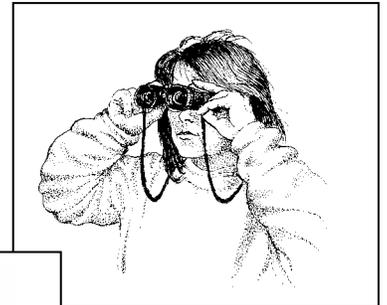
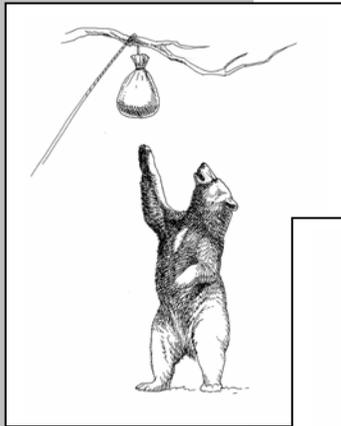


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# An Assessment of Black Bear Impacts in New York



**June 2006**

**HDRU Series No. 06-6**

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## HUMAN DIMENSIONS RESEARCH UNIT PUBLICATIONS SERIES

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**Key Words:** adaptive impact management, black bear, deliberation, impacts, stakeholder engagement, stakeholder input group

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## EXECUTIVE SUMMARY

A team of DEC staff developed a new framework for black bear management planning in New York State in 2002. The framework establishes a cyclical process for adapting New York's management program to changing social and environmental conditions. The framework focuses on stakeholder-defined impacts as the basis for setting fundamental objectives of management. Situation analysis that includes efforts to better understand and articulate impacts is an important component of the new approach. During the first round of planning for the new framework, wildlife managers were using three guiding questions to inform their situation analysis.

1. What effects are regarded as impacts of concern by black bear management stakeholders?
2. Is the black bear management program focused on the impacts that matter most to stakeholders?
3. Is the management program designed to emphasize management activities that will have the greatest influence on increasing positive impacts or decreasing negative impacts?

Human dimensions Research Unit (HDRU) staff worked closely with a team of wildlife managers within DEC to address question one (i.e., to assess what effects are regarded by stakeholders as impacts).

We begin this report by describing of the concept of impact management. In the main body of the report, we describe impacts, fundamental objectives, and ends-means connections developed by a team of researchers and wildlife managers using a sequence of linked stakeholder engagement mechanisms. Finally, we use results from the engagement process, including results from an evaluation of stakeholder input group (SIG) processes, to question a set of assumptions about outcomes that are produced through (1) stakeholder engagement, (2) deliberation, and (3) focus on impacts.

The intended audience for this report is wildlife managers and management stakeholders who engage in future rounds of bear management planning. We hope that this record will be a touchstone for additional refinement of impacts categories in coming years. Wildlife managers and management stakeholders outside New York also may find value in this report, as an illustration of how the impact concept and impact management can be put into practice, not just for black bear management, but for management of wildlife generally.

## **Methods**

HDRU staff involvement in situation analysis was formalized as a series of DEC-sponsored stakeholder engagement activities between 2001 and 2003. Impacts were identified and characterized through a multi-step stakeholder engagement process that involved:

- Review of stakeholder input obtained from 1992-1994 on proposed regulatory changes for bear hunting and dog training in New York, to identify potential categories of effects that stakeholders define as impacts.
- Nominal group sessions held in 3 regions to generate lists of effects that stakeholders defined as impacts.
- A mail survey implemented to collect representative information on impacts by region of the state.
- Repeated implementation of a stakeholder input group (SIG) process, to provide insights about impacts at a regional level and to initiate deliberation about ends-means connections for impact management.

## **Findings**

Deliberations within the Bear Management Plan Team identified a range of specific effects that the management plan team agreed to place into six broad impact categories: ecological, economic, health/safety, psychological, social, and management. Stakeholder informants who participated in nominal group meetings also identified a range of impacts. The Plan Team came to the conclusion that the broad categories of impacts identified by stakeholder representatives were similar to the categories wildlife managers and stakeholder nominal groups had identified previously.

Based on a review of all available information, DEC staff determined that 12 specific effects were impacts. The Management Plan Team determined that one ecological effect, one social effect, two management effects, three economic effects, and four psychological effects would be defined as impacts. In the body of this report, each of the 12 impacts is described, evidence supporting staff judgments to identify each effect as an impact is presented, and the stakeholder groups most interested in each specific impact are indicated.

## **Discussion**

The multi-step, recursive process of stakeholder engagement reported here led to a number of positive outcomes for the management agency and wildlife

management stakeholders. It stimulated articulation of impacts, fundamental objectives, and assumed means-ends connections for black bear management in New York State. Having that information in written form makes it easier for managers to communicate the essence of their bear management program to stakeholders and agency administrators. The information has already been used to support agency decisions that led to a package of proposed bear hunting regulation changes.

Members of the Plan Team concluded that the SIG process holds promise as a means to improve their understanding of local stakeholder interests and concerns. Outcome evaluation of the first three implementations suggests that the SIG process also holds promise as a means to understand the connections stakeholders' make between management actions and the end states they desire. The process was refined and additional implementations occurred in 2005 and 2006. Regional DEC staff plan to continue using the SIG process in other regions to further assess management needs around the state.

The set of impacts described here may be expanded or revised as a result of future input processes. Each time the SIG process is implemented, new process participants can benefit from the information about impacts created by their predecessors. Using SIGs should help wildlife managers identify impact management priorities for specific regions, communicate with new stakeholder groups about means-ends relationships, and provide responsive and adaptive management.

Several researchers have reported that well-designed processes for citizen participation in natural resource management (including black bear management) can contribute to better decisions by increasing stakeholder knowledge and by improving stakeholder attitudes toward other people and management agencies. Results of the stakeholder engagement process reported here are generally consistent with those findings. The overall engagement process required wildlife managers and SIG participants to make more thoughtful means-ends connections than they might have if no engagement process had been used. That contributed to learning outcomes that may translate into better, more durable bear management decisions in the future.

Some SIG participants had difficulty comprehending the impact concept as presented in 2003 processes. That likely impeded information processing by those participants. Comprehension problems also could have stifled creativity in the impact identification process. Revisions to the SIG process were incorporated in 2004 in an effort to reduce jargon when describing the impacts concept.

SIGs did not lead managers to consider a broader array of action alternatives. However, SIGs did stimulate stakeholders to think more rigorously about familiar action alternatives. The overall engagement process also prompted wildlife managers to think more rigorously about means-ends connections that have been assumed for many years without much critical reflection. It is important for managers and

stakeholders to articulate linkages between fundamental objectives (ends) for management and the enabling objectives (means) for addressing those fundamental objectives. Creating a complete articulation of means-ends relationships can help decision makers create an effective decision-making frame. Figures 1-8 are offered as a starting point for discussion. DEC staff expect these figures to be revised in many ways as new input is incorporated over time.

Steps in the process of defining impacts unfolded over a long time frame. It is important to note that bear management activity was ongoing even as managers were engaged in a process of defining impacts. The management agency was making decisions and taking actions all the while. Taking the time to carefully define or refine understanding of impacts wasn't an impediment to program delivery, nor was the process used as an excuse to delay management decisions. The time commitment for bear management situation analysis is likely to move more quickly in future planning cycles.

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## INTRODUCTION

A team of DEC staff developed a new framework for black bear management planning in New York State in 2002 (DEC 2003b). The framework establishes a cyclical process for adapting New York's management program to changing social and environmental conditions. Stakeholder engagement, impacts, deliberation, and adaptive impact management (Riley et al. 2002, 2003) are featured elements of the planning framework. Given those characteristics, implementation of the framework provides opportunities to evaluate several assumptions about stakeholder engagement, deliberation and impacts as a focus of wildlife management.

The new planning framework is implemented through a cycle of activities that begins with situation analysis (i.e., an assessment of the environmental and social conditions that set the context for bear management). Human dimensions researchers worked closely with a team of bear managers to conduct the first situation analysis, which incorporated stakeholder input for decision making. Part of that situation analysis is documented here.

We begin this report by describing the concept of impact management. In the main body of the report, we describe impacts, fundamental objectives, and ends-means connections developed by a team of researchers and wildlife managers using a sequence of linked stakeholder engagement mechanisms. Finally, we use results from the engagement process, including results from an evaluation of stakeholder input group (SIG) processes, to question a set of assumptions about outcomes that are produced through stakeholder engagement and focus on impacts.

The primary audience for this report is wildlife managers and management stakeholders who engage in future rounds of bear management planning. We offer this report as a reference

or baseline document. We hope that this record will be a touchstone for additional refinement of impacts categories in coming years. Wildlife managers and management stakeholders in other states are our intended secondary audience. We hope that this work illustrates how the impact concept and impact management can be put into practice, not just for black bear management, but for management of wildlife generally.

### **An Overview of Impact Management**

Comprehensive wildlife management programs employ a suite of management interventions and policies as means to achieve an array of management objectives (Crowe 1983). This creates a need to think carefully about how any given management action will contribute to achievement of management goals. DEC's black bear management planning framework (DEC 2003a) includes processes that encourage managers and stakeholders to use deliberative techniques to link management actions to fundamental objectives for the benefit of the people of New York State. To understand this approach, it is necessary to review how wildlife management and impacts are defined in the planning framework.

*Wildlife management defined.* Wildlife management is conducted to achieve a range of outcomes that yield benefits for people – outcomes such as the continued existence of wildlife, opportunities to utilize wildlife in sustainable ways, or relief from problems related to wildlife. Wildlife management is essentially about making decisions and taking actions to achieve specific, benefit-yielding goals. DEC's bear management planning framework (DEC 2003a) adopts a definition of wildlife management offered by Riley et al. (2002):

*Wildlife management is the guidance of decision-making processes and the implementation of practices to purposefully influence interactions among and between people, wildlife, and habitats to achieve impacts valued by stakeholders.*

*Impacts defined.* DEC's planning framework also adopts the definition of wildlife-related effects and impacts presented by Riley et al. (2002). Wildlife-related effects are defined as positive and negative outcomes of interactions among wildlife, people, and wildlife habitat. The term "impacts" refers to a special subset of the many effects resulting from interactions among people, wildlife, and wildlife habitat.

Countless effects are produced through interactions between people, wildlife, and wildlife habitat. Many go unnoticed by stakeholders. But a subset of effects are recognized by stakeholders and regarded as being important. Effects in this important subset are "impacts." The term impacts is appropriate because these are effects that impact achievement of one's fundamental objectives.

A single interaction between wildlife and people may generate both positive and negative impacts, because different stakeholders can have very different evaluations of the same interaction. Even the same individual may perceive an interaction as creating both positive and negative impacts. Whether that stakeholder evaluates the overall interaction positively or negatively depends on how he or she personally weighs the importance of each positive and negative impact.

The DEC planning framework for black bear management asserts that helping the public understand effects, even those not apparent to a casual observer, is an important role of managers and educators. In fact, the less obvious effects (perhaps revealed only through research) will not register with stakeholders as impacts unless they are recognized and understood. Nevertheless, while scientists, managers or educators may explain effects, it is ultimately stakeholders who interpret the relative importance of effects based on their values.

It is a collective effort for various stakeholders to determine which effects constitute impacts that deserve management attention. Tradeoffs are typically involved because of practical limits of management scope. Riley et al. (2003) argue that wildlife managers and stakeholders can identify a reasonable number of effects that constitute impacts to be managed in any given geographic region.

In summary, the bear management planning framework focuses on stakeholder-defined impacts as the basis for setting fundamental objectives of management (DEC 2003a). Situation analysis that includes efforts to better understand and articulate impacts is an important component of the new approach. During the first round of planning for the new framework, wildlife managers were using three guiding questions to inform their situation analysis.

- What effects are regarded as impacts of concern by black bear management stakeholders?
- Is the black bear management program focused on the impacts that matter most to stakeholders?
- Is the management program designed to emphasize management activities that will have the greatest influence on increasing positive impacts or decreasing negative impacts?

### **METHODS USED TO IDENTIFY IMPACTS**

Human Dimensions Research Unit (HDRU) staff provided a range of professional support for implementation of DEC's new planning framework for bear management (DEC 2003a). HDRU involvement was formalized as a series of DEC-sponsored stakeholder engagement activities between 2001 and 2003. Impacts were identified and characterized

through a multi-step stakeholder engagement process, as summarized in Table 1 and described in the following text subsections.

Most of the steps in Table 1 represent consultative forms of public engagement, where stakeholders convey information to policy makers through processes initiated by the policy-making agency (Rowe and Frewer 2005). The final step (i.e., stakeholder input group [SIG]

**Table 1.** Public engagement steps used to identify and characterize black-bear related impacts in New York State, 2001-2003.

<u>Management and researcher teams</u>	<u>Stakeholder representatives</u>
	Input for bear hunting and dog training regulation changes (1992-1994)
Facilitated process to synthesize experience as preliminary impacts statements (2001)	
	Nominal group sessions held in 3 regions to generate lists of effects that might be impacts (2001)
Facilitated process used to synthesize input from nominal group sessions as guidance for preparation of a mail survey instrument (2002)	
	Mail survey implemented to collect representative input on impacts by region (2002)
Facilitated process used to synthesize new input on impacts (2003)	
	Stakeholder input groups (SIGS) convened to provide detailed insights at a local level, and begin discussing ends-means connections (2003)

processes) represents a participatory form of engagement, with two-way information exchange between stakeholders and a policy-making agency (Rowe and Frewer 2005). In participatory forms of engagement, structural elements such as dialogue and negotiation create opportunities for opinion change in stakeholders or members of the policy-making agency (Rowe and Frewer 2005:256). Because the SIG processes were designed to encourage deliberation and focus on impacts, they provided an opportunity to question manager's assumptions related to deliberation and focus on impacts.

The overall effectiveness of a public engagement mechanism depends in part on how well the mechanism elicits information from all members of a target audience (Rowe and Frewer 2005). By this standard, the last step in Table 1 (i.e., SIG processes) can be considered a useful, but at best partial mechanism for engaging stakeholders in black bear management. Other mechanisms are needed to reach out to and receive information from all bear management stakeholders. DEC's approach to engagement reflects an understanding of these needs. SIG processes were employed as part of a comprehensive engagement approach, not as a replacement for engagement mechanisms like public information campaigns, stakeholder surveys, or established regulatory review processes.

The first column of Table 1 identifies a series of facilitated processes, during which members of the Bear Management Plan Team worked with HDRU staff to synthesize information from stakeholders. Rowe and Frewer (2005:269) point out that presence/absence and quality of facilitation is an important structural aspect of public engagement mechanisms.

“Active facilitation has been shown to increase relevant information elicited when compared to some identical processes without facilitation (e.g., Offner et al. 1996, Anson et al. 1995). One way in which it appears to work is to counter a common trend in groups that results in the adoption of a ‘satisficing’ strategy in which a group settles

for the first decision that proves satisfactory (e.g., with which no one greatly objects) rather than adopting an ‘optimizing’ strategy in which the group goes on to consider better alternatives (Rowe 1992).”

In this case, facilitation was an important structural component of the public input process.

Facilitation was used to improve information elicitation from both stakeholders and managers.

Both groups are susceptible to decision traps (like satisficing) that lead to premature closure of the problem-definition aspect of decision making.

### **Synthesis of Previous Input and Nominal Group Meetings**

With HDRU assistance, members of the Bear Management Plan Team (referred to hereafter as the Plan Team) used a sequence of stakeholder engagement mechanisms to identify impacts and fundamental objectives for management. First, the Plan Team generated a preliminary set of impacts, based in part on insights from a series of public meetings conducted between 1992 and 1994 (to solicit input on proposed bear hunting and dog training regulation changes). As a next step, the Plan Team worked with human dimensions (HD) specialists, who designed and implemented a series of regional nominal group meetings to obtain input on the range of impacts recognized by stakeholders in 2001 (Table 2).

### **Stakeholder Mail Survey**

Findings from the 2001 small group meetings informed design of a self-administered mail-back questionnaire. The questionnaire was used as the data collection instrument for a statewide survey implemented in spring, 2002. The stakeholder survey allowed researchers to quantify the nature and extent of impacts experienced by people based on their region (e.g., Catskills vs. Adirondacks), stakeholder group (e.g., hunters vs. nonhunters) or value orientation (Fulton et al. 1996).

**Table 2.** Specific impacts identified by DEC staff and by stakeholders in three regional meetings (1 = Catskill meeting; 2 = Allegany meeting; Adirondack meeting).

Impact Category	DEC staff	Regional meetings		
		1	2	3
<b>Health and Safety Impacts</b>				
Health benefits from bear-related recreation (e.g., stress reduction)	X <sup>1</sup>			
Health benefits from consuming bear by-products	X			
Obtaining food by bear hunting		X		
Injury associated with a bear-related vehicular accident	X			X
Injury from a bear attack	X			
Injury to pets from a bear attack (*not human health)	X			
Contracting disease or parasites transmitted by bear	X			
<b>Positive psychological impacts</b>				
Psychological benefits of leisure associated with photography (e.g., impressing friends, proving they were close to a bear)		X		X
Personal satisfactions, benefits of leisure associated with hunting (e.g., excitement, killing a bear, “becoming one with nature”).		X		X
Benefit of knowing that bear exist in one’s local area (just knowing that one lives in a place where bear exist	X			
Enjoyment (e.g., excitement, fascination, novelty, warm fuzzy feelings, connection to nature, “experiencing the bear mystique,” perception of having witnessed an extraordinary thing) (can be associated with seeing a bear near home or in some other context, at a safe distance)		X		
<b>Negative psychological impacts</b>				
Fear/dread of a bear attack (fear of personal injury)	X	X	X	X
Fear/dread of a bear attack (fear of confrontation)	X	X	X	X
Fear/dread of a bear-vehicle collision	X	X		
Nuisance, aggravation associated with bear problems (residential)		X	X	
Nuisance, aggravation associated with bear problems (agricultural)		X	X	
Fear/dread of property damage associated with bears	X			
Fear/dread of disease transmission to people (e.g., rabies, Lyme disease).		X		
Fear/dread of disease transmission to pets (e.g., rabies, Lyme disease).		X		

<sup>1</sup> An “X” denotes that a given group identified the effect as important and worthy of management attention.

**Table 2.** Continued.

Impact Category	DEC staff	Regional meetings		
		1	2	3
<b>Negative psychological impacts</b>				
Concern that DEC may spread disease by trapping bears and moving them to other regions of the state.		X		
Fear/dread of a bear attack on pets	X			
Feeling of powerlessness to prevent recurrence of bear problems			X	
Trauma associated with actual or potential loss of a business		X		
<b>Economic impacts</b>				
Tourist expenditures benefit local businesses		X	X	X
Positive economic effects of bear-related recreation	X			
Positive economic effects created as people replace property damaged by bears (e.g., bird feeders, trash containers).		X		
Economic effects of trade in bear by-products	X			
People want to benefit by selling bear parts		X		
People want to benefit by selling bear photos		X		
Tax revenues benefit county and town where people buy land for hunting or other recreational purposes			X	
Cost of property damage associated with bears (agricultural)	X	X	X	X
Cost of property damage associated with bears (residential)	X	X	X	X
Cost of vehicle damage associated with a bear-vehicle collision	X		X	
Catastrophic economic loss-business failure		X		
<b>Economic impacts (continued)</b>				
Cost of lost tourism and tourism revenue if a bear attack occurs and is publicized			X	
Private property values affected negatively if development rights are restricted				X
Reduced county tax base if public land holdings are increased				X

**Table 2.** Continued.

Impact Category	DEC staff	Regional meetings		
		1	2	3
<b>Sociological impacts</b>				
Social benefits of bear-related activities (eg, hunting, viewing, arts and crafts)	X			
Medical research value of bear	X			
Social costs of conflicts between people stop in cars to view or feed bear (problem for motorists, business owners, home owners).			X	X
Social costs of conflicts between people who feed bear and their neighbors who don't want bear attracted			X	X
Allocation issues: anglers and hunters become concerned about competition with bears for fish and game resources		X		
Research findings satisfy publics' interest in knowing that people in their community are developing a better understanding of the natural world.		X		
Social costs of confrontation between people with different views on bear management	X			
Dissatisfaction with DEC response among individuals that believe people are the problem, not bears.		X		
Satisfaction or dissatisfaction with DEC bear management plan based on correlation of plan and personal interests.		X		
<b>Ecological impacts</b>				
Perceived ecosystem functions that result from the presence of black bears	X			
People want to feel like there is "a balance between people and bears," that society ensure that human activities don't preclude existence of places where bear can live, and somehow remain wild and natural.				X
Concern that bears not be extirpated (that population of bears is not eliminated due to hunting or poaching)		X		X
Bear competition with other species	X			
Population effects of bear predation on other species of plants or animals	X			
People fear bear overpopulation because they believe the presence of more bears could lead to more bear problems for people				X

**Table 2.** Continued

Impact Category	DEC staff	Regional meetings		
		1	2	3
<b>Educational impacts</b>				
Educational values associated with bears (eg, using bears or bear parts in education, use of bear images in magazines, books, videos)	X			
Research findings or other information satisfy publics' interest in knowing more about the natural world or bears.		X		X
People want to learn about bears through personal experience in a natural setting.			X	X
Misperceptions about bear develop (some people want educational efforts to reduce misperceptions about bear).				X

The survey instrument assessed: (1) people’s experiences with black bears; (2) the nature and extent of impacts experienced from black bears across the state; and (3) public opinion about specific approaches to managing conflicts with individual problem bears. The mail survey was designed to meet multiple objectives (Siemer and Decker 2003). This report focuses on survey objective 2: identifying important effects (i.e., impacts) produced by interactions between people and black bears, and differences in personal importance people place on those effects.

**Survey implementation:**

A mail survey was implemented with a stratified random sample of approximately 3,000 New York State residents. The target audience was state residents north of New York City, sampled from five geographic areas or strata: (1) the Allegany bear hunting zone; (2) the Adirondack bear hunting zone; (3) the Catskill bear hunting zone; (4) upstate New York outside a bear hunting zone; and (5) the downstate counties of Rockland or Westchester. The sample size for each geographic area was 600 people.

The black bear management survey was implemented in March and April 2002. HDRU staff mailed a cover letter, questionnaire, and return envelope to all members of the sample on March 22. Nonrespondents to the first mailing received up to three reminder mailings. Those who had not responded to the first three mailings were mailed a final letter on April 19. The questionnaire return period was closed on June 3.

Four hundred twenty-eight questionnaires were undeliverable, reducing the total sample size to 2,572. The overall adjusted survey response rate was 40% (1,036 usable returns). The response rates by strata were: 42% (Adirondack), 43% (Allegany), 44% (Catskill), 43% (upstate areas between bear hunting zones) and 30% (Rockland and Westchester counties).

Given the response rates experienced, a nonrespondent follow-up survey was completed. Using a computer-assisted telephone interviewing (CATI) system, the Cornell University Computer Assisted Survey Team (CAST) completed a 3-5 minute follow-up telephone interview with 75 nonrespondents. CAST staff completed the interviews between June 5 and June 15, 2002.

The follow-up study revealed that respondents differed from nonrespondents (and from the population of all adult residents of New York State) on a few background characteristics. For purposes of survey analysis reported in this chapter, the data were weighted to adjust for respondent-nonrespondent differences in gender and rate of hunting participation.

### **Stakeholder Input Group (SIG) Process**

DEC followed the 2002 stakeholder assessment study with funding to develop a stakeholder input group (SIG) process. HDRU and Cornell Cooperative Extension (CCE) staff developed, implemented, and evaluated the SIG process (Schusler and Siemer 2004). HDRU,

CCE, and DEC staff applied the SIG process in three locales in 2003: the upper Catskill region, lower Catskill region, and western New York. The SIG process was designed to “... help DEC staff articulate area-specific management objectives (based on identified impacts) and related plans of action” (DEC 2003a:17). DEC and HDRU staff served as technical advisors, answering questions about the biological and social dimensions of black bear management.

DEC defined stakeholder input groups as temporary, *ad hoc* entities. Each group had about a dozen members. CCE facilitators selected participants from candidate lists they developed together with DEC staff. Facilitators selected participants to reflect diverse stakes in black bear management (i.e., people experiencing different kinds of impacts), and to minimize over representation of any single interest.

Participants were asked to: review two background documents; seek input from others; contribute local experience and knowledge; participate as an individual (not as an official representative of a particular group); and keep an open mind. CCE, HDRU, and DEC staff were expected to: facilitate meetings, provide subject matter expertise, respond to participants’ questions and information needs, keep an open mind, and incorporate input as feasible into proposals for management actions.

Each input group was expected to: clarify bear-related impacts, identify priorities for impact management, and suggest actions to manage key impacts. We designed the initial meeting to develop a common information base among participants. During the first meeting, CCE, HDRU, and DEC staff introduced the planning framework and SIG process, presented information on bear natural history, introduced the concept of impacts, and instructed participants to seek input from others in their community or stakeholder group.

In the second meeting, we asked participants to review, clarify, and add to the list of bear-related impacts that the Plan Team had developed from prior stakeholder engagement activities. We then asked participants to prioritize which impacts were most important in their region of the state. Each group was asked to select priority impacts on which to focus further discussion. In the third meeting, we asked participants to identify fundamental objectives, enabling objectives, and management actions for priority impacts.

**Process evaluation:**

We developed a self-administered mail-back questionnaire to assess outcomes produced during the SIG processes. The SIG process can be considered a specific group decision support system, or GDSS (Rouwette 2003). We constructed an evaluation survey instrument that followed design guidelines that Rouwette (2003) offered to researchers interested in the outcomes of group decision support systems. The evaluation assessed whether the SIG process: (1) set a context in which participants were motivated to process information; (2) utilized structural elements that promoted central information processing (as described in the elaboration likelihood model of attitude change [Petty and Cacioppo 1986]; or achieved any of several desired learning outcomes. Most items in the questionnaire used a five-point response scale (strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree).

Each SIG participant was contacted by a DEC staff member by regular mail and asked to complete the questionnaire. Group members who had not responded within two weeks were contacted by the same DEC staff members with a reminder mailing. Approximately 64% of process participants completed an evaluation questionnaire (Table 3).

**Table 3.** Meeting attendance and questionnaire returns, by stakeholder input group (SIG) location.

<u>Location</u>	<u>Attended at least 1 meeting</u>	<u>Attended all meetings</u>	<u>Returned an evaluation questionnaire</u>
Upper Catskill	12	7	8
Lower Catskill	14	9	6
Allegany (western NY)	10	6	9
Totals	36	23	23

## RESULTS

Deliberations within the Plan Team identified a range of specific effects that the management plan team agreed to place into six broad categories (Table 4). Stakeholder informants who participated in nominal group meetings also identified a range of impacts. The Plan Team came to the conclusion that the broad categories of impacts identified by stakeholder representatives were similar to the categories wildlife managers and stakeholder nominal groups had identified previously (see Table 2), though some specific differences emerged.

Any of the specific effects listed in Table 2 could be considered an impact for a given stakeholder. Based on a review of all available information, DEC staff determined that 12 specific effects were impacts (Table 4). In this section, each of the effects listed in Table 2 are described, evidence supporting staff judgments to identify each effect as an impact is presented, and the stakeholder groups most interested in each specific impact are indicated.

**Table 4.** General categories of impacts and specific impacts, defined by DEC staff (based on management experience and stakeholder input activities through 2003).

<b>Effects Categories</b>	<b>Specific Effects of Greatest Concern in 2003 (Impacts)</b>
<p><b>Ecological Effects:</b> Effects on wildlife, wildlife habitats, and ecological systems that result from interactions between wildlife, people, and the land.</p>	<ul style="list-style-type: none"> <li>• Long-term population viability of black bears in New York State.</li> </ul>
<p><b>Economic Effects:</b> Monetary effects produced by interactions among people, related to black bears.</p>	<ul style="list-style-type: none"> <li>• Costs of bear-related damage to commercial property.</li> <li>• Cost of bear-related damage to residential property.</li> <li>• Economic activity associated with bear-related recreation (hunting, viewing, photography).</li> </ul>
<p><b>Health/Safety Effects:</b> Effects on human safety or health.</p>	<ul style="list-style-type: none"> <li>• Number and severity of actual human injuries caused by black bears.</li> </ul>
<p><b>Psychological Effects:</b> Enhancement or diminishment of psychological well being for individuals, stakeholder groups, or society overall.</p>	<ul style="list-style-type: none"> <li>• Personal satisfaction associated with bear-related activities (hunting, viewing, photography).</li> <li>• Personal/psychological effect of commercial property damage.</li> <li>• Personal/psychological effect of residential property damage.</li> <li>• Perception of threat from black bears.</li> </ul>
<p><b>Social Effects:</b> Social effects associated with interactions among people, where black bear are the reason for the interaction.</p>	<ul style="list-style-type: none"> <li>• Importance placed on understanding the natural world.</li> </ul>
<p><b>Management Effects:</b> Effects associated with bear management actions.</p>	<ul style="list-style-type: none"> <li>• Reaction to active management or intervention.</li> <li>• Importance placed on having a wildlife management agency that has the knowledge and expertise to conduct black bear management.</li> </ul>

The Plan Team synthesized input from management experience, nominal group meetings, the SIG process, and a statewide mail survey to establish a set of fundamental objectives. The Team operated on the assumption that fundamental objectives could be reached by taking actions to manage impacts. Team members linked fundamental objectives to enabling objectives and management actions. The results of their efforts are synthesized in Figures 1-8. Every element outside the fundamental objective box represents either a means or an enabling objective to achieve the listed fundamental objective. Arrows in each figure describe which enabling objectives and means are believed to influence achievement of specific fundamental objectives (ends). Boxes with a dotted line represent actions that managers suggested as potentially useful, but currently unavailable in New York State.

### **Ecological Impacts**

Ecological impacts are effects on wildlife, wildlife habitats, and ecological systems that result from interactions between wildlife, people, and the land. The Plan Team recognized several subcategories of ecological effects in New York. They decided that that ecological effect of greatest interest—the impact on which management will be focused -- is viability of the black bear population in New York State. One of the fundamental objectives of black bear management in New York is to maintain a self-sustaining population of black bears. It is useful to parse this impact into two subgroups: impacts of land use on black bear habitat and impacts of black bear hunting on black bear populations.

*Impacts of land use on black bear habitat.* The basic elements of black bear habitat include food, water and shelter. Two of those habitat components – food and shelter – have been enhanced in recent decades through human activities. Due to changes in land use and

reforestation, availability of food and shelter has significantly increased during the last 100 years (Clarke, 1976).

Land use practices in New York (and several other states in the Northeast) have resulted in an increase in the percentage of forested land, which has increased the amount and connectedness of black bear habitat. Moreover, each of the three core bear ranges contains large tracts of public forest land that provide suitable black bear habitat. New York's Adirondack and Catskill Forest Preserves alone encompass approximately 323,886 acres (800,000 hectares) of black bear habitat.

*Impacts of bear hunting on black bear populations.* Legal harvest is a major source of mortality for black bears in New York. For example, hunting accounted for 90% of known black bear mortality in the Catskill region during the 1970's (Decker et al. 1981, Decker and O'Pezio 1989). However, black bear hunting opportunities have been managed to ensure that the viability of regional bear populations is not threatened. Trend information suggests that the black bear population in New York has been increasing over the last decade. Wildlife managers monitor bear harvest and take steps to reduce harvest pressure if they believe that hunting mortality is occurring at an unsustainable level. Managers can change hunting opportunity by changing season length, season dates, areas open to hunting, or by complete closure of hunting seasons.

*Support for classifying ecological effects as impacts.* DEC was created to address recognized public concern about environmental and wildlife conservation. New York State Environmental Conservation Law gives DEC a legal mandate to "promote natural propagation

and maintenance of desirable species in ecological balance . . .” (Environmental Conservation Law, Section 11-0303).

The value that people place on sustaining a healthy assemblage of wildlife species in New York is well known and codified by the Bureau of Wildlife as a goal to, “Assure that populations of all wildlife in New York are of appropriate size to meet all the demands placed on them.” Within this goal are several related subgoals, including: (1) “maintain knowledge of species in sufficient detail to recognize population shifts;” (2) “manage, protect, maintain, and restore habitat/natural communities to keep animals present;” and (3) “make sure species have viable populations.”

Participants in all SIGs expressed concern about the effects human activities may have on bear populations. Members of three SIGs thought “maintaining the long-term population viability of black bears” should be a fundamental management objective (Schusler and Siemer 2004). Participants in one SIG believed that DEC should make “ensuring that black bears do not threaten the viability of other wildlife populations” a fundamental objective (Table 5).

Though all SIG participants agreed that wildlife management actions should not jeopardize the population viability of black bear, members of the groups also believed that DEC’s management program has been adequate to maintain bear population viability to date and they had confidence that the management program will continue to do so into the future.

*Affected stakeholder groups.* Black bear population viability is an effect desired by a broad array of stakeholders, including groups that may experience negative interactions with bears (e.g., a survey of Minnesota farmers [Garshelis et al. 1999] found that farmers who believed bears play an important ecological role in their local area were more tolerant of bear

damage to agricultural crops). Public and private land managers, commercial and residential development interests, bear hunters, wildlife and environmental organizations, and local planning and zoning boards may be particularly important stakeholders with regard to managing ecological impacts.

*Enabling and fundamental objectives related to Ecological impacts.* The Plan Team synthesized public input on ecological impacts as a single fundamental objective: maintain a viable bear population in portions of the state where having a bear population is acceptable and compatible with human land uses (Figure 1). The wording of the objective reflects an assumption that stakeholders may not want bear populations to become established in some urbanized portions of the state.

Enabling objectives were crafted in two categories: those related to research and those related to management actions/interventions. On the research side, managers recognize that they need to monitor the bear population as a means to understand bear population dynamics. On the management action side, managers recognize needs to control hunting-related bear mortality and to take steps to maintain the quality and quantity of habitat necessary to sustain bear populations. Bureau of Wildlife staff concentrate on managing hunting opportunity as a means to control that source of bear mortality. Other units within DEC (e.g., Bureau of Habitat, Division of Law Enforcement) implement regulatory actions to protect environmental quality. The Division of Lands and Forests and other offices within DEC use education, partnerships, land purchases, and public lands management to enhance the quality and quantity of habitat available for bears.

**Table 5.** Comparison of impact and fundamental objective statements generated by members of the Bear Management Plan Team (PT), and three SIG process groups (LC=Lower Catskill, IP=Upper Catskills, AL=Allegany).

<u>Impact Categories</u>	<u>Related fundamental objectives</u>
<p><b>Ecological:</b></p> <ul style="list-style-type: none"> <li>• Long-term population viability of black bears in New York State. (PT)</li> <li>• Effects of bear on ecological community, especially depredation on deer.(LC)</li> <li>• Concern about loss of quality bear habitat. (LC)</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain viable black bear populations in NY where acceptable and compatible with human land uses (PT)</li> <li>• Maintain co-existence of bears and people (LC)</li> <li>• Maintain co-existence of bears and people (UC)</li> <li>• Ensure that a self-sustaining population of wild bears continues to exist in the Catskills. (UC)</li> </ul>
<p><b>Economic:</b></p> <ul style="list-style-type: none"> <li>• Costs of bear-related damage to commercial property. (PT)</li> <li>• Cost of bear-related damage to residential property. (PT)</li> <li>• Economic activity associated with bear-related recreation (hunting, viewing, photography). (PT)</li> <li>• Costs of preventing bear-related damage.(LC)</li> <li>• Costs of bear-related damage to commercial, agricultural property. (UC) <ul style="list-style-type: none"> <li>◦ Costs of corn damage.</li> <li>◦ Costs of apiary damage.</li> </ul> </li> <li>• Costs of bear-related damage to commercial, non-agricultural property. (UC)</li> <li>• Costs of bear-vehicle accidents. (UC)</li> <li>• Costs for management by DEC (more \$, more staff time). (UC)</li> </ul>	<ul style="list-style-type: none"> <li>• Keep economic costs of agricultural damage by black bears within tolerable levels. (PT)</li> <li>• Keep personal costs of bear nuisance/ residential damage incidents within tolerable levels. (PT)</li> <li>• Promote positive economic effects of bear-related recreation. (PT)</li> <li>• Reduce economic costs of residential problems with bears. (LC)</li> <li>• Increase economic activity associated with hunting. (UC)</li> <li>• Reduce cost of agricultural damage. (UC)</li> <li>• Minimize economic costs of lost tourism in the Catskills that could result if a human injury by bear occurred. (UC)</li> </ul>

Table 5. continued.

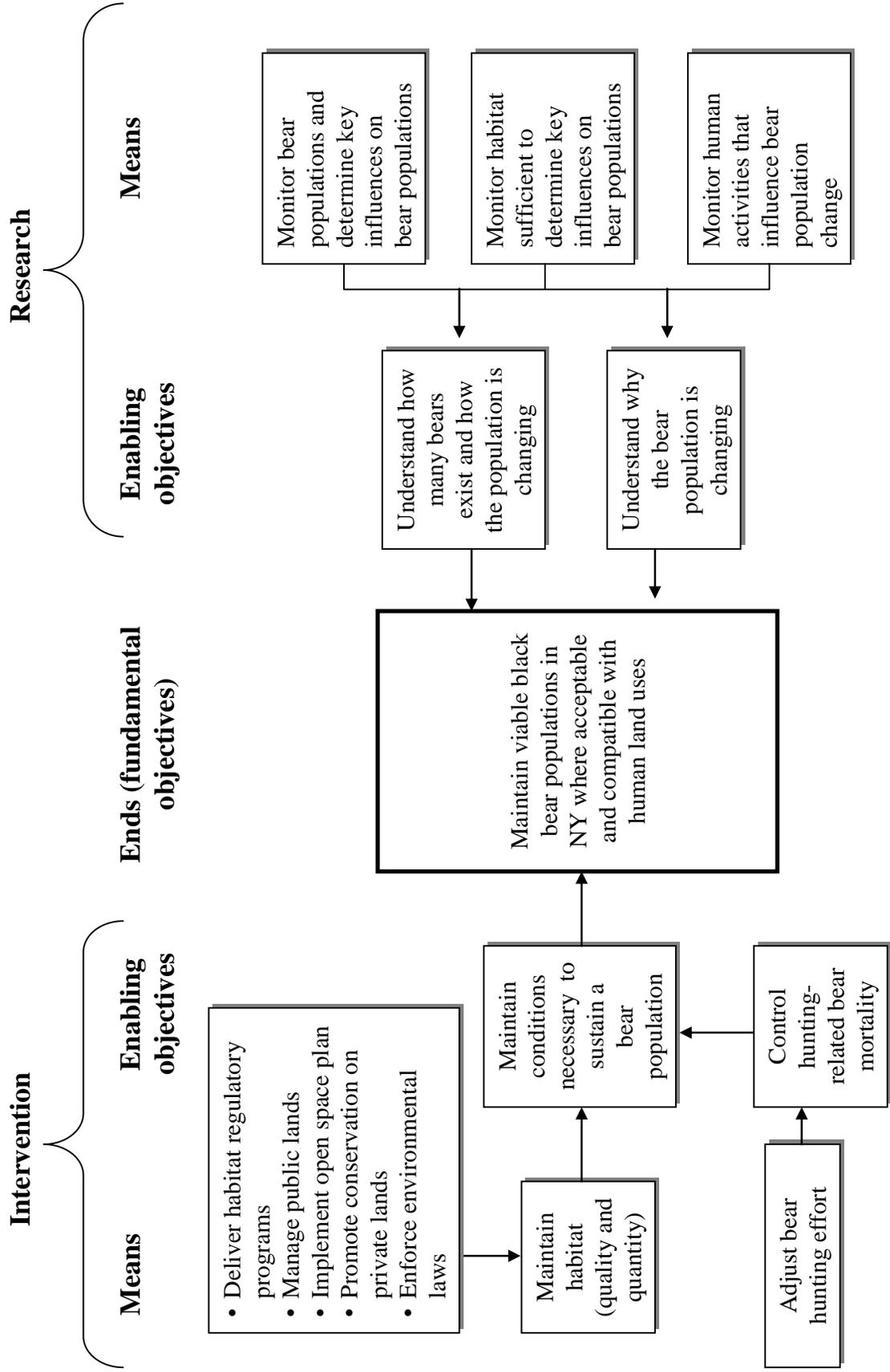
<u>Impact Categories</u>	<u>Related fundamental objectives</u>
<b>Economic:</b>	
• Costs of apiary damage. (W)	• Reduce costs of apiary damage. (W)
• Costs of crop damage. (W)	• Prevent residential property damage. (W)
• Economic gain from enterprises to control bear-related problems. (W)	
• Economic activity associated with hunting and taxidermy. (W)	
• Economic activity associated with camping, hiking, and photography. (W)	
• Costs of managing bear-related problems. (W)	
<b>Health/Safety:</b>	
• Number and severity of actual human injuries caused by black bears. (PT)	• Minimize risk of injury to campers, hikers, and household residents. (PT)
• Number and severity of actual human injuries caused by black bears at campgrounds, resorts, and hotels. (UC)	• Maintain human safety. (LC)
• Number and severity of bear-auto collisions. (W)	• Maintain human safety. (UC)
	• Ensure public safety; prevent injury to people. (W)

Table 5. Continued.

<u>Impact Categories</u>	<u>Related fundamental objectives</u>
<b>Psychological:</b>	
<ul style="list-style-type: none"> <li>• Personal satisfaction associated with bear-related activities (hunting, viewing, photography) (PT) especially balancing conflicts among different recreational interests related to bear.(LC)</li> <li>• Personal/psychological effect of commercial property damage. (PT)</li> <li>• Personal/psychological effect of residential property damage. (PT)</li> <li>• Perception of threat from black bears. (PT)</li> <li>• Fear that bear will take pets.(LC)</li> <li>• Potential contact with bears in developed areas.(LC)</li> <li>• Personal satisfaction from knowing that bears exist. (W)</li> </ul>	<ul style="list-style-type: none"> <li>• Minimize public concerns about unsafe encounters between people, their pets, and black bear. (PT)</li> <li>• Reduce negative psychological effects of residential problems with bears. (LC)</li> <li>• Enable people to obtain psychological benefits associated with bear hunting. (LC)</li> <li>• Enable people to obtain psychological benefits associated with deer hunting. (LC)</li> <li>• Increase recreational opportunity/benefits for hunters (i.e., psychological/personal satisfaction). (UC)</li> <li>• Provide opportunities for people to gain psychological benefits associated with viewing bear or bear sign. (W)</li> <li>• Minimize negative psychological impacts for homeowners. (W)</li> </ul>
<b>Social:</b>	
<ul style="list-style-type: none"> <li>• Importance placed on understanding the natural world. (PT)</li> <li>• Interaction between neighbors around activities that could attract bear (e.g., trying to convince neighbors to minimize bear attractants around their homes).(LC)</li> <li>• Concern that hunting affects non-hunters' ability to enjoy other recreational activities, such as hiking. (UC)</li> <li>• Recognition that bears belong here. (W)</li> <li>• Importance placed on understanding views of other stakeholders. (W)</li> </ul>	<ul style="list-style-type: none"> <li>• DEC and citizens have the capacity to engage in bear management. (PT)</li> <li>• All members of the public have at least a rudimentary understanding of bears. (PT)</li> </ul>

Table 5. Continued.

<u>Impact Categories</u>	<u>Related fundamental objectives</u>
<b>Management:</b> <ul style="list-style-type: none"><li>• Reaction to active management or intervention. (PT)</li><li>• Importance placed on having a wildlife management agency that has the knowledge and expertise to conduct black bear management. (PT)</li><li>• Importance placed on management education (for police and others) to train qualified, “first-on-the-scene” personnel.(LC).</li><li>• Importance placed on having a wildlife management agency that has the knowledge and expertise to conduct black bear management (including research). (W)</li></ul>	<ul style="list-style-type: none"><li>• Address public reaction to management proposals or interventions</li></ul>



**Figure 1.** Ends-means matrix to address bear population maintenance (ecological impact 1).

## **Economic impacts**

Economic impacts are monetary effects produced by people preventing, replacing or repairing property damaged by bears, or by people spending money to engage in bear-related recreation. It is useful to partition this set of impacts into three subgroups: commercial property damage; noncommercial property damage, and expenditures associated with bear-related recreation.

*Support for classifying commercial property damage as an impact.* Black bears must consume large amounts of high quality foods during spring, summer, and fall in order to survive the winter period and successfully rear young. Human-created food sources are powerful attractants to black bears, especially in years when drought conditions reduce availability of natural foods. Every year, DEC receives complaints from agriculturalists who have suffered an economic loss from black bear depredation. Beekeepers, corn growers, and orchardists are the most likely stakeholders to experience economic losses to black bears. Others who experience occasional losses to black bears include forest owners, livestock producers, and grape producers.

Property damage costs have been recognized and addressed in New York for many years (Will and Kopp 1982), but little research has been completed in New York to estimate the precise cost or perceived severity of agricultural damage by black bears. A study in the mid-1980's documented an increase in black bear damage suffered by landowners in the Catskills (Decker et al. 1985). In neighboring Massachusetts, a study of agricultural producers found that corn growers and beekeepers perceived noticeable increases in black bear damage between 1985 and 1990 (Jonker et al. 1998). Approximately 15% of agricultural producers in Massachusetts reported experiencing some level of black-bear damage in 1990 (Jonker et al. 1998). The

majority (68%) of corn growers who experienced damage described the level of damage as low or moderate. The majority (72%) of beekeepers who experienced damage described the damage as substantial or severe (Jonker et al. 1998). Most of the agricultural producers who experienced black bear damage in 1990 reported the value of the damage as less than \$1,000 (Jonker et al. 1998).

Complaint records in New York suggest that corn producers probably experience the largest dollar amount of damage, though the total is dispersed among many producers and relatively few experience a catastrophic loss due to bears. Individual beekeepers probably experience the most severe losses, because their total operations are generally small and a black bear can destroy an entire colony of bees in a single incident.

The 2002 black bear management survey demonstrated that many residents of New York are aware that some agriculturalists experience bear-related property damage. Sixty-five percent of survey respondents indicated they were concerned about the cost of agricultural damage caused by black bears (16% of respondents were very concerned about those effects).

DEC recognizes the desire that people have to minimize economic losses to wildlife. This is codified as a BOW goal to, “Minimize the damage and nuisance caused by wildlife and wildlife users” and related subgoals (i.e., to provide people with avenues for relief from wildlife damage, and to manage wildlife populations in a manner which addresses wildlife damage and nuisance concerns).

The Plan Team assumes that controlling commercial property damage is a means to maintain wildlife stakeholder acceptance capacity (Decker and Carpenter 2000) (WSAC) among private landowners. It is important to maintain a climate of public support for the presence of

bears among private landowners, because landowner decisions profoundly affect the quality and quantity of habitat available to bears.

Results from SIGs clarified that concern about commercial property damage varies by region. Controlling the cost of damage to commercial property was identified as a high priority in the Catskill and Allegany regions, but not in the Adirondack region (where there is comparatively less agriculture). The economic costs of apiary damage were a priority concern, while crop damage was viewed as a concern for a range of wildlife species but not as a priority impact for bear management.

*Support for classifying noncommercial property damage as an impact.* Every year black bears attracted to human food sources cause damage to private property around homes and campsites. Campers and backpackers may experience damage to food storage containers, tents, campers, or motor vehicles. The majority of problem incidents in residential settings involve damage to bird feeders, trash containers, and barbecue grills. The monetary costs associated with these incidents is relatively low.

Bears sometimes damage the exterior of buildings in attempts to gain access to foods. A few times each year, black bears gain entrance to residential buildings and may cause extensive damage within those buildings. For instance, in 2004, staff received over 30 reports of a bear entering a garage or home in the Catskills (Mathew Merchant, DEC biologist, personal communication). The costs associated with these uncommon incidents can be substantial.

Little research has been completed in New York to estimate the precise cost or perceived severity of noncommercial property damage by black bears. Some information about this topic was gathered in private landowner studies in the Catskills in 1978 (Brown et al. 1979, Decker et

al. 1981) and 1983 (Smolka et al. 1984, Decker and O'Pezio 1989). Fewer than 2% of landowners reported having experienced property damage from bears sometime before 1978 (Smolka et al. 1984). A greater percentage of landowners had experienced property damage between 1978 and 1983 (about 6%). However, the studies indicated that most damage incidents reported by these landowners involved little monetary loss (\$100 dollars or less) and were considered to be tolerable in exchange for having bears present in the Catskills (Smolka et al. 1984).

In the 2002 mail survey, 66% of respondents expressed concern about the cost of residential property damage caused by black bears (14% of respondents were very concerned). In core bear ranges, about one in ten respondents had experienced bear-related property damage at some time (Allegany range: 5%; Adirondack range:12%; Catskill range:12%). However, people who had experienced some kind of residential property damage were no more likely to express concern about damage than were people without actual property damage experience.

DEC recognizes the desire that people have to minimize residential property damage and nuisance created by wildlife. As stated above, this is codified as a BOW goal to provide people with avenues for relief from wildlife damage and nuisance, and to manage wildlife populations in a way that addresses concerns about damage and nuisance.

Results from SIGs clarified that concern about residential property damage varies by region. Concerns about residential property damage were greatest in the Catskill region (which is consistent with the fact that the greatest number of complaints about residential problems with black bears are registered in that region).

Although the number of people affected by residential economic damage is low, the Plan Team believes it is important to control residential problems as a means to maintain a social climate where bear populations are tolerated. If residential problems with bears can be controlled, WSAC (Decker et al. 2000) for a bear population will be increased. High WSAC is necessary to retain a level of support needed to manage for sustainable bear populations (especially in regions with high human populations and expanding residential development).

*Expenditures associated with bear-related recreation.* Managers assume that some communities in core black bear range benefit from the economic expenditures (on food, lodging, fuel, and equipment) associated with wildlife-related and other outdoor activities. Expenditures on bear-related recreation have not been estimated in New York. However, wildlife officials estimated that black bear hunters in Virginia spent more than \$17 million on food, lodging, equipment, and transportation during the 1999-2000 hunting season (VDGIF 2002). They estimated that during the same license year nationwide expenditures by black bear hunters exceeded \$184 million (VDGIF 2002).

Over half of 2002 mail survey respondents said it was important to them that their region gets local economic benefits from tourists who come to hunt or view black bears. About 20% of respondents said it was very important to them that their region receive such benefits.

The Plan Team recognizes the desire that communities have to benefit from recreation and tourism expenditures. This is codified as a BOW goal to, “assure that we meet the public desire for indirect benefits of wildlife” and “foster and support the social and economic benefits to be derived from wildlife, and the public’s awareness of wildlife.” Members of a Catskill SIG

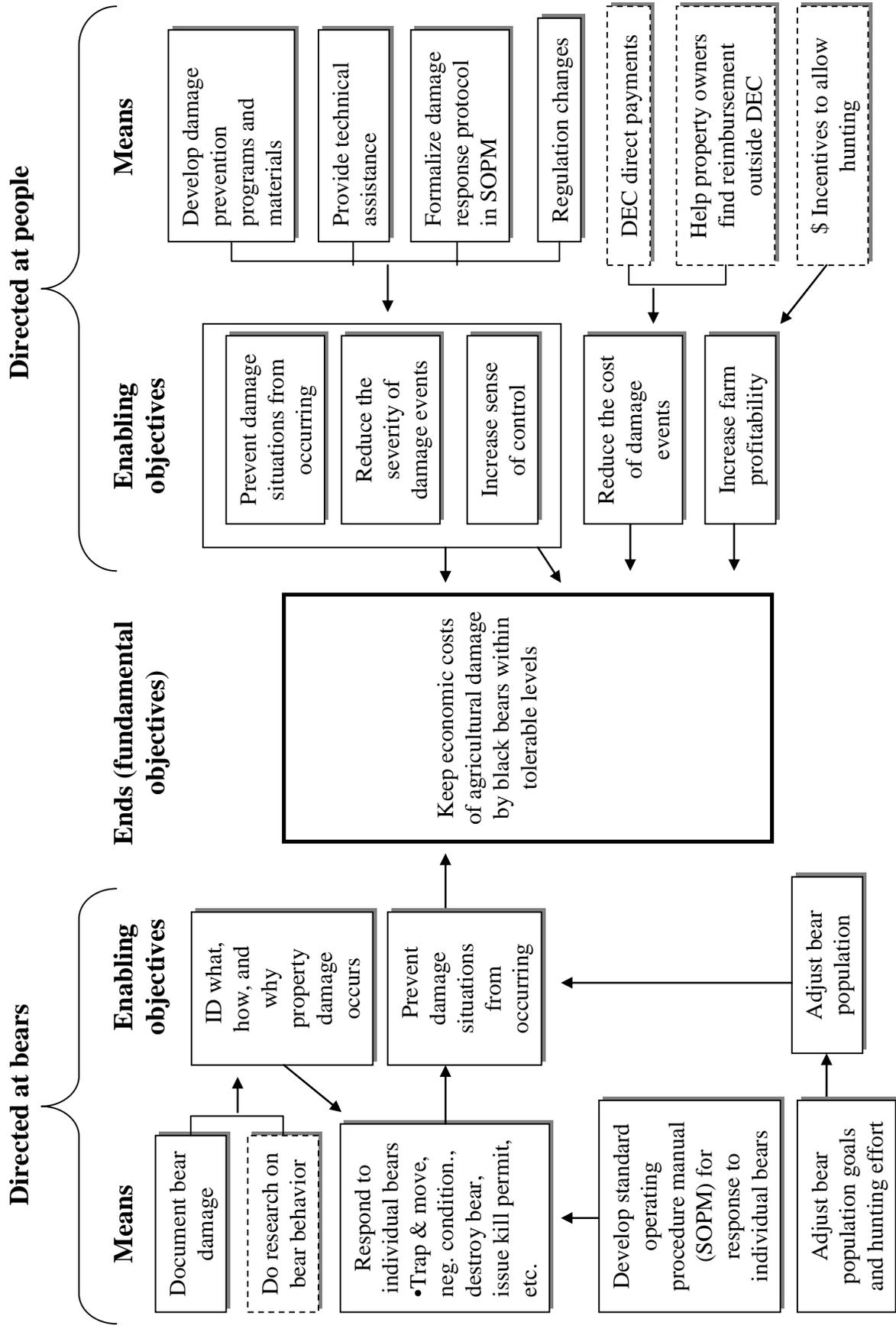
were concerned about the potential economic loss to camps, hotels and other businesses that could result from lost tourism should a bear-related human injury occur in their region.

*Affected stakeholder groups.* Beekeepers, corn producers, and other agricultural stakeholders are obvious target audiences for actions taken to address the costs of agricultural damage. Homeowners, campers, and backpackers are key audiences for actions to address residential and other noncommercial property damage. Small businesses, chambers of commerce, and community leaders are key audiences for actions related to enhancing the economic impact of bear-related recreational activities.

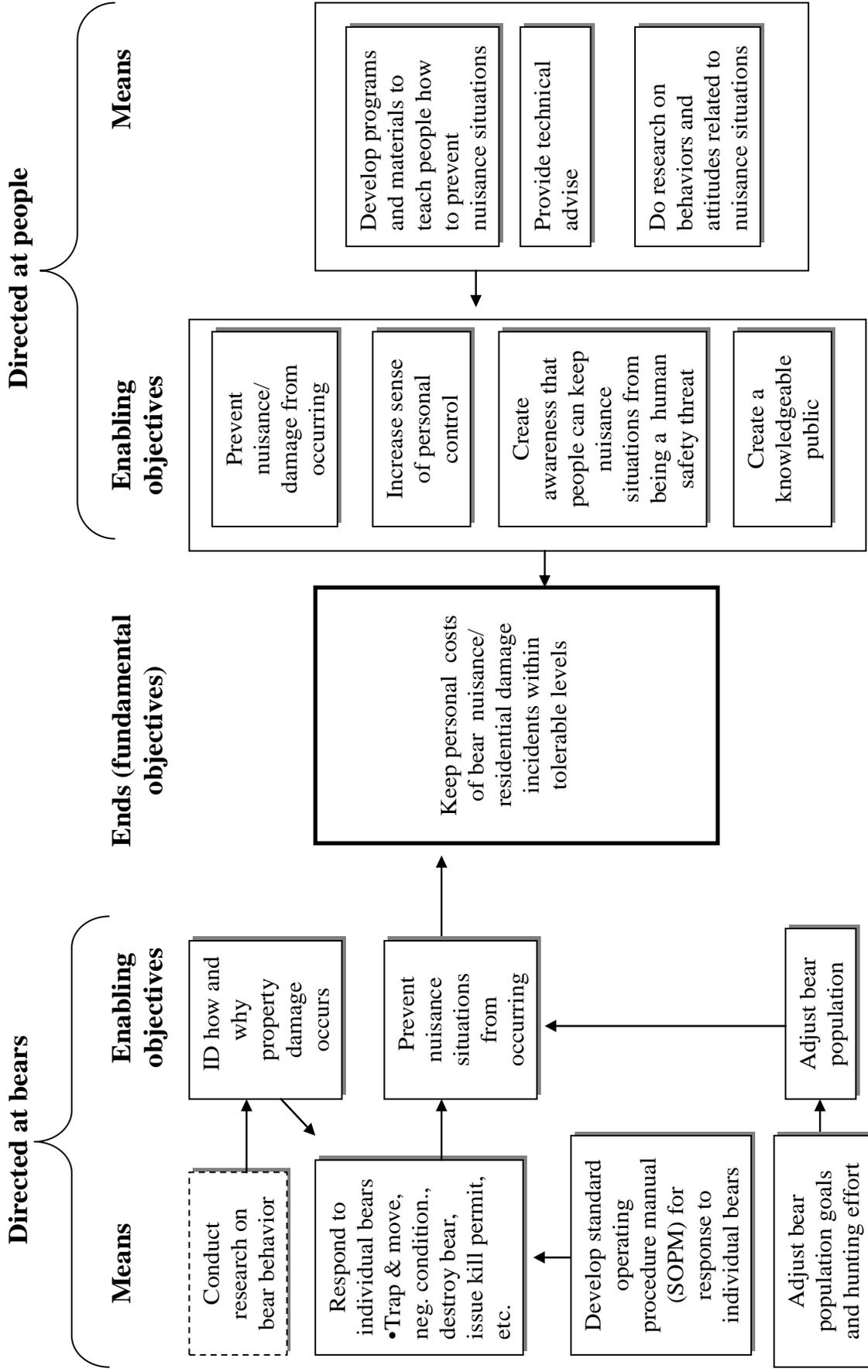
*Enabling and fundamental objectives related to economic impacts.* The Plan Team synthesized public input on economic impacts into three fundamental objectives (Figure 2-4). Enabling objectives were crafted in two categories: means directed at people and means directed at bears.

The Plan Team believes that adjusting the bear population is a means to achieve all three fundamental objectives in the economic sector. Research on bears and interventions to negatively condition or remove bears also are considered means to prevent damage events from occurring (Figure 2).

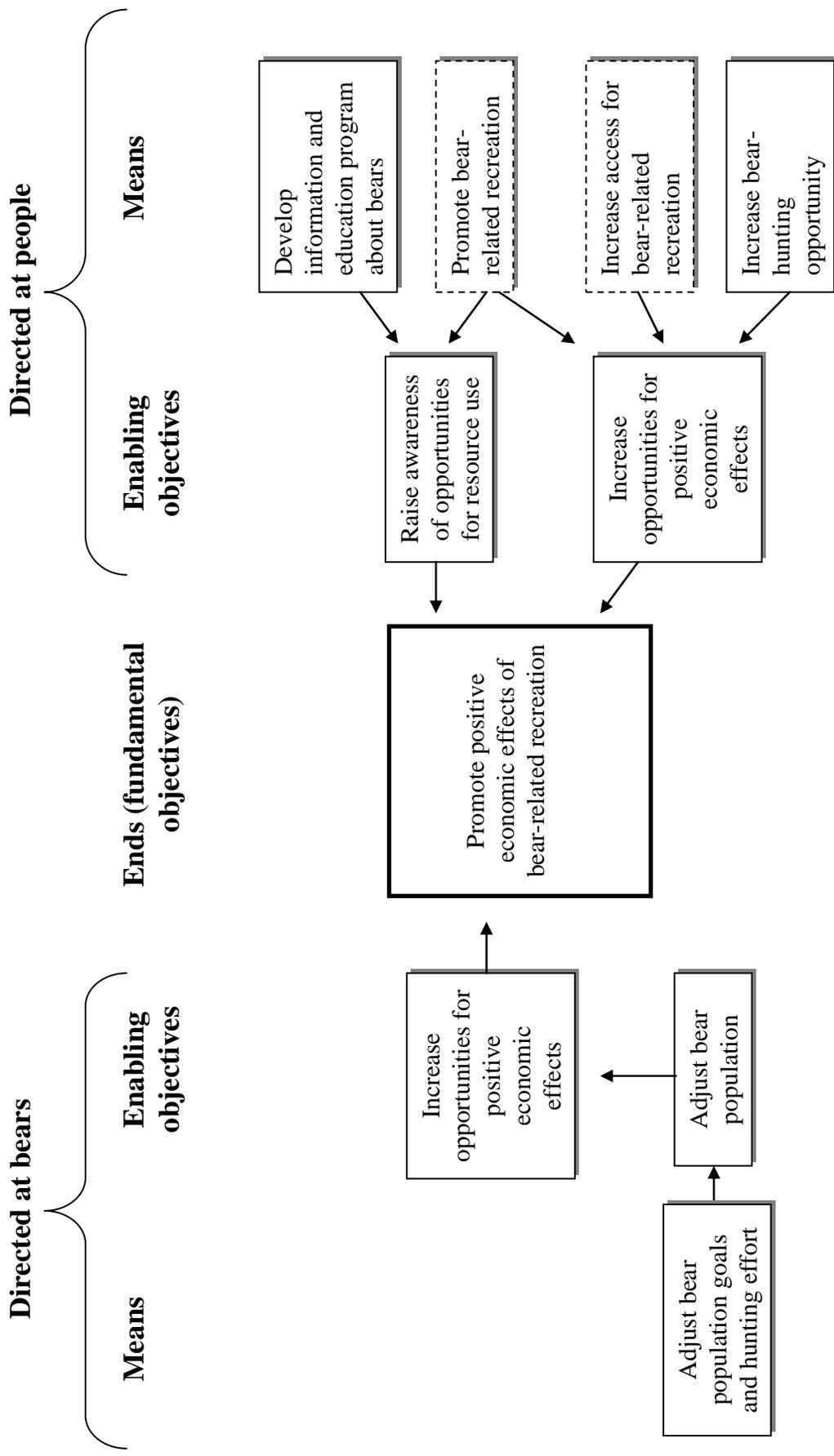
The Plan Team described a suite of enabling objectives focused on stakeholders. Information, education and a standard operating procedures manual (SOPM) are used to reduce the frequency and severity of damage incidents, as well as to increase a sense of control by stakeholders. The Plan Team identified several means to reduce the negative economic effects of bear-related commercial property damage. However, the means they discussed (e.g., making direct payments to property owners, providing financial incentives to landowners who allow



**Figure 2. Ends-means matrix to address agricultural damage (economic impact 1).**



**Figure 3.** Ends-means matrix to address nuisance/residential property damage (economic impact 2).



**Figure 4.** Ends-means matrix to address economic benefits of bear-related recreation (economic impact 3).

hunting) are not programs currently offered by DEC. Likewise, the stakeholder-oriented means they discussed for promoting positive economic effects of bear-related recreation are not implemented by DEC.

### **Human health and safety impacts**

Wildlife managers recognize black bears as a potential vector for transmission of diseases to people. Black bears can transmit rabies and trichinosis. As a host for several species of ticks, black bears are a potential vector for transmission of lyme disease, babesiosis, Rocky Mountain spotted fever, tularemia, and toxoplasmosis (Huffman et al. 2005, Nims and Durden 2005). Managers believe that the risk of transmission of disease from black bears to people is low and further management actions to address these effects is regarded as a low management priority.

Vehicle collisions with black bears can result in human injuries. The number of collisions varies annually (the documented number of annual collisions has varied between 14 and 61 over the past 20 years). Drivers may not report all incidents to DEC, so the actual number of bear-vehicle collisions may be higher than the documented number of collisions. No one has been fatality injured in bear-related vehicular accident in New York, though human fatalities have occurred in other states (e.g., a motorist was killed in a bear-vehicle accident in Virginia in 2001 [VDGIF 2002]).

The likelihood of being injured by a black bear in North America is very low (Herrero 1985, 2005; Herrero and Fleck 1990). Between 1960 and 2000, only eight injuries were reported to have been caused by black bears in New York and none of the injuries were serious. Since 2000, there have been two more serious injuries to people, including an unprovoked fatal encounter involving an infant. This incident was the first ever human fatality caused by a black

bear in New York State, and only the second human fatality caused by a black bear in the northeastern United States since 1900. Though these events are rare, wildlife managers are concerned because the number of fatal incidents across the continent has increased in recent years. Herrero (2005) reported 11 black bear-related human fatalities in North America during the 1990's. He reports another 11 black bear-related mortalities between 2000 and October, 2005 (Herrero 2005). Even though bear-related human injuries are rare, wildlife managers in the northeastern U.S. are concerned because of increasing levels of human activity in areas occupied by black bears. Most human injuries by black bears result from defensive bear behavior (though the fatal events are often associated with predatory bear behavior [Herrero 2005]). The conditions for a defensive attack by a black bear may be created if a person approaches a bear attracted to a human food source (e.g., pet food, birdseed, or garbage) or if a person blocks a bear's escape route.

*Support for classifying these effects as impacts.* Human safety is a primary consideration underlying black bear management even though black bear related human injuries are rare. The priority that people place on public safety is codified by the Bureau of Wildlife as a subgoal to, "Manage wildlife populations in a manner which addresses wildlife damage, nuisance, and human health and safety."

The 2002 black bear stakeholder mail survey provides information on contemporary views about public safety and black bears. As expected, few respondents (1%) reported having an experience where they felt physically threatened by a black bear. About 4% reportedly knew someone who had a threatening experience and about 8% had read or heard media accounts in the previous year (March 2001 – March 2002) of someone who had been threatened or attacked

by a black bear. Approximately 80% of respondents agreed with the statement, “The risk of being threatened by a black bear in New York State is acceptably low.” However, more than one-third of respondents were somewhat or very concerned about being confronted by a black bear while outdoors. As human and bear populations have increased in New York so have the number of incidents where people encounter black bears under conditions where bears could exhibit defensive behavior that may threaten human safety.

All three SIGs placed low priority on the impact “actual number and severity of human injuries” because participants recognized that human injuries from bear are rare. In later discussion of management actions, however, it became clear that the fundamental objective of maintaining human safety was a high priority in all locations.

*Affected stakeholder groups.* Management actions to address safety impacts should be targeted toward stakeholders most likely to encounter black bears. This would include recreationists (e.g., campers, hikers, hunters, photographers) and residents in areas occupied by black bears.

*Linking ends and means.* Figure 5 focuses on the means that enable managers to achieve two fundamental objectives: minimizing risk of injury to recreationists or household residents. The fundamental objective of maximizing safety has two subdimensions: safety of outdoor recreationists and safety of people at home.

Enabling objectives were crafted in two categories: actions directed at bears and actions directed at people. On one side, managers believe they need to use regulated bear hunting to reduce the bear population, because reducing the population will reduce the interactions between people and bears. Managers believe that behavioral conditioning of individual bears can modify

bear behavior and will reduce problem interactions with people. Managers believe that, in a few cases, destroying a bear will be necessary to remove animals that threaten public safety.

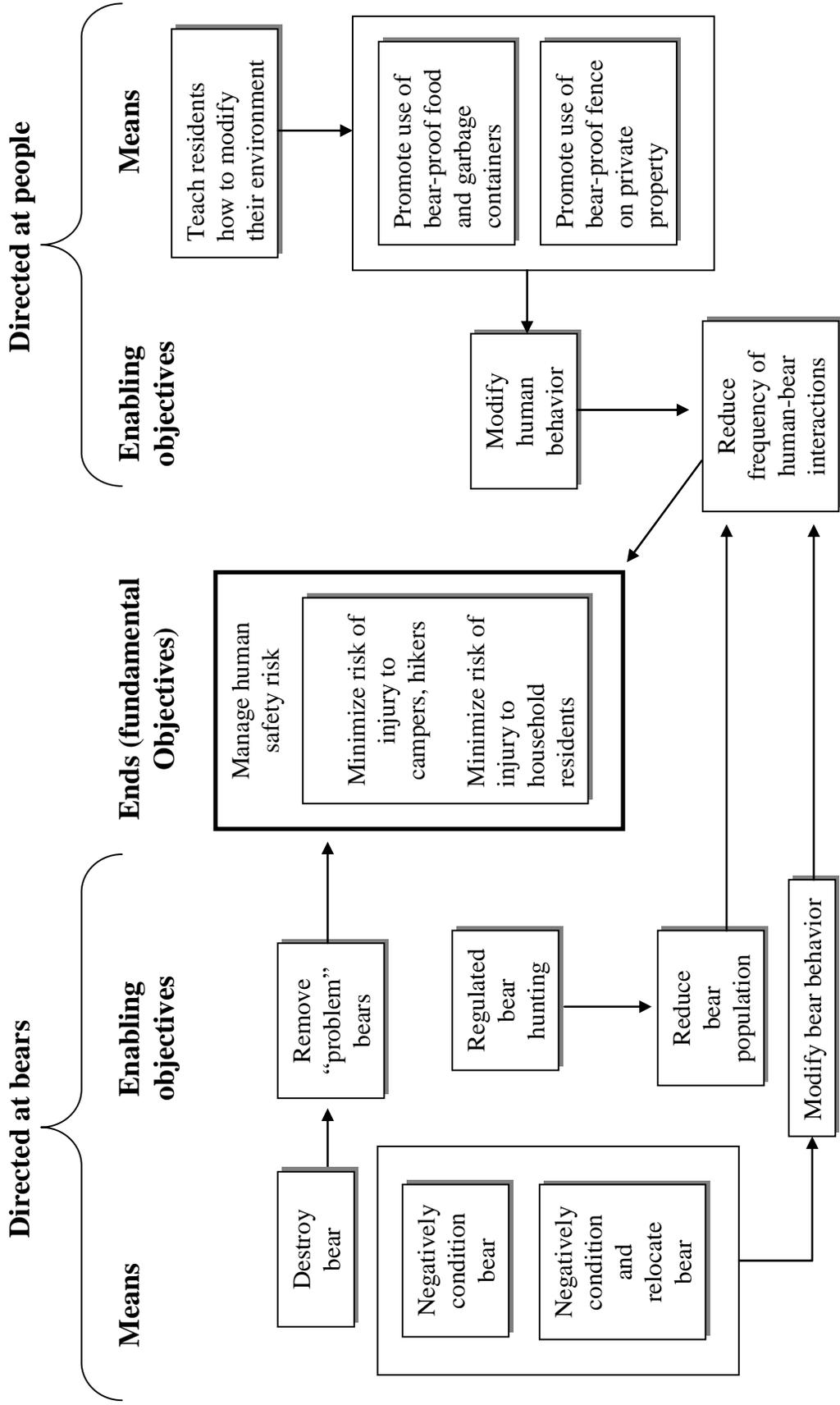
Destroying bears is considered a means of protecting human safety by eliminating those few interactions that present a high risk to human safety. Modifying bear behavior are intended to address the majority of interactions (which represent low to moderate risk to human safety).

Managers also believe that education is important because teaching people problem prevention behaviors will lead to behavioral modifications that remove bear attractants and thus reduce the frequency of problem interactions with bears. Like efforts to modify bear behavior, modifying human behavior is intended to address those interactions before they reach a point where risk to human safety is high.

### **Psychological impacts**

Human-wildlife interactions produce a wide range of positive and negative psychological effects. This is arguably the largest general category of effects. The most important psychological effects from a management perspective include: personal satisfactions produced through bear-related recreation; negative psychological effects associated with property damage; and negative psychological effects associated with perceived risk of a black bear attack.

*Support for classifying these effects as impacts.* The majority of 2002 mail survey respondents said it was important to them to obtain a range of benefits from black bears. A majority placed some importance on getting personal enjoyment from activities where they might see a bear, or spending time with family and friends during activities where they might see a bear. About 25% said it was very important to them to obtain such benefits, which result from involvement in



**Figure 5.** Ends-means network to address actual safety risks associated with black bears in New York (safety impact 1).

wildlife-related or other outdoor activities. Men were more likely than women to place high importance on obtaining these benefits.

In both the upper and lower Catskills, some participants expressed the desire for increased psychological benefits or personal satisfaction associated with hunting. Some participants in all groups valued the psychological benefits associated with viewing bear. Concerns around the negative psychological effects for people experiencing bear-related problems in residential, commercial, and camping situations were stated in all three groups. SIGs identified managing concern about residential problems with bears as a higher priority than managing actual safety risks to people. The groups reasoned that concern about risk is more of an issue than actual risk, because people who have an elevated level of concern or perceived risk will not support bear conservation.

*Affected stakeholder groups.* Though psychological effects are individual, it is useful for management purposes to consider common psychological effects for stakeholder groups such as homeowners, wildlife watchers, hunters, or campers. It also may be useful to develop targeted messages for men and women. Men are more likely than women to place high importance on obtaining psychological benefits from bear-related recreation. Women are more likely than men to express concern about health and safety risks associated with human-bear interactions.

*Linking ends and means.* The Plan Team only developed a complete means-ends diagram for one psychological impact (Figure 6). They established a fundamental objective of minimizing public concerns about unsafe encounters between people, their pets, and bears. The Plan Team reasoned that research on bear behavior and a standard operating procedure manual could guide response to individual problem bears. That is expected to reduce actual risks

presented by bears. The Plan Team reasoned that DEC also could manage public concern through information, education, training, and research programs. Those activities are expected to improve public understanding of actual risks, increase stakeholders' sense of control over interactions with bears, reduce the prevalence of risky situations (i.e., situations where bears are attracted to human foods), and by maintaining DEC's standing as an entity that can be trusted to provide objective problem prevention information.

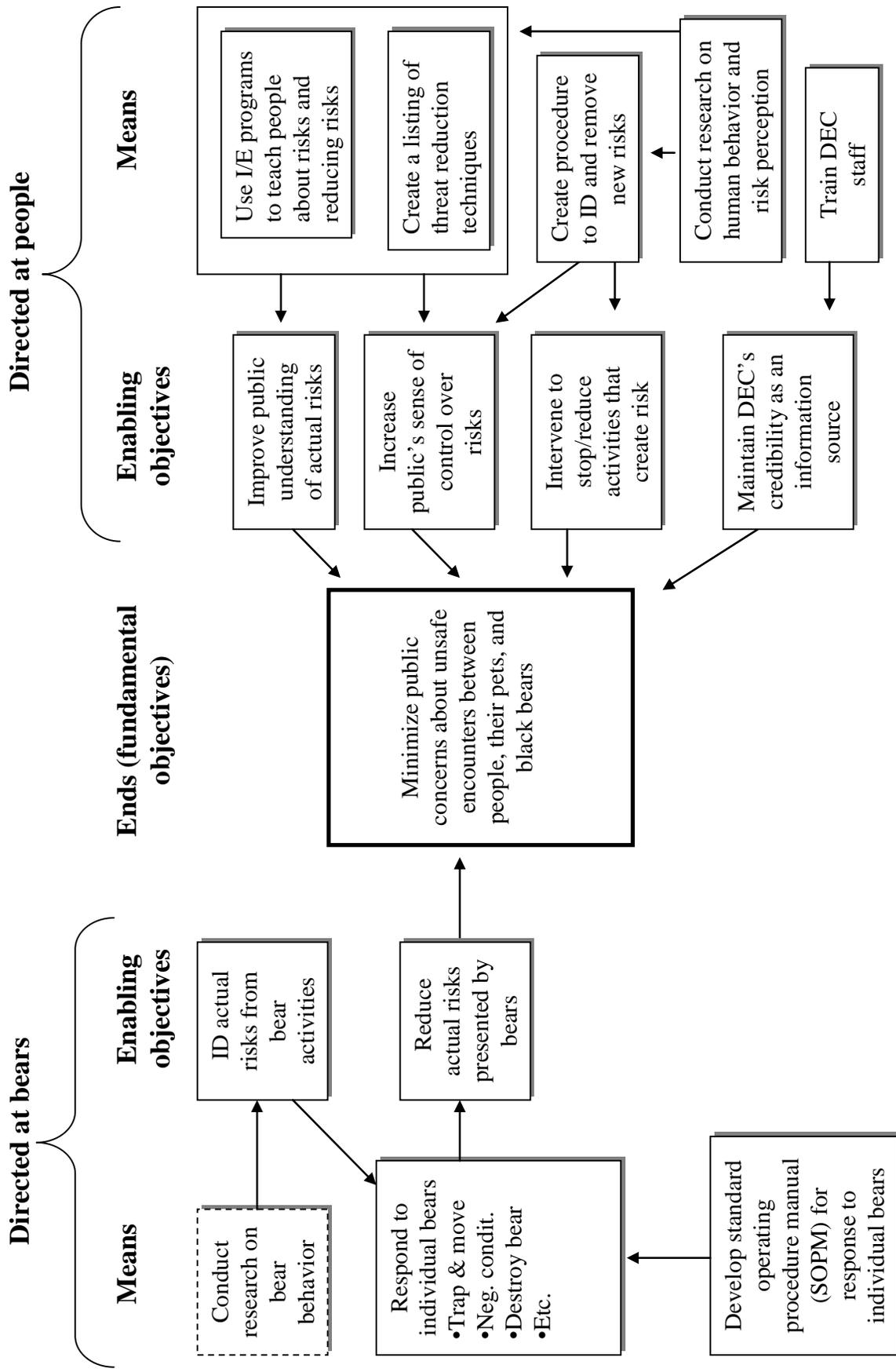
### **Social Impacts**

Social effects are produced through interactions among people where black bears are the reason for the interaction. Small group meetings and mail survey results suggested that one particular social effect merits management attention as an impact: the importance that people place on ensuring that all members of society have an understanding of the natural world.

*Support for classifying these effects as impacts.* Most 2002 mail survey respondents (88%) said it was important to reduce public misperceptions about black bears. Over half (59%) said it was very important to them to reduce public misperceptions. SIGs also believed that increasing public understanding of bears was important (in fact, the groups tended to establish that as a fundamental objective – a desired end state, not just a means to some other end).

DEC staff recognize a need to maintain high levels of public understanding of wildlife and wildlife management. One of BOW's goals is to "Assure that we meet the public desire for information about wildlife." A related subgoal is to "Achieve a climate of public opinion conducive to the management and use of wildlife."

In all locations, SIG participants placed importance on having a wildlife agency with the knowledge and expertise to conduct black bear management. Recognizing DEC's current



**Figure 6.** Ends-means matrix related to address perceived safety risks associated with black bears (psychological impact 1).

inability to hire additional staff, each group emphasized the need to devote additional resources to black bear management, especially for research and education. Participants in the upper Catskills and western New York specifically included “dedicating a DEC staff person to ongoing bear-related education” and “creating a budget line for education” respectively among their suggested management actions. Participants viewed these as essential to accomplishing objectives that they felt could be most effectively addressed through education.

*Affected stakeholder groups.* This particular effect may be of greatest importance to people with a strong wildlife benefits orientation (Fulton et al. 1996).

*Linking ends and means.* The Plan Team created two fundamental objectives in this domain: ensuring that DEC and citizens have the capacity to engage effectively in bear management, and ensuring that all members of the public have at least a rudimentary understanding of bears. This objective is achieved in part by conveying research information about bears to stakeholders through effective information and education programs. It also is achieved through training that gives DEC staff to effectively communicate, educate, and interact with stakeholders (Figure 7). The Plan Team also recognizes that partnerships with nongovernmental organizations are a means to achieve this fundamental objective. However, those kinds of partnerships are not extensive or well developed today.

### **Management impacts**

Wildlife managers recognize that some stakeholders are just as concerned about the effects produced by management actions as they are about the effects produced by interactions with black bears. There is often disagreement about the acceptability of various management actions across stakeholder groups. Various stakeholder groups may be particularly concerned

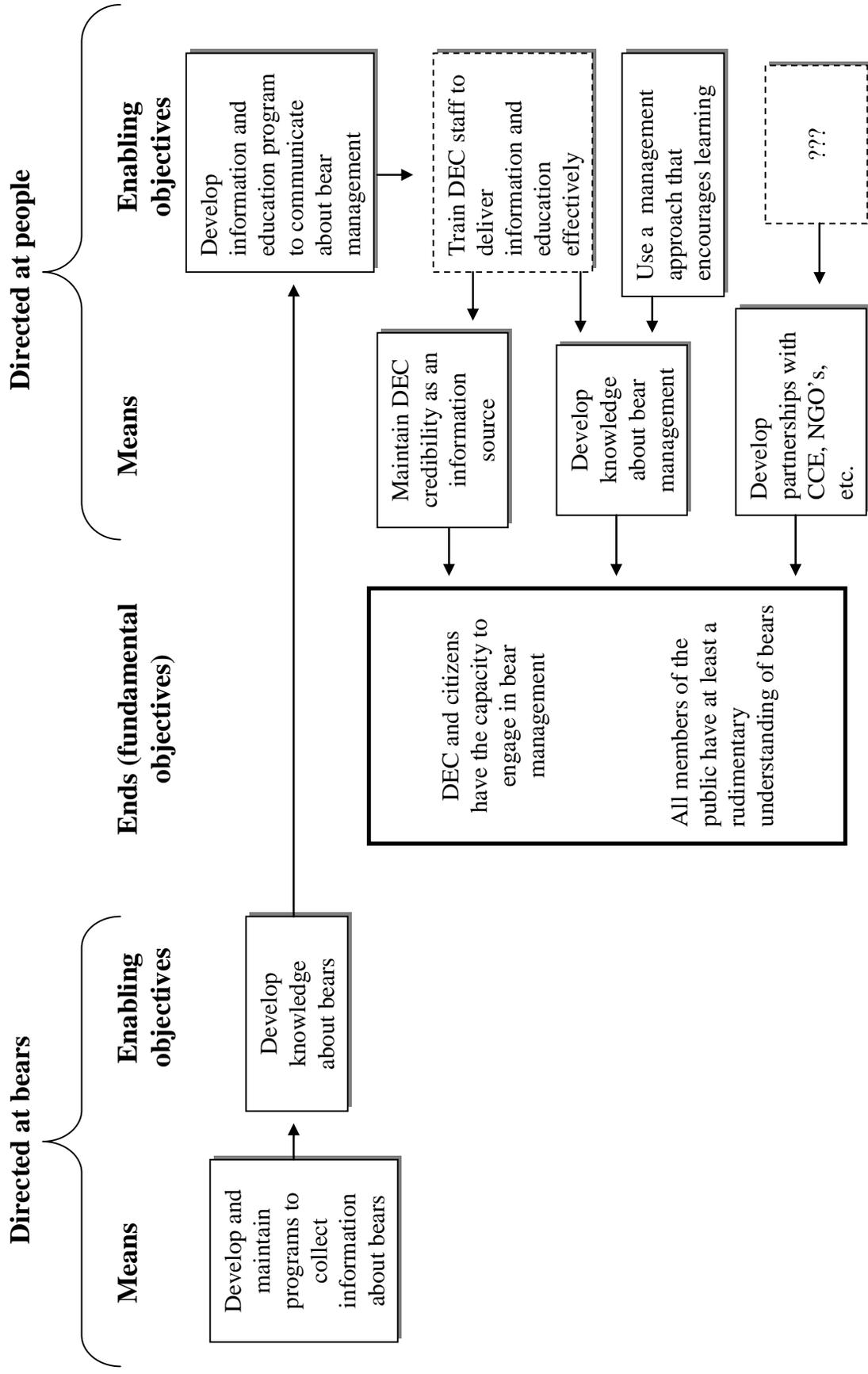
about bear hunting generally, specific methods of bear hunting, lethal response to problem bear situations, or a management policy to take no action.

*Support for classifying these effects as impacts.* Wildlife managers know from experience that people care deeply about how wildlife are managed. Acceptability of various management practices varies greatly across groups and disagreement about management actions is frequently a source of conflict among stakeholders and managers. Such conflicts are an expected and healthy part of decision making. BOW has a goal to, “Assure that we deliver programs efficiently.” To do so, BOW has subgoals to maintain a high level of staff knowledge and expertise about wildlife management, and to develop effective working relationships with stakeholders who want to participate in processes whereby management decisions are made and management actions are selected.

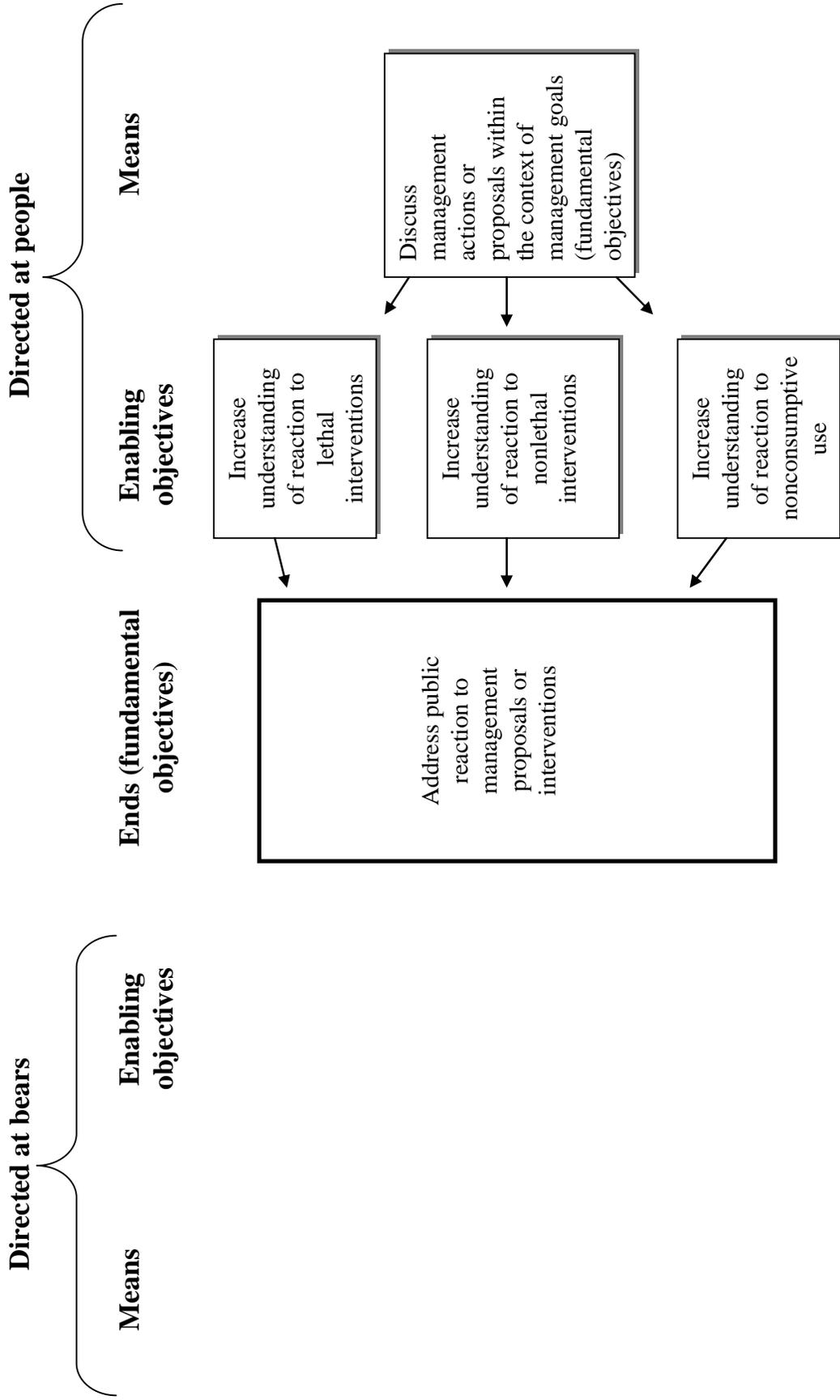
*Linking means to ends.* The Plan Team did not develop a complete means-ends diagram for this category of impacts. General ideas were discussed (Figure 8), but constructing a detailed ends-means diagram was not possible without a specific management issue as a referent.

### **SIG process outcomes**

**Context:** Focusing on problems important to the stakeholder is believed to create high motivation to process information (Rouwette 2003). Three sets of items were developed to assess whether SIG processes created such a context. Most participants agreed that their process led to a focused discussion on problems of importance (Tables 6-8), thus the participants should have been motivated to process information. There were a few exceptions to that overall pattern. For example, one of the processes focused on apiary damage and not all participants believed that effect was important enough to be called an impact in their region.



**Figure 7.** Ends-means matrix to address educational objectives (social impacts 1-2).



**Figure 8.** Ends-means matrix to address impacts produced by management proposals/actions.

**Mechanism:** Outcomes such as attitude and behavior change are more likely if the structure of a GDSS facilitates information processing. Evaluation results were consistent with the presence of mechanisms for enhanced information processing (a necessary condition for central cognitive processing) (Table 9). Participants typically believed that communication between group members and supporting staff was clear. They believed that diverse opinions were represented and that all participants had an opportunity to express and discuss their opinions. They believed that the processes focused on bear management priorities. On the other hand, some participants did not believe that the format afforded enough opportunity to discuss points on which people held divergent opinions. Some participants were unclear about how DEC intended to use input from the processes to make decisions. Also, the impacts concept was not particularly clear or useful for some participants (Table 10).

**Outcomes:** Most process participants believed that their SIG process yielded positive learning outcomes. Most agreed that the process led to greater understanding of the priority impacts discussed and the opinions of other stakeholders (Table 11-12). They tended to agree that the process led to a shared vision of management priorities in their region (Table 11-12). Fewer participants agreed that the process increased their trust in DEC or their understanding of how to manage priority impacts (Table 11).

Responses suggested that the process led many participants to consider a broader range of viewpoints and management problems than they would have considered otherwise (Table 12). The majority of respondents believed that the process led to discussion of a broad range of action alternatives. However, not all of the participants thought the process brought up discussion of novel actions (things participants hadn't considered before) (Table 12).

**Table 6.** Combined responses to the statement, “It is important for DEC to manage this impact [in the region where the SIG was held]” (SA=strongly agree; A=agree; N=neither; D=disagree; SD=strongly disagree).

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<b>It is important for DEC to manage this impact in [region name].</b>	n	SA	A	N	D	SD
Long-term population viability of black bears in New York State (ecological)	8	75.0	25.0	-	-	-
Costs of bear-related damage to agricultural property (economic)	8	50.0	50.0	-	-	-
Costs of bear-related damage to non-agricultural, commercial property (economic)	8	37.5	62.5	-	-	-
Costs of apiary damage (economic)	9	44.4	33.3	-	11.1	11.1
Property damage and human safety risks experienced by homeowners (economic, health/safety)	9	22.2	77.8	-	-	-
Psychological benefits produced by viewing bears or bear sign (psychological)	9	22.2	55.6	11.1	11.1	-
Psychological costs produced by residential problems with bears	6	66.7	33.3	-	-	-
Psychological benefits produced by hunting (bear and deer)	6	100.0	-	-	-	-
Willingness of people to tolerate or co-existence with bears	6	50.0	33.3	16.7	-	-

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**Table 7.** Combined responses to the statement, “Failing to address this impact would have serious implications for residents [in the region where the SIG was held]” (SA=strongly agree; A=agree; N=neither; D=disagree; SD=strongly disagree).

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<b>Failing to address this impact would have serious implications for residents in [region name].</b>	n	SA	A	N	D	SD
Long-term population viability of black bears in New York State (ecological)	8	25.0	50.0	25.0	-	-
Costs of bear-related damage to agricultural property (economic)	8	50.0	37.5	12.5	-	-
Costs of bear-related damage to non-agricultural, commercial property (economic)	8	25.0	62.5	12.5	-	-
Costs of apiary damage (economic)	9	11.1	33.3	11.1	44.4	-
Property damage and human safety risks experienced by homeowners. (economic, health/safety)	9	22.2	55.6	-	22.2	-
Psychological benefits produced by viewing bears or bear sign. (psychological)	9	11.1	44.4	11.1	22.2	11.1
Psychological costs produced by residential problems with bears	6	50.0	50.0	-	-	-
Psychological benefits produced by hunting (bear and deer)	6	66.7	33.3	-	-	-
Willingness of people to tolerate or co-existence with bears	6	83.3	16.7	-	-	-

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**Table 8.** Combined responses to the statement, “It was important to me personally that the input group focus on this impact” (SA=strongly agree; A=agree; N=neither; D=disagree; SD=strongly disagree).

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<b>It was important to <u>me</u> that the input group focus attention on this impact.</b>	n	SA	A	N	D	SD
Long-term population viability of black bears in New York State (ecological)	8	62.5	37.5	-	-	-
Costs of bear-related damage to agricultural property (economic)	8	25.0	50.0	25.0	-	-
Costs of bear-related damage to non-agricultural, commercial property (economic)	8	25.0	50.0	25.0		-
Costs of apiary damage (economic)	9	22.2	44.4	22.2	11.1	-
Property damage and human safety risks experienced by homeowners (economic, health/safety)	9	22.2	66.7	11.1	-	-
Psychological benefits produced by viewing bears or bear sign (psychological)	9	11.1	55.6	11.1	11.1	11.1
Psychological costs produced by residential problems with bears	5	60.0	40.0	-	-	-
Psychological benefits produced by hunting (bear and deer)	6	50.0	33.3	-	-	-
Willingness of people to tolerate or co-existence with bears	6	66.7	16.7	16.7	-	-

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**Table 9.** Participant assessment of whether SIG processes utilized mechanisms that enhance participants' ability to process information (SA=strongly agree; A=agree; N=neither; D=disagree; SD=strongly disagree).

	n	SA	A	N	D	SD
Communication between participants was clear and understandable.	23	17.4	82.6	-	-	-
Communication between participants and <u>DEC staff</u> was clear and understandable.	23	21.7	78.3	-	-	-
Communication between participants and <u>process facilitators</u> (Cooperative Extension) was clear and understandable.	23	4.4	82.6	4.3	8.7	-
Communication between participants and <u>Cornell University staff</u> was clear and understandable.	23	4.3	73.9	13.0	8.7	-
Everyone in the group had a chance to voice their opinions.	23	39.1	56.5	4.3	-	-
There was ample opportunity to discuss points where people had divergent opinions.	23	26.1	34.8	17.4	17.4	4.3
There was adequate opportunity for open and extensive discussion.	22	18.2	36.4	9.1	31.8	4.5
The process helped us focus on priorities for black bear management.	23	30.4	56.5	8.7	4.3	-
The process included people with diverse opinions on bear management.	23	30.4	56.5	4.3	8.7	-
It was clear to me how DEC intends to use input from the stakeholder group.	23	8.7	52.2	26.1	13.0	-

**Table 10.** Results of semantic differential items on clarity and utility of the impacts concept as described by process facilitators or in the bear management planning framework.

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**As described by process staff, the impacts concept was ...**

	n						
Clear	21	28.6	33.3	28.6	9.5	0	Unclear
Useful for discussion purposes	21	23.8	47.6	19.0	4.8	4.8	Not useful for discussion purposes

**As described in the *Framework* document, the impacts concept was ...**

	n						
Clear	21	28.6	33.3	28.6	9.5	0	Unclear
Useful for discussion purposes	21	33.3	38.1	19.0	4.8	0	Not useful for discussion purposes

---

**Table 11.** Participant self reports about outcomes from SIG process (part I) (SA=strongly agree; A=agree; N=neither; D=disagree; SD=strongly disagree).

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<b>The input group process . . .</b>	n	SA	A	N	D	SD
Increased my understanding of the priority impacts we discussed in our meetings.	23	13.0	65.2	17.4	4.3	-
Helped our group reach a shared vision of the priorities for impact management in the western New York.	23	13.0	65.2	13.0	4.3	-
Improved my understanding of the opinions of the other participants.	23	21.7	65.2	13.0	-	-
Increased my level of trust in DEC as an agency.	23	21.7	34.8	39.1	4.3	-
Gave me insight into the possibilities for managing impacts.	23	13.0	60.9	26.1	-	-
Was an efficient way to get input for DEC decisions about black bear management.	23	26.1	56.5	13.0	4.3	-

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**Table 12.** Participant self reports about outcomes from SIG process (part II) (SA=strongly agree; A=agree; N=neither; D=disagree; SD=strongly disagree).

	n	SA	A	N	D	SD
I learned more about the ways that black bears impact people.	22	9.1	63.6	18.2	4.5	4.5
My <i>group</i> gained insight about the ways that black bears affect people.	22	13.6	68.2	13.6	4.5	-
This process required participants to consider a broader range of viewpoints than they would have otherwise.	22	22.7	72.7	4.5	-	-
This process helped participants form a shared vision of priorities for black bear management.	22	18.2	72.7	4.5	4.5	-
The group considered management <u>problems</u> that I would not have considered otherwise.	22	13.6	54.5	18.2	9.1	4.5
The group considered management <u>action alternatives</u> that I would not have considered otherwise.	22	9.1	50.0	22.7	13.6	4.5
All the impacts that need attention in (your region) were discussed.	22	13.6	45.5	31.8	9.1	-
A broad range of useful solutions were discussed.	22	13.6	63.6	13.6	4.5	4.5
In the process the pros and cons of possible solutions were attended to.	22	9.1	54.5	22.7	13.6	-
The actions that participants suggested to manage key impacts were based on sound arguments.	22	18.2	45.5	27.3	9.1	-

Most participants considered the SIG process a good or very good way to clarify impacts and identify priorities for impact management in local areas (Table 13). However, substantial minorities of participants thought the SIG process was a poor way to identify the best strategies to manage impacts or to design area-specific management plans (Table 13).

## **DISCUSSION**

The multi-step, recursive process of stakeholder engagement reported here led to a number of positive outcomes for the management agency and wildlife management stakeholders. It stimulated articulation of impacts, fundamental objectives, and assumed means-ends connections for black bear management in New York State. Having that information in written form makes it easier for managers to communicate the essence of their bear management program to stakeholders and agency administrators. The information has already been used to support agency decisions that led to a package of proposed bear hunting regulation changes.

Members of the Plan Team believe that the SIG process holds promise as a means to improve their understanding of local stakeholder interests and concerns. Outcome evaluation also suggests that the SIG process holds promise as a means to understand the connections stakeholders' make between management actions and the end states they desire. HDRU staff used insights from the first round of process implementation to refine the process before a fourth implementation (in central New York in 2005). Evaluation results from the 2005 implementation suggest that revisions in process delivery led to increases in the proportion of participants experiencing desired learning outcomes. Regional DEC staff used the SIG process in a three-county area (i.e., Washington, Rensselaer, Columbia counties) in 2006. Staff plan to continue using the SIG process in other regions as needs arise.

**Table 13.** Participant assessment of SIG process as a way to increase understanding of impacts and means to manage impacts.

How would you rate the stakeholder input process on the following:	n	Very poor	poor	good	Very good	Not sure
As a way to clarify how bears impact people in the western New York.	22	-	4.5	45.5	50.0	-
As a way to identify which impacts matter most to people in ... (region).	22	-	4.5	45.5	50.0	-
As a way to stimulate thinking about what might be the best management strategies (means) to achieve desired outcomes (ends) in ... (region).	22	4.5	36.4	59.1	-	-
As a source of input DEC staff can use to set area-specific management objectives and plans of action.	22	4.5	45.5	45.5	4.5	-

The set of impacts described here may be expanded or revised as a result of future input processes. For example, each time the SIG process is implemented, process participants will develop written products and those products will be used as an information source by DEC and any SIGs formed in following years. Each set of stakeholders will benefit from the information about impacts created by their predecessors. Using SIGs should help wildlife managers identify impact management priorities for specific regions, communicate with new stakeholder groups about means-ends relationships, and provide responsive and adaptive management.

Stakeholders who participated in the SIG process reported several learning outcomes consistent with our assumptions about stakeholder engagement and deliberation. Several researchers have reported that well-designed processes for citizen participation in natural

resource management (including black bear management) can contribute to better decisions by increasing stakeholder knowledge and by improving stakeholder attitudes toward other people and management agencies (Guynn and Landry 1997, Lafon 2002, Lafon et al. 2004, Landre and Knuth 1993, McMullin and Nielson 1991, Peek 1998, Stout et al. 1996, Wondolleck and Yaffee 2000). Results of the stakeholder engagement process reported here are generally consistent with those findings. The overall engagement process required wildlife managers and SIG participants to make more thoughtful means-ends connections than they might have if no engagement process had been used. That contributed to learning outcomes that may translate into better, more durable bear management decisions in the future.

We expected SIGs to identify novel impacts and action alternatives. To the contrary, SIG participants identified impacts that fell into well-established categories. Expectations that managers and stakeholders would identify truly novel impacts may have been naïve, given the approach used and the extent of bear managers' experience. Managers entered the process with decades of experience and a great deal of previous public input. Stakeholders were exposed to the managers' list of impacts as an anchor point, which may have limited the potential to identify novel impacts. Managers and stakeholders both identified a broad range of effects. However, the process of defining those as impacts, and then whittling those down to priority impacts, brought us back to a list much like the list of DEC's goals for management.

It also should be noted that some SIG participants had difficulty comprehending the impact concept as presented in 2003 processes. Rowe and Frewer (2005:273) point out that even when technically correct information is provided by content experts, information transfer will be inhibited if process participants fail to understand terms used by process sponsors. If

comprehensibility of the impacts concept was low for some participants, that likely impeded information processing by those participants. Comprehension problems also could have stifled creativity in the impact identification process. Revisions to the SIG process were incorporated in 2004 in an effort to reduce jargon when describing the impacts concept.

SIGs did not lead managers to consider a broader array of action alternatives. However, SIGs did stimulate stakeholders to think more rigorously about familiar action alternatives. The overall engagement process also prompted wildlife managers to think more rigorously about means-ends connections that have been assumed for many years without much critical reflection.

Using a facilitated stakeholder engagement process slowed the process of problem definition and alternative examination. In that sense, a basis for better decision making may have been created even though the decision frame was not broadened.

It is important for managers and stakeholders to articulate linkages between fundamental objectives (ends) for management and the enabling objectives (means) for addressing those fundamental objectives. Creating documents like figures 1-8 has practical importance. Managers who consider a comprehensive and hierarchical set of fundamental objectives are more likely to identify a comprehensive range of enabling objectives and action alternatives. Creating a complete articulation of means-ends relationships can help decision makers create an effective decision-making frame (Keeney 1992:92). Figures 1-8 are offered as a starting point for discussion. DEC staff expect these figures to be revised in many ways as new input is incorporated over time.

Steps in the process of defining impacts unfolded over a long time frame. It is important to note that bear management activity was ongoing even as managers were engaged in a process

of defining impacts. The management agency was making decisions and taking actions all the while. Taking the time to carefully define or refine understanding of impacts wasn't an impediment to program delivery, nor was the process used as an excuse to delay management decisions. The time commitment for bear management situation analysis is likely to move more quickly in future planning cycles.

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