

Endangered Species UPDATE

*Including a Reprint of the latest USFWS
Endangered Species Technical Bulletin*

August 1988 Vol. 5 No. 10

THE UNIVERSITY OF MICHIGAN
School of Natural Resources



**Special
Issue**

**A Fifteen Year Retrospective on the
Endangered Species Act**

Expanding the Range of Species Conservation Information

In 1976, the U.S. Fish & Wildlife Service Office of Endangered Species began publishing the *Endangered Species Technical Bulletin* to keep agencies, private organizations, industry, and concerned individuals abreast of developments in the federal endangered species program. At that time, the Bulletin was distributed free of charge to all who requested it. In 1981, however, federal budget cuts forced the Fish & Wildlife Service to limit distribution of the Bulletin to federal employees and federally sponsored researchers. This meant that the public could no longer receive up-to-date information the listing, recovery, and status of endangered species and related federal actions and programs.

In response to the cutbacks, the School of Natural Resources at The University of Michigan initiated a reprint program in 1983. Since then, the UPDATE has grown into a unique forum for ideas and information on endangered species protection. Each month, the regular version of the Update combines two publications in one: a reprint of the *Endangered Species Technical Bulletin* and a cover section produced by the School of Natural Resources. In this way, the UPDATE blends reports on the status of individual species with articles and editorials discussing a broad range of species conservation issues.

To keep this important source of information available, we depend on the support and participation of subscribers. Our annual subscription fee is \$15. This covers the cost of printing and mailing. We hope you decide to support our efforts and become a part of the Update forum.

**Endangered Species
UPDATE**



Endangered Species UPDATE

*A forum for information exchange on
endangered species issues*

Special Issue: August 1988
Vol. 5 No. 10

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The Special Issue

The regular format of the Endangered Species UPDATE includes a reprint of the U.S. Fish and Wildlife Service's *Endangered Species Technical Bulletin* along with a cover section produced by the School of Natural Resources. However, due to the length of this special issue, the *Technical Bulletin* reprint has not been included. The next reprint will be printed in the September issue of the UPDATE. The views expressed in this issue are solely those of the individual authors and are not necessarily the views of the School of Natural Resources or the Fish and Wildlife Service.

Instructions for Authors:

The Endangered Species UPDATE welcomes articles related to species protection in a wide range of areas including but not limited to: research and management activities for endangered species, theoretical approaches to species conservation, and habitat protection and preserve design. Book reviews, editorial comments, and announcements of current events and publications are also welcome.

Readers include a broad range of professionals in both scientific and policy fields. Articles should be written in an easily understandable style for a knowledgeable audience. Manuscripts should be 8-12 double spaced typed pages. For further information please contact Kathryn Kohn.

Front Cover:

loggerhead sea turtle (*Caretta caretta*)
photo by Patrick D. Hagan

Back Cover:

Andean condor (*Vultur gryphus*)
photo by Franz Camenzind

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Letter From The Editor

In April 1978, almost fifteen years after the Tennessee Valley Authority (TVA) proposed to construct a multimillion dollar dam on the Little Tennessee River, one of the most controversial and renowned endangered species protection cases was heard in the nation's highest court. In posing his challenge to the Endangered Species Act, Griffin Bell, the counsel for TVA, pulled a small glass jar from his briefcase. The jar contained one tiny snail darter. As he held it up before the Supreme Court, he asked how a three-inch fish could be valued higher than a multimillion dollar dam. The image created by Bell epitomizes the struggle to implement one of the most extraordinary pieces of legislation to come out of the environmental movement - The 1973 Endangered Species Act.

The value of preserving an endangered species and the profit from economic development seem incommensurable. After all, we are taught in the most basic math class that one cannot compare apples and oranges in the same equation. Yet this is precisely the dilemma that the Act requires us to confront. As John Fitzgerald writes later in this issue, the Act is "an injunction to ourselves to live in a way that is compatible with all other species."

The 1973 Act has now survived one and a half decades of American politics. Although there have been times when it appeared as though the rug was about to be pulled out from beneath it, the basic framework of the Act has remained intact. The history of the first fifteen years is the subject of this special expanded issue of the Endangered Species Update. The intent is to pose, explore, and begin to answer two fundamental questions: What have we learned about endangered species protection since the passage of the 1973 Act? and based on one and a half decades of experience, where should we direct future efforts in the field? To borrow a line from David Ehrenfeld's essay in *The Last Extinction*, "The future is shy. If you want to catch a glimpse of it, you have to sneak up on it from behind. So the place to start for a look into the future is the past." This notion underlies the character and design of this Update. Ultimately the purpose of a good retrospective should be to gain better perspective.

Toward this end, each of the following eight essays is a mix of reporting, reflection, and prescription. Although they are written from different perspectives and in varying styles, at least three common themes stand out. First, our increased sensitivity and understanding of the plight of many species (some of which has been stimulated by the Act) has opened our eyes to the severity of the extinction crisis. Bill Reffalt graphically illustrates this point in his discussion of the endangered species listing process.

The original 1966 version of the Endangered Species Act was passed with the intent of protecting only about 35 species of mammals and 30-40 species of birds believed to be near extinction.

Today there are over 1,000 species on the federal list of threatened and endangered species. And this only begins to scratch the surface of the problem. Some 3,900 species have been identified as candidates for listing in the United States alone; extinction rates in tropical countries dwarf these figures.

Yet, if the extinction problem is greater than we had ever imagined, so too is the power and scope of the Act itself. In remembering the early debates over the Act, Lynn Greenwalt recalls that many members of Congress thought they were voting to protect eagles, bears, and whooping



California condor (*Gymnogyps californianus*)
photo by Noel F.R. Snyder

cranes, and failed to make the connection to questions about irrigation projects, timber harvests, the dredging of ports, or the generation of electricity. Steven Yaffee takes this point one step further by suggesting that the consultation process has "gotten the endangered species program into land use planning through the back door." In this light, the Act is (or has the potential to be) one of the most powerful, comprehensive environmental laws ever passed by the U.S. Congress.

The second theme, although not new, is one of the most pivotal issues in endangered species protection. To state that all endangered species are to be saved is one thing, to actually carry out such a decree is another. Inadequate resources and the lack of commitment on the part of many administering agencies severely weaken our ability to effectively implement the Act and provide substantial protection for many species. Faith Campbell outlines many of the details of this issue in her review of the appropriation history of the Act, but the problem is reiterated throughout the essays.

Finally, to address the magnitude of the endangered species problem, in the next fifteen years we must move from many of the reactive measures that characterize the current programs to proactive strategies. The situation described by many of the authors might be likened to a treadmill that is steadily (or perhaps exponentially) increasing in speed. As more and more species are pushed to the brink of extinction, our chances of keeping up with the problem, by continuing to try to run faster in the same direction, will only diminish. In other words, we must begin to address the problem of species extinction from new, creative perspectives. Our focus must turn from the preservation of individual species toward the protection of the full spectrum of biological diversity including communities, ecosystems, and regional landscapes. In the final article, Scott et al. move forward from this recognition and begin to outline an integrated strategy for biological diversity preservation.

As the issue of species extinction moves to the forefront of the environmental agenda, reflecting on and drawing lessons from the past will be critical. With so much at stake, perhaps we cannot afford to do otherwise.

This special issue is part of our continuing efforts to improve the Endangered Species Update as a forum for the exchange of ideas and information on endangered species protection. As such, we hope that this issue will be the beginning of a dialogue rather than an end in itself. Currently, there is the possibility of an expanded book version of this special issue as well as an internationally sponsored symposium on the subject (contact Mike Scott of the Idaho Cooperative Fish and Wildlife Research Unit or Dave Harlow for more information about this symposium).

I hope you enjoy the issue and look forward to your comments and suggestions.



Kathryn Kohm
Update Editor

The 1973 Endangered Species Act: Looking Back Over the First 15 Years

by Michael J. Bean

On April 29, 1988, a California condor hatched in the San Diego Wild Animal Park. This event, the first such hatching ever to result from condors mated in captivity, was widely hailed as a dramatic breakthrough in the decade's long struggle to prevent the extinction of this largest of North American birds. That success followed by only a few months the birth in Wyoming of the first litter of black-footed ferrets to survive more than a few days after being born in captivity. Amidst the celebration of these conservation milestones, it may be forgiven if a few people temporarily forgot that years of virtually unparalleled effort and expense to preserve wild populations of these two species had already ended in failure. Captive propagation, once intended as a tool to supplement other conservation efforts, now represents the only hope for these species.

The examples of the condor and ferret underscore the difficulty in assessing the results of the Endangered Species Act. Are they success stories or are they failures? Unsatisfying as it may be, they are not yet either. Rather, they are still unfinished stories. That they are packed with suspense and tragedy is already apparent; whether their endings will be happy or sad cannot be foretold. The same can well be said of the Endangered Species Act itself.

When passed by Congress and signed into the law by President Nixon, conservationists heralded the Endangered Species Act as a turning point in our relationship with the other living creatures with whom we share the earth. Motivated by the sobering recognition that "economic growth and devel-

opment untempered by adequate concern for conservation" had driven numerous species to extinction and endangered many others, Congress boldly sought to stem the tide of extinctions depleting the diversity of life itself.

Today, fifteen years later, how much of the Act's promise has been realized and how much more remains to be? On the encouraging side, nearly every state has enacted its own endangered species legislation and established its own program paralleling and supplementing the federal program. Concern for endangered species has been integrated into the programs of most federal agencies, including the vitally important federal agencies that manage one-third of the nation's land. The Endangered Species Act has also stimulated major conserva-

tion initiatives by private organizations like The Nature Conservancy, which has used its unique land acquisition talents to acquire and protect habitats for many endangered species.

The ultimate measure of success or failure of these efforts, however, is whether the species that are the objects of the Act's concern face a more or less secure future. For some, prospects for survival are definitely brighter than they were fifteen years ago. The bald eagle, symbol of the nation, is making an encouraging comeback all across the country; the peregrine falcon, once completely extirpated from the eastern United States, has been successfully reintroduced there; the brown pelican in the Southeast and the American alligator throughout the South have fully recovered; even the whooping crane, reduced to only fifteen birds in 1941, has now been increased more than tenfold.

If the number of recovered species seems few, it must be remembered that fifteen years is a very short time in which to expect dramatic results. During that period, however, the foundations for future species recoveries have been laid. For many species, the likelihood of eventual recovery has increased because research done under the Endangered Species Act has made it possible to understand better the causes that threaten their survival and to identify the actions needed to remedy those threats. For others, we may only have bought additional time. Additional time is no small matter, however, for it may prove to be vital time in which to try to design more long lasting solutions.

Unfortunately, the negative side



loggerhead sea turtle hatchling (*Caretta caretta*)
photo by Donna Dewhurst, FWS

of the ledger is not small. Efforts to protect the last remaining wild California condors and black-footed ferrets have failed; their future hinges entirely upon the success of captive breeding efforts. The Palos Verdes blue butterfly of California no longer has even that hope. It went extinct earlier this decade despite years of formal protection under the Endangered Species Act. So too did Florida's dusky seaside sparrow, a species first listed for protection in 1967 under the original Endangered Species Preservation Act of 1966. The last individual of that species died in captivity on June 16, 1987. Outside our nation's borders, the situation is even more bleak. The African elephant, rhinoceros, giant panda, and chimpanzee, species to which major conservation efforts have been directed, continue to spiral downward. As yet undescribed species disappear daily from the relentless pace of deforestation in the tropics.

If any lesson is clear after fifteen years of experience under the Endangered Species Act, it is that the threat of extinction is far greater than it was appreciated to be in 1973, and that the resources needed to address the problem are far greater than those that have been made available thus far. Significant sums have been expended to aid the conservation of the condor, ferret, bald eagle, and a small number of other species. But these represent a tiny fraction of all the species now formally protected under the Endangered Species Act. In early April, just a few weeks before the baby condor's birth, that list surpassed the one thousand mark. At least that number have already been identified for possible future listing.

Are the increased resources that are needed for effective conservation of most of these species likely to be made available? Fortunately, public support for endangered species conservation, at least as expressed in public opinion polls, is high. Recognizing that strong support, elected public officials are

always at pains to emphasize how much they favor the protection of endangered species. Unfortunately, those same officials often make their strong declarations of general support just as they are about to propose pulling the carpet from beneath efforts to protect a particular species. In congressional debates, proponents of amendments to strip the government of authority to reduce the drowning of endangered sea turtles in shrimp nets, to lessen the rigors of the Act's restrictions with respect to federal highway building, to remove a species altogether from any protection under the Act, or otherwise to stymie what has been proposed to be done under the Act can invariably be counted on to begin

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their remarks with some version of "I am a strong supporter of protecting endangered species," (usually accompanied by a grandiloquent reference to the majesty of the bald eagle) and to follow that introduction with an all important "however" (typically accompanied by a sneering reference to the snail darter).

To understand this seeming contradiction, one must consider the political history of the Endangered Species Act. For these purposes, that history can usefully be divided into two eras. The watershed dividing them was the great tumult precipitated by the battle over the snaildarter and the TVA's Tellico Dam. Until that watershed event, relatively little controversy attended the federal endangered species program. The procedures for adding species to the threatened and endangered lists

were fairly simple, and proposals to list particular species seldom met with strenuous objection. The Act's all-important Section 7, requiring federal agencies to ensure that their actions not jeopardize the continued existence of any species, had not precipitated any major controversies. Protecting species threatened by extinction was perceived, both by the public and its elected officials, as a good thing, or at least a harmless thing.

Then came the test. The federal courts, ultimately including the Supreme Court, the Congress, newspaper editorial writers throughout the country, and countless others all wrestled with the same question: Which was

more important, to prevent the extinction of a fish that virtually no one had ever heard of or to build another TVA dam that virtually no one had ever heard of either? Editorial writers either ridiculed the notion that protecting a mere fish could justify scrapping a multi-million dollar dam or rushed to point out that the dam was an unneeded and wasteful expenditure of tax dol-

lars, regardless of its environmental impact. Implicit in the latter argument, of course, was the not very reassuring notion that a truly worthwhile dam would clearly be too important to sacrifice for a mere fish. The Supreme Court did not have to wrestle with these value judgments; its role was simply to discern the will of Congress. Congress clearly meant to save the fish, not the dam, said the Court. Congress, however, had the last word and said otherwise.

Since that upheaval, life has not been the same, and not just for the snail darter. Congress and the development community learned very quickly that the Endangered Species Act could lead to major practical consequences and that these might be unpopular and costly. Suddenly, elected officials began to add a "however" to their declara-

tions of support for protecting endangered species. They also added a host of complicating amendments to the Endangered Species Act, focusing in particular on the listing process in order to slow down the addition of new species for the Act's protection and thereby reduce the number of potential conflicts in the future. Whereas new listing proposals once generated little controversy, now a proposal was truly unusual

of the Alabama flattened musk turtle was also delayed beyond the deadlines specified in the Act, while the Service reportedly assured the state's congressional delegation that the listing of the turtle would never be the basis for clamping down on water pollution from the coal industry. A Service regional determination that construction of Stacey Dam in Texas would jeopardize the survival of the Concho water snake was

willing to abandon its basic duties to escape the political heat. That perception, in turn, emboldens still others to pressure the agency for even more concessions. That dilemma now confronts the Fish and Wildlife Service and the federal endangered species program. It is, at bottom, the reason that a handful of Senators have for three years blocked Senate consideration of legislation to reauthorize the Endangered Species Act over issues of no immediate importance to the vast majority of the Senate.

The challenge for the endangered species program in its next fifteen years, and particularly during the next Administration, will be to restore the perception that decisions in the program are in fact being made on the basis of the scientific criteria that the law specifies rather than in response to political pressures. Key to restoring that perception will be the appointment of individuals as Director of the Fish and Wildlife Service and Administrator of the National Oceanic and Atmospheric Administration who are broadly experienced in the management and conservation of living resources, strong in their conviction that it is the job of those agencies to ground their decisions in the best scientific data available, determined to seek the increased budgetary resources needed for an effective endangered species program, and widely regarded as having unquestioned integrity.

Today, the first of a new generation of California condors sees a world of bright lights, human faces, and cage bars. Whether it and others that may follow will ever see a world of rugged mountains, distant horizons, and open skies depends upon how committed the stewards of the endangered species program are to achieving those ends. For the condor, that commitment appears to exist. For the success of the endangered species program, no less a commitment must be made for the many other plants and animals whose very survival is the program's object.



Ash Meadows Amargosa pupfish (*Cyprinodon nevadensis mionectes*)

photo by Tom Baugh

if it failed to generate controversy. Once a species is listed, the federal agency responsible for its protection is rarely able to escape political battering, cajoling, threatening, and worse; all aimed at keeping the agency from being too vigilant in the carrying out of its Endangered Species Act duties for that species.

The political pressures have often been too much for the Fish and Wildlife Service to bear. Readers of this *Update* could not have escaped noticing the irony in the report in the January issue that a recent survey turned up none of four endemic Tombigbee River freshwater mussels that the Service listed as endangered in 1987. Completion of the Tennessee-Tombigbee Waterway effectively sealed their fate; only after that project's completion did the Service conclude that it was safe to list these species, whose obituaries can now be readied for future publication. Listing

quickly reversed by Washington after congressional pressure. Not needing to await a headquarter's directive, the Denver regional director reportedly put out the word that he would insist on a no-jeopardy ruling for Denver's controversial Two-Forks Dam project even before the Service's biological studies were completed. These examples, and many others like them that might be given, reveal the disquieting side of the statistics so often cited to show that, since Tellico Dam, there have been virtually no conflicts between endangered species needs and development desires.

Political pressures and the necessity to accommodate at least some of them may well be inevitable in any program with regulatory consequences. The danger inherent in such accommodations, however, is that if they are made too easily and too often, they create a perception that the agency charged with administering the program is weak and

Michael Bean is Chairman of the Environmental Defense Fund's Wildlife Program and author of *The Evolution of National Wildlife Law*.

Reflections on the Power and Potential of the Endangered Species Act

by Lynn A. Greenwalt

The Endangered Species Act (ESA) became law in December, 1973; I was named Director of the U.S. Fish and Wildlife Service two months before. Thus, this remarkable legislation and I have had a long association. This retrospective assessment of one of the most powerful environmental laws of the century is that of a non-lawyer who, with his associates, attempted to realize the potential of the legislation without letting its inherent power become its downfall.

From its beginning, the Act was regarded as special. A professor friend of mine from a western university once told me he always asked one of his government classes to characterize the fundamental nature of the Act. The predominant theme of these responses, he reported, was that the Act is in a way theological. It reflects a nation's collective commitment to prevent any species of plant or animal from disappearing - a pledge his students felt transcends the social, economic, and national security issues usually addressed in legislation. When one considers that the Act protects the Socorro isopod, a small crustacean which has remained unchanged for millions of years and is now restricted to a few small springs in Mexico and the American Southwest in the same way that it protects the bald eagle, then it is evident we have made a commitment that is unlike any other.

The passage of the Act was accompanied by the U.S. ratification of the Convention on International Trade in Endangered Species (CITES). This Convention provided the vehicle for international cooperation in the management of threatened and endangered species worldwide, and later proved to be a source of concern about the rights of U.S. state wildlife management agen-

cies to define their own destinies.

One of the first jobs to be faced after the Act was signed was the development of regulations by means of which the Act would be executed. A new body of regulatory direction had to be developed, a chore that took many months, and through which the real strength of the Act was revealed. Gradually it became evident that the ordinary course of federal business would never be the same as the intentions of the Act and the reality of the regulations were felt on a day-to-day basis.

The real strength of the Act, however, did not become evident until the matter of the Tennessee Valley Authority's Tellico Dam and a tiny fish, the snaildarter, illuminated the issue. The Tellico Dam project was well under-way when a citizen's group filed a lawsuit to require the agency to comply with the ESA in order to protect the snaildarter. Ultimately this action resulted in a U.S. Supreme Court determination which stated simply that if a project jeopardized a properly listed

species, the project must give way to the organism in jeopardy.

Only a new law could change that. A modification of the ESA was sought immediately, stimulating a rash of proposals and modifications of the statute. During rounds of congressional hearings, many witnesses from Congress came forward to say they did not know this new act would protect everything; they thought they were voting for legislation to protect eagles, bears, and whooping cranes. They professed not to understand at the time of passage that this law might raise questions about irrigation projects, timber harvests, the dredging of ports, or the generation of electricity. In short, the gap between the ideological commitment to endangered species protection and a more substantial commitment to behavior change surfaced and began to widen.

As the debate raged on, a few recommendations began to take shape. It was finally concluded that the Act should be changed to provide for a special review of conflicts like the Tellico



piping plover (*Charadrius melodus*)

Dam issue. An amendment providing for the appointment of a special review committee was passed (including an important proviso that key members could not delegate their responsibilities as reviewers). Such a committee was convened to study the Tellico situation.

After assembly and examination of information related to the snail darter controversy the Committee found the Tellico Dam project without convincing merit and determined that it could not be allowed to eliminate the snail darter. This decision was followed almost immediately by a skillful application of parliamentary procedures in Congress, and the Tellico Dam project was exempted from all provisions of the Act.

One of the ironic results of the case was that TVA, spurred on by the pressure of the issue, found room in its budget to develop a way to protect the little known snail darter. In the process, they found populations of the tiny, reclusive fish in other streams of the area. The event, at least, helped increase general understanding of the affects of human on other creatures, and demonstrated how little is really known about the flora and fauna of the United States.

Yet, the interposition of a plant or animal between humans and their desires to build, change, or turn a profit became increasingly controversial. It was alleged on one hand that proponents of the Act were trying to stop evolution, or at least that part of the process which causes species to disappear. It was sometimes difficult to convince holders of this view that evolution doesn't really count if it is speeded up by a bulldozer or a chainsaw. Others maintained that environmentalists would want to save the virus causing smallpox, or on a more practical level, would protect a man-killing grizzly bear instead of its potential victims.

A later amendment to the Act required wide dissemination of any proposal to define "critical habitat" for any species, lest the unwary discover their private rights might be curtailed because of the presence of a tiny toad or a rare fly-catching plant.

Early in the process of applying the Act, the question of how to deal with

large predators emerged. The grizzly bear was at the center of some of the first controversies. When the bear was finally listed as threatened, its listing was accompanied by a provision allowing for an annual total "man-caused" take, including a legal harvest, protection of livestock, and human self-defense. In the absence of this flexible approach, the last great mammalian predator in the U.S. might not have been listed at all.

A similar controversy developed around the timber wolf, a remnant population of which existed in northern Minnesota. Those opposed to protecting the wolf insisted that any real increase in wolf numbers would decimate dairy herds in the area and wreak havoc on deer populations for which the area is well-known. Hence, a carefully-drawn plan for the management of wolves in the area was developed, and state and federal officers were made available to control depredating wolves. The plan has worked well, though it has not allowed for state-managed sport harvest

black-footed ferret (*Mustela nigripes*)
photo by Tim W. Clark



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of wolves; lawsuits brought by pro-wolf groups have prevented the exercise of that degree of flexibility.

As the Act matured the often-heard expressions of concern about its intrac-

tability, its inconvenience, and its resistance to the application of practical interpretation have been demonstrated to be without merit. For instance, Section 7 of the Act requires federal agencies to "consult" with the U.S. Fish and Wildlife Service to determine whether actions proposed by an agency will lead to the "jeopardy" of any listed species. These consultations, more often than not, have resulted in identification of minor adjustments in the proposal in order to accommodate the needs of a species in question such that the project could go on without harm to the species. Some consultations took months of interaction among experts; most, however, were concluded with a telephone call or an exchange of letters.

In more recent years, the influence of the Act has resulted in innovative and imaginative resolution of problems that have sparked the interest and enthusiasm of everyone involved. A housing development in California that might have eliminated a rare butterfly was changed to accommodate the needs of the insect. The developer has emphasized and exploited his commitment to this idea, and residents of the new development are sensitive to, and proud of their co-dwellers.

The strength of the Act has been tested many times and remains unwavering. The means by which the Act is carried out have been changed, and in most cases ought to have been changed. For laws unreasonably executed which provide little room for flexibility or which are applied without an opportunity for the public to understand and shape the nature of those laws are doomed in the long-run.

In spite of its strength, however, the Act is vulnerable; its armor is not seamless. The Act is vulnerable to political intervention and to decisions that are based on political expediency rather than what is best for the species. It is not easy to resist the pressure to make special arrangements which provide for the advance of projects or programs or individual proposals. Proponents may justify such accommodations on national security, on overwhelming national economic interests, or the clearly supe-

rior need demonstrated by the very merits of a proposal.

The administrator of the Act is always conscious of the possibility of powerful forces affecting a change in the Act that may have shattering future consequences. He or she is always aware of the need to strike the balance, to proceed with caution, to accommodate today in order to prevail tomorrow. Yet the Act has been honed and polished in such a way that it need not be compromised. Its strength will grow because the credibility of what it stands for will be enhanced. As life becomes more complicated and the burgeoning needs of the human species impinge with increasing pressure on non-human species, the need for informed decisions becomes more acute. Good science must be accompanied by a better public understanding of how our lives touch other species, and how their well-being affects our own.

Of course we find our lives more complicated by this understanding. It is a blade with two edges. On one side, there is a temptation to administer the law through political compromise, more often than not unwarranted.

For example, a species considered to have little intrinsic merit may affect a major project (such as a dam or a highway) to the extent that the project cannot proceed without major adjustments or active consideration of some complex alternative. This can excite the interest of the political community, members of which are sensitive to the idea that human constituents are far more important than any other species, especially when a species does not enjoy a great deal of popularity. For example, protection of certain fishes of the Colorado River has increasingly come into conflict with the need for increasing exploitation of that river. In order for the fish to survive, water must be made available at the right time and in the right quantity. Moreover, temperature, rate of flow, and other physical characteristics of the river are often crucial habitat components. It is difficult to know what to do: requisite studies are expensive

and take many years to conduct, and water development projects - or their proponents - cannot wait. In such a circumstance, politicians often bring intense pressure to bear upon the administrators of the Act, even to the extent of threatening legislative action to "fix" the problem. Administrators, ever conscious of the power of politicians, may attempt to resolve the issue by offering mitigation schemes designed to obviate the hazard to a species with the understanding that any adverse consequences to the species will be taken care of later on.

Yet, to succumb to the temptation to fix the problem after the fact, is to admit an inability to deal with the issue now, when there are many possible

Once in a while a collective decision is made that things must be done right - that we have an obligation transcending the usual day-to-day living of life.

options available. As the project moves forward, the number of choices available for mitigating impacts on a threatened or endangered species may be limited or non-existent. The idea of finding a convenient way out today, the cost of which may be extirpation or extinction, is a denial of the purpose and intent of the Act and establishes a dangerous precedent.

On the other side, some may be drawn to use the strength of the Act to stop events which they oppose. It is appealing to "find" a species and use it to forestall an action of which one does not approve and, once successful, to forget the species. Each of these is an inappropriate application of the law. Each undercuts the true value, even the sanctity of the other species with which we are inextricably allied.

In retrospect, and viewed by one who has administered the Act and now looks at it from the perspective of a citizens' conservation organization, the Endangered Species Act has worked at two levels. One level is that of a statute

designed to create an institutional sensitivity toward all species and to provide the greatest possible protection for those found to be at hazard of extinction. On another level, the Act has allowed us to gain a better understanding of our species' relationship to all the others with whom our destiny is entwined. We have been obliged to face the reality that what we human beings do has a bearing on the well-being of other species, and most importantly, that our own well-being is in large measure determined by how other species fare. We are, perhaps, on the verge of recognizing the absolute necessity to make decisions so there are no losers, even if it means our species must accept compromises of a kind we seldom thought about 15 years ago.

Every retrospective exercise implies a prospect. The noble aspirations of the Act as it was formed 15 years ago will prevail only if there is a commitment to vigilance and to assuring there is no steady erosion of the Act because we are too impatient or inordinately greedy. There must be resistance to letting the Act be used to solve problems more properly resolved by other means, to urgings that the Act is "inconvenient" for some, or to the attacks by those who continue to find it an impediment to business as usual.

Once in a while a collective decision is made that things must be done right - that we have an obligation transcending the usual day-to-day living of life. That obligation may be to the future, or to an oppressed or disadvantaged few, or to an ideal. The Endangered Species Act represents a national pledge to the future, to an emerging understanding of the role we humans play in the transactions of the natural world. If we remain alert, caring, and committed, the prospect for a body of enlightened legislation, as well as for the reality it addresses, is a bright one.

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United States Listing for Endangered Species Chronicles of Extinction?

by William C. Reffalt

“For one species to mourn the death of another is a new thing under the sun. The Cro-Magnon who slew the last mammoth thought only of steaks. The sportsman who shot the last [passenger] pigeon thought only of his prowess. The sailor who clubbed the last auk thought of nothing at all. But we, who have lost our pigeons, mourn the loss. Had the funeral been ours, the pigeons would hardly have mourned us. In this fact, rather than in Mr. DuPont’s nylons or Mr. Vannevar Bush’s bombs, lies objective evidence of our superiority over the beasts.” (Leopold, 1949, p. 110)

When Aldo Leopold penned *On A Monument To The Pigeon* in 1947 (excerpted above), he conveyed a note of optimism. Now, forty-one years later, there are signs that optimism was premature.

Nearly seventy-four years have passed since the carefully recorded demise of the last passenger pigeon, a twenty-nine year old female residing in the Cincinnati Zoological Gardens (Terres, 1980). That same doom-filled month (September 1914) chronicled the passing of the last captive Carolina parakeet (Terres, 1980). Their quiet deaths loudly echoed the earlier extinction of the Labrador duck and great auk, reawakening the nineteenth century wave of concern generated by the near extinction of the bison and the ominously increasing documentation of drastic declines in many other species. Yet even as America realized that its forests would never again feel the hurricane-might of the pigeon profusion or witness the brightly colored, chattering flocks of parakeets, committed men and women were using that tragedy to generate support for increasing U.S. efforts to stem the tide of extinctions that appeared ready to engulf America’s prominent wildlife species.

During that era there were no official lists of endangered wildlife. A few books and several dozen magazine articles presented terse descriptions of those species that would be found no more and listed those deemed most likely to follow the pigeon and several other members of our wildlife heritage to the abyss of extinction (see for example Hornaday, 1913).

The Official Lists

When the first Endangered Species Act (ESA) was passed in 1966 (P.L. 89-669), the Secretary of the Interior was directed, after consultation with affected states and scientific groups having expertise in the matter, to “publish in the Federal Register the names of the species of native fish and wildlife found to be threatened with extinction” (80 Stat. 926). This congressional directive to create the first official U.S. list post-dated the July 1966 *Redbook*, published by the International Union for the Conservation of Nature, containing lists of rare and endangered species around the world (Fisher et al., 1969). Significantly (as demonstrated below), when the first ESA passed, the expressed intent was to protect 35 or so species of

mammals and 30 to 40 species of birds in this nation believed to be near extinction (Congressional Quarterly Almanac, 1966).

Congress institutionalized the global scope of the 1969 ESA (P.L. 91-135) by authorizing the Secretary to list wildlife “threatened with worldwide extinction” and to prohibit the importation of such species into the United States except under specified conditions. The decision to list a species required consultation with the states that might be affected and, in the case of foreign species, with the nation(s) where the species is normally found. In contrast to the earlier, somewhat informal process for listing, the 1969 Act intended that listing decisions comply with the Administrative Procedures Act (5 U.S.C.; 1001-1011) (Bean, 1983).

With the enactment of P.L. 93-205 on December 28, 1973 and subsequent amendments, the Act became the most far-reaching wildlife statute ever adopted by any nation (U.S. Fish & Wildlife Service, 1981). Among the innovations in the 1973 law were features further expanding the scope of the original statute. Many additional species became subject to listing with the addition of plants and the expansion of

the term "fish or wildlife" to include all animals. In addition, descriptions of critical habitat (i.e. areas essential to recovery of a listed species) were expected to accompany the listing of a species - an often difficult task even for relatively well-known, but highly mobile wildlife. Under the 1973 Act, the listing process became more demanding and even more formalized. The legislation even established procedures and time limits for acting on listing petitions. During the previous seven years, 109 U.S. species and 300 foreign species had been listed (Congressional Quarterly Almanac, 1973). Following passage of the 1973 Act, 346 species were listed over the next seven years (DiSilvestro, 1985).

Effects of Listing

Several benefits are bestowed upon endangered or threatened species once federal agencies officially list them. Listing conveys greater recognition of a species' precarious status as well as the need for restraint in modifying any conditions affecting them. Agencies, organizations, and individuals must consult with the Fish and Wildlife Service or the National Marine Fisheries Service before any federally-assisted action modifies a listed species' habitat, or when individuals of the species might be taken. Listing also shields endangered or threatened species by applying restrictions on the taking or trafficking of such species. Finally, listing leads to creation of a plan for recovering the species and facilitates acquisition of land or interests in land to assist recovery. Such conservation safeguards are not inconsiderable in their effects. Sometimes, such measures can halt excessive losses of individuals in the population, thereby arresting a population decline and permitting adequate time to take recovery actions, or as in some cases, allowing the species itself to recover its numbers. However, for species where the threshold of adequate recruitment remains unmet or habitat has been rendered incapable of supplying vital functions, carefully planned and executed actions are essential to recovery. For species on the official list,

a great deal can happen before the needed recovery actions are outlined in a plan, the plan is approved, and successfully implemented. For endangered, but not officially listed, species serendipity comprises the most likely salvation.

The Backlog Problem

In October of 1975, less than two years after passage of the expanded Act, the Fish and Wildlife Service (FWS) testified that it had received petitions to list 23,962 species in addition to 144

listing actions undertaken on its own authority (Schreiner, 1975, p. 14). Such backlogs have been a major factor influencing implementation of the ESA (for example see Schreiner, 1975, p. 16). To cope with the backlogs, the FWS developed a triage type of system to establish priority lists which emphasized the higher orders of animals and those which agency officials believed would respond best to recovery actions (Schreiner, 1975, p. 16). Yet, this approach has produced heated controversy and criticism. Neither the issues nor the backlogs have yet vanished.

Current Listing Status

As of May, 1988 a summary of ESA listings and recovery plans produces the following:

Approximate numbers of species, subspecies or populations

U.S. Endangered:	377	Foreign Endangered:	467
U.S. Threatened:	118	Foreign Threatened:	39
Total U.S. Listed	495	Total Foreign Listed:	506
Approved Recovery Plans = 229 (covering 283 species, etc.)			

The fact that nearly twenty-two years after the first ESA and almost fifteen years after enactment in its current form only 57% of U.S. listed species have approved recovery plans, fails to demonstrate attainment of the basic promises of the Act. When coupled with the listing backlogs, the task of achieving those promises seems Herculean. This is what the record shows:

- Approximately 34% of likely U.S. threatened or endangered (T/E) species have been officially listed (i.e. listed + Category 1).
- Approximately 11% of possibly T/E species have been officially listed (i.e. Category 2 added to above total).
- Approximately 6% of possibly T/E species have approved recovery plans.

Of the 495 U.S. listed species, only about 16 (3.2%) are recovering. Unfortunately, another 18 listed species (3.6%) are possibly extinct. For most species, a positive determination that absolutely no more of their kind live on this planet is an extremely difficult task. For example, the recent discovery of several ivory-billed woodpeckers on Cuba followed three decades in which no verified sightings were made.

Another list records the "delisted" species. Since the creation of such statistics, the FWS has logged 15 delisting actions. In the good news category, three of these delistings have been due to recovery of the species, and two (the brown pelican and American alligator) represent recovery over portions of their range. Another four of the delisting actions have been due to corrections of the original data or status. The bad news is that six of these delisting actions (40%) resulted from the species becoming officially extinct.

(Statistics compiled by The Wilderness Society from U.S.F.W.S. Data. June 9, 1988.)

Over the years, the FWS has compiled several pre-listing lists. The so-called "Candidate Category 1" List (now totaling about 950 U.S. species) includes those species, subspecies, or populations for which existing data support official listing as either threatened or endangered, but which have not been listed due to lack of a priority or inadequate resources to complete the formal listing process. It is currently believed that about 177 (18.6%) of the Category 1 entries already may be extinct. Candidate Category 2 includes species, subspecies or populations for which the existing data are considered inadequate to make a listing decision; however, someone or some organization has provided evidence that the status of a species is either threatened or endangered. This list includes about 2,944 entries; about 118 (4.0% of them may be extinct.)*

Assessment of the Past

When the first evidence of severe wildlife depletion was compiled over a century ago, it aroused actions by the individual states and several federal agencies. The agencies' actions ultimately achieved a good measure of success. Elk, deer, antelope, turkeys, and several other game species responded well to management actions including stricter hunting limitations (especially termination of market hunting); introductions into former, recovered ranges; and establishment of parks, forests, refuges, and other protected areas. Another factor aiding the recovery was the initial, fortuitous recovery of forest habitats from the denudation experienced as manifest destiny pushed America's frontier beyond California's rugged coastline. Post-frontier human populations were sparse, and demands on wildlife and wildlands were moderate by today's standards. The species in immediate jeopardy were also those readily granted public sympathy, and agency budgets were adequate to ac-

(* Data in this paragraph are from the 1986 and 1987 Defenders of Wildlife reports entitled: Saving Endangered Species, verified with FWS officials by The Wilderness Society in June, 1988.

complish the common management devices then known to the biologists.

With no official endangered species lists, the agencies were largely able to select and develop programs at the pace and in the priority order they chose. There were no unyielding public interest groups pressing the agencies to hold hearings or write impact statements; no second-guessing by consulting biologists under contract to corporate interests. There was a limited, well known and popular group of animals to attend to, and as their needs became known and were supplied, these (mostly game) species responded favorably. The largest interest group -hunters - provided immediate feedback, praise, and bigger license sales which provided more resources to enlarge the cycle of success. Other conservationists gave their praise too, and spread the words of success and desiderata to Congress and millions of Americans through their testimony,

small white lady slipper (*Cypripedium candidum*)
photo by Thomas H. Arter, The Nature Conservancy



The lists and the listing process have thus become a focus of attention and a means of controlling the pace of the entire ESA effort.

books, magazines, meetings and films. Both federal and state budgets benefited.

By 1966, however, when the ESA was deemed necessary, things had become more complex, human populations had redoubled and the land was being used for maximum benefit to the "bottom line." Numerous little-known species were being evicted for purposes of "higher and better" use of the land and water. As the ESA developed and its scope broadened, many "ugly ducklings" and species whose needs sometimes conflicted with the bottom line also became candidates for listing. Biologists often knew very little about the requirements of the species or the full extent of their habitats. Funding for an enlarged endangered species program was hard to come by, and the on-going popular management and research programs left little or no resources available for these unillustrious and often controversial creatures.

Requirements for listing became more precise and more demanding, and the potential candidates for federal protection grew into the thousands. The public became more interested, more involved, and more demanding. Some asked "what good is that creature anyway?" and answers were not easily at hand and often sounded fanciful. Agencies quickly found that less controversy meant less discomfort. And since there was more to be done than money or time allowed, "priorities" had to be set; besides, "Why not do the less controversial ones first?" (except in emergencies). The lists and the listing process have thus become a focus of attention and a means of controlling the pace of the entire ESA effort. In the past seven years, only 246 species were listed -40% less than the first seven years and 29% less than the second seven years since passage of the 1966 Act.

By the time species "qualify" for official listing, the ecological situation is frequently critical, and the available options (if known) for successful recovery are quite limited. This often results in high costs for research and management. Thus, agencies are constantly faced with balancing high costs and high



California sea otter (*Enhydra lutris*)
photo by Richard Bucich, courtesy Friends of the Sea Otter

**Too often,
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hemorrhage.**

risks efforts (i.e. those that include data gaps and great uncertainty) against those requiring less resources and having higher chances of success. Endangered species work is not a low tension job.

Given such a foregoing background and perspective, the two fundamental questions that repeatedly arise are can the inexorable rise of extinctions be averted? And if so, how?

What Then the Future?

"A deep chesty bawl echoes from rimrock to rimrock, rolls down the mountain, and fades into the far blackness of the night. It is an outburst of wild defiant sorrow, and of contempt for all the adversities of the world.

"Every living thing (and perhaps many a dead one as well) pays heed to that call. To the deer it is a reminder of the way of all flesh, to the pine a forecast of midnight scuffles and of blood upon the snow, to the coyote a promise of gleanings to come, to the cowman a threat of red ink at the bank, to the hunter a challenge of fang against the bullet. Yet, behind these obvious and immediate hopes and fears there lies a deeper meaning, known only to the

mountain itself. Only the mountain has lived long enough to listen objectively to the howl of the wolf."

(Leopold, 1949, p.129)

Americans have taken bold steps, through the ESA, to sustain the remarkable wildlife heritage of this nation. Becoming the even more responsible beings urged by Leopold in *Thinking Like a Mountain* calls upon us to make further, stronger commitments. Current versions of the ESA reauthorization contain some of what is called for: monitoring programs for candidate species; strengthened plant protection; increases in authorized funds; and manpower to accelerate all facets of the ESA efforts; and greater penalties for those who would extinguish a living spark forever and destroy a piece of the common heritage.

But even those sorely needed thrusts seem to fall short of the monumental task known to be at hand. Perhaps the time has come for Congress to emulate the wisdom and objectivity of "the mountain" and to set aside its tendency to view each potential conflict over a species recovery effort with a legislator's microscope. Perhaps it is time to summon the foresight and cour-

age to legislatively place all candidate Category 1 species on the official list without further ado. Congress also needs to provide new direction for identifying, listing, and implementing plans to recover endangered wildland communities that is, those communities where several populations are failing because the basic habitat has become overly modified or fragmented and is unable to sustain itself unless steady, protective steps are taken soon.

Too often, listing species has been akin to giving morphine to cure a hemorrhage. The time has come to go beyond easing the pain to stabilizing the environments while completing needed analyses, and then taking the necessary curative steps for full recovery. Human judgements of the patients' appearance or net economic worth impede action. Only mountain-like objectivity and wisdom will properly serve these patients' cure. For one species to take great pains to avert the death of another is the new thing under the sun this generation should impart to the future.

William Reffalt spent 23 years with the Fish and Wildlife Service, with over two years heading the policy-guiding Division of Refuge Management. He currently is the Program Director for National Wildlife Refuge System issues at The Wilderness Society.

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Protecting Endangered Species Through Interagency Consultation

by Steven L. Yaffee

Sometime in early 1973, in the organized chaos of the 93rd Congress, a sleeper was added to a developing piece of environmental legislation. Preservationists, administration experts, and the House Merchant Marine and Fisheries Committee staff pushed for including in the Endangered Species Act an absolute mandate for federal agencies to protect endangered species. Where previous legislation had required federal agencies to provide protection "where practicable," Section 7 (as enacted) requires agencies to take "such action necessary to insure that actions authorized, funded, or carried out by them do not jeopardize the continued existence of an endangered species." Further, it placed a measurable requirement on the agencies not to destroy critical habitat, and prescribed a mechanism for implementing the requirement via interagency consultation.

The change from the old consultation requirement to the new mandate was significant. While the concept of interagency cooperation through consultation was well-defined in wildlife law by the early 1970s (Bean, 1977, p.192), it had yielded little substantive effect. Just as my pleas to my young daughter to "cooperate" fall on deaf ears when she sees cooperation not in her best interests, so do congressional mandates that ask one agency to help another. The old statute required action to protect endangered species "insofar as is practicable and consistent with (the

agency's) primary purposes." By 1973, history, to say nothing of common sense, suggested that the odds of getting the U.S. Department of Transportation to alter plans for an interstate highway to protect a rare bird, or the Army Corps of Engineers to forego a dam to protect a population of endangered bats were slim indeed. Then along came Section 7.

While the absolute mandate rarely results in absolute action, it has raised the priority of endangered species preservation on the agenda of numerous federal development agencies by making it disadvantageous not to do so.

The Wisdom of the Section 7 Consultation Process

One of the remarkable things about Section 7 is that it has survived relatively intact. Although the interagency consultation process has been refined, streamlined, and provided with an al-

most-never-used exemption process, the mandate remains solid. It survives because it makes sense substantively, it has been implemented flexibly and adaptively (perhaps too much at times), and environmentalists have mustered enough support in Washington to turn away major challenges. Establishment of the so-called God Committee (*), the high-level exemption-granting group, might have been feared by the environmentalists in 1978, but it has provided an essential political pressure valve: You say you have an irreconcilable conflict? Well we can handle that. Put it to the test.

While Section 7 is problematic as development policy, as endangered species policy it makes sense. It recognizes the fact that a regulatory program is only as good as its implementation network. Public policy functions by changing the behavior of a range of parties. In the case of endangered species policy, action must come not only from the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service, but from a range of public and private agencies and groups. Statutes create the conditions for such networks of institutions to function in two ways: 1) by enabling action where mutual interest exists, and 2) by structuring incentives to encourage groups to act appropriately. The Endangered Species Act uses both of these mechanisms. When funds are available, Section 6 grants, which provide financial assis-

(*) Responding to political pressures to weaken the absolute mandate contained in the Endangered Species Act, amendments enacted in 1978 contained a process by which a project that presented an irreconcilable conflict with an endangered species could be exempted from the requirements of the Act after review by a high-level interagency committee. Composed of the Secretaries of Agriculture, Defense and Interior, the Chairman of the Council of Economic Advisors, the Administrators of the Environmental Protection Agency and the National Oceanic and Atmospheric Administration, and representatives of affected states, the Endangered Species Committee had the power to choose between a project and a species, and hence was immediately called the God Committee. In fact, the process established by the Amendments has only been employed twice: for the Tellico Dam and Grayrocks Dam projects. Neither received an exemption from the provisions of the Act.

tance to state endangered species programs, allow for state-federal cooperative action where mutual interest exists. Interagency cooperation, as defined by Section 7, functions by influencing the incentives agencies face.

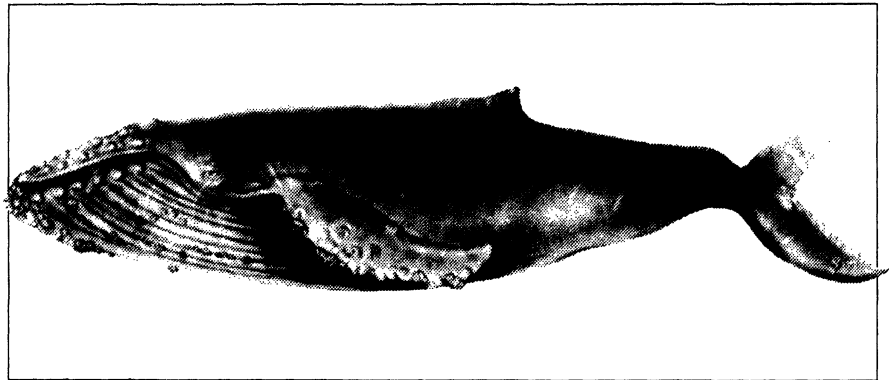
Section 7 also works fairly well because it recognizes the strategic disadvantage that nonhuman (and nonvoting) lifeforms have. While the absolute mandate rarely results in absolute action (Yaffee, 1982), it has raised the priority of endangered species preservation on the agenda of numerous federal development agencies by making it disadvantageous not to do so. Ever since the Tellico Dam Supreme Court decision (*TVA v. Hill*, 437 U.S. 153 (1978)) that stated that Congress intended the absoluteness of the mandate contained in Section 7, development agencies have recognized the potential for delay and controversy that can result from failing to consider endangered species (at least somewhat) in planning their projects. Similarly, the Fish and Wildlife Service fears the political controversy that can result from visible issues that appear to pit preservation against economic development concerns. While the mandate has created an additional and important lever that can be used by non-governmental intervenors, such groups have used the lever sparingly fearing a congressional backlash against the program. As a result, all three groups have the incentive to seek creative solutions that accommodate preservation and development concerns.

The interagency consultation provisions of the ESA have also been significant in that they have moved endangered species policy further into the business of protecting habitat rather than simply protecting individual plants or animals. Since the long term solution to the endangered species problem requires ecosystem-level planning (U.S. Congress, Office of Technology Assessment, 1987, 90) and greater up-front care in land development and management, incorporating endangered species consideration in ongoing processes of federal planning makes a lot of sense. Interagency consultation has gotten the endangered species pro-

gram into land-use planning through the back door (Coggins and Russell, 1982). Indeed, endangered species hotspots (that is, places that witness a lot of controversy over proposed developments) may be fairly reliable indicators of broader planning problems. Hence, the prevalence of conflicts between endangered species and proposed developments on a number of western water systems, such as the Upper Colorado

percent of all consultations (Di Silverstro, 1986, p.359).

FWS documentation suggests that very few of these projects were cancelled due to the endangered species conflict. Of the 86 projects that received jeopardy opinions in fiscal years 1982, 1983, and 1984 (out of 18,670 consultations including 922 formal consultations), only 14 were identified as having been cancelled or withdrawn, and only a



humpback whale (*Megaptera novaeangliae*)

drawing by Eveyln Sozuck

and the North Platte Rivers, bespeak a serious resource allocation problem that goes beyond the endangered species dimension. Places that evidence a fair number of conflicts over endangered species are in need of deliberate and creative planning. Such planning should consider and respond to resource shortages in a manner that balances the variety of human resource uses and protects biological systems including endangered species habitat.

The Implementation Record

On the surface at least, the record of the implementation of Section 7 suggests that such planning is possible. While the total number of consultations carried out by the FWS has increased dramatically, the number of projects that have been delayed significantly or stopped has been remarkably small. For example, the total number of consultations more than quadrupled in the seven-year period between 1979 and 1986 (Alderson, 1987, p.15). The number of jeopardy opinions - cases in which the FWS determines that a project is likely to harm an endangered or threatened species - was consistently less than one

portion of those due to endangered species protection reasons (U.S. Fish and Wildlife Service, Office of Endangered Species, undated, 5). More typically, mitigating measures are designed into the projects to offset or avoid the threat to the species. For example, developers of a landfill in San Jose, California agreed to a number of mitigation measures to offset the project's impact on the bay checkerspot butterfly (*Euphydryas editha bayensis*), currently listed as a threatened species. Measures included creation of a conservation trust fund, ongoing research, habitat acquisition and management, restoration and revegetation when the landfill is at capacity, and offsite reintroduction and recovery (Murphy and Freas, 1988). Similarly, biological opinions on several marina projects on the intracoastal waterway in Florida have prescribed a variety of measures to offset impact on the West Indian manatee, including reducing the number of power boat slips, reducing boat speed limits, conditioning slip rental agreements, and providing information to boat owners about the nature of the threat to the manatee.

Contrary to common complaints, consultations do not appear to result in

excessive delay of projects. The 922 formal consultations carried out in fiscal years 1982-84 averaged 50 days to complete. Consultations that received jeopardy opinions, and hence involved the most work, were completed on average in three months time. Since endangered species considerations are simply one of numerous components of most federal permitting or development processes, three months of review time is most likely a drop in the project review bucket, and insignificant if consultation is initiated early in the regulatory process.

An analysis of conflicts between the consultation requirements of the Endangered Species Act and western water projects provides the best "worst case" data. Early last year the General Accounting Office produced an analysis of the effects of the consultation requirements on water projects in 17 western states that concluded,

"Consultations carried out under the Endangered Species Act have had little effect on western water projects. While 68 consultations affected projects over the 7-1/2 year period we examined, for the most part these effects have not been major. Further, even when the consultation affected the project, Department of the Interior and other agency officials indicated that other events occurring at the same time (such as difficulties in arranging project financing) some-

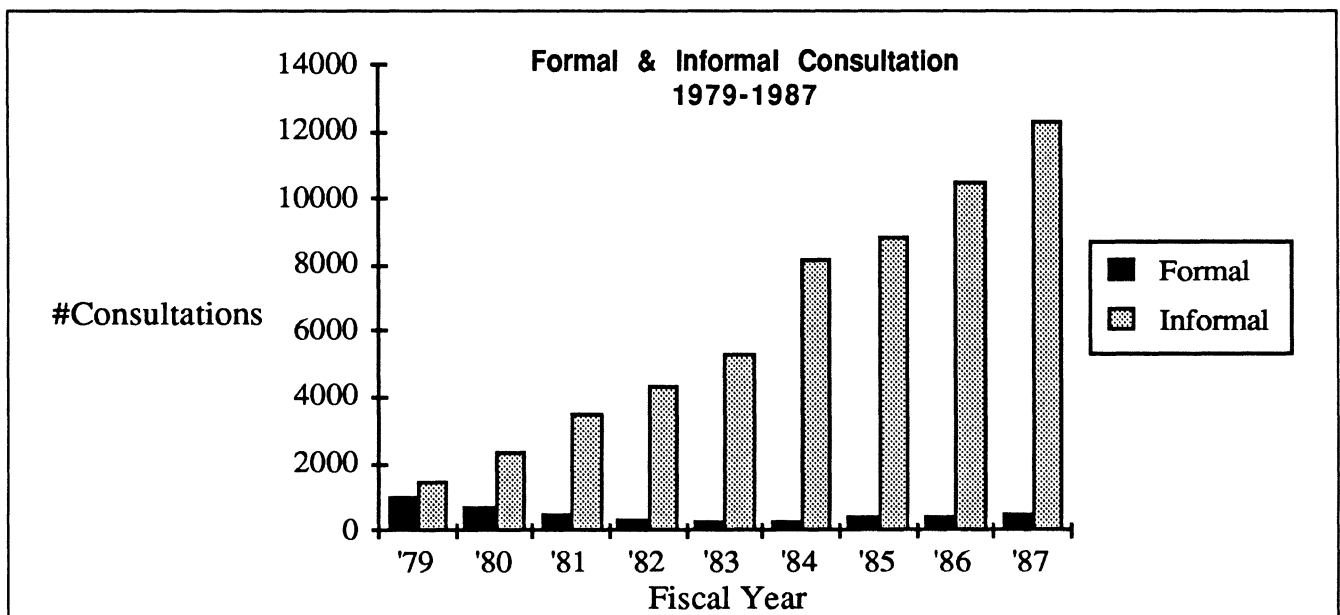
times had a more significant effect than the consultation process. The willingness and ability of the Service and project sponsors to arrive at compromise solutions when conflicts occurred also contributed to reducing the consultation requirement's ultimate effect on project development." (U.S. General Accounting Office, 1987, p. 30)

While the implementation record is reassuring to those who are concerned that the Act has delayed or increased the cost of development, the same data can give rise to concerns that species might be receiving inadequate protection. Does a low number of projects cancelled due to conflicts with endangered species mean species are not receiving enough consideration? Does few jeopardy opinions mean that the conflicts have been worked out, or that the FWS is trying to minimize controversy, potentially at some expense to endangered species protection? Does the fact that the FWS increasingly has used informal consultations mean that the agencies are getting better at designing projects considering the needs of endangered species, or that the FWS is trying to keep the process out of the more costly and potentially more controversial terrain of formal consultations (formal consultations as a percent of total consultations declined from 38 % in 1979 to roughly 4% currently)? While there are no clear answers to these questions, my sense is

that the effect of the Section 7 consultation process varies among agencies and specific projects. For most agency decisions, Section 7 has insured that endangered species are at least considered as part of impact assessment; for a number of projects, consultation has resulted in significant changes in project design; and for a few projects that seemingly threaten a major and unmitigable impact on a species, the Section 7 process has created an additional window into agency decision making, providing information and opportunity for proponents of endangered species protection to influence federal permitting and development decisions.

Problems in Implementation

There have been problems with the implementation of the consultation process, though the problems have been largely with the implementation of the statute, and not the law as written (if a distinction can be made). As has been true with other elements of the ESA, consistently limited funding has constrained FWS activity in the consultation process. Over the past decade, consultation activity has more than quadrupled, yet budgets and staff allocations have stayed constant at roughly \$2.5 million per year. Either FWS personnel have gotten four times more efficient at carrying out consultations (an unlikely situation) or the amount of staff



effort per consultation has declined. The shift from formal to informal consultation no doubt partly reflects the workload problem: informal consultations take less time, provide more room for negotiation, and avoid the bureaucracy of the formal consultation process.

We should also acknowledge the fact that participants in the consultation process follow their perceived incentives, and many of these incentives run counter to the interests of endangered species protection. No doubt the FWS has shifted to using informal consultations in part to avoid the visibility and potential for controversy that formal consultation entails. Likewise development agencies face a disincentive to volunteer information that will establish a threat to a listed species, and legislators and nongovernmental parties of all kinds participate in the process in whatever way they can to influence its outcome.

Political considerations clearly are present in the consultation process, and it would be surprising if they were not. Consultation decisions are allocation decisions. They contribute to an on-the-ground definition of who gets what resources when. The December 1986 decision on the Stacy Dam in west central Texas is a decision that allocates water resources and associated habitat to a variety of interests in the region, including those of the Concho water snake. (Endangered Species Technical

Bulletin, Feb. 1986 and Jan. 1987). We should expect that the Texas congressional delegation will get involved in the issue (as they did) and that the FWS faces a strong incentive to respond to such pressure (as they did in accepting a mitigation plan for the snake that they had rejected in May of the same year as unlikely to work) (Alderson, 1987, p.15). Rather than bemoan the fact that politics enters into endangered species decision making, we should recognize the realities of the situation and work to exploit the benefits of political inputs, as sources of information about collective values and how intensely they are held, and minimize the negative effects of such forces on species preservation.

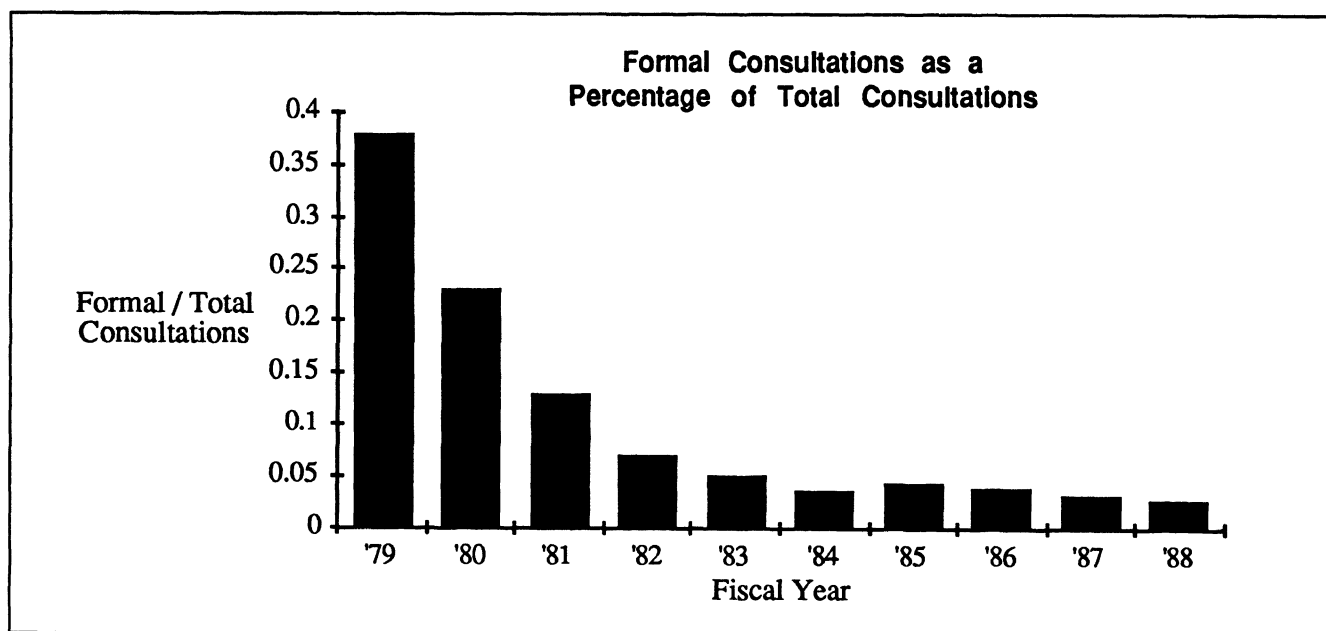
Improving the Process

How do we walk this tightrope? If we could design the ideal consultation process, it would include the following: (1) it would be absolutely firm on ends - preservation of species - yet flexible on means to reach those ends; (2) it would provide the resources necessary to implement the policy effectively, including staff and information; (3) it would address the magnitude of the underlying problem; and (4) it would be proactive, not limited to crisis-oriented reaction.

The Section 7 consultation process moves us well along towards this type of process, but we need to go further. As discussed above, the absolute mandate

provided in the Act and the opportunities provided for judicial intervention by proponents of preservation help to create an incentive structure that moves towards the first objective. Yet, we can go further. We need to insure that the process remains visible by providing information on informal and formal consultations in a format that makes it accessible to nongovernmental groups that can serve as watchdogs to promote adherence with the preservation goal. A sample of projects on which consultation has taken place should be examined post-consultation on a regular basis (preferably by an uninvolved party) to evaluate the actual habitat consequences and hence the adequacy of current consultations. To promote creativity in devising compromise solutions that adequately protect species, training is needed of FWS and development agency personnel to insure that the full range of mitigation techniques are utilized and that development options are fully explored. In some situations, this inventing of options might require FWS biologists to be more expert on development alternatives than they otherwise might want to be.

We want to promote consensus-building in dealing with these conflicts, but not at the cost of long-term harm to an endangered species. Approaches like the so-called Windy Gap strategy probably go too far. Named for a project on the Colorado River in north central



Colorado, the Windy Gap approach signalled the influence of the Reagan Administration on endangered species decision making. Up to 1981, the FWS held to the position that any water diversion from the Upper Colorado would probably jeopardize resident endangered fish, and that more data was needed to evaluate fully their effects. Beginning with the Windy Gap project and continuing for more than thirty additional projects, the FWS began issuing "no jeopardy" opinions, allowing project construction to proceed contingent on project sponsors contributing to a fund that would pay for impact studies and required conservation measures. Environmentalists noted that if the stud-

Rather than bemoan the fact that politics enters into endangered species decision making, we should recognize the realities of the situation and work to exploit the benefits of political inputs. . .

ies found that the depletions were deleterious, it would be too late. Levying fees as part of a mitigation package is not of itself objectionable; the Grayrocks Dam project on the North Platte used this as a component of a mitigation package to protect a Whooping Crane stopover point. But simply allowing projects to proceed if they pay tribute without knowing what will happen is inappropriate.

A consistent set of resources are needed to insure that the consultation process works as it should. These funds include an increase in budget and staff slots for the FWS, and probably for their counterparts in development and permitting agencies. Besides the training identified above, FWS (and National Marine Fisheries Service) staff should be trained in negotiation skills, recog-

nizing that their long-term success in what is almost always a negotiation environment lies in their power to persuade, develop alternatives and mobilize support for their position.

Information is also needed to make the consultation process work better. While certainly more research into the needs and dynamics of endangered species populations would help resolve some of the technical uncertainty prevalent in consultations, better notification processes would be helpful to disseminate information on the existence and habitat needs of known endangered species. Developing systems like the Endangered Species Information System and other computerized sources of information, and making them accessible to project developers and environmental groups (with appropriate safeguards to avoid publishing the location of sensitive species that could be "collected" to death) might help avoid some of the conflicts before they arise. Proponents of development often prefer a tough yet certain situation to a less constrained but uncertain one. Part of the problem with the consultation process from a developer's standpoint is its mystery and uncertainty. While some of this is due to the lack of information on many species, to the extent that we can devise information systems that allow developers to avoid problems, we will be better off.

An effective consultation process should also deal with the magnitude of the problem - it is here that action is particularly needed. Consultations should include any and all species who we suspect might be jeopardized by development, not just those that have made it through the listing gauntlet. Impacts on candidate species should be evaluated as part of the informal consultation process, even though the ESA's absolute mandate to protect will not (and perhaps should not) apply. While the regulatory process of necessity functions on a case-by-case basis, more work on evaluating and forecasting cumulative effects of development is needed. Finally, the consultation process should not be limited to projects on U.S. soil. Activities that involve federal

government support or permits overseas should be evaluated through inter-agency consultation. Although the Act provides for foreign consultations, implementation has fallen far short of its potential. Since a good deal of the global endangered species problem lies in the loss of habitat in the tropics, any lever that we have to stem the tide should be employed. The Section 7 process is an existing regulatory process that could have an effect.

The approach to endangered species protection established by the ESA is fundamentally a reactive process. It responds to crisis, proposed developments, and alleged endangerment. The persistent poverty that has surrounded the program has limited any attempts to be proactive through strategic planning for future developments that avoid species conflicts. The ESA provides a very good stop-gap approach, and the consultation process moves us in the right direction, but the long-term solution to the problem will only come from more effective planning processes at all levels of administrative organization. This is especially true as we broaden our view of endangered species preservation to include the ecosystems and processes of which such species are a part and that give them vitality and meaning.



Wood Stork (*Mycteria americana*)
photo by David Mcewen, USFWS

The endangered species problem is principally a land-use problem, and it will only be solved through deliberate action that utilizes expertise and involves all affected parties in decision making. How do we achieve this type of collective choice process in a society that tends to be suspicious of planned change? By utilizing more effectively existing federal and state planning processes, such as those ongoing for Forest Service and BLM lands, breathing life into moribund regional planning institutions such as river basin commissions, and creating ad hoc groups especially around endangered species hotspots. The endangered species coordinating committees for the Upper Colorado and the North Platte Rivers are steps in the right direction. Regional biological diversity councils formed by inter-agency memorandum of understanding and/or by new legislation might also help provide oversight and direction.

Improving the consultation process, and indeed, improving other elements of the endangered species program, demands leadership. It requires a federal administration cognizant of the value of biological diversity and committed to endangered species reservation. It demands a lead administrative agency that is given a chance to succeed. Both of these items require constituency-building. Endangered plants and animals will only be protected as long as there is the political will to do so. A policy is only as good as its support coalition. Proponents of protection must continue to lobby and develop an understanding of the importance of the issue throughout the populace. Constituent support allows decision makers who want to make choices that benefit endangered species to do so, and can influence decision makers who otherwise would not care about endangered species concerns.

Implementation requires action from a variety of participants. Government regulation will not solve the problem alone, and efforts to deal with federal budget deficits will limit future federal programs. Expertise and understanding should be cultivated in state

The persistent poverty that has surrounded the program has limited any attempts to be proactive through strategic planning for future developments that avoid species conflicts.



West Indian manatee (*Trichechus manatus*)

photo by Galen Rathbun

agencies. Nongovernmental organizations must continue to play a major role, through monitoring, lobbying, educating, and fund raising.

The endangered species problem is a problem of human civilization. It should not be surprising, therefore, that its solution requires our improving the functioning of human decision-making institutions. Perhaps more than other elements of the ESA, the Section 7 consultation process provides a focal point for the diverse set of human demands that are placed on natural resources. Mediating between these demands in a way that protects components and processes of the nonhuman world is a difficult but an essential task.

Steven Yaffee is a Professor in the School of Natural Resources at The University of Michigan and author of *Prohibitive Policy: Implementing the Federal Endangered Species Act*.

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The Appropriations History of the 1973 Endangered Species Act

By Faith Campbell

Effective protection for endangered species depends upon adequate financing. Funds are necessary to employ staff to evaluate whether species should be listed, to assess the possible impacts of proposed activities, and to devise and carry out programs to restore the species to viable population levels. In addition, law enforcement agents must be available to investigate violations of the law's legal protections. Finally, habitat areas must be purchased and managed to ensure that they remain suitable for the species' use.

Several federal agencies are involved in protecting endangered species: the Fish and Wildlife Service for terrestrial species, the National Marine Fisheries Service for marine species, and the U.S. Department of Agriculture for enforcing restrictions on importation and exportation of listed plant species. In addition, the federal land-managing agencies, primarily the Forest Service and Bureau of Land Management, have major responsibilities for protecting endangered species.

The overriding theme of the appropriations history of the Endangered Species Act (ESA) is that none of these agencies has been adequately funded to effectively carry out a comprehensive species protection program.

Resources vs. Need: The Widening Gap

Tables 1 and 2 show that although funding for endan-

gered species conservation work has increased for all relevant agencies, it has not increased fast enough to keep up with even the tardy expansion of the federal endangered species list - much less the ever-expanding number of non-listed species in need of protection.

Overall, FWS spending on endangered and threatened species, excluding land acquisition, has increased three times faster than inflation since the first year of the program. This is slightly faster than the pace of listings for native U.S. species. However, much of this growth took place during the 1970s, when funding outpaced listings. During the early years of the Reagan Admini-

stration, spending declined severely. According to Barton (1987, p. 326), the endangered species program increased 3% in constant dollars over the entire Reagan Administration, from 1981 to 1987. In other words, funding in FY1987 was almost the same as in FY 1981, despite the listing of 237 species during the period. Actually, the funding situation is even worse than this figure suggests. Since the 3% increase apparently includes land acquisition, it masks the decline in real resources allocated specifically for listing and conserving endangered species.

The National Marine Fisheries Service does not separate funding for

Table 1: Appropriations for the Fish & Wildlife Service Endangered Species Program
(in millions of dollars)

FY	'74	'75	'76	'77	'78	'79	'80		
Total	4.657	5.542	9.486	13.330	16.534	18.869	20.087		
FY	'81	'82	'83	'84	'85	'86	'87	'88	• ESARC
Total	22.782	17.769	20.459	22.205	26.944	28.824	29.764	31.066	*98.66
lstng	4.101	1.987	2.057	2.595	3.191	3.071	3.622	3.259	11.2
const	2.578	2.459	2.541	2.575	2.845	2.625	3.193	2.971	6.6
prmts	-	-	-	-	.718	.815	.866	.855	-
rcvry	4.629	5.217	5.129	4.714	5.884	6.031	6.565	7.512	20.5+
sec6	3.920	0	2.000	2.000	3.92	4.204	4.3	4.3	25.7
r&d	2.084	2.434	2.966	4.135	4.404	4.544	4.827	5.201	5.2
law enf	5.470	5.672	5.766	6.186	5.815	7.381	6.228	6.805	8.3
hatchery	-	-	-	-	.167	.153	.163	.163	-

* Includes NMFS and some FWS programs not included in this line-item breakdown
• ESARC : Endangered Species Act Reauthorization Coalition

endangered species under its jurisdiction from that for species protected under the Marine Mammal Protection Act. Consequently, it has proven difficult to determine actual funding levels. In FY 1987 and 1988, funding was \$3.168 million and \$3.614 million, respectively. Appropriations have apparently never exceeded \$4 million, a token sum. In contrast, the Center for Environmental Conservation has recommended an appropriation of \$7.5 million.

Other federal agencies charged with species protection struggle with a similar gap between the magnitude of the problems which they face and the resources available for action.

U.S. Department of Agriculture

The U.S. Department of Agriculture (USDA) is responsible for enforcing both the ESA and the import and export regulations for plants called for in CITES (the Convention on International Trade in Endangered Species). There is no separate appropriation for the program, but USDA is assumed to use the amount authorized (\$1,850,000) for this purpose. This authorization represents 2% of the total appropriation for the USDA division carrying out the above responsibilities. In 1985, the Endangered Species Act Reauthorization Coalition (ESARC - a group of more than 30 scientific, animal welfare, and conservation organizations) recommended increasing the authorization to \$2.5 million to allow for inflation and to encourage the USDA to improve its monitoring of plant trade, training of port inspectors, and species identification materials. The need to hire botanists for two additional ports which receive large numbers of imported orchids was of particular concern at that time.

Federal Land-Managing Agencies

Under Section 7 of the Act, the major federal land-managing agencies have a legal obligation to further the purposes of the Act by promoting recovery of listed species on their lands. Since a significant number of listed and candidate species occur on public lands

(see Table 4), managing agencies have the opportunity to halt or even reverse population declines and perhaps obviate the need for listing. Currently, the primary need is to hire adequate numbers of biologists in field offices where land-use decisions are made. These biologists must be given sufficient authority to curtail land uses that are harmful to listed or candidate species. Some additional funds are needed to erect and maintain fences and signs protecting fragile areas and to patrol areas subject to vandalism.

Forest Service:

The number of listed species on Forest Service land grew by 58% between 1981 and 1987. During this time, funding for endangered species almost tripled as a result of congressional additions. However, the \$4.49 million available for endangered species protection in FY1988 still falls short of the need. Virtually all of the funds have been spent on fewer than a dozen species of mammals and birds. Only when Congress began earmarking money for work with endangered plants did the Forest Service begin a comprehensive program for that kingdom.

Forest Service staff now recognize the need to increase funding for endangered species, and are developing a program to "sell" endangered species to higher levels of the Service, its parent agency, the Department of Agriculture, and the President's Office of Management and Budget.

Bureau of Land Management:

The number of listed species on BLM lands grew by 87% between 1982 and 1987, while funding slightly more than doubled. Although more funds are needed, the FY1988 allocation of \$4.3 million does represent 23% of BLM's total wildlife budget. As such endangered species funding cannot be increased until we overcome BLM's overall funding inadequacies. The BLM's budget has been cut nearly 10 % since FY1981. According to Barton (1987, p. 341), BLM's renewable-resource programs have been hit particularly hard.

Table 2.
Funding for Land Acquisition
by the USFWS (in millions of dollars)

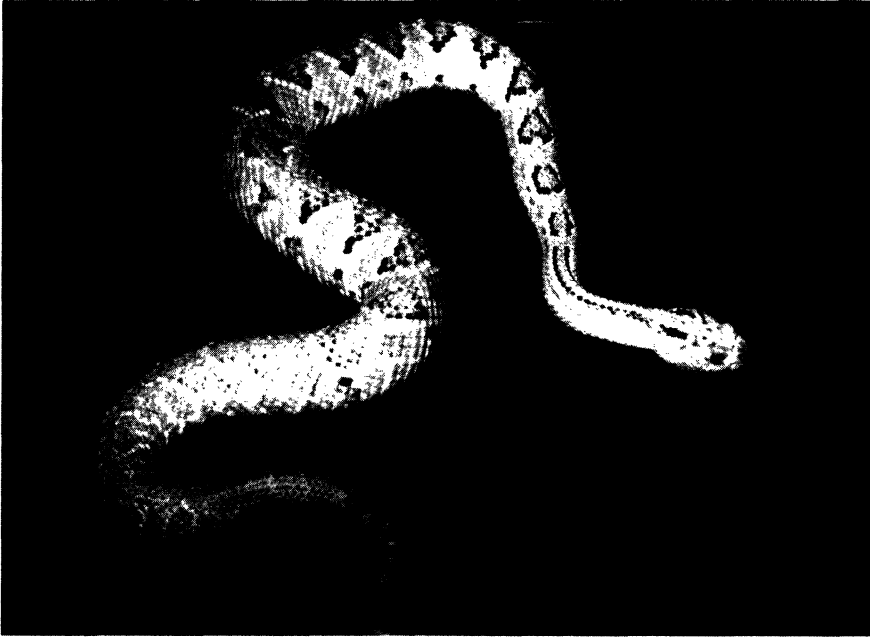
FY	Admin. Request	Appropriation
'81	11.42	9.303
'82	1.139	16.489
'83	1.567	35.2
'84	0	46.297
'85	45.54	63.218
'86	1.5	38.7
'87	1.5	42.4
'88	1.6	51.754

Table 3.
Funding for Endangered
Species Programs of the Forest
Service & Bureau of Land
Management (in millions of dollars)

FY	Forest Service	BLM
'80	NA	1.99
'81	1.544	1.44
'82	1.537	1.39
'83	1.31	1.65
'84	2.43	2.65
'85	2.46	3.95
'86	2.37	3.75
'87	3.62	3.39
'88	4.49	4.3

Table 4.
Number of Listed Species
Found on Federal Lands

FY	Forest Service	BLM
81	97	?
'82	99	75
'83	99	85
'84	110	96
'85	124	109
'86	132	127
'87	153	140



Despite the fact that BLM manages more habitat than any other agency its habitat management program has been cut 21% in constant dollars. This is the largest cut of any of the federal agencies with wildlife habitat responsibilities.

National Park Service:

It is more difficult to assess the National Park Service's funding needs for endangered species protection because its resource budget is compiled by individual park units. However, it is clear that considerably more money is needed for at least some parks, especially those in Hawaii. Relatively few species listed as endangered or threatened are found in these parks because the FWS trusts the National Park Service to protect species whether they are listed or not. However, inadequate funding and staff undercut many of the parks' efforts.

Haleakala National Park in Hawaii, particularly its Kipahulu District, is the highest priority area in the entire National Park system in terms of biological conservation work. The Kipahulu District was relatively pristine in the late 1960s, but has since been invaded by feral pigs and goats which now threaten to destroy the area. To control these threats in the Kipahulu and Crater districts, Haleakala National Park requires

a resource budget of about \$700,000 - four times that requested by the Administration.

Hawaii Volcanos National Park has advanced further in ungulate control. However, it is threatened by exotic (alien) plants, which are smothering native vegetation. Hawaii Volcanos National Park estimates that it will cost \$900,000 per year to control pigs, goats, and invasive plants in a reasonable portion of the Park's most pristine habitats - double its current funds. In order to ensure long-term continuity, these funds must come from the park's permanent base funds, not annual add-ons or park entrance fees.

The Price of Inadequate Funding

Delays:

The most conspicuous problem related to inadequate funding is long delays in the listing process. There are currently 3,900 "candidates" for listing, of which nearly 1,000 are known to qualify for protection. Completion of the listing process and initiation of active protection and management, however, has been prevented by lack of staff. According to Defenders of Wildlife and other members of the Endangered Species Act Reauthorization Coordinating Committee, listing these Category 1

candidates within ten years would require an annual appropriation of \$7 million (in 1988 dollars) - double the current level. Carrying out status surveys on the 2,900 Category 2 candidates (about which less is known) within ten years would require an additional appropriation of \$1.6 - \$1.75 million per year. Once this is accomplished, listing and subsequent protection actions would require further funds.

Species Recovery:

The ultimate goal of the Act is not to list species *per se*, but rather to provide protection such that they may be legitimately recovered and taken off the threatened and endangered list. The recovery portion of the program should have expanded rapidly to allow research and protective actions on the increasing number of species on the list. However, it has not. In its first years, the Reagan Administration defended delays in listing additional species by saying that it wanted to concentrate on the recovery of species already on the list. Nevertheless, funding for recovery in FY1988 was only 26% greater than in FY1981 (in current, not constant dollars) - far short of the 66% increase in U.S. species listed during this time.

The consequences of failing to fund the recovery program adequately show up in official statistics; despite legal requirements, recovery plans have been completed for only 263 of 998 listed species, and approximately 40% of the 420 U.S. listed species still have no approved recovery plan. Furthermore, many of the existing plans are now out of date and implementation has lagged. Less than half of the existing plans are being actively implemented, and then only to the minimal extent needed to fend off extinction. The 1984 FWS recovery implementation report stated that only 23 species were known to be increasing, 10 were considered stable, the status of 154 was unknown, and over 30 species were at crisis population levels or presumed extinct.

Sections 6 and 7:

Funding for Section 6 cooperative grants, under which the states are en-

couraged to protect federally listed species, has also failed to keep pace with the increase in either the number of species listed or number of cooperative agreements signed. The current appropriation of \$4.3 million is approximately one-quarter of the level needed to fund each agreement at the same level as in 1977 (excluding higher costs due to inflation and the increased number of listed species). Funding inadequacies also plague Section 7 under which all federal agencies must consult with the FWS or the NMFS if they wish to take action which may affect an endangered or threatened species or modify its critical habitat. In order for such consultations to proceed promptly and still

Land acquisition without management is often analogous to sailing a boat without sail or rudder. Although time and money are spent purchasing land for species protection, managers are left drifting without the means to chart a desired course.

be sufficiently thorough to ensure protection, the FWS must have adequate staff to respond to agency contacts. Defenders of Wildlife point out that while the number of consultations begun each year is now about five times that in 1979, the funds appropriated are lower in real dollars.

Land Acquisition and Subsequent Management:

Another area which is key to leveraging increased conservation efforts on the behalf of endangered species, is the need to follow land acquisitions with appropriate management. Over the past eight years, land acquisitions funded by

the Land and Water Conservation Fund have continued to grow, although at a lower rate than in the 1970s (Barton, 1987, p. 326). This land acquisition was funded by Congress largely over Administration objections (see Table 3). Endangered species benefit from both these programs to some extent. William Reffalt, former Director of the FWS Refuge Management Division, has estimated that in past years, the proportion of acquisition projects (not funds) which included lands inhabited by endangered or threatened species was about 75%; in FY1988, this figure fell to 50%.

Habitat acquisition, however, is not sufficient to ensure the survival of endangered species. Land acquisition without management is often analogous to sailing a boat without sail or rudder. Although time and money are spent purchasing land for species protection, managers are left drifting without the means to chart a desired course. Thus, despite sizable increases for refuge operations, funding remains inadequate.

Perhaps the most egregious example of the results of acquisition without ensuring proper maintenance is provided by the Hakalau Forest National Wildlife Refuge (NWR) in Hawaii. Since FY1984, Congress has provided \$16.7 million above the Administration's request for purchase of native forest in Hawaii to protect five endangered species of forest birds. Hakalau Forest NWR was purchased in October 1985. Additional funds were provided in FY1988 to purchase Keauhou-Kilauea NWR. Congress has also provided additional funds for maintenance of Hakalau NWR and the other twelve refuges in the Hawaiian Islands Complex.

Welcome as these funds are, they still fall short of need. This year, maintenance funds for Hakalau and the 12 other refuges total \$1,280,000, including a Congressional add-on of \$500,000. Hakalau Refuge's share is \$170,000. This has permitted the hiring of one supervisor provided with an office (located over two hours away from the refuge) and a vehicle; stationing of

one temporary employee at the refuge to supervise fence construction and compliance with grazing permits; development of fire control and grazing management plans (but not their implementation); and a pilot study of reforestation methods.

Proper management of Hakalau requires a budget of about \$2.7 million for the next fiscal year. The FWS needs to build 60 to 70 miles of fence to control inroads by cattle and feral pigs. The cost of building this fence has been variously estimated from \$1 million to several times that figure, depending on the terrain encountered. To ensure that the terms of the current grazing leases are followed, and to supervise the building and maintenance of needed fences, the refuge must have a permanent, on-the-ground staff. It will cost approximately \$700,000 per year to provide a minimal staff.

Ideally, once fences are installed, cattle grazing should be ended and additional funds appropriated to maintain the fences, plant native tree species, remove pigs, and control banana poka.

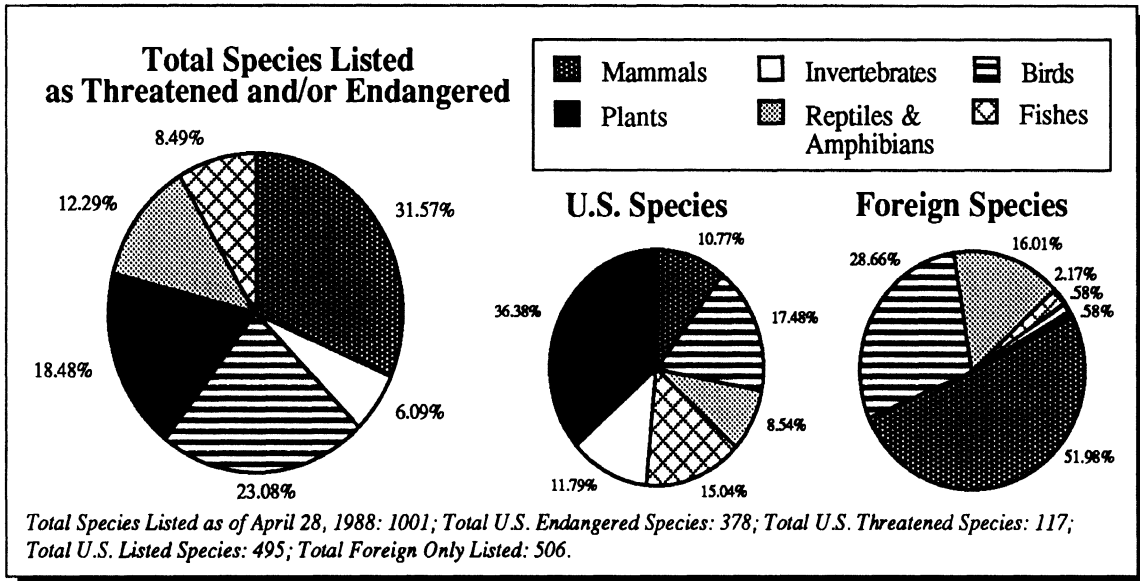
In all, annual maintenance budgets should be in the \$1 million range. Without such, the endangered birds species originally slated for protection are likely to be lost despite the best intentions behind the land purchase.

Directions for the Future

The public is generally unaware of the disparity between the needs of the federal endangered species program and available resources. The endangered species program constitutes only 4% of the FWS budget - or 9% if one excludes land acquisition and the permanent trust fund accounts (Barton, 1987, p. 329). Endangered species receive approximately 4% of the National Marine Fisheries Service research and habitat conservation funds (Barton, 1987, p.351-2), 9% of the Forest Service wildlife habitat management budget, and 23% of the Bureau of Land Management's wildlife budget. To close the funding gap, several strategies must simultaneously be pursued. Several of these are outlined below.

(continued on p. 26)

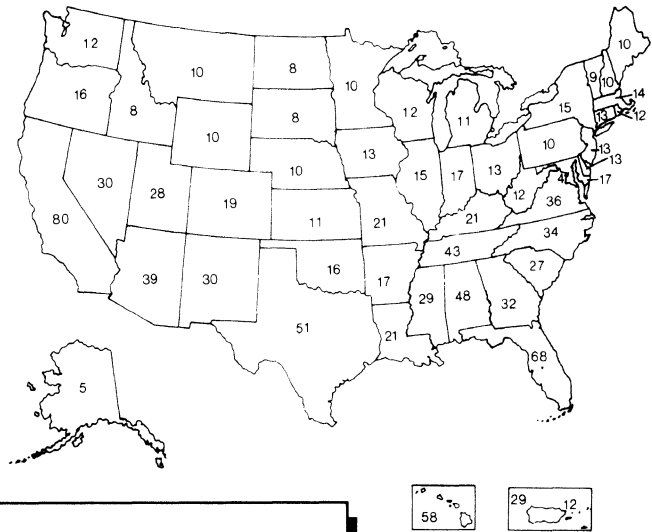
Endangered Species Statistics: (Source: USFWS)



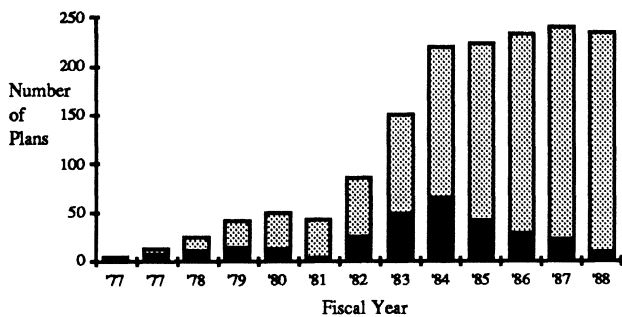
Alabama cranebrake pitcher plant (*Sarracenia rubra* var. *alabamensis*)



Total number of Threatened and Endangered Species listed by state



Fish & Wildlife Service Recovery Plans

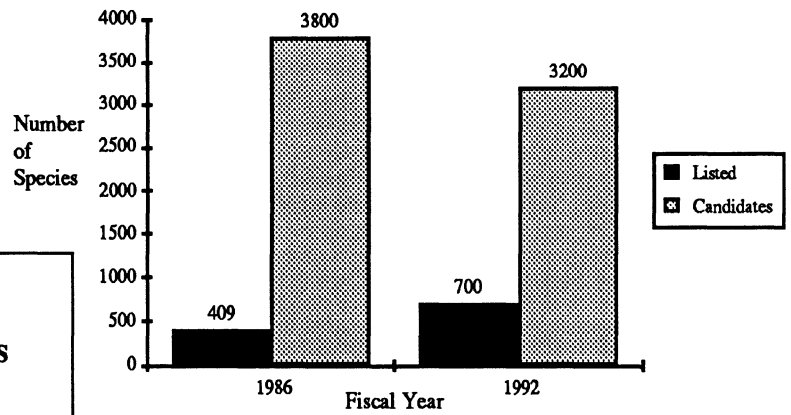


Some plans have more than one species while there is more than one plan for other species. Of the 495 listed species, there are 268 (54%) that are covered by one or more plan.



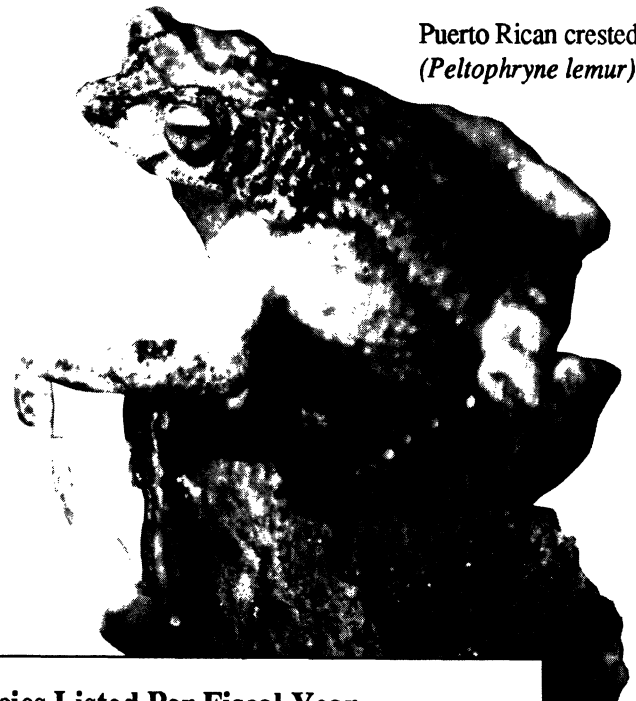
Whooping crane
(*Grus americana*)

Listed U.S. Species & Candidates for Listing (1986 and Projected for 1992)



Summary of Selected Endangered Species Actions (as of May 1, 1988)

- 1001 Current species entries in the list
- 506 Of those are foreign only
- 495 Of those occur in the U.S.
- 10 Species were first listed by emergency rule
- 13 Species have been delisted entirely
- 992 Individual species are now on the list
- 9 Species listed separately as endangered & threatened
- 378 U.S. species are listed as endangered
- 117 U.S. species are listed as threatened
- 103 Species have critical habitat designated
- 23 Experimental Populations were established

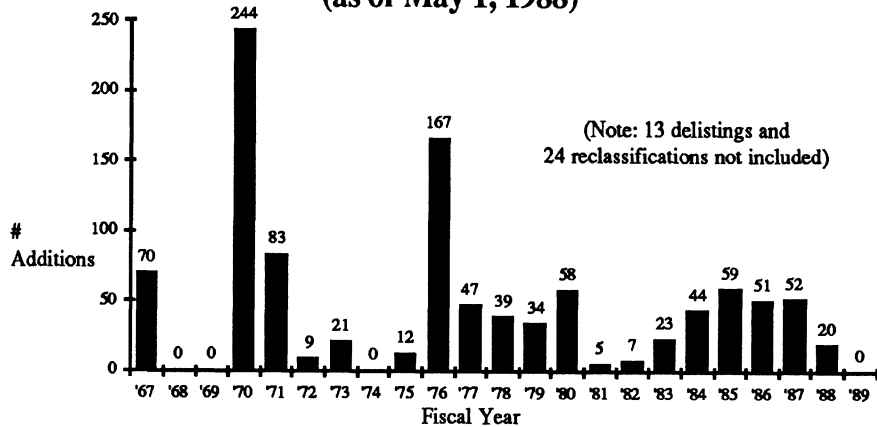


Puerto Rican crested toad
(*Peltophryne lemur*)

Key Largo cotton mouse
(*Peromyscus gossypinus allapaticola*)



Number of Species Listed Per Fiscal Year (as of May 1, 1988)



Devoting More Existing Funds to Endangered Species:

Although conservation organizations and the public verbally put a high priority on conserving endangered species, this priority is not reflected in funding. Game management still dominates

spectrum of conservation organizations (ranging from hunter-oriented groups to the humane societies) will have to agree to reallocating funds away from the long-established game programs.

Of course, game management programs have their own funding mecha-

spread funds more broadly by reducing the federal share to 60%. This should still be sufficient to stimulate state efforts. In fact, it may be more effective since many states now feel that the chance of obtaining funds is so low that they do not even bother to apply.

Setting Priorities:

Priorities must be set among species as well. From the standpoint of biological conservation, emphasis should be put on those communities or clusters of rare species which have a reasonable chance to survive. Acquisition and adequate management of refuges sheltering several species is more cost efficient and ecologically sound. The few high-profile mammals and birds which we have been pushed to the very brink of extinction may be able to survive on voluntary contributions. Others, such as the bald eagle and the peregrine falcon are now able to recover on their own without further high-cost interventions.

Candidate species should also be listed in clusters rather than singly. For this to occur, however, the FWS and NMFS must overcome their current antipathy to listing, and hire additional staff in the needed specializations (e.g. invertebrate zoologists and botanists).

Avoiding "Last Minute" Rescue Attempts:

Finally, the costs of "mitigating" the impacts of development on endangered species could be cut substantially if the responsible agencies faithfully carried out their legal obligations to ensure that their actions do not harm endangered or threatened species. Although there would still be costs associated with placing adequate numbers of biologists in Forest Service and BLM district offices, the need for last-minute "rescues" would be reduced.

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Barton, K. 1987. Federal Fish and Wildlife Agency Budgets. in Roger Di Silvestro (ed.) The Audubon Wildlife Report 1987. Academic Press, Inc., Orlando FL.



amber darter (*percina antesella*)

photo by Wayne Starnes

the nation's wildlife conservation programs. During the Reagan years, while endangered species funding increased 3% in constant dollars, funding for the entire FWS, (again, excluding permanent trust funds) increases by 8% - from \$288 million in 1981 to \$396 million in 1986 [Barton, 1987, p. 326]. As we noted above, endangered species benefit from the two programs which received the greatest increases: land acquisition and refuge maintenance. However, approximately 60% of the FWS's operating budget (about \$240 million) goes to other programs such as habitat protection, research and development, migratory birds conservation, fisheries enhancement, and wetlands inventories. These funds are from general appropriations, not from taxes on hunting and fishing equipment or migratory bird hunting licenses. The FWS could prioritize protecting endangered species under these programs, rather than continuing the fiction that these needs are being met with funds earmarked for endangered species programs.

As described above, a large proportion of the Forest Service's and National Marine Fisheries Service's wildlife management dollars also go to non-endangered species. Much could be done if all the relevant agencies devoted a larger proportion of their existing wildlife budgets to endangered species. However, for this to happen, the whole

nisms and well-entrenched bureaucratic and public support groups. Furthermore, it is definitely true that certain game species need improved management. Some duck species, for example, have declined precipitously in recent years. To justify dipping into other long-standing program funds and/or to obtain needed "new" money, the conservation community must also agree on a source of dedicated tax funds to finance endangered species conservation.

Lobbying for Appropriations:

The conservation community should also put more energy into lobbying for appropriations for wildlife management agencies. Conservation organizations and particularly the public find it easier to lobby in opposition to weakening amendments or for reauthorization of the Act than for necessary funds to implement programs. Within this lobbying effort, more attention must be placed on the "nitty-gritty" aspects of management. As was pointed out with reference to Hakalau Forest NWF, land acquisition is not enough.

Additionally the community should consider reducing the federal "matching share" for the Section 6 grants to state endangered species programs. Given the squeeze on federal funds, it is unrealistic to expect the federal government to continue to pay 75% of program costs. It would be better to

Withering Wildlife: Whither the Endangered Species Act?

A Review of Amendments to the Act

by John M. Fitzgerald

The Endangered Species Act of 1973 (Pub. L. No. 93-205, 87 Stat. 884, 16 U.S.C. §§1531-1543) exemplifies some of the best elements of environmental law. It recognizes the global nature of the problem of extinction and incorporates each basic level of government and law: international treaties; federal and state governments; and individual citizens who can petition and sue in their local district court to help ensure protection for species around the world. For example, in Defenders of Wildlife v. Hodel, the Circuit Court ruled that conservation groups could challenge a regulation worldwide without challenging any particular project (Defenders of Wildlife v. Hodel, No. 87-5132 E.L. R. (8th Cir. July 8, 1988)). It quite literally allows us, as French scientist and educator Renee Dubos (among others) was fond of saying, "to think globally and act locally."

We now seem to have achieved an Act with which a sizeable majority of legislators can live. The rapid loss of species worldwide (particularly in tropical rainforests) demonstrates, however, that even if the vast majority of lawmakers can live with the law, a vast number of species cannot. Clearly, the destruction of natural areas and the degradation of other elements from ozone to oceans have joined excessive killing of wildlife to create threats to wild and human life that require more than the Endangered Species Act to correct. Yet the Act forms a core around which new layers of scientific understanding and legal protection can grow.

The Act is an injunction to ourselves to live in a way that is compatible with all species. We can exclude certain insect pests (1), yet even our notion of pests and pestilence changes from generation to generation. Since we have

only begun to scratch the surface in terms of identifying and categorizing species, let alone the factors that sustain many of them, we are beginning to learn that intact ecosystems must be protected as well. It has become apparent that wholesale conversions of major natural areas or systems, especially without restoration of others to compensate, cannot be conducted without severe consequences.

In 1988, the fifteenth year since its enactment, the Act has been scrutinized by Congress for the fourth year in a row. In fact, since 1976, one or both houses of Congress have actively considered amendments to the Act every year except 1983 and 1984 (2).

The history of the Act has been one

of tension between short-term costs and long-term benefits. In the following review of the major amendments and issues before Congress concerning the Act in this fifteenth anniversary year, this is perhaps the most salient theme. The issues are presented here in the context of the Act's history as well as its future. It will note briefly how these issues arose and how the Act and related statutes may change as a result of that Congressional attention.

Major Amendments: 1978-1982

The Act was amended in several significant ways during the late 70s and early 80s. The process of amending the Act might be characterized by those who have amended it as an attempt to seek a proper balance in legislation - to make the Act work in a way that is flexible but effective. Yet, the general tenor of amendments from 1978 to 1982, for the most part, was to reduce the rigidity of the original legislation by



northern white rhinoceros
(*Ceratotherium simum cottoni*)
photo by Emil Schulthess

**The Act is an
injunction to
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allowing exemptions and exceptions from the general rules against taking and jeopardizing listed species, and by making the listing process more deliberate (3).

Among the most significant changes in this period was the 1978 creation of the exemption process (Section 7(e-h)). Though rarely used, it provides for review of highly charged conflicts between species protection and development by a multiagency committee. This "God Committee," as it has been named, can grant exemptions from the statute's requirements for projects that it determines are so important as to warrant running the risk of a species' extinction (4).

Much more widely used is the process created in 1982 for allowing incidental taking of individuals of a species by agencies (Section 7(b)(4)) and, to a lesser extent, by private persons (Section 10(a)(2)). The first requires that such takings "not violate" the basic premises of the section by jeopardizing a species. The second sets up a detailed process which requires a commitment of resources for conservation. In addition, it requires a finding that the proposed taking(s) will be incidental to an otherwise lawful activity, and that they will be of such limited nature that they will not appreciably reduce the likelihood of the species' survival and recovery in the wild. In concept, these permits and statements were probably necessary for the practical functioning and political survival of the Act. In practice, however, the Section 7(b)(4) process may undermine recovery efforts. Regulations adopted on June 3, 1986 seem designed only to prevent absolute extinction and not to avoid reducing the likelihood of recovery (see discussion of changes in regulations June 3, 1986, 51 Fed. Reg. 19926-62, especially at 19934). Thus, the authority to provide incidental taking statements in the consultation process may result in more taking than some would have anticipated in 1982 (*Id.*).

Congress provided for the consideration of economics in the listing process in 1978 (Pub. L. No. 95-632m 92 Stat. 3751 (1978)). This inclusion of economic analysis was later expanded by the Reagan administration thereby grinding the listing process to a near halt. A positive change in 1982 was an amendment requiring that the listing

process include the best available biological data but not economic analyses. This foreshadowed the rejection of Senator James McClure's (R-ID) attempt to require economic impact assessments in developing and revising recovery plans. He offered and later withdrew his amendment on July 28, 1988 just before the Senate passed the most recent reauthorization bill and amendments. The Senate passed H.R. 1467 but substituted the contents of S.675 as amended on the floor for everything after the enacting clause of the House bill (134 Cong. Rec. S10165-1110169, July 28, 1988).

The 1988 Reauthorization: Reaffirming the Commitment

Since early 1985, the Endangered Species Act Reauthorization Coalition (ESARC), a group of more than thirty scientific, animal welfare, and conservation organizations formed during the 97th Congress, has been urging Congress to make the Act more effective. Other interests ranging from shrimp fishermen to Western water utilities, have urged Congress to adopt delays, exemptions, and lesser standards of protection.

A reauthorization bill to provide improvements and authority for increased funds was approved by the House but stalled in the Senate at the end of the 99th Congress in 1986.

As of this writing, a bill to strengthen the Act in modest but important ways has survived the six most difficult of the ten rounds of approval needed for most legislation. The Senate bill was held up for over eight months by a few Senators with complaints not about what was in the bill (S.675) but about the existing Act and implementation efforts. These Senators did not attempt to amend the bill in Committee. Rather, they used Senate procedures to delay consideration of the Act, essentially holding the bill and its noncontroversial improvements hostage in exchange for weakening amendments that would probably never pass in a straight vote on the floor.

Yet, on July 28, 1988, the Senate

finally approved S.675 after considerable political jockeying and acceptance of some uncontested amendments (134 Cong. Rec. S. 10163-76, (daily ed., July 28, 1988.)) The vote on final passage was 93-2 with Senators Symms (R-ID) and Garn (R-UT) voting nay. Overall, these floor amendments would not constitute major changes in the Act; they are discussed below along with other issues and amendments that have arisen in the 100th Congress.

Issues in the 100th Congress: Repeating Old Patterns

Carrying Water for Whom?

The problem of allocating scarce western water has been at the heart of many dramas, from 19th century sodbusters battling stockmen to conflicts between endangered wildlife and desert swimming pools, golf courses, and other 20th century amenities.

In 1982, Congress declined to reduce the priority of saving listed wildlife over marketing water in the West. Instead, it added the policy "that Federal agencies shall cooperate with state and local agencies to resolve water resource issues in concert with the conservation of endangered species." (Section 2(c)(2)). At that time, the controversies were largely over Platte and Colorado River water.

In the 99th and 100th Congresses, attempts to conserve the threatened Concho water snake threatened to hold up reauthorization. The U.S. Fish and Wildlife Service (FWS), however, reversed its earlier opinion that another dam at the confluence of the Concho River and a smaller Colorado River in Texas would jeopardize what remained of the beleaguered reptile. Conservation groups declined to challenge that reversal for fear of losing a tough case or provoking a damaging amendment. Yet Congress also declined to amend the Act concerning western water after its General Accounting Office concluded that the Act had not delayed water projects (see Steven Yaffee's article in this issue).

Conflicts Over Specific Species:

Threatening wolves and grizzlies:

The Act in general prohibits the taking of endangered species (Section 9(a)) and directs the Secretary of the Interior to promulgate and implement regulations for the conservation of threatened species (Section 4(a)). Some, including a number of state wildlife managers, interpreted this to mean that although an "endangered" animal could not be taken, there were no standards in the statute controlling the taking of a "threatened" species. In 1982, Minnesota's Department of Natural Resources and the Fish and Wildlife Service proposed a "sport trapping"

of threatened species such as Minnesota wolves and Montana grizzlies will be allowed to expand to the level at which federal protection is no longer needed.

Earlier in the same line of Minnesota cases, plaintiffs won a suit to insure that the trapping of wolves known to be killing livestock was permitted only in a way that targeted the offending wolves. (Fund for Animals v. Andrus, 11 Env't. Rept. Cas. (BNA) 2189 (D. Minn. 1978).) As such, the courts generally have held that individual threatened predators can be taken by government personnel, but that open seasons are not allowed absent proof of population pressure that cannot be relieved by other practical means (Sierra Club v. Clark).

Symms (R-ID) and Howell Heflin (D-AL) concerning other issues remained.

In the 100th Congress, the Senate Committee noted in its report on S.675 (S. Rpt. 240, 100th Cong., 1st Sess., 5-6 (1987)) that the Committee had not been presented with evidence to indicate that the Montana grizzly bear hunt did not fall within the extraordinary case exception provided in the Act and thus reaffirmed the general rule of Sierra Club v. Clark.

The Committee also noted the flexibility available for managing experimental populations under the 1982 amendment adding Section 10(j) (*Id.*).

The experimental designation has been used for the red wolves reintroduced on the Alligator River National Wildlife Refuge in the District of Representative Walter Jones (D-NC), Chairman the House Merchant Marine Committee. In addition, the recovery plan for the Rocky Mountain gray wolf calls for reintroducing wolves in Yellowstone National Park under "experimental" and probably "nonessential" status. These designations allow more flexible management such as removal of the wolves if the experiment does not succeed.



gray wolf (*canis lupus*)

photo by David Mech

season on threatened timber wolves, a step the Carter Administration had refused to take.

The Sierra Club, Defenders of Wildlife, and a dozen other groups sued to enjoin William Clark, then Interior Secretary, from implementing regulations allowing the season. They asserted that he was authorized to allow such taking by regulation only in a manner consistent with the Act's definition of conservation (Section 3, paragraph 3). In Sierra Club, et al. v. Clark (755 F. 2d 1506, 8th Cir. Ct. App., 1985), the 8th Circuit agreed with the conservationists and held that the definition limits the use of regulated taking to "...the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved as stated in Section 3(3) of the Act." This is in part to ensure that populations

Yet, some state fish and wildlife agencies, such as Montana Game and Fish Department whose grizzly hunt was threatened, prevailed upon the International Association of Fish and Wildlife Agencies to seek an amendment overturning Sierra Club v. Clark. This was considered at length in a series of Congressional hearings in Washington and the field from 1985 to 1987 (5). Due to insufficient support, the amendment has never been offered. However, Senator Alan Simpson (R-WY) was one of three who prevented the Senate from completing action on a reauthorization bill (S.725) in the 99th Congress. Until very late in the session he held up the bill in hopes of persuading conservationists to concede to an amendment overturning Sierra Club v. Clark. Simpson failed and withdrew his hold knowing that holds by Senators Steve

Drowning Sea Turtles-

The Net Cost of Southern Trawls:

The most time-consuming issue the 100th Congress faced when considering Endangered Species Act reauthorization was the protection of sea turtles from shrimp trawlers. After years of discussion and negotiation in the face of mounting evidence that trawl nets drown five species of listed sea turtles, the National Marine Fisheries Service issued a rule in 1987. The rule required that over the next several months some estuarine and all high sea trawlers in the Southeast Atlantic and Gulf of Mexico install Turtle Excluder Devices (TEDs). TEDs are mesh panels or grates that shunt sea turtles and other large objects out of nets but allow shrimp to pass through and be caught. They cost from less than \$40 to \$400 each, and each trawler may need as many as four.

In light of a perceived need for more testing in certain in-shore areas

(estuaries, etc.) and a somewhat lesser risk associated with the shorter trawl times in-shore, the House Committee adopted a two-year delay for the in-shore regulations.

Rep. Solomon Ortiz (D-TX) offered an amendment to delay the regulations throughout the Gulf of Mexico's off-shore areas as well until mid-1990. After a long fight, this was defeated in Committee and again on the floor of the House by a vote of 147 to 270 (134 Cong. Rec. H11642 (daily ed. Dec. 17, 1987)).

Not to be denied, shrimpers turned to their Senators. Despite evidence that TEDs save fuel and prevent the unwanted destruction of valuable finfish as well as sea turtles, Senator Heflin held up S. 675 for more than six months after the bill was reported. In July 1988, a compromise was reached and the Heflin amendment was accepted without opposition in the Senate on July 25, 1988. This amendment delays the in-shore requirement until 1990 and the offshore TEDs requirement until May 1, 1989. It also initiates a study addressing Senator Heflin's questions about the relative effectiveness of TEDs and other conservation practices (134 Cong. Rec. S9763-5 (daily ed. July 25, 1988)).

Monitoring an Unlisted Number: Category One Species

After the Reagan Administration took office, the endangered species listing process came to a virtual halt, partially in response to amendments complicating the process. Congress addressed this in a 1982 listing amendment which excluded economics from the process of listing species (but not critical habitat), and added a process for responding to petitions to list or delist species. Most importantly, however, it provided a virtually unlimited escape hatch: Section 4(b)(3)(B)(iii) allows the Secretary to determine that some species warranted listing but may be precluded by lack of resources. These are called "Category One" candidates. By the summer of 1988, there were approximately 950 Category One candidates, nearly as many as the thousand



red-cockaded woodpecker (*Picoides borealis*)

photo by Reed Noss

species that were fully listed.

After extensively rewriting the listing provisions of the Act as recently as 1982, neither Congress nor many in the conservation community felt it was wise to reopen the issue. However by 1985, the Fish and Wildlife Service declared that nearly 300 candidate species awaiting listing were by then considered presumably or possibly extinct (49 Fed. Reg. 21664-75; 50 Fed. Reg. 37958-67, 39526-84). Listing was proceeding through the mid-1980s at a pace of about 50 species per year. This, in addition to the backlog of nearly 3,000 species awaiting listing, led the full House and the Senate Environment Committee in the 99th Congress to approve an amendment to Section 4(b)(3). This amendment would require the Secretary to establish an "effective" system for monitoring Category One candidates, and to use the emergency listing process to add them to the protected list if they were shown to face a significant risk. This was one of the very few amendments to the Act contained in the bill (H.R. 1027) that the House passed under suspension of the rules in July 1985. It was incorporated again in both the House and Senate bills in the 100th

Congress. The question of precisely what an effective monitoring system would be is initially up to the Secretary. Likewise, how the monitoring requirement should be enforced is unclear; but the duty to list candidates facing a significant risk would be mandatory.

Amendments to Delist Species

When the House considered H.R. 1467, it did so under an open rule which did not limit amendments that could be offered. This resulted in an open floor fight over some of the basic procedures of the Act. The Merchant Marine Committee leaders, full Committee Chairman, Walter Jones (D-NC), and Subcommittee Chairman, Gerry Studds (D-MA) successfully led the House in rejecting these attempts and reaffirming the House's commitment to the integrity of the Act.

Among the direct challenges to the Act were three proposals to directly remove species from the list of protected species through legislation amending the Act.

One such proposal was made by Rep. Ron Marlenee (R-MT) to delist the gray wolf. After graphic exhibition by

Rep. Marlenee of the hardships that livestock and their owners face, supporters of wolf recovery, including Rep. Bruce Vento (D-MN) and Rep. Wayne Owens (D-UT) noted the ability to deal with problem wolves under current law as well as the importance of preserving the wolf. The Marlenee amendment was also opposed in a letter to all members from Rep. John Dingell (D-MI), a primary author of the 1973 Act, and Rep. Morris Udall (D-AZ), long-time Chairman of the House Interior Committee. Rep. Marlenee withdrew his amendment after the Committee leadership promised to help him with wolf control problems (133 Cong. Rec. H11258, Dec. 11, 1987).

Rep. Charles Stenholm (D-TX) proposed an amendment to delist the Concho water snake but withdrew it after the Committee leadership promised to work with him to ensure that evidence of additional snakes would be taken into account in revising agreements to conserve snakes that remain after flooding roughly half the remaining habitat. This was justified on the grounds that more snakes had been found. However, more rocky riffles where the snakes breed had apparently not been found (*Id.* at H11258).

Rep. Wes Watkins (D-OK) offered an amendment to delist the leopard darter, a fish that occurs in Oklahoma. He asserted that there were enough of them to warrant removal from the list, and that their presence on the list had discouraged economic development in the area - although no projects had been held up by the fish in many years. Chairman Studds pointed out, as he had in reference to the Marlenee amendment, that the Act provides a process and timetable for responding to petitions to delist species. No one had presented such a petition. Mr. Watkins insisted on a recorded vote. The amendment was defeated 136 to 273. (133 Cong. Rec. H11623, Dec. 17, 1987.)

In rejecting these amendments, the House reaffirmed the 1982 listing amendment which stated that the decision to list or to delist a species should be based on biological evidence rather than economics. Once a species is listed, the

Act provides numerous ways of both conserving and taking the species. So far Congress has declined to delist species by legislative action. This leaves open the question of whether Congress might some day, by legislative action, list Category One species since the only reason for not listing them is lack of resources.

More Viable Recovery Plans

In perhaps the most important difference with the House bill, the 1988 Senate bill would amend Section 4(f) of the Act to require the development of recovery plans without regard to taxonomic status (plants and other taxonomic groups have often been overlooked in the recovery process), with site-specific management actions to achieve recovery, and with schedules and cost estimates by which to judge success of the plan. Although the best recovery plans already contain most of these elements, it is clear to the Senate that it is desirable for all parties to have a more thorough analysis of what the Service believes is required for the recovery of a species. The amendment also calls for an annual report to the committees of jurisdiction on the status of listed species' recovery. The House is expected to accept the Senate recovery amendment in conference. (134 Cong. Rec. S1074, July 28, 1988.)

The Senate bill would also add a new subsection to Section 4 requiring that the Secretary implement a system to effectively monitor recently delisted species for five years to ensure their continued viability. The Secretary is to carry out this monitoring in cooperation with the states (*Id.*).

Doubling Funding for State Cooperation

The Senate bill, in a new subsection of Section 4, authorizes the Secretary to make matching funds available to states not only for work on behalf of listed species but for work on candidate species and recently delisted species as well. This provision increases the continuity of protection and recovery ef-

forts. It is also important in that it provides that listed status will not be an absolute prerequisite for federal/ state cooperative assistance (*Id.*).

The Senate bill also provides that an amount not taken from but equal to five percent of the \$300 million for game species in the Pittman-Robertson (hunting license taxes) and Wallop-Breaux (boat motor fuel, fishing tackle and other taxes) federal aid accounts would be deposited directly into a conservation fund without further appropriation by Congress. This was expected to provide a steady fund of nearly \$15 million annually to match state funds using the current ratios of 70 to 90 percent federal/state funds, depending on the number of states involved in a given project (*Id.*; Sen. Rept. 240, 100th Cong., 1st Sess. 10-12 (1987)).

In light of objections from the Senate Appropriations Committee, the automatic appropriations phrase was dropped from the bill on the floor. The absence of a sizeable and steady fund once again leaves endangered wildlife in a vulnerable position.

Consultation: A Considered Silence

Although the Committees generally shied away from consultation controversies, the consultation process was threatened by a last-minute floor amendment proposed by Rep. Ron Packard (R-CA). In describing the amendment, Packard said "...It simply allows the Secretary of Interior to consider human life as a part of evaluating whether a project ought to be built or not" (133 Cong. Rec. H11644, (daily ed. Dec. 17, 1987)). The actual amendment, however, would have required the Secretary to automatically exempt any project that might offer the mathematical prospect of saving a human life before attempting to save endangered species in its path (*Id.*, the amendment is reprinted in the Record, but was unavailable to most House members before the vote). It is the design of the current Act to consider all the benefits of such projects along with the conservation of a species and, if necessary, provide alternative designs or approaches

for the project. In addition, the Section 7(g) exemption process is available in the case of irreconcilable conflicts.

The House agreed that the process developed over several years should not be scrapped, and defeated the Packard amendment 151 to 266 (*Id.* at 11645-6).

In previous "reauthorizations," Section 7 had been the focus of considerable attention. The mutual reluctance of Congress and the Administration to revisit the Section was evidenced by the fact that the Fish and Wildlife Service (FWS) did not promulgate regulations implementing changes made in 1979 and 1982, nor did it make other changes in the consultation regulations until June 3, 1986 (51 Fed. Reg. 19926-62).

In the 1986 regulations, the Administration changed the language concerning the biological and geographic thresholds for invoking Section 7(a)(2)'s requirements for biological assessments and opinions. The Secretaries of Commerce and Interior inserted the word "both" in the definition of "jeopardize" so that an agency action is declared "likely to jeopardize" a species only if it is found to be likely to jeopardize "both" the continued existence and recovery of a species rather than if it is to jeopardize only the recovery (*Id.*, at 19934). The FWS comments accompanying the changes asserted that

It seems that Congress has come to the point where specific species or projects are unlikely to be the subject of more than short-term legislative exemptions.

this was always the case although some, many of whom commented on the proposed rule, questioned whether the purpose of the Act (and Section 7(a)(1) in particular) is fulfilled if recovery efforts

are being undermined by agency actions that reduce the likelihood of recovery.

Without a statutory change to require or otherwise support, the changes in regulations, the 1986 regulations also dropped the explicit requirement of previous regulations that agency actions affecting listed species in foreign countries be subject to the consultation requirement (*Id.* at 19929-30). The FWS was fairly inefficient at pursuing this even under the Carter Administration, and dropped it internally soon after the Reagan Administration took office. This 1986 regulation officially and publicly turned a blind eye to actions that harm endangered foreign species and are funded or carried out by U.S. agencies. This was done in spite of the fact that U.S. loans and grants often trigger large developments in foreign countries which threaten these species.

In response to both of these changes in the regulations, the Senate Committee in its report wrote:

To the extent that these regulations attempt to restrict the Act's requirements that each federal agency consult with the Secretary to ensure that its actions are not likely to jeopardize the continued existence and recovery of any listed species, the regulations have no statutory basis, are contrary to congressional intent, and are contrary to the law. [emphasis added] (S. Rept. No. 240, 100th Cong., 1st Sess. 6-7 (1987)).

This was reiterated by the Subcommittee's ranking Republican Senator, John Chafee (R-RI) in his statement on the floor on July 25, 1988 (134 Cong. Rec. S9758 (daily ed. July 25, 1988)). The House report did not address these issues, although its Interior and its Foreign Operations Appropriations Committee reports have recommended such consultations since the 1986 regulations were promulgated. In August 1986, Defenders of Wildlife and the Humane Society of the United States challenged this regulation in court, and on July 8, 1988, the 8th Circuit Court instructed the U.S. District Court in Minnesota to decide whether consultations



Devils Hole pupfish (*Cyprinodon diabolis*)
photo by Tom Baugh

concerning overseas effects were required (*Defenders of Wildlife v. Hodel*, 8th Cir. No. 87-5132).

In regard to one programmatic application of Section 7, the House did adopt an uncontested compromise amendment instructing the Environmental Protection Agency (EPA) to reassess the cost-effectiveness and accuracy of proposed label restrictions on pesticides. These restrictions were intended to bring the agency into compliance with the Act and with biological opinions rendered by the FWS. Under the amendment, the EPA is to conduct broader education concerning the program as well (133 Cong. Rec. H11248 (daily ed. Dec. 11, 1987)). On the same day, December 11th, 1987, Senator Melcher proposed amendments to the Interior Appropriations bill which included one providing \$260,000 more for predator control in Montana and another sharply curtailing action by the Environmental Protection Agency to limit pesticide use that might harm endangered wildlife until September 15, 1988. These were accepted by the Congress. The Senate is expected to accept a similar amendment without the requirement of cost/benefit calculations (134 Cong.

Rec. S9760-1 (daily ed. July 25, 1988)).

In the meantime, a suit brought by Defenders of Wildlife and the Sierra Club in 1986 resulted in an April 1988 order to cancel the registration of strychnine for above-ground uses in most of the country. The use of strychnine is lethal to 62 protected species and hence violates the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act. The Court found that, among other things, the EPA and Interior had failed to comply with the basic requirements of the consultation process and were themselves committing unpermitted takings (Defenders of Wildlife et al. v. Administrator, EPA; and Secretary, Dept. of Interior, Civ. 4-86-687, U.S. District Court, District of Minnesota, April 11, 1988). This judgment has been appealed to the 8th Circuit by the government and the Farm Bureau who were codefendant-intervenors.

Petal Poachers and Purloined Plants

In 1982, Congress added protection for plants from private collecting on federal land. Rep. Don Young (R-AK), ranking minority member of the House "Fish and Wildlife" subcommittee, had long opposed protection for plants and "lower" species but acquiesced in 1987. Thus, both the recently passed House and Senate bills contain amendments to Section 9 that would make it a violation to maliciously damage listed plants on federal land or harm them on private land in violation of state law. During House consideration, an amendment by Rep. Stan Parris (R-VA) to limit the sanctions to those who "knowingly" damage listed plants was accepted without a recorded vote (133 Cong. Rec. H11622 (daily ed. Dec. 17, 1987)).

Penalties

The large number of successful lawsuits filed under the Act is an indication of the many opportunities for saving endangered wildlife missed by agencies due to both lack of resources and aggressive enforcement. For each lawsuit filed, there were probably several more in recent years that could have

been. More to the point, there were probably several instances where a harmful action could have been avoided altogether with more effective education and guidance by the agencies charged with implementing the Act.

A general lesson that can be taken from this is that there is a need to agree on objective legal standards, and then to provide citizens with the means to sue to enforce those standards if the government is not able or willing to do so. Furthermore, instead of asking taxpayers to pay for all recovery work, we might first ask those who harm listed wildlife to pay restoration costs just as we do for those who run stop lights and damage cars.

In the 100th Congress, conservationists and members of the Merchant Marine Committee proposed an amendment that would have required violators of the Act to pay the cost of restoring the wildlife or habitat they had destroyed, to the extent that such costs could be determined using the basic principles of tort law. Congress has already given states and cities the right to sue illegal dumpers of hazardous substances and oil for the costs of restoring natural resources for which they act as trustees (42 U.S.C. Sections 9604-9612). Committee leaders and some conservationists were reluctant to recommend such a remedy for endangered wildlife in light of the large sums that might be involved. As a compromise, the Committees accepted amendments by Rep. Claudine Schneider (R-RI) and Senator Bob Graham (D-FL) that directed that fines be increased

by a factor of two-and-one-half to keep up with inflation since 1973 and be retained to offset funds that would otherwise have to be appropriated for recovery work.

A similar provision was included in the "Elephant Conservation" bill, H.R. 2999, approved by the Merchant Marine Committee on August 4, 1988 and passed by the House on August 8, 1988 (134 Cong. Rec. H6582 (daily ed. Aug. 8, 1988)). In addition to ivory trade controls, the bill sets up a fund into which fines for illegal trade in ivory would be paid. Those funds and others will be devoted to elephant conservation work. This bill may be accepted by the Senate in the ESA conference committee since it amends the Act.

What Next?

The rejection of delisting amendments, the protection for plants, and the direction to implement recovery plans regardless of taxonomic status demonstrate a growing understanding and acceptance by Congress, and its constituents of the notion that writing off any species should not be done lightly.

It seems that Congress has come to the point where specific species or projects are unlikely to be the subject of more than short-term legislative exemptions. The Act has the flexibility to survive most difficult cases that would undercut the Act. The question now is whether its principles can be applied more aggressively across the board.

Although the Act itself is strong,



northern spotted owl (*Strix occidentalis caurina*)

photo by K. Bruce Jones

experts estimate that extinctions are occurring at an accelerated pace worldwide, and that many North American species continue to decline. The question remains "What can we do next to reverse this trend?"

One answer is to actively implement every section of the Act: the recovery plans; the general wildlife conservation plan envisioned in Section 5(a); the active programs of each agency envisioned in Section 7(a)(1); and the international aspects of the law in general. This has yet to be done.

Another long-run answer may be to shift the burden of proof to those who would adversely affect biological diversity or the viability of any ecosystem by requiring them to demonstrate the nature and extent of their impact in environmental impact statements (such as those required for federal actions under current law). Further, actions that significantly decrease the viability of any species or ecosystem should be barred unless an exemption is provided through a system similar to that provided for in section 7(g) of the Act. The standards involved would have to be appropriate to species not yet endangered. Its overall purpose would be to make us pause before substantially reducing the viability of a species or community. Although such standards would require further definition, the concepts are being explored. For example, the Science and Technology Committee of the House has considered legislation on the preservation of biological diversity (H.R. 4335, 100th Congress, 2d Sess. (1988)).

The "reauthorization" of such statutes as the Fish and Wildlife Conservation Act (known as the "Non-Game Act") and the Sikes Act concerning Defense Department and other federal lands offers opportunities for taking a broader view of wildlife conservation. These reauthorization bills are still being considered in the 100th Congress.

Such administrative and legislative standards would help ensure that we learn to live in a way that conserves the full diversity of wildlife and recognizes the relative importance of all habitats, from pristine areas and wildlife travel

corridors to the more marginal habitats of farm, city, and suburb.

Whether it is eliminating DDT or mercury so that embryos can at least be born and born whole, or wondering what is in the red and brown tides that wash dead marine life upon our beaches, we are learning that whatever we do to other species, even the least of these, we do also to ourselves. The Endangered Species Act will continue to help us learn how to live compatibly with nature and to reflect our learning as we apply and amend it. The question is whether we can learn the lesson well enough and soon enough.

Epilogue

As of this writing, final congressional approval of a conference committee bill appeared virtually certain.

If the 100th Congress does not enact a reauthorization bill, the same improvements will be sought and the same fights will be fought in Congress for some time. With passage, the new administration will need to implement the amendments. Without passage, the administration will be pressed to improve the endangered species program along the same lines to the extent possible without new legislation. The administration will also be pressed to support more comprehensive legislation.

While awaiting long-term reauthorization of higher appropriations levels, the Congress has appropriated funds annually to implement the existing Act and is expected to continue to do so if necessary.

Yet in many ways, the process just begins again with another cycle of implementing the Act. This basic code, much like a genetic code, takes visible shape with slight variations each time it is used, thus evolving to ensure its survival and the survival of all that depend on it.

A poster decorating several Senate offices in the Summer of 1988 read: "Wanted Alive...S.675." We have seen and will see again, that the Endangered Species Act is very much alive.

John Fitzgerald is the Counsel for Wildlife Policy at Defenders of Wildlife. He is also one of the leaders of the Endangered Species Act Reauthorization Coalition.

Notes:

- (1) The Act in Section 3(6) provides for the Secretary to exclude insects determined "to be a pest whose protection would present an overwhelming and overriding risk to man."
- (2) Pub. L. No. 94-325 (1976); Pub. L. No. 95-212 (1977); Pub. L. No. 95-632 (1978); Pub. L. No. 96-69 (1979); Pub. L. No. 96-159 (1979); Pub. L. No. 96-246 (1980); Pub. L. No. 97-304 (1982). In July 1985, the House passed H.R. 1027; in March 1986, the Senate Committee reported S725; in December 1987, the House passed H.R. 1467, and in July 1988, the Senate passed H.R. 1467 as amended by substituting for its contents those of S. 675.
- (3) A 1984 review of the first ten years under the Act by Defenders of Wildlife, a national wildlife conservation and advocacy group, found that the administration of the Act had become too lax to fully achieve the purposes stated in the Act. (Saving Endangered Species, May, 1984.) In reports published in succeeding years, Defenders of Wildlife has made numerous and detailed recommendations concerning changes in the Act and its implementation which are largely beyond the scope of this article. Those changes did include several approved by the 100th Congress and discussed in this article.
- (4) Ironically, the Committee unanimously rejected an exemption bid for the Tellico Dam, the project that had inspired the creation of the process. Not to be denied, Senator Howard Baker (R-TN) and Rep. Tom Bevill (D-TN) pushed through a special legislative exemption for the dam as a rider to the next available appropriations bill (Pub. L. 96-69, Title IV, 93 Stat. 449 (1979)).
- (5) For example, House Subcommittee Chairman, John Breaux (D-LA) asked Montana Fish, Wildlife, and Parks spokesman Ron Marcoux, "Mr. Marcoux, can you tell me just for the record, how we are saving the grizzly by having a hunting season on them?" Subcommittee on Fisheries and Wildlife Conservation and the Environment Hearing, Endangered Species Act Reauthorization - H.R. 1027, at 81, March 14, 1985 (99th Cong., 1st Sess. Serial No. 99-10); See also Hearings before the Subcommittee on Environmental Pollution of the Environment and Public Works Committee of the Senate on S. 725, April 16 and 18, 1985, S. HRG. 99-70, at 8, 23-24, 33-34, 201-202, 421-424. Senator Max Baucus (D-MT) also chaired a hearing on the subject in Great Falls, MT on July 1, 1985.

Implementing Endangered Species Recovery Policy: Learning As We Go?

by Tim W. Clark and Ann H. Harvey

Those involved in endangered species recovery programs often face extremely complex situations as they tackle the nuts-and-bolts work of saving species. Recovery programs that have developed over the last 15 years have had to deal with technically demanding biological tasks and uncertainties, limited resources, numerous participants, and intense public scrutiny and involvement, among many other difficulties. These factors combine to make species recovery a complicated, interactive, technical and administrative challenge. Professionals working in these programs often view recovery primarily as a biological problem. They have generally given much less explicit attention to policy and organizational variables in recovery programs, instead attributing problems simply to bad luck, lack of resources, "politics," or uncommitted individuals in other organizations. Yet the organizational arrangements, decision-making processes, and other policy variables affecting recovery programs can be as critical to success as technical and biological tools. A better understanding of the policy and organizational dimensions of endangered species work could greatly enhance the effectiveness of many recovery programs.

Participants in recovery programs often view the problems they encounter as unique to their species and their program. But problems stemming from inappropriate organizational and decision-making arrangements may be more generic and prevalent than is currently recognized in recovery efforts. By looking at these programs through a policy and organizational framework, common patterns may be detected which would otherwise remain underappreciated or invisible. Lack of atten-

tion to these aspects of recovery can result in ineffective and inefficient programs, and ultimately in species extinction. With so much at stake, it is imperative to develop a framework for analysis and to learn from past and ongoing recovery efforts in order to improve future programs.

Notable successes have been achieved in many recovery programs. For example, the American alligator (*Alligator mississippiensis*) recovered rapidly in many parts of its range as a result of federal and state protection under the Endangered Species Act (ESA) (Endangered Species Technical Bulletin 1985). Yet many accounts of endangered species recovery programs refer to implementation difficulties encountered by participants (e.g., Duff 1976; Carr 1986; Askins 1987). In this paper, we discuss four common features of recovery programs that have led to implementation problems. First, species recovery is a tremendously complicated task, often involving numerous participants who must some-

how integrate their diverse perspectives into a workable program. Second, these participants often have conflicting goals, some of which have more to do with controlling the recovery coalition than saving the species. Third, explicit consideration of organizational structures appropriate to the task of saving species is rare; recovery programs tend to develop into traditional hierarchical bureaucracies. Fourth, intelligence failures and program delays often occur because of preconceptions held by decision makers and the large number of "clearances" required in programs with multiple participants.

To illustrate our points, we draw on examples from the ongoing black-footed ferret recovery effort which has received much public and professional attention (*). Even though we focus on the ferret recovery effort in the years 1981 through 1986, from the discovery of the Meeteetse population until its extinction in the wild, the four implementation themes addressed in this paper were apparent throughout the past 15

black-footed ferret (*Mustela nigripes*)

photo by Tim W. Clark



(*) Even though the events described in our examples are recent, different interpretations of what occurred already exist. For a different perspective, see Thorne and Williams (1988).

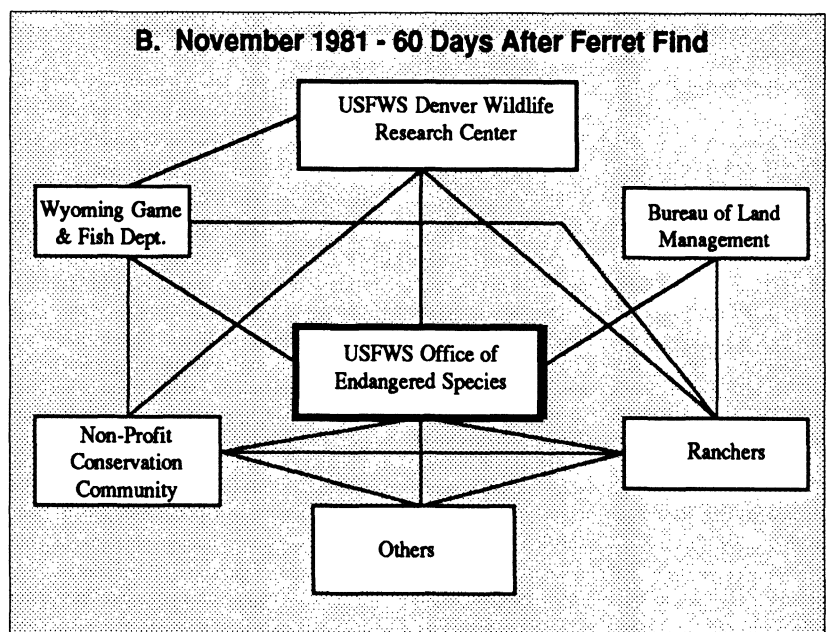
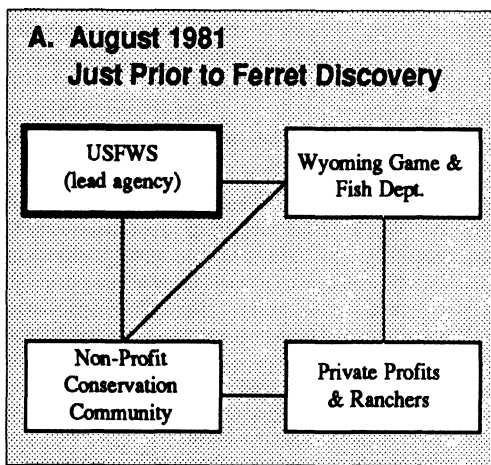


Figure 1.
The evolving formal organizational arrangements centered on recovery of the Meeteetse black-footed ferrets. (A) Simple Matrix (B) Complex Matrix (C) Bureaucratic (D) More Bureaucratic

years. Our use of the ferret case history could be misunderstood as blame-finding and negative, and in fact, we have been urged to forget past, acknowledged implementation mistakes. We feel strongly, however, that unless these persistent features of implementation are scrutinized and given some meaning through a policy and organizational framework, they will never be recognized for what they are and managed effectively. By using the ferret example as illustration, we are not implying that it is an especially good or bad program. Rather, we suggest that the examples may be representative of the implementation problems found in many recovery programs, and that the lessons to be learned from examining them can be useful in many other cases.

In the second section of the paper we suggest ways to improve the policy, organizational, and individual dimensions of recovery program implementation. Recovery programs are an implementation device in the larger policy process, and participants must have knowledge in and of this process. The organizational dimension involves the structure and management of the recovery program itself, including such factors as who is permitted to participate, how information is gathered and used, how authority and control over the program are allocated, how decisions are made, and how disagreements within

the recovery coalition are resolved. The individuals who make up recovery teams are part of these policy and organizational dynamics and can have roles of influence. Careful attention to all these overlapping and interactive elements is essential.

The Black-Footed Ferret Story

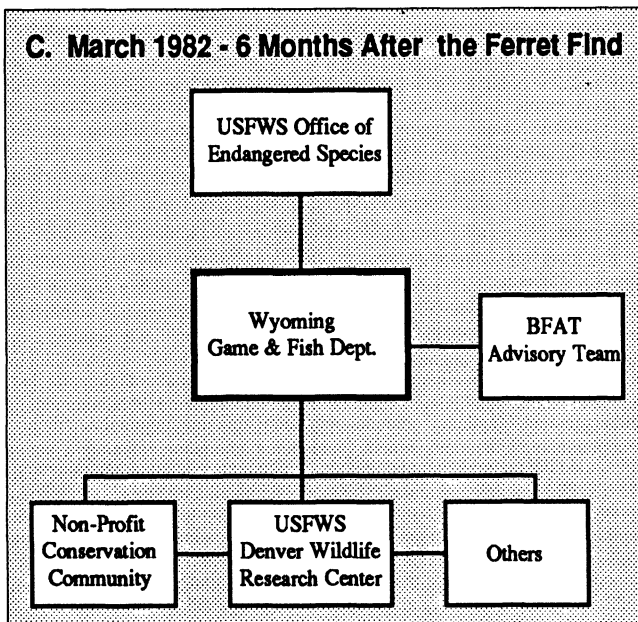
The black-footed ferret (*Mustela nigripes*) is the most critically endangered mammal in North America. It was listed in the U.S. Fish and Wildlife Service's Redbook of Endangered Species in 1964, and it was placed on the FWS endangered species priorities list in 1976. It is a solitary, nocturnal carnivore preying almost exclusively on prairie dogs (*Cynomys sp.*). The ferret spends almost all of its time below ground in prairie dog burrows where it hunts and finds shelter. In the 137 years since the ferret's scientific discovery, only two small populations have ever been studied—one in South Dakota (1964-1974) and the second near Meeteetse, Wyoming (1981-1987). Both wild populations are now extinct.

In 1920, an estimated one million ferrets existed in 40 million hectares of habitat (prairie dog colonies) over 12 states and 2 Canadian provinces (Anderson et al. 1986). Widespread and long-lasting prairie dog poisoning programs, with the goal of rangeland im-

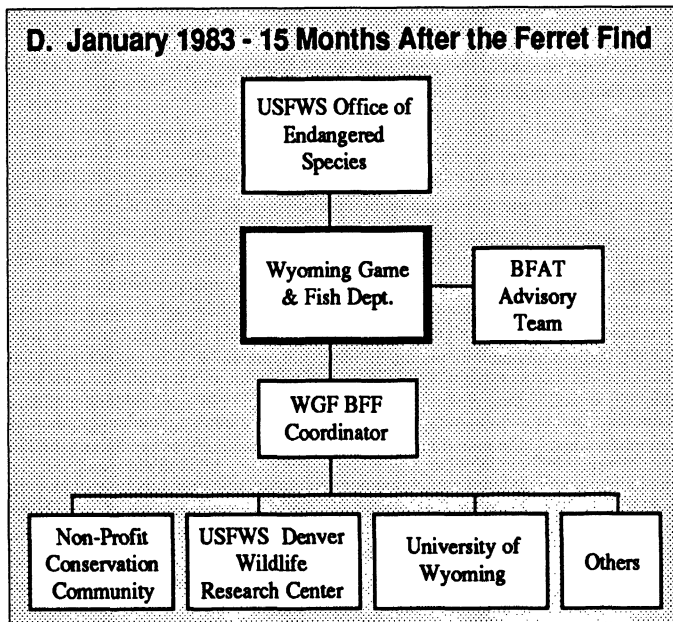
provement, destroyed ferret habitat. This loss, combined with other factors such as diseases, pushed ferrets to the very edge of extinction by 1980. In fact, many people and agencies considered the ferret extinct by that time.

The Meeteetse ferrets were discovered serendipitously: a ranch dog killed a dispersing male. The source population of ferrets was found nearby occupying 37 prairie dog colonies (about 3,000 ha) scattered over about 260 square kilometers on 9 ranches in a mix of private and public lands. The presence of this ferret population surprised everyone. A few months after the discovery, the U.S. Fish and Wildlife Service transferred lead authority for the ferret recovery program to the state and the Wyoming Game and Fish Department. Ferret ecology and behavior were extensively studied as ferrets were observed directly, tracked in snow, and radio-collared. Spotlight surveys each summer revealed peak annual numbers (1984, 129 ferrets including 25 litters). Annual ferret losses were high, about 50-90+ percent (Forrest et al. 1988). By early July 1985, counts showed a much lower population than in all previous years (58, including 13 litters). By early September, mark/recapture population estimates showed that the population had declined to 31±8 ferrets. By early October, the population had declined to 16±5. And by November, only about 6

C. March 1982 - 6 Months After the Ferret Find



D. January 1983 - 15 Months After the Ferret Find



ferrets were thought to remain in the wild. The catastrophic loss of about 150 ferrets between fall 1984 and fall 1985 was documented. During July-September 1985, ferrets were lost at the rate of one every 2 to 3 days. The decline was thought to be caused by canine distemper, a disease 100 percent fatal to ferrets. Techniques were developed to locate ferrets and extensive searches were conducted over several states. No ferrets or recent sign were found.

During Fall 1985, 6 Meeteetse ferrets were captured to prevent loss of the species. These ferrets were housed in close proximity, and 2 ferrets infected with canine distemper transmitted it to the other 4. All 6 died shortly thereafter. Another 6 were hastily captured and housed individually; all survived. These 6, added to the 6 thought to exist in the wild, constituted the world's known population—about 12 individuals in early 1986. In 1986, the 6 captive ferrets did not reproduce, but the 6 wild ferrets produced 10 young in 2 litters, and most were added to the captive population. This brought the world's known population to 18, all in captivity. The captive ferrets produced 7 surviving young in two litters in 1987. No more wild ferrets were found. Breeding success was better in 1988, with 44 young in 13 litters being produced. Ten of the 44 young born in 1988 died. The fate of the species now depends on the

captive ferrets and any wild ferrets that may exist (Maguire et al. 1988).

In late 1985, the International Union for the Conservation of Nature and Natural Resources' (IUCN) Captive Breeding Specialist Group entered the ferret recovery program in an advisory role, bringing considerable technical information and expertise to the captive breeding program. The captive population is presently held in a single location in Wyoming. The agencies responsible for the ferrets are planning to divide the population in order to minimize the chances of the entire population being eliminated by a disease epidemic or other catastrophe (Oakleaf 1988). The participants in the ferret program hope to use captive-bred ferrets to establish a second or third captive breeding colony in other states in late 1988, and an Interstate Coordinating Committee has been formed to identify potential reintroduction sites (Thorne 1988).

Implementation Problems In Recovery Programs

1. Complexity of Cooperation: Multiple Participants and Perspectives

Like most endangered species programs, the ferret program includes a number of governmental and non-governmental participants, who became involved - formally and informally - for

a variety of reasons. More than 20 organizations and 100 individuals have participated in the ferret program since 1981. The primary participant groups are the U.S. Fish and Wildlife Service, the Wyoming Game and Fish Department, ranchers, and the conservation community. The management complexities involved in coordinating the actions of multiple participants in wildlife programs can compound an already difficult biological task (Harvey 1987). This is not to argue that participation should be limited to only a few. To the contrary, a multiplicity of participants provides an essential diversity of knowledge, skills, and perspectives as well as a useful system of checks and balances that contribute significantly to recovery. But to capture these needed interests and skills and meld them into productive, coordinated action requires a carefully constructed and managed program and an explicit and effective decision and policy process.

Each participating organization in a recovery program possesses a distinct perspective from which it sees the program, its operation, and other actors. Each organization may differ from the others in its sense of urgency about recovery of a species and in its thoughts about the best location and means for recovery. For example, conflict arose between participants in the ferret case over the question of when and where to

initiate a captive breeding program.

Because perspectives vary so much, the participating organizations may have contradictory criteria by which each measures program success.

A program's structure is both a determinant and an outcome of organizational power.

For example, some agencies gauge success primarily by increases in a species' numbers, successful captive breeding, or gains in data collection leading to better understanding of the species' ecological requirements. For others, the major criterion of success is the degree to which they can prevent public controversy or effectively control key aspects of the program. Disagreement over these criteria has led to conflicts in recovery programs, as technicians, scientists, managers, and administrators seek to impose their readings of the "facts" and their values on other participants (see Latour 1987).

2. Goal Displacement: Task Goals Versus Control Goals

All participants in endangered species programs genuinely seek species recovery. Despite this common goal, however, program participants often disagree about the means to achieve it, for a variety of reasons: professional disagreements, legal and procedural differences, differences of opinion on leadership and proper organizational roles, and direct incompatibility of the suggested actions with other goals held by their organization (or simply a preference for these other goals) (see Pressman and Wildavsky 1973). Participants may try administratively to redefine the recovery program to fit their own agencies' perspectives and priorities, which can be quite inflexible (Yaffee 1982).

In some cases, a very obvious conflict arises between the "task goal" (i.e. saving the species) and the "power/



(*Calypso bulbosa*)

photo by Jim Weber

control goal" of some agencies (i.e., gaining and maintaining control of the recovery program). "Goal displacement" occurs when an agency becomes more focused on power/control goals than on substantive biological task goals. A program driven by power/control goals is likely to compromise the biological task goals when the two come into conflict, as they invariably will. If the organization relies on a bureaucratic top-down style of decision making, control and power goals tend to dominate, whereas if goals are set from the bottom up, by those individuals most directly in contact with the species, task goals tend to dominate (Daft 1983).

A conflict between task and control goals was evident over all the years of the Wyoming ferret recovery program. The Wyoming Game and Fish Department, which had been given lead agency status by the U.S. Fish and Wildlife Service, wanted to keep the ferrets within the state and carry out captive breeding only after the state had developed facilities to do so. Weinberg (1986: 65) wrote, "As [Wyoming] officials acknowledge, they never seriously considered allowing ferrets to leave the state [for captive breeding]. 'We'd have

no control over them.'" Analysis indicates that Wyoming's insistence on controlling the program created unproductive conflict and caused delays (Carr 1986, May 1986).

3. Organizational Structures

One major cause of a program's failure to meet its goals is the use of inappropriate organizational structures (Hall 1987). Most recovery challenges go well beyond the boundaries of any single organization. Coalitions are formed which must integrate diverse structures, ideologies, and standard operating procedures to meet the common task goal. But agencies setting up a new recovery program rarely give explicit thought to how the recovery coalition should be structured. Programs are often set up along standard bureaucratic lines, not because such an arrangement has proven to be the most effective, but because no other structure is considered. This limits the set of solutions that seem plausible, and that are tried. In the first 15 months of the ferret recovery program, the recovery coalition's organizational structure evolved from a simple matrix to a traditional bureaucratic arrangement, where it has remained (See Fig. 1).

Organizational structure has profound effects on task divisions, resource allocations, distribution of information, and controls, and hence on the overall effectiveness of the program. If task goals cannot be met or are stifled because of structural constraints, then the program will falter or fail. Bureaucratization is implicated as a root cause of many implementation problems (Warwick 1975). Those who implement recovery programs should give explicit consideration to other organizational structures, such as horizontally coordinated task forces and project teams (Clark and Cragun in press).

A program's structure is both a determinant and an outcome of organizational power. A structure that concentrates decision making authority and control in the hands of one agency makes it easy for that agency to reduce or eliminate the role of other organiza-

tions, and to control information for its own benefit. The lead agency in the ferret program used several widely recognized bureaucratic mechanisms (Salancik and Pfeffer 1977) to consolidate its power. For example, it filled positions of power in its "advisory team" with its own personnel (e.g., chairman and secretary). By restricting permits and limiting contact with the press, it also controlled data generation and public access to that data. The bureaucratic structure chosen by Wyoming helped to solidify its top-down control over decision making, allocation of resources, definition of participant roles, and the timing and location of recovery activities. Unfortunately, this structure also closed the decision-making process to significant available information and suggestions for solutions from both inside and outside participants, and reduced the program's ability to be creative and responsive (see Etheredge 1985).

4. Intelligence Failures and Delays

Intelligence failures and delays have been common problems in recovery programs, resulting in part from conflicts among participants, goal displacement, and use of inappropriate organizational structures. Quality decision making depends on intelligence (i.e. the use of information or the "acquisition, analysis, and appreciation of relevant data." (Betts 1978:61, emphasis in original)). Even when information is available to decision makers, a variety of factors may lead them to dismiss it as erroneous, inaccurate, or misleading. In the ferret program, agency officials at first discounted 1985 field data indicating that the ferret population was on a rapid decline. Officials took the most sanguine view of the situation, arguing that it was just a normal population fluctuation, that the field methods and data were in error, or that the ferrets had migrated elsewhere (Weinberg 1986, Randall 1986, Zimmerman 1986).

A root cause of intelligence failures, according to Betts (1978), is that decision and policy makers operate under policy premises that constrict

perceptions and lead to "selective inattention" to facts and outright "blindness" in some instances (Lasswell 1971; Schön 1983). These preconceptions can block learning, change, and adaptation (Etheredge 1985). Organizational arrangements that stifle legitimate dissenting views exacerbate intelligence failures.

In such a difficult and uncertain task as recovering species, where numerous participants are involved, disagreements over the best course of action are to be expected. When dealt with constructively, such disagreements and conflicts have been valuable to recovery programs by providing alternative ideas and solutions for the group to consider. But the need to reach agreement on these points of contention has often caused delays. In some cases a participant who was intensely opposed to a program, and who had adequate resources to block it, has held up recovery actions until major concessions were made.

There is evidence that this occurred in the ferret case. Because Wyoming initially had no captive breeding facility, resources to build one, or staff to man one, and because of their agency's strong opposition to sending ferrets to other facilities outside Wyoming, captive breeding could not move forward when first called for. Extensive bargaining over several years between Wyoming and other participants and the dramatic collapse of the wild population ensued before Wyoming initiated captive breeding in 1985 (Weinberg 1986, Randall 1986).

Not all delays are intentional. Some delays result from the time required to formulate and approve plans and funding requests or from competing demands on participants' time. Regardless of the source, program delays are often difficult to separate from program failures (Pressman and Wildavsky 1973). Does Wyoming's move to breed ferrets in captivity, which occurred a year or two later than recommended by field teams and conservationists (Weinberg 1986) and after the wild population had sharply declined, count as a failure or a success? In view of the captive

breeding program's results in 1988, some observers may reasonably argue, "Better late than never." Although the outcome of the captive breeding program to date gives cause for optimism, we should not assume that the program's delays were of no significance. If we can learn from past mistakes, we collectively can be more responsive to such crises in the future.

Improvements

How can participants in recovery programs begin to deal with these implementation problems and others? To improve future performance in conserving species and the ecosystems on which they depend, appreciation of the actual complexity of the work to be done is required. This means developing a broad understanding of the interactive web of biological, organizational, and policy components involved. Such a "systems perspective" can be very different from the conventional views held by traditional biologists and bureaucrats, views which are rooted in single university disciplines and reinforced in certain agency cultures and loyalties (Brewer 1988).

Improvements in recovery programs are possible in three areas: policies, organizations, and individuals - in addition to the constant striving to improve technical biological work. The ideas presented below are a brief look at some analytical and problem-solving techniques and approaches that could help to broaden participants' perspectives and improve their ability to adapt quickly to the demands of species recovery. We are aware that many recovery programs face extreme resource shortages, and that participants may view some of these suggestions as being too time-consuming and expensive to be practicable. We argue that these ideas and techniques can help recovery programs anticipate and avoid common pitfalls that have hindered efficient and effective action in the past. Since we can give only the briefest introduction to these ideas and techniques, we urge readers to delve into the literature cited for more thorough explanations.

1. Improvements in the Policy Process

By policy, we mean the complex set of interactive decisions and actions by which societies and governments establish goals based on their values and establish the means to reach those goals (Ham and Hill 1987). It is essential in defining a recovery challenge to explore thoroughly its history, scientific and management context, and trends, and to identify all factors which may have a bearing on the success of the program. Evidence suggests that some of these factors, particularly policy and organizational variables, are underappreciated or "invisible" to some participants. Organization and management structures, resource limitations, uncertainty, and jurisdictional and control issues are just a few of the variables which can fundamentally affect the decision and policy processes and ultimately the outcome of a recovery program. Many of these variables involve participants' values. The policy sciences offer analytical tools that can minimize the subjective distortions and simplifications that cause many implementation problems (Lasswell 1971). The policy sciences' problem-solving tools are specifically designed to address both technical and value-laden issues. Policy scientists look at how knowledge is used in the decision and policy processes, and simultaneously, at how well these processes themselves are working. By contrast, technical experts tend to generate basic knowledge and pay little attention to complex decision processes.

One model that could be very useful for recovery programs is the "decision seminar," a technique designed to allow a group of specialists and decision makers to integrate their knowledge to solve complex problems (Lasswell 1960, Brewer 1975). A core group of 10 to 15 participants must be willing to commit the time needed to understand the problem (over months or years, if necessary), although the seminar is also open to outsiders. An explicit problem-solving orientation is used. The group maps the context of the problem and determines its past trends, probable future outcomes, and options available to

solve the problem. The process by which decisions are made is also explicitly and continuously considered. Participants' independent assessments of the problem are compared, common views are discussed, and discrepancies are considered. All relevant methods for analysis of the problem are used, and new methods are encouraged. When the group arrives at a decision, responsibilities for carrying it out are assigned. Documentation of participants' activities becomes the group's "institutional memory" (Brewer 1975). An interdisciplinary approach is essential. Many recovery programs incorporate some aspects of the decision seminar model. But, for the most part, they lack the explicit attention to multiple methods and the breadth of analysis that characterize decision seminars. Recovery programs which fully adopt a decision seminar format could be expected to improve both their openness to problem-solving techniques and their awareness of their own decision-making processes.

Another specific tool that has proven useful in species recovery programs is decision analysis which allows managers to integrate ecological theory, objective data, subjective judgments, and financial concerns in making decisions under conditions of uncertainty (Maguire 1986). Probabilistic models are developed relating the outcomes of alternative actions to random events in the environment, and probability values are

assigned to each possible outcome of a decision. For example, the probability of extinction of a species can be estimated under current management conditions and then compared with extinction probabilities under different management scenarios. The probabilities and effects of random events such as severe weather and disease, and the costs of different management actions can be explicitly considered. Parties that dispute the facts can see where they agree and disagree and suggest ways of assembling information to resolve disputes. Analysts have applied decision analysis to the critically endangered Sumatran rhino (*Dicerorhinus sumatrensis*) and other species (Maguire et al. 1987; Maguire et al. 1988).

"Adaptive management" (Hollings 1978) is a third way of guiding recovery group actions. From this perspective, decision making should be treated explicitly as a process of making mistakes and correcting errors (Brewer 1988). Instead of seeking for and relying on a single "best answer," managers should consider many plausible approaches and solutions, adapting to changes in the problem and its context. The key to adaptive management is to monitor the outcomes of decisions carefully so as to learn from each and to cut losses when "solutions" are not working. Since recovery programs almost always involve risk and uncertainty, managers should use contingency planning to anticipate



peregrine falcon (*falco peregrinus*)

FWS photo

the possibility of failures.

Through the decision seminar process, using decision analysis and adaptive management, an explicit understanding can be gained not only of the substantive problem but of the processes most useful for solving it. Some movement in this direction has occurred in the ferret program. The participation of the IUCN Captive Breeding Specialist Group (CBSG) in the ferret recovery program since 1985 has improved the program's technical capabilities and broadened discussion of a range of ideas and problem-solving approaches. This has brought the program a little closer to the decision seminar model than it was before. Although the program still functions under several policy and organizational constraints dictated by Wyoming, CBSG's participation to date has resulted in a more focused problem-solving orientation and has contributed greatly to the success of the captive breeding effort.

2. Organizational Improvements

The second kind of improvements needed in recovery programs are organizational. Organizations are more than just a collection of individuals; they persist over time and have established norms, traditions, and activities above and beyond the individuals who direct and staff them. They are major determinants of the behavior of those individuals and major actors in policy implementation. The nature of endangered species recovery programs—complex, rapidly changing, and highly uncertain—requires organizational arrangements that fit these task properties. Highly bureaucratized organizations with rigid standard operating procedures probably lack the flexibility needed. Recovery program managers should question whether the program's organizational structure is hindering the recovery effort. Organizational development consultants could provide valuable expertise in matching recovery program structures to organizational tasks and environments.

An effective organization should process information well and learn rap-

idly from its own mistakes. Useful organizational models for endangered species recovery include task forces and project teams operating under adaptive management and decision seminar guidelines. (Task forces tackle temporary problems, and project teams address problems that need long-term, continuous coordination; Daft 1983). A recovery team should ideally be composed of professionals with formal training and experience, who are focused on completing the job successfully and willing to accept the uncertainty and risk inherent in endangered species challenges.

Certain characteristics are key to the effective functioning of recovery teams. As the recovery task and its larger context change, the team must be able to respond quickly and adaptively, using all available information. Communication practices which facilitate high creativity, such as emotional supportiveness, brain-storming, and non-personally directed evaluation of ideas are helpful. A willingness to examine any and all alternatives is essential. Teams must avoid "groupthink," in which disagreements and conflicting perspectives are muted in the interest of maintaining group cohesion (Janis 1972). A strong, mutually supportive atmosphere in which mistakes will not result in withdrawal of the group's support is important. Mistakes and failures should be viewed as occasions for learning and for improving the system.

Clark and Cragun (*in press*) provide a framework for analyzing organizational problems and for implementing change in species recovery programs. This 14-step procedure includes four major stages: problem identification, development of alternative strategies, development of an action plan, and implementation and evaluation of the action plan. It can guide participants in defining problems and objectives, identifying forces that could help or hinder movement toward objectives, analyzing strategies to overcome obstacles, outlining specific tasks to be accomplished, and evaluating the success of their efforts. It provides an explicit method for recovery programs to use in solving

both technical and organizational problems.

3. Individual Improvements

Improvements can also occur at the individual level. Many participants and observers believe the root cause of faltering programs is misguided or selfish individuals. This "human relations" view of organizations oversimplifies the many complex organization, management, and policy aspects introduced here (see Hall 1987, Ham and Hill 1987). Individuals are molded and constrained by conventional experience, established policy prescriptions,

Analysis is often less important than values and preconceptions as a basis for decision making.

and agency structures and procedures. Nevertheless, individual performance in a recovery program is an important factor in the success of the program and it can, in many cases, be improved.

An admonishment often heard is that if only individuals would act with more professional integrity, a program could significantly be improved. But as Betts (1978:82) noted, "Integrity untinged by political sensitivity courts professional suicide." Betts suggests that individuals can try to improve programs by asking hard questions of their superiors, acting as Socratic agnostics, nagging decision makers into awareness of the full range of uncertainty, and making authorities' calculations harder rather than easier. But most leaders will not appreciate these approaches by individual professionals (e.g., Craighead 1979, Hornocker 1982, Clark 1986). Simply providing more reliable facts or new arguments to decision makers will not reverse their basic beliefs. Analysis is often less important than values and preconceptions as a basis for decision

making (Betts 1978). Real solutions depend on the openness of decision makers and their understanding of the premises they use in accepting or rejecting intelligence. Individuals should continue trying to improve their programs, but they should do so with an understanding of the potential political consequences of their efforts.

The sheer complexity of endangered species and ecosystem conservation tells us there is no single, straightforward, technocratic recipe for success. The essential challenge in species and ecosystem conservation, as in all complex situations, has always been to address unbounded problems successfully when our analytical resources are bounded (Ascher 1986). Real improvements will come about by refining the conceptual tools that enhance understanding of complex conservation problems and by developing practical tools that allow the problems to be dealt with realistically. A number of conceptual and practical tools already exist but go largely unused. Improvements will not come quickly, even with increased use of these tools. There are many barriers to learning and improvement (Etheredge 1985), but with so much at stake in every recovery program, we must learn to recognize and overcome those barriers. The full extent of these problems across all endangered species recovery programs is unknown. But we hope that this paper will stimulate further documentation, discussion, and analysis, and we are hopeful that improvements will ensue.

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Beyond Endangered Species: An Integrated Conservation Strategy for the Preservation of Biological Diversity

by J. Michael Scott, Blair Csuti, Kent Smith, J.E. Estes, & Steve Caicco

The loss of species has become a major issue attracting worldwide attention (Myers 1979; Tangley 1985; Wilson 1985). While the list of endangered, threatened, and sensitive species in North America is already depressingly long, it continues to grow. Today, as we reflect back over the years since the passage of the Federal Endangered Species Act, we see a chronicling of this loss at a level unforeseen by those responsible for the Act.

Currently the U.S. Fish and Wildlife Service lists over 1,000 species as endangered or threatened (USFWS 1988). An additional 3,000 or so are identified as either Category One or Two species. These include plants and animals for which sufficient information currently exists to propose listing, and those believed to be threatened or endangered but for which more data are required to meet the legal requirements for listing. While these figures may seem staggering, they don't begin to tell the whole story. A report recently commissioned by The California Nature Conservancy, for example, estimated that 220 animals, 600 plants, and 200 natural communities may be currently threatened with severe reduction or even extinction in California alone (Jones and Stokes Assoc. 1987). Worldwide, projections of 5,000 extinctions per year in the near future have been made (Myers 1979). Yet, in the years since the Act was passed, only 229 Recovery Plans have been approved (USFWS 1988). Many of these elaborate and costly plans have been written for species numbering less than 100 individuals (Scott et al. 1987).

We have learned much since the passage of the Endangered Species Act. Our greatest lesson may be, however,

In terms of protecting biological diversity, the bottom line is not whether we are able to recover a handful of species that are currently on the endangered species list, but the overall richness of our flora and fauna in 100 years.

that despite our best efforts, species continue to go extinct as the result of man's activities. And, our current programs to address these resources have become essentially efforts to document their loss through the listing process. Our emphasis on saving critically endangered species, one at a time, has too frequently resulted in crisis management for individual plants and animals, many for which there is little hope of ever recovering (Scott et al. 1987; Smith 1988).

A simple comparison illustrates the dilemma in which implementation of the Endangered Species Act has left us. When we compare the burgeoning list of threatened and endangered species and the funding provided for these taxa with the tremendous cost of recovery for any single species, only one conclusion can be reached: we cannot possibly save all of these species. Regardless of how we feel about the value of such resources, existing social, economic, and biological realities stop us well short of saving all the endangered taxa. From a cost perspective, making significant advances toward recovery of many, if not most taxa, would take tens of millions of dollars more per species than we can

ever reasonably expect to be allocated (Smith 1988).

There should be little wonder, then, over the obvious frustration that resource professionals and concerned citizens feel when attempting to deal with endangered species issues. As the situation continues to worsen, frustrations and confrontations continue to increase to the point where a sense of hopelessness prevails.

We believe that a significant change in focus in addressing these issues is warranted and possible;

and, that we do have a choice. We can continue focusing our efforts on the critically endangered through a species approach, and have individual recovery efforts diluted each time a new plant or animal is added to the list. Or, we can proceed in a more positive direction by shifting some of our focus on individual species to a more broad-based ecosystem approach aimed at preventing species from becoming endangered. By integrating new and existing conservation strategies, we can begin to move from our traditional single species management philosophy toward a land-based philosophy with the goal of conserving overall biological diversity. One such approach is described in this paper; using Gap Analysis as part of an integrated strategy for the preservation of diversity. Certainly it is not the only approach. But it is one that, given current technology, we believe provides a solid basis for addressing a complex and critical conservation need.

It is of great concern that even game species that are abundant today could be reduced to non-harvestable numbers or even endangerment in 100 years. These reductions will result largely from the predictable but avoid-

able loss of wildlife habitat through future patterns of land use and management. Thus, a greater challenge than recovering individual species is to insure the integrity of existing natural communities and ecosystems, thereby minimizing the number of species which may suffer significant population declines. In terms of protecting biodiversity, the bottom line is not whether we are able to recover a handful of species that are currently on the endangered species list, but the overall richness of our flora and fauna in 100 years. Only a small fraction of Earth's biological diversity can be kept in cryogenic arks or in "protective custody." If biological diversity is to be saved, our focus must turn toward saving functioning ecosystems (Ehrlich and Ehrlich 1981).

We emphasize that programs for species on the brink of extinction should not be abandoned. However, it is our contention that a more balanced conservation strategy is needed to supplement endangered species recovery programs. It is easier and more cost-effective to protect intact, functioning ecosystems with their myriad species than to initiate emergency room conservation measures for one endangered species after another, or to wait until common species become endangered before acting to protect them (Scott et al. 1987).

The challenge, then, is to plan future patterns of growth and modifications in land use to insure the survival of most of the remaining biological diversity. This goal will not be reached by

rescuing specific endangered species, but by keeping enough of the living world around to supply us with, among other things, disease-resistant strains of crop plants, new medicines for new diseases, and functioning watersheds that supply water for drinking and irrigation. We offer gap analysis of cover types and species richness as a new approach that could place resource managers in a proactive rather than reactive mode.

Gap Analysis: Key to an Integrated Conservation Strategy

The most obvious way to determine the extent of biological diversity currently protected is to identify those species and communities that occur in protected areas. Native species that have adapted to man and his modified environment would be excluded from this analysis as would non-native species. All unprotected species and communities represent "gaps" in the conservation safety net (Burley 1988). Because most species are restricted to particular habitats and biogeographic regions, an analysis of existing preserves in relation to vegetation types and centers of high species richness will identify gaps in the existing preserve network. If collectively protected, these areas would capture the majority of continental biological diversity (Scott et al. 1987).

There are a number of approaches to "gap analysis," each with strengths and weaknesses. The most widely used

indirect assessment of the distribution of biological diversity relies on vegetation types as indicators of specific communities of plants and animals (e.g., Diamond 1986; Huntley 1988; Crumpacker et al. 1988; Backus et al. 1988). Whereas an inventory of protected plant communities is clearly an important component of gap analysis, there are several critical shortcomings that can only be addressed by more direct measurements of the distribution of biological diversity. The most pressing of these problems concerns spatial scale and validity.

While we know that intensive field work can lead to a species-by-species assessment of protection at the local level (Margules et al. 1988), the botanical component of biological diversity, for example, is usually approached from a more general vegetation level. However unlike species, vegetation types or associations are artificial and often ambiguous entities. No universally accepted system of vegetation classification exists. In fact, classifications of natural communities are usually specific to states (Noss 1987) or regions and unique in purpose and structure. Often, this situation is compounded because numerous classifications have been developed for a single state or region. At the continental scale, IUCN and UNESCO reviewed the protection of 24 biogeographic provinces in North America (Udvardy 1984). Crumpacker et al. (1988) investigated the representation of 135 Kuchler "potential natural



Pahrump poolfish (*Empetrichthys latos latos*)

photo by Tom Baugh

It is easier and more cost-effective to protect intact, functioning ecosystems with their myriad species than to initiate emergency room conservation measures for one endangered species after another, or to wait until common species become endangered before acting to protect them.

vegetation (PNV)" types on federal and native american lands in the United States. Within the state of California, various classification schemes have identified from 15 to 70 plant communities (Barbour and Major 1988), with many systems describing subdivisions of those communities (e.g., Cheatham and Haller 1975; Paysen et al. 1980). The California Department of Fish and Game in cooperation with the California Nature Conservancy has identified 375 natural communities in California and is working on establishing protection priorities for these communities (Holland 1987). For most regions, the process of classifying vegetation can best be described as chaotic. This makes it virtually impossible to reach consensus on how conservation priorities should be set. Further, as Noss (1987) points out, "some important ecological functions of heterogeneous landscapes . . . are not necessarily protected by conservation strategies that focus on separate, homogeneous community-types."

The question of appropriate scale is not the only problem with a vegetation-based gap analysis. Plant communities may exist in various stages of disturbance; this fact is of the utmost importance to their conservation priority. Crumpacker et al. (1988) describe the difficulty of using Kuchler PNV types as a basis for predicting current cover and land use practices. For example, "forested types in very early successional stages often may be only slightly more valuable for conservation purposes than . . . croplands or pastures" (Crumpacker et al. 1988). It is questionable whether the prairie communities of the Great Plains would ever revert to their Kuchler PNV types, even if agricultural activity were to cease immediately. This creates significant problems in interpretation.

Verification of vegetation identity and status is a critical but rarely practiced component of vegetation classification and mapping. The use of remote-sensing data, especially those generated by high-altitude aerial photography and satellite imagery, may improve this situation in the future (Mayer 1984; Scott et al. 1987). Nevertheless, field validation

is essential to accurately assess the range of variability in species composition and structure within a mapping unit, and provides an opportunity to appraise the reliability of the map.

An approach which is more complete than using only vegetation cover type to determine how well we are protecting this diversity is to include information on species richness for those taxa where biologically defensible data on distribution are available. Adequate distribution information exists for most species of vertebrates and for some plants and subgroups of invertebrates (primarily butterflies). Although vertebrates make up only a small fraction of all the named species, perhaps three percent (Wilson 1988), their mobility and habitat specificity make them useful indicators of overall biological diversity (Scott et al. 1987).

It is important to note, however, that while the conservation of a few highly mobile vertebrates can provide an "umbrella" under which many other plants and animals are protected, the habitat requirements of vertebrates and invertebrates often differ enough that the conservation of one does not ensure that of the other (Murphy and Wilcox 1986). In addition, Pyle (1982) points out several advantages that butterflies in particular have as regional biogeographical indicators: they have limited vagility; are often host-specific to certain plants; their high reproductive potential minimizes changes in their distribution caused by human activity; and, there are enough species to provide regional patterns but not so many as to overwhelm the analysis. Because of their host-plant specificity, they tend to "condense the vast amount of ecological information available in plants" (Pyle 1982).

Based on these factors, we believe that a useful approach to developing a long-range strategy for preserving biological diversity is a multi-faceted

analysis of the gaps in the network of protected areas. Such an analysis would examine the distribution of several key elements of biological diversity relative to areas currently under protective management or ownership at scales of 1:100,000-1:500,000. At minimum,



Schaus swallowtail (*Papilio aristodemus ponceanus*) George Krizek

these would include the following:

- Vegetation types (actual rather than potential) at a scale of 1:100,000 or larger.
- Terrestrial Vertebrate Distribution, including: centers of species richness for vertebrates grouped by taxa (e.g. nongame mammals, waterbirds, uncommon species, etc.) in each vegetation type and biogeographic province, centers of endemism, species-by-species protection status.
- Terrestrial Invertebrate (butterfly) Distribution, including: centers of species richness in each biogeographic province, centers of endemism, species-by-species protection status.
- Threatened, Endangered, and Sensitive Species Distribution in areas managed for the preservation of biological diversity, including: public lands (federal, state, county), with an assessment of the degree of protection offered by present management and, private nature preserves.

Materials and Methods for Developing an Integrated Conservation Strategy

The raw materials for any biogeographical study are maps depicting the distribution of species or communities

of interest. Because many animal species display preferences for certain habitat types, a vegetation map is the highest priority in the community portion of the gap analysis. A vegetation map will also assist in delineating the ranges of terrestrial animals. The vegetation map should be as large in scale as practical. We suggest 1:100,000 but no smaller than 1:500,000. Many states do not have a single vegetation map but do have several covering different portions of the state. The best of these could be compiled into a single map.

Distribution maps of vertebrates and some invertebrates, particularly butterflies, are commonly generated from the collective locations of records of occurrence. Many states have or are developing atlases depicting the distribution of species. If such distribution maps are unavailable, they can be prepared using known records of occurrence, and can serve as the basis for preparing a map of the probable limits of distribution. However, range maps can only assess the possibility of encountering a species and will always contain some patches of inappropriate habitat within the described range. The predictive ability of a range map increases to the degree that it is corrected by a fine-scale habitat map and is verified by experts and ground truthing.

Information on land ownership is commonly mapped by state and federal agencies. The Bureau of Land Management publishes 1:500,000 or 1:1,000,000 scale maps of land ownership and management status for most states. Private and state preserve areas can be individually plotted and added to these existing data bases. Although some federal agencies are mandated to preserve biological diversity, different categories of federal ownership are managed for different purposes. For example, many National Forests allow cutting of stands on old growth timber that, for practical purposes, can never be regenerated. Bureau of Land Management lands throughout the arid west are typically subject to intensive grazing, with little monitoring to determine the status or trends in their biological diversity. A series of ranks indicating the

masked bobwhite FWS photo
(*Colinus virginianus ridgwayi*)



level of protection should be applied to various categories of land ownership and management. The Nature Conservancy assigns categories of: (1) total protection of native communities, (2) partial protection of native communities, and (3) no protection (Craig Groves, pers. comm.).

Before the development of computerized Geographic Information Systems (GIS), the establishment of an integrated conservation strategy would have been very difficult, if not impossible. Recent advances have made it possible to store and analyze multiple layers of geographic data on relatively inexpensive micro-computer systems. Once stored, the computer can respond to search commands to identify gaps in the system of protected areas from a variety of perspectives. Comparison of these results makes it possible not only to determine which species or communities are currently protected, but also to identify alternative conservation strategies to achieve various levels of protection of other areas of high biological diversity (Scott et al. 1987).

Because many species are restricted to certain biographic provinces, it should be possible to identify sets of species whose distributions are correlated. Often, several areas of richness will occur in a single province, offering alternative management or protection strategies. Not surprisingly, local areas

with considerable habitat or topographic heterogeneity will tend to have richer faunas and floras. The distribution of species within vegetation types can also be investigated. By directly measuring the distribution of an entire class of species (e.g., all mammals, all birds), the value of vegetation-based gap analyses can also be measured. This could be especially important for areas where species distributions are poorly known (e.g., most of the world's tropical moist forests) and where gap analysis based on vegetation maps may be the only practical approach to preserve design. Additionally, the strengths and weaknesses of vegetation-based conservation strategies could also be analyzed. The analysis of centers of high vertebrate and invertebrate (butterfly) richness may uncover important gaps in a conservation strategy based solely on one or the other group.

Stages in a multi-faceted gap analysis at the state level might be as follows:

- 1) Draft or compile and digitize a map of vegetation type distribution.
- 2) Ground truth the vegetation map.
- 3) Draft and digitize vertebrate and invertebrate (butterfly) distribution maps.
- 4) Ground truth the animal distributions.
- 5) Input data on land-ownership status.
- 6) Generate a map depicting species richness.
- 7) Generate a map for special interest species (e.g., threatened, endangered and sensitive plants and animals, endemic taxa, and uncommon species found in less than three vegetation types).
- 8) Define and outline centers of species richness.
- 9) Compare lists of species represented in centers of richness to have an optimal number of species protected vs. number of centers of richness (e.g., analyze data set for minimum redundancy) and maximum species and habitat representation. Rank centers of richness by contribution to state, regional, and continental biological diversity. Determine current percentage of each area of species richness in

protected areas.

- 12) Identify minimum and optimum areas required for protection of pre-determined levels of statewide species richness.
- 13) Identify landscape corridors between areas of high species richness.

Questions addressed in the analysis would include the following: 1) Are existing preserves located in areas of high species richness? 2) Are threatened, endangered, or other species of special interest represented in protected areas? 3) What is the ownership status of species rich areas? 4) What proportion of threatened, endangered, or sensitive species are protected in existing preserves? 5) How will changes in land use affect the number of species not found in protected areas? 6) What vegetation types are not found in protected areas? 7) What species occur in protected areas? What species do not occur in protected areas? Which species are represented in the largest numbers of protected areas? Which species are represented in the fewest number of protected areas? 8) What set or sets of unprotected areas should be given protection to include a viable population (Gilpin and Soule 1986) of each species in at least one preserve? 9) Do adequate landscape corridors exist between areas of high species richness to provide for dispersal and interbreeding of populations?

Once the gap analyses for a single state have been completed, then the process could be extended to regions and eventually continents. Data obtained during the verification process could be incorporated into existing data banks such as the Heritage Program developed by The Nature Conservancy.

Field Verification of Sites Recommended for the Preservation of Biodiversity

A GIS-based gap analysis of the distribution of biological diversity and protected areas should be carried out at the finest level of resolution allowed by existing data. The results will be the identification of multiple areas high in

species richness in each state and areas covered by vegetation types not represented in existing preserves. In many cases, these areas will coincide. Because vegetation maps and species distribution maps can only predict the presence and condition of populations and communities in an area, field verification of key unprotected sites will be necessary.

Furthermore, each species and community has specific habitat and space requirements. Beyond confirming the presence of elements of diversity in areas with high protection priority, the minimum boundaries of proposed preserves or management units will have to be established in relation to species and community requirements.



Nashville crayfish (*Orconectes shoupi*)

photo by Dick Biggins

As Noss (1987) points out, "animal species that require a combination of contiguous habitat types to meet life history needs may not be protected unless the inventory system explicitly recognizes habitat combinations in the landscape." In addition, many communities exist in several successional stages, and the spatial and temporal aspects of patch dynamics define a minimum size for long-term persistence. Pickett and Thompson (1978) describe this as the "minimum dynamic area." Furthermore, the population sizes and spatial heterogeneity needed to provide particular plant and animal species with reasonable protection from extinction through genetic, demo-

graphic, or stochastic events, and the description of recommended preserve or managed area boundaries becomes a necessary part of an integrated conservation strategy.

These last aspects, those of describing actual preserve or managed area boundaries based on species and/or community requirements represent a fine tuning of the gap analysis process itself. Critical factors that contribute to this final step include: population viability assessments (PVA's) for special interest or featured species; consideration of minimum dynamic area for landscape maintenance (Pickett and Thompson 1978); and incorporation of other important stewardship or management requirements.

A Model Program and Applications

Although gap analyses for vegetation types have been undertaken for potential vegetation for Costa Rica (Backus et al. 1988), California (Klubnikin 1979), and the U.S. (Crumpacker et al. 1988), no attempt has been made to integrate the results with actual vegetation or patterns of species richness distributions and endangered species locations to generate an integrated conservation strategy. Further, each study represented a static picture of conservation needs, and none provided generally accessible graphic displays of the results.

Given the fact that the opportunities for in situ preservation of biological diversity are rapidly vanishing in both the developed and underdeveloped nations, there is an urgent need to apply GIS technology to a multi-faceted gap analysis of conservation needs. This approach is currently being tested in Idaho. Based on refinement of the results of this pilot project, a nationwide application could be completed before the end of the next decade.

The current emphasis on conservation of endangered species is diverting most conservation energy and resources to species on the brink of extinction (Scott et al. 1987; Hutto et al. 1987; Csuti et al. 1987). In the final analysis, the success of efforts to preserve biological diversity will be judged on the number of surviving species 100 years from now, not on whether we save the California condor or black-footed ferret in the next decade. We need to act now to develop a strategy to accomplish this goal. Identifying gaps in the current network of preserves (terrestrial and aquatic), the protection of which will save most of the remaining species and communities, is an efficient and cost-effective way to retain the maximum biological diversity in the minimum area.

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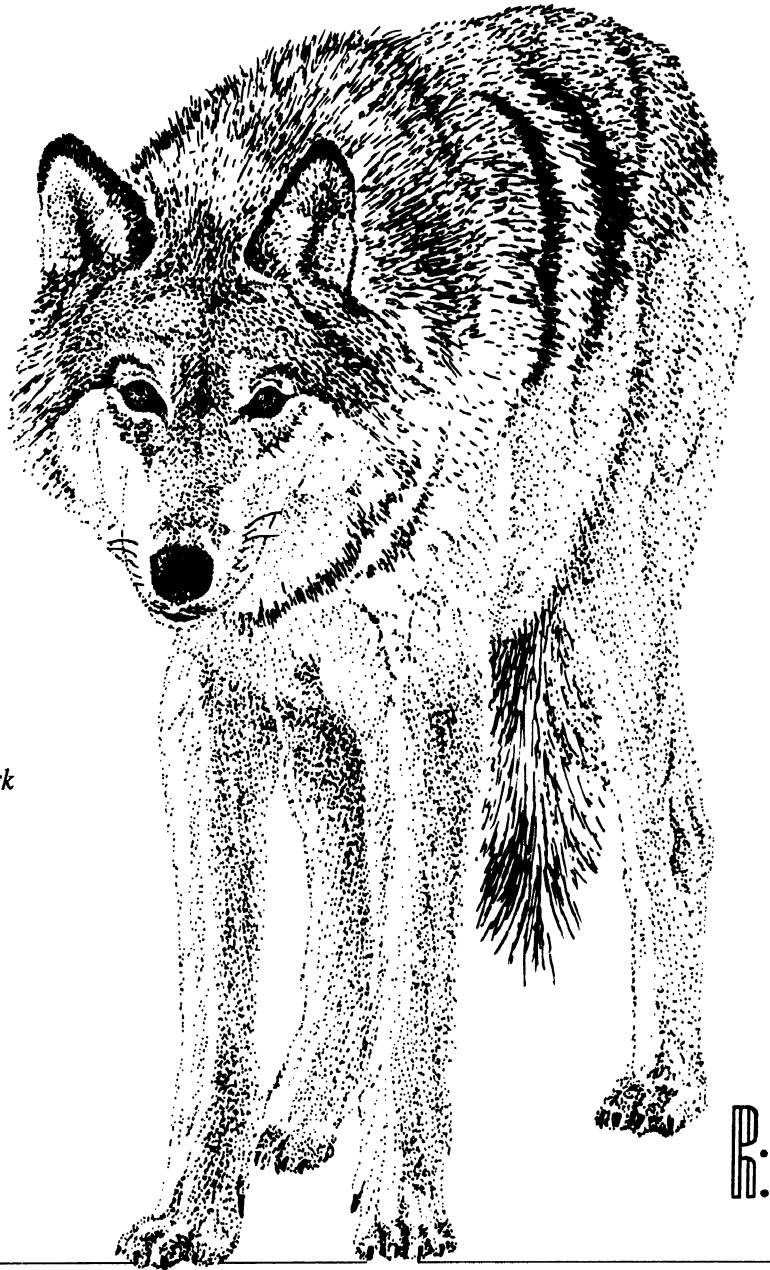
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"Ultimately, we are the endangered species. *Homo sapiens* are perceived to stand at the top of the pyramid of life, but the pinnacle is a precarious station. We need a large measure of self-consciousness to constantly remind us of the commanding role which we enjoy only at the favour of the web of life that sustains us, that forms a foundation of our total environment..."

Remarks of Senator Leahy quoted in The Sinking Ark by Norman Meyers (1979).



R.P.

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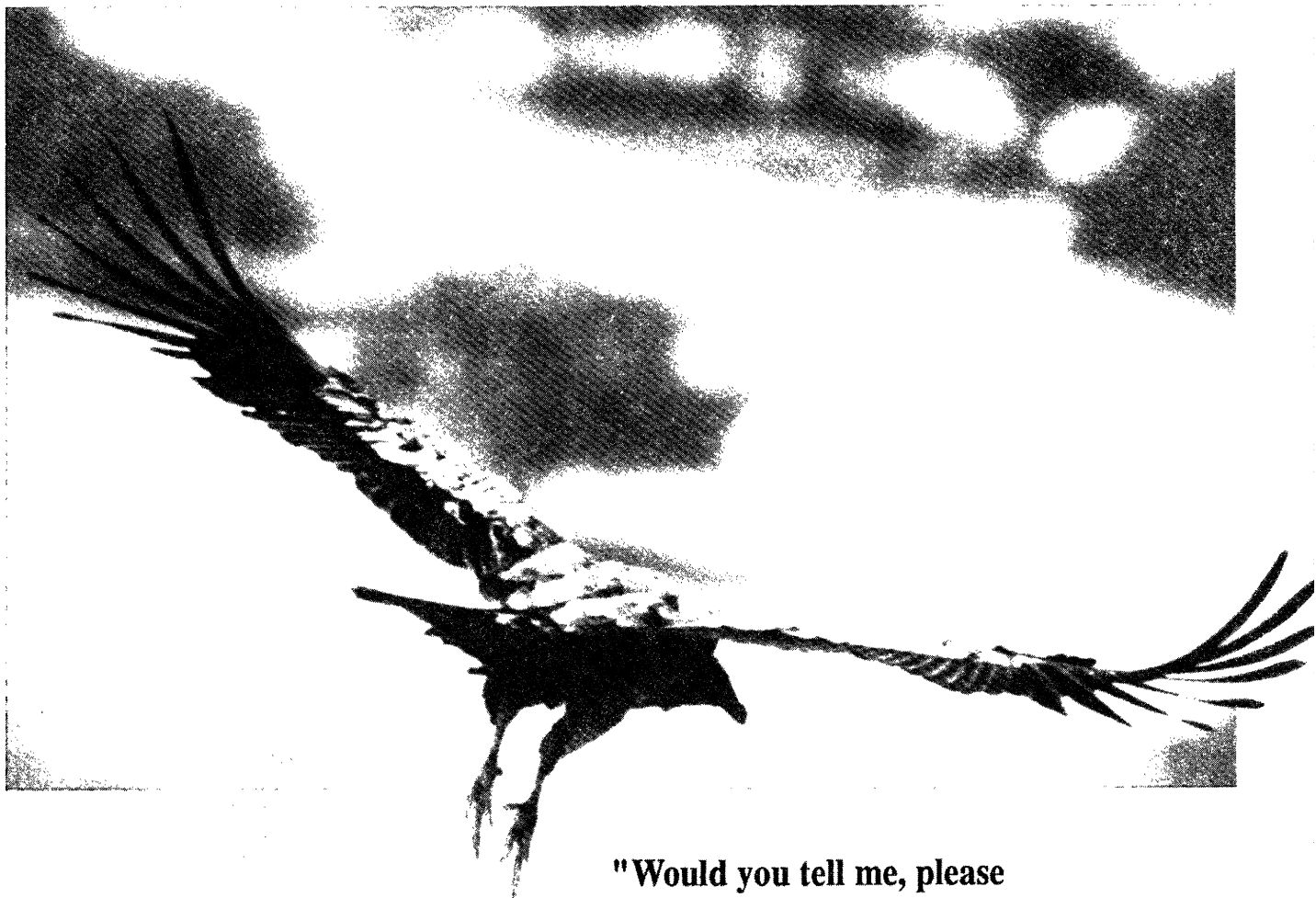
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