

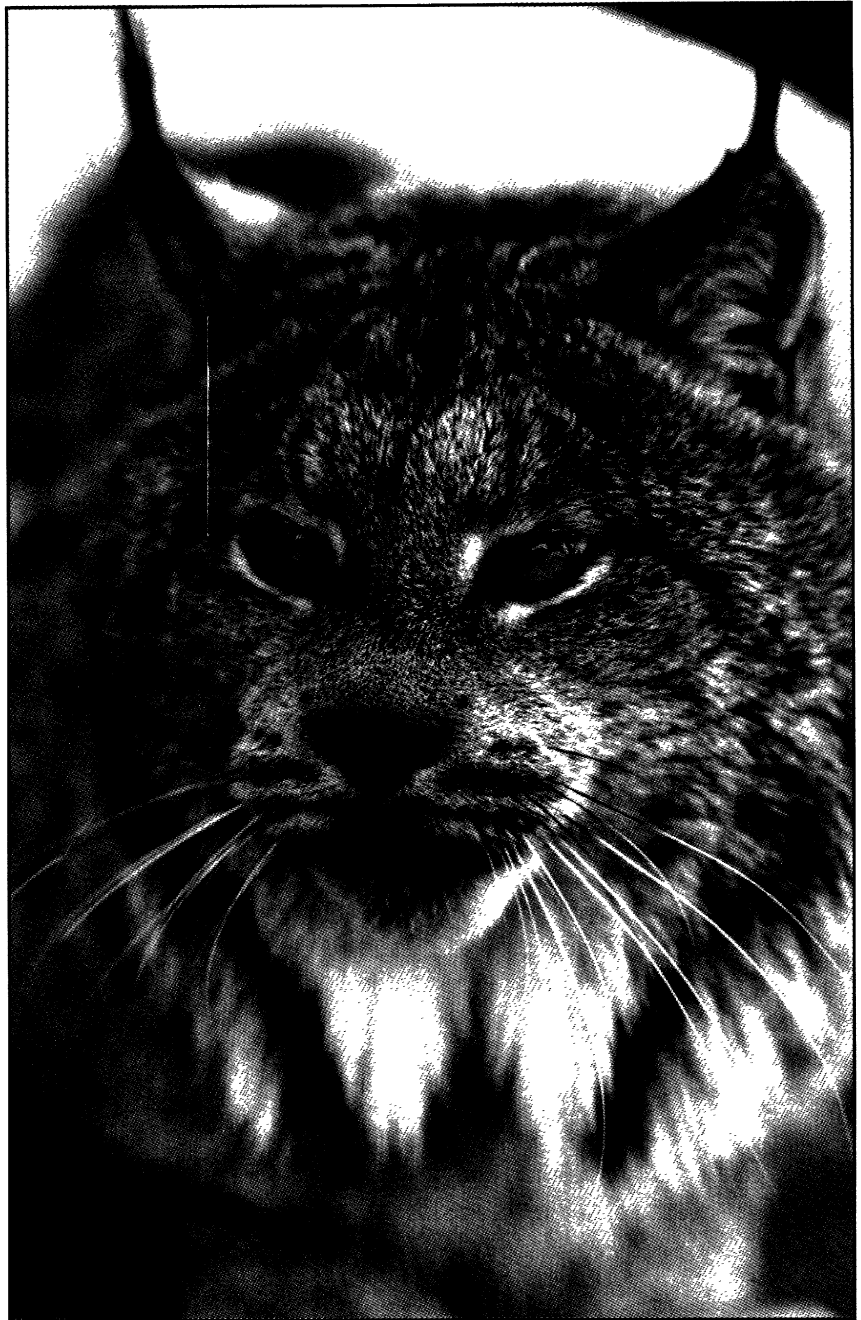
# Endangered Species UPDATE

*Including a complimentary copy of the  
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**School of Natural Resources and Environment  
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Insert: November/December 1998 U.S. Fish and Wildlife Service Endangered Species Bulletin

# Jinxed Lynx? Some Very Difficult Questions with Few Simple Answers

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In Colorado, Canadian lynx (*Lynx canadensis*) have recently been reintroduced to areas where they once roamed. This highly controversial project brings to light some concerns about reintroduction efforts and humans' role in trying to control nature. Critics believe that it's hurried and ill-planned. Colorado represents the southernmost portion of the lynx's historical range. Lynx will be taken from Canada and, according to a wildlife manager (public meeting, October 1, 1998) in the Colorado Division of Wildlife (DOW), they'll be "dumped out" into a rather different ecosystem in Colorado with an expectation of at least 50% mortality, some due to starvation. John Seidel (DOW) views the reintroduction as "an experiment of sorts" (Boulder Camera, January 10, 1999). In the same article, Dale Reed (DOW) agrees that Colorado's plans are a gamble because of the possibility that there won't be enough food for translocated animals. Should such experiments be conducted with such poor odds of success?

The reintroduction of lynx is justified by some people because the animals "will be killed anyway by trappers." This reasoning simply buys into a system that supports animal exploitation. Just because animals might be killed in one way doesn't justify killing them in other ways. Conservationists (and others) would be well-advised to think of better reasons to undertake reintroduction projects. Furthermore, additional lynx likely will have to be trapped in Canada to meet the demand for pelts. Thus, in addition to the death of translocated lynx, others

will die to replace them. On January 5, 1999, a local news program showed lynx who were going to be translocated to Colorado struggling violently with trappers. Some trapping is being done by inexperienced trappers and lynx are escaping from traps. These facts raise numerous practical and ethical concerns.

The importance of blending rigorous science and public support in reintroduction programs can't be emphasized too strongly. It's necessary to know if lynx show enough behavioral flexibility to allow them to adapt to ecosystems differing in climate, vegetation, and food resources. It's also essential that suitable habitat be protected indefinitely. Lynx are difficult to reintroduce in the best of conditions. A well-planned effort in New York State was unsuccessful and Swiss biologists have been working for years on a similar project.

It's unethical and disingenuous to perform reintroduction experiments when it's believed at the start that half the animals will die. It's also unethical to undertake reintroduction programs simply to prevent species from being listed as endangered or threatened under the Endangered Species Act (ESA). When the ESA is invoked, local control over land use (for example) is trumped by federal control, and some people understandably want to keep the federal government out of local concerns. One way to keep the federal government out is to attempt to reintroduce animals to keep their numbers up. In Colorado, Mr. Seidel (*Clawmark*, 1998, volume 1) noted "If we don't begin work on

this reintroduction, the federal government will take the lead within the next several years." Indeed, action by the Federal government could occur as soon as June 1999. Along the same lines, in an article in the Bozeman (Montana) Daily Chronicle (September 12, 1998) concerning the reintroduction of lynx into Idaho, it's noted that "Idaho officials acknowledge granting permission to relocate lynx is partly an effort to block possible Endangered Species Act restrictions in the state."

Needless to say, I wish these programs and all animals well, but rushing into reintroduction efforts because of political and other pressures is ill-advised. Moving slowly and carefully is essential. Let's hope the lynx aren't jinxed from the start.

## Is more better?

Reintroduction programs also raise other questions. For example, it's not clear that species preservation and conservation *have* to be valued, why "more is better," why biodiversity should be conserved, or if we can improve nature. With rare exceptions, carnivore reintroduction programs are unlikely to do much for preservation, conservation, or biodiversity given the high mortality of reintroduced animals even in well-planned efforts (witness the fate of recently reintroduced Mexican wolves). In 1995, Benjamin Beck, then Chair of the American Zoo and Aquarium Association's Reintroduction Advisory Group, lamented "... we must acknowledge frankly at this point that there isn't overwhelming

evidence that reintroduction is successful." Two reintroduction experts, Richard Reading (at the Denver Zoo) and Tim Clark (Yale University) stressed in a recent review of carnivore reintroduction projects that "It is clearly desirable to improve approaches to reintroduction."

Given that even many experts are extremely skeptical of attaining the goals of reintroduction efforts, it's important to reassess what we are doing and why. Just because we *can* do something doesn't we *ought* to do it. Indeed, there are numerous factors beyond the control of scientists and others who so dearly want them to succeed. Recently, three biologists argued that personal attitudes, human shortsightedness, and greed, would, with few exceptions, be insurmountable stumbling blocks in attempts to manage animal populations.

### Can we achieve more by doing less?

I raise the questions I have not because I'm a kill-joy who's against all reintroduction efforts. I deeply appreciate the good intentions and efforts of all involved, but sometimes good intentions aren't enough. And, there's no room for failure. I ponder these questions because the issues aren't as clear as many people want them to be. Nature is complex, but many people want simple, quick solutions when tinkering with her. There aren't any. Successful proactive planning takes time. Making compassion choices often requires patience and restraint. When trying to conserve species or restore ecosystems we must be concerned with all animals who are involved, not only human-centered goals. Many lives are at stake. Should individuals be moved and perhaps suffer and die because of what we want? Should individuals be traded off for the good of their species? Should individuals who have lived without certain predators or competitors be confronted

with them? Should populations and ecosystems that have developed and sustained themselves in the absence of predators be altered? It may turn out in some cases that it's impossible to regain what was lost. It may be infeasible to recreate what once existed because times have changed and we can't recreate what once was. In the end we may simply be faking nature.

### Late note:

Since February 26, 1999, three lynx introduced to the wild have been discovered dead.

### Literature cited

Estes, J. A. 1998. Concerns about rehabilitation of oiled wildlife. *Conservation Biology*, **12**:1156-1157.

### Interested readers can see:

Bekoff, M., and Jamieson, D. Ethics and the study of carnivores: Doing science while respecting animals. In J. L. Gittleman (ed.), *Carnivore behavior, ecology, and evolution*, Volume 2. Cornell University Press, Ithaca, New York. pp. 15-45. 1996.

Bekoff, M. Deep ethology, animal rights, and the Great Ape/Animal Project: Resisting speciesism and expanding the community of equals. *Journal of Agricultural and Environmental Ethics* **10**: 269-296. 1998.

Bekoff, M. Ethical enrichment and human-carnivore interactions: Being proactive rather than reactive. In J. L. Gittleman, S. M. Funk, D. W. Macdonald, and R. K. Wayne (eds.) *Carnivore Conservation*. Cambridge University Press, London and New York. 1999.

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## Endangered Species UPDATE

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Cover: Canada lynx (*Lynx canadensis*).  
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# 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.*

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## 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).**

<p><b>Problem-Oriented Exercise</b></p> <ol style="list-style-type: none"><li>1. <b>Goals.</b> 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.</li><li>2. <b>Alternatives.</b> What alternatives are available to the participants and others to solve the problems?</li><li>3. <b>Evaluation of alternatives:</b> Would each contribute toward solution of the problems or not?<ol style="list-style-type: none"><li>a. <b>Trends:</b> Did it work or not work when tried in the past on relevant occasions?</li><li>b. <b>Conditions:</b> Why, or under what conditions, does it work or not work?</li><li>c. <b>Projections:</b> Would it work satisfactorily under these conditions?</li></ol></li></ol> <p><b>Repeat</b> the procedure to refine and supplement considerations of goals, alternatives, and evaluation so far.</p>
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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



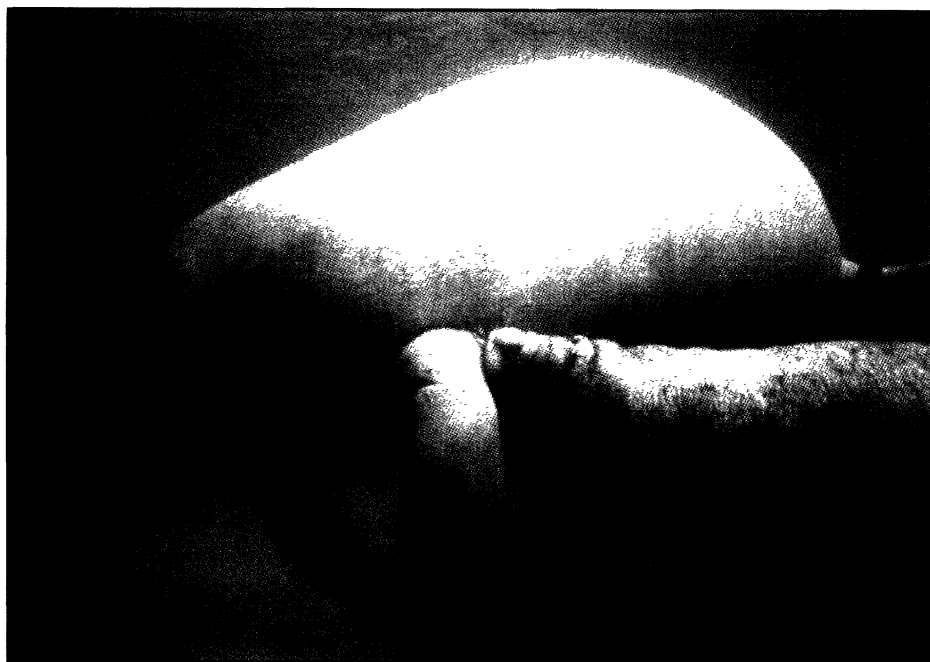
smooth response.

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 Lounsbury 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.

### **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 organiza-



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

tionally 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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### Literature cited

- Ascher, W. and R. Healy. 1990. Natural resource policymaking in developing countries. Duke University Press, Durham, North Carolina.
- Clark, T.W. 1996. Appraising threatened species recovery efforts: Practical recommendations. Pp. 1-22 in *Back from the brink: Refining the threatened species recovery process*. Australian Nature Conservation Agency in Transactions of the Royal Zoological Society of New South Wales, Australia.
- Clark, T.W. 1997. *Averting extinction: Reconstructing endangered species recovery*. Yale University Press, New Haven, Connecticut.
- Clark, T.W., A.P. Curlee, and R.P. Reading. 1996. Crafting effective solutions to the large carnivore conservation problem. *Conservation Biology* 10:1,036-1,045.
- Clark, T.W., P. Schuyler, T. Donnay, P. Curlee, T. Sullivan, M. Cymerys, L. Sheeline, A. Reading, R. Wallace, T. Kennedy, Jr., A. Marcer-Battle, and Y. De Fretes. 1992. Conserving biodiversity in the real world: Professional practice using a policy orientation. *Endangered Species UPDATE* 9(5/6):5-8.
- Clark, T.W. and R.D. Brunner. 1996. Making partnerships work: Introduction to decision process. *Endangered Species UPDATE* 13(9):1-5.
- Clark, T.W. and R.L. Wallace. 1998. Understanding the human factor in endangered species recovery: An introduction to human social process. *Endangered Species UPDATE* 15(1):2-9.
- Clark, T.W. and R.L. Wallace. 1999. The professional in endangered species conservation: An introduction to standpoint clarification. *Endangered Species UPDATE* 16(1):9-13.
- Dery, D. 1984. *Problem definition in policy analysis*. University Press of Kansas, Lawrence, Kansas.
- Florida Department of Environmental Protection. 1997. Letter from Kenneth D. Haddad, Chief, Florida Marine Research Institute, to Mr. Sam Hamilton, Southeast Regional Director, U.S. Fish and Wildlife Service, December 26.
- Florida Marine Research Institute. 1996. A

- draft summary of selected FMRI activities during the 1996 manatee epizootic. Florida Marine Research Institute, Florida Department of Environmental Protection, St. Petersburg.
- Geraci, J. and V. Lounsbery. 1997. Draft contingency plan for manatee die-offs. Florida Department of Environmental Protection, Tallahassee, Florida.
- Janis, I.L. and L. Mann. 1977. Decision making: a psychological analysis of conflict, choice, and commitment. The Free Press, New York.
- Kilmann, R.H. and I.I. Mitroff. 1979. Problem defining and the consulting/intervention process. *California Management Review* 21(3):26-33
- Lasswell, H.D. 1971. A pre-view of policy sciences. American Elsevier Publishing Company, New York.
- Lasswell, H.D. and M.S. McDougal. 1992. Jurisprudence for a free society. Kluwer Law International, The Hague, Netherlands.
- Layne, J.N. 1965. Observations of marine mammals in Florida waters. *Bulletin of the Florida State Museum* 9:131-181.
- Marine Mammal Commission. 1996. Letter from John R. Twiss, Jr., Executive Director, to The Honorable John G. Rogers, Acting Director, U.S. Fish and Wildlife Service, December 31.
- Marine Mammal Commission. 1997. Annual report to Congress, 1996. Marine Mammal Commission, Bethesda, Maryland.
- Marine Mammal Commission. 1998. Annual report to Congress, 1997. Marine Mammal Commission, Bethesda, Maryland.
- Merton, R.K. 1966. Social problems and sociological theory. Pp. 775-824 in R.K. Merton and R.A. Nisbet, eds. *Contemporary social problems*. Second edition. Harcourt, Brace, & World, New York.
- Miller, B.J., R.P. Reading, and S.C. Forrest. 1996. *Prairie night: Black-footed ferrets and the recovery of endangered species*. Smithsonian Institution Press, Washington, D.C.
- O'Shea, T.J., G.B. Rathbun, R.K. Bonde, C.D. Buergelt, and D.K. Odell. 1991. An epizootic of Florida manatees associated with a dinoflagellate bloom. *Marine Mammal Science* 7(2):165-179.
- Rose, P., J. Baker, and D. Peterson. 1981. Comprehensive work plan for the West Indian manatee. U.S. Fish and Wildlife Service, Washington, D.C.
- U.S. Fish and Wildlife Service. 1980. West Indian manatee recovery plan. U.S. Fish and Wildlife Service, Atlanta, Georgia.
- U.S. Fish and Wildlife Service. 1989. Florida manatee (*Trichechus manatus latirostris*) recovery plan. U.S. Fish and Wildlife Service, Atlanta, Georgia.
- U.S. Fish and Wildlife Service. 1996. Florida manatee recovery plan. U.S. Fish and Wildlife Service, Atlanta, Georgia.
- U.S. Fish and Wildlife Service. 1997. Contingency plan for catastrophic manatee rescue and mortality events. U.S. Fish and Wildlife Service, Atlanta, Georgia.
- U.S. Fish and Wildlife Service. 1998. Letter from Sam D. Hamilton, Regional Director, to Mr. Kenneth D. Haddad, Chief, Florida Marine Research Institute, January 23.
- Weiss, J.A. 1989. The powers of problem definition: the case of government paperwork. *Policy Sciences* 22:97-121.
- Willard, A.R. and C.H. Norchi. 1993. The decision seminar as an instrument of power and enlightenment. *Political Psychology* 14(4):575-606.
- Work, T.M. 1996. Evaluation report on the 1996 Florida manatee die-off. National Wildlife Health Center, National Biological Service, Honolulu.

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# Marine Matters

## Thailand's Disappearing Mangroves: Factors in the Destruction of a Resource

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### Abstract

*Mangrove resources in Thailand are disappearing at an alarming rate. Benefits of healthy mangrove systems include shoreline stabilization, "nursery" functions for thousands of associated species, and direct value as timber products (fuel wood, building supplies, etc.). Due to underlying population and development pressures, however, mangrove areas are being developed in ways that favor short-term economic gain over the long-term economic and ecosystem benefits that mangroves provide. While there are several causes of mangrove destruction in Thailand, the primary, conversion to shrimp aquaculture ponds, is the focus of this paper. Conversion of mangrove areas to intensive aquaculture projects results in an array of complex ecological problems, and negative impacts on the economically crucial fishing industry. Immediate regulation of this conversion process is hampered by three basic factors: the lack of a centralized environmental agency or interagency cooperation, lack of enforcement capabilities, and unsustainable management practices at the local level. International efforts are hindered by similar factors. Economic incentives for sustainable management practices are suggested as a possible future direction.*

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### Introduction

Like much of the developing world, Thailand and many of the countries in Southeast Asia are today being faced with complex and often contradictory questions about development and conservation. Many of Thailand's natural resources are being consumed at breakneck speeds in the race to develop economically. This is evident in the consumption, and subsequent degradation and destruction of the once vast stretches of mangrove forests that formerly lined much of Thailand's coastlines. The tracts of mangroves in the Southeast Asian region make up 30% of the world's mangroves, over half of which are of commercial importance (Chou 1994). The World Resources Institute has estimated that 87% of Thailand's mangroves have been lost since pre-agricultural times (World Resources 1993). Another source

claimed that over half of Thailand's mangrove resources have been lost since 1960 (McNeely and Dobias 1991). Mangroves are being destroyed for a variety of reasons, most of which ignore long-term, sustainable benefits in favor of short-term economic gains. There are several problems with which conservation efforts have and will continue to face, ranging from an inability of the government to effectively regulate mangrove exploitation to a simple lack of interest in regulation in the face of economic gains. Examining one cause of mangrove destruction, shrimp aquaculture gives a microcosmic example of the pervasive and basic problems that Thailand faces with mangrove conservation.

### Mangroves in Thailand

Defining a mangrove can be surprisingly tricky. "Mangroves" can re-

fer to particular species, or an ecosystem. Robertson and Alongi (1992) define a mangrove as "...a tree, shrub, palm, or ground fern, generally exceeding one half metre in height and which normally grows above mean sea level in the intertidal zone of marine coastal environments, or estuarine margins." This broad definition includes 20 families from two plant divisions (ferns and angiosperms). If only those species that are exclusive to the habitat described above are included, the total number of species that can be considered mangroves is around 60 (Saenger 1983). Mangrove forests are dominated by two orders, Myrtales and Rhizophorales, which account for 25% of all families and 50% of all species. For the purposes of this paper, mangroves will be considered an ecological entity, rather than a genetic one. As a group, mangroves share several



**Southeast Asian mangroves, much like these Florida mangroves, are sensitive to human abuse. Photograph by M. E. McPhee.**

highly specialized and collectively well known adaptations, including notably exposed breathing roots, support roots and buttresses, salt excreting leaves and viviparous water dispersed propagules (Robertson and Alongi 1992). Not all species considered to be mangroves share all of these characteristics, but a debate on the inclusion or exclusion of individual species is beyond the scope of this report. As ecological entities, mangroves will be considered not only as species, but as the foundation of ecosystems.

### **Ecological and economic importance of mangroves**

Unfortunately, mangrove resources have often been viewed as undesirable land, accelerating their destruction and hampering conservation efforts. "[Southeast Asian] policy makers have long regarded mangroves as wasteland that encourages the breeding of mosquitoes and have cleared extensive areas for agriculture, aquaculture, as well as residential and commercial development" (Chou 1994). Mangroves, however, provide a long list of services for Thailand that make them

critically valuable to economic well-being. Like other marine resources, mangroves have direct as well as indirect economic values. The direct value of mangroves to the local inhabitants comes from the use of the wood for fuel (including charcoal), as building materials, and occasionally as a supplementary food source. Commercial uses include the use of bark in the production of tannin, and wood in the production of chipboard. Mangrove systems also serve important physical functions, such as acting as silt traps and shore breaks. Without mangroves, much of the near-shore marine environment would suffer increased silt levels and sedimentation rates, and the on-shore environment would suffer increased rates of erosion and degradation (Robertson 1992). The ramifications of increased silt levels in near-coastal waters include potential degradation of coral communities. Water quality affects zooxanthellae rates of photo-production, upon which corals depend. Tourism is Thailand's number one source of income and any degradation of the resources that support that industry could have serious effects on the economy. These nega-

tive impacts, however, are largely indirect, and difficult to quantify amidst a host of other factors.

One of the most important roles of mangroves is the shelter and breeding ground functions they play for many fish and other commercially important seafood species (as well as other non-commercially important species). Saenger et al. (1983) described thousands of species across 22 taxonomic orders that have been found associated with mangrove ecosystems in the highly diverse Southeast Asian region. The sheltered, brackish-water interface between land and water is the ideal ground for young fish to grow, develop, and breed. Fish provide 28% of total animal protein in Asia (CGIAR 1995), the highest percentage of any region in the world. The people of Southeast Asia are largely dependent not only on fish for their food, but on the mangrove systems upon which these and other species depend. Fish stocks are adversely affected when their breeding and feeding grounds, namely mangroves, are degraded. The complex interplay between the health of regional fisheries and mangrove exploitation will be discussed at length later in this paper.

The "nursery" function that mangroves provide is not the only economically significant role played by mangrove systems. Sustainable charcoal production has been estimated to generate an annual income of about \$22.4 million. Monetary values have also been placed on some of the services that mangroves have traditionally provided for local inhabitants. "Many of the estimated 100,000 poor villagers who live along the coast depend very closely on the mangroves to sustain or supplement their livelihoods. Various services provided by the mangroves, such as provision fuelwood, medicines, and food have been found to contribute over USD 1,000 per household in certain

areas of Thailand (an amount roughly equal to the average Thai's annual income)" (McNeely and Tobias 1991). As with other ecological systems there is a great deal of uncertainty in our understanding of how a mangrove system works and exactly what the benefits it provides. "These [coastal] ecosystems also interact with the offshore water, and in many ways offshore waters are dependent on inshore productivity. Thus, the potential implications of ecological disruption in the coastal area are far greater" (Kent and Valencia 1985).

### **Threats to mangroves in Thailand**

#### *Underlying Causes*

Thailand shares the conflict between development and environmental quality with many other developing nations. Economic growth is often valued first, all too often at the expense of the environment. Thailand has experienced remarkable economic growth during the last 20 years, and this growth can be largely attributed to its export driven economy (Flaherty and Karnjanakesorn 1995). In examining the benefits derived from exploiting mangroves, perceived gains often appear to both the government and local people to be more important and definitively more tangible than the somewhat intangible benefits of conservation or sustainable management. Unfortunately, the exploitation of natural resources for short-term gain often makes it impossible to reap the long term-benefits.

In exploring the reasons why economic growth and the accompanying exploitation of natural resources often takes precedence over longer-term sustainable management practices, another underlying reason for many of these issues and problems becomes impossible to ignore—the explosive rate of human population growth throughout the region, especially in

coastal environments. Seventy percent of the region's current population (444 million) is currently settled in the coastal region. The region's population has been projected to grow 63% by the year 2025, and in the face of continuing coastal migration trends, coastal issues will only be exacerbated. In Thailand, for example, the percentage of people living in coastal environments has increased from 12.5% in 1960 to 22.6% in 1990 (Chou 1994). "Burgeoning populations are possibly the biggest cause of mangrove destruction and degradation. This can be clearly seen all over Asia: where populations are high, little good mangroves are left" (Jin-Eong 1995). As fewer resources are available, the benefits derived from these resources become smaller, in turn making those dependent on such resources poorer. Poorer people are then forced to look to exploit more resources, completing the "vicious cycle" of environmental degradation.

#### *Direct Causes*

Mangroves are threatened by a broad range of factors, ranging from more recent issues driven by industry and the export-led economic nature of the Thai economy to traditional harvesting by local peoples. Most of these traditional usages, including cutting for use as building materials, fuelwood, or the production of charcoal, or simply as dumping sites for unwanted household and residential wastes, have been occurring for hundreds of years and are integral parts of life. On the other hand, many of the commercial reasons for mangrove destruction are clearly not sustainable and warrant closer examination. The recent boom in the tourist industry, with the corollary development of hotels, golf courses, and the expansion of ancillary tourist facilities, directly threatens the existence of mangroves through destructive in-filling and

draining for the valuable ocean-front property that mangroves occupy. Mangroves have also been removed or degraded by such pursuits as mining, solar salt farms, and agricultural development (Flaherty and Karnjanakesorn 1995). In recent years, a large amount of mangrove logging has been carried out by the Japanese chipboard industry. One source listed harvesting for chipboard materials as one of the three largest reasons (along with the aforementioned land-reclamation for infrastructure development and conversion to shrimp aquaculture ponds, as discussed below) for mangrove destruction (Jin-Eong 1995). It is interesting to note that, with this example, the benefits to the Thai (and Southeast Asia) economy are not substantial. As one author states, "economic returns to the countries whose mangroves have been exploited are meager...operators appear only interested in a quick harvest and then moving on to the next site rather than a sustained use of a particular site" (Jin-Eong 1995).

### **Shrimp aquaculture**

While all of the above reasons are certainly important contributors to mangrove destruction, by far the most important is the conversion of mangrove lands into ponds for shrimp aquaculture. Of the 80,592 hectares of mangroves that have been converted to other uses between 1961 and 1986, 38.3% were converted to aquaculture (Flaherty and Karnjanakesorn 1995). The destruction of mangroves through conversion to shrimp ponds is so pervasive and widespread that, for example, one region (Chanthaburi Province) lost 90% of its mangroves between 1986-1989 (McNeely and Dobias 1991). The conversion to shrimp aquaculture again largely involves short-term economic benefits at the expense of long-term conservation. "Shrimp is the

highest-value seafood entering world trade channels and has become an important export product and hard currency earner for countries with the requisite resources" (Flaherty and Karnjanakesorn 1995). The necessary resources are mangroves and seawater, both of which Thailand has (or at least had) plenty. In addition, aquaculture was seen as something that could be engaged in small-scale, so that the rural poor and disadvantaged could benefit from some of the development opportunities. Thailand, like other Southeast Asian countries, has taken full advantage of the economic benefits of the rapidly growing aquaculture arena. "...since the late 1970s world production of cultured shrimp has soared, rising from less than 1% of the world's total shrimp production in 1980 to an estimated 20%" (Flaherty and Karnjanakesorn, 1995). Taking advantage of many of these short-term benefits, however, has unfortunately incurred the loss of many long-term ones.

Reliance on shrimp ponds and other farmed seafood products has been seen as a means of making up some of the lost production from fisheries. The Gulf of Thailand and the surrounding seas are now considered commercially depleted because of a variety of factors—not the least of which is the destruction of mangroves. Approximately 80% of Thailand's fishery production comes from the Gulf of Thailand, and the rest comes from the surrounding areas (Kent and Valencia 1985). The establishment by many countries of a 200 mile Exclusive Economic Zone (EEZ), and the subsequent passing of this idea into international accord has had significant effects on the fishing industry in Thailand. Partly because of Thailand's concave coastal shape, a full third of traditional Thai fishing areas are found in what are now the EEZs of other Southeast Asian countries, including Vietnam, Kampuchea,

and Myanmar. There have already been some flare-ups about migratory Thai vessels, as the enormous Thai otterboard trawler fleet and thousands of small-scale, traditional fishing enterprises are forced to fish in a much smaller, severely depleted area (Kent and Valencia 1985). Thailand is losing its standing as the leading fishing nation in the region and is now being forced to look to other alternatives for production. These alternatives have included negotiation for fishing rights, but one of the most important (especially in terms of impact on the environment) has been the introduction and support of shrimp aquaculture. A report written in 1985 stated that, "Inland fisheries and coastal aquaculture present real possibilities as gap-filling measures, particularly since they are aimed at the socially important small-scale sector" (Kent and Valencia 1985).

Depleted fish and other wild seafood stocks have historically been blamed on over-fishing, but at the same time, the support structures upon which these fisheries are dependent (namely the mangroves) have been considered "underdeveloped." The longer-term benefits of sustainable mangrove management, one of the central components of fishery vitality, are ignored and a "quick-fix," the conversion of mangrove lands into aquaculture ponds, has been promoted instead. "Little or no consideration is given to the loss of wetland benefits arising from their damage or conversion, which, if properly accounted for, could exceed the economic gains of development" (Flaherty and Karnjanakesorn 1995). The result of this view and resulting practices has been the destruction of one of Thailand's most valuable resources on an enormous scale.

Interestingly, despite the massive conversions of mangroves to shrimp ponds, the gains from these ponds are short-lived at best and not being

shared by a significant portion of society. Unfortunately, in an increasingly crowded market, coastal lands have become prohibitively expensive for many rural poor. This places aquaculture projects out of reach for the very people for which these projects were designed as engines of growth. The high costs of coastal lands also reduce the capacity of growers to be environmentally sensitive in their growing methods as they attempt to maximize their returns on a large initial investment. The result is highly intensive ponds, with little or no mangroves left to act as buffers, vegetative cover, and water purifiers between the aquaculture areas. "Used this way [as high intensity shrimp ponds] the value of mangroves is fleeting. Once the trees are cleared they don't grow back, and within a few years, shrimp ponds become fouled in their own wastes, leaving the land useless and barren—true wasteland. Timber companies, shrimp farmers, and local people then set their sights on untouched mangrove stands, continuing the cycle of destruction" (Weber 1994). This pattern of environmental destruction is exactly the kind Thailand cannot afford—yet it is exactly the pattern in which it finds itself.

## **Policy issues**

### *National efforts*

Given problems with environmental degradation, the benefits of leaving mangroves standing, the lack of equitable distribution of benefits from mangrove conversion, and the role mangrove destruction plays in the regional fisheries problems, Thailand has a pronounced need for policy action to more effectively regulate mangrove conversion and conserve some of this vanishing resource. The question remains how, in practicality, to do this. Why haven't policy measures been taken to regulate aquaculture and other industries responsible

for mangrove destruction? Independent producers have simply gone in, cleared what lands they thought to be necessary, produced aquaculture products until the lands are exhausted and then simply moved on—leaving wasteland behind them. There are several fundamental reasons why no effective measures have been made in an attempt to regulate the conversion of mangrove destruction to aquaculture ponds. This lack of effective policy extends from the regional to the national and even to the international level. The results have been disastrous.

While the Thai government is coming to the realization that policy action is becoming increasingly necessary, any actions are hampered by a combination of three basic factors. First, the Thai government lacks an overriding environmental agency and there is little, if any, interagency cooperation among the different offices and agencies that are involved in natural resource management. The National Environment Board (NEB), which was created in 1975 under the provisions of the Improvement and Conservation of National Environmental Quality Act of 1975, has limited jurisdiction. Its activities are primarily limited to advising, recommending, and coordinating projects, rather than actually implementing them (Tobin and White 1993). This lack of authority to implement projects makes any formulated plans hollow at best. In the field of mangrove conservation alone the Royal Forest Department, the Department of Fisheries, the Department of Mineral Resources, and the Department of Land Development all share responsibility with the NEB, and "(a)lthough intersectoral linkage and cooperation has frequently been promised, it has seldom appeared in practice" (Flaherty and Karnjanakesorn 1995). McNeely and Dobias (1991) state that "those institutions assigned re-

sponsibility for conservation have suffered from insufficient staff and finance and from a narrow sectoral approach to the task...Government policies sometimes appeared to be working at cross purposes." With the lack of a centralized body to deal with environmental problems, cooperation between the relevant agencies is essential, especially when an interdisciplinary and complex solution is being sought, such as is the case with the mangrove/fisheries situation. This lack of institutionalized procedures for dealing with environmental issues is common to many developing countries and the result is similar to that in Thailand—an inability to effectively coordinate natural resource management or conservation plans.

A second major impediment to effective conservation is the producers themselves. As the shrimp aquaculture industry exists today, the industry does not have to internalize the damages it causes to the environment, so there may be no incentive for individual producers to curb their activities in order to promote sound environmental practices. Local inhabitants and even larger-scale producers may not be aware of the negative impacts of high-intensity aquaculture on the environment. Even if they are, they simply may not care. In the face of poverty and hunger the mandate of a far away government may not be enough.

The third major impediment stems directly from the first two. Even if Thailand were to come up with an environmentally sound and economically viable compromise solution to the problem of mangrove degradation, the problem still remains of how to enforce those regulations. For example, there currently exist some marine and coastal reserves designed to protect mangroves, but their effectiveness is severely hampered by the inability of the Thai government to enforce area guidelines.

"(R)eserves do exist in the area, but their effectiveness is in question. Local communities generally do not have jurisdiction over marine areas" (Kent and Valencia 1985). Illegal encroachment onto lands designated as reserves is a common result in developing countries where the wants and desires of local inhabitants do not coincide with the policy objectives of national governments. With a lack of enforcement capability, this encroachment will continue largely unabated.

Despite a genuine and growing concern about Thailand's vanishing mangrove resources, major organizational and societal impediments remain. Organizational matters within the government, such as establishing an effective and powerful environmental agency (or at least an effective and well-connected network of agencies) need to be addressed before it will be possible to adequately address environmental considerations. The prospects for this kind of reorganization are, at best, unknown and, at worst, unlikely. "It is unreasonable to expect that governments will respond quickly or appropriately to recommendations that they reorganize themselves to achieve sustainable development" (Tobin and White 1991).

#### *International efforts*

International efforts pointed at preserving Thailand's resources might face the same problems that national efforts have. The Ramsar Convention, for example, which is the major international agreement designed to protect the world's wetlands has not even been signed by Thailand, or most of the other Southeast Asian countries (with exception to Vietnam). The Law of the Sea is another international agreement that takes into account the need for conservation efforts in the marine environment, but again the problems of making effective legislation (and then



enforcing them) is very problematic in Thailand's situation. At least one report mentioned the possibility of having some of Thailand's mangrove reserves listed as World Heritage Sites, which would give the Thai government access to limited international funds in an effort to conserve the vanishing mangroves. The problems with enforcing these regulations in the face of possible, and even probable local resistance, however, are still as formidable as ever, making the World Heritage Fund an unlikely source for major mangrove conservation efforts.

### Conclusions and future directions

At least in the short-term, it seems unlikely that there will be effective development of institutional controls on a national or international scale. What alternatives exist? Theoretically, shrimp and other types of aquaculture can take place on a sustainable basis. One of the main reasons shrimp farms are not being sustainably managed is that producers are not encouraged to do so. Movements pointing the industry towards producing in a more sustainable manner would seem to be a possible solution. Education at different levels seems to be one way of accomplishing this, ranging from the locals themselves to relevant governmental agencies. The NEB recently invited the IUCN, with funding from USAID, to advise on how economic incentives might be used to support the conservation of biodiversity. The resulting report recommended that, "the government provide assistance to local shrimp farmers in applying available technology to increase shrimp production rates on existing farms; encourage silvi-fishery projects that combine aquaculture and mangrove conservation; and continue to provide support for infrastructural development in lands inland from

mangroves" (McNeely and Dobias 1991). The report went on to stress what the authors considered to be components of an effective plan. These "ingredients" included inclusion of local scientific expertise, providing support so that scientists and economists could effectively collaborate on management issues, and creating a mechanism whereby new policies could be integrated into government structures (McNeely and Dobias 1991). Applying economic incentives in moving towards sustainable management practices would seem to be in line with Thailand's dominant development paradigm, and would therefore be more likely to succeed at both the local and the national levels than simple conservation regulations.

Thailand is faced with a complex and difficult issue when attempting to halt the tide of destruction of her mangrove resources, yet there do appear to be some options for the future. Intensive aquaculture production cannot continue without disastrous consequences to not only the mangroves themselves but also the critically important fisheries stocks in the offshore areas. The short-term solution, it seems, is to develop aquacultural systems that do not adversely affect the environment, or at least not to the same scale which they do currently. Regulatory policies aimed at conservation of rapidly vanishing mangroves may not work, for a few basic reasons inherent in the nature of the Thai government. One thing, however, is certainly clear—addressing the central dilemma between conservation and development may be Thailand's only hope for preserving the last vestiges of her once great mangrove systems.

### Literature cited

CGIAR. 1995. May 14 press release by the Consultative Group on International

- Agricultural Research. <www.cgiar.org> (November 1995).
- Chou, L.M. 1994. Marine environmental issues of Southeast Asia: state and development. *Hydrobiologia* **285**:139-150.
- Flaherty, M. and C. Karnjanakesorn. 1995. Marine Shrimp Aquaculture and Natural Resource Degradation in Thailand. *Environmental Management* **19**(1):27-37.
- Jin-Eong, O. 1995. The ecology of mangrove conservation and management *Hydrobiologia* **295**:343-351.
- Kent, G and M.J. Valencia, eds. 1985. *Marine Policy in Southeast Asia*. University of California Press, Berkeley, CA.
- McNeely, J.A. and R.J. Dobias. 1991. Economic Incentives for Conserving Biological Diversity in Thailand. *Ambio* **20**(2):86-90.
- Robertson, A. I. and D. M. Alongi, eds. 1992. *Tropical Mangrove Ecosystems*. Coastal and Estuarine Series, #41. The American Geophysical Union, Washington, D.C.
- Saenger, P., E. J. Hegerl and E. J. S. Davie, eds. 1983. *Global Status of Mangrove Ecosystems*. Working Group on Mangrove Ecosystems of the IUCN Commission on Ecology in cooperation with the United Nations Environment Programme and the World Wildlife Fund. Reprinted from *The Environmentalist* 3: Supplement No. 3.
- Schweitzer, J. 1992. *Conserving Biodiversity in Developing Countries*. *Fisheries* **17**(3):35-38.
- Tobin, R.J. and A.T. White. 1993. Coastal Resources Management and Sustainable Development: A Southeast Asian Perspective. *International Environmental Affairs* **5**(1):50-66.
- Weber, P. 1993. Missing Mangroves. *World Watch* **6**(2):30-33.
- Weber, P. 1994. Net Loss: Fish, Jobs, and the Marine Environment. *Worldwatch Paper* 120.
- World Resources Institute. 1993. *World Resources 1993-1994* (a guide to the global environment). Oxford University Press.
- World Resources Institute. 1994. *World Resources 1994-1995* (a guide to the global environment). Oxford University Press.

# Legislative News

## **Petitions to List Butterfly and Goshawk**

The Southwest Center for Biological Diversity 2/11 announced it joined with several Californian groups to file an emergency petition for the listing of the Santa Monica hairstreak butterfly as an endangered species. The butterfly depends on Coast live oak habitat, which is threatened by development. On 2/12 SWCBD, Biodiversity Legal Foundation, and the Sitka Conservation Society filed a motion to force the US Fish and Wildlife Service to list the Queen Charlotte goshawk as an endangered species. The goshawk's habitat in the old growth rainforest's of Alaska, Canada, and the Pacific Northwest is being destroyed by clearcutting. (GREENLines, 22 Feb. 1999)

## **USFWS Sued for Delays in Revisions to Grizzly Bear Recovery Plan**

The Earthjustice Legal Defense Fund 2/5 announced it is suing the US Fish and Wildlife Service on behalf of 19 other environmental organizations. The groups say the government failed to comply with a 1995 court order to address deficiencies in the grizzly bear recovery plan. The agency was supposed to find a better way to count grizzly populations. One plaintiff said, "We are particularly concerned with the agency's continued reliance on methods of measuring grizzly populations that are simply not accurate." Environmentalists insist on

an accurate count before the species can be considered for delisting from the Endangered Species Act. (GREENLines, 10 Feb. 1999)

## **Salmon Species Listed in the Pacific Northwest**

Nine Northwest salmon and trout species today will be listed as threatened or endangered under the federal Endangered Species Act, the first time such a listing will affect a major metropolitan area (Reuters/Washington Post). The listings, which go into effect within 60 days, will extend protections to wild salmon found in nearly every watershed in Washington state, as well as in parts of Oregon's Willamette Valley (Sam Howe Verhovek, New York Times). Washington Gov. Gary Locke (D): "Nothing like this has ever happened anywhere in the US. Virtually every county and every citizen in the state will be affected" (David Whitman, US News & World Report, 3/22/99 issue). The fish to be listed include the Puget Sound chinook, the Lower Columbia River chinook, Upper Columbia spring chinook, Lake Ozette sockeye, Hood Canal summer chum, Lower Columbia chum and the mid-Columbia steelhead. The National Marine Fisheries Service plans to defer until 9/99 decisions on whether to extend similar protection to four other salmon runs in California and Oregon (Verhovek, New York Times). (GREENLines, 15 March 1999)

# ***You do interesting work!*** **Share it with the UPDATE.**

The *Endangered Species UPDATE* is designed and published as a forum for information exchange on endangered species issues. The *UPDATE* welcomes articles related to species protection in a wide range of areas including, but not limited to, research and management for specific endangered or threatened species, theoretical approaches to species conservation, policy and legislation related to species conservation, and strategies for habitat protection and preserve design. In addition, book reviews, editorial comments, and announcements of current events and publications are welcome.

The *Endangered Species UPDATE* accepts several kinds of manuscripts. These include:

1. Feature Article—on research, management activities and policy analyses for endangered species, theoretical approaches to species conservation, and habitat protection. Manuscripts should be approximately 3000-4000 words with abstract.
2. Opinion Article—a concise and focused argument on a specific endangered species issue; can be more speculative and less documented than the feature article. These are approximately 600-800 words with abstract.

## **Manuscript submissions and specifications**

The manuscript should be submitted on a disk or by e-mail. Regardless of how you submit, please send us a hard copy and all of the appropriate contact information for all authors. If you are using Microsoft Word for Macintosh or WordPerfect, please save in the most recent version possible. For other programs, save the document in a rich text format (RTF). Send disks and hard copies to Editor, *Endangered Species UPDATE*, School of Natural Resources and Environment, University of Michigan, Ann Arbor 48109-1115. If submitting by e-mail, please send as an attachment to [esupdate@umich.edu](mailto:esupdate@umich.edu).

## **Photographs, illustrations, and other visuals**

Photographs, line drawings, and other graphics are encouraged. In choosing photographs, please consider their ability to transfer into a black and white medium (i.e. do not choose photos that rely on color for contrast). Copyrighted material must include written permission for use in the *UPDATE*, signed by the copyright holder. For all graphics, a caption should be included, and they should be clear enough to be reduced 50 percent.

## **Citations, acronyms, etc.**

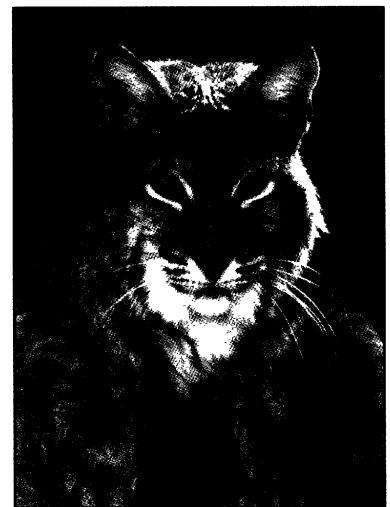
Literature citations in the text should be as follows: (Buckley and Buckley 1980b; Pacey 1983). The Literature cited section must be typed and follow the format used in the journal *Conservation Biology*. For example:

Balmford, A., N. Leader-Williams, and M. J. B. Green. 1995. Parks or arks: Where to conserve large threatened mammals? *Biodiversity and Conservation* 4:595-607.

For other abbreviations and details, consult the Editor.

## **Copyright and reviewing proofs**

Authors will receive by fax a final version of their article, before it goes to press, for their review and proofing. The *Endangered Species UPDATE* and University of Michigan typically hold copyright for articles published, and authors will be asked to sign a contributors' agreement when the article is accepted. The vast majority of copyright requests are from educational institutions and non-profit organizations. The copyright agreement allows the author to reprint the article as long as credit is given to the *UPDATE*.



**Canada lynx (*Lynx canadensis*).**  
**Photograph by Jim Schulz, © Chicago Zoological Society**

# News From Zoos

## Dallas' New Hospital

Except for the reptile ward and quarantine rooms, the new \$3.75 million A.H. Meadows Animal Health Care Facility at the Dallas Zoo is complete and open for business. The 15,440-square-foot facility was built with private donations and opened late last year. The new zoo hospital is more than 20 times larger than its 1950s-era predecessor. The facility combines administrative offices once spread out over four buildings. It also has modern surgical preparation rooms, a cutting-edge X-ray machine and separate areas for study and research. The building is designed so the business at hand flows in logical progression: animals can be easily transported to the receiving room, weighed, and delivered to treatment or quarantine wards. Though the building will be unseen by zoo visitors, its influence will be felt. Beyond protecting the health of zoo inhabitants, the improved facilities give zoo officials an ability to exhibit rarer and more endangered animals. Visitors will eventually see a big difference in the type of animals that can be exhibited, both at Dallas and at the Fort Worth Zoo, which opened its own new animal health facilities in October. [By David Flick / The Dallas Morning News]

## Monterey Opens Largest Living Deep Sea Exhibits in the World

"Mysteries of the Deep", open March 1999 through January 6, 2002 at the Monterey Bay Aquarium, will introduce visitors to residents of Earth's largest habitat—the dark, cold ocean waters that make up 80% of the living space on our planet. Some 40 to 60 species, collected from depths as great as 3,300 feet, will be on display. Most have never been seen in any aquarium. Visitors will meet mushroom corals, predatory tunicates, sea whips, spider crabs, catsharks, ratfish, feather stars, eelpouts, Pacific hagfish and California king crabs, along with dozens of others. Some will be part of multi-species exhibits that re-create the look of deep sea communities. Others will be displayed in stunning single-species exhibits that showcase the grace and beauty of these unusual (and surprisingly colorful) animals. Because it is so difficult to collect and care for these animals, no other aquarium is expected to create a similar exhibit in the foreseeable future. Researchers will have an unusual opportunity to study these rarely seen dwellers of the deep.

Visitors will take a tour of the Monterey submarine canyon, an underwater chasm off California's central coast. The canyon reaches depths of over two miles; within Monterey Bay, it is about a mile deep from rim to floor—as deep and as steep as the Grand Canyon in Arizona. Unprecedented live exhibits, videos and hands-on displays will carry visitors through three major deep sea habitats: vertical canyon walls; the midwater, a dark ocean realm with no solid surfaces; and the sea floor. A fourth exhibit gallery will explore the ways that people are using deep sea resources, and the impacts we're having on the health of deep ocean ecosystems. The aquarium will also debut an expanded daily program of live video broadcasts from deep sea robot research subs as they explore the Monterey submarine canyon. Also part of the exhibit will be a deep sea crafts room for kids, and an exhibit of scientific illustrations made in the 1930s during William Beebe's pioneering dives in a bathysphere off the island of Bermuda.

## Rapley New President of the Canadian Committee for IUCN

The Toronto Zoo is pleased to announce that Dr. William A. Rapley, Executive Director, Biology & Conservation, has been elected President of the Canadian Committee for IUCN (CCIUCN) for a two-year term. The Canadian Committee has a membership of 50 including government and nongovernment agencies and individuals, covering a broad spectrum of activity in the conservation field across Canada. Three years ago IUCN established an international office in Montreal. Programs assigned to Montreal include the world programs for Temperate and Boreal Forest, Water and World Water Council, Fisheries and Marine programs, Arctic issues and a number of international projects. During his term as President, Dr. Rapley intends to try to unify and promote conservation activities across Canada and support IUCN.

*Information for News From Zoos is provided by the American Zoo and Aquarium Association.*

# Bulletin Board

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## World Resources Institute Web Postings

The World Resources Institute recently posted a series of information resources on the following topics on the web:

Climate, Biodiversity and Forests (<http://www.wri.org/wri/ffi/climate/>)

Developing Environmental Indicators: Materials Ecology (<http://www.wri.org/wri/sdis/indictsr/>)

Global Biodiversity Forum 13 (San Jose, RAMSAR) (<http://www.wri.org/wri/biodiv/gbf/gbf13.htm>),

The Impact of Ecosystem Degradation on People's Lives: Searching for Stories from Around the World (<http://www.wri.org/wri/wr2000/>)

Leverage for the Environment: A Guide to the Private Financial Services Industry (<http://www.wri.org/wri/iffe/leverage.htm>)

Logging Burma's Frontier Forests: Resources and the Regime (<http://www.wri.org/wri/ffi/burma/>)

Safe Climate, Sound Business (<http://www.wri.org/wri/cpi/scsb/>)

Sustainable Development Information Service (<http://www.wri.org/wri/sdis/>)

## A Wilderness Revival

In hopes of broadening and invigorating current wildlands protection efforts, the winter 1998/99 issue of *Wild Earth* contains strategy articles by some of the most respected leaders in the conservation movement, such as Sierra Club's Carl Pope, the Wilderness Society's Bill Meadows, and former US Congressman Jim Jontz. Noted wildlife advocates Kristin DeBoer, Louisa Willcox and Jamie Dayen report on northeastern wolf recovery, grizzlies and the science of extinction, and the need for cultural restoration, respectively. Conservation biologist Brian Miller and co-authors discuss the use of focal species in conversation planning. The issue also includes detailed up-

dates on wilderness campaigns in OR, NM, CO, UT, NV, CA, AZ and the Northern Rockies. For more information or to order a \$3 copy of this issue, please contact *Wild Earth* (POB 455, Richmond, VT 05477; (802) 434-4077; [info@wild-earth.org](mailto:info@wild-earth.org)).

## Sustainable Fisheries: Options for the Future

The Marine Stewardship Council (MSC) will be hosting a conference titled "Sustainable Fisheries: Options for the Future." The purpose of the conference is to focus world attention on the serious crisis facing the marine environment as a result of over-fishing, and examine some possible solutions. The conference will take place April 19-20, 1999 in New York City, USA. For information, please contact Brendan May, External Affairs Director (e-mail [brendan.ma-@msc.org](mailto:brendan.ma-@msc.org) or fax +44 171 3501231).

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*Announcements for the Bulletin Board are welcomed.*

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# Endangered Species UPDATE

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