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How agencies respond to human–black bear conflicts: a survey of wildlife agencies in North America

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Abstract: Managing interactions between humans and American black bears (*Ursus americanus*) has evolved from public feeding and viewing of garbage-habituated bears to nationwide bear education campaigns focused on removing food attractants. We conducted a self-administered survey to assess how wildlife agencies respond to human–bear conflict and identified techniques currently used to manage conflicts throughout US, Canada, and Mexico. Forty-eight agencies responded to the survey and answered questions about bear populations, levels of complaints, types of interactions, and agency responses. Most (75%) agencies surveyed relocated problem bears, but only 15% believed relocation was an effective tool. Half (50%) of the agencies always marked problem bears that were captured and released; 50% both monitored the results of relocated bears and maintained a database. Most (69%) agencies ranked garbage/food attractants the most common type of human–bear conflict. Our results suggest that management responses to human–black bear conflict can be strengthened by adopting protocols for marking, monitoring, and maintaining a database for all bears captured in association with conflict incidents; moving from reactive to proactive approaches for garbage management; and developing comprehensive bear education programs that strive to make education a more dynamic and interactive process. Despite the unique circumstances of local politics and laws, all agencies need to strive to develop systems to document and evaluate the effectiveness of their actions to prevent and manage conflict. By monitoring actions and results, agencies can design improvements and move forward in an adaptive management framework.

Key words: American black bear, conflict protocol, database management, education, human–bear conflict, on-site release, relocation, survey, *Ursus americanus*

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Management of American black bears (*Ursus americanus*) has changed dramatically in the last 60 years. Commonly accepted practices have evolved from public feeding and viewing of garbage-habituated bears in National Parks in the early 20th century (Ingram 1995, Thompson and McCurdy 1995) to nationwide bear education campaigns focused on removing food attractants. A primary component of most current bear management programs in North America is some type of bear awareness program aimed at educating people on how to avoid or prevent conflict with food conditioned bears. Wildlife researchers and managers have refined how they respond and manage nuisance black bears for over 30 years in a constant effort to further reduce human–bear conflict (Pelton 1972, Bacon 1974, LeCount 1979, LeCount and Baldwin 1986, Johnson 1990, Ciarniello 1997, Clark et al. 2002, Ricklefs 2005). Managing human–bear conflict is arguably one of the most challenging priorities wildlife managers face today because black bears occur throughout most of North America, have a high tolerance for anthropogenic activities, and readily adapt to artificial food sources. In fact, despite increasing human populations across the continent, bear populations are increasing in many regions. With regard to the increasing number of bears, projected human population growth, and diminishing habitats, there is little doubt the potential for human–bear conflict will escalate in the next decade. Therefore, it is critical for wildlife researchers and managers to continue investigating human–bear conflicts to better understand behavioral patterns of bears and people. It is equally important for wildlife agencies to scientifically document and

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communicate successes and failures of their management strategies so other managers and bear management programs as a whole can efficiently develop and implement more effective protocols. To that end, our objective was to compile and compare black bear conflict management protocols throughout North America so management agencies could learn from the experiences of other jurisdictions and update their own management protocols. Our survey builds on previous work on bear management protocols by Will (1980), Warburton and Maddrey (1994), McLaughlin and Vaughan (1999), and Whittaker and Burns (2001).

Methods

We developed and emailed a self-administered questionnaire to assess elements of human–bear conflict protocols and to identify techniques used by wildlife agencies to manage conflicts throughout the US, Canada, and Mexico. The questionnaire included 25 questions about bear populations, levels of complaints, types of interactions, management strategies, and documentation. Question formats included multiple-choice, ranking from most to least common, and yes/no responses (Appendix A). For comparison purposes in the US, we report some of the responses by region (northwest = Alaska, Idaho, Montana, Oregon, Washington, Wyoming; southwest = Arizona, California, Colorado, New Mexico, Nevada, Oklahoma, Texas, Utah; northeast = Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Vermont; southeast = Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, West Virginia, Virginia, Missouri).

For the analysis, we converted all responses to numerical scores. We treated multiple-choice scores as nominal data, yes/no scores as dichotomous data, and ranked scores as ordinal data. For multiple-choice scores we calculated the proportion of each score from all choices. Similarly, we calculated the proportion of each score for ranked questions but standardized the result by the highest possible total score. In some cases, respondents gave incomplete or multiple answers or a range. For ranges we used the average score; we omitted from analysis incomplete or multiple answer data.

In the US, we calculated the number of human–bear complaints per 10,000 people (US Census Bureau 2000). Because the average complaint level per person in some states would be dramatically affected by including metropolitan areas where bears do not occur, we also calculated per capita complaint rate for only those counties occupied by black bears, using the distribution map from Pelton and van Manen (1994). Although Pelton and van Manen's map is dated and bear distribution may have changed since 1994, it is the best available bear distribution map by county. We did not include Mexico or Canadian jurisdictions in our analysis because data on human population size were not available to us at a similar geographic scale.

We surveyed 39 states, 12 provinces, and Mexico; Mexico did not provide data by state. States without self-sustaining bear populations (North Dakota, South Dakota, Nebraska, Kansas, Iowa, Indiana, Illinois, Delaware, and the District of Columbia) were not contacted; the Province of Prince Edward Island also was not contacted. The survey was conducted between March and July 2006, and the agency's bear biologist or manager completed the survey.

Results

Population

We received completed questionnaires from all 39 states, 8 of 12 provinces, and Mexico. Of the 48 responding agencies, 44 (91.6%) provided general estimates of black bear population size, totaling approximately 747,000 animals in North America (Table 1). In the US, Alaska reported the highest number of black bears with a "conservative" estimate of 72,500; in the lower 48 states, bear population sizes varied from 55 in Mississippi to 34,000 in California. In Canada, British Columbia reported the highest number of bears, approximately 140,000, and New Brunswick reported the lowest, with 16,000. Mexico did not report a bear population estimate.

Complaints

All 48 agencies provided an average number of complaints per year, resulting in approximately 43,237 complaints annually in North America (Table 1). Complaints per 10,000 people for counties occupied by bears ranged from 0.01 (Texas) to 12.15 (Connecticut; Fig. 1). Most (82%) respondents indicated black bear problems were "common", "increasingly common", or a "serious problem" (Table 1). For the provinces, British Columbia and

Table 1. Black bear population estimates, number of black bear complaints per year, and black bear complaint trend for Mexico and by state or province, from a 2006 survey of North American wildlife agencies.

Jurisdiction	Estimated black bear population[a]	Bear complaints/year	Bear complaint trend
British Columbia	140,000	10,000	increasing
Manitoba	30,000	1,450	common
New Brunswick	16,000	200	common
Nova Scotia	unknown	1,037	increasing
Ontario	100,000	10,000	common
Quebec	70,000	1,156	increasing
Saskatchewan	30,000	225	common
Yukon	10,000	100	common
Alabama	75	3	minor
Alaska[b]	72,500	1,250	common
Arizona	2,500	66	serious
Arkansas	3,500	148	common
California	34,000	1,000	common
Colorado	12,000	1,200	common
Connecticut	300	2,250	increasing
Florida	2,637	1,182	increasing
Georgia	2,200	837	increasing
Idaho	20,000	35	minor
Kentucky	250	87	serious
Louisiana	600	350	increasing
Maine	25,000	300	minor
Maryland	550	400	serious
Massachusetts	2,950	110	increasing
Michigan	1,700	350	increasing
Minnesota	25,000	55	minor
Mississippi	55	2	minor
Missouri	350	80	increasing
Montana	16,500	250	increasing
Nevada	200	165	increasing
New Hampshire	5,000	750	common
New Jersey	2,400	1,100	increasing
New Mexico	5,500	200	serious
New York	7,000	1,000	increasing
North Carolina	11,000	300	common
Ohio	100	35	minor
Oklahoma	200	25	common
Oregon	27,750	500	increasing
Pennsylvania	15,000	1,500	increasing
South Carolina	1,150	160	increasing
Tennessee	2,750	1,000	increasing
Texas	unknown	1	minor
Utah	2,250	35	common
Vermont	4,100	250	serious
Virginia	8,000	431	increasing
Washington	25,000	475	common
West Virginia	11,000	1,000	common
Wyoming	unknown	177	increasing
Mexico[c]	unknown	10	minor
Total	747,083	43,237	

[a]Based best available information; methods and precision vary.
[b]Excludes interior Alaska.
[c]Statistics not provided by state.

Ontario reported the highest number of annual bear complaints, with 10,000/year in each province, and New Brunswick and Yukon had the least with 200 and 100, respectively. In the US, Connecticut, despite an estimated bear population of 300, had the most complaints at 2,250, followed by Pennsylvania with 1,500. Not surprisingly, the states with the least number of complaints were Alabama, Mississippi, and Texas; each of these states had only remnant bear populations. Mexico reported an average of only 10 complaints/year.

The majority of agencies (69%) ranked garbage/food attractants the most common type of human–bear conflict, followed by general sightings (Table 2, Fig. 2). The apiary/orchard/crop category and human encounters were ranked similarly; livestock and human attacks were the least common type of conflict reported. Most (77%) respondents indicated they did not have a damage fund to reimburse losses due to black bears.

Summer (Jun–Aug) was the peak complaint period for 52% of the agencies across North America, followed by spring (Mar–May; peak for 29% of agencies) and fall (Sep–Nov; 19% of agencies). The northwestern states reported 67% of the human–bear conflict occurred in both spring and summer (most states ranked these seasons equally; followed by fall (33%); in the southeastern states, spring (42%) and summer (42%) were also the peak time for conflict. In the southwest, 50% of states reported summer as the peak followed by fall (38%) and spring (12%); in the northeast, summer (55%) produced the most conflict followed by spring (45%). In the Provinces, 71% reported summer as the peak followed by fall (29%). In Mexico, spring was the peak season for conflict.

Conflict response protocols

Forty-three agencies (89%) had defined protocols (i.e., agency policy or standard operating procedure) for field personnel when responding to human–bear conflicts. In response to the question ''How does your agency respond to black human–bear interactions where public safety is a factor?'' the most common response was a site visit, followed by capture/relocation, and euthanasia; kill permits and use of hunters were the least common response (Fig. 3). Culvert traps were the most common method used to capture black bear, followed by leg-hold snares; the use of dogs was least common method.

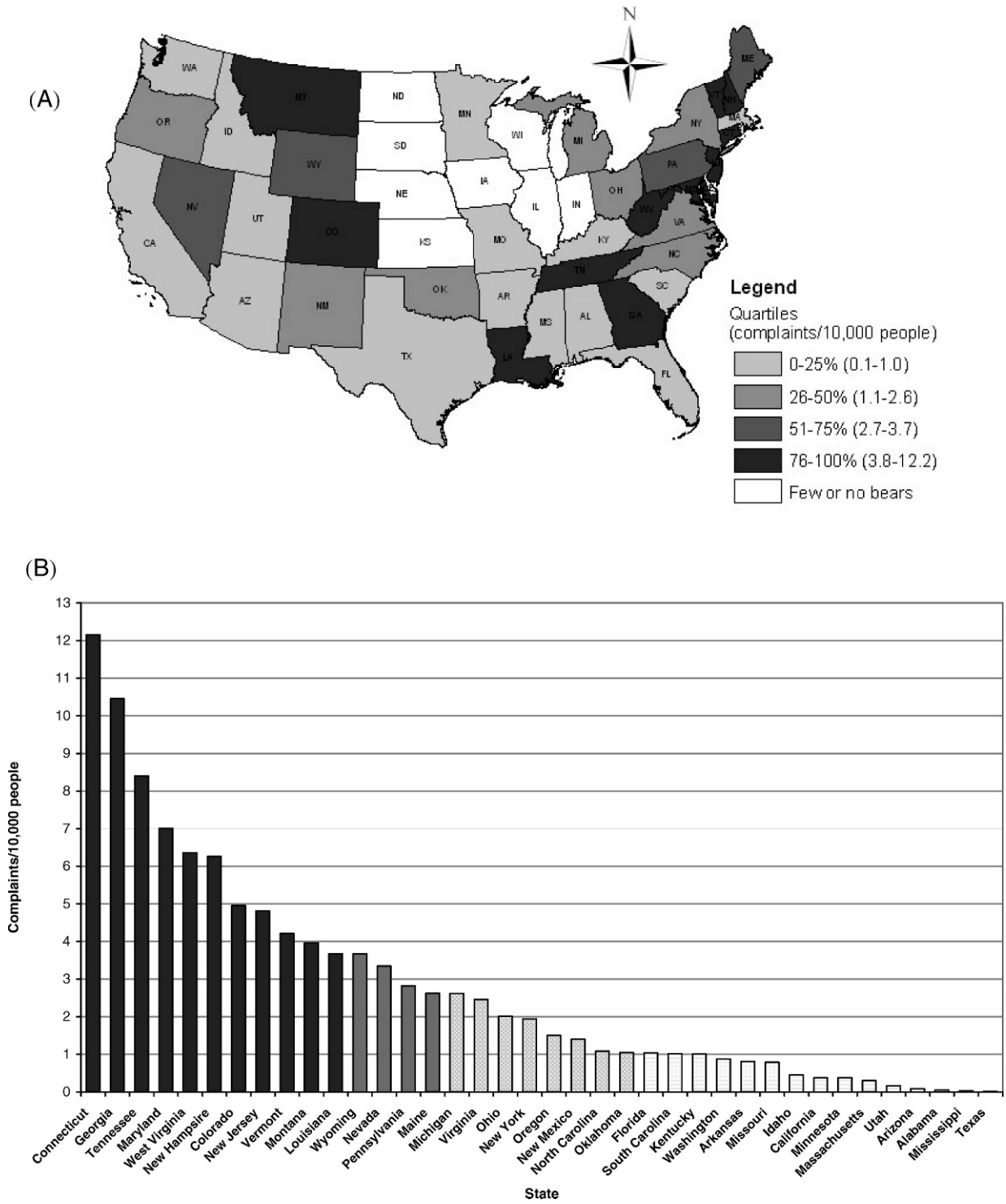

Fig. 1. Number of black bear complaints by state per 10,000 people (in counties occupied by black bear only) from a 2006 survey by location (A) and ranked comparison (B).

Table 2. Rankings of 7 black bear–human conflict types (most [1]–least common [7]) by state or province from survey of North American wildlife agencies, 2006. No response = nr.

State	General sightings	Garbage/food attraction	Human/black bear encounters	Campsite encounters	Apiary/orchard / crop damage	Livestock attacks	Human attacks
British Columbia	1	2	4	5	3	6	7
Manitoba	2	1	nr	nr	3	4	5
New Brunswick	4	1	5	3	2	6	7
Nova Scotia	3	1	2	nr	4	nr	nr
Ontario	1	2	3	4	5	6	7
Quebec	1	3	2	4	5	7	6
Saskatchewan	5	1	6	2	4	3	7
Yukon	1	2	3	4	6	7	5
Alabama	nr	1	3	nr	2	nr	nr
Alaska	3	1	2	5	7	4	6
Arizona	1	2	4	3	nr	5	6
Arkansas	2	1	3	6	5	4	7
California	2	1	4	3	5	6	7
Colorado	1	2	6	5	3	4	7
Connecticut	1	3	2	6	5	4	7
Florida	1	2	4	nr	3	5	6
Georgia	2	1	4	3	5	6	7
Idaho	7	1	5	4	3	2	6
Kentucky	3	1	2	4	5	6	7
Louisiana	2	1	5	4	3	6	nr
Maine	3	1	6	4	2	5	7
Massachusetts	2	1	5	3	4	6	nr
Michigan	2	1	5	4	3	6	7
Minnesota	nr	1	nr	nr	2	nr	3
Mississippi	1	4	2	5	3	6	7
Missouri	1	2	7	7	3	7	7
Montana	4	1	2	5	3	6	7
Nevada	2	1	3	5	4	6	nr
New Hampshire	6	1	4	2	3	5	7
New Jersey	2	1	3	5	6	4	7
New Mexico	3	1	5	4	2	6	7
New York	1	2	6	3	4	5	7
North Carolina	2	1	5	6	3	4	7
Ohio	1	2	nr	nr	3	4	nr
Oklahoma	4	1	6	6	6	7	7
Oregon	5	1	1	4	2	3	nr
Pennsylvania	2	1	3	5	4	6	7
South Carolina	5	1	3	4	2	6	nr
Tennessee	2	1	3	4	6	5	7
Texas	1	nr	nr	nr	7	nr	7
Utah	6	1	4	2	3	5	7
Vermont	1	2	4	6	3	5	7
Virginia	4	1	nr	nr	2	3	nr
Washington	2	1	5	4	3	6	7
West Virginia	6	1	2	5	3	4	7
Wyoming	6	1	2	5	4	3	7
Mexico[a]	7	4	3	6	2	1	5

[a]Statistics not provided by state.

Most (75%) agencies relocate problem bears. Of these 36 agencies, 16 (44%) indicated that ''public pressure'' was the primary reason for relocation and 14 (41%) indicated it was driven by a ''2 or 3 strike policy'' (bears were initially relocated for conflict or nuisance reasons, but if they returned to the conflict site or were elsewhere identified a second or third time as a conflict/nuisance bear, they were euthanized, generally for public safety). Only 5 agencies (15%) indicated relocation was the best management approach.

We found 42% (20 of 48) of states and provinces use on-site release as an alternative to relocation or killing bears involved in conflicts. However, similar

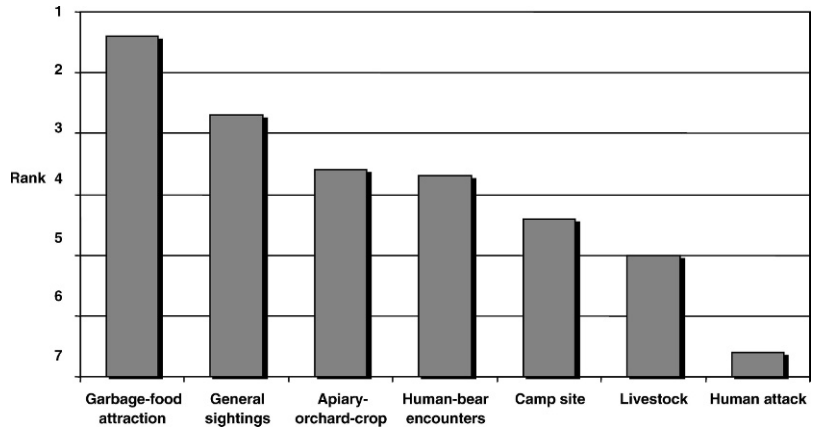

Fig. 2. Comparative frequency of reasons given for complaints of black bear–human conflicts as reported by North American wildlife agencies (ranking 1–7, 1 most common), 2006.

to relocation data, only 65% (13 of 20) of these respondents mark released bears in all cases and only 9 respondents maintain a database.

Most agencies (64%) used aversive conditioning as a tool for black bears involved in conflict. Rubber bullets and loud noises were the most common aversive conditioning used; barking dogs were seldom used. Half (24 of 48) of respondents indicated that their agency used bear-resistant containers; of those 33% (8 of 24) provided agency funds to purchase bear-resistant containers, suggesting most agencies use outside funds to purchase bear-resistant containers, likely because of budget limitations.

Monitoring and data management

Twenty-four (50%) agencies reported that they marked captured problem bears ''all the time'', 11 (23%) marked bears ''most of the time'', 7 (15%) marked bears ''some of the time'', and 3 (6%) ''never'' marked released bears (2 did not respond). Fifty percent (23 of 46) of agencies maintained a database of marked animals to monitor results of aversive conditioning and relocation of black bears. Forty-two percent (20 of 48) of respondents released bears on-site. Of these, 13 always marked released bears and 14 maintained a database to monitor results.

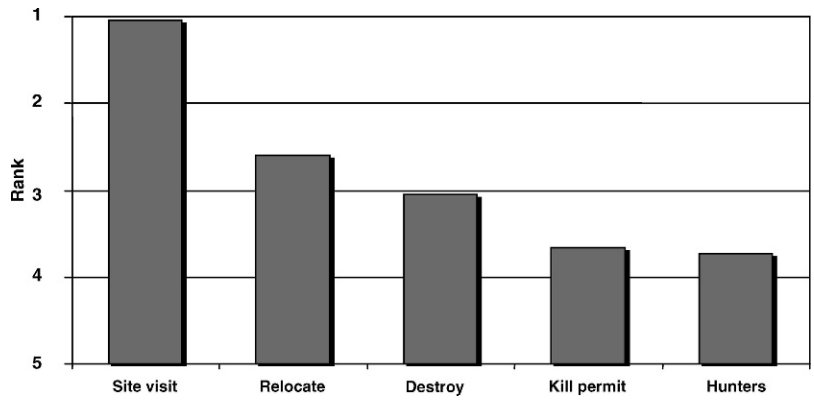

Fig. 3. Comparative frequency (rank 1–5; 1 being the most common) of how wildlife agencies in North America respond to black bear–human conflict where public safety is a factor, 2006.

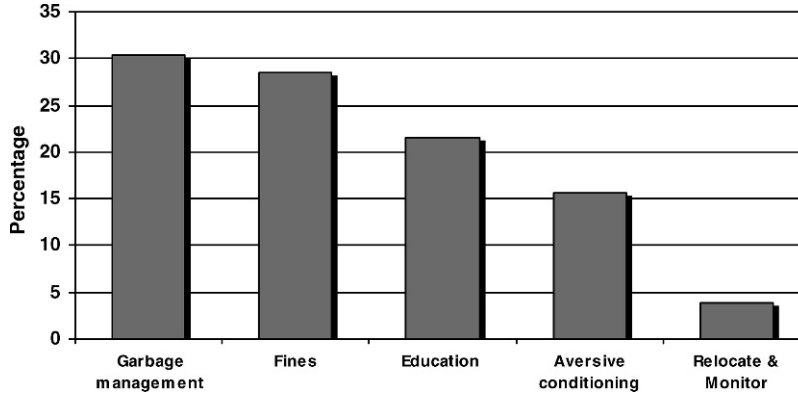

Fig. 4. Percent North American wildlife agencies reporting techniques they would like to use more often when responding to human–bear conflict, from a 2006 survey.

Legislation

About half of respondents (47%) indicted that their state or province had a statute, policy, or law allowing fines for creating depredation situations. In response to the question ''What techniques would you like to see your agency use more when responding to human–bear interactions?'' ''garbage management'' and ''fines'' were preferred over reactive approaches such as ''aversive conditioning'' and ''relocation'' (Fig. 4).

Education

Most agencies (81%) had a bear education program; ''brochures'', ''press releases'', and ''radio and TV'' were the most common resources (Fig. 5). There was no clear indication of the method they would like to use more to educate the public, although 26% indicated ''radio and TV'', followed almost equally by ''press releases'' (21%) and ''workshops'' (20%).

Discussion and management recommendations

Bear complaints/state

In the US, we found wide variation in the number of annual bear complaints (range:1–2,150). However, when we restricted our measure of human population size to counties occupied by bears, 82% (31 of 38) of states reported <5 complaints/10,000 people annually. Many states with high human populations and substantial bear populations (e.g., Arkansas, California, Massachusetts, Minnesota, Washington) had relatively low bear complaints per capita (<1 complaint/10,000 people annually).

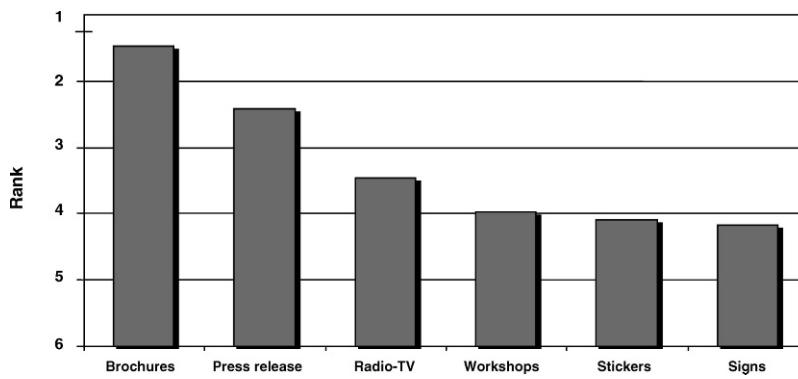

Fig. 5. Comparative frequency of types of education materials (ranked 1–6; 1 is most common) North American wildlife agencies provide and use to educate the public about nuisance black bears, from a 2006 survey.

Not surprisingly, we found that garbage related complaints were most common. The behavioral consequences of food-conditioned bears have been well documented and human–bear conflicts typically lead to relocating or destroying the bear (Garner and Vaughan 1989, Garshelis 1989). Work by McCarthy and Seavoy (1994) suggests that education on proper sanitation methods should be the first priority to address garbage related issues. Although using a bear-resistant container may help resolve garbage-related issues in chronic problem areas (McCarthy and Seavoy 1994, R. Spencer, unpublished data), this may be cost prohibitive on a regional level. We suspect that is why only half (24 of 48) of agencies used bear-resistant containers and only 8 (33%) of those funded bear-proof containers. Bear-resistant containers generally cost $500–2,000 and can require substantial equipment changes for garbage collection agencies. Lack of agency funds and personnel limits the ability to make bear-resistant containers readily available. To overcome this, we encourage managers to develop education-based pilot projects in selected problem areas and focus efforts to secure funding for bear-proof containers through legislative funds, matching funds, grant proposals, and partnering with local wildlife organizations and waste management companies. Developing and nurturing grassroots outreach efforts that are dedicated to disseminating accurate information about bears and conflict prevention through sanitation can be extremely effective (Morgan et al. 2004).

It may be beneficial to establish an agency policy on food attractants and the use of bear-proof containers. Policy is similar to the process of problem solving, where the problem is defined (i.e. garbage and food attractants are the problem), plans are formulated, plans are executed, and results are evaluated (Bacon 1974). We recognize that these approaches have an upfront investment in time and energy, but argue that these can be compensated by important future dividends if garbage-related human–bear conflicts are greatly reduced or eliminated. When human–bear conflicts are caused by access to garbage, we encourage a proactive approach to address the problem with the expectation of a positive result, as opposed to the annual reactive response often resulting in stretching limited resources and relocation or killing multiple bears; an evaluation of the effectiveness of these approaches should include an analysis of costs.

Conflict response protocols

We found that most agencies respond to human–bear conflict where safety is a concern by visiting the complaint site to determine the appropriate action, providing educational materials, trapping, or euthanasia. Most interesting to us was the issue of relocation. Over two-thirds of wildlife agencies relocated bears involved in human–bear conflict, yet only 15% indicated it was an effective management tool. Because almost half of responding agencies did not maintain a database to monitor relocation success, it was unclear what data or relocation parameters were used to produce that result. Our survey suggests that the policy decision to relocate bears was driven more by social pressure than biological merit. Relocation as a management tool has been well documented (Rogers 1986, Warburton and Maddrey 1994, Witmer and Whittaker 2001, Beckman et al. 2004), but few authors stress the need for ongoing science-based evaluation (Martin et al. 1994). This issue is further complicated by agency liability, lack of relocation areas, strain on limited personnel and funding (Riley et al. 1994), and the fate of the relocated bear. Based on the information we collected on relocation, agencies believe the public expects them to use non-lethal methods to resolve human–bear interactions. In addition to public expectations, agency decisions about bear relocation also should be based on the efficacy of relocation as a means to prevent further human–bear conflicts.

We recommend that all relocated bears be permanently marked and that agency databases be maintained to monitor results of relocations. Synthesis of these data could provide valuable long-term scientific and management information, and helpful, credible data on relocation results for public dissemination and future policy direction. Useful information could include the bear's age, sex, problem behavior, distance moved, aversion technique, success rate, how often bears returned (re-offended), and time elapsed if the bear returned to the problem area. For example, in the past Washington Department of Fish and Wildlife did not permanently mark all relocated bears or maintain a centralized database and did not identify bear relocation sites. The Department was thus unable to determine if a released bear re-offended. This was particularly problematic because the Department has a two strikes policy. Incomplete data was used when responding to internal, legislative, and public

requests on success rates for bear relocation. We suspect many wildlife managers in other states and provinces face similar circumstances, and would likely benefit from comprehensive data. Further, with so many states and provinces indicating that human–bear conflict are common, increasingly common, or serious, maintaining a database would provide perspective as this trend will likely continue to be a management priority for agency personnel and the public. It would also provide a basis for objective rather than subjective determination of results from long-term bear relocation efforts.

On-site release, monitoring, and data management

Compared with relocation, capturing and releasing a bear on-site, coupled with aversive conditioning, is a new technique that has become more common in the last decade (Clark et al. 2003, Beckman et al. 2004). We believe it is important that agencies monitor bears released on-site and develop agency databases to evaluate the effectiveness of on-site release and aversive conditioning as a practical management technique. A fundamental component of the database should include the stage of behavior when the on-site release occurred (e.g., day or night active, the bear's behavior when confronted by humans; Clark et al. 2002). Preliminary data from 3 states in the western US (Nevada, Montana, Washington) suggest that the technique has merit in a variety of circumstances, is often more effective at reducing reoccurrence of conflict, requires less time, and is more cost effective than relocation (Carl Lackey, Nevada Department of Wildlife, Reno, Nevada, USA; Carrie Hunt, Wind River Bear Institute, Florence, Montana, USA, personal communications, 2006; WDFW unpublished data). The goal of this approach would be a bear that maintains its home range yet avoids areas of human activity, thus reducing the need for agency staff to relocate or kill new bears occupying vacant territories in chronic problem areas. However, there is a paucity of published information for on-site release with aversive conditioning and not all agencies maintain databases to monitor results, demonstrating the need for more research and monitoring on this approach.

Legislation

The majority of respondents indicated their agency had no policy, legislation, or statute that allowed fines for individuals who fed bears or created situations that attracted bears (even in chronic problem areas). Because garbage and food attractants were the most common circumstance that generated human–bear conflict, and because agencies need to respond to these circumstances, a formal process to reduce or eliminate that cause may be a key component to addressing garbage-related issues. Second to garbage management, most agencies supported using fines for addressing human–bear conflict situations. When education fails, agencies need an incremental and effective tool to address chronic problems. For agencies that pursue the use of fines, we recommend a database to track and monitor their effectiveness to determine if human–bear conflict subsides as a result of issuing fines. This information may be used to generate agency and legislative support by documenting the effectiveness of fines for saving bears, increasing bear and public safety, and ultimately improving bear management.

Education

We believe education should be the underlying foundation of all state and provincial black bear management programs. Across North America, wildlife agencies should provide education and outreach that corrects false perceptions, informs the public about bear habituation to artificial food sources, and provides information for litigation on injuries and attacks to humans. Agencies use a variety of educational sources (radio and TV, news and press releases, workshops), and spend substantial time and effort on messages about securing garbage, removing bird feeders in spring, and not feeding bears. In fact, these are the messages of the National "Be Bear Aware" Campaign (C. Bartlebaugh, Center for Wildlife Information, Missoula, Montana, USA, personal communication, 2006), the Provincial "Get Bear Smart" Society (Whistler, British Columbia, Canada), and "Bear Wise" (Ontario, Canada). The value of education to reach bear management objectives and reduce human–bear encounters is recognized by a diverse group of stakeholders (Gore et al. 2006), including virtually all non-governmental organizations, and state, federal, and provincial governments responsible for bear management across North America; it has been a topic in all Eastern and Western Black Bear Workshops since they began in 1972. This is further evidenced by the number of brochures, pamphlets, logos, buttons, interpretive

programs, roadside signs, and bulletin board displays produced and provided by nearly all of these groups and agencies.

Although 12 of 48 (25%) respondents indicated they would like to use radio and TV more often when educating the public on the prevention of human–bear interactions, there was no clear preferred method. We suspect this may in part be due to regional differences in the type and degree of problems and to agency and bear managers' actual or perceived need for a specific type of education message. We agree that more effort to characterize the structure of bear education programs is important and that performance indicators tied to educational efforts may be valuable to assess effectiveness (Gore et al. 2006). In addition, we encourage bear managers and agencies to engage the public as they develop, improve, or implement a black bear education campaign. Public input may help agencies to provide the most effective, useful, and well received education programs. We suspect most responses will be consistent with current education and outreach tools. However, there may be small but critically important regional differences on issues, concerns, or information the public desires that are overlooked in current education brochures, signs, press releases, and workshops. Requests for input on topics to include in educational programs could be made informally by distributing a short questionnaire at community meetings, presentations, or workshops (Davidson et al. 1994). More formal (and likely expensive) methods could include public involvement processes around the state or province or scientifically-designed mail or telephone surveys that gauge the public's understanding of bears and human–bear conflict issues, and ask for public input on bear education needs or interests (Lafon et al. 2003).

Our survey indicates that agencies use a variety of approaches for managing human–bear conflict; however, there doesn't appear to be a best approach. Our results suggest that management responses to human–black bear conflict can be strengthened by: (1) adopting protocols for marking, monitoring, and maintaining a database for all bears captured in association with conflict incidents, (2) moving from reactive to proactive approaches for garbage management, and (3) developing comprehensive bear education programs that strive to make education a more dynamic and interactive process. Despite the unique circumstances of local politics and laws, all agencies need to strive to develop systems to document and evaluate the effectiveness of their actions to prevent and manage conflict. By monitoring actions and results, agencies can design improvements and move forward in an adaptive management framework.

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Appendix A

Black bear/human interaction and management survey, Washington Department of Fish and Wildlife, 2006.

1) How many bear complaints/calls does your agency experience per year?
2) Do you have a current estimate of the bear population in the state? If so, how many?
   Yes No Estimate:
3) What type of bear-human interactions does your agency deal with (please number 1-most common- and 7 least common)?
   a) General sightings
   b) Garbage / food attractions (bird feeders, etc.) (''nuisance'' behavior)
   c) Human/Bear encounters
   d) Campsite encounters
   e) Apiary/Orchard/Crop damage
   f) Livestock attacks
   g) Human attacks
   h) Agency does not have bear problems
4) How would you classify bear problems overall? (check one or more that apply)
   a) Minor problem
   b) Common problem
   c) Increasingly common problem
   d) Serious problem
5) What time of year does your agency experience the highest number of human/bear conflicts?
   a) Spring (March-May)
   b) Summer (June-August)
   c) Fall (September – November)
6) Does your Agency have standard or defined protocol or policy when responding to black bear/human interactions?
   Yes No
7) How does your agency respond to bear-human interactions where public safety is a factor? (please number 1-most common- and 5 least common)
   a) Have agency personnel visit the site to determine the cause, course of action, and offer suggestions.
   b) Capture and relocate the bear
   c) Capture and destroy the bear
   d) Send hunters and/or hound handlers to kill/chase the animal
   e) Issue a landowner kill permit
8) What type of agency personnel responds in the field?
   a) Biologist
   b) Game Warden/Conservation Officer
   c) Problem/Nuisance Wildlife Specialist
   d) Wildlife Services
   e) Private Contractor
9) If the decision is made to destroy the bear, who dispatches the animal?
   a) Biologist
   b) Game warden
   c) Wildlife Services
   d) Private contractor
10) If capture is performed, what methods does your agency commonly use to capture bears? (please number 1 most common –3 least common)
   a) Culvert (Barrel) Trap
   b) Snares
   c) Trained dogs
11) Does your agency relocate captured bears?
   Yes No
12) If yes, why does your agency relocate bears?
   a) Because it is the most effective management tool
   b) Because of public pressure or support for this approach
   c) Because the agency practices a 2 or 3 strike policy
13) Does your agency capture and release bears on site?
   Yes No
14) Does your agency use aversive conditioning techniques?
   Yes No
15) If yes, what aversion techniques do you use? (please number 1-most common-4 least common)
   a) Loud noises (cracker shells, gunshots)
   b) Rubber bullets / beanbags

c) Trained barking dogs (Karelian Bear Dogs or hounds)
d) Others (explain)_____

16) Are captured bears marked prior to release?
a) Never
b) Some of the time
c) Most of the time
d) All the time

17) If yes, how does your agency mark bears?
a) Ear tags
b) Tattoo
c) Radio collar
d) Paint or dye on the hide
e) Other: _____

18) Does your agency maintain a database to monitor results of relocation or aversive conditioning techniques?
Yes No

19) Does your agency have a damage fund to reimburse loss caused by bears?
Yes No

20) Does your agency use or fund the use of bear-proof containers?
Use –Yes No Fund – Yes No

21) Does your agency have a "bear aware" or bear education program?
Yes No

22) If yes, what education materials does your agency provide and use?
(please number 1-most common- and 6 least common)
a) Brochures / pamphlets
b) Stickers /patches
c) Signs at trailheads/kiosks
d) Newspapers/Press releases
e) Radio / Television
f) Slide programs; talks

23) Does your agency have a statute, policy, or law that allows agency personnel to fine the public for attracting bears or creating a depredation situation?
Yes No

24) What techniques would you like to see your agency use more of when trying to educate the public on prevention of bear/human interactions?
a) Brochures/Pamphlets
b) Stickers/patches
c) Signs at trailheads/kiosks
d) Press releases
e) Radio / Television
f) Workshops
g) Other (explain)_____

25) What techniques would you like to see your agency use more when responding to bear/human interactions?
a) Educational materials
b) Relocate bears and monitor success
c) Aversive conditioning (i.e. dogs)
d) Legislation or fines for attracting wildlife
e) Garbage management

Rocky Spencer died 8 September 2007 while capturing bighorn sheep. Rocky worked for Washington Department of Fish and Wildlife since 1978. For the past 5 years, Rocky had been a Large Carnivore Specialist and routinely worked with cougars and black bears. Rocky devoted much of his career to helping people and large carnivores co-exist. This is his last publication. It echoes his message about responsible management and public education. The Washington Department of Fish and Wildlife, our profession, and the citizens of Washington will miss him. Our condolences go to his friends and family.