

Evaluating a conservation investment designed to reduce human–wildlife conflict

Meredith L. Gore¹, Barbara A. Knuth², Clifford W. Scherer³, & Paul D. Curtis²

¹ Department of Fisheries and Wildlife, School of Criminal Justice, Michigan State University, 13 Natural Resources Bldg., East Lansing, MI 48824, USA

² Department of Natural Resources, Cornell University, Ithaca, NY 14850, USA

³ Department of Communication, Cornell University, Ithaca, NY 14850, USA

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Correspondence

Meredith L. Gore, Department of Fisheries and Wildlife, Michigan State University, 13 Natural Resources Building, East Lansing, MI 48824, USA. Tel: 517.432.8203; fax: 517.432.1699. E-mail: gorem@msu.edu

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Abstract

Outreach programs are interventions that have the potential to influence the unique context of human–wildlife conflict as well as the political, economic, and social systems within which human–wildlife conflict occurs. However, evaluation of these programs is limited. The purpose of this research was to determine a human–wildlife conflict outreach intervention’s effect on environmentally responsible behavior using the case of human–black bear conflict in New York, The New York NeighBEARhood Watch Program, and the Elaboration Likelihood Model. We found no short-term evidence of environmentally responsible behavior change after the program was implemented. We discuss inhibitors of desired program impact and the utility of our evaluation framework to measure program effect. Given the staying power of outreach interventions and their unknown effects on mitigating human–wildlife conflict, it is imperative that evaluation of programs be a required part of their implementation. Results presented herein can advance discussion about the role of outreach interventions by highlighting assumptions, realistic expectations, and outcome measures.

Introduction

A solid base of knowledge exists about wildlife attitudes (Decker *et al.* 2001), best practices for environmental education and communication (Jacobson 1999; Gardner & Stern 2002), and program evaluation techniques (Leach *et al.* 2002). Even with the large body of empirical literature on how to effect attitude–behavior change, such as Ajzen’s (1985) Theory of Planned Behavior, evaluations linking theory and practice are limited. Evaluating outreach interventions (for example, education and communication-based actions taken to foster conservation) is important for rating them relative to other approaches (Zint *et al.* 2002). Confounding the lack of evaluation is that when outreach does occur, existing measures of effect may not be wholly appropriate for wildlife conservation or may use inconsistent methods; the usefulness of such information is limited. Ferraro &

Pattanayak (2006:482) summarized the current state of affairs in wildlife conservation program evaluation when they asked: “Does the intervention work better than no intervention at all?”

This question is relevant to human–wildlife conflict. It is undisputed that human–wildlife conflict poses conservation challenges; it can threaten populations of species and people that interact with them (Gore *et al.* 2005; Johnson *et al.* 2006; Parker & Osborn 2006). As human and wildlife populations increasingly overlap, so too can risks to and from wildlife (Berchielli *et al.* 2003). There is a pressing need to minimize human–wildlife conflict. Many stakeholders rely on outreach interventions to prevent or reduce human–wildlife conflict (Schusler & Siemer 2004). Interventions can be appealing because they are not constrained by culture or ecosystem; they transcend the context of human–wildlife conflict, as well as the political, economic, and social systems within

which human–wildlife conflict occurs. The lack of rigorous evaluation about these programs' efficacy however, is problematic for achieving conservation goals.

Our research evaluates a wildlife-related outreach intervention to determine the degree to which it may improve environmentally responsible behavior (see Disinger 1983) and reduce conflict. We set the following objectives for this research focusing on the case of human–black bear (*Ursus americanus*) conflict in South-eastern New York, USA: (1) evaluate the efficacy of an outreach intervention program to promote environmentally responsible behavior; and (2) identify factors potentially contributing to or inhibiting desired outcomes.

Conceptual background

Existing measures that evaluate conservation programs narrowly focus on variables that can predict environmentally responsible behavior such as knowledge (that is, understanding), attitudes (that is, position), motivation (that is, reason for acting), and experience (that is, background) (Hungerford & Volk 1990; Kleiman *et al.* 2000; Zint *et al.* 2002). Our literature review failed to uncover evaluation studies in the wildlife conservation arena offering direct measures of effect (that is, attitude or behavior change) from an outreach intervention. We used the Elaboration Likelihood Model (Petty & Cacioppo 1981) for our research because it measures predictors of environmentally responsible attitude, behavior, and direct effects of outreach interventions (Webb & Sheeran 2006). We briefly describe the psychology-based model below and direct the interested conservationist to Manfredi (1992) for more information about this framework in a natural resource context.

Elaboration refers to an individual's reflection process regarding a risk such as human–wildlife conflict. Elaboration likelihood, the extent to which an individual thinks about arguments within a message about the risk, is a continuum that can be summarized by two main paths (Igartua *et al.* 2003). Elaboration likelihood is influenced in large part by knowledge, motivation, and experience. At the low end of the continuum, peripheral processes guide information processing; central processes dominate the high end of the continuum (Larson 2001). In low-elaboration likelihood situations, little deliberative thought regarding a risk message occurs; rather, the characteristics of the argument (for example, packaging, layout) promote information processing. In high-elaboration likelihood scenarios, critical deliberation about arguments in a message occurs; the details, content, and logic of the message foster information processing. Both central and peripheral processing may

occur; however, the predominant route reveals the consequence (for example, attitude and behavior change). The Elaboration Likelihood Model helps us understand “how” and “why” people may be persuaded to take more environmentally responsible behavior to reduce human–wildlife conflict.

Given the risks associated with human–wildlife conflict, outreach interventions can focus risk messages on assessed and perceived risks from conflict. Risk perception is an intuitive judgment made by a citizen as opposed to a technical assessment made by an expert (Slovic 1987). Risk perception is salient to human–wildlife conflict (Gore *et al.* 2006b) and may influence support for wildlife management, behavior toward wildlife, and receptivity to wildlife messages (Knuth *et al.* 1992). Increased risk perception has been linked to increased risk-reducing behavior (Cho 2003). Factors influencing wildlife-related risk perception (see Gore *et al.* 2007) can be used to inform the messages used in an outreach intervention, and risk perception can serve as the attitude of interest for the Elaboration Likelihood Model. We integrated these frameworks to achieve research objectives and interpret results.

Methods and analysis

Study design

We adapted a quasi-experimental nonequivalent control group design with pre- and postprogram samples (Campbell & Stanley 1968; Zint *et al.* 2002) to identify the extent to which a program generated intended outcomes. This study design is applicable when a researcher believes pretest measurements could affect posttest responses, and is strong at reducing threats to causality (Cook and Campbell 1979). Four towns in Southeastern New York were purposefully selected for this research to serve as nonequivalent groups: Warwick, Woodstock, Deerpark, and Saugerties. Woodstock and Warwick were selected as treatment towns to provide data on effect. Saugerties and Deerpark were selected as reference towns to provide counterfactual evidence. Each town had similar frequencies and types of human–wildlife conflict (for example, human–black bear conflict) yet varied in demographics (Table 1). The methods for this research were approved for the duration of the project by the Cornell University Committee on Human Subjects, protocol ID # 04-06-008.

Outreach intervention

The New York NeighBEARhood Watch Program (NYNWP) was implemented in treatment towns

Table 1 Key characteristics of nonequivalent Southeastern New York treatment (Woodstock and Warwick) and reference (Saugerties and Deerpark) towns

Town	Human population (2000)	Population density (people/km ²)	Area (km ²)	Black bears harvested in 2003	Percent respondents reporting bear damage in 2004 ^a	Percent respondents reporting bear damage in 2005 ^a
Woodstock	6,241	241	174	10	38 (<i>n</i> = 104)	27 (<i>n</i> = 65)
Warwick	30,764	264	785	21	18 (<i>n</i> = 45)	13 (<i>n</i> = 28)
Deerpark	7,858	306	171	15	18 (<i>n</i> = 42)	14 (<i>n</i> = 33)
Saugerties	19,868	798	168	9	17 (<i>n</i> = 59)	15 (<i>n</i> = 36)

^aRespondents self-reported property damage (for example, birdfeeder, garbage can); reports may or may not have been verified by state wildlife biologists.

May–October 2005 in Southeastern New York. Similar to other human–wildlife conflict outreach interventions (Gore *et al.* 2006a), the NYNWP was designed to promote environmentally responsible behavior and result in: (1) reduced number of complaints filed to authorities; (2) reduced magnitude and frequency of negative human–black bear interactions; and (3) helping communities cope with living with black bears. The genesis for the program arose in large part from: (1) increasing complaints to biologists; (2) increasing human and bear population density and overlap; (3) stakeholder input group requests; and (4) New York's first bear-related human fatality in August 2002. The program involved a set of 8 materials whose content focused on residential behaviors that could be changed to reduce the risks of human–black bear conflict; materials were categorized by the authors as being either central or peripheral based on the Elaboration Likelihood Model (Appendix 1). Additional details about program materials, distribution protocol, and recommendations for future materials and interventions can be found in Gore and Knuth (2006). Six risk-reducing environmentally responsible behaviors were emphasized in the NYNWP: (1) refraining from hanging *birdfeeders* during warm-weather months; (2) feeding *pets* indoors; (3) storing *BBQ grills* indoors when not in use; (4) putting out *garbage* the morning of pick-up; (5) not keeping a *compost* pile; and (6) picking up fruit dropped from *fruit trees* and harvesting fruit from trees when ripe. Beyond simply providing information, NYNWP materials aimed to promote behavior change by targeting perceptions of risk, previously quantified with exploratory research (for example, Gore *et al.* 2006b).

Mail survey

We implemented similar preprogram (2004) (*N* = 2,800) and postprogram (2005) (*N* = 2,800) questionnaires using Salant and Dillman's (1994) standard 4-wave survey protocol. Previous survey work about black bears

in Southeastern New York (for example, Siemer and Decker 2003) suggested a low (< 60%) response rate for the mail survey; we anticipated a 40% response rate in each community and increased our sample size to ensure adequate statistical power, established using an on-line sample size calculator. We pooled respondents from both treatment and reference communities into a single treatment and reference group to further increase statistical power and chose not to weight variables because it would have artificially decreased the importance of a particular subgroup of respondents that responded at a higher rate (Babbie 2004). Demographic questions queried age, gender, years living in county of residence, and highest completed level of education. Questionnaire items focused on pre- and postprogram risk perceptions and bear-related environmentally responsible behaviors. We queried three antecedents to bear-related risk perception: cognitive knowledge about black bears; willingness to change behavior; and experience with residential human–black bear conflict. We posed a minimum of 3 5-point Likert-type survey questions for each antecedent, determined Chronbach's α (Hair *et al.* 1998) to test internal reliability (that is, measure consistency in coding), and summed responses to create an index. Because our model included direct measures of effect, we also created indexes for risk perception and behavior change. Respondents were categorized as being central or peripheral processors, based on methods detailed in Gore and Knuth (2006). Chi-square tests were used to determine goodness-of-fit and a general linear model multivariate procedure produced an analysis of variance used to determine effect.

Results

The total preprogram survey response rate was 46.6% (*n* = 1,211) (Woodstock = 61.5%, Warwick = 41.7%, Saugerties = 53.6%, Deerpark = 42.3%); the total postprogram survey response rate was 41.1% (*n* = 950)

Table 2 Demographic characteristics of pre- (2004) ($N = 1,211$) and post- (2005) ($N = 950$) program survey respondents in Southeastern New York treatment (Warwick and Woodstock) and reference (Saugerties and Deerpark) towns

Variable	Town	Preprogram (2004) respondents	Postprogram (2005) respondents	χ^2
Age (years)	Treatment	58 (SD = 13.3)	58 (SD = 12.8)	74.391 ^a
	Reference	56 (SD = 14.0)	56 (SD = 13.2)	
Gender (female)	Treatment	48%	55%	5.037 ^b
	Reference	37%	41%	
Time living in County (years)	Treatment	28 (SD = 19.2)	29 (SD = 18.8)	8.356 ^c
	Reference	23 (SD = 17.0)	22 (SD = 17.1)	

^a $P = 0.250$; ^b $P = 0.025$; ^c $P = 0.039$.

(Woodstock = 50.5%, Warwick = 39.1%, Saugerties = 37.7%, Deerpark = 39.3%). The average age of treatment respondents ($\bar{x} = 58$ years) and reference respondents ($\bar{x} = 56$ years) did not differ between study years, or significantly between groups. Although females comprised larger percentages of respondents than males in treatment towns during both years, the proportion of female respondents from treatment towns increased from 2004 to 2005. On average, treatment respondents had resided in their county for a longer period of time ($\bar{x} = 29$ years) than did reference respondents ($\bar{x} = 22$ years) (Table 2). All survey respondents were slightly older than and more educated than the general population (www.census.gov accessed August 2006). The majority (57%) of all post-program respondents recalled ≤ 1 NYNWP material ($\mu = 1.61$, $SD = 1.77$); 74% recalled ≤ 2 materials, and 85% recalled ≤ 3 materials.

In 2004, reference and treatment respondents did not differ in their knowledge of how to keep black bears away from their home (4.2% change, $\chi^2 = 11.302$, $P = 0.256$); 1 year later, neither group demonstrated a change in this knowledge (6.0% change, $\chi^2 = 12.955$, $P = 0.165$). Neither treatment (4.2% change, $\chi^2 = 2.668$, $P = 0.263$) nor reference (2.3% change, $\chi^2 = 1.216$, $P = 0.544$) respondents indicated a change in their willingness to adopt environmentally responsible behaviors after the NYNWP. The proportion of respondents reporting experiences with black bears at or near homes or property (for example, birdfeeder damage) decreased for both treatment (41.2% change, $\chi^2 = 43.434$, $P < 0.01$) and reference (44.2% change, $\chi^2 = 10.285$, $P = 0.036$) respondents in 2005; there was no difference in experience between groups (4.0% change, $\chi^2 = 6.437$, $P = 0.169$).

Risk perception increased after the NYNWP. Respondents in both groups were less likely to strongly agree that the risks associated with black bears were acceptably low after the NYNWP; the increase in risk percep-

tion was greater among treatment respondents than reference respondents (Table 3). A variety of bear-related experiences were influential on risk perception (Table 4). Of the six bear-related environmentally responsible behaviors targeted by the NYNWP, only composting decreased between years ($\chi^2 = 86.613$, $P < 0.01$); however, the percent change was greater among reference respondents (5.3%) than treatment respondents (0.8%). Some individuals did change behavior. Overall, the most-to-least adopted environmentally responsible behaviors were a decrease in composting, storing BBQ grills indoors when not in use, hanging birdfeeders only during cold-weather months, securely storing garbage and keeping it indoors, harvesting ripe fruit from trees, and not feeding pets outdoors (Table 5). Among the respondents who identified changing their bear-related behavior in 2005, the most commonly reported reason all respondents gave for changing five of the six behaviors was problems experienced with bears. Only 3% of all respondents who reported changing their garbage-storage behavior stated they did so due to the outreach intervention (Table 6). Residential (vs. agricultural) complaints filed to the state wildlife agency decreased in 2005 from 2004; however, both years were below the 10-year average of complaints for the region (M. Merchant, New York State Department of Environmental Conservation, personal communication, 2004). Years lived ($F = 5.744$, $P = 0.017$, partial eta-squared = 0.017) in the county of residence positively influenced treatment respondents' environmentally responsible behavior change.

Discussion

We found no short-term evidence of environmentally responsible behavior change after the NYNWP was implemented; however, we successfully applied an evaluation framework that examined direct program effects. To

Table 3 Southeastern New York treatment (Warwick and Woodstock) and reference town (Saugerties and Deerpark) respondents' changes in risk perception associated with human–black bear conflict

Question	Town	Year	% SA	% A	% Neither A nor D	% D	% SD	χ^2	
The risk I will experience property damage from a black bear is acceptably low.	T	2004	58.0	21.4	7.2	8.8	4.5	46.76 ^a	
		2005	37.7	37.2	11.0	10.3	3.9		
		Change	−20.3	15.8	3.8	1.5	−0.6		
	R	2004	60.2	24.0	6.8	5.2	3.8		23.21 ^b
		2005	45.7	33.3	9.6	7.1	4.4		
		Change	−14.5	9.3	2.8	1.9	0.6		
The risk I will have pets/livestock threatened by a Black bear is acceptably low.	T	2004	59.9	19.9	11	5.7	3.5	62.94 ^c	
		2005	35.2	35.9	13.3	10.5	5		
		Change	−24.7	16	2.3	4.8	1.5		
	R	2004	64.8	18.3	7.6	5.9	3.3		39.75 ^d
		2005	46.9	30.6	9.6	6.5	6.5		
		Change	−17.9	12.3	2	0.6	3.2		
The risk I or a family member will be threatened by a Black bear is acceptably low.	T	2004	57.8	20.9	9.7	7.5	4.1	61.57 ^c	
		2005	34.3	39.8	10.2	10.2	5.5		
		Change	−23.5	18.9	0.5	2.7	1.4		
	R	2004	61.1	20.3	8.4	7	2.7		31.15 ^f
		2005	45.3	30.8	11	8.1	4.8		
		Change	−15.8	10.5	2.6	1.1	2.1		

^{a–f} $P < 0.05$; T = treatment towns; R = reference towns; SA = strongly agree; SD = strongly disagree.

evaluate the degree to which the NYNWP promoted environmentally responsible behavior, we measured change in the antecedents to attitude change, attitude change, and behavior change in treatment and reference towns.

Given increased risk perception has been linked to increased compliance with risk behavior (Cho 2003), one might expect that the increase in risk perception detected in treatment towns would manifest in detectable behavior change. Indeed, this attitude–behavior relationship effect seems to be a consummate assumption with many human–wildlife conflict outreach interventions and speaks to the systemic need to include measures of direct effect in program evaluation. We learned that most respondents in both groups were peripheral processors and ranked peripheral materials as being more effective at helping them cope with living with black bears. Given that peripheral information processing dominated, our results indicating limited behavior change are not surprising; attitude and behavior change initiated

via the peripheral route is typically ephemeral or weak (Petty *et al.* 1997). Future research is needed on long-term effects.

The question central to human–wildlife conflict management is what changed attitude but not behavior? Social and environmental variability external to the evaluation are obvious considerations. A review of secondary data revealed a good mast crop in 2005. This may have contributed to the observed outcomes; in years of bountiful natural food, black bears are less likely to use human-coincident food stores (Beckmann & Berger 2003). Also, media coverage of the NYNWP occurred throughout the program's implementation. A content analysis is underway on NYNWP media coverage to understand the nature and valence (if any) of a media effect on risk perception. Accounting for external influences such as these in summative evaluation is important because they may ultimately affect the magnitude and frequency of human–wildlife conflict (Gore *et al.* 2006a), and thus conclusions

Table 4 Types of black bear-related experiences influencing risk perception among both reference and treatment respondents in 2005

Type of black bear-related experience	Type III sum of squares	R ²	df	F	P-value
Self or family personally threatened	1.348	0.044	12	3.361	<0.01
Had belongings damaged	14.095	0.111	12	9.197	<0.01
Have known a person with belongings damaged	8.17	0.044	12	3.377	<0.01
Pets attacked or threatened	2.975	0.074	12	5.908	<0.01

Table 5 Percentage and counts of preprogram (2004) and postprogram (2005) survey respondents who had the opportunity to but did not engage in desirable bear-related human behaviors targeted by the New York NeighBEARhood Watch Program (for example, residents who had pets, BBQ grills, compost piles)

Undesirable behavior	Town	2004 (N = 1211)	2005 (N = 950)
Keeping garbage unsecured	Treatment	43.3% (n = 520)	42.0% (n = 399)
	Reference	54.0% (n = 653)	48.8% (n = 463)
Feeding pets outdoors	Treatment	3.6% (n = 43)	4.0% (n = 38)
	Reference	8.8% (n = 106)	8.0% (n = 76)
Storing BBQ outdoors when not in Use	Treatment	68.5% (n = 823)	70.8% (n = 672)
	Reference	72.5% (n = 871)	73.8% (n = 701)
Keeping a compost pile	Treatment	17.7% (n = 214)	16.9% ^a (n = 161)
	Reference	82.5% (n = 999)	77.2% ^b (n = 733)
Hanging birdfeeders in warm weather	Treatment	56.5% (n = 684)	56.5% (n = 536)
	Reference	42.4% (n = 513)	42.9% (n = 407)
Not harvesting fruit from trees	Treatment	40.3% (n = 488)	40.2% (n = 381)
	Reference	41.0% (n = 496)	40.7% (n = 386)

^{a,b} $P < 0.05$.

about program impacts. Having a reference group can help reduce false assumptions; had there been a change in environmentally responsible behavior that warranted statistical analysis of the attitude–behavior change re-

lationship, including confounding variables in analysis would be paramount.

It is possible that desired outcomes were inhibited by a lack of change in antecedents to elaboration likelihood (for example, knowledge, willingness to change, and experience). Another possibility is that the lack of antecedent change was based on a lack of program salience or inaccurate measurement of risk perception related to the specific environmentally responsible behavior change targeted by the NYNWP. We are skeptical of this because the content and format of the NYNWP was based on pre-program survey data, exploratory bear-related risk perception research, and extensive review. Public interest in bear-related outreach was quantified as being generally high in Siemer & Decker (2003) black bear public opinions survey in 2002.

This study reveals methodological and theoretical insights for human–wildlife conflict management and evaluation. First, the environmentally responsible behavior literature (Hungerford & Volk 1990; Zint *et al.* 2002) denotes characteristics (that is, knowledge, motivation, experience) that serve as proxies for improved environmentally responsible behavior. This proxy approach appears relevant yet inadequate for comprehensive human–wildlife conflict-related evaluation. Indeed, even though many respondents reported having experiences with bears, and reported experience with bears as being the primary reason for changing their bear-related behavior, we found no statistical relationship between experience and behavior change in treatment communities. Additional predictive measures are likely needed to reliably inform the attitude–behavior relationship. Future evaluations may replicate the study design found herein, but should explore additional, alternative antecedents to attitude change.

Second, using an isomorphic framework such as the Elaboration Likelihood Model provides for

Table 6 Post-program (2005) respondents' behavior change and rationale for change

Desirable behavior	Percent of respondents reporting change in behavior after intervention	Percent of respondents who reported behavior change due to outreach intervention	Percent of respondents who reported behavior change due to other reason	Most commonly reported reason for behavior change
Garbage indoors	13	3	47	Experienced problems with bears
Feed pets indoors	8	0	42	Experienced problems with animals
Store BBQ grill indoors	3	0	50	Experienced problems with bears and other animals
Not hang birdfeeder	3	0	36	Experienced problems with bears
Not compost	8	0	54	Experienced problems with bears
Harvest trees before fruit falls	1	0	25	Tree just developing

comprehensive evaluation because it measures behavior and attitude change to produce a direct estimate of program effect. Even though the antecedents to risk perception did not change in valence, risk perception did change as a result of the NYNWP. It is possible that without a measure of behavior, if instead we only looked at proxies for (or actual) attitude change, we might have concluded the NYNWP was effective at improving environmentally responsible behavior (for example, Type I error). Given the global ubiquity of human–wildlife conflict and the potential devastating and irreversible impacts from not mitigating human–wildlife conflict, “false positives” in evaluation should be avoided. The evaluation framework presented herein offers one method for doing so.

Outreach interventions are highly appropriate for the diversity of challenges associated with human–wildlife conflict; we do not suggest conservationists abandon their use. Value-added benefits from interventions, such as capacity building, partnership formation, and livelihood preservation are relevant to conservation. We believe wildlife-related outreach interventions are likely to retain their role as key conservation investments for reducing human–wildlife conflict in the future. For example, findings presented herein were immediately used by New York State Department of Environmental Conservation (NYSDEC) black bear managers to adapt statewide black bear outreach efforts and have informed ongoing, strategic black bear management planning at both a state and regional level. Researchers collaborating with biologists on a systems dynamics model of black bear management used findings to calibrate the model now used for black bear “issue education” (Siemer *et al.* 2007). Residents of one treatment town consulted with the lead author to determine the transferability of process and findings to reduce risks from human–coyote conflict. However, given the persistence of wildlife-related outreach interventions and their unknown effects in mitigating human–wildlife conflict, evaluation of such programs should be a required part of their implementation.

The results presented herein can advance discussion about outreach interventions, and their evaluation, by highlighting important assumptions about realistic expectations for outcomes and their measures. We cannot assume that using proxies for attitude or behavior change will be accurate in determining effect, or that external social or environmental forces will not act in a way that could influence program effect. While proxies for environmentally responsible behavior have value in certain circumstances, they may not always be sufficient or wholly accurate in human–wildlife conflict scenarios. The literature is devoid of evidence supporting resolution of human–wildlife conflict vis-à-vis a single inter-

vention. Multipronged approaches to reducing risks from human–wildlife conflict should be explored and systematically evaluated.

We recommend conservationists clearly articulate their outreach intervention goals, and tie these goals to a realistic timeframe over which outcomes can be achieved. Researchers evaluating outreach programs should explore additional, alternative measures of direct program effects and theoretical models that accommodate these measures; methods used in this research may serve as a baseline upon which to build additional benchmarks. Future research should focus on improving our understanding of the relationship between knowledge, attitudes, and behaviors possible to achieve through outreach intervention programs.

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Supplementary material

The following supplementary material is available for this article:

Appendix 1: New York NeighBEARhood Watch Program materials.

This material is available as part of the online article from: <http://www.blackwell-synergy.com/doi/full/10.1111/j.1755-263X.2008.00017.x> (This link will take you to the article abstract).

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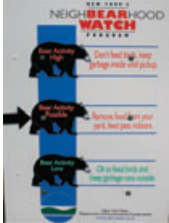

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Appendix 1. New York NeighBEARhood Watch Program materials.

Outreach material and quantity	Format and primary message/content details	Peripheral or central material and justification
Billboard (n = 2) 	Standard-size, located along main roads, color; garbage, and birdfeeder	Peripheral: negative affect, singular argument, attractive
Magnet (n = 4805) 	Approximately 7.5 cm by 13 cm, bear-shaped, 3 colors; birdfeeder and garbage	Peripheral: positive affect, expert source, attractive
Fact sheet (n = 247) 	Four pages, black and white, available online in PDF and in hard copy; general biology, relevant laws, avoiding residential problems	Central: neutral affect, diverse sources, multiple arguments, detailed
Bear-o-meter (n = 6) 	Two meter-high, weatherproof, adjustable arrow; pet feeding, birdfeeders, garbage	Peripheral: expert source, attractive, repetitive
Magazine article reprint (n = 714) 	Four page, multicolored reprint from “Conservationist magazine;” general biology, management history, living with bears	Central: neutral affect, diverse sources, multiple arguments, detailed

Continued

Appendix 1. Continued.

Outreach material and quantity	Format and primary message/content details	Peripheral or central material and justification
Lawn sign (<i>n</i> = 321) 	Three color, weatherproof, one-sided; do not feed bears	Peripheral: positive affect, expert source, attractive
Brochure (<i>n</i> = 5006) 	Tri-fold, multicolored; living with bears in residential areas	Central: detailed, multiple arguments
Poster (<i>n</i> = 76) 	Letter-sized, multicolored; you live in bear country; birdfeeders, garbage, pet food	Central: detailed, multiple arguments, neutral affect