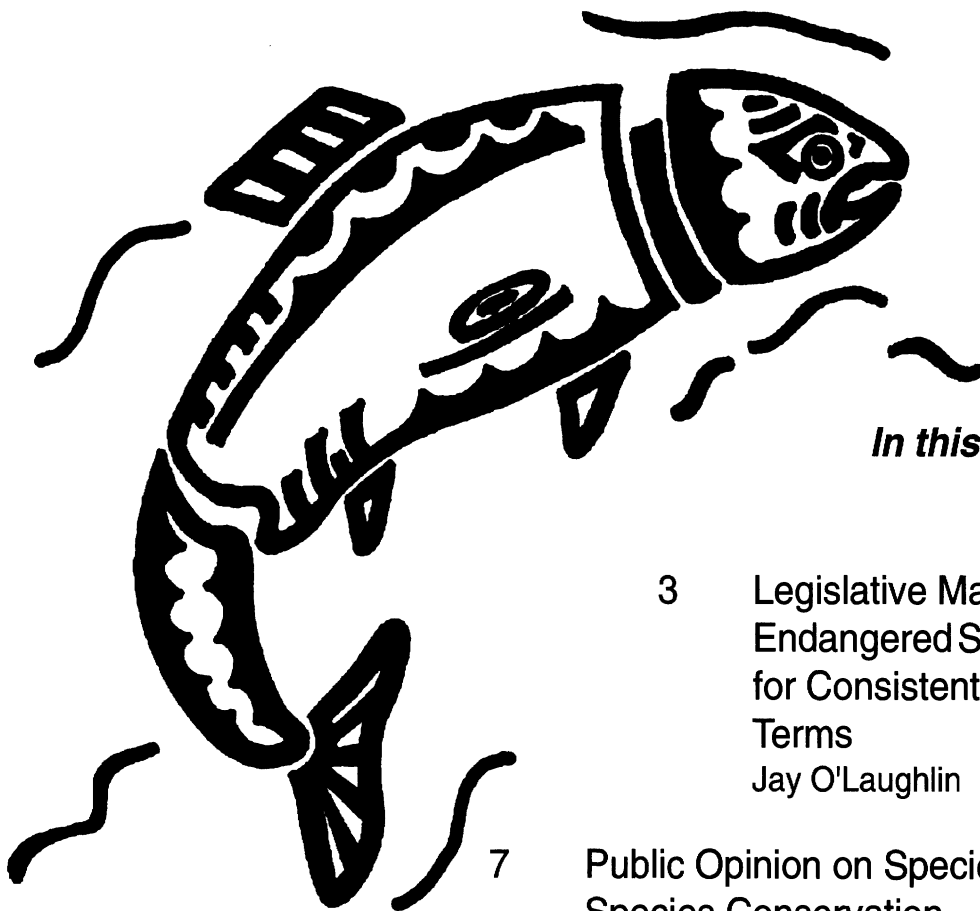


# Endangered Species UPDATE

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

May/June 1997  
Vol. 14 Nos. 5&6

School of Natural Resources and Environment  
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## *In this Issue*

- 3 Legislative Mandates of the  
Endangered Species Act and a Plea  
for Consistent Use of Technical  
Terms  
Jay O'Laughlin
- 7 Public Opinion on Species and Endangered  
Species Conservation  
Brian Czech and Paul R. Krausman
- 11 Oregon Embarks on Bold Recovery Plan for Pacific Salmon: Should it be  
Used as an Alternative to an ESA Listing?  
Glen Spain
- 17 Conservation Spotlight: Desert Fish  
Mike Demlong
- 19 News From Zoos

Insert: May/June U.S. Fish and Wildlife Endangered Species Bulletin

# Letter to the Editor

I wanted to express my concern with Kimberley Walley's article in the Opinion section of the Oct/Nov issue which was critical of Habitat Conservation Plans being developed in concert with the Administration's "No Surprised" policy for private landowners. In an effort to illustrate her concerns, she used Plum Creek's recently completed Cascades HCP in Washington as an example of "inadequate protection" for affected species.

Ms. Walley inaccurately described the protection offered in the HCP as limited to harvest deferrals on 4,300 acres of the 170,000 acre area covered under the plan. In reality, 38 separate mitigation measures are described in the plan to address the biological needs of 285 species included in the HCP approved by the U.S. Fish and Wildlife Service and National Marine Fisheries Service. These include harvest restrictions to retain nesting and dispersal habitat in specific areas totaling 5,600 acres which are currently used by resident spotted owls and retention of a minimum of 8% of Plum Creek ownership in nesting, roosting and foraging habitat for spotted owls. Moreover, riparian buffers on fish-bearing streams are 8 times the width required under current state forest practices rules. The HCP establishes requirements for marbled murrelet surveys, goshawk nest site protection, road and habitat management for grizzly bears and wolves, and watershed analysis to address fish and forest hydrology concerns. The plan also specifies targets to maintain a diversity of forest vertebrate species. A significant element of the plan is a research and monitoring program which will provide both compliance and biological data necessary to evaluate the plan's success and modify it in the future if necessary.

Ms. Walley is entitled to her opinions about the content and quality of habitat conservation plans being prepared by private landowners in cooperation with the Departments of Interior and Commerce. It seems reasonable to expect that she would at least read and accurately describe the plans she chooses to criticize.

Lorin Hicks, Ph.D.  
Director, Fish and Wildlife Resources  
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Seattle, Washington

## Endangered Species UPDATE

A forum for information exchange on  
endangered species issues

May/June 1997 Vol. 14 Nos. 5&6

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# Legislative Mandates of the Endangered Species Act and a Plea for Consistent Use of Technical Terms

Jay O'Laughlin

## Introduction

The Endangered Species Act (ESA) is a public policy for protecting, and improving the status of, plants and animals whose continued existence is imperiled. ESA policy consists of a legislative statute, administrative regulations and guidelines, and judicial rulings. The ESA statute includes hortatory declarations such as the purpose of the Act (ESA § 2), definitions (ESA § 3), and mandates for executive agencies. These mandates include interagency cooperation (ESA § 7) and substantive outcomes, such as a list of protected species and their recovery plans (ESA § 4) and protection against take (ESA § 9). (See Sidebar for definitions of underlined terms.)

Understanding the goals of the ESA statute and the Act's implementation mechanisms can enhance species conservation programs by improving communication among interested parties. Describing ESA ends and means with consistent and precise use of ESA-defined terms facilitates discussion of and improvements to implementation issues.

An Endangered Species UPDATE article by a U.S. Fish and Wildlife Service (FWS) official (Clark 1996) reviewing the ESA's legislative mandates did only a partial job, in my opinion. Personal or agency viewpoints sometimes obscured the underlying statutory requirements and several terms were misused. For example, by stating that the ESA is a "clear public policy...to prevent the destruction of nature's diversity," Clark (1996) was offering an interpretation of ESA policy,

not describing a legislative mandate. "Diversity" is a term absent from the ESA, however, "destruction" is used in section 7 in reference to critical habitat. The ESA's imperfect blend of biological science and law (Rohlf 1991) makes understanding its mandates anything but clear.

The ESA's mandates can be explained by analyzing the three key parts of the statutory design—identification, protection, and recovery (O'Laughlin and Cook 1995). First, Clark (1996) clearly explained identification, which is the section 4 process for listing threatened or endangered species. Second, she described protection as the "primary objective" of the ESA program (Clark 1996). However, she inexplicably omitted section 7 jeopardy and critical habitat protections, while section 9 take protection was adequately explained. Third, although Clark considers recovery to be the "ultimate purpose" of the Act (Clark 1996), she substituted some interpretations for mandates. For example, Clark said the FWS oversees recovery activities, but failed to mention that section 4(f) mandates the FWS to develop and implement recovery plans. Finally, although they are not mandates, Clark (1996) also described how responsibilities for marine animals are split between agencies—these assignments have far-reaching implications deserving more discussion than was provided.

This article complements Clark's article on southern sea otter (*Enhydra lutris nereis*) conservation by focusing on section 7 protection, recovery mandates, and

agency responsibilities. I use ESA-defined technical terms (see Sidebar), and separate legislative mandates from agency viewpoints, administrative regulations, judicial interpretations, and court rulings.

## Section 7 protection

The statute mandates that federal agencies neither jeopardize listed species nor adversely modify their critical habitat. In her brief discussion of section 7, Clark (1996) failed to mention the two protection provisions of the ESA's "Interagency Cooperation": jeopardy protection and habitat protection.

### Jeopardy protection

Clark stated that the Interior Secretary, acting through the FWS, "oversees the protection and conservation of fish, wildlife, and plants found to be in serious jeopardy" (Clark 1996). This use of jeopardy adds confusion and vagueness by inconsistently using a technical term. "Seriously imperiled" would have been a more appropriate phrase, especially when Clark used "imperiled" in a similar context in her concluding paragraph. Absent from the ESA statute or regulations, "imperiled" is convenient for avoiding repetitive use of "threatened and endangered."

Jeopardy is a vague standard used for protecting listed species. Section 7 provides statutory protection by mandating that any action by a federal agency may not jeopardize the continued existence of a listed species. Through the consultation process defined in section 7, the FWS or the NMFS must provide a written statement, called

a biological opinion, if a federal action may jeopardize a species. "Jeopardize" is not defined in the ESA statute, but is in FWS regulations (see Sidebar). There are no degrees of jeopardy in the ESA.

#### *Habitat protection*

Discussion herein separates ESA statutory requirements for protecting habitat for imperiled species from implementation of the Act by the FWS. This analysis should not be construed as an attempt to diminish the crucial importance of habitat protection in many species conservation programs.

According to Clark (1996) "the ESA is habitat-oriented. It seeks to conserve 'the ecosystems upon which endangered species and threatened species depend.'" This interpretation is inconsistent with mandates and statutory design. One of the purposes of the ESA is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved" (ESA § 2(b)). The means to this end is the listing of individual species (NRC 1995).

The ESA statute is species-oriented. To say otherwise, one would have to argue that protection of critical habitat is the same as ecosystem conservation. The critical habitat approach can effectively protect ecosystems only if it is pursued rigorously (NRC 1995). The FWS does not do so; less than 15% of the listed species have designated critical habitat.

Furthermore, the ESA definition of conserve (see Sidebar) applies to species, not their habitat, and conservation involves actions to promote species recovery. Such actions may or may not include habitat protection, depending on the role of habitat as one of five factors

### Sidebar -- Essential Endangered Species Act Definitions

Section 3 of the ESA provides definitions of the terms used in the Act. Some of the important statutory definitions essential to understanding the ESA are as follows (verbatim from the statute, with added underlining):

- The term "species" includes any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which breeds when mature.
- The term "endangered species" means any species which is in danger of extinction throughout all or a significant portion of its range other than [certified insect pests].
- The term "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- The terms "conserve", "conserving", and "conservation" mean to use and the use of all methods and procedures which are necessary to bring any endangered species to the point at which such measures are no longer necessary. Such methods and procedures include...all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case...regulated taking.
- The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. [Note: regulations define "harm" to include significant habitat modification (see below).]
- The term "critical habitat" for a threatened or endangered species means—the specific areas...essential to the conservation of the species and which may require special management considerations or protection.

The U.S. Fish and Wildlife Service has defined some ESA terms in its implementing regulations. Some essential regulatory definitions are as follows:

- "Harm" is defined to include an act which actually kills or injures wildlife [including] significant habitat modification where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering (50 C.F.R. § 17.3).
- "Jeopardy" is defined as follows: "jeopardize the continued existence of" [as in ESA § 7(a)(2)] means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, number, or distribution of that species (50 C.F.R. § 402.02).

considered in listing determinations. The other factors considered are overutilization, disease or predation, regulatory inadequacy, and other impacts on continued existence (ESA § 4(a)). Actions benefiting a listed species would generally benefit an ecosystem in which the species is a component, however, other parts of the same ecosystem may be adversely affected by managing for listed species. For example, southern sea otter conservation efforts negatively affect fisheries and abalone (Wendell 1996) and sea urchin populations, with largely unknown ecological effects on kelp forests and associated coastal organisms (VanBlaricom 1996).

Congress intended that the ESA would protect habitat through the critical habitat feature, however, the FWS prefers to use its discretionary authority to protect habitat in a way not envisioned by Congress (Houck 1993). Using the harm definition, the FWS protects habitat for listed species regardless of whether or not it is critical; i.e., essential for conservation (see Sidebar). The regulatory definition of harm—a component of the statutory definition of take (see Sidebar)—renders critical habitat meaningless (Bean 1983). In 1995, the controversial definition of harm was upheld by the Supreme Court (Babbitt v. Sweet Home Chapter of Communities for a Great Oregon, 115 S.Ct. 2407, 1995).

Critical habitat has not been designated for the southern sea otter, as is the case with more than 85% of listed species. By ignoring the term "critical habitat" and stating that federal agencies must protect "important habitat," Clark (1996) avoided the contentious issues associated with critical habitat. For example, the FWS is required to designate critical habitat under section 4 and protect it from destruction or adverse modifica-

tion under section 7 *except* when it is imprudent or undeterminable (50 C.F.R. § 424.12(a)). In addition, critical habitat designation is a legislative mandate enforceable through judicial review, as in Northern Spotted Owl v. Lujan (758 F. Supp. 621, W.D. Wash. 1991). Critical habitat issues have been analyzed elsewhere (see Tobin 1990, Murphy and Noon 1991, Houck 1993, O'Laughlin and Cook 1995).

### Recovery

Recovery is the "ultimate purpose" of the ESA program (Clark 1996). By identifying the responsibilities of the regulatory agencies as "overseeing recovery activities for listed species," Clark (1996) may have understated their role, depending on what "overseeing" might mean. Section 4(f) mandates that the "...Secretary shall develop and implement [recovery] plans for the conservation and survival of [listed] species." This

mandate is a more compelling directive than "overseeing recovery activities."

Clark (1996) mentioned the southern sea otter translocation law (Publ. Law 99-625) as requiring the FWS to develop and implement a recovery plan, but neglected to say that section 4(f) mandates that a recovery plan provide "objective, measurable criteria...that the species be removed from the list," as well as "estimates of the time required and the cost to carry out those measures needed to achieve the plan's goal." The agencies implementing the ESA are thus mandated to plan and implement activities that will result in the recovery and subsequent de-listing of the species.

### Agency responsibilities

Almost all ESA implementation tasks are assigned to the Secretaries of the Interior and Commerce Departments (ESA § 3(15)). Nevertheless, all federal agencies have an



The bald eagle (*Haliaeetus leucocephalus*) has benefited from the power of ESA legislation. Photo by Mike Greer © Chicago Zoological Society.

affirmative duty to conserve species (ESA § 7).

Agency assignments for marine animals do not follow any prescribed protocol. Interior, through the FWS, is responsible for manatees, walruses, sea otters, and polar bears; whereas Commerce, through the National Marine Fisheries Service (NMFS), is responsible for seals, whales, dolphins, porpoises, and sea lions. These assignments were made following the creation of the NMFS in 1970 and had nothing to do with protecting endangered species; instead they reflect the agencies' interests, abilities, preferences and a spirit of compromise (Tobin 1990).

The FWS generally argues that the agency should have some responsibility for all species at risk of extinction. For example, following the ESA's enactment in 1973, the FWS and NMFS resolved a jurisdictional dispute over sea turtles: the NMFS has jurisdiction when turtles are at sea, the FWS when turtles come on land to lay their eggs.

Either the FWS did not vie for responsibility or the agency's efforts carried little weight when the first population of anadromous fish, the winter-run Sacramento River chinook salmon (*Oncorhynchus tshawytscha*), was listed in 1990. Soon after, three salmon populations native to Idaho's Snake River and its tributaries were also listed. The NMFS has jurisdiction for salmon throughout their life cycle, including when the fish move from the ocean into fresh water to spawn in their natal streams and rivers. This brings the NMFS into Idaho, hundreds of miles from the marine environment, where the agency is responsible for recommending changes in activities on or near federal land that may affect freshwater ecosystems, including grazing, logging, mining, and recreation.

## Conclusion

The ESA raises fascinating economic, institutional, and political issues that will not soon fade (Tobin 1990). Because of the controversies associated with these issues, we should use language to precisely and clearly separate facts from values. Legislative mandates are matters of fact and deserve to be presented as such. Even though the statute is only one part of ESA policy, it is a good starting point for understanding policy implementation. Vague definitions aside, the ESA is a clear statement of a national commitment to protect imperiled plants and animals and improve their situation. Personal values and agency interpretations masquerading as fact muddy up, rather than clarify, our understanding of implementation issues and inhibit debate about socially acceptable means to attain the ESA goal.

## Acknowledgments

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# Public Opinion on Species and Endangered Species Conservation

Brian Czech and Paul R. Krausman

## Introduction

Species endangerment has been a major concern in the United States for over a century. A rich history of legislation prior to 1973 (Table 1) provided the foundation upon which the Endangered Species Act of 1973 (ESA) was built, but the ESA arguably provides more protection from extinction than all prior laws combined. Certainly, no prior law was as comprehensive, nor as controversial.

The purposes of the ESA (Section 2(b)) are to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the [international conservation] treaties and conventions..." The ESA provides those means through an array of domestic and international tactics (Table 2). Every federal agency is affected, as are state and local agencies that use federal money. Many private landowners are affected, too.

The regulatory power created by the ESA is wielded by the Secretary of Interior through the Fish and Wildlife Service (FWS) and, to a lesser extent, by the Secretary of Commerce through the National Marine Fisheries Service (NMFS). The ESA has a history of strict interpretation by the courts (Coggins 1991), and two ESA issues have become increasingly controversial: 1) the types of species that are listed (Williams 1996, Bergman 1995, Dingell 1989), and, 2) the limitations that the ESA imposes on development projects, especially in the private sector (Dwyer et al. 1995, Heinen 1995). The accrual of political peril to the ESA is reflected in its reauthorization

and appropriations history (Campbell 1991). The ESA was originally authorized for five years, and reauthorization and/or authorization amendment has occurred in 1976, 1978, 1979, 1982, and 1988, when the ESA was again authorized appropriations for a five-year period. A conventional reauthorization formulated during fiscal year 1992 would have authorized appropriations for the five-year fiscal period of October 1, 1992 to September 31, 1997. However, Congress has only authorized funds in one-year increments since 1993, and bills to weaken the ESA were introduced in both houses of the 104th Congress (Cheever 1996). In fact, the ESA was "at the top of the list of environmental statutes targeted by the 104th Congress to be weakened or outright eliminated" (Ehrlich and Ehrlich 1996:116).

With controversial issues, public opinion is an important factor for policy makers. Unfortunately, there is little current data on national public opinion. To determine what data did exist, we conducted literature database searches with Quicksearch<sup>®</sup>, using "Endangered Species Act" as a key phrase. As of June 1996, the

Congressional Record Index contained 273 records, corresponding approximately to the number of hearings in which the ESA was a primary topic.

We found reference to 1,341 ESA articles published in natural science journals, most of which are concerned with the biology and evolutionary ecology of species, and with conservation strategies. We found 48 ESA articles in social science journals, most of which are accounts of the social and political effects of the ESA and species endangerment on landowners. Most of the research conducted on public opinion (summarized by Kellert 1996) has focused on attitudes toward various taxa, and was conducted prior to 1990. Much of it was conducted on regional populations.

In light of this, we decided to conduct a survey to ascertain public opinion on different types of species, species conservation, the ESA, and related institutions, and to investigate relationships among demographic factors and conservation attitudes. The purpose of this preliminary article, however, is limited to providing the mean responses to our survey questions and some preliminary interpretations thereof.

- **The Yellowstone Park Protection Act of 1894**
- **Lacey Act of 1900**
- **Migratory Bird Treaty Act of 1918**
- **Migratory Bird Conservation Act of 1929**
- **Fish and Wildlife Coordination Act of 1934**
- **Bald Eagle Protection Act of 1940**
- **Whaling Convention Act of 1949**
- **Endangered Species Preservation Act of 1966**
- **Endangered Species Conservation Act of 1969**
- **Marine Mammal Protection Act of 1972**

Table 1. Legislation pertaining to species conservation prior to the Endangered Species Act of 1973.

Section	Content
2	lists findings and declarations of Congress
3	provides definitions
4	outlines listing procedures
5	authorizes land acquisition for habitat protection
6	provides for FWS cooperation with states in endangered species programs
7	requires federal agencies to pursue the preservation of species, and to consult with FWS before taking any action that could threaten the existence of a species or specimens thereof
8	calls for international cooperation in general
8A	provides guidelines for the implementation of the Convention on International Trade of Exotic Species of Fauna and Flora
9	prohibits the taking of threatened and endangered species by any party, public or private
10	provides exceptions to Section 9
11	outlines enforcement mechanisms and specifies penalties
12	directs the Smithsonian Institution to review the status of endangered plants and to develop methods for plant species conservation
13	brings the act in conformance with other legislation
14	repeals portions of the prior endangered species acts usurped by ESA
15	authorizes appropriations in 5-year cycles
16	specifies the effective date (as the date of enactment)
17	prevents any interpretation of ESA that would weaken the provisions of the Marine Mammal Protection Act
18	requires the Secretary of Interior to submit an annual cost report on a species specific basis

Table 2. Contents of the Endangered Species Act. The act does not have a section 1.

## Methods

We mailed questionnaires to a random sample of 2,000 American households, following the protocol of Salant and Dillman (1994). We defined eight types of species (birds, mammals, reptiles, amphibians, fish, plants, invertebrates, and microorganisms) and seven factors which might influence the perceived importance of an animal's conservation: apparent ecological importance, body size, cultural and historical traits, intelligence or behavioral complexity, monetary value, physical attractiveness, and rarity (hereby referred to as prioritization factors). To determine respondents' valuation of species types and prioritization factors, we used visual analog scaling, whereby the respondent indicates relative value by marking a point along a spectrum ranging from 0 to 100 (i.e., no importance to most importance). The data obtained

are therefore ratio, allowing for finer distinctions in difference and more precise statistical analyses than do ordinal data such as those obtained with Likert scales (Rubin 1983).

We also used visual analog scaling to analyze public attitudes toward species conservation and related institutions. First, to address issues of landowner rights, respondents rated three statements on a visual analog scale in which 0 represented total disagreement, 100 represented total agreement, and 50 represented neutrality. Second, using a scale from "not important" to "extremely important," we explored the importance of maintaining economic growth, ecosystem health, democracy, property rights, conservation of species, and resources for future generations in American society. Finally, we used multiple choice questions to assess public opinion on the causes of species en-

dangerment, the propriety of the ESA, and the acceptability of other types of policies important to species conservation. The results are proportions of people responding to various choices, so are immediately interpretable in terms of majorities and minorities.

## Results and Discussion

We obtained 643 questionnaire responses. Accounting for delivery problems, the response rate was 40%. The geographic distribution of respondents closely resembled that of the population at large, and the proportions of respondents belonging to the two major political parties were nearly the same as with the voting public. Respondents were also similar to the voting public in terms of education and employment levels. Respondents averaged about five years older (mean age = 51.6)



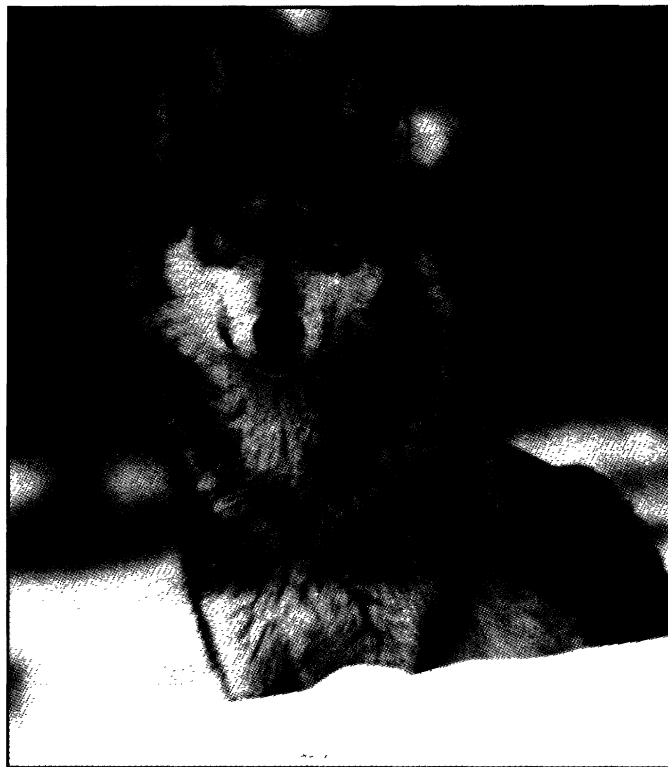
than United States voters (U. S. Bureau of the Census 1996). Despite instructions intended to obviate a skewed sex ratio of respondents, 70% of respondents were male. This could be related to Kellert's (1987) finding that males were more concerned about conserving wildlife species and habitats than were females, who tended to be more concerned about domestic animals and individual animal welfare.

We found significant ( $\alpha=0.05$ ) differences in respondents' valuation of types of species. On a relative valuation scale of 0-100, respondents value plants (72), birds (71), and mammals (71) significantly higher than all other types. Fish (68) constitute a second level of importance. Reptiles (59), amphibians (59), and invertebrates (57) occupy a third level, and microorganisms (52) are valued significantly less than all other types.

Despite these taxonomic preferences, respondents considered ecological importance (77) and rarity (73) to be the most important factors in judging the importance of species for conservation. Other important factors were cultural significance (57) and intelligence (53). Monetary value (32), physical attractiveness (29), and body size (28) were

deemed much less important.

On an agreement scale of 0-100 (where a score of 50 indicates neutrality), respondents support (62) the statement, "Landowners should not have the right to use their property in ways that endanger a species." Similarly, respondents disagree (41) with the notion that, "Endangered species protection should not interfere with a landowner's right to develop property." Respondents also believe (58) that, "Landowners prevented from developing their property because of endangered species laws should be paid for any lost income by respondents." Agreement with the latter is positively correlated with age—older respondents feel more



The Mexican wolf is one of many species for whom public opinion affects recovery policy. Photo by Mike Habermann © Minnesota Zoo.

strongly that landowners should be compensated for lost income.

On a scale from 0-100, respondents rated the importance of conserving species at 76.5, similar to the importance of property rights (76.3) and economic growth (75.4). Each of these concepts are valued significantly ( $\alpha=0.05$ ) less than ecosystem health (80.5) and democracy (82.5). However, the availability of resources for future generations (85.8) is the concept considered most important.

Fifty-five percent of respondents realize that habitat loss due to natural resource extraction and economic development is the biggest cause of species endangerment in the United States today. Thirty-six percent feel endangerment is due to toxic chemicals, while 7% blame harvesting (e.g., hunting). Only 2% believe that introduced species are the biggest cause.

Five-percent of respondents would like the ESA revoked, 11% would like it weakened, 35% want it retained as written, and 49% want the ESA strengthened (Figure 1). There

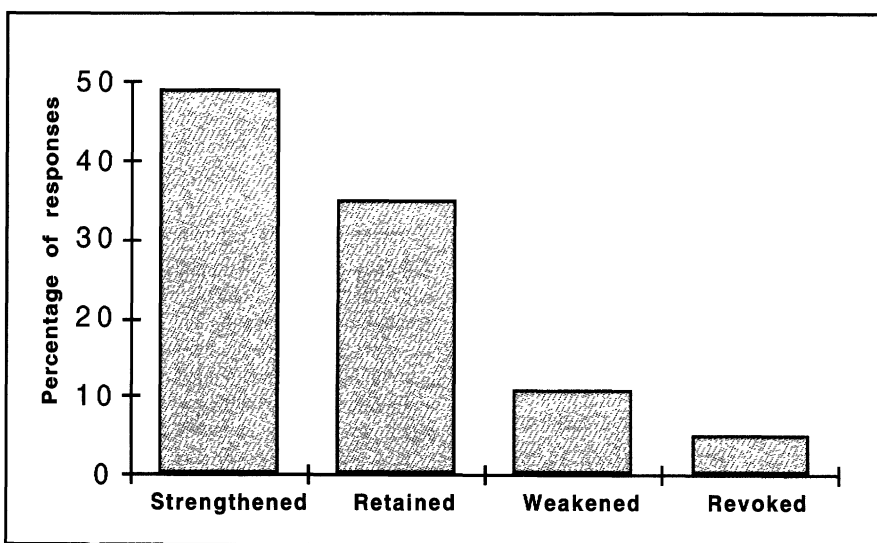


Figure 1. Percentage of respondents who would like to see the ESA strengthened, retained as written, weakened, or revoked.

was no significant difference in overall species valuation between people from the East (eastward of the Great Plains) and people from the West, and similarly low proportions from the East (14%) and West (19%) favor weakening or revoking the ESA. However, among those preferring to maintain the ESA as written or strengthen the ESA to protect more species, a higher proportion (53%) from the East want it strengthened. In the West, 41% want the ESA strengthened.

Respondents' awareness of habitat loss is reflected in attitudes toward remedial strategies. Sixty-eight percent of respondents favor eliminating subsidies for practices that degrade endangered species habitat (12% oppose that strategy, and 20% are undecided). Sixty-one percent favor policies that would promote a stable human population rather than population growth (22% opposed, 17% undecided). Forty-eight percent favor policies that would lower the consumption of resources, especially by wealthy individuals (30% opposed, 21% undecided). Judging by the comments of respondents, the clause "especially by wealthy individuals" dissuaded many respondents that would otherwise have favored consumption policies. It is difficult to estimate, however, how many respondents would have favored such policies without an emphasis on wealthy individuals. Only 6% favor a ban on hunting, fishing, trapping, and wildlife harvesting of all sorts (87% opposed, 7% undecided).

Finally, respondents were asked to rate the statement, "I consider myself to be an environmentalist," on a scale from 0-100 (0=disagree, 100=agree). On average, respondents view themselves as environmentalists (59).

## Conclusion

Our results suggest that species conservation is of greater concern than other issues and attitudes that have

become associated with the concept of environmentalism. Specifically, the Endangered Species Act seems to be highly valued for 2 reasons. First, the public is generally concerned about the extinction of species, and the ESA is the only law that directly addresses that concern. Second, the public is most concerned about posterity, and has a basic understanding that the ESA dissuades activities that liquidate depleted resources and make them unavailable to future generations. In addition to the ESA, the public, on average, favors policies that would eliminate subsidies to resource extractors, promote population stabilization, and temper the consumption of natural resources.

## Acknowledgments

Numerous professors of statistics, political science, psychology, and biology at The University of Arizona, students, and citizens outside of academia reviewed the questionnaire for unconventional phraseology, vagueness, predisposition, and other questionnaire design problems. We are especially indebted to Terry Daniels, Bill Shaw, and Tom Brown for their reviews of the questionnaire, and to Pat Jones for statistical advice. We thank the United States Forest Service, The University of Arizona's School of Renewable Natural Resources, and The University of Arizona's Agricultural Experiment Station for fiscal support.

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# Oregon Embarks on Bold Recovery Plan for Pacific Salmon: Should it be Used as an Alternative to an ESA Listing?

Glen Spain

## Introduction

On April 25, 1997, with the ink still drying from last minute negotiations, the National Marine Fisheries Service (NMFS) announced that it would *not* list the 'Northern Oregon Evolutionarily Significant Unit (ESU)' of coho salmon in deference to the State of Oregon's Coastal Salmon Restoration Initiative (now known simply as the "Oregon Plan"). This is remarkable, for no other state has ever attempted such a comprehensive recovery plan, nor been able to avoid a federal listing in this fashion.

Given the wide mix of coho recovery strategies being tried in both California and Oregon (with two of three coho ESU's listed, the other not), the west coast is now a perfect laboratory for developing new kinds of state-federal species protection partnerships. Unfortunately, the Oregon Plan is still being presented in the rhetoric as somehow incompatible with ESA protection, when just the opposite is true. Worse, the Oregon Plan is now being trumpeted as a model state recovery effort to be copied primarily *to avoid an ESA listing altogether*.

As the Northwest Regional Director of the Pacific Coast Federation of Fishermen's Associations (PCFFA), the largest organization of commercial fishermen on the west coast, I have been personally involved with the development of the Oregon Plan from its inception. In this article I will draw on that experience to describe the plan, explain how it works, discuss whether it is in fact preferable to an ESA listing, look at how both the ESA and the Oregon Plan might work together, and hopefully draw some conclu-

sions applicable to the development of future recovery plans of this sort elsewhere.

## Seriousness of the decline

The term "salmon," as used on the west coast, means any of the seven major species of the genus *Oncorhynchus*, which includes chinook or king salmon (*Oncorhynchus tshawtscha*), coho or silver salmon (*Oncorhynchus kisutch*), coastal searun cutthroat (*Oncorhynchus clarki clarki*), steelhead (*Oncorhynchus mykiss gairdneri*), chum salmon (*Oncorhynchus keta*), pink salmon (*Oncorhynchus gorbuscha*) and sockeye salmon (*Oncorhynchus nerka*). As a genus these species are often lumped together and called "salmonids."

Specifically, the plight of Pacific salmon has been recognized since at least the 1880's. However, much of the information was buried until the American Fisheries Society's (AFS) publication of "Pacific Salmon at the Crossroads," their landmark coast-wide salmon population assessment (Nehlsen et al. 1991). The conclusion of this report was chilling: more than 214 distinct stocks of salmon in the Northwest and northern California (the vast majority of those still remaining) are at varying degrees of risk of near term extinction, with at least 106 other stocks already extinct. Virtually every river system and coastal basin has one or more species of salmon that face extinction. The report also clearly identified onshore habitat loss—including the impacts of logging, overgrazing, mining and hydropower development—as the

leading cause of these declines.

Geographic Information System (GIS) mapping of the AFS findings also produced some startling results (Frissell 1993). Coho salmon are already extinct in 55% of their historic range, endangered in 13%, threatened in another 20%, of 'special concern' in an additional 5% and could be classified as 'not known to be declining' in only 7% of their historic range—and some of those runs are classed in this 7% due only to lack of data (Table 1).

Armed with this information, salmon advocates, including the Pacific Rivers Council, the Western Division of the AFS, and 21 other groups, filed a formal petition with the National Marine Fisheries Service (NMFS) to list coho (*Oncorhynchus kisutch*) coastwide on October 19, 1993.

Unlike other species of Pacific salmon, coho are very sensitive to inland habitat problems because they spend up to their first 18 months in freshwater streams. Over decades, the impacts of logging, overgrazing, mining pollution and other human uses have directly affected coho populations. Most Oregon streams now produce less than 20% of their historic salmon populations, with many producing much less. By 1994, wild coho populations in Oregon had declined from 1 to 2 million, to less than 20,000 returning adults—a 99% decline. Fishing closures largely kept pace with these population declines. However, in a final emergency conservation effort, the remaining coho ocean fisheries were closed down coastwide in 1994. Unfortunately, fishing closures alone can never bring back damaged habitat. If habitat continues to decline,

Species	Extinct	Endangered	Threatened	Special Concern	Not Known to be Declining
Coho	55%	13%	20%	5%	7%
Spring/Summer Chinook	63%	8%	16%	7%	6%
Fall Chinook	19%	18%	7%	36%	20%
Chum salmon	37%	16%	14%	11%	22%
Sockeye	59%	7%	3%	16%	15%
Pink Salmon	21%	5%	<1%	<1%	73%
Sea-run Cutthroat	6%	4%	61%	29%	0%
Winter Steelhead	29%	22%	7%	18%	24%
Summer Steelhead	45%	5%	5%	27%	18%

Table 1. Status of salmon species in the Pacific Northwest and distribution status as a percentage of historic habitat.

eventually too few fish will come out of the river systems to ensure even minimal replacement—even with no fishery harvest at all. Even with total fishing closures, there is no hope of saving these species unless inland habitat loss can be halted and eventually reversed (Lawson 1993).

In July, 1995 (roughly 8 months past its statutory deadline), NMFS proposed the listing of three genetically distinct Evolutionarily Significant Units (ESU's), with the northernmost unit, the "Oregon Coast ESU," ranging from Cape Blanco in southern Oregon to the Columbia River. Coho were clearly in trouble all along the coast, and onshore habitat loss, particularly from logging and agricultural impacts, was identified in the listing proposal as a main culprit in these declines. Still stinging from timber harvest restrictions previously required for spotted owls and marbled murrelets, the prospect of further restrictions due to coastwide salmon listings put the timber, cattle and agricultural interests in a frenzy. Fearing the worst (and knowing that some of their common land use practices were being called into question), they pressed hard politically to avoid a similar closedown to protect fish. When their efforts to gut the ESA in the 104th Congress failed, they turned to state governments to avoid a listing.

### The origins of the Oregon Plan

In response to such serious population declines, then Oregon Governor Barbara Roberts called a Salmon Restoration Conference in December 1992. Governor Roberts invited a broad cross section of interests, including the Pacific Coast Federation of Fisherman's Associations, and arranged working groups to draft restoration recommendations. In work sessions, timber and agricultural interests deflected any effort to make regulatory changes in their practices, but fully supported establishing a system of locally based "watershed councils" to work on local restoration efforts. The 1993 Legislative Session soon thereafter passed a bill giving these watershed councils formal legal recognition and providing them with state expertise and financial resources for staffing. There are now about 60 such councils in Oregon, covering almost every coastal and some inland watersheds.

Recognizing past failures of state-driven salmon restoration efforts, watershed councils were designed to create local 'buy-in' by involving locals with the salmon restoration. Projects were intended to be 'ground up,' i.e., proposed by local watershed council participants, with the state agencies providing support rather than control.

To a large degree, this approach has been successful, particularly in

conservative rural areas where suspicion of outside government programs generally runs high. Critics note, however, that watershed councils are generally unable to curb local industrial land use practices which are contributing to salmon habitat destruction statewide. In fact, councils are often dominated by the very industrial landowners whose practices are in question. Critics also note that projects which typically gain approval through local watershed councils are only those that are noncontroversial—not necessarily those most beneficial to the salmon. However, when Governor Kitzhaber replaced Governor Roberts in January of 1995, the watershed council structure was already *a fait accompli* with a developing local constituency. It was a place to start.

When NMFS first proposed listing coho in July of 1995, Oregon's Governor Kitzhaber faced a defining moment. The Governor, himself an avid fly fisherman and outdoorsman, immediately recognized the urgent need to restore the region's salmon resource, for both economic and cultural reasons. Economically, salmon are extremely valuable to northern California and the Pacific Northwest. As recently as 1988, salmon fishing in the Northwest (including both commercial and recreational sectors) contributed more than 62,000 family wage jobs and generated over \$1.25 billion for the regional economy. In 1988,

Oregon's share of salmon dollars supported about 14,000 of these family wage jobs (representing more than \$275 million/year in annual personal income) (Pacific Rivers Council, 1992). Given the already depressed salmon populations of 1988, these figures for total value of the resource are quite conservative. They also exclude all non-market and "quality of life" values, and are based only on hard dollars.

With roughly two-thirds of coho habitat on nonfederal lands, Kitzhaber believed that the watershed council 'local control/voluntary action' approach was more likely to get private landowners mobilized and cooperative than a typical 'top-down' federal program under the ESA. He also felt that the ESA alone would not be able to achieve actual restoration—it would only restrict direct 'take,' particularly on private lands.

Unfortunately, there were a lot of hidden agendas. The timber and agricultural industries, which have long dominated state politics, feared federal restrictions and wanted a state controlled recovery plan primarily in the hopes of avoiding an ESA listing (and thus federal control). Fishing industry closures coastwide had devastated local economies so both local political interests and the fishing industry itself were screaming for real recovery efforts, not just ESA avoidance. The Governor wanted real recovery, but in the midst of Oregon's worst budget crisis in history selling any new program would be impossible without broad political support. Thus there was an unusual confluence of forces, each operating out of self-interest, that made progress politically possible.

Shortly after the proposed listing decision, the Governor's office went into high gear. In an unusual move, the Governor announced his "Coastal Salmon Restoration Initiative" and personally instructed ev-

ery state agency to quickly come up with an initial plan for salmon recovery measures. He also met with the heads of each state agency every two weeks on this issue, giving them assignments and holding them accountable for their portions of the plan. These bi-weekly staff meetings allowed Governor Kitzhaber to end traditional inter-agency bickering and ramrod an ambitious restoration plan through a conservative Legislature just in time to meet the court imposed listing decision deadline of April 25, 1997.

### **What the Oregon Plan does**

The Oregon Plan is based on some fundamental principles: (1) no additional regulations or changes in existing law (a politically expedient compromise, given a hostile Legislature and regulation resistant industrial landowners); (2) increased enforcement of existing laws, including additional funding for current enforcement programs; and (3) primary reliance on voluntary efforts from local landowners, organized through local watershed councils and industry trade or landowner associations.

The Governor does have a strong argument in favor of voluntary action and against federal control alone. Specifically, the ESA prohibits actual 'take,' but very little else. Even recovery plans required under the ESA do not require actual recovery (as that term is commonly understood). They require only the maintenance of sufficient populations to avoid extinction or threat of extinction. Indeed, the term "recovery" has never been defined as a matter of law under the ESA, and is therefore confused throughout the statute and regulations with the requirement to "conserve" a species. Conservation is a minimal requirement that has been interpreted by courts to be only "far more than to merely avoid the

elimination of protected species" (*Defenders of Wildlife v. Andrus* (428 F. Supp. 167, 170 (D. D.C. 1977))), but not necessarily to bring populations close to historic levels. Conservation throughout the ESA has only been defined as avoiding jeopardy rather than in terms of a recovery standard, which would presumably require restoration as well as maintenance. Furthermore, while the ESA can be effective in controlling destructive land uses on federal lands, it is not that effective in changing land uses on state owned and private lands. Many of its provisions (such as the Section 7 consultation process) apply only to federal projects or projects with a federal nexus.

For political reasons, the Plan was aggressively sold to industrial landowners and the Legislature as a way to avoid an ESA listing. This was just what they wanted to hear. However, this was not the stated goal of the program itself, which reads: "It is the mission of the Oregon Coastal Salmon Restoration Initiative to restore our coastal salmon populations to productive and sustainable levels based on their natural, cultural and economic values to the people of Oregon." Thus there has been a schizophrenic tension between these two views of the Plan. Most conservation and some fishing groups see the whole process as a cynical attempt by industrial timber and agricultural landowners to exempt themselves from responsibility for past and future habitat destruction. Others see it as the best hope there is (in spite of its flaws) for achieving actual recovery over the long term. It may in fact be both.

Though this fact has been lost in the debate, the Oregon Plan is intended to operate with or without an ESA listing. It is also a stand alone recovery plan should a listing later occur. Unlike a similar effort in California which quickly dissolved,

Oregon's program was always intended to be scientifically credible as a recovery plan, not just as an excuse for not listing. The same plan has thus served multiple functions, garnering political support from different forces for widely differing—and even incompatible—reasons.

By happy fortune, the political conditions were ideal for the negotiations that led to the Oregon Plan. From the viewpoint of the industrial timberland or agricultural land owner, the Oregon Plan was an opportunity to avoid a listing, i.e., to avoid federally mandated reforms of land use practices linked to salmon declines. From the viewpoint of the Governor, primary reliance on voluntary efforts made the package politically saleable and fundable through a skittish and anti-regulatory Legislature suffering severe budget shortfalls. From NMFS's (and the White House's) viewpoint, the Oregon Plan offered an expedient way out of making a politically charged listing decision. It was also clear that NMFS had neither the willingness nor the institutional capa-

bility to develop its own recovery efforts and much preferred leaving it to the state. The Oregon Plan thus seems to be good for all the political interests involved. However, the question really should be whether the Plan is good for the fish.

### **The downside of the deal**

Unfortunately, there are some serious flaws in the Oregon Plan which cannot be readily overcome. These include:

(1) *Reliance on Oregon's laws when Oregon's laws are the problem.* Oregon's natural resource protection laws have proven seriously deficient in controlling salmon habitat losses. Compared to either Washington or California, many of Oregon's current regulatory regimes are weak at best. In fact, some laws actually prohibit protecting salmon spawning areas. For example, the Oregon Revised Statutes (ORS) Section 196.810 prevents more than 20% of any waterway from being designated "essential indigenous anadromous salmonid habitat." Gravel extraction is thus allowed in all the

remaining areas, regardless of the impact on spawning salmon. Under Oregon law there is also no regulatory restriction on streambed removal-fill activities of less than 50 cubic yards—a much weaker standard than under the Clean Water Act. Beefing up enforcement of weak or counterproductive laws is not going to result in much additional protection.

As they stand, the existing regulatory mechanisms cannot be relied upon to adequately control, curtail or reverse the widespread pattern of salmon habitat destruction. Even though NMFS did negotiate a "Memorandum of Agreement" calling for rule making improvements to some of these laws, there is a real question about how much widespread land use practices can be changed by internal agency rule-making alone. Many of the laws themselves need to be changed. Unfortunately, the chances of passage in a Legislature politically controlled by those very industries whose practices would have to be curtailed are very dim.



Chinook salmon. Photo by Jim Larison © Oregon State University.

(2) *Some of the industrial sectors most affecting salmon spawning areas are contributing the least.* As part of the Oregon Plan the timber industry, the fishing industry and other sectors have pledged a great deal of money and effort to protect salmon. Other industrial sectors (such as agriculture) have offered relatively little under the Plan. Furthermore, all recovery measures to be taken by the inland industries are voluntary, whereas the Plan calls for relatively severe and mandatory cutbacks in commercial fishing. Even though curtailments in fishing alone cannot offset declines caused by decades of serious habitat losses onshore, commercial fishing restrictions under the Plan are in fact far more draconian than those required under the ESA. Unequal contributions of this sort create serious inequities and undermine confidence that the Plan will ever achieve its recovery goals.

(3) *Voluntary efforts avoid dealing with real causes.* Watershed councils are required by law to be broad-based, including representation from local landowners. However, it is often these landowners whose land use practices are part of the problem. Critics charge that the result is a 'dumbing down' of restoration efforts so that only those measures which are noncontroversial or do not inconvenience landowners can ever be achieved. Thus short term 'band aide' approaches are pre-selected over anything that would require local landowners to make more fundamental changes.

This criticism is also leveled by the American Fisheries Society—unless the major upstream land uses that destroy fish habitat are first corrected, all downstream recovery efforts may become futile. For example, many upland land use practices result in landslides drowning out lower spawning areas with silt and debris. Many studies of the relationship between

clearcut logging and landslides bear this out. The preliminary results of an ongoing study by the U.S. Forest Service in Oregon, for instance, indicate that in recent heavy rains landslides were 2.6 times more frequent from slopes clearcut within the last 20 years, as compared to forested slopes. When combined with the effects of road-related activities, the frequency rose to 5.7 times that of untouched areas.

(4) *The standard of the Plan should be what is biologically necessary, not what is politically most palatable.* Many elements of the Oregon Plan are based on political and funding constraints, rather than biological needs of the fish. There are still legitimate scientific doubts about whether the Plan itself would lead to widespread recovery for the species even if fully implemented. To provide some assurances, an independent scientific review panel and on-going monitoring program were established to test and verify the Plan's operations and assumptions, as well as to correct any problems later identified through an adaptive management process. This will help, but may not be enough if the Plan itself is flawed.

(5) *Voluntary efforts are inherently unreliable.* There are already signs that some of the voluntary efforts pledged by affected onshore industries may not be forthcoming. Some have contingencies and preconditions that make them less firm. Unfortunately, all voluntary restoration efforts are inherently unenforceable, and therefore unreliable.

(6) *The lack of stable funding.* The 1997 Oregon State Legislature has only provided funding (\$30 million) for the first two years of what is at least a 50 year recovery program. Future funding is tied to future Legislative approval, which means the whole program will be a political football in every future state budget. Without long-term dedicated funding that is insulated from the political process,

the long-term stability of the whole program is questionable.

### **Should a listing have been deferred?**

Many groups involved in this process, including most of the original listing petitioners, argued that it was unwise to jettison the ESA as a bottom line 'safety net' in favor of an untried and unenforceable state plan. Some of their concerns are summarized as follows:

First, since the Oregon Plan is based almost entirely on voluntary measures, these may or may not materialize over time. While we hope they do, history is rife with restoration plans that sounded great on paper but which ultimately failed in delivery. A truly risk averse strategy would also include a listing. In fact, federal courts have consistently ruled that promised future actions, however grandiose, cannot be the basis for failure to list when it is biologically warranted (see Southwest Center for Biological Diversity v. Babbitt, 939 F. Spp. 49 (Dist. of Columbia Circuit 1996), and Save Our Springs, et. al. v. Babbitt (MO-96-CA-169), U.S. District Court, Western District of Texas (Opinion issued April 15, 1997) for two recent examples). However, if the Oregon Plan becomes an ESA mandated 'recovery plan,' it would have some teeth. This argues that both should work together as part of the whole package.

Second, the Oregon Plan will not significantly improve Oregon's laws. No new laws are contemplated in the Oregon Plan, and there are serious limits to how much existing laws can be improved purely through rule-making. Merely enforcing bad laws will never lead to recovery. A listing, however, at least protects against additional 'take' in ways that Oregon's weak laws cannot.

A third concern is that without an ESA listing there would be abso-



lutely no prohibition against actual 'take' of these fish in large numbers. At present, since there is no ESA protection, landowners within the Oregon ESU can now destroy all the fish or fish habitat on their property with total impunity. At present, coho are not a protected species in Oregon under either state or federal law. The ESA can at least provide an important interim "safety net" to help prevent extinction while voluntary recovery efforts are being organized and given a chance to work.

Finally, a listing may be necessary to assure that federal agencies do their share to protect these fish on federal lands—or at least that they take no actions inconsistent with state recovery efforts. The Oregon Plan deals only with the roughly two-thirds of salmon habitat on state or privately owned lands. It provides no protection whatsoever for these fish on federal lands, which contain the remaining one-third of all remaining salmon habitat, including the most important refugia. Unfortunately, history provides many examples of failures by federal agencies to adequately protect salmon on public lands. Federal timber sales, for instance, are still being managed in ways that may increase downstream sediment loads and thus jeopardize lower stream restoration projects funded under the Oregon Plan. There are efforts underway to curtail such activities through ESA-based litigation for species already listed. However, without an actual listing, there are no such legal remedies. Unless federal projects are at least brought into consistency with the Oregon Plan, federal activities may work at cross purposes with the Plan itself, thus reducing its effectiveness.

The Oregon Plan is experimental, and results are certainly not guaranteed. It is a hopeful effort, however, and certainly the most ambi-

tious and comprehensive state sponsored species recovery plan to date. PCFFA and other groups have strongly supported the Oregon Plan as the basis of a real recovery plan—though not as an excuse for not listing. During the years the Plan is getting underway and proving itself on its own merits, we may need the ESA 'safety net' so that the species will at least receive some interim protection—and so crucial time will not be lost if the Plan fails.

It simply does not have to be one or the other—either ESA listing or the Oregon Plan. The Oregon Plan and a listing under the ESA are fully compatible and should be melded together to assure maximum protection. Once listed, NMFS would still have to develop a recovery plan as required by the ESA—and clearly the Oregon Plan would be the backbone of that recovery plan. In our own experience with other listings, few landowners will withdraw from the process once a listing occurs. Sometimes it is only the listing that breaks through the posturing and brings everyone to the table without preconditions.

There is plenty of room in the ESA to allow states the freedom and flexibility to develop and implement their own recovery efforts, while still using the listing to maintain minimal "take" restrictions under the ESA. What has been ignored in the debate is that we can in fact have the best of both worlds.

Unfortunately, by falling into dualistic either/or thinking and pitting ESA protection against state recovery, both state and federal agencies are missing a golden opportunity to fashion a partnership on salmon recovery that could be of great benefit to both, as well as serve as a model for ESA recovery efforts elsewhere. Oregon's own efforts should not be used as a pretext to ignore other available tools. It makes no sense to jettison the ESA 'safety net' while so many coho populations are so close to extinction—

particularly for a voluntary recovery plan that is still incomplete, experimental and unenforceable.

Ultimately, however, the Oregon Plan is going in the right direction—but not because it is being used as an excuse not to list. If all goes well, Oregon's bold efforts will result in delistings and nonlistings the way it should be done—through full recovery back to healthy populations, rather than politically expedient back room deals intended to avoid protection as long as possible. Denial never works in the end. It is time to try actual recovery.

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# Conservation Spotlight:

## Desert Fish

Mike Demlong

It is difficult to inspire people to care about fish—unless they are in sticks, steaks or fillets. The Phoenix Zoo, however, is doing just that with a comprehensive conservation and education program designed to help imperiled Arizona fish.

Within the boundaries of The Phoenix Zoo is a series of artificial lakes originally created as a bass hatchery for the Arizona Game and Fish Department. The hatchery closed in the early 1960's, but the lakes and surrounding land were leased to the new Phoenix Zoo.

In the fall of 1995, the living collections staff at the zoo proposed to convert this underutilized area into a refugium for endangered native fish. To ensure the success of this project, the zoo enlisted experts from Arizona State University (ASU), U.S. Fish and Wildlife Service (FWS), Arizona Game and Fish Department, Dexter National Fish Hatchery, Willow Beach National Fish Hatchery, American Zoo and Aquarium Association Freshwater Fish Advisory Group, Arizona Zoological Society Conservation Committee, Salt River Project, and City of Phoenix Parks, Recreation, and Library Department. Our objectives were to create a long-term refugium for endangered native fish and headstart juveniles for potential reintroduction projects. The decision to use the zoo-held fish for either reintroduction, brood stock, or as a genetic refugium will be determined by the FWS.

The FWS's biological assessment determined the 15-acre lake to be suitable habitat and offered to introduce endangered bonytail chub (*Gila elegans*) and razorback sucker (*Xyrauchen texanus*) once non-native game fish were removed. These native species were appropriate because both once thrived in the rivers that dissect Phoenix. However, numerous species, including the bonytail chub and razorback sucker, have been pushed toward extinction by dams, exotic fish, water diversion for residential and farming use, pollution from agricultural run-off, river channelization, loss of wetland nurseries, and dewatering. Approximately 40 species of North American freshwater fish have become extinct this century, and approximately 80% of fish in the arid Southwest states are imperiled.

Bonytail chub historically ranged from Wyo-

ming to Mexico, throughout the Colorado River and many of its tributaries. Today, bonytail are seldom found in the upper Colorado River and are instead restricted to two artificial lakes along the Arizona/California border. The temperature, physical and chemical composition of these lakes are very different from those in which the fish evolved. For example, the Colorado, once a warm, heavy silted, swift river, is now a cold, clear series of artificial impoundments.

Since the damming of the Colorado River in 1954, there has been no recruitment in wild populations. The few bonytail recovered are geriatric adults of 40 years of age or more. Failure of this fish species to maintain a self-supporting population in the wild is attributed to habitat alteration from dams and the introduction of exotic fish species for sport fishing. Consequently, the bonytail chub is the most endangered fish in the Colorado River Basin, perhaps in the entire United States. Fortunately, between 1979 and 1981, 18 adult bonytail were captured to establish a captive propagation population at the Dexter National Fish Hatchery. Eleven of these fish became the genetic founders of the entire captive hatchery population used for reintroduction efforts.

The second species of native fish released in the zoo refugium were razorback suckers. Like the bonytail chub, they ranged throughout the Colorado River Basin in Wyoming, Colorado, Utah, Arizona, and Mexico. In the early 1900's, the species was so abundant that it supported a commercial fishery in central Arizona, providing human food, animal food, and fertilizer. The largest population of razorback suckers (approximately 23,000) is restricted to Lake Mojave, however a smaller population of about 1,000 fish remains in the middle Green River. Unfortunately, little or no recruitment has been documented in either population.

Since non-native fish compete with native species for resources, zoo staff removed as many adult gamefish from the zoo lake as possible. With the assistance of Arizona Game and Fish Department, hundreds of largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis machrochirus*), and green sunfish (*Lepomis cyanellus*) were translocated

using fishing poles, electroshock boats, drift nets, and various other traps over a two month period. Captured fish were relocated to other lakes on the zoo grounds or to city parks within the metropolitan Phoenix area.

Once the majority of non-native fish were removed from the lake, the drain valve was opened and within seven days the lake was empty. The lake bed was allowed to dry for the entire month of June to kill any remaining fish and embryos. Small pools of water were treated with ichthyocide on three separate occasions to be sure no fish survived.

In early July, the lake was refilled with canal water from the mountain watersheds northeast of Phoenix. Ironically, the water used to fill the fish refugium was from the same watersheds that once fed the rivers the fish historically inhabited. Since canal water is also contaminated with game fish, it had to be filtered before entering the renovated lake. Zoo staff members, biologists from ASU, and engineers from Salt River Project, collaborated to design a fish excluder where canal water entered the grounds. The filter is a 12 foot long concrete trough partially filled with 3/16 inch crushed aggregate. All canal water flowing in the zoo lakes falls on top of a raised gravel bed, impeding non-native fish and ideally their larvae and eggs. Dead and live fish, crayfish, and inorganic and organic debris are removed daily from the gravel bed to improve filtration. Daily cleaning takes about five minutes and approximately every two months the gravel bed is replaced with new aggregate. Some juvenile non-native fish have reappeared in the lake. They either passed through the excluder device or were missed in the initial treatments. Fortunately, the native fish have grown large enough to avoid predation by non-natives.

The lake took two weeks to refill and was aged for several more weeks to allow reestablishment of aquatic invertebrates and phytoplankton. In August 1997, approximately 200 bonytail chub were released, followed by 5,000 razorback suckers in November. The bonytail chub originated from a captive population maintained at the Dexter National Fish Hatchery in New Mexico. The razorback suckers were wild caught as larvae at Lake Mojave, and head-started at Willow Beach National Fish Hatchery in Parker, Arizona before release in The Phoenix Zoo lake.

Fishermen, boats, and a smelly lake bed are hard things to hide at a city zoo. So instead of

hiding the activities, they were publicized. The arrival of the endangered fish was announced to the community via local television stations and major newspapers. To interpret the project to zoo visitors, The Phoenix Zoo incorporated temporary script into guided tram tours and installed temporary interpretive signs around the lake. Informal surveys of zoo visitors revealed general support for the project and associated inconveniences (e.g., no monkeys on the lake islands, the strong offensive odor, dead fish).

Eventually, temporary graphics were replaced with permanent interpretive stations around the lake's perimeter. At each station, visitors were provided with information about the endangered fish project, the animals' natural history, and reasons for their decline. Each interpretive station includes two life-size "touchable" cement sculptures of an adult razorback and bonytail chub. The three-dimensional sculptures attract visitors to the interpretive station and help them visualize an otherwise invisible animal.

Zoos and aquariums cannot provide what endangered native fish need most to survive: clean water, unaltered habitat and absence of non-native species. What we can provide are captive refugia for imperiled species, and an opportunity to motivate over 120 million people a year to minimize their impact on the aquatic natural world. The Phoenix Zoo is providing low cost, low maintenance refugia for three species of endangered native fish (the third is the desert pupfish (*Cyprinodon macularius*)). Yearly maintenance of this project costs less than the monthly food bill for one tiger! Depending on the success of this project and FWS needs, The Phoenix Zoo hopes to eventually convert three more artificial lakes on zoo grounds to endangered fish refugia. For more information on this project contact Mike Demlong, The Phoenix Zoo, 455 North Galvin Parkway, Phoenix, AZ 85008, phone (602) 273-1341, ext. 7624 or e-mail at [mdemlong@phoenix-zoo.org](mailto:mdemlong@phoenix-zoo.org).

# NEWS FROM ZOOS



Photo by Steve Reichling

## Three New Species of Tarantula Identified in Belize

Steve Reichling, Ph.D., Assistant Curator of Reptiles at the Memphis Zoo, has identified three new species of tarantulas since 1994. All three new species are found in Belize, Central America. One of the newly identified spiders (*Acanthopelma annae*) is fingernail-sized and the smallest tarantula known to exist. Even more exciting, was the identification of a "thick-shinned" spider (known as the antelope spider to locals), co-discovered and described by Reichling and Canadian arachnologist Rick C. West. This spider is so unique it has been given its own genus (*Crassicrus lamanai*). A third spider (*Crypsidromus gutzkei*), which has a red abdomen and metallic gold legs, is known by a single specimen.

## American Zoo and Aquarium Association (AZA) Offers Accreditation to Five North American Facilities

Recently, the AZA Accreditation Commission granted accreditation to five North American zoological facilities, bringing the total number of accredited members to 180. The new members include Brevard, Zoo, Melbourne, FL; Chehaw Wild Animal Park, Albany, GA; Dallas World Aquarium, Dallas, TX; The Florida Aquarium, Tampa, FL; and the Rainforest at Moody Gardens, Galveston, TX. For a zoo or aquarium to become an AZA member, they must undergo an extensive peer review which includes an initial application and a two day on-site visit by a team of zoo and aquarium professionals. The visiting team observes all aspects of the facility operation including keeper training, safety procedures for both animals and humans, education programs, veterinary programs, and a financial review. The team prepares a report, which is reviewed by the Accreditation Commission. After top officials are interviewed by the Commission, a vote is taken and accreditation is either granted or denied. Any facility that is denied may re-apply at a later date after the concerns of the Commission have been addressed.

## Philippine Crocodiles Arrive at Fort Worth Zoo

Fort Worth Zoo recently received a pair of Philippine crocodiles (*Crocodylus mindorensis*) from the Gladys Porter Zoo in Brownsville, Texas. Philippine crocodiles are the rarest and most endangered of all crocodylians. Once found on at least eight islands in the Philippine Archipelago, over-hunting and habitat loss has confined them to small isolated pockets with approximately 100 remaining in swampy sections of a few islands. This has led the IUCN to rank their status in the wild as "critical." The AZA Crocodylian Advisory Group has designated the Philippine crocodile as their highest priority and recommended a Species Survival Plan© if new blood lines can be obtained. Currently, a working relationship between the IUCN/SSC Crocodile Specialist Group, the AZA Crocodylian Advisory Group, CFI personnel and the Philippine Department of Environment and Natural Resources is being developed, and it is hoped that new crocodiles will soon be added to the breeding population in the United States.



Photo by Brad Doherty

# Bulletin Board

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## Third International Conference on Environmental Enrichment

Sea World is hosting the Third International Conference on Environmental Enrichment which will be held October 12 - 16, 1997 at the Clarion Plaza Hotel in Orlando, Florida. To obtain additional information, contact Thad Lacinak at (407) 363-2651 or (407) 345-5397 (fax).

## USFWS Home Page

The U.S. Fish and Wildlife Service now has a new International Affairs Home Page where you can find updated information on CITES, including CITES resolutions, information on permits, fact sheets, etc. It can be found at <http://www.fws.gov>.

## Green Volunteers Guide

The 1997 edition of the *Green Volunteers Guide* has just been published. It includes more than 100 projects and organizations worldwide, where enthusiasts can volunteer from one week to one year, to study or care for a whole range of

species in a variety of habitats. A wide choice of no-cost projects and research opportunities for students is also listed.

The directory can be ordered for \$US 16, plus postage, through E-mail at: [green\\_volunteers@rcm.inet.it](mailto:green_volunteers@rcm.inet.it).

## Plant Population Genetics Symposium

The 1997 Janet Meakin Poor Research Symposium titled "Plant Population Genetics: Bridging the Gap Between Research and Stewardship" will be held October 30, 1997 at the Chicago Botanic Garden in Glencoe, IL.

The symposium is intended to provide an overview of current research in the field of plant population genetics including inbreeding and outbreeding depression, relationship between reproductive biology and population genetics, and techniques for measuring genetic diversity. The symposium will also focus on the role of genetics in restoration projects and rare plant recovery as well as other connections between research and stewardship in the field of population genetics.

The fee to attend the conference is \$69 for Garden members and \$86 for nonmembers. For further information

or to register by phone with credit card, please call the Education Registrar at (847) 835-8261.

## Human Conservation Behavior

The Biodiversity Support Program, a U.S.A.I.D.-funded consortium of World Wildlife Fund, The Nature Conservancy, and World Resources Institute, announces its new publication, *Understanding and Influencing Behaviors in Conservation and Natural Resources Management*, by Dr. Bruce Byers. This reports the findings and conclusions of a four-year study on approaches and methods for understanding and influencing human behavior in conservation and natural resource management.

For orders, or more information, contact BSP Africa Program, World Wildlife Fund, 1250 24th Street, N.W., Washington, DC 20037; Tel.: (202) 778-9795; Fax: (202) 861-8324; E-mail: [rosemarie.gay@wwfus.org](mailto:rosemarie.gay@wwfus.org).

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*Announcements for the Bulletin Board are welcomed. Some items from the Bulletin Board have been provided by Jane Villa-Lobos, Smithsonian Institution.*

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# Endangered Species UPDATE

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