Crafting Effective Solutions to the Large Carnivore Conservation Problem

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Abstract: *How problems are defined and redefined largely dictates how they will (or if they can) be solved, especially complex problems such as the challenge of conserving large carnivores in North America. We describe a practical and comprehensive method for analyzing problems within specific human and ecological contexts and for inventing, evaluating, and selecting solutions. We conducted a problem definition exercise for the large carnivore conservation problem and arrived at five key variables that must be addressed in order to protect these threatened species: cultural history, valuation, ecology, management systems, and the policy process. Our analysis maps the broad dimensions of the problem and identifies areas to be targeted by any successful solution strategy. The method we present and our proposed initial definition of the carnivore conservation problem can serve as a springboard for further analysis and policy making at specific sites and at appropriate scales for on-the-ground solutions to this and other natural resource problems.*

Moldeando Soluciones Efectivas para el Problema de la Conservación de Carnívoros Mayores

Resumen: *La forma en que los problemas son definidos y redifinidos, en gran forma dirigen la manera en que estos serán (de ser posible) resueltos, especialmente problemas complejos como lo es el reto de la conservación de mamíferos mayores en Norte América. Describimos un método práctico y comprensivo para analizar los problemas dentro de un contexto humano y ecológico específico, así como para crear, evaluar y seleccionar soluciones. Realizamos un ejercicio de definición del problema de la conservación de los carnívoros mayores y arribamos a cinco variables que deben ser atendidas para proteger estas especies amenazadas—historia cultural, valuación ecológica, sistemas de manejo y proceso de las políticas. Nuestros análisis crea mapas de las dimensiones generales del problema e identifica áreas a atender con estrategias exitosas. El método que presentamos y nuestra definición inicial del problema de la conservación de los carnívoros puede servir como una plataforma para futuros análisis y la estructuración de políticas en sitios específicos a una escala apropiada para dar soluciones reales a estos y otros problemas relacionados con los recursos naturales.*

Introduction

Large carnivores such as grizzly bears (*Ursus arctos horribilis*), gray wolves (*Canis lupus*), mountain lions (*Puma concolor*), and wolverines (*Gulo gulo*) have been among the most persecuted of all North American animals. Following European settlement more than 300 years ago, these species experienced massive declines (Dunlap 1988). Populations of wolves, Florida panthers (*P. c. coryi*), and grizzly bears have been so decimated in the 48 conterminous United States that they are now protected under the U.S. Endangered Species Act. Other carnivore species such as wolverines and fishers (*Martes pennanti*) have been proposed for protection or are receiving special management attention (e.g., Ruggiero et al. 1994). Concern for large carnivores is also evident in Canada (Hummel & Pettigrew 1991; Paquet & Hackman 1995). Many of the forces that caused carnivores to decline—especially direct and indirect killing and habitat destruction—are still operating today, and if these continue at current levels, large carnivores may cease to exist except in a few wild areas and zoos.

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To design and implement effective carnivore conservation strategies for specific contexts, we need to address the full range of cultural and ecological factors that threaten carnivore survival. This paper introduces a systematic method for defining complex problems. We apply this method to the multifaceted problem of large carnivore conservation in North America and offer recommendations to improve the situation. We hope this analytical approach and general map of the carnivore conservation problem will be applied to many different sites and conservation problems.

Problem Definition as a Problem-Solving Tool

Carnivore conservation is usually discussed in terms of problems that must be overcome. In most instances, the most readily identifiable or proximal "problem" for threatened carnivores is habitat loss and overkilling. Yet this problem is a function of myriad, site-specific human and ecological forces, ranging from market-driven resource extraction to poaching. Thus, it is necessary to map the carnivore conservation problem more completely rather than merely to identify symptoms whose origin and redress remain a mystery. Much has been written in the ecological literature about the challenge of conserving large carnivores. Much has also been published about the concept of problem definition in the literature on problem solving, critical thinking and policy. We combine these fields of research in our approach to mapping the problem and developing conservation strategies for large carnivores.

Problems are commonly understood to be difficult and undesirable situations that require solution. This general understanding is unsatisfactory, however, because it opens many questions: For whom is this situation a problem? Why is it a problem? Where do we begin to solve the problem? Problems can be described or defined in a way that answers these and other questions. A problem definition is "a package of ideas that includes, at least implicitly, an account of the causes and consequences of undesirable circumstances and a theory about how to improve them" (Weiss 1989:97). Problem definition provides a powerful analytical framework that guides, frames, and shapes all subsequent actions.

Many practical problem solvers, including policy analysts, consider problem definition to be the most important step in policy formulation, implementation, and evaluation. Schön (1983, 1987; Schön & Rein 1994) describes two major ways to view problems. First is the traditional, technical-rationalist approach, in which problems are assumed to be "objective" entities that present themselves to the scientist or manager. It is assumed that only one rational understanding of the problem exists, which the problem solver must find and describe in an unbiased manner. This perspective on problems has dominated the field of conservation.

Second is the view taken here that problems are defined by people who view situations based on a certain set of values or beliefs, personal and professional experience, and cognitive and affective perception (Dery 1984). People rarely view problems in similar terms; some may identify a vital problem whose solution will bring clear benefits when others may not even think that a problem exists. Thus, problems are understood not as "objective entities in their own right, but rather as analytic constructs" (Dery 1984:25). Individuals from different professional, organizational, geographic, or economic groups often identify and define problems very differently, even when they are ostensibly considering the same issue (Keller et al.; Mattson et al.; Primm & Clark, this issue). Thus, multiple problem definitions can exist for a given problem, and the task for decision makers and managers is (1) to develop a broad, systematic understanding of the problem and the many constituencies who are framing it; (2) to bring opponents toward a shared problem definition or perspective; (3) to forge an effective, feasible problem-solving strategy; and (4) to implement the strategy successfully.

Lasswell (1971*a*:39) laid out a general strategy for problem solving that undertakes five "intellectual tasks." These activities can be used to guide the process of problem definition. The first task is to clarify the goals of people involved or affected by the problem and its solution. This must be an inclusive exercise so that as many views as possible are considered. It might best be undertaken as a group effort to come to an agreement on the community's fundamental preferences and goals (see Primm, this issue). The second task is to describe the history and trends of the problem. This should include empirical data on the biophysical and cultural context of the problem and relevant processes such as decision making. It is especially important for people to understand who is participating in framing the problem, what values they hope to indulge, their expectations, what leverage and strategies they might bring to bear, and their actions. The third task is to try to understand the relationships of all the factors that have influenced, affected, or caused the problem. The physical, biological, and social sciences are usually employed here. In the conservation arena, recovery plans and similar documents of problem definition have traditionally emphasized the ecological causes of species endangerment. But it should be remembered that fully accounting for conservation problems entails much more than proximal, biological explanations. The fourth task is to project the trajectory, severity, and consequences of future developments. This must be done, of course, in conjunction with the description and explanation of the problem. The final task is the invention, appraisal, and selection of alternatives (Lasswell 1971*b*). The projected developments are compared to the community's goals, and management interventions are creatively designed to make up the discrepancy.

The order of the tasks is somewhat arbitrary, although adequate description of the situation (i.e., tasks one through four) must come before effective solutions can be formulated (i.e., task five) (R. Brunner, personal communication). It is usually necessary to undertake several of the tasks simultaneously and to revisit certain tasks as new information suggests new directions of inquiry and as players or other aspects of the context change. Biases are inevitable—personal, disciplinary, parochial, and organizational (Lasswell 1971*a*)—yet their potentially harmful influence can be minimized through the use of adequate conceptual tools. Successful conservation efforts depend on defining problems usefully by carrying out the five intellectual tasks and minimizing the effects of biases.

We focus attention on the concept of problem definition for one reason: how problems are defined dramatically shapes all subsequent actions or attempts to solve them (Dery 1984; Ascher & Healy 1990). Justification for this "problem orientation" comes from recognition that if a problem is poorly defined, management actions can "intensify rather than ease the original problem(s)" (Brewer & deLeon 1983:32). This comprehensive, systematic approach contrasts with technical-rationalist perspectives that can prevent identification and resolution of the full array of critical issues and biases that typify complex problems (Simon 1985; Clark 1993).

When a community is offered a problem definition or when it is confronted with competing definitions of a problem, people must evaluate them, judge their adequacy, and compare them (Quade 1975; Hogwood & Gunn 1984). Does this definition consider the whole problem? Is it systematic and contextual? Does it account for disciplinary, parochial, organizational, or valuational biases? Does it suggest realistic, practical alternatives for improving the situation? Does it facilitate a systematic analysis of alternatives? Are the objectives and goals to be achieved clear? Does it focus attention on a manageable set of factors, and is it thus meaningful to decision makers? These are some of the criteria that Weiss (1989) suggests for assessing the adequacy of a problem definition and for comparing competing definitions.

Too many public programs, including conservation efforts, accomplish little because they fail to define problems adequately (Ascher & Healy 1990). For example, a biology-biased definition of the large carnivore conservation problem might state that loss and fragmentation of habitat, historic over-killing, and today's cumulative environmental effects are endangering carnivores. Therefore, habitat protection, reduced mortality, and reduced cumulative impacts are the solution. Is such a definition of the problem (and the solution) adequate? In light of the above criteria, we suggest that this definition of the carnivore conservation problem is incomplete. Problem definitions that fail to appreciate the history, science, trends, and socioeconomic, organizational, and political contexts will lead to faltering programs because they are not sufficient to clarify goals, generate practical alternatives, and justify the goals and the selected alternative to the public and to decision and policy makers. Unfortunately, the central role and power of problem definition is little understood in the conservation arena. Agency biologists and managers, university researchers, and nongovernmental conservationists who employ current problem definitions have not always taken advantage of the full spectrum of methods and tools available to them for saving large carnivores.

To be useful in framing a solution, therefore, a problem definition must do more than describe an undesirable situation or even a more desirable alternative. It must also frame the steps necessary to achieve the desired state, and it must indicate if the problem is worth solving (i.e., do the benefits of solving the problem outweigh the costs?). Defining problems is an exercise through which "we learn about what may be achieved and accomplished, about what opportunities for improvement exist, by filtering out, through our values, theories, and a trial-and-error search, what we cannot and do not wish to do" (Dery 1984:26). To promote democratic decision making (democracy being the fundamental premise of the governments of the U.S. and Canada) and to reduce debilitating partisan conflict, the entire process must be as open and participatory as possible (Dryzek 1990; Primm, this issue).

It is important to distinguish problem definition from decision making. In one analyst's metaphor (Simon 1979 as cited in Dery 1984), a problem is like a maze through which the decision maker must find the best path: problem definition is the exercise of mapping the maze, whereas decision making is the actual navigation (successful or not) through the maze. Our analysis of large carnivore conservation in North America maps the broad ecological, social, political, and economic dimensions of the maze and identifies a range of paths. But decision making and the formulation and implementation of policy must be tied closely to actual cases, contexts, sites, and problems. The range of management options generated in each case will reflect the problem definition of the community of people involved, their biases, values, and goals. For cooperative problem solving to occur, participants must ultimately share a broad definition of the problem—the basic outlines of the maze and the array of paths that can be taken.

A Working Definition of the Large Carnivore Conservation Problem

Common Definitions

Before describing our assessment of the large carnivore conservation problem, it is useful to highlight a few ex-

isting problem definitions that indicate how people generally think and act with regard to carnivore conservation. Most recent definitions of the carnivore conservation problem in North America focus on single species and on ecological and management concerns. They rarely address valuational, social, institutional, or other factors that have contributed to the problematic ecological and management situations. For instance, several authors have offered definitions of the Yellowstone grizzly bear conservation problem (or parts of the problem) that differ greatly in their focus and their recommendations for managers. Aside from brief references to the sociopolitical context of grizzly bear conservation, the U.S. Fish and Wildlife Service (1993) defined the problem in terms of ecological variables such as deteriorating habitat and human-induced bear mortally. Mattson and Craighead (1994) and Shaffer (1992) also offered biologically based definitions, although they went further by analyzing how agency management of grizzly bear research and recovery planning figures into the conservation problem. Primm (1993), who focused on the policy context of grizzly conservation, identified a host of biological, political, and organizational factors that have created a context that prevents successful implementation of intended conservation solutions. These several definitions differentially meet the criteria for adequacy of problem definition.

The differences in these problem definitions are especially dramatic in light of the solutions suggested by the various authors. The U.S. Fish and Wildlife Service (1993) emphasized such biological factors as secure and sufficient habitat, but Primm (1993) emphasized political and social factors that he felt must be addressed before habitat preservation could be achieved. By its own admission, the U.S. Fish and Wildlife Service's (1993) recovery efforts alone cannot ensure grizzly conservation over the long term, both because it does not explicitly and systematically address an array of factors identified as essential for understanding and solving the problem, and because the cooperation of many other public and private parties is essential for any successful conservation strategy.

Existing multi-species approaches (Hummel et al. 1992; Noss 1992) generally define the large carnivore conservation problem from the standpoint of conservation biology. Valuational considerations and the socioeconomic context are largely ignored or assumed, as are agency management behavior, organizational structures, social and psychological factors, and policy process dynamics.

Are any of the current single- and multi-species definitions likely to lead to conservation successes? They may, but because they largely fail to take into account key variables and their contexts, it is unlikely that they will solve the carnivore conservation problem in general or at any specific site. Each problem definition will likely compete with others for limited resources, agency commitments, and public and political attention. To foster cooperative problem solving, we advocate a redefinition of the large carnivore conservation problem, and we hope to lay the groundwork for such an effort.

Redefinition of the Problem

We used the problem-solving approach described earlier to analyze the large carnivore conservation problem in North America and to suggest measures for ensuring the long-term survival of free-ranging wild carnivores. We identified five general variables as a basis for understanding the problem in a comprehensive manner and for devising solution strategies (Fig. 1). These variables provide a general explanation of why carnivores have declined in abundance and distribution and why current conservation efforts are inadequate. They are interrelated in complex ways, many unknown and undoubtedly described inadequately by us. By trying to generate alternatives and avoid premature selection of a solution, we sought to move from a "choice situation" to a "problem definition situation" (Maier 1962). Successful problem solving demands that we clarify the nature of the problem and define it usefully before finalizing goals, identifying and choosing alternatives, committing resources, and implementing solutions.

We then identified 33 subvariables to guide formulation of solution-oriented strategies and tactics (Table 1). We defined the subvariables broadly, realizing that they are all interrelated in complex but still largely unknown ways. We argue that this complexity need not be unraveled before proceeding with efforts to improve conservation programs. In fact, the complexity may never be unraveled, and time is short. We recommend focusing on variables and scales that offer feasible avenues of redress, fully recognizing the larger dimensions of the problem. The variables and subvariables we identified can be used to guide thinking and action in particular cases and contexts.

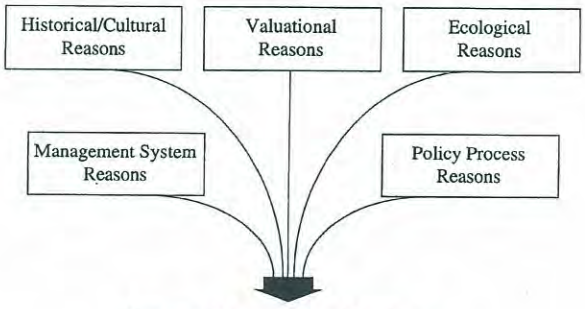

Figure 1. Schematic representation of the five-part problem definition for large carnivore conservation in North America.

Table 1. A generalized list of variables and subvariables to be considered in a contextual problem definition of the large-carnivore conservation problem in North America.*

Category/Variable	
Cultural history	1. Traditional fears and dislikes
	2. Control over nature
	3. Historical and cultural portrayal
	4. Tradition of killing predators
	5. Contemporary competition with humans
	6. Improved killing technology
Valuation	7. Increasing support for carnivore conservation
	8. Varied attitudes, knowledge, and perceptions
	9. Experiences with carnivores, context, and social setting
	10. Symbolism of carnivores
	11. Economic values
	12. Property rights
	13. Difficulty in valuing "fairly" or comprehensively
Ecology	14. Direct and indirect killing
	15. Habitat loss, fragmentation, and insularization
	16. Life-history features
	17. Ecological characteristics
	18. Stochastic factors (demographic, environmental, genetic, catastrophic)
	19. Research and monitoring difficulties and adequacy of scientific models
	20. Cumulative effects
Management systems	21. Agency missions, goals, and cultures
	22. Organizational structures (information flows, communication patterns, etc.)
	23. Individual knowledge, training, and incentives
	24. Operating procedures (coordination, control, leadership, etc.)
	25. Power and authority relationships
	26. Management plans, scales, follow-through
	27. Multiple agency jurisdiction
Policy process	28. Policy prescription and formulation pitfalls
	29. Policy and program implementation pitfalls
	30. Policy and program evaluation, termination and succession pitfalls
	31. Multiple, polarized actors (perspectives, strategies, situations, etc.)
	32. Difficulty of consensus-building processes
	33. Competition between many public policy issues

**Adequate problem definition must account for each of these through description, explanation, and projection of trends. For a copy of a detailed assessment of each subvariable, please contact the authors.*

Cultural History

Fear and persecution of predators dates back many centuries. It can be argued that the Euro-American historical and cultural bias toward eliminating predators has resulted in their rare and declining status. Even a casual study of medieval manuscripts or European mythology illustrates the deep-rooted nature of this fear (Lopez 1978; Kellert 1985*a*). Large carnivores have long been viewed as harbingers of death and a direct threat to human life. Negative feelings have been compounded by the threat carnivores potentially pose to economically important livestock, huntable wildlife, and other land uses (Kellert et al.; Rasker et al., this issue).

The rationale for eradicating predators has been attributed to the Judeo-Christian belief that people have dominion over all of Earth's creatures (White 1973). European settlers in North America brought these negative, dominating attitudes with them and proceeded to tame the wilderness and rid the land of predators. What started as an initially unorganized and opportunistic effort slowly became highly organized, efficient, and entrenched. Bounties were offered for wolves and mountain lions, and, starting early this century, the U.S. and Canadian governments began eradication efforts with predator control programs. Eradication efforts were propelled by technological improvements in traps, firearms, and poisons, as well as economic and government incentives. Controlling avian and mammalian predators was seen (and continues to be seen by some) as a necessity for defending livestock and protecting populations of game species (Dunlap 1988).

Valuation

Large carnivore declines can also be attributed to how the species are valued by society. Valuations of large car-

nivores vary greatly among different socioeconomic, geographic, and demographic groups, depending on their knowledge and perceptions of the species, their attitudes toward the species and related issues (conservation, resource extraction, etc.), their experiences with the species, and the context and social setting of their valuation (Reading 1993; Kellert et al., this issue).

In contrast to those who have held the predominant historic view of predators as dangerous, harmful competitors, significant numbers of North Americans have begun to think in the last few decades that large carnivores should be the focus of conservation rather than eradication efforts (Kellert 1985*b*; Kellert et al., this issue). Antagonistic attitudes toward large carnivores continue to be based on historical and cultural fears; concerns for human safety; beliefs about real or perceived competition with humans for livestock, game, and habitat; concerns over the loss of property rights under conservation legislation (e.g., the U.S. Endangered Species Act); and negative symbolism associated with large carnivores, such as viciousness and ferociousness (Leopold 1949; Kellert 1991; Kellert et al., this issue). In contrast, supportive attitudes toward large carnivores are often based on perceptions of their attractiveness, an appreciation of their intelligence and strength, an affection for nature and animals, an understanding of the ecological role played by large carnivores, moral and ethical beliefs, and positive symbolism associated with large carnivores, such as strength, courage, and endurance (Leopold 1949; Lopez 1978; Rolston 1981, 1985; Kellert 1985*a*; Kellert et al., this issue).

Many of the positive values associated with large carnivores are difficult to quantify using traditional economic measures and therefore generally represent externalities that are usually ignored or undervalued (Bishop 1978; Usher 1986; Rasker & Hackman, this issue). In contrast, many of the negative values, such as the costs of livestock predation or the prevention of certain land uses in conservation zones, are more easily measured and receive more emphasis. Furthermore, the negative impact of individual human activities—for example, one clear-cut or one new tract of homes—on a large carnivore population is often small (Mattson & Craighead 1994), yet the cumulative effect of such impacts can be quite harmful (Noss et al., Weaver et al., Mattson et al., this issue).

Ecology

People commonly point to a number of direct and indirect ecological factors as the reason for carnivore declines. Currently, direct eradication efforts are much less prominent than indirect factors contributing to mortality and declining habitat. People still hunt and trap wolves, mountain lions, bears, and wolverines, but the removal of bounties, the institution of legal protection in some areas, and bans on some poisons in selected areas have reduced the influence of direct, legally sanctioned mortality (although illegal killing still occurs). Mortality now generally results from removal of "problem" animals seen as threats to humans (e.g., grizzlies near campgrounds or roads), traffic or other "incidental" killing (e.g., hunter encounters), declines in prey populations, and escalating alteration of habitat that isolates populations (Noss et al., Weaver et al., Mattson et al., this issue). Many large carnivores are sensitive to human development and legal and illegal (including incidental) killing facilitated by high road densities (Paquet & Hackman 1995; Mattson et al., this issue).

Several life-history and ecological characteristics of large carnivores make them especially susceptible to the damaging effects of deteriorating and fragmented habitat and high rates of incidental mortality (Weaver et al., Noss et al., this issue). Large carnivores have slow reproductive rates, small litters, and relatively delayed sexual maturity (wolves excepted), so their productivity is often far less than required to compensate for mortality rates. Large carnivores have extensive home ranges and require large prey populations, so only vast, relatively intact ecosystems can support top-level carnivores (Shaffer 1992).

A further complicating factor is that the ecology of some carnivore species is insufficiently understood for effective conservation (Weaver et al., this issue). The low densities, secretive behavior, and long generation interval of most large carnivores make them difficult and expensive to study. Conservation and management are also stymied by inadequate scientific models. Even when we have representative data, we often cannot answer key management questions because our models are unable to address the complex mix of variables believed to affect carnivore populations (Mattson et al., this issue).

Management Systems

It can be argued that many large carnivore populations continue to decline because management systems, especially those of government agencies, have inappropriate structures, designs, incentives, leadership, communication patterns, individual and group performance, feedback, and organizational learning mechanisms.

State, provincial, and national agencies responsible for managing large carnivores have a number of characteristics that limit their individual and collective abilities to meet conservation challenges (Yaffee 1994). Hierarchical bureaucratic structures and management orthodoxy can create delays, rigidity, timidity, and difficulty in situations that are novel, uncertain, urgent, and complex (Kanter 1983; Clark et al. 1989)—which is clearly characteristic of the carnivore conservation situation. Legal,

structural, cultural, and technological frameworks differ greatly. The management process for which agencies are responsible includes acquiring and processing key information and developing and implementing detailed management plans, even though key information is often absent.

There is often a discrepancy between formal, mandated policy and actual on-the-ground policy, in part because agencies generally have ill-defined, multiple, or conflicting goals derived from a variety of legal mandates (for example, one goal may be to maximize big-game populations, yet another goal may be to preserve endangered predators that prey on these same game species) (Yaffee 1982, 1994; Bixby 1991; Mattson & Craighead 1994). Resulting programs lack proper integration and direction because of inadequate leadership and limited expertise. Without clear management targets, it is almost impossible to evaluate the efficacy of management efforts, which in turn precludes improvement (Brewer & deLeon 1983).

Incentives for individuals within an agency may not be linked to management efficacy, so personal, professional, and organizational agendas have a large influence on management actions (Brewer & deLeon 1983). In addition, most managers receive training inadequate to the complex tasks they face (Orr 1990; Clark 1993). Traditional training and management focus on biological and technical considerations and temporal and spatial scales that have sociopolitical rather than ecological meaning.

In addition, most ecosystems large enough to support large carnivores are managed by several different state, provincial, and national land and wildlife management agencies as well as myriad private landowners (Keiter & Locke, this issue). Each agency operates under different legislative mandates, histories, and standard operating procedures, which limits or precludes exchange of information and expertise, open communication, joint decision making, and other mechanisms required for true cooperation at macro-system levels. Evaluation of conservation achievements and consequent adjustments in performance are not facilitated by incomplete information and ill-defined or conflicting goals (Clark et al. 1991; Grumbine 1992; Clark & Minta 1994). Furthermore, agency structures and cultures do not effectively address complex, polarized policy environments made up of numerous competing constituents (Warwick 1975; Primm, Primm & Clark, this issue).

Policy Process

Large carnivore declines can also be attributed to a weak or faulty policy process that results in inadequate problem definitions, policy prescriptions, implementation, and evaluation. With many diverse actors in and out of government involved in the policy process at ecosystem and international scales, formulating policy that ensures large carnivore conservation is problematic (Primm & Clark, this issue). Policy is usually the result of a complex mix of competing interests, often resulting in policies that are antithetical or at least inadequate to many conservation challenges. Often there is no consensus among participants regarding "the common good," and different values and scales are employed. The policy process does not perform optimally for any one goal such as carnivore conservation (Primm, this issue). It consists of several phases, all of which offer numerous opportunities for conservation goals to be derailed (Brewer & deLeon 1983; Ascher & Healy 1990). Typical weaknesses include inappropriate or incomplete characterization of the problem, delayed expert consultation, overly optimistic analysis, biases in expertise, the predominance of expert opinion over public concerns, competing directives, performance incentives that may not be wholly tied to successful policy implementation, goal inversion or subversion, and insufficient monitoring and evaluation.

Given the complex, politicized, and technical nature of conservation problems, the policy process rarely solves problems in an equitable, effective, or efficient manner (Brewer & deLeon 1983; Ascher & Healy 1990). If conservationists, managers, researchers, and concerned citizens possessed an explicit understanding of the policy process and how to participate in it most constructively, it would improve the odds of achieving more accommodating policies for large carnivore conservation. Without this kind of knowledge and sophistication, the policy process will continue to be dominated by short-term rationality, self-interest, competition, and fragmented solution seeking.

Using Problem Definition to Design Successful Conservation Strategies

Everyone defines—consciously or unconsciously, professionally or casually, adequately or incompletely. Many of the controversies in the conservation arena center on the question "What is the problem?" The best problem definitions accomplish two things: they minimize social contention so that progress can be made, and they save threatened species and ecosystems. Devising adequate problem definitions requires some understanding of the standards of adequacy and of the function of problem definition in policy making.

Our five-part definition of the large carnivore conservation problem is a useful first step because it offers a relatively comprehensive map for effective action. Our problem definition draws attention to a broader array of variables than is commonly considered in carnivore conservation. It identifies five general variables and many subvariables that we believe are pertinent to nearly all large carnivore cases. We believe that this effort can give participants in conservation programs a better apprecia-

tion of policy making and their role in it. This analysis does not, however, clarify or set community goals, nor does it offer alternatives to solve the large carnivore conservation problem. These steps must be taken within specific contexts in real situations. Lasswell's five intellectual tasks for problem solving can guide and frame case-specific efforts by providing a method for adequate problem definition for carnivore conservation. This strategy makes people more conscious of what they are actually doing when they set out to solve problems.

The next step is for participants in carnivore conservation efforts to undertake specific problem definitions at meaningful scales. A scale that is too large (encompassing too many species over too large an area over too many years) is unworkable; one that is too small (a subpopulation in a highly localized context) accomplishes little toward the ultimate goal. We need to avoid the hit-and-miss analysis, incomplete problem identification, and incremental, piecemeal policy implementation that have characterized natural resource management. Programs can be realistically formulated and implemented only when they address the special cultural and biophysical contexts of potential conservation areas.

Problems are best defined as a team activity by people with varied, complementary knowledge (Primm & Clark, this issue). Biases must be recognized, and domination by single organizations, interests, or disciplines must be avoided. The process should be open and focused on the task. It should result in fairly clear goals, feasible alternatives, and useful tactics. A multiplicity of methods can be used to gain knowledge about the problem, its causes, consequences, trends, and alternative solutions, as well as people's goals for the situation. Population viability assessments, for instance, can help in developing alternatives by modeling the outcomes of various management interventions (Lindenmayer et al. 1993). Decision analyses, risk assessments, social surveys, economic assessments, and implementation analyses are among the many other useful approaches (Maguire et al. 1990; Maguire 1991).

Once the problem has been adequately defined, decisions about alternatives must be made. To recall the metaphor we used earlier, once the mapping exercise is largely completed, progress toward the chosen destination must be navigated. Problem definition continues to affect the social processes of choosing, implementing, and evaluating alternatives. A good problem definition will take into account the interests of all concerned people, those whose lives are affected by the problem or the solution and those who must implement the selected alternative. Ideally, the process of problem definition will have built a strong consensus so that people have a stake in its success and will work to support it.

But problem definition is an ongoing process that can and should be revisited throughout the lifetime of a conservation program. One recurring criticism of recovery plans, which usually constitute the major characterization of the prevailing problem definition, is that they are seldom revised to reflect the changing status of the problem and our understanding of it. Static recovery and management plans facilitate overly rigid, pre-planned implementation. Monitoring and evaluation should be a continual effort leading to updated, responsive problem definitions (Mattson et al., this issue).

Conclusions

Improving the process of problem definition is a means to move toward more effective conservation of the larger North American carnivores. Increased attention to problem definition has utility that extends to many natural resource issues, although carnivore conservation provides a particularly powerful illustration because of its complex, emotional, and polemic nature. Greater consensus on the fundamental problem would significantly improve the prospects for large carnivores.

Because many people tend to be solution-oriented rather than problem-oriented, insufficient time and effort is given to in-depth, comprehensive analysis of problems as a prelude to carrying out effective solutions in the field. Problem definition should be viewed as the key analytic and technical tool for developing effective, practical solutions to carnivore conservation. We hope that our broad, five-part problem definition, which focuses on cultural history, valuation, ecology, management systems, and the policy process, provides a framework for viewing and assessing the large carnivore conservation problem practically. Continual refinement of this definition, coupled with simultaneous efforts to address more tractable subvariables on technically practical and politically feasible scales, promises to improve carnivore conservation efforts greatly.

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