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The Endangered Species Act and "Sound Science"

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Summary

The adequacy of the science supporting implementation of the Endangered Species Act (ESA) has received considerable congressional attention over the years. While many scientific decisions pass unremarked, some critics accuse agencies responsible for implementing the ESA of using "junk science," and others counter that decisions that should rest on science are instead being dictated by political concerns.

Under the ESA, certain species of plants and animals (both vertebrate and invertebrate) are listed as either *endangered* or *threatened* according to assessments of the risk of their extinction. Once a species is listed, powerful legal tools are available to protect the species and its habitat. Efforts to list, protect, and recover threatened or endangered species under the ESA can be controversial. Some of this controversy stems from the substantive provisions of this law, which can affect the use of both federal and nonfederal lands. The scientific underpinnings of decisions under the ESA are especially important, given their importance for species and their possible impacts on land use and development.

The Fish and Wildlife Service in the Department of the Interior and the National Marine Fisheries Service in the Department of Commerce administer the ESA, and each agency has policies and requirements to ensure the integrity and objectivity of the science that underlies ESA decisions. The Information Quality Act (P.L. 106-554, IQA or Data Quality Act) also imposes general requirements and has resulted in agency changes to carry out the goals of that act to maximize the quality, objectivity, utility, and integrity of information disseminated by the agencies.

In several situations, economic and social disputes have resulted from actions taken to list, protect, and recover species under the ESA. Critics in some of these disputes assert that the science supporting ESA actions is insufficiently rigorous. Others assert that in some instances decisions were political rather than scientific. Controversy has arisen over what might be the essential elements of "sound science" in the ESA process and whether the ESA might benefit from clarification of how science is to be used in its implementation. The courts have had occasion to review the use of science by the agencies, which generally must show their decisions were not arbitrary and that they rest on credible science. For some purposes, if that science is the best available, even if it is considered imperfect or incomplete, it still may be used.

Several bills affecting science as used in the ESA were introduced in recent Congresses, but to date none have been enacted. Legislative activity in the 112th Congress is summarized in CRS Report R41608, *The Endangered Species Act (ESA) in the 112th Congress: Conflicting Values and Difficult Choices*, by Eugene H. Buck et al. No bills concerning ESA and science have yet been introduced in the 113th Congress.

This report provides a context for evaluating legislative proposals through examples of how science has been used in selected cases, a discussion of the nature and role of science in general, and its role in the ESA process in particular, together with general and agency information quality requirements and policies, and a review of how the courts have viewed agency use of science.

Contents

Introduction 1
Questioning the Adequacy of Science in ESA Actions 2
Canada Lynx Survey 2
Hatchery Salmon 4
Steller Sea Lions 5
Gray Wolves in Eastern States 6
Climate Change and Sound Science 7
General Political Influence Charges 8
Science: The Interaction with Policy 9
What Is Science? 9
Scientific Method 10
Other Scientific Values: Transparency and Updating 11
Science and Policy 12
Scientific Integrity: Who Will Guard the Guardians? 14
The Information Quality Act 14
Agency Regulatory Requirements and Policies 15
Scientific Integrity Policy at FWS 17
Provisions of the Policy 17
Investigating Allegations of Misconduct 18
Scientific Integrity Policy at NMFS 19
Provisions of the Policy 19
Investigating Allegations of Misconduct 19
Practical Problems in Applying Science 20
Science in ESA Implementation 20
Issues and Background 20
Precautionary Principle: The Two-Edged Sword? 21
ESA Provisions on Science 22
Judicial Interpretation of the Use of Science Under the ESA 24
Congressional Action 26
Conclusion 28

Contacts

Author Information 28
Acknowledgments 28

Introduction

Many situations have focused congressional attention on the adequacy of the science[1] supporting implementation of the Endangered Species Act (ESA).[2] While most science-based actions under ESA are unchallenged, opponents of some actions under ESA accuse agencies of using "junk science," while others assert that decisions that should rest on science are instead being dictated by political concerns. Legislation to address the use of science in implementing ESA has been introduced in each Congress since the 107th Congress, but no measures have been enacted.

The ESA was enacted to identify species at risk of extinction, to provide means to help such species recover,[3] and to protect the ecosystems of which declining species are a part.[4] Listings and other actions under the ESA may affect land uses and development. Endangered species are likely to reflect stressed resources or ecosystems, with various interests on all sides of the resource issues. There are multiple examples, such as protecting salmon in the Klamath River Basin or northern spotted owl habitat in the Pacific Northwest, where economic and social disputes have resulted from actions taken to list, protect, and recover species under the ESA. As a result, the protective posture of the ESA[5] and the use of science in its implementation have received renewed attention. By law, ESA decisions must be based on the best science available, but this requirement can mean different things to different people.

The agencies that administer the ESA, the Fish and Wildlife Service (FWS) in the Department of the Interior, and the National Marine Fisheries Service (NMFS)[6] in the Department of Commerce, have procedures and policies in place to ensure the objectivity and integrity of the science that underpins agency decisions. In addition, the Information Quality Act (IQA) resulted in guidelines from the Office of Management and Budget (OMB) in 2001 that also relate to the quality of agency information. The agencies have responded to the IQA with additional ESA-related guidelines, and FWS, like the rest of the Department of the Interior, has adopted a new Scientific Integrity Policy.

At issue has been how science is used in the ESA processes for listing species, consulting on federal actions, designating critical habitat, and developing recovery plans. For example, oversight hearings have focused on whether more scientific rigor is necessary in implementing the ESA.[7] A later hearing concerned DOI efforts to avoid more instances of documented modification of scientific conclusions through political manipulations by senior officials.[8]

Beginning with the 107th Congress, bills have been introduced to require empirical or field-tested data as well as independent scientific reviews, science review boards, and increased public

[1] In the context of this report, "science" refers to the physical and life sciences, not the social sciences (e.g., economics).

[2] P.L. 93-205 (as amended), 87 Stat. 884; 16 U.S.C. §§1531, et seq. For general background on the ESA, see CRS Report RL31654, *The Endangered Species Act: A Primer*, by M. Lynne Corn and Kristina Alexander.

[3] Section 3(3), 16 U.S.C. §1532.

[4] Section 2(b), 16 U.S.C. §1531(b).

[5] See Tennessee Valley Authority v. Hill, 437 U.S. 153 (1978), which discusses the history and importance of species protection under the ESA.

[6] NMFS is also referred to as "NOAA Fisheries."

[7] U.S. Congress, House Natural Resources, *Endangered Species Act Implementation: Science or Politics*, Oversight Hearing, 110th Cong., 1st sess., May 9, 2007, H. Hrg. 110-24 (Washington: GPO, 2007).

[8] U.S. Congress, House Committee on Natural Resources, Subcommittee on National Parks, Forests and Public Lands, *The Danger of Deception: Do Endangered Species Have a Chance?*, Oversight Hearing, 110th Cong., 2nd sess., May 21, 2008, H.Hrg. 110—72.

involvement. Questions have also been raised on how to handle situations when the *available* science is not extensive. Some suggest that considerations other than species conservation should prevail; others seek to change the current posture of the law by changing the role of science. For still others, efforts to amend the ESA in these areas are seen as an attempt to undermine the ESA, which they assert struck a reasonable balance on these issues, and they question whether an amendment concerning science is advisable or practical. These considerations are complicated by the costs and time required to acquire more extensive data, particularly in connection with many lesser-known species. Many rare and endangered species are little studied because they are hard to find or because it is difficult to locate enough of them to support scientific research. In addition, restrictions on activities that might affect listed species could discourage some research.

This report approaches the issues surrounding "sound science" by discussing (1) controversies over the last decade; (2) the role of science in general—what science is, and what it can and cannot do—as background for assessing the adequacy of science in ESA implementation; (3) the role of science in the legal and policy ESA context; (4) current requirements on the quality and use of information and science by FWS and NMFS; and (5) legislation to address concerns relating to ESA science.

Questioning the Adequacy of Science in ESA Actions

Several situations have focused congressional attention on concerns about the adequacy of ESA science. Examples illustrating a range of different types of scientific concerns include (1) allegations of sample tampering in population surveys for Canada lynx; (2) concerns over how to treat surplus hatchery-propagated salmon; (3) Steller sea lion protection and its conflicts with North Pacific fishery management; and (4) eastern gray wolves.

Canada Lynx Survey

Before the Canada lynx (*Lynx canadensis*) was listed in 2000,[9] a federal interagency group began a three-year nationwide survey of habitat in 1999 to detect the presence or absence of Canada lynx, a species then under consideration for ESA listing. This survey annually covered more than 60 sampling areas in several states. Hair samples were collected and analyzed for DNA characteristics to identify the species that left hair samples on rubbing posts. A positive result (i.e., a "hit") of a lynx hair sample in an area already known to be occupied lynx habitat was used to help calibrate survey effectiveness. If a hit came from habitat where lynx occupancy was unknown, tracking surveys in snow and other investigations were conducted to verify the hit. These tracking surveys and associated investigations were intended to help determine the extent and significance of lynx occurrence in the area. A conclusion that wild, resident lynx were present was not automatically made from survey hit information, since the hit could also be from feral lynx (e.g., an escapee from a lynx fur farm), pet lynx, or wild but transient lynx.

Controversy arose from media reports of possible irregularities with the collection and testing of lynx survey samples. Several federal and state researchers had submitted hair samples for testing which had not been collected naturally from the wild, to test the capability of the testing

[9] 65 *Federal Register* 16051-16086 (March 24, 2000) listed the species as threatened across the northern tier of 11 states from Washington to Maine, plus Utah and Colorado. The species was not listed at the time in New Mexico.

procedures.[10] These submissions were not in the planned protocol for the studies. Some individuals feared that unplanned test samples might be used to extend the known range of ESA-protected lynx and impose additional restrictions on land owners. Concerns were also raised that media coverage may have sensationalized the situation beyond its facts.[11] No new habitat was added to the lynx's known range as a result of the irregular samples.

Another issue regarding listing of lynx illustrates the difficulty of studying and listing rare or elusive species whose ranges and behaviors are not well understood. With the original listing, no lynx in New Mexico were covered, because FWS did not include states where the population was thought to be transient, or not viable due to an inadequate prey base—in the New Mexico case, too few snowshoe hares. However, further research showed that perhaps lynx were more abundant there than previously thought. On August 8, 2007, Forest Guardians, Sinapu, Center for Native Ecosystems, Animal Protection Institute, Animal Protection of New Mexico, Carson Forest Watch, and Sierra Club, Rio Grande Chapter, petitioned to have the listing changed to include portions of northern New Mexico. One major issue in the boundary change debate was whether any lynx found in northern New Mexico were simply young, dispersing animals that would eventually die out after being unable to find adequate resources or whether these young animals represented a significant part of the population. Eventually, FWS concluded that this portion of the species' range warranted inclusion in the listing, but that the change was precluded by other higher priorities.[12] It assigned the listing decision a priority of 12, the least urgent possible level.

Designation of critical habitat for this species has also been controversial on scientific grounds. Defenders of Wildlife sued FWS to force designation of critical habitat. The U.S. District Court for the District of Columbia instructed FWS to propose critical habitat by November 1, 2005, and to issue a final rule for critical habitat by November 1, 2006.[13] On November 9, 2006, FWS designated approximately 1,841 square miles of critical habitat in three states: Minnesota (Koochiching and St. Louis counties), Montana (Flathead and Glacier counties), and Washington (Chelan county).[14] Because boundaries within the chosen states were primarily national parks or other protected areas, and because other states with lynx habitats were omitted, some environmental and scientific groups charged that even these boundaries were inadequate, and another suit was filed to expand designated critical habitat. Among other things, these groups argued that the designation was inadequate on various scientific grounds.[15] On February 25, 2009, FWS determined that the critical habitat should be expanded to approximately 39,000 square miles in portions of Maine, Minnesota, western Montana, northeastern Idaho, north-central

[10] Testing blind reference samples is typically an important element in scientific analysis control, but submitting the unplanned samples for testing was not part of a written protocol agreement with the testing laboratory. A lack of intent to defraud may be indicated by reports that the biologists told others what they were doing, recorded the samples as being blind checks in their sample logs, and supplied sample numbers to the testing facility that were not part of the study's coordinate system.

[11] Ted Williams, "Lynx, Lies, and Media Hype," *Audubon Magazine* (May-June 2002): 24-33. For details, see GAO Report GAO-02-496T, *Canada Lynx Survey: Unauthorized Hair Samples Submitted for Analysis*. The three-page GAO report concluded that samples were submitted outside the study's protocol, without drawing inferences about fraud or deception.

[12] 74 *Federal Register* 66938-66950.

[13] 70 *Federal Register* 68294-68328.

[14] 71 *Federal Register* 66007-66061.

[15] For example, see comments by Defenders of Wildlife, available at http://www.defenders.org/resources/publications/programs_and_policy/wildlife_conservation/imperiled_species/lynx/lynx_critical_habitat_comments.pdf.

Washington, and northwestern Wyoming.[16] FWS also acknowledged that a former deputy assistant secretary at the Department of the Interior, Julie MacDonald, may have inappropriately reduced the earlier designation.[17]

The 2009 critical habitat designation was ruled invalid by the Montana federal district court, which found that FWS had not considered the economic impacts adequately.[18] The court halted application of the critical habitat designation in the area in which the economic analysis had been inadequate (a national forest in Washington). An earlier decision, by a different judge of the same court, also found the critical habitat designation flawed, but left the rule in place while FWS considered the features of lynx-occupied areas in certain national forests.[19]

Hatchery Salmon

Naturally spawned fish are genetically diverse and therefore considered to be more vigorous than the genetically more similar hatchery fish. Consequently, agency scientists have distinguished between hatchery-raised and wild salmon to maximize production of the latter. Over the years, these distinctions have been controversial in several respects. In 1993 NMFS issued its Interim Hatchery Listing Policy on how to consider hatchery fish in listing determinations for Pacific salmon and steelhead species. The interim policy concluded that hatchery fish could be in the same evolutionarily significant unit (ESU) as wild fish.[20] Eventually, a federal court found that the interim policy violated the ESA by listing below the species level. The court found that if hatchery and wild salmon were in the same ESU, they should not have different listing status.[21]

NMFS revised the policy to reflect the court's decision. The final hatchery listing policy (HLP) was released four years later, in 2005.[22] The HLP requires NMFS to consider the status of the ESU as a whole, rather than the status of only the wild fish within the ESU, when determining whether to list the species. It also provides that the entire ESU would be listed, rather than just the wild fish.

Two suits were filed in two different district courts. One suit challenged how the HLP affected steelhead trout. Two types of groups sued in the steelhead case: groups that wanted wild fish considered as distinct from hatchery fish, and groups that wanted to require NMFS to make no distinction between the origins of fish. The court found the HLP was invalid because it was not based on the best available scientific data.[23] The court found the HLP undermined a fundamental purpose of the ESA—to preserve natural, self-sustaining populations. The court further found it scientifically questionable whether risk assessment criteria developed by NMFS for making status determinations could be applied to fish populations that included both hatchery and wild fish, since the criteria were designed to be applied only to wild fish. NMFS's downlisting of steelhead from endangered to threatened by applying the HLP was ruled invalid. But the court upheld the NMFS decision to include hatchery and wild fish in the same ESU.

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[16] 74 *Federal Register* 8616.

[17] 74 *Federal Register* 8617-8618.

[18] Wyoming State Snowmobile Association v. U.S. Fish and Wildlife Service, No. 09-CV-00095-F, 2010 WL 3743933 (D. Mont. September 10, 2010).

[19] Alliance for the Wild Rockies v. Lyder, No. CV-09-73-M, 2010 WL 3023652 (D. Mont. July 28, 2010).

[20] 58 *Federal Register* 17573, at 17574 (April 5, 1993).

[21] Alsea Valley Alliance v. Evans, 161 F. Supp. 2d 1154, 1161 (D. Or. 2001).

[22] 70 *Federal Register* 37204 (June 28, 2005).

[23] Trout Unlimited v. Lohn, No. CV06-0483-JCC, 2007 WL 1795036 (W.D. Wash. June 13, 2007).

The Ninth Circuit Court of Appeals upheld only a portion of the steelhead decision.[24] The appellate court distinguished between the two steps of the listing process: defining the species, and then determining whether the species should be listed. The Ninth Circuit agreed with NMFS that the effects of hatchery fish on wild fish could be considered at the listing phase, not the definitional stage. The court gave discretion to NMFS's science, although it noted that there may not be scientific consensus regarding the threat hatchery fish pose to wild fish. The appellate court reversed the lower court's holding that downlisting the fish was invalid, finding that hatchery fish did not necessarily put wild fish at risk.

A second suit was based on how the HLP affected salmon. In this case, the court held that NMFS properly considered hatchery and wild fish as having different extinction risks in its listing decision.[25] The court rejected the plaintiffs' argument that special regulations regarding taking salmon had to apply uniformly to hatchery and wild fish. The Ninth Circuit Court affirmed the lower court's decision.[26]

Steller Sea Lions

The western population of Steller sea lions was listed in 1990 as endangered under the ESA, and their abundance has been declining for several decades.[27] Starting in late 1998, NMFS prepared three biological opinions[28] that were based on the hypothesis that intense fishing for pollock, Pacific cod, and Atka mackerel off Alaska was causing localized depletion of these fish and therefore starving Steller sea lions. Critics among commercial fishermen argued that NMFS based its biological opinion on a scientifically untested hypothesis to make a jeopardy finding on fishing levels and practices under the ESA, while NMFS insisted on a higher standard of certainty for the science under the Magnuson-Stevens Fishery Conservation and Management Act, supporting fishery management measures to address localized fish depletion problems.

In a fourth biological opinion on authorization of these fisheries, NMFS took a different approach, after Steller sea lion feeding studies and population trends at some rookery sites raised questions about the localized depletion hypothesis. Litigation on this issue was settled early in 2003.[29] In response, NMFS (1) published an addendum to its 2001 biological opinion to clarify the effects of the fisheries on Steller sea lions and their critical habitat and (2) completed a Final Programmatic Supplemental Environmental Impact Statement and Record of Decision concerning the Alaska groundfish fishery. In early December 2010, NMFS restrictions on commercial Atka mackerel and Pacific cod fishing in the western Aleutians to protect western Steller sea lions reignited this controversy.[30] As a result of litigation challenging the NMFS

[24] Trout Unlimited v. Lohn, 559 F.3d 946 (9th Cir. 2009).

[25] Alsea Valley Alliance v. Lautenbacher, No. 06-6093-HO, 2007 WL 2344927 (D. Or. August 14, 2007).

[26] Alsea Valley Alliance v. Lautenbacher, 319 Fed. Appx. 588 (9th Cir. 2009).

[27] For more background on this issue, see http://www.fakr.noaa.gov/protectedresources/stellers/default.htm.

[28] These opinions were related to consultation on the effects of the authorization of groundfish fisheries in the Bering Sea and Aleutian Islands region under the Fishery Management Plan (FMP) for Groundfish of the Bering Sea and Aleutian Islands Management Area, and of the authorization of groundfish fisheries in the Gulf of Alaska under the FMP for Groundfish of the Gulf of Alaska, including the prosecution of parallel groundfish fisheries in Alaska state waters. These FMPs were developed by the North Pacific Fishery Management Council and approved by NMFS under the authority of the Magnuson-Stevens Fishery Conservation and Management Act.

[29] Greenpeace v. National Marine Fisheries Service, No. C98-0492Z, Agreed Order at 2 (W.D. Wash). For a detailed discussion of this litigation, see Jerry McBeath, "Greenpeace v. National Marine Fisheries Service: Steller Sea Lions and Commercial Fisheries in the North Pacific," *Alaska Law Review*, v. 21 (June 2004): 1-42.

[30] For a copy of the December 2010 biological opinion, fishery management response, and subsequent litigation, see

determination that commercial fishing jeopardized those Steller sea lions, a court ordered NMFS to prepare an environmental impact statement for Steller sea lion protection measures. [31]

Gray Wolves in Eastern States

Wolves are an adaptable species, as shown by their behavior and by their presence in a tremendous variety of ecosystems.[32] Variations in color, size, and bone structure have led some mammalogists to designate wolves in different areas as different subspecies or populations, whereas other experts would recognize only a single species with variability. Biologists commonly describe their colleagues as *lumpers* or *splitters*, based on their inclinations in classifying organisms. As the names suggest, lumpers are those who tend to minimize differences, and see one or a few species, perhaps with some variations, while splitters tend to emphasize those differences, dividing a species into many subspecies, or populations. As one well-known mammalogist once stated: "Splitters make very small units—their opponents say that if they can tell two animals apart, they place them in different genera, and if they cannot tell them apart, they place them in different species. Lumpers make large units—their opponents say that if a carnivore is neither a dog nor a bear they call it a cat."[33]

For wolves, which are (or were) found in temperate and polar areas throughout the Northern Hemisphere, some observers (splitters) have argued that there are as many as 24 subspecies in North America and 8 in Europe and Asia.[34] More recently, lumpers have had the upper hand in the scientific community. However, that tide may be changing. In May 2011, the U.S. Fish and Wildlife Service (FWS) proposed recognizing a third species of wolf (*Canis lycaon*), in addition to the gray and red wolf.[35] The wolves being considered for this new species designation live (or lived) primarily in the eastern United States.

In the ESA context, the academic debate has considerable significance. Under the ESA, if a taxon is listed (for example the genus *Hylobates*), then all of the species of gibbons which belong to that genus are all protected. Similarly, if *Canis lupus* is listed, then all wolves (subspecies, and DPS) belonging to that species are all protected. However, if FWS concludes that there are animals commonly referred to as wolves, but which do not belong to *Canis lupus* at all, then those wolves would lose their ESA protections unless or until they won ESA protection on their own merits.

From a scientific viewpoint, designating wolves found in the eastern United States as a separate species is not assured. For example, the encyclopedic *Mammal Species of the World* discusses the validity of *Canis lycaon* as a distinct species and concludes that evidence for separation is

http://alaskafisheries.noaa.gov/protectedresources/stellers/esa/biop/final/1210.htm.

[31] Alaska v. Lubchenco, No. 3:10-cv-00271 (D. Alaska January 19, 2012). For general information on the EIS preparation, see http://alaskafisheries.noaa.gov/sustainablefisheries/sslpm/eis/scopingissues0512.pdf.

[32] For example, should climate change continue and arctic snow cover continue to diminish, will the genes for white coats diminish in the arctic wolves? That may be likely, since light-colored wolves would be at a disadvantage in much of the year and over a growing area. Natural selection would then tend to disfavor these animals and their offspring.

[33] George Gaylord Simpson, "The Principles of Classification and the Classification of Mammals," *Bulletin of the American Museum of Natural History*, vol. 85 (1945), p. 23. Debates over the proper classification of species are not rare, particularly for vertebrates; only the listing of a species and the need for legal clarity over what is protected and what is not bring such debates into a practical realm.

[34] See discussion, citing various authors, in L. David Mech, *The Wolf: The Ecology and Behavior of an Endangered Species*, pp. 29-31 (Garden City, NY: Natural History Press 1970).

[35] 76 *Federal Register* 26086 (May 5, 2011). The comment period was later extended to September 26, 2011. No action has been taken on the proposal to date.

equivocal.[36] However, it does not currently consider this wolf in the East to be a distinct species. Moreover, the North American consortium of national professionals who manage the Integrated Taxonomic Information System (ITIS, the source considered authoritative on taxonomy and taxonomic validity in the United States and its territories, Mexico, and Canada) currently considers this wolf as a *subspecies (Canis lupus lycaon)*.[37] The validity debate considers evidence related to mitochondrial DNA, morphology, evidence of hybridization with coyotes, the natural variability of widely distributed species, and the extremely low population densities that make conclusive evidence difficult to obtain. A change in the taxonomic status would, in effect, de-list any remaining eastern wolves on the basis of that new status, rather than on an assessment of its conservation status. Only a new decision to list would return such wolves to a protected status.

Climate Change and Sound Science

In another version of the debate over science and ESA, the focus is less on the use of science in ESA decision-making per se and more on the use of the act to force decisions on a scientific issue. Specifically, some have argued that the ESA might be a suitable tool to restrict greenhouse gas emissions. However, years after the theory was proffered, no published court opinion has considered this issue.

The idea, as spearheaded by the Center for Biological Diversity (CBD), is to petition FWS and NMFS to list as endangered or threatened various animals whose habitat is or will be adversely affected by climate change. Once a species is listed, the argument would be made that sources of substantial greenhouse gas emissions, such as coal-fired power plants, cause an unlawful "take" of these species under ESA Section 9 by the effect such emissions have, via climate change, on the species' habitat. This could force negotiation of an incidental take permit for the source, with conditions to limit greenhouse gases.

Case law, however, does not demonstrate that the ESA is used as an enforcement tool to make climate change arguments. In three cases where ESA challenges were directed at federal projects related to power plants, only one involved climate change allegations, *Palm Beach County Environmental Coalition v. Florida*, and it was not clear whether those claims were premised on the ESA or on another legal basis.[38] In an Eighth Circuit case, *Sierra Club v. U.S. Army Corps of Engineers*,[39] a claim was made that emissions harmed specific species near the power plant, and did not allege global harm. A similar claim was made in *Palm Beach County*. Neither court reviewed the ESA claims, finding procedural reasons. In the third case, *United States v. Pacific Gas and Electric*, the court held that the ESA had not been violated; also, the claims of harm to species related to a power plant were not based on GHGs.[40]

Despite the apparent lack of litigation premised on climate change *taking* species, some regulatory changes were made to limit lawsuits based on that cause of action. In December 2008, FWS changed the regulations that dictated how a Service considered impacts of federal projects on listed species.[41] Those regulations were effective only from January 15, 2008, to May 5, 2008,

[36] Don E. Wilson & DeeAnn M. Reeder (editors), *Mammal Species of the World. A Taxonomic and Geographic Reference* (3rd ed.), Johns Hopkins University Press: 2005.

[37] The ITIS data base is online at http://www.itis.gov/.

[38] Palm Beach County Environmental Coalition v. Florida, 651 F. Supp. 2d 1328 (S.D. Fla. 2009). Plaintiffs also had alleged violations of the Clean Air Act, National Environmental Policy Act, and the Clean Water Act.

[39] 645 F.3d 978 (8th Cir. 2011).

[40] 776 F. Supp. 2d 1007 (N.D. Cal. 2011).

[41] 73 *Federal Register* 76272 (December 16, 2008) (effective January 15, 2009).

after Congress acted to halt them in P.L. 111-8.[42] During that period of regulatory change, definitions related to the effects of an action were modified to "reinforce the Services' current view that there is no requirement to consult on [greenhouse gas] emissions' contribution to global warming and its associated impacts on listed species."[43] Despite the revocation of those changes, it does not appear that the scope of effects has expanded, likely due to the fact that the regulations already limited review to those effects with a reasonable certainty to occur.[44]

Another regulatory change of the same time period is still in place. It restricts lawsuits claiming incidental takes of polar bears to instances where the agency action occurs in the state of Alaska.[45] The polar bear was listed under the act primarily due to shrinking habitat caused by changing climate.[46] The polar bear regulation prevents a lawsuit claiming that a power plant in any state other than Alaska harmed the polar bear by indirectly causing its ice floe habitat to diminish. The law that authorized revocation of the regulations discussed above, P.L. 111-8, also authorized revocation of the polar bear rule, but the Secretary of the Interior and the Secretary of Commerce did not act to revoke that rule. On December 7, 2010, FWS designated approximately 187,000 square miles offshore and onshore in Alaska as critical habitat for the species (75 *Federal Register* 76085).

General Political Influence Charges

In addition to specific claims of poor science such as those cited above, there have been claims of more general interference in scientific decisions under ESA. Among the high-profile claims were charges that a former deputy assistant secretary at the Interior Department, as well as other DOI officials, were responsible for changing a number of decisions that had been supported by career staff. The DOI Inspector General (IG) found that the official, Julie MacDonald, had interfered with scientific determinations regarding endangered species. Ms. MacDonald resigned shortly thereafter. In a hearing before the House Committee on Natural Resources on July 31, 2007, the DOI deputy inspector general, Mary Kendall, added that DOI did not investigate allegations of then-Vice President Cheney's involvement in some of the decisions, but would have done so if it had been aware of the allegations at the time. Some Republican members of the committee argued that even if the involvement occurred, the contacts would not have been improper.[47]

As a result of the IG investigation and the resignation, FWS reconsidered decisions concerning eight species: white-tailed prairie dog, Preble's meadow jumping mouse, two Hawaiian picture-wing flies, arroyo toad, southwestern willow flycatcher, California red-legged frog, and Canada lynx.[48] The reconsideration came after FWS regional directors reported that Ms. MacDonald

[42] 74 *Federal Register* 20421 (May 8, 2009) ("With this final rule, the Department of the Interior and the Department of Commerce amend regulations governing interagency cooperation under [the ESA]. In accordance with the statutory authority set forth in the 2009 Omnibus Appropriations Act (P.L. 111-8), this rule implements the regulations that were in effect immediately before the effective date of the regulation issued on December 16, 2008").

[43] 73 *Federal Register* at 47872.

[44] 50 C.F.R. §402.02.

[45] 50 C.F.R. §17.40(q)(4). See also CRS Report RL33941, *Polar Bears: Listing Under the Endangered Species Act*, by Eugene H. Buck, M. Lynne Corn, and Kristina Alexander.

[46] 73 *Federal Register* 28212 (May 5, 2008).

[47] "Endangered Species Official Says Misconduct Casts 'Cloud' Over Scientific Integrity of Interior Program," *Daily Environmental Report (BNA)*, August 1, 2007, p. A-6.

[48] Since the announcement of the review, these species have been the subject of five-year reviews, proposals for revised critical habitat, new ranges, and proposed rules for listing. For more information on each species, see the FWS endangered species website at http://www.fws.gov/endangered/wildlife.html. Currently, two of these species are listed

influenced the outcome without a scientific basis. On August 30, 2007, the Center for Biological Diversity filed a notice of intent to sue DOI, claiming interference with decision-making concerning 55 listed species. Claims concerned primarily FWS elimination of designated critical habitat in a number of states, but also decisions to de-list or down-list some species, and not to list others.[49] Pressure cited for the decisions was primarily from Ms. MacDonald, but other DOI officials were also named in the notice. In addition to these reviews, which cite previous specific interference in scientific analysis, FWS announced other reviews or changes in previous ESA decisions. Examples included a review of the proposed listing of Gunnison sage grouse;[50] and a re-examination of the recovery plan and the reduction in designated critical habitat for the northern spotted owl.[51]

Some federal courts rejected FWS determinations in part because of Ms. MacDonald's influence. For example, the timeline for determining bull trout critical habitat was adjusted by the District Court of Oregon because of her input.[52] Listing determinations for the greater sage grouse[53] and the Sonoma and Santa Barbara salamander[54] were sent back to the agency by two other courts.

Science: The Interaction with Policy

"Science" or "sound science" is held up as desirable by all sides of the ESA debate. Some studies are seen as supporting a certain action by one party, and as insufficient for decision-making by another. And at times, other studies are held up as supporting opposing sides. With these apparent contradictions, it is useful to examine, in an ESA context, (a) what is "science;" (b) what is the scientific method; and (c) how do science and public policy interact?

What Is Science?

The National Academy of Sciences has given a fairly typical definition of science: "Science is a particular way of knowing about the world. In science, explanations are limited to those based on observations and experiments that can be substantiated by other scientists. Explanations that cannot be based on empirical evidence are not a part of science."[55] Science therefore is not simply

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as endangered (arroyo toad and southwestern willow flycatcher); four as threatened (Preble's meadow jumping mouse, one species of picture-wing fly, California red-legged frog, and Canada lynx (part of range)); and three as candidates (white-tailed prairie dog, one species of picture-wing fly, and Canada lynx (in New Mexico). The Center for Biological Diversity was a plaintiff in many of the lawsuits in this controversy. Their history of the issues, species by species, can be found at http://www.biologicaldiversity.org/species/index.html.

[49] "Enviros Threaten Legal Action on Behalf of 55 Endangered Species," *Environmental News Service*, August 30, 2007.

[50] See http://www.fws.gov/mountain-prairie/species/birds/sagegrouse/. This species is designated as a candidate species whose listing is warranted but precluded by other, higher-priority species.

[51] See E&E News at http://www.eenews.net/eenewspm/2009/04/01/archive/2?terms=Julie+MacDonald; Carpenters Indus. Council v. Salazar, No. 08-1409, 2010 EL 3447243 (D. D.C. September 1, 2010). Critical habitat has not yet been revised; a comment period on the proposed revision closed on July 6, 2012 (see Fish and Wildlife Service, "Revised Critical Habitat for the Northern Spotted Owl (*Strix occidentalis caurina*)," 77 *Federal Register* 324856, June 1, 2012). The recovery plan update was published on July 1, 2011. See http://ecos.fws.gov/docs/recovery_plan/RevisedNSORecPlan2011_1.pdf.

[52] Alliance for the Wild Rockies v. Allen, No. 04-1813, 2010 WL 2015407 (D. Or. July 1, 2009).

[53] Western Watersheds Project v. Fish and Wildlife Service, 535 F. Supp. 2d 1173, 1175 (D. Idaho 2007).

[54] Center for Biological Diversity v. U.S. Fish and Wildlife Service, No. C04-04324, 2005 WL 2000928 (N.D. Cal. August 15, 2005).

[55] National Academy of Sciences, *Science and Creationism: A View from the National Academy of Sciences, Second*

an aggregation of facts unconnected with each other; rather, science is a way of examining phenomena to produce explanations of the "why" and "how" of these phenomena. Terms used in describing the nature of science include scientific fact, scientific hypotheses, and scientific laws and theories.[56] Scientific knowledge is dynamic, changing as new information becomes available. In this sense, science does not reveal "truth," so much as produce the best available or most likely explanation of natural phenomena, given the information available at the time; in many cases, analysis of the data may even give an estimate of the degree of confidence in the explanation. Moreover, scientific conclusions naturally depend on the questions that are asked. For instance, the question of whether an action is likely to jeopardize the continued existence of a species in the next 10 years might have a different answer than if the time in question is the next 100 years.

Scientific Method

The *scientific method* is the heart of science, and has been defined as

> [i]nvestigating a system by formulating hypotheses (educated guesses based on initial observations) about the behavior of the system, then making predictions based upon these hypotheses, and finally designing experiments (or making observations) to test these predictions. After several tests validate different predictions, a hypothesis becomes a scientific theory or law. This process is the basis of western science.[57]

Scientific methods may vary based on the objective and the nature of the subject matter.[58] Usually, the scientific investigation begins after some casual observation about the real world (e.g., dairy maids who have had cowpox rarely contract smallpox) and an observer who wonders "why?" It begins then with a hypothesis based on observations (e.g., humans who have had cowpox are immune to smallpox). Testable predictions are made based on the hypothesis (e.g., inoculation with cowpox will prevent smallpox). Data are systematically collected and classified to test the predictions (e.g., patients were first inoculated with cowpox and then exposed to smallpox). The data are interpreted and a conclusion is drawn based on the outcome of the experiment (e.g., since the patients inoculated with cowpox did not contract smallpox, cowpox inoculations will prevent smallpox). Models (e.g., epidemiological or microbiological) may be developed to describe the phenomenon or help make predictions (e.g., the spread of the disease). Noteworthy results are often published, which usually requires scientific peer review. Once the hypothesis is considered to be thoroughly tested, it is considered or contributes to a "theory" or "law" and becomes part of the body of scientific knowledge. Even accepted theories and laws

Edition (Washington, DC: National Academy Press, 1999), p.1. (Hereinafter referred to as *Science & Creationism.*)

[56] In scientific inquiry, a *fact* means that the observation has been repeatedly confirmed and is considered true. A *hypothesis* provides a tentative statement that can be tested. A *law* is a descriptive generalization about how some aspect of observable reality behaves under stated circumstances. A *theory* is a well-substantiated explanation of some aspect of observable reality that can incorporate facts, laws, inferences, and tested hypotheses. *Science & Creationism*, p.1-2.

[57] Henry W. Art (gen. ed.), *The Dictionary of Ecology and Environmental Science*, A Henry Holt Reference Book (New York: H. Holt, 1993), p. 479. The sequence of events described in the paragraph may be significantly modified where extremely long-range or long-term phenomena do not permit easy experimentation. In such instances, hypotheses must be tested in other ways. Astronomy and climatology are fields in which such problems are common, but researchers on endangered organisms also face similar challenges when the rarity of their subject precludes many experiments.

[58] Basic tools in science include systematic classification, numeric measurements, controlled variation of conditions, replication of results by different observers, experimentation by isolating variables, predictions based on the law of cause and effect, mathematical analysis, and more. For more information, see *McGraw-Hill Encyclopedia of Science & Technology* (New York: McGraw Hill), v. 16 (1992): 115-117. Note, too, that there is no reason to confine this definition to western science, although this form of thinking did arise in European civilization.

remain open to re-examination if new information arises. It is through these methods that science gives weight to the viewpoints of one scientist versus another. The work of a scientist that has not survived (or even been submitted to) this process is given less weight than the work of one that has.

Several of these elements—data collection, models, and scientific peer reviews—have become important in legislative discussions. Scientific peer reviews generally evaluate the analysis, interpretations, and conclusions developed from the data, and sometimes review the data (observable facts). Models have long been part of the scientific method; models include physical models (e.g., DNA strands or various sizes of balls to represent the solar system), mathematical formulas, computer simulation programs, and many more.[59] Models are based on stated or implicit assumptions that can usually be applied to predict outcomes based on changing different variables. As new information becomes available, models can be confirmed, modified, or discarded. With this definition, models are a seamless part of the scientific process, and science without models and modeling would be difficult to imagine. The models as well as the facts and scientific theories may in turn be cited by decision-makers.

The scientific method is not the only way of "knowing." Traditional knowledge and common sense also play an important role. For instance, elders among Native groups may report that whales have calved in a certain lagoon as far back as their own grandparents can remember, or that certain springs in the desert have never before gone dry until recent decades. A scientist's decades of experience with a particular species sometimes also falls into this category. Although such information has often been disregarded in the past, greater attention is now paid to it.

In addition, many common sense observations (e.g., that salmon cannot jump up rivers that contain long stretches of dry creek bed or that heavy rain across bare slopes produces sediment runoff) might merit study to quantify the observation, but not to verify it. Experience and common sense, especially when supported by scientific analyses tending in the same direction, can provide important input for ESA-related (and other) decisions.

Other Scientific Values: Transparency and Updating

The scientific method has, at its heart, two values that are strongly implied (as in the description above) but not often stated: (1) a transparent approach in which both new and old data are available to all parties; and (2) a continuing effort to update data, and therefore modify, and even reject, previously accepted hypotheses in light of new information.[60] Together, transparency and updating are the cleansing mechanism that gradually sweeps away scientific misunderstandings and errors—a *sine qua non* for scientific advancement. Logically, then, policy decisions based on

[59] More formally, a *model* can be defined as a "simplified representation of a system or structure, usually on a smaller scale than that of the original. A theoretical model is a mental construct that may be formalized into mathematical equations or verbal descriptions. If accurate, it may be used to make predictions about the original system. Models can also be physical; a flowchart is a two-dimensional model of a system, and three-dimensional models or prototypes are often made of airplanes and other vehicles in the process of development." *The Dictionary of Ecology and Environmental Science,* p. 7. (This definition would probably have been more precise if it had said that models whose predictions prove to be false are inadequate, and the models must therefore be modified or discarded.)

[60] Scientific history is all but littered with famous approaches that were once widely held and later rejected (even though considered "good science" in their heyday): geological catastrophism, Lamarckian evolution, the four "humors" of medicine, Newtonian physics, Ptolemaic cosmology, etc. A transparent re-examination of these hypotheses, and a commitment to updating the information on which they were based, led to their replacement with hypotheses which more accurately explained available data. No doubt some widely held hypotheses of our own time will be replaced in light of new data.

science would include a mechanism providing for a transparent policy process, and a commitment not only to review such decisions, but actually to gather new information to assure that decisions remain consistent with the best available science. On the one hand, the speed of data-gathering sometimes may exceed that of the slow regulatory process. On the other hand, lack of funding may stop data-gathering altogether. And a lack of transparency (e.g., due to fear of lawsuits or to hidden assumptions that may affect decision-making) can also lead to decisions based on science that does not meet the best-available standard.[61]

Science and Policy

Scientists and policy-makers typically ask different kinds of questions. On the one hand, scientists deal with facts and observations along with the models and hypotheses to explain them (with some of the latter potentially useful for predicting likely future events, such as volcanic eruptions, solar flares, nuclear hazards, and rates of extinction). On the other hand, decision-makers often seek to affect how the world "ought to" or "should" be. Annually, science is the major or only input for dozens or hundreds of listing determinations and permit actions, and for thousands of interchanges (both formal and informal) on interagency consultation under Section 7.[62] The great majority of these actions generate little or no controversy, but these non-controversial actions are overshadowed by the much smaller number of actions which may produce headlines.

The complexity, uncertainty, and risk associated with many ESA issues, and the predictive nature of science with its emphasis on the probability of various outcomes rather than on absolute certainty, can make the interaction of scientists and decision-makers frustrating for both. The ESA specifies that "solely" scientific criteria may be considered in a listing decision, but it does not specify the guidelines agencies (NMFS and FWS) should follow in assessing risk. As a result, choices may not be consistent between, or even within, the agencies. Similarly, when federal agencies consult with FWS or NMFS on the effects of their proposed actions (under Section 7 of ESA), FWS or NMFS must determine whether the proposed action is likely to jeopardize the continued existence of the species or lead to adverse modification of its critical habitat. How are decision-makers to respond to a forecast that the chance of a hurricane coming ashore in a particular place in the next 24 hours is 20%? That the risk of heart disease is an additional 8 women in 10,000? That a species has a 60% chance of becoming extinct in the next 100 years?[63] The ESA itself does not provide clear guidance to agencies on how to address questions of risk. In the example of salmon, scientists have provided a quantitative response. However, should a salmon run with a particular level of risk be listed as endangered, threatened, a low-priority candidate, or not at all? In all of these matters, different parties may have different risk tolerances.

In the context of such decisions, where does science stop and policy begin? The indistinct boundary between science and policy can be further obscured by some scientists (usually

[61] For a discussion of transparency in and updating, see Holly Doremus, "Using Science in a Political World: the Importance of Transparency in Natural Resource Regulation," in Wendy Wagner and Rena Steinzor, eds., *Rescuing Science From Politics: Regulation and the Distortion of Scientific Research* (Cambridge, UK: Cambridge University Press, 2006), pp. 143-164.

[62] Under §7, federal agencies are required to consult with NMFS or FWS when actions they fund, authorize, or carry out may affect any ESA-listed species. This section requires all federal agencies to ensure that their actions are not likely to jeopardize the continued existence of any endangered or threatened species. Consultations pursuant to §7 are conducted with federal action agencies to avoid, minimize, or mitigate the impacts of their activities on listed species.

[63] In addition, while there may be a consensus view, absolute unanimity among scientific experts, even on such seemingly simple estimates, would be fairly unusual.

associated with particular positions) or decision-makers who want science to provide certainty for complex policy decisions.[64] As a result, policy questions (e.g., how much risk to bear?) may be cast as science questions, and decision-makers may ask scientists to make what are essentially policy choices.

At first glance, it might appear that science could be completely objective and neutral. And the usual protocols of science are likely to produce objectivity through peer review and efforts to reproduce (or not) the results of other scientists. Errors found through these and other means will usually weed out incorrect conclusions. Yet some scientists may have personal values that might influence (consciously or unconsciously) the questions they ask, the models or experiments used, the assumptions made, and the interpretation of the results of an experiment.[65] Scientists working for various agencies, companies, tribes, and other interest groups may be influenced by policy positions of their employer. Vigorous debate is part of the essence of science, but the result can be difficult for courts and policy-makers to assess.

The influence can be quite subtle, and two examples may illustrate the problem. In a controversy over national forest management policy in Wisconsin, assumptions were incorporated into "diversity indices," which were to be used to create a baseline against which various alternative forest plans could be measured.[66] This seemingly simple exercise, apparently grounded in science, contained an assumption which facilitated an outcome that would produce moderate to high levels of timber harvest. Specifically, the diversity indices stressed populations of habitat generalists (e.g., ruffed grouse, ground squirrels, common yellowthroats (a bird), and pileated woodpeckers, species commonly found in Wisconsin's second growth, suburbia, and cut-over areas). By choosing such species as the measure of the alternatives, then alternatives that produced more of them would be "preferred." Timber harvest was a major tool to promote this type of habitat, and an alternative featuring fairly high harvest levels and little old growth was chosen as the preferred option—an outcome to be expected based on the initial choice of species. Inclusion of other species dependent on deep forests (e.g., northern goshawks and barred owls) would have resulted in a different "preferred" option.

A second example, even more subtle, of the risks of unstated assumptions in scientific inquiry concerns the initial discovery of the snail darter in the Little Tennessee River. This fish was discovered by Dr. David Etnier of the University of Tennessee in August 1973, as the controversy over the ESA and the building of the Tellico Dam was growing. He recognized it at the time as a species new to science, and not known from other locations. Two years later, the fish was listed as endangered by FWS. Eventually, the fish lay at the heart of one of the biggest controversies in the history of the ESA. The area of the fish's discovery was searched, in part, because of the proposed substantial change in the riverine habitat through the construction of a large dam.[67] Years later, after the dam was completed, this species was found in small numbers at nine

[64] Thomas J. Mills, "Position Advocacy by Scientists Risks Science Credibility and May Be Unethical," *Northwest Science*, v. 74, no. 2 (2000), p.165-168.

[65] Depending on which assumptions are used in the technical analysis, different predictions may result from different scientists.

[66] For a discussion of the planning process at these two national forests and the associated lawsuits, see Oliver A. Houck, "On the Law of Biodiversity and Ecosystem Management," *Minnesota Law Review*, v. 81 (April 1997): 869-979.

[67] A listing proposal may, by itself, trigger expanded scientific investigations and direct scarce resources to those species rather than to others. This additional attention and funding may also occur when an unusual habitat is threatened by development, as it did in the Tellico project.

additional locations and in 1984 was reclassified as threatened.[68] The subtle bias (searching that specific area rather than some others) produced a result (major controversy and ground-breaking lawsuits) that might not have occurred had all similar habitats been equally searched. Yet such problems are well known in science: one makes discoveries in the places one examines, and not in the places one doesn't.

Scientific Integrity: Who Will Guard the Guardians?

The Information Quality Act

Federal statutes have affected the information federal agencies gather and use, and have located significant oversight powers in the Office of Management and Budget (OMB) through the Office of Information and Regulatory Affairs (OIRA). Section 515 of Appendix C of the Treasury and General Government Appropriations Act for FY2001,[69] generally known as the Information Quality Act (IQA) or the Data Quality Act, directs OMB to (1) issue government-wide guidelines to federal agencies to ensure and maximize the quality, objectivity, utility, and integrity of information disseminated by federal agencies; (2) establish a procedure for people to seek corrections of agency information; and (3) require periodic reports to the Director of OMB of complaints regarding agency information. OMB published final guidelines on February 22, 2002.[70] Departments and agencies were required to issue their own guidelines to achieve the information quality goals, and to establish administrative mechanisms to allow persons to request correction of information maintained and disseminated by the agency; and to report periodically on the number and nature of complaints received and how such complaints were handled.[71]

Some have applauded the IQA as likely to result in better procedures and more credible information. Others have expressed concerns that the act may be used to stymy agency action through the "correction" procedures, and that the OMB oversight might result in more political input into scientific decisions.

The OMB guidelines set out the entities to which the guidelines apply and define basic terms. *Government information* means information that is created, collected, processed, disseminated, or disposed of by an agency. *Disseminated* means that the agency initiated or sponsored distribution of information to the public, as opposed to another agency or in response to a Freedom of Information Act request, for example.

The purpose of the guidelines was to develop a process for reviewing the quality of information before it is disseminated. Quality includes the objectivity, utility, and integrity of information. Objectivity involves presentation and substance: whether information is presented in an accurate, clear, complete, and unbiased manner, and whether the information is accurate, reliable, and

[68] This aspect of the Tellico Dam history was only a small part of the larger story. "Appendix B: A Chronology of Tellico" in out-of-print CRS Report 90-242, *Endangered Species Act: The Listing and Exemption Processes* (available to congressional clients upon request from the authors), presents more details on the snail darter and Tellico Dam controversy. For more on the history of Tellico and the discovery of the snail darter, see William B. Wheeler and Michael J. McDonald, *TVA and the Tellico Dam* (Knoxville, TN: University of Tennessee Press, 1986).

[69] P.L. 106-554 (H.R. 5658), 114 Stat. 2763A-153 and 154.

[70] 67 *Federal Register* 8452 (February 22, 2002).

[71] The IQA itself and the implementing regulations seem focused on the transparency of federal information, especially after the fact of its dissemination, though less so in the gathering of data. On the other hand, a commitment to updating information is only implied. See "Other Scientific Values: Transparency and Updating" above.

unbiased. Some of the elaboration on objectivity is very significant to the ESA context. For example, the OMB guidelines address peer review as contributing to objectivity, stating that if:

> data and analytic results have been subjected to formal, independent, external peer review, the information may generally be presumed to be of acceptable objectivity. However, this presumption is rebuttable based on a persuasive showing by the petitioner in a particular instance. If agency-sponsored peer review is employed to help satisfy the objectivity standard, the review process employed shall meet the general criteria for competent and credible peer review recommended by OMB-OIRA to the President's Management Council (9/20/2001) ... , namely "that (a) peer reviewers be selected primarily on the basis of necessary technical expertise, (b) peer reviewers be expected to disclose to agencies prior technical/policy positions they may have taken on the issues at hand, (c) peer reviewers be expected to disclose to agencies their sources of personal and institutional funding (private or public sector), and (d) peer reviews be conducted in an open and rigorous manner."[72]

The element of integrity of information is relevant to current ESA issues and accusations in that *integrity* refers to "the security of information-protection of the information from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification."[73] Although this guideline seems to refer to unauthorized alteration of information, it may be relevant in that various sides of recent issues have accused others of changing information to serve political ends.

The information quality directives and policies of FWS and NMFS that predated the IQA and those that have been adopted since that act are discussed under "Agency Regulatory Requirements and Policies," below. OMB also plays a role under the Paperwork Reduction Act in that OMB must review and approve all efforts of an agency to collect information from nonfederal sources.[74]

Since enactment, the IQA has had little effect on ESA court cases. In one, the U.S. Air Force challenged a 2003 FWS decision that slickspot peppergrass should be protected under the ESA. FWS withdrew its listing decision for reconsideration.[75] Ultimately, the peppergrass was listed,[76] but the listing was vacated based on a non-scientific dispute.[77] In another action, a farming association claimed that the biological opinion of FWS regarding delta smelt violated the IQA. The court ruled that the claim was moot.[78]

Agency Regulatory Requirements and Policies

The ESA agencies have adopted various policies over the years to interpret the use of science in implementing the ESA. In addition, new policies have been established since the enactment of the IQA. The Department of the Interior promulgated information quality guidelines that are

[72] 67 *Federal Register* 8459-8460.

[73] Ibid. at 8460.

[74] 5 U.S.C. §§1320, et seq.

[75] See Western Watersheds Project v. Foss, No. CV 04-168, 2005 WL 2002473, *6-7 (D. Idaho August 19, 2005) (discussing the delay of the listing decision while additional data were gathered).

[76] 74 *Federal Register* 52014 (October 8, 2009).

[77] Otter v. Salazar, 2012 WL 3257843, *19-20 (D. Idaho August 8, 2012) (holding that FWS failed to define adequately *foreseeable future* as required by the ESA).

[78] Family Farm Alliance v. Salazar, 749 F.Supp.2d 1083 (E.D. Cal. 2010). A subsequent decision indicates that FWS conducted a review under the IQA. In re Consolidated Delta Smelt Cases, 812 F.Supp.2d 1133, 1148 (E.D. Cal. 2011).

available on the FWS website (see http://www.fws.gov/informationquality/), along with specific FWS guidelines.

As discussed above, an important issue has been what to do when the available scientific information is not complete. Various FWS documents addressed this and other issues before the IQA guidelines were issued. The precautionary principle "to save all the pieces" is the position taken in the *Endangered Species Consultation Handbook*.[79] The handbook states that efforts should be made to develop information, but if a biological opinion must be rendered promptly, it should be based on the available information, "giving the benefit of the doubt to the species," with consultation possibly being reinitiated if additional information becomes available. This phrase is drawn from the conference report on the 1979 amendments to the ESA,[80] which states that the "best information available" language was intended to allow FWS to issue biological opinions even when inadequate information was available, rather than being forced by that inadequacy to issue negative opinions, thereby unduly impeding proposed actions. But the conference report also states that if a biological opinion is rendered on the basis of inadequate information, the federal agency proposing the action has the duty to show its actions will not jeopardize a species and a continuing obligation to make a reasonable effort to develop additional information, and that the statutory language "continues to give the benefit of the doubt to the species."[81]

In 1994, long before the enactment of the IQA, FWS and NMFS developed several interagency ESA-related cooperative policies on information standards under the ESA.[82] Under these policies, FWS and NMFS receive and use information from a wide variety of sources, including individuals. Information may range from the informal—oral or anecdotal—to peer reviewed scientific studies, and hence the reliability of the information can also vary. Federal biologists are to review and evaluate all information impartially for listing, consultation, recovery, and permitting actions, and to ensure that any information used by the two agencies to implement the ESA is "reliable, credible, and represents the best scientific and commercial data available."[83] Agency biologists are to document their evaluations of all information and, to the extent consistent with the use of the best scientific and commercial data available, use primary and original sources of information as the basis of recommendations. In addition, documents developed by agency biologists are reviewed to "verify and assure the quality of the science used to establish official positions, decisions, and actions." The extent to which agency decisions rest on adequate and objective scientific information has usually been debated.

Agencies deal with the scientific bases for decisions in other ways as well. Another joint policy notes that, in addition to the public comments received on proposed listing rules and draft recovery plans, FWS and NMFS are also to solicit expert opinions and peer review to ensure the best biological and commercial information.[84] With respect to listing decisions, the agencies solicit the expert opinions of three specialists and summarize these in the record of final decision.

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[79] *Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities under Section 7 of the Endangered Species Act* (Washington, DC: Fish and Wildlife Service and National Marine Fisheries Service, March 1998), p.1-6.

[80] U.S. House, Committee of Conference, *Endangered Species Act Amendments*, H.Rept. 96-697 (Washington, DC: U.S. GPO, 1979), p. 12.

[81] Ibid.

[82] 59 *Federal Register* 34271 (July 1, 1994).

[83] Ibid.

[84] 59 *Federal Register* 34270 (July 1, 1994).

Special independent peer reviews can be used when it is likely to reduce or resolve a high level of scientific uncertainty.[85]

OMB issued its *Final Information Quality Bulletin for Peer Review* on December 15, 2004.[86] The *Bulletin* sets out a gradation of peer review procedures depending on the degree to which the information in question is influential—stricter minimum requirements for peer review of highly influential scientific assessments are required, but significant discretion is still left to the agency in formulating peer review plans.

In some instances, FWS and NMFS procedures instituted before the *Bulletin* were considered to have satisfied the IQA. For example, in publishing its listings of Pacific salmon as threatened or endangered, NMFS referred to the 1994 joint NMFS/FWS policy on peer review,[87] which requires those agencies to solicit independent expert review from at least three qualified specialists, concurrent with the public comment period. With respect to the proposed salmon listings, NMFS sought technical review of the listing determinations "from over 50 independent experts selected from the academic and scientific community, Native American tribal groups, Federal and state agencies, and the private sector."[88] NMFS asserted that the 1994 peer review policy and the comments received from several academic societies and expert advisory panels collectively satisfy the requirements of the OMB Peer Review bulletin.[89]

Scientific Integrity Policy at FWS

A scientific integrity policy (hereinafter "the Policy") for the Department of the Interior (DOI), including FWS, was announced by Secretary Ken Salazar on February 1, 2011.[90] It will be updated as warranted. According to the Secretary's statement, it applies to departmental employees who engage in or supervise research, or communicate publicly on scientific or scholarly information or "use this information to make policy, management or regulatory decisions." There are provisions applying to contractors and other persons working on scientific research on the Department's behalf.

Provisions of the Policy

Some DOI agencies have had a policy on scientific integrity (or some similar term) for many years. The Fish and Wildlife Service (FWS) has had a Scientific Code of Professional Conduct for the Service for many years;[91] its provisions are similar to those long in use as DOI's primary science agency, the U.S. Geological Survey, and to the new Policy.

Salient provisions of the Policy include the following:

- facilitation of "the free flow of scientific and scholarly information, consistent with privacy and classification standards";
- provision of "information to employees on whistleblower protections";

[85] Ibid.

[86] See http://www.whitehouse.gov/omb/memoranda/fy2005/m05-03.pdf.

[87] 59 *Federal Register* 34270 (July 1, 1994).

[88] 70 *Federal Register* 37163 (June 28, 2005).

[89] Ibid.

[90] See http://www.doi.gov/news/pressreleases/Salazar-Announces-New-Scientific-Integrity-Policy-and-Designation-of-Departmental-Science-Integrity-Officer.cfm. The policy itself is available at http://elips.doi.gov/app_dm/act_getfiles.cfm?relnum=3889.

[91] A version of this Code, updated in 2008, is available at http://www.fws.gov/policy/212fw7.html.

- definitions of conflict of interest and of scientific and scholarly misconduct;
- duties of various DOI officials;
- a stated code of conduct for all persons generally engaged in scientific or scholarly pursuits, for scientists and scholars specifically, and for decision makers;
- procedures for reporting and resolving allegations of misconduct;
- specified corrective or disciplinary actions; and
- rules for participation as an officer or board member of professional societies or other non-federal organizations.

Because these policies already existed for some, if not all, DOI agencies, the new department-wide code may result in little practical change. A court described the FWS IQA Guidelines as not imposing any substantive standards, but instead requiring a narrative discussing the strengths and the weakness of the data.[92] Accordingly, the guidelines did not provide a basis for suit.

Investigating Allegations of Misconduct

If scientific misconduct at FWS is alleged, according to the Policy's specified procedures, the FWS Director establishes a Scientific Integrity Review Panel (SIRP; slightly different procedures apply if the allegation is against an agency head or the Office of the Secretary). The SIRP investigates the allegation and addresses the significance of the alleged misconduct, its severity and deviance from accepted scientific practice, and intent. Misconduct is defined to include fabrication, falsification, or plagiarism, but explicitly excludes honest error, difference of opinion, and difference from a management decision. The chair of the panel is appointed by the director. The chair, with the concurrence of the director, appoints three additional members with subject matter expertise from any part of DOI. In addition, the agency's human resources officer is an ad hoc member of the panel. The panel is encouraged to seek a consensus decision.

The SIRP report is pre-decisional and is sent to the Departmental Scientific Integrity Officer (DSIO), the FWS SIO, and the relevant manager. The reports are to provide advice and recommendations, among other things. If misconduct is found, the DSIO or FWS Scientific Integrity Officer (SIO) is to work with the responsible manager and the human resources officer to determine corrective or disciplinary action. If no misconduct is found by the SIRP, the manager is directed to send a memo to the accused, with a copy to the DSIO or SIO, saying there will be no further action, and closing the case.

From the thousands of interactions among FWS scientists that might fall under the purview of a SIRP, Scientific Integrity investigations were conducted seven times during FY2012; three investigations were closed with no finding of misconduct. Two are still open due to associated actions in court or in the office of the DOI Inspector General. One investigation found that some allegations were verifiable and some were not. One found misconduct and is in the hands of the DOI Solicitor.[93] In addition, ten informal queries to the FWS SIO in FY2012 resulted in two cases that are still open, and no misconduct in the remaining eight cases.

[92] San Luis & Delta-Mendota Water Authority v. Salazar, 760 F.Supp.2d 855, 963-64 (E.D. Cal. 2010).

[93] Personal communication between Lynne Corn and Dr. Richard Coleman, FWS SIO on December 6, 2012.

Scientific Integrity Policy at NMFS

The National Oceanic and Atmospheric Administration (NOAA), including NMFS, released a final Scientific Integrity Policy on December 7, 2011, as NOAA Administrative Order 202-735D.[94]

Provisions of the Policy

These are the major provisions of the NOAA Scientific Integrity Policy:

- establish NOAA's Principles of Scientific Integrity and the general NOAA Policy on Integrity of Scientific Activities;
- define the reciprocal responsibilities among scientists, their managers and supervisors, and policy makers by establishing a Code of Scientific Conduct and a Code of Ethics for Science Supervision and Management;
- provide for compliance training and maintenance of a NOAA Scientific Integrity Commons website for its employees; and
- set procedures for resolving allegations of misconduct and consequences for misfeasance by adopting an associated Procedural Handbook.

This policy is applicable to all NOAA employees who are engaged in, supervise, or manage scientific activities, analyze or publicly communicate information from scientific activities, or use scientific information or analyses in making policy, management, or regulatory decisions. In addition, all contractors who engage in these activities and recipients of NOAA financial assistance are also covered.[95]

Investigating Allegations of Misconduct

If scientific or research misconduct is alleged, a finding of misconduct requires a determination based on a preponderance of the evidence and must have been engaged in intentionally, knowingly, or in reckless disregard of NOAA's Scientific Integrity Policy. In response to any allegation of misconduct, NOAA's Deputy Undersecretary for Operations (DUS/O) will assess and determine if the allegation is sufficiently credible and specific to warrant an inquiry. If an inquiry is warranted, the DUS/O appoints an Integrity Review Panel Chair and a Determining Official, and proposes appointments to the Review Panel. The Review Panel collects evidence and receives written testimony in order to prepare an inquiry report. Based on the inquiry report, the Determining Official will decide whether an investigation is warranted. After any investigation, the Review Panel prepares an investigation report. Upon review of the investigation report, the Determining Official may specify appropriate institutional administrative actions. Upon receipt of the Determining Official's report, if misconduct is deemed to have occurred, the DUS/O refers the matter to an appropriate manager for consideration of possible administrative action.

Like FWS, NOAA (which includes NMFS) has had few allegations of scientific misconduct, among the thousands of interactions among scientists. During the period beginning December 7,

[94] A copy is available at http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_202/202-735-D.pdf.

[95] Procedures for implementing NOAA's Scientific Integrity Policy are outlined in a handbook, available at http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_202/Procedural_Handbook_NAO_202-735D_31Jan_2012.pdf.

2011, when NOAA's Scientific Integrity Policy came into effect and the end of the FY2012 on September 30, 2012, NOAA received three allegations of scientific and research misconduct. Two of these cases are still in process and one (which did not involve NMFS or ESA) was dismissed.[96]

Practical Problems in Applying Science

For some obscure groups of organisms (e.g., freshwater clams, small freshwater fish species, and many insects), it may prove difficult to find sufficient experts to provide peer reviews, and these specialists often have other duties and may not be available (or willing) to serve governmental regulators in a timely manner. Also, there is the issue of compensating scientists who participate in peer reviews: currently, academic scientists reviewing documents for their eligibility for grants or for publication receive little, if any, compensation. Reviews are generally accomplished by mail, and are (by design) normally anonymous. Grafting such a system onto a contentious area which may require extensive meetings, lost time from primary research and teaching activities, and potentially the polar opposite of academic anonymity could prove difficult, or further limit the pool of willing reviewers. In addition, achieving peer review by impartial, scientists may also be an issue if the listing or action being reviewed could involve major economic factors in which the scientists have an interest (e.g., research funding, employment, etc.).

In 1998-1999, the Society for Conservation Biology (SCB), in cooperation with FWS, performed a national review of 135 recovery plans, covering 181 species listed under the ESA.[97] The National Center for Ecological Analysis and Synthesis at the University of California, Santa Barbara, reviewed the database resulting from this study.[98] It found among other things that a relatively low proportion (30%-40%) of recovery criteria were clearly based on biological information, that inclusion of academic scientists on recovery teams led to more explicit use of biological information in recovery plans, and that recovery plans developed with federal scientists only were less likely to reflect adequate attention to species biology. FWS responded to this study with 10 action items to strengthen recovery planning by increasing efforts to expand the diversity of recovery plan contributors, improving the internal consistency of recovery plans, continuing to expand ties to academic and professional communities, etc.[99]

Science in ESA Implementation

Issues and Background

Property rights advocates, business interests, environmentalists, scientific organizations, and federal agencies have all decried, at various times, the scientific basis of various ESA decisions. This seeming consistency is misleading, since the reasoning and objectives of the groups may be diametrically opposed. To some extent, the debate over the application of science in ESA is predictable, given the scarcity of information on many wild species and the even higher likelihood of very limited data on rare species. Some examples of questions that turn on matters at the dividing line between science and policy are:

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[96] NOAA's report is available at http://nrc.noaa.gov/Scientific%20Integrity%20Annual%20Report.pdf.

[97] For more information about their methods, see http://www.nceas.ucsb.edu/recovery.

[98] Leah R. Gerber and Cheryl B. Schultz, "Authorship and the Use of Biological Information in Endangered Species Recovery Plans," *Conservation Biology*, v. 15, no. 5 (October 2001): 1308-1314.

[99] Deborah T. Crouse, Loyal A. Mehrhoff, Mary J. Parkin, Diane R. Elam, and Linus Y. Chen, "Endangered Species Recovery and the SCB Study: A U.S. Fish and Wildlife Service Perspective," *Ecological Applications*, v. 12, no. 3 (June 2002): 719-723.

- If a species' distribution is poorly known (as is the case with Canada lynx), should it be listed?
- If a species' taxonomic status is a matter of dispute (as with the FWS proposal to change the taxonomic status of remaining wolves in the eastern United States and thereby remove them from their current protection under ESA), should it be protected under ESA?
- If a species is wide-ranging and begins, on its own, to reappear in an area it once occupied (as with a few wolves in Yellowstone in the late 20th century), should these animals be regarded as a "resident population" for purposes of ESA?
- Should a formerly widely distributed species (such as bald eagles) warrant protection in parts of its range, when it is still or has again become fairly abundant in other parts of its range?
- Should a species that is possibly "contaminated" with genes from other populations (as with Florida panthers) warrant protection?

More broadly, how should the federal government regulate in the inevitable absence of complete information, and what is the current posture of the ESA in this regard?

Precautionary Principle: The Two-Edged Sword?

Different constituencies react to decisions under ESA based on a number of factors. People who face job loss, or communities fearing economic instability, would probably respond that the federal government should be quite certain that the species is present (as with Canada lynx and Alabama sturgeon), is valid taxonomically (as with eastern wolves and northern goshawks), is protected over no wider an area than necessary (as with Rocky Mountain wolves), and is delisted as soon as possible (as with bald eagles and Florida panthers). Representatives of many scientific or environmental organizations would probably counter that the federal government should provide a margin of safety to recognize both the irreversibility of extinction and the frequent lack of complete information. This can best be achieved, they might add, by beginning to protect species when their populations are still sufficient to avoid drastic and expensive measures (e.g., the extensive efforts necessary for whooping cranes and Florida panthers), and by seeking to promote and protect ecological balance wherever possible.

In effect, it is the *precautionary principle* that is being invoked by these various interests. This principle, exemplified in the expression "better safe than sorry," can be loosely defined as applying to situations when potential harm is serious and irreversible, though full scientific certainty is lacking. The precautionary principle would have regulators act to reduce (or eliminate) the harm while weighing the probable costs and benefits of acting or not acting.[100] The precautionary principle is not the sole purview of one side of the debate: scientists would invoke it in some debates to be certain of protecting a species or its habitat, while those fearing job loss would invoke it to protect their livelihoods.

At this philosophical level, the scientific questions shade into law and policy: how should regulations be administered and on which side should the "burden of proof" lie for protection?

[100] For discussions of the precautionary principle, see Poul Herremoës, et al. (eds.), *Late Lessons from Early Warnings: the Precautionary Principle 1896-2000*, European Environment Agency, Report No. 22; and Vern R. Walker, "Some Dangers of Taking Precautions Without Adopting the Precautionary Principle: A Critique of Food Safety Regulation in the United States," *Environmental Law Reporter*, v. 31 (2001): 10040-10047. A significant aspect of the debate on this issue, particularly in the regulation of pollution, is what level of knowledge is needed about potential harm to justify action.

That is, should a project be allowed to go ahead because it cannot be proven harmful to a listed species? Or should it be stopped because it cannot be proven to avoid jeopardy? For example, a dam may be proposed whose reservoir would replace some miles of rapids with still water, thereby substantially altering a large portion of some listed species' known habitat. All sides may agree that construction of the dam would have this effect. FWS might issue a jeopardy opinion on the dam's construction—knowing that the listed fish is found only in areas with rapids and that fish rarely tolerate this much change. FWS would argue that not only is it fulfilling its statutory obligation to "ensure" that the action would not jeopardize the species, but also that it is basing its decision on sound science—using the precautionary principle because there is not enough information to show that dam construction would be safe for the species. Supporters of the dam may ask for proof that the listed fish could not survive in the new reservoir or argue that this particular fish might not respond in the same manner as other related species that had been studied more extensively.[101] They may further argue that FWS's decision is based on "bad science"—that in the face of such uncertainty, the precautionary principle would have the agency construct the dam and benefit those dependent on the reservoir's water, rather than allow the threat to the listed fish to stop construction. Yet the underlying science is the same. In this example, the same scientific information is being used to justify opposite positions, based on different applications of the precautionary principle. And both positions would be based on the (usually false) hope that scientific certainty is even possible in policy decisions.

For many of the species facing extinction, there may be little or no information and insufficient personnel or funds available to study them, especially those species with little charisma or known economic value. What should be done in such instances? Should decisions be weighted in favor of the species, or of the users (e.g., irrigators, ranchers, builders)? The ESA does not expressly address this balancing act (and certainly not quantitatively), but considering the strongly protective purpose of the ESA—to save and recover species—and considering the statutory requirement to use the "best scientific ... data available,"[102] arguably the ESA intends that all declining species should be given the benefit of the doubt and a margin of safety provided. Many scientists feel this is the appropriate stance—that we should apply the precautionary principle to "save all the pieces (species)" since we lack the knowledge to pick and choose among species. Others counter that such protection may prove unnecessary while imposing substantial economic injury. The National Research Council concluded that the current balance between these two views in the agencies leans toward less protection: "[T]he structure of hypothesis testing related to listing and jeopardy decisions can make it more likely for an endangered species to be denied needed protection than for a non-endangered species to be protected unnecessarily."[103]

ESA Provisions on Science

The ESA requires that decisions to list a species be made "solely on the basis of the best scientific and commercial data available"[104] and after reviewing the status of the species and taking into

[101] Note that studies to answer the questions raised by the supporters of the dam could be quite difficult, might take several seasons, and could even be impossible if the species is sufficiently rare. Yet FWS must, within a limited time, reach a biological opinion on whether the dam would jeopardize the species or adversely modify critical habitat.

[102] ESA Section 4(b).

[103] National Research Council, *Science and the Endangered Species Act* (Washington, DC: National Academy Press, 1995), p.15. Many of the issues under debate were studied, described, and discussed in this publication. (Hereinafter referred to as *Science & ESA*.)

[104] A committee report on legislation amending the ESA discussed why listing was to be solely a scientific decision and also interpreted *commercial data* as meaning trade data (e.g., landings of fish, skins sold, or export statistics). In

account those efforts being made by states, political subdivisions of states, or foreign nations to protect the species. The word *solely* was added in the 1982 amendments to the ESA, to clarify that the determination of endangered or threatened status was intended to be a biological decision made without reference to economic or other "non-biological" factors which could be considered in fashioning responses once a species is listed. There is no elaboration on the meaning of the phrase elsewhere in the ESA itself or in agency regulations. Incomplete data, different interpretations among scientists, and evolving disciplines in science[105] can make the consideration of relevant science challenging for the regulatory agencies.

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discussing the addition of the word *solely*, H.Rept. 97-567 (1982), at pp. 19-20, states:

> The principal purpose of the amendments to Section 4 is to ensure that decisions pertaining to the listing and delisting of species are based solely upon biological criteria and to prevent non-biological considerations from affecting such decisions. To accomplish this and other purposes, Section 4(a) is amended in several instances.
> Section 4(b) of the Act is amended in several instances by Section 1(a)(2) of H.R. 6133. First, the legislation requires that the Secretary base his determinations regarding the listing or delisting of species "solely" on the basis of the best scientific and commercial data available to him. The addition of the word "solely is intended to remove from the process of the listing or delisting of species any factor not related to the biological status of the species. The committee strongly believes that economic considerations have no relevance to determinations regarding the status of species and intends that the economic analysis requirements of Executive Order 12291, and such statutes as the Regulatory Flexibility Act and the Paperwork Reduction Act, not apply. The committee notes, and specifically rejects, the characterization of this language by the Department of the Interior as maintaining the status quo and continuing to allow the Secretary to apply Executive Order 12291 and other statutes in evaluating alternatives to listing. The only alternatives involved in the listing of species are whether the species should be listed as endangered or threatened or not listed at all. Applying economic criteria to the analysis of these alternatives and to any phase of the species listing process is applying economics to the determinations made under Section 4 of the Act and is specifically rejected by the inclusion of the word "solely" in this legislation.
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> Section 4(b) of the Act, as amended, provides that listings shall be based solely on the basis of the best "scientific and commercial data" available. The committee did not change this information standard because of its interpretation of the word "commercial" to allow the use of trade data. Retention of the word "commercial" is not intended, in any way, to authorize the use of economic considerations in the process of listing a species.

The conference report on the same legislation confirms that it was the intent of both chambers that economic factors not play a role in the designation and listing of species for protection. H.Rept. 97-835 (1982) at p. 19, states:

> Section 2 of the Conference substitute amends section 4 of the Act in several ways. The principal purpose of these amendments is to ensure that decisions in every phase of the process pertaining to the listing or delisting of species are based solely upon biological criteria and to prevent non-biological considerations from affecting such decisions.
>
> The Committee of Conference (hereinafter the committee) adopted the House language which requires the Secretary to base determinations regarding the listing or delisting of species "solely" on the basis of the best scientific and commercial data available to him. As noted in the House Report, economic considerations have no relevance to determinations regarding the status of species and the economic analysis requirements of Executive Order 12291, and such statutes as the Regulatory Flexibility Act and the Paperwork Reduction Act, will not apply to any phase of the listing process. The standards in the Act relating to the designation of critical habitat remain unchanged. The requirement that the Secretary consider for listing those species that states or foreign nations have designated or identified as in need of protection also remains unchanged.
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> The committee adopted, with modifications, the Senate amendments which combined and rewrote section 4(b) and (f) of the Act to streamline the listing process by reducing the time periods for rulemaking, consolidating public meeting and hearing requirements and establishing virtually identical procedures for the listing and delisting of species and for the designation of critical habitat.

[105] For example, the science of taxonomy and systematics has been revolutionized by experimental tools acquired from both genetics and computational biology. *Science & ESA*, p. vii.

The decision of whether to list a species can be compared to diagnosing versus treating cancer: whether a patient *has* cancer should be a strictly medical decision; other factors—whether the patient can afford treatment, whether the cancer can be treated effectively, etc.—can be considered in deciding how (or even whether) to *treat* the cancer. Similarly, Congress provided that scientific data alone should be the basis for listing decisions, but other factors are to be considered in other decisions and actions under the act.[106]

Science can also play a role in post-listing decisions and procedures under the ESA. For example, scientific information is used in designating critical habitat for listed species. Science also is heavily involved in the "consultation" process under Section 7 of the act. During this process, an agency proposing an action ascertains whether the proposed action might affect a listed species. If the proposed action might adversely affect a listed species, FWS or NMFS renders a biological opinion on whether the action might jeopardize the continued existence of a species or result in destruction or adverse modification of critical habitat of a listed species. If so, FWS or NMFS suggests "reasonable and prudent alternatives" to the proposed agency action so as to avoid those outcomes.[107] The science that underlies these opinions and recommended alternatives must be summarized and frequently has been challenged.

Science also is used to develop habitat conservation plans and incidental take permits under Section 10 of the ESA, and also is a part of the development of recovery plans to bring the species to the point where the protections of the ESA are no longer needed.

Judicial Interpretation of the Use of Science Under the ESA

As a general matter, judicial review can help ensure that agency decisions and use of scientific data are sound. Under the Administrative Procedure Act (APA), a court may set aside an agency's decision if it is "arbitrary, capricious, an abuse of discretion or otherwise not in accordance with law."[108] The Supreme Court has described circumstances in which a rule would normally be found arbitrary and capricious: "if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise."[109]

[106] For example, economic impacts and other relevant impacts *must* be considered when designating critical habitat under §4(b)(2) of the ESA (16 U.S.C. §1533(b)(2)), and the Secretary may modify a designation based on these considerations.

[107] In very exceptional cases (well under 0.1%), FWS or NMFS may issue a jeopardy opinion without reasonable and prudent alternatives, i.e., the agency cannot offer a reasonable and prudent alternative that would still allow the project to go forward without jeopardizing the species or without adversely modifying its designated critical habitat. In such cases, the action agencies have two or possibly three choices: (a) drop the project; (b) apply for an exemption through §7 (generally considered a very burdensome option by federal agencies and therefore very rarely attempted); or (c) continue anyway, and risk a lawsuit if their actions are discovered and challenged.

[108] 5 U.S.C. §706(2)(A).

[109] Motor Vehicle Manufacturers Association v. State Farm Mutual Automobile Insurance Co., 463 U.S. 29, 43 (1983); Okeeffe's, Inc. v. U.S. Consumer Product Safety Commission, 92 F.3d 940, 942 (9th Cir. 1996).

The agency must "examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made."[110] In reviewing an agency action, the courts generally are "highly deferential" to the agency.[111] This is especially true with respect to matters, such as scientific issues, that involve the agency's particular expertise,[112] but the presumption of agency expertise may be rebutted where the agency decision is not reasoned and the agency fails to articulate a rational relation between the facts found and the decision made.[113] In the ESA context, the APA standards may require that regulations or agency actions be rationally related to the problems causing the decline of a species, especially when other interests are adversely affected.

Courts have elaborated on the use of science in general, and on the *best data available* language within the ESA. One court has held that the statutory phrase does not require, and hence a court cannot order, FWS or NMFS (the Services) to conduct additional studies to obtain missing data, and that the agency must rely on even inconclusive or uncertain information if that is the best available at the time of a listing decision.[114] The relevant agency cannot ignore available biological information,[115] especially if that information is the most current[116] or is scientifically superior to that on which the decision-maker relied.[117] A federal agency requesting consultation under Section 7 of the ESA cannot refuse to provide FWS with the "most relevant scientific data available from reputable scientists on the ground that it was not perfect" or its methodology could be criticized, because doing so would eviscerate the statutory requirement that the best available science be used.[118] However, if there is a lack of science, the agency cannot rely on data that its own scientists unanimously agree is inaccurate.[119]

Courts have addressed how the Services should consider future actions in listing decisions. A Service may not postpone listing a declining species until it is on the brink of extinction in reliance on uncertain, future actions of another agency.[120] The Services must rely on existing regulatory mechanisms in their listing determinations,[121] and not on future, uncertain, or voluntary actions to justify a decision not to list a species,[122] although cooperative efforts may be considered.[123]

A court also has said that "the 'best scientific and commercial data available' is not a standard of absolute certainty, and [is] a fact that reflects Congress' intent that the FWS take conservation

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[110] Motor Vehicle Mfrs., *supra*, at 43; Dioxin/Organochlorine Center v. Clarke, 57 F. 3d 1517, 1525 (9th Cir. 1995).

[111] Ethyl Corporation v. Environmental Protection Agency, 541 F. 2d 1, 34 (D.C. Cir. 1976), *cert denied*, 426 U.S. 941 (1976).

[112] Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 377 (1989).

[113] Maine v. Norton, 257 F. Supp. 2d 357, 389-390 (D. Me. 2003)(internal citations omitted).

[114] Southwest Center for Biological Diversity v. Babbitt, 215 F.3d 58 (D.C. Cir. 2000).

[115] Connor v. Burford, 848 F.2d 1441 (9th Cir. 1988).

[116] Southwest Center for Biological Diversity v. Babbitt, 926 F. Supp. 920, 927 (D. Ariz. 1996).

[117] Las Vegas v. Lujan, 891 F. 2d 927, 933 (D.C. Cir. 1989).

[118] Natural Resources Defense Council v. Evans, 279 F. Supp. 2d 1129, 1179-80 (N.D. Cal. 2003).

[119] Center for Biological Diversity v. Lohn, 296 F. Supp. 2d 1223, n.13 (W.D. Wash. 2003).

[120] Biodiversity Legal Foundation v. Babbitt, 943 F. Supp. 23 (D.D.C. 1996).

[121] Section 4(a)(1)(D); 16 U.S.C. §1533(a)(1)(D).

[122] Southwest Center for Biological Diversity v. Norton, Civ. Action No. 98-934, 2002 U.S. Dist. LEXIS 13661 at *27 (D.D.C. July 29, 2002), citing: Biodiversity Legal Foundation v. Babbitt, 943 F. Supp. 23, 26 (D.D.C. 1996) and Oregon Natural Resources Council v. Daley, 6 F. Supp. 2d 1139, 1153-1154 (D. Or. 1998).

[123] Defenders of Wildlife v. Babbitt, 97-CV-2330, 1999 U.S. Dist. LEXIS 10366 (S.D. Cal. 1999).

measures before a species is 'conclusively' headed for extinction."[124] If FWS does not base its listings on speculation, or disregard superior data, the fact that the studies on which it does rely are imperfect does not undermine those authorities as the best scientific data available—"the Service must utilize the best scientific ... data *available*, not the best scientific data *possible*" (emphasis added).[125]

On the other hand, an agency's response must be appropriate to the problem that needs to be solved. One case struck down regulations that totally banned duck hunting in an area to protect one species of duck.[126] Another case stated that low numbers of a particular species alone did not necessarily warrant listing—other factors must be considered, such as the reasons for the low numbers, whether the numbers are declining, and how experts view the population numbers.[127]

Another court stated that the bar FWS has to clear in terms of evidence is very low, but it must at least clear it. In the context of issuing Incidental Take Permits under Section 10 of the ESA, this means the Service must demonstrate that a species is or could be in an area before regulating it, and must establish the causal connection between the land use being regulated and harm to the species; mere speculation of potential harm is not sufficient.[128]

One court held that a biological opinion that was not "coextensive in scope" with the agency action failed to consider important aspects of the problem and was therefore arbitrary and capricious.[129]

Congressional Action

In the last decade, several bills have been introduced to address the role of science in ESA decisions. Although committee hearings have been held and some bills have been reported, none have been enacted.[130] Some bills address very specific aspects of science in the ESA context; others concern the fundamental treatment of scientific matters under the ESA.

No bills have been introduced to date in the 113th Congress to amend the ESA. In the 112th Congress, among the bills addressing specific science questions, H.R. 909, S. 706, and S. 1720 would have prohibited consideration of the climate change-related impact of a greenhouse gas upon any species of fish, wildlife, or plant. H.R. 1837 would have prohibited the Secretaries of the Interior and Commerce from distinguishing between natural-spawned and hatchery-spawned, or otherwise artificially propagated strains of a species, in making any determination under ESA

[124] Defenders of Wildlife v. Babbitt, 958 F. Supp. 670, 680 (D.D.C. 1997).

[125] Building Industry Ass'n of Superior California v. Norton, 247 F.3d 1241, 1246-1267 (D.C. Cir. 2001), *cert. denied* 534 U.S. 1108.

[126] Connor v. Andrus, 453 F. Supp. 1037 (W.D. Tx. 1978).

[127] See Southwest Center for Biological Diversity v. Norton, Civ. Action No. 98-934, 2002 U.S. Dist. LEXIS 13661, at *35-*38 (D D.C. July 29, 2002).

[128] Arizona Cattle Growers Association v. United States Fish and Wildlife Service, 273 F. 3d 1229 (9th Cir. 2001).

[129] Greenpeace v. National Marine Fisheries Service, 80 F. Supp. 2d 1137, 1150 (W.D. Wash. 2000). In this case, data were available on the cumulative effects of the agency action, but were not analyzed.

[130] A detailed analysis of the provisions and feasibility of these measures is beyond the scope of this report. For a list of current ESA bills with a brief description of their provisions, see CRS Report R40185, *The Endangered Species Act (ESA) in the 111th Congress: Conflicting Values and Difficult Choices*, by Eugene H. Buck et al. and CRS Report R41608, *The Endangered Species Act (ESA) in the 112th Congress: Conflicting Values and Difficult Choices*, by Eugene H. Buck et al.

that relates to any anadromous fish species that are present in the Sacramento and San Joaquin Rivers or their tributaries.

Other bills take on more generic matters, though few recent bills have taken this broader approach. Proponents of "sound science" legislation believe that ESA amendments are necessary to rein in the perceived extremism of the ESA that allowed federal agencies to use "shoddy science."[131] Furthermore, supporters believe amendments are needed to help those who have to deal with an "unreasonable" ESA. They claim that private property rights would be helped by these proposals because a species would have to actually be endangered to be listed and that the proposals would make it more difficult to use falsified data, which they charged was being done by government agencies.[132] Also, they see this legislation as improving recreational and commercial access to public lands. They claim that access to public lands is improved when ESA decisions use peer-reviewed science to protect "truly endangered species."[133]

Opponents voice concerns that "sound science" legislation is a misnomer and would substantially weaken the "best available science" used to implement the ESA and undermine the precautionary approach to protecting imperiled plants and animals.[134] They are concerned that such legislation might weaken the ESA by putting in place requirements for studies and processes that are impossible to achieve, radically weakening America's ability to protect its threatened and endangered species and wildlands. They further believe that legislation, using the mask of "sound science," would result in special rights for industry, and increase the costs, delays, and bureaucracy associated with implementing the nation's most important wildlife conservation law.[135] They further claim widespread support among scientists for their views.

In July 2002, a letter from more than 300 scientists was sent to members of Congress requesting that the "current debate over science in the ESA not lead to changes that could weaken the ESA's provisions to stem the loss of biological resources."[136] They were concerned that adding requirements would cause additional delays and increase bureaucratic procedures for crucial decisions, that added peer review requirements were unnecessary, that new statutory limits on the use of scientific methods (e.g., analysis of population viability) for the collection and analysis of scientific data would reduce protection, and that policy-makers should follow the precautionary principle and take "the most prudent course of action by choosing alternatives that are not likely to harm listed species."

FWS raised concerns about "sound science" legislation when testifying before the 107th Congress:[137]

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[131] See "Bill Challenges Environmental Extremism" at http://www.newsmax.com/archives/articles/2002/7/8/193618.shtml.

[132] American Land Rights Association, "Endangered Species Bill Protects Property Rights," press release, July 10, 2002 (available at http://www.ewire.com/display.cfm?Wire_ID=1239).

[133] "Endangered Species Not So Endangered," *Blue Ribbon Magazine*, February 2003 (available at http://www.sharetrails.org/magazine/article.php?id=156).

[134] See the Endangered Species Coalition at http://www.stopextinction.org/.

[135] Sasha Gennet, "New ESA Amendments: Sound Science or Political Shell Game?" *BioScience*, vol. 54, no. 12 (December 2004), p. 1070. Available at http://www.bioone.org/perlserv/?request=get-document&issn=0006-3568&volume=054&issue=12&page=1070.

[136] Ellen Paul, "Science: The Newest Political Football in the Endangered Species Game," *BioScience*, vol. 52, no. 9 (September 2002): 792. A copy of the letter, dated July 9, 2002, was posted at http://www.earthjustice.org/program/wildlife/science.html.

[137] Craig Manson, Assistant Secretary for Fish and Wildlife and Parks, before the House Committee on Resources, March 20, 2002, at http://www.fws.gov/laws/Testimony/107th/2002/MansonESA3.20.htm.

> [W]e have concerns with the structural and budgetary impacts of enacting this legislation. We also believe that the Department has existing authority to implement improvements that will greatly enhance the science we use.... We believe that the additional processes added by the two bills would be costly to implement.... We are concerned that the considerable new process required in both bills will impact the Fish and Wildlife Service's ability to provide consultations and other decisions in a timely manner and, in some cases, may compromise the Fish and Wildlife Service's ability to meet statutory deadlines.

Conclusion

The application of science under the ESA is periodically controversial in debates over the act. Yet of the thousands of science-based decisions involved in administration of the law, relatively few become controversial or generate headlines. When they do, there are those who argue that actions by FWS or NMFS provide more protection than necessary at some cost to economic welfare; others assert that insufficient attention is paid to science, resulting in insufficient or delayed protections of species that warrant more concern. To date, the relatively low number of actions judged under the two agencies' Scientific Integrity Policies suggests that outright scientific misconduct is exceedingly rare. Whether all the remaining science-based actions (both controversial and non-controversial) under ESA reach a substantially higher standard is uncertain; the debate concerning under- or over-protection based on science continues.

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