEY, M.J. 1991. Water for wildlife: integrating science and politics in wildlife conservation. *Policy Studies Journal* 19:534–541.
- McMULLIN, S.L. 1993. Approaches to management effectiveness in state fish and wildlife agencies. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.
- . 1996. Natural resource management and leadership in public-arena decision making: a prescriptive framework. Pages 54–63 in D.R. DeVries, editor. *Multidimensional approaches to reservoir management*. American Fisheries Society Symposium 16. Bethesda, Maryland, USA.
- , AND L.A. NIELSEN. 1991. Resolution of natural resource allocation conflicts through effective public involvement. *Policy Studies Journal* 19:553–559.
- , M.D. DUDA, AND B.A. WRIGHT. 2000. House Bill 38 and future directions for the Department of Game and Inland Fisheries: results of stakeholder and staff studies and recommendations for future action. Virginia Polytechnic and State University, Blacksburg, Virginia, USA, and Responsive Management, Harrisonburg, Virginia, USA.
- PETKO-SEUS, P.A. 1985. Knowledge and attitudes of campers toward black bears in Great Smoky Mountains National Park. Thesis, University of Tennessee, Knoxville, Tennessee, USA.
- PEYTON, B. 1989. A profile of Michigan BHA and bear hunting issues. *Wildlife Society Bulletin* 17:463–470.
- . 1998. Defining management issues: dogs, hunting and society. *Transactions of the North American Wildlife and Natural Resources Conference* 63:544–554.
- RITTER, K.Y. 1967. The effect of group discussion, group participation and personal contact upon attitude change. Thesis, Kansas State Teachers College, Emporia, Kansas, USA.
- ROBINSON, S.A., J.A. PARKHURST, AND J.E. CARDOZA. 1993. Co-existing with black bears in Massachusetts. University of Massachusetts Cooperative Extension System, Amherst, Massachusetts, USA.
- ROLSTON, H., III. 1987. Beauty and the beast: aesthetic experience of wildlife. Pages 187–196 in D. Decker and G.G. Goff, editors. *Valuing wildlife*. Westview Press, Boulder, Colorado, USA.
- STOUT, R.J., D.J. DECKER, B.A. KNUTH, J.C. PROUD, AND D.H. NELSON. 1996. Comparison of three public-involvement approaches for stakeholder input into deer management decisions: a case study. *Wildlife Society Bulletin* 24:312–317.
- VAUGHAN, M.R. 1998. Research proposal: population and habitat ecology of Virginia's hunted black bear population: phase II. Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA.
- WAGNER, K.K., R.H. SCHMIDT, AND M.R. CONOVER. 1997. Compensation programs for wildlife damage in North America. *Wildlife Society Bulletin* 25:312–319.
- WRIGHT, B.A., N.D. EMERALD, S.P. MOTT, AND D.E. STEFFEN. 2001. Virginia survey of hunter harvest, effort and attitudes 1999–2000. Center for Recreation Resources Policy, George Mason University, Manassas, Virginia, USA.

Received: 28 May 2001

Accepted: 15 October 2002

Associate Editor: S.J. Riley