Solving Problems in Endangered Species Conservation: An Introduction to Problem Orientation

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Abstract

Addressing endangered species problems successfully is a complex task that involves knowledge of the problem itself and its context. This paper is the fifth in an ongoing series in the Endangered Species UPDATE aimed at improving knowledge and analytical skills in endangered species conservation (Clark et al. 1992; Clark and Brunner 1996; Clark and Wallace 1998; 1999). In endangered species programs, problem-solving decisions and on-the-ground management are complicated and affected by numerous considerations. We illustrate complexities of problem solving in endangered species programs, using the Florida manatee recovery program as an example, and describe a practical approach for analyzing problems in endangered species conservation. This problem oriented approach to decision making can help researchers, managers, analysts, other professionals, and interested people to better understand and develop recovery alternatives that are in the best interests of endangered species conservation.

Introduction

Endangered species conservation is crisis-oriented. Often, a field season is too short, interagency conflict threatens to stall efforts, or a program is held back by a puzzling technical problem, an impending budgetary shortfall, or a public outcry. These and many other problems must be overcome in recovery efforts. Viewing recovery as a series of interrelated problems that must be successfully addressed requires professionals and other people involved to be "problem oriented" in their outlook and actions. Because of the atmosphere of crisis that accompanies recovery efforts, decision making in both the field and office can occur that is often not problem oriented. Decision makers, for example, may choose the one "conservation" alternative that is most appealing or expedient at the moment. This may be the alternative that casts them in the best possible light, produces the least number of conflicts, or otherwise allows them to feel best about themselves or their work (Ascher and Healy 1990).

We call this sort of decision making "solution oriented." It occurs when an individual or group is confronted with a problem and first decides which outcome is preferable and then makes a decision that will best achieve their preferred outcome. Often this approach is based on a limited view of the problem at hand. Instead of being genuinely "problem oriented," the effort is focused and "solution oriented," and decisions are made for purposes other than efficient species recovery. In this paper, we examine the problem oriented approach in general terms, describe its features and benefits, and illustrate its practical utility to endangered species conservation.

What are "problems?"

There are many ways to define a problem–all related to who develops the definitions (Weiss 1989). Analysts, legislators, lobbyists, advocates, scientists, managers, and the general public may have different views of an endangered species problem. In this article we focus mainly on the behavior of federal and state agency staff involved in species recovery–especially those in positions of decision making authority.

Decision makers in endangered species programs are no different than decision makers elsewhere–they commonly choose to pursue solutions to problems that benefit them personally or professionally. As Janis and Mann (1977) note, "self-approval is an essential requirement for being satisfied with a decision." This, however, is not always the best way to address endangered species problems. By relying too heavily on personal fulfillment criteria, alternatives that better address the recovery problem are often overlooked or ignored. What is best for the decision maker is often not best for addressing the conservation problem. Some decision makers fail to recognize this

point and, as a result, decision making is less effective than it otherwise could be. When this kind of problem includes decisions critical to the conservation of endangered species, the difference can be substantial and have significant long-term, and perhaps even catastrophic, effects on the recovery of the species.

Generally speaking, what is a problem? Problems result from the discrepancy between a desired outcome and the outcome that actually occurs (Dery 1984; Kilmann and Mitroff 1979; Merton 1966). For example, consider a federal or state agency that reintroduces an endangered species into currently unoccupied habitat to establish a new and eventually viable population. Once the species is reintroduced into the unoccupied habitat, however, it suffers nearly 100 percent mortality due to various factors. The discrepancy between the desired outcome (establishing a new viable population) and the actual outcome (near 100% mortality of the introduced species) is the problem. To address this problem, the agency's staff has a number of approaches they can take. If they are solution oriented, they may choose an alternative that addresses the problem as quickly and easily as possible, such as attempting another reintroduction regardless of the reasons for the failure of the initial reintroduction. Using a solution oriented frame of reference to endangered species conservation tends to recycle a misconceived conservation problem over and over in ways that consistently fail. For example, this is what actually happened in the endangered black-footed ferret (*Mustela nigripes*) case in Wyoming (Miller et al. 1996; Clark 1997). If participants' desire to carry out reintroduction is strong enough and they wish to save face, to not be considered a failure, or to accomplish an important scientific success, they may collect selected data that indicate that the near 100% mortality rate was caused by factors that are not likely to be repeated again, and thus rationalize attempting another reintroduction. The focus is on a single alternative, not on understanding the actual problem at hand, including the possibility that their own solution oriented approach may be a problem as well.

We believe that a better approach to conservation is to be problem oriented. We recommend adopting a strategy of understanding the problem, including its context, rather than focusing on the most desirable technical solution. This approach offers a range of practical alternatives for addressing conservation problems in clearer and more realistic terms, and can result in more effective decision making for endangered species conservation. It is also an approach in which action can take place despite underlying and potentially substantial scientific uncertainty.

In endangered species conservation, science, management, and policy, decision making is often disconnected and in some cases polarized. That is, different participants are often responsible for each of these three areas, and the strategies used to make decisions in each area are often different and in some cases diametrically opposed. For example, consider a hypothetical endangered species. For our purposes, the problem at hand is the species' decline. Conservation of the species requires further research, management actions to protect it and its habitat, and policy decisions to promote the continuation of its recovery program. For this species at a given point in time, a research decision may be made on the basis of what data are needed for its recovery, whereas a management decision might be made on the basis of who will need to be consulted before an action can be taken. A policy decision, such as which aspects of the program to cut or continue, might be made on the basis of how large a budget can be realistically hoped for in the next funding cycle. A specific outcome of each of these three decisions might be necessary to further the recovery of the species, but there is often no common basis to tie these decisions together–no unifying, integrative problem oriented approach to the species' recovery. In fact, the research decision might be made on the basis of interests and skills of the lead researcher. The management decision might be made on the basis of a decision maker's desire to avoid consulting with a disliked person or agency, and the policy decision might be made on the basis of how hard a decision maker is willing to battle superiors for increased funding. Decisions made on these bases are solution oriented and rarely benefit species conservation. Unfortunately, the opportunity to be genuinely problem oriented may not exist or be possible in such settings.

Five tasks of problem orientation

To carry out sound integrated research, management, and policy, and to avoid a solution oriented approach, Harold Lasswell (1971) proposed a strategy for problem solving that consists of five tasks: clarifying goals, describing trends, analyzing conditions, projecting developments, and inventing, evaluating, and selecting alternatives (Table 1). We recommend that this approach be used in endangered species conservation, though it is applicable to any kind of problem, conservation or otherwise.

The five tasks direct individuals to ask questions and seek out information in a fashion conducive to learning as much as possible about a conservation problem before making a decision to address it. This approach has been described and used on large carnivore conservation in the

Table 1. The following outlines one of several different ways to use problem orientation to address problems (after Brunner, pers. comm.; Clark 1997).

Problem-Oriented Exercise

1. **Goals**. What outcomes do we prefer? What are the problems with respect to these goals?
   Problems are discrepancies between desired outcomes and the outcomes that actually occur.

2. **Alternatives**. What alternatives are available to the participants and others to solve the problems?

3. **Evaluation of alternatives**: Would each contribute toward solution of the problems or not?
   a. **Trends**: Did it work or not work when tried in the past on relevant occasions?
   b. **Conditions**: Why, or under what conditions, does it work or not work?
   c. **Projections**: Would it work satisfactorily under these conditions?

Repeat the procedure to refine and supplement considerations of goals, alternatives, and evaluation so far.

northern Rocky Mountains of the United States and Canada (Clark et al. 1996), in appraising threatened species conservation in Australia (Clark 1996), and in selected endangered species cases in the United States (e.g., Clark 1997). Most recovery efforts attend to several of these five tasks in varying degrees and with varying levels of success. We describe each of the tasks briefly.

Clarifying goals

"The goal-clarifying task is indicated by the blunt question, 'What ought I to prefer?'" (Lasswell 1971). Because the endangered species problem occurs in a context (e.g., the structure of a recovery program or the dynamics of interagency or interoffice relations), it is vital to always keep an eye on the problem and its context. This goal question is best answered for a given endangered species problem after considering the problem's context or social process (Clark and Wallace 1998). Considering the social process means analyzing a particular problem or situation using several indicators. These include: (1) the actual or desired participants involved, (2) their various perspectives on the issue, (3) in what situations they interact or might interact, (4) what values (or assets or resources) they use in their efforts to achieve their goals, (5) what actions or strategies they use to achieve their goals, (6) what outcomes they will or might achieve, and (7) what the real and potential effects of their actions are (Clark and Wallace 1998 after Lasswell 1971; Willard and Norchi 1993). Once these factors have been considered, it becomes much easier to determine the costs and benefits of desired goals while aiming to reduce uncertainty and the potential to introduce further problems into the decision making process. Social process mapping should continue over the life of the recovery effort.

Describing (historical) trends

Describing trends means finding out how the species and its habitat are doing and also which participants and perspectives in the species conservation effort have met or fallen short of goals in the actions they have taken (Lasswell and McDougal 1992). "The immediate aim is to suggest that much can be accomplished in a problem-solving strategy that gives full weight to asking and answering the questions, 'Where are we? How far have we come in achieving what we are aiming at? Where are the positive and negative instances of success or failure?'" (Lasswell 1971). Answering these questions further clarifies the reasons that actions are taken and that certain outcomes result. It is important, however, to do so for each technical component as well as each participant in the recovery effort. It is also important to understand how the other facets of the social process outlined above pertain to how well the overall program is meeting goals.

Analyzing conditions

For each of the trends identified about the species and its habitat and its human context there is a set of conditions influencing it. In order to understand trends in the species' numbers or habitat quality or whether participants have met or fallen short of goals it is necessary to analyze the factors that account for those trends. This task focuses on scientific inquiry, not only of endangered species biology, but also of human and organizational behavior and policy preferences in the social process.

Making projections

The fourth task involves making projections about what will likely happen given past trends and conditions. In part, this task demands that we suspend our beliefs and conventional views of what actions participants might take in the future. Instead it asks that we take a current situation and project it, free of the effects of possible future actions, to its likely outcome. For example, if current legislation severely reduces an agency budget for species recovery, the projected outcome is likely bleak. This example simply illustrates that by projecting current circumstances into future outcomes, we gain better insight into how those circumstances

will affect the conservation problems at hand. Such projections also indicate where interventions or other alternatives are needed to address the problem and produce acceptable future outcomes. In our budget example, given that the species will decline without adequate funds, two alternatives include increasing the budget of the hamstrung agency or transferring authority for species recovery to an agency with better funding. The other part of making projections is to try to foresee the consequences of choosing certain alternatives.

Inventing, evaluating, and selecting alternatives

This task calls for creating, reviewing, and choosing objectives and strategies for achieving them. In other words, what approaches do we use to realize the goals we set for endangered species conservation? What are the alternatives we will undertake to change conditions so that future trends will be favorable for the species and the human system involved? On the basis of all that we have learned about a given problem in the four previous tasks, what decisions should we make to reach our preferred goal?

In endangered species conservation these five tasks must be carried out to some extent over and over again over the lifetime of the program. For example, a detailed look at historical trends might force some endangered species program participants to return to and reformulate their goals. At every point in carrying out the five problem orientation tasks, problem solvers may be required to return to earlier tasks. The following case illustrates the importance of problem orientation in endangered species decision making.

Mass mortality, contingency planning, and the Florida manatee

Early in 1982, 39 Florida manatees (*Trichechus manatus latirostris*) died due to what is believed to have been the effects of a toxin caused by a dinoflagellate commonly associated with red tide in Florida (O'Shea et al. 1991). Although it was not the first time red tide was a suspected cause of manatee mortality (Layne 1965), it was the first such die-off to occur after the development of a formal Florida manatee recovery program under the Endangered Species Act (ESA).

The Florida manatee was listed as endangered under the ESA upon its passage in 1973, and is also protected under the Marine Mammal Protection Act of 1972. The first recovery plan for the species was adopted in 1980 along with a comprehensive work plan to coordinate interagency implementation of the recovery plan (U.S. Fish and Wildlife Service 1980; Rose et al. 1981). The original plans did not specify measures to be taken in preparation for a die-off. Following the 1982 die-off, calls were made for the U.S. Fish and Wildlife Service (FWS) and the Florida Department of Natural Resources (FDNR, now the Florida Department of Environmental Protection [FDEP]) to develop a contingency plan to address preparations for and actions necessary to respond to another die off. At the time, FWS and FDNR represented the lead federal and state research and management authorities in the manatee recovery program.

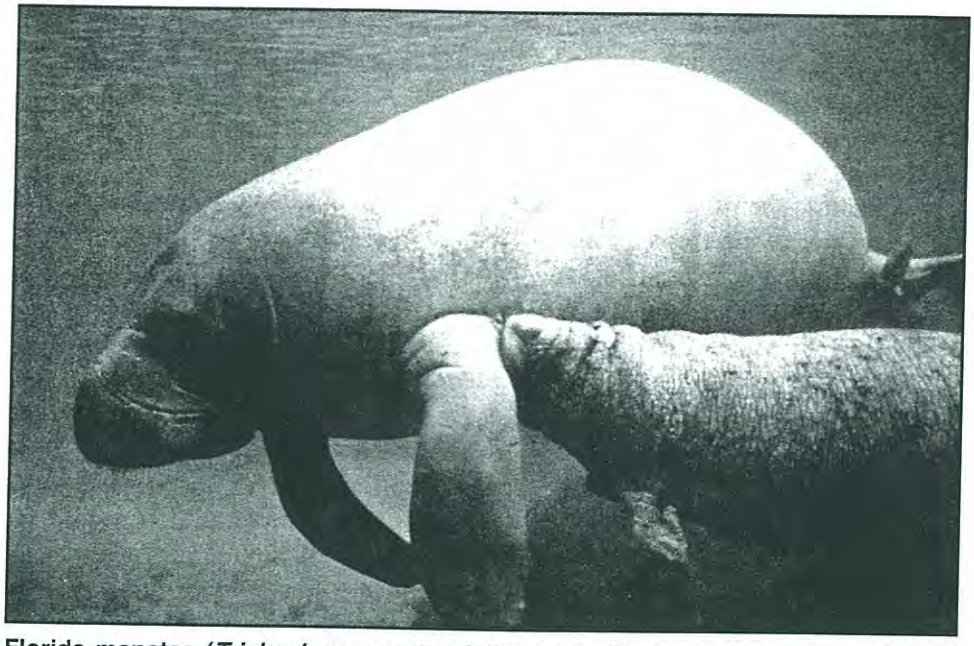
In 1988, FWS convened a new Florida manatee recovery team and charged it with revising the recovery plan, which it did in 1989 (FWS 1989). By 1988, no contingency plan had been developed. As a result, the recovery team considered developing a contingency plan for responding to future die-offs to be among the highest priorities in manatee recovery. Subsequently, the revised recovery plan specified that FWS and FDNR should complete the contingency plan by January of 1990. When that date passed, researchers involved in the 1982 event reiterated the need for a contingency plan (O'Shea et al. 1991).

According to FWS staff, after the release of the revised recovery plan, FDNR staff were given initial responsibility for drafting the contingency plan. Not having prepared anything by 1992, they asked FWS to prepare it. FWS agreed, but got no farther than preparing an outline, which was subsequently shelved when other issues that FWS considered more pressing took precedence. As a result, when another red tide-related die-off occurred in 1996, there was no contingency plan and the response, in terms of coordination and cooperation among key participants, was chaotic.

The 1996 die-off lasted approximately two months, from early March into May, and resulted in the deaths of 149 manatees (Florida Marine Research Institute 1996; Marine Mammal Commission 1998). Early in the die-off, multiple manatee carcasses were being recovered every day, creating an unprecedented workload for an experienced team of scientists schooled in manatee carcass salvage, pathology and epidemiology, contaminants, and other areas necessary to respond to a die-off. The response illustrated both the exceptional technical capabilities of participants in the manatee recovery program and the inability of those participants to address a die-off of such magnitude unprepared. Problems that may have been minor during times of low manatee mortality were substantially magnified by the frenzied atmosphere of the die-off response. Issues concerning personality conflicts, the chain of command, communication among participants (particularly between agencies) and with the media, coordination of response tasks, taking and handling of tissue samples, and distribution of data, among others, became major stumbling blocks to a

smooth response.

Virtually all of the problems experienced by participants in the response were attributable either directly or indirectly to the lack of a contingency plan (Marine Mammal Commission 1997). This was noted by many participants in the response, as well as independent reviewers (Marine Mammal Commission 1996 & 1997; Work 1996). By April 1997, FWS answered its critics by completing a contingency plan (FWS 1997). This plan, however, did not sufficiently address FDEP's involvement or the steps necessary to convene and coordinate an interagency team to respond to future die-offs. As a result, FDEP contracted to have its own contingency plan developed by the end of the year (Geraci and Lounsbery 1997). Soon after, FDEP suggested to FWS that it combine the two plans, and FWS agreed to do so (FDEP 1997; FWS 1998). At present, the combined contingency plans are expected jointly from FWS and FDEP.



Florida manatee (*Trichechus manatus latirostris*). Photograph courtesy of the Department of Defense.

Problem orientation in the Florida manatee case

Mass mortality of manatees is a crisis that triggers the need to quickly mobilize and organize numerous experts located in different places, responsible for different tasks, and answerable to different mandates, superiors, and budgetary constraints. The initial and overriding goal of a manatee die-off response is to efficiently and effectively coordinate and carry out the response, including determining the cause and doing whatever is possible to mitigate it. In 1996 the discrepancy between that goal and what actually occurred created the problem–the response was poorly coordinated and, as a result, aspects of it were poorly carried out. Participants and observers noted trends–a technically proficient but organizationally poor response to the 1996 die-off. They also noted the conditions underlying those trends: participants in the die-off response were able to fall back on their substantial technical knowledge, but suffered from lacking organizational skills.

Following the die-off, in response to these trends and conditions participants and observers projected possible scenarios based on whether the goal (an efficient and effectively implemented response) would be met in the future. That is, what would happen in the event of another die-off if there (1) was still no contingency plan, or (2) was a comprehensive contingency plan in place. Alternatives flow logically from these projections. In this case, the one obvious alternative to be pursued was to ensure that a contingency plan was produced. Everyone involved in the die-off response recognized this, and many pressured FWS to undertake the job in a timely fashion, which it did. FDEP, independent of FWS, then developed its own plan to address deficiencies in the FWS plan.

Obviously, neither FWS nor FDEP completed a contingency plan prior to the 1996 die-off. It took a crisis, and its associated wake-up call, to provoke action. After the 1982 manatee die-off, analysis of the trends and conditions surrounding the die-off and the response to it by recovery program participants and observers led to the formation of a goal. That goal was to develop a contingency plan, and it was even formalized in the Florida manatee recovery plan. The fact that it did not happen until after a second, more severe die-off occurred illustrates how difficult it can be to successfully perform the five tasks of problem orientation given real contexts, even when addressing a well-defined problem.

As in many other endangered species programs, in the manatee recovery program FWS and FDEP are constantly challenged to assess trends and conditions, set goals, make projections, and evaluate alternatives to address numerous problems. The Florida manatee recovery program is complex–there are more than 20 state and federal agencies and non-governmental organizations given formal responsibility for implementing recovery tasks in the most recent recovery plan revision (FWS 1996). Additionally, the manatee's principal

threats include collisions with motor boats (of which there are more than 750,000 registered in Florida) and loss or degradation of their habitat due to coastal development (of which there is a great deal in Florida). The recovery program's bureaucratic complexity combined with the exacting demands of mitigating manatee mortality and habitat loss leads to a "brush fire" mentality in which long-range planning in the regulatory agencies takes a back seat to a crisis-a-day atmosphere.

Excessive workload is not an excuse for the agencies' failure to develop a contingency plan prior to the 1996 die-off. Rather, it is an illustration of the difficulties encountered in problem orientation. For any given problem, it is necessary to undertake the five problem orientation tasks. When confronted with multiple problems every day in which trends, conditions, goals, projections, and alternatives must be weighed, it can be difficult to keep up with the intellectual and practical demands. It is in these instances when practitioners may become solution oriented and skip certain tasks, particularly making projections and considering alternatives, to make decisions based on personal interest.

In the case of the manatee die-off contingency plan, the decision not to prepare such a plan even after it was mandated in the 1989 recovery plan was not malicious. Rather, it was the result of a solution orientation in which it was easier to bypass the problem orientation tasks than to undertake them in a hypothetical situation (the possible occurrence of another manatee die-off). It can be very difficult to project potential consequences of a given decision. Following the 1982 die-off, however, by considering the complexities of die-off response, the possibility of contending with a much larger die-off in the future, and the many people and actions that would need to be coordinated, the organizational shortcomings of the 1996 die-off could have been projected. Had FWS staff taken a little time to conduct the problem orientation tasks, they might have recognized the benefits of developing a contingency plan and taken action sooner.

Conclusions

In endangered species conservation, it is critically important to address each of the five problem orientation tasks in every conceivable situation practicable. The benefit of problem orientation, regardless of who undertakes it, is to better understand the problem or decision and its context. This may sound like a call for a lot of time-consuming academic effort for a crisis-oriented field in which time is always at a premium. The problem orientation tasks, however, can be conducted quickly; they do not have to be time-consuming, merely an honest attempt to place in context facts, options, and potential consequences of a decision. It makes sense to gain as broad an understanding as possible of the context of a problem before addressing it. Problem orientation helps this process, and in so doing improves the scope of knowledge available to the decision maker, clarifying which alternatives will best achieve the goals of conservation. We have illustrated how problem orientation can be used to improve decision making and actions for endangered species conservation. Using the approach we propose will help anyone interested in practical endangered species conservation to gain a better understanding of the issues they wish to address.

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