TESTIMONY

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GREETINGS AND SALUTATIONS

Mr. Chairman, Members of the Committee. I am honored to have this opportunity to appear before you to speak on the issue of the role of science in the implementation of the Endangered Species Act (ESA).

My name is Ray Dueser. I am a Professor of Fisheries and Wildlife and Associate Dean of the College of Natural Resources at Utah State University. I am proud to reside in the 1st Congressional District of Utah. I am affiliated with a number of professional societies and organizations which have publically-stated interests in the re-authorization of the ESA, and I have worked been engaged in endangered species research and recovery since 1984. I have worked with the U.S. Fish and Wildlife Service, several State agencies and a host of private conservation organizations on issues related to the ESA. I have been especially deeply involved with the recovery of the endangered Delmarva fox squirrel (*Sciurus niger cinereus*) on the beautiful Eastern Shore of Maryland. Nevertheless, I am here today simply as an informed citizen, invited by a member of the Committee, and not as a representative of the organizations with which I am affiliated. Any reference to positions these organizations may espouse relative to the ESA are based on my knowledge as a reader of the scientific literature.

THE ENDANGERED SPECIES ACT OF 1973

The ESA of 1973 is widely regarded as a landmark piece of legislation. The purposes of this Act 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 treaties and conventions set forth [elsewhere in this Act]" (16 U.S.C. 1531 et seq.).

These few words effectively changed how America manages and conserves its rich natural heritage of animals, plants and ecosystems.

To accomplish these far-reaching objectives, the Act provides a process for determining whether a species is at risk of extinction, removing the "threats" that endanger the species, and restoring the species to a viable condition. The essential steps in this process include: (1) identifying and listing "threatened" and "endangered" species of animals and plants on the basis of their risk of extinction, (2) designating the "critical" habitat required for the survival of the species, (3) providing immediate protection against acts that would further jeopardize the species, (4) developing and implementing a plan for the recovery of the species to a viable condition, and ultimately (5) "delisting" the species when the threat of extinction has been reduced (Carroll 1996). The strict provisions of the Act vest substantial regulatory and enforcement powers with the Fish and Wildlife Service (FWS) of the U.S. Department of the Interior (for terrestrial and freshwater species) and the National Marine Fisheries Service (NMFS) of the U.S. Department of Commerce (for marine and anadromous species).

In formulating this Act, Congress required that all decisions made under the ESA be based "... *solely on the basis of the best scientific and commercial data available* ..." [Section 4. (b), emphasis mine]. Science and scientific data have thus served to inform ESA decision-making from the very beginning. This strong reliance on scientific data is meant to ensure the factual basis, objectivity and reliability of decisions regarding the status of species, their critical habitats and their risk of extinction.

THE SCIENTIFIC UNDERPINNINGS OF THE ESA

The first wide-ranging review of the scientific principles underlying the ESA was motivated by a 1992 letter from the leaders of Congress to the Chairman of the National Research Council (NRC). The Congress requested that the NRC convene a "Committee on Scientific Issues in the Endangered Species Act" to study several scientific matters related to the ESA (NRC 1995). The distinguished membership of this Committee represented expertise in ecology, systematics, population genetics, wildlife management, risk and decision analysis, ESA legal and legislative history, economics, and the implementation of the ESA from both public and private perspectives. The Committee was asked to review a host of thorny scientific issues and how they relate to the ESA. These issues included the species concept, conservation conflicts between species, the role of habitat conservation, recovery planning, risk analysis and decision-

making under uncertainty, and issues of timing in the ESA decision-making process.

The overall conclusion of this wide-ranging review was that "... the ESA is based on sound scientific principles" (NRC 19995:4). Indeed, this review stands today as one of the clearest summaries of the scientific underpinnings of the ESA.

THE ROLE OF SCIENCE IN ESA IMPLEMENTATION:

A SELF-CONSCIOUS REVIEW

The ESA has emerged over the past quarter century as a public policy lightening rod. This act provides a "voice" for the animals, plants and ecosystems of America, and for those citizens who value natural diversity as a core element of the American heritage. In doing so, however, it frequently creates conflict over the enforcement of the public's will in a society founded on the core concept of individual rights. This is particularly true when conflicting demands are made on a shared public resource such as water or timber and when the public's interest in the survival of a species somehow constrains the use of a privately-owned resource such as land.

Despite the intended reliance of the ESA on a strong foundation of science, there has emerged on multiple fronts over the past several years the realization that the scientific base for ESA implementation should be both broader and deeper. For example, many of the professional and scientific societies whose members are involved with endangered species research and recovery have taken a self-conscious approach to assessing and enhancing the value of their science to recovery planning and implementation. Similarly, the academic and research community recently has undertaken several large-scale, scholarly reviews designed to identify both the realized and potential contributions of ecological science to endangered species recovery.

The Ecological Society of America in 1992 established an ad hoc Committee on Endangered Species to "... undertake an analysis of how scientific information could be used more effectively to assist in the preservation of the Nation's biological resources" (Carroll et al. 1996:2). The Committee found that ecological science might be used more effectively in the listing process, the establishment of recovery priorities, and the delisting process. Among the Committee's suggestions were three based directly on advances in ecological science that post-dated the passage of the ESA in 1973:

- Revise the scientific guidelines for setting priorities in the listing process to include (A) the "inclusive benefits" afforded by the protection of a species, (B) the ecological role played by a species in a community, (C) the "recovery potential" of a species, and (D) taxonomic distinctness.

- Expand the use of "population viability analysis" to (A) examine the prospects for a species' recovery in a variety of biological-environmental contexts, (B) identify alternative ways to recover and sustain a species, perhaps at different economic and/or social costs, and (C) improve the odds of success for recovery plans.

- Increase the likelihood of successful recovery by (A) spreading the risk and (B) planning and acting expeditiously.

Carroll et al. (1996) were generally encouraged by the obvious influence of ecological science on the implementation of the ESA up to that time, and were optimistic about the potential contributions yet to be made.

The academic and research community recently focused close scrutiny on the Habitat Conservation Plan (HCP) concept within the ESA. Introduced through amendment of the ESA in 1982, the HCP is essentially a land use plan that allows a non-federal landowner to obtain an "incidental take permit" for a listed species in exchange for making conservation commitments on that land. The HCP is intended to minimize and mitigate the taking. This take permit authorizes a landowner to carry out specified development activities on the land, even if those activities alter protected habitat or otherwise harm ("take") threatened or endangered species. The HCP concept was developed as a means of reducing the level of tension between the FWS and private-sector landowners. Given the rapid proliferation in both the number of approved HCPs and the cumulative acreage represented by these agreements, questions arose in the mid-1990s about both the scientific basis of HCPs and the effectiveness of the HCP as a recovery and conservation tool (James 1999).

The American Institute of Biological Sciences (AIBS) and the National Center for Ecological Analysis and Synthesis (NCEAS) recently collaborated on a critical review of 208 HCPs written and approved in compliance with the ESA. A more detailed analysis was applied to a representative subset of 43 HCPs. This review was undertaken, among other reasons, to "... identify ecological theory and methods that can be applied to strengthen the design, management and monitoring of HCP areas" (Kareiva 1997). The final

report was posted on the NCEAS Web site in January 1999 (Kareiva et al. 1999). The major finding was that many of the HCPs recommended conservation actions that were not supported by the "best available data." While using the "best available data" may have justified an HCP legally (and politically), that data still may not have been sufficient to support the approved management actions. Sufficient supporting data simply did not exist in many cases. Insufficiency took a variety of forms, including the lack of information about current status and population trends, the absence of quantitative estimates of the proposed "take" of the species or its habitat, and the lack of information about the likely efficacy of proposed mitigation strategies.

Given this finding, Kareiva et al. (1999) made a host of recommendations for improving the HCP agreement process, including:

- Important data gaps should be acknowledged explicitly in the HCP. The uncertainty resulting from these gaps may, in some cases, be offset by more stringent mitigation requirements.
- Management and monitoring should be viewed as an exercise in "adaptive management" (Walters 1986), in which management and monitoring are designed to provide feedback (and possible corrective insights) into future management decisions.

- Proposed HCPs should be reviewed by independent, qualified advisory panels.

Amendments that were made to the FWS habitat conservation planning handbook in the months after release of Kareiva et al. (1999) incorporated many of these recommendations, and thereby significantly improved the HCP process.

The ESA stipulates the development of a recovery plan for most threatened and endangered species. This plan then guides decision-making related to the recovery program and directs the actions of managers in the implementation of the program. Through a collaborative effort supported by the Society for Conservation Biology, the FWS and NCEAS, Boersma et al. (2001) undertook an extensive systematic review of a random subset of recovery plans for the 931 listed species for which the FWS was responsible in 1998. This large sample, representing nearly 20% of the listed species for which a recovery plan had been approved at that time, included 85 plant and 96 animal species; 100 single-species, 29 multiple-species, and 6 ecosystem recovery plans; and 68 species plans which had been revised at the time of the review and 113 plans which had not been revised. Boersma and a team of 325 researchers drawn from the ranks of faculty, post-docs and graduate students at 19 universities exhaustively reviewed the selected plans for a long list of attributes such as plan length, length of time between listing and plan completion, number and composition of individuals on the recovery team, and number of species included in the plan. They also scored each plan for scientific content based on factors such as the amount of biological and natural history information available for the species, prescribed management actions, monitoring protocols, and recovery criteria.

Boersma et al. (1999) used the FWS "trend" category for each species as an index of recovery plan effectiveness. Each species was classified as improving, stable, declining, extinct or unknown. These data were then used to test four principal hypotheses:

- Revised plans would be more effective than unrevised plans.

- Plans developed by a diverse group of authors would be more effective than those written only by federal agency employees.

- Plans in which recovery criteria were explicitly linked to a species biology would be more effective than those lacking such links.

- Multi-species plans would be more effective than single-species plans, because they incorporate a broad view of threats and tend to be more integrative.

Analysis of this massive and complex data set yielded several general results and more than a few surprises:

- Recovery plans tend not to improve in effectiveness with revision.

- Participation of non-federal team members in plan development seems to have a positive influence on plan effectiveness.

- The value of linking recovery goals to species biology is less clear-cut than expected, but nonetheless important for effective recovery planning.

- Multi-species plans tend to be less effective than single-species plans.

- Management tends not to be monitored sufficiently to determine whether it is working, effectively precluding the use of adaptive management as a recovery protocol.

- Recovery plans typically take too long to write, delaying the implementation of management.

- Plan length is not a good predictor of plan effectiveness.

Overall, the results reported by Boersma et al. (2001) tended to be more ambiguous than was anticipated. They nevertheless confirmed the value of using sufficient, defensible data in recovery planning, implementation and monitoring. The authors concluded with a call for increased reliance on adaptive management in the revision of recovery plans, the inclusion of diverse perspectives and viewpoints in the recovery planning process, close linkage between species biology and recovery goals, and close monitoring of multi-species recovery plans. They repeatedly call for the incorporation of more, better and relevant science in recovery planning.

An even more extensive analysis and synthesis of this data set has been completed by Hoekstra et al. (In press), and will be published in June 2002, as an issue of the journal *Ecological Applications*. I have seen the abstracts, but not the manuscripts for this set of papers. Review of even the abstracts confirms the creative commitment of the academic and research community to expand the role of sound - i.e., reliable, relevant and sufficient - science in conservation management. Publication of this volume no doubt will represent an historic benchmark in the evolution of ecological science as a self-conscious servant of public policy.

WHEN SCIENTIFIC WORLDS COLLIDE:

A TRAGIC CASE STUDY

The recent experience of the resource managers and citizens of the Klamath River Basin (KBR) of southern Oregon illustrates what can happen when scientific worlds collide. The water resources of the Basin are managed by the U.S. Bureau of Reclamation (BOR), while the threatened and endangered fish of the Basin

are managed (protected) by the FWS (shortnose sucker and Lost River sucker) and the NMFS (Southern Oregon/Northern California Coasts coho salmon), under the "best science available" administrative and regulatory requirements of the ESA. A sequence of decision-making occurred within and among these agencies in 2001 that ultimately precipitated both a management tragedy in the form of shaken public confidence and a human tragedy in the form of economically and socially stressed communities. Without wishing to offend by brevity, I will attempt to summarize the essential facts (as I have received them) in a few sentences.

In January 2001, the BOR issued a biological assessment that operation of the Klamath Basin (Water) Project would be harmful to the welfare of the threatened coho salmon without specific constraints on stream flows in the Klamath River. The BOR

then proposed relatively low monthly minimum flows for 2001. In April 2001, the NMFS issued a biological opinion that operation of the Klamath Project as proposed by the BOR would place the coho salmon in jeopardy. The NMFS then formulated a reasonable and prudent alternative (RPA) incorporating, among other things, monthly minimum flows in the Klamath River higher than those proposed by the BOR.

Similarly, in February 2001, the BOR issued a biological assessment that operation of the Klamath Project would be harmful to the welfare of the endangered suckers without specific constraints on water level in the Klamath lakes. The BOR proposed to operate the lakes at very low monthly elevations. In April 2001, the FWS issued a biological opinion that operation of the Project as proposed by the BOR would place the coho salmon in jeopardy. The FWS then formulated an RPA incorporating, among other things, monthly lake levels higher than those proposed by the BOR.

In meeting its statutory responsibilities to provide water to its users, the BOR proposed to operate with low lake levels, low flows and significant irrigation diversions. In meeting their own statutory responsibilites to enforce the ESA in the protection of threatened and endangered fish, the FWS and NMFS proposed to operate with high lake levels, high flows and reduced diversions. The FWS and NMFS biological opinions and RPAs prevailed, and water management in the Basin was changed for 2001. No irrigation water was provided to farmers for the 2001 growing season. To further complicate matters, 2001 was a year of historic drought in the Basin.

Recognizing the benefits of stringent peer review of scientific and technical judgements, the Departments of the Interior and Commerce jointly requested an NRC review of "... the scientific basis for the biological opinions that resulted in changes of water management for year 2001" (NRC 2002:xi). The NRC recently issued an interim report on the matter in which it found, among other things, that:

"... all components of the biological opinion issued by the USFWS on the endangered suckers have substantial scientific support *except for the recommendations concerning* (higher) *minimum water levels for Upper Klamath Lake* (emphasis mine)" (NRC 2002:2).

"... there (also) is no scientific basis for operating the lake at mean minimum levels below the recent historical ones (1990-2000), as would be allowed under the USBR proposal (NRC 2002:3).

"... (there is no) clear scientific or technical support for increased minimum flows in the Klamath River main stem" (NRC 2002:3).

"... reduction in main-stem flows, as might occur if the USBR proposal were implemented, cannot be

justified" (NRC 2002:3).

The interim NRC report thus concluded that there was no substantial scientific basis for either maintaining higher lake levels for the endangered suckers or maintaining higher minimum river flows for the threatened coho. The report also concluded that there was no substantial scientific basis for the USBR proposals to maintain both lower lake levels and lower river flows. With respect to minimum lake levels and minimum river flows, both sides in the dispute were operating without strong scientific support. Important elements of the RPAs stipulated by the FWS (high lake levels) and the NMFS (high river flows) were without sufficient scientific support. In reality, the position of the BOR (low lake levels and low river flows) also were without sufficient scientific support - but the FWS and NMFS RPAs had priority.

The outcome for the Klamath Basin was an economic nightmare. But from the perspectives of the agency parties involved, each was trying to meet its mandate: more water for people (BOR), more water for lake fish (FWS), and more water for river fish (NMFS). Each of these agencies behaved in a risk-averse manner from its own perspective, seeking to maximize the gain (and minimize the risk) for its constituents. BOR wanted to ensure plenty of water for irrigators - so it proposed to maintain uncommonly low lake levels and river flows. FWS wanted to ensure plenty of water for its lake fish - so it proposed to maintain unusually high lake levels. NMFS wanted to provide plenty of water for its river fish - so it proposed to maintain unusually high stream flows. And all of this occurred in a year of abnormally low water availability!

Final resolution of this controversy awaits further review by the NRC committee. Nevertheless, this incident already has precipitated intense public scrutiny of the reliance on "the best science available" in the implementation of the ESA, including the listing, recovery and downlisting sections of the law. Others on this panel are more qualified than I to comment on the details of the biological assessments, biological opinions and NAS review involved in this particular case. The recent release of the Final Biological Assessment by the BOR (USBR 2002) strongly suggests that constructive steps are being taken to formulate - based on the best science available - a more balanced approach to resource management in the Klamath Basin.

CONGRESS' OWN SEARCH FOR SOUND SCIENCE

In the meantime, there is substantial interest in this case even within this Committee. The letter inviting me to testify indicated that the hearing would concern two proposed amendments to the ESA - H.R. 2829 introduced by Mr. Walden of Oregon and H.R. 3705 introduced by Mr. Pombo of California - which are intended to enhance the role of scientifically credible data, independent peer-review and public involvement in the implementation of the ESA. I have neither legislative experience nor legal training. There undoubtedly are fine points and nuances in the subject bills that elude me. With this caveat, I have nevertheless tried to review these bills from the perspective of a working scientist with some ESA experience. As I read it, H.R. 2829 would:

- require the Secretary of the Interior, when evaluating otherwise comparable data, to "... give greater weight to scientific or commercial data that is empirical or has been field tested or peer-reviewed,"

- require the Secretary to establish (written) criteria for the admissibility of scientific and commercial data to be used in a listing determination,

- require the submission of "... data obtained by observation of the (candidate) species in the field ..." prior to a status determination,

- mandate both the "acceptance" of landowner-provided data on the status of a species and the inclusion of this data in the record for any status determination,
- require the Secretary to publish "... a description of additional scientific and commercial data that would assist in the preparation of a recovery plan,"
- require the Secretary to solicit the submission of such data by any interested party, and describe any plans "... for acquiring additional data,"
- require the independent, scientific review of any proposed listing, delisting, recovery plan, jeopardy opinion or RPA decisions rendered by the Secretary,
- require the evaluation and consideration of any such independent, scientific reviews in a final determination
- require the Secretary to actively solicit and consider information provided by States in any Section 7 consultation, and
- ensure the right of "... any person who has sought authorization or funding from a Federal agency for an action that is the subject of the consultation" to be fully informed about (and throughout) the process.

Similarly, as I read H.R. 3705, it would:

- mandate the basic types of scientific information to be included in a petition,
- require that the Secretary acknowledge receipt of such a petition, and provide public notice of the petition to each landowner possibly affected by the petition and to the Governor of each State possibly affected by the petition,
- require the independent, scientific review of petitions and findings regarding petitions, including review of "... the sufficiency of all relevant scientific information and assumptions in the petition relating to the taxonomy, population models, and supportive biological and ecological information ..."
- require the independent, scientific review of "Whether the methodology and analysis supporting (a) petition meet the standards of the academic and scientific community" and "Whether the petition is supported by clear and convincing evidence ... that the petitioned action may be warranted,"
- require the appointment and convening of a review board to conduct an independent, scientific review of any finding issued by the Secretary,
- require full public disclosure of the findings of the independent review board, any points of disagreement between the Secretary and the board, and the basis for resolution on any such disagreement,

- require an independent review of jeopardy opinions issued by the Secretary, and

- stipulate that any species for which a petition (for listing or delisting) has been declined "... may not be considered (again) by the Secretary for one year."

Both of these bills emphasize increased use of "good" (i.e., relevant and reliable) and sufficient science in ESA decision-making, enlarge the role of peer review in the evaluation of ESA decisions, increase the amount of public disclosure about the decision-making process, and increase Federal-State consultation. Both would provide for greater scientific and public scrutiny of the ESA process, and both would appear to set a demanding performance standard for the Secretary of the Interior. Each of these changes has the potential to improve the operation of the ESA in significant ways.

On the other hand, these improvements would come at some real cost of bureaucracy, time delays and expense. Given the volume of review and comment already required for ESA implementation each year, and the apparently significant expansion of review called for in these bills, the expense of administering the ESA is likely to go up dramatically. Furthermore, the plan to compensate decision reviewers with cash payments would produce another substantial new expense. Without an accompanying increase in budgets, these requirements will reduce the amount of funding available for actually implementing recovery. These bills have the potential to harm recovery programming in the absence of new funding.

Furthermore, as I understand them, each bill prompts several specific questions and comments. For example, would the requirement in H.R. 2829 that the determination of threatened or endangered status be "... supported by data obtained by observation of the species in the field " preclude the reintroduction of an extirpated species that might not have been seen in a region for 50 years or more? Also, what are the implications of the proposed requirement that landowner-provided data about the status of a species on the land be included in the rule-making process? Not all "data" represents information. The information content of "data" often is determined significantly by the sampling protocol and procedure(s) by which the "data" was obtained in the first place. Also, is the call in both bills for increased reliance on the use of "empirical data" a procedure for minimizing the role of analytical and simulation models in the decision process? (Often, such models are the only way to integrate complex data into a simplified but realistic description of overall system behavior.) Finally, in H. R. 3705, the disqualification for service on review boards of anyone "who is, or has been, employed by or under contract to the Secretary or the State in which is located the (subject) species" would have the effect in most cases of eliminating any and all otherwise "qualified" individuals.

It is gratifying to see the members of the Congress and the members of the academic and research community both so deeply engaged in the search for ways to make to science - meaning scientific data, scientific principals and scientific reasoning - increasingly relevant to the administration and implementation of the Endangered Species Act. The ESA merits no less than our combined best efforts. Thank you for your consideration.

PARTIAL LIST OF REFERENCES

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