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Science, Judgment, and Controversy in Natural Resource Regulation, (with H. Doremus)

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I. INTRODUCTION

The modern environmental movement is the heir to the Enlightenment's substitution of science, broadly defined, for religion as the fundamental norm for organizing society. There are, of course, important ethical, religious and "spiritual" strands to modern environmentalism, but environmentalism is primarily science-based. Environmentalism would not exist were it not for the writings of scientists such as Aldo Leopold,[1] Rachael Carson,[2] Rene Dubos[3] and Paul Sears,[4] to name just a few. Environmental law is even more indebted than the environmental movement to science; science has been seen both as the justification for environmental law and as the means for fairly administering it.

Initially, environmentalism was built on a simple but radical principle: let nature be. The hope was that science could point the way to measures that would let nature co-exist with human exploitation. The modern recognition of the complexity of nature and the need for active

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[1]ALDO LEOPOLD, A SAND COUNTY ALMANAC (1949).

[2]RACHEL CARSON, SILENT SPRING (1962).

[3]RENE DUBOS, REASON AWAKE: SCIENCE FOR MAN (1970).

[4]THE SUBVERSIVE SCIENCE: ESSAYS TOWARD AN ECOLOGY OF MAN (Paul Shepard and Daniel McKinley, eds. 1967).

management has made science even more important. Today, environmental law seeks to find the perfect balance between preservation and exploitation.

Administration of the Endangered Species Act (ESA) in the Klamath Basin illustrates the challenges of scientifically managing nature. A series of science-based decisions are needed, from species listing to consultation on federal actions. Those decisions carry substantial costs for the people who share the landscape with protected species. Unless science can provide some level of confidence that management actions are both necessary and effective, those decisions will be widely perceived as unfair. The key question, not yet answered, is just how much confidence should be expected.

That science must play a role in natural resource management decisions goes almost without saying. It is obvious that we cannot protect endangered species unless we know something about their needs, that we cannot rebuild depleted fisheries without some sense of their population dynamics, and that we cannot sensibly decide whether and to what extent to log in our national forests unless we know something about how that decision will impact the physical and biotic environment. Not surprisingly, the law has responded to the need for scientific input. A wealth of legislative and regulatory mandates require that environmental and natural resource management agencies seek the advice of scientists, consider the best available scientific information, or obtain outside scientific review of their decisions.

Natural resource regulation, it would be fair to say, is heavily "scientized," by which we mean both that the current regulatory structure requires the use of science in a wide range of decisions, and that the decisionmakers emphasize the role of science in those decisions. Nonetheless, critics on all sides of the political spectrum claim to believe that regulatory decisions remain insufficiently scientific. Critics equate scientific decisionmaking with an objective, rational, analytically rigorous approach, contrasting it with "political" decisionmaking,

which is assumed to be subjective, emotional, and responsive to special interests.[5] They agree that making decisions more scientific, and thus less political, will produce better regulatory decisions.[6] However, at this point the consensus disappears. Critics sharply disagree about whether regulators are plagued primarily by too little good information or too much bad information.

There may well be points in the decisionmaking process at which greater objectivity would be desirable. As we argue in more detail below, however, science can never provide the perfect rationality we have been conditioned to expect from it. Therefore, simplistic generalized demands for objective rationality are not a useful reform strategy. Typically, the disputes are fundamentally about how incomplete data are interpreted and applied, rather than about what the data are or how they have been gathered. Agency judgments, in other words, are the real issue. It is impossible to entirely prevent the exercise of judgment, influenced by the subjective values and biases of the decisionmaker, from creeping into decisions. A more useful inquiry would take a closer look at the role of judgment, asking at what stage and through what mechanisms it

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[5]Some legal academics, particularly proponents of quantifiable decisionmaking, have also urged the need to make regulatory decisions, particularly those in the environmental realm, more scientific. *See, e.g.,* E. Donald Elliott, *Strengthening Science's Voice at EPA*, 66 LAW & CONTEMP. PROB. 45, 49 (2003) ("there is currently too much politics and not enough science in our environmental decisions").

[6]Two reports issued within months of each other from very different political perspectives illustrate this point. In July 2003, the conservative Hoover Institution published POLITICIZING SCIENCE: THE ALCHEMY OF POLICYMAKING (Michael Gough, ed., 2003), a collection of essays, many about environmental regulation, complaining that politics was overriding science to produce rampant unnecessary environmental regulation. The next month, Representative Henry Waxman, a liberal Democrat, released a report, asserting that the George W. Bush administration had sacrificed scientific integrity at federal agencies in order to further its conservative agenda. U.S House of Representatives Committee on Government Reform – Minority Staff Special Investigations Division, Politics and Science in the Bush Administration (Prepared for Representative Henry Waxman) (available, as updated November 13, 2003, at http://democrats.reform.house.gov/features/politics_and_science/pdfs/pdf_politics_and_science_rep.pdf). Early in 2004, the Union of Concerned Scientists weighed in with its own report charging that the Bush administration was manipulating, distorting, and suppressing science on an unprecedented scale. Union of Concerned Scientists, Scientific Integrity in Policymaking: An Investigation into the Bush Administration's Misuse of Science 2 (March 2004) (available at http://www.ucsusa.org/global_environment/rsi/page.cfm?pageID=1322).

factors into resource management decisions, whether the effect of those judgment steps is to advance or retard the identification and achievement of societal goals, and, when correction is needed, how judgments might be more closely constrained.

II. What Science-Based Decisionmaking Is Intended to Achieve

As a preliminary step before considering whether the use of science in resource management decisions requires reform, and if so in what guise, it is worth looking more closely at what benefits science is supposed to bring. Science mandates, in their various forms, are expected to serve several distinct goals.

First, science is supposed to help society achieve exogenously-determined substantive goals by ensuring that the most precise and accurate information available is factored into decisions. For example, before harvest of marine mammals may be authorized under the Marine Mammal Protection Act (MMPA), the National Marine Fisheries Service (NMFS, also known as NOAA Fisheries) must find, on the basis of the best scientific evidence available, that the permitted harvest is consistent with "sound principles of resources protection and conservation" and "will not be to the disadvantage" of the stock in question.[7] Science is invoked to help assure that the substantive conservation goals of the Act, primarily maintenance of stocks at the optimum sustainable population level,[8] are met.

Second, science is expected to clarify highly general goals in specific contexts, or to strike a viable balance between conflicting goals. Again the MMPA provides an example. Optimum sustainable population is defined as the population level that will provide the greatest productivity for harvest, consistent with the health of the ecosystem.[9] That goal is a compromise between exploitation and protection; science is expected to identify the point at which society

[7] 16 U.S.C. § 1371(a)(3)(a), 1373(a).

[8] 16 U.S.C. § 1361(2).

[9] 16 U.S.C. § 1362(9).

can have its cake while eating as much of it as possible. Similarly, under the ESA, federal agencies must ensure, using the best scientific data available, that their actions will not jeopardize the continued existence of a listed species.[10] But if, in the course of the consultation process through which this obligation is implemented, the regulatory agency determines that the proposed action will cause jeopardy, it must recommend reasonable and prudent alternatives,[11] that is modifications of the action that will allow it to proceed without jeopardizing the listed species. These statutory requirements assume that science can find a perfect balance point, allowing extraction and development precisely up to the point at which they become inconsistent with conservation. In this paradigm, science justifies regulatory restrictions that impose substantial economic impacts on individuals and communities dependent on resource exploitation by showing those restrictions to be necessary and effective.

Third, science mandates might be intended to constrain the exercise of discretion by agencies that are no longer automatically trusted to pursue the public interest. As Justice Scalia put it in *Bennett v. Spear*:

> The obvious purpose of the requirement that each agency "use the best scientific and commercial data available" is to ensure that the ESA not be implemented haphazardly, on the basis of speculation or surmise. While this no doubt serves to advance the ESA's overall goal of species preservation, we think it readily apparent that another objective (if not indeed the primary one) is to avoid needless economic dislocation produced by agency officials zealously but unintelligently pursuing their environmental objectives.[12]

When the science mandates of the ESA and other conservation laws were first put in place in the early 1970s, they might reasonably have been seen as needed to increase judicial oversight,

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[10]16 U.S.C. § 1536(a)(2).

[11]16 U.S.C. § 1536(b)(3)(A).

[12]520 U.S. 154, 176-77 (1997). We do not endorse Justice Scalia's exercise in stautory interpretation, which ignores both the ESA's overriding conservation purpose and the specific history of its science requirements. *See* William W. Buzbee, Expanding the Zone, Tilting the Field: Zone of Interests and Article III Standing Analysis After Bennett v. Spear, 49 Admin L. Rev. 763, 784-86 (1997). We simply use it as an example of one kind of expectation for science-based decisionmaking.

because judicial review under the Administrative Procedure Act (APA) at that time was extraordinarily deferential.[13] Today, however, ordinary APA review requires that agencies provide some scientific justification for highly technical decisions even in the absence of any explicit legislative science mandate. It is not clear that science mandates add any additional level of constraint.[14]

Science mandates do help to limit the influence of forbidden considerations in regulatory decisions, in a way that the APA's limits on arbitrary and capricious decisions do not. For example, the ESA was amended in 1982, in response to the Reagan administration's refusal to add species to the protected list, to require that listing decisions rest solely on the best scientific data available.[15] That change was intended to prevent the regulatory agencies from deciding not to list species based on concerns about the economic costs of conservation.[16] While no one believes the change has entirely kept costs out of the implicit regulatory analysis, it at least forecloses open reliance on costs as a basis for refusing to list.

A science mandate need not be as explicit as the ESA's listing provision to have this effect; it may enough that the decision to be made is clearly a scientific one. Under a statute making continued imports of tuna dependent upon the Secretary of Commerce finding that the common practice in eastern Pacific tuna fisheries of setting nets based on the presence of dolphins was not having a significant adverse effect on dolphin populations, a federal court recently held that the Secretary could not consider the impact of the decision on trade or

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[13]*See* Merrick B. Garland, *Deregulation and Judicial Review*, 98 HARV. L. REV. 505, 532 (1985).

[14]Holly Doremus, *The Purposes, Effects, and Future of the Endangered Species Act's Best Available Science Mandate*, 34 ENVTL. L. 397, 423 (2004).

[15]16 U.S.C. § 1533(b)(1)(A).

[16]Holly Doremus, *Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 WASH. U. L.Q. 1029, 1055 (1997); H.R. CONF. REP. NO. 97-835 at 20; H.R. REP. NO.97-567 at 20.

international relations.[17] The court reversed the agency's conclusion that there was no significant effect, because the evidence suggested that conclusion was based more on concerns about foreign relations than on the available scientific evidence.

Finally, it is often hoped that requiring that agencies base their regulatory decisions on science will tone down intense conflicts over the allocation of scarce natural resources. For example, the CALFED Bay-Delta Authority, created by agreement between California and the federal government in the late 1990s, included from the outset a strong emphasis on credible scientific analysis independent of regulatory decisionmaking, and ongoing oversight by distinguished outside scientists.[18] CALFED was intended to resolve the bitter conflicts between the state and federal governments, between water users and environmental groups, and among water users, that had for years paralyzed efforts to address the environmental problems plaguing the San Francisco Bay-Delta.[19] A strong science program was seen as an essential element of the program from the outset, with the idea that more complete, transparent, and credible scientific information would defuse some of the controversy.[20] Emphasis on science in decisionmaking, however, and even increased databases if decoupled from increased understanding, can exacerbate controversy by making it easier for people on all sides of the dispute to selectively

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[17]Earth Island Inst. v. Evans, 2004 WL 1774221, slip op. at 26-30 (N.D. Cal., Aug. 9, 2004).

[18]*See* CALFED Bay-Delta Program, Programmatic Record of Decision 74-76 (Aug. 28, 2000), available at http://calwater.ca.gov/Archives/GeneralArchive/rod/ROD8-28-00.pdf (last visited Jan. 27, 2005).

[19]For descriptions of the background to CALFED and the difficult and protracted negotiations that gave birth to the program, see Patrick Wright, *Fixing the Delta: The CALFED Bay-Delta Program and Water Policy Under the Davis Administration*, 31 GOLDEN GATE L. REV. 331 (2001); Elizabeth Ann Rieke, *The Bay-Delta Accord: A Stride Toward Sustainability*, 67 U. COLO. L. REV. 341 (1996); A. Dan Tarlock, *Federalism Without Preemption: A Case Study in Bioregionalism*, 27 PAC. L. J. 1629, 1643-45 (1996).

[20]*See* Katharine L. Jacobs, Samuel N. Luoma, and Kim A. Taylor, *CALFED: An Experiment in Science and Decisionmaking*, ENVIRONMENT, Jan./Feb. 2003, at 30, 36.

reinforce their beliefs.[21] Furthermore, it is easy to oversell the value of science in calming controversy. Most of the conflicts over natural resource management boil down to disagreements about values and priorities. Unless scientific information reveals that all competing goals can be achieved, it will not solve the underlying conflict.[22]

Dan will add a paragraph on acceptable risk solutions?

III. The Inevitability of Judgment in Regulatory Decisionmaking

Simple science mandates – directives that agencies use the best available scientific data, consult with scientists in formulating decisions, and seek review of data by outside scientists – could ensure accurate decisions, closely constrain agency discretion, and defuse controversy if: 1) the available scientific data were reliably complete, precise, and relevant to the decision (or could be made so within the time frame allowed for decisionmaking); and 2) agency decisionmakers could be relied upon to strike the same balance between competing goals as the larger society would. Unfortunately, neither of these conditions is routinely satisfied.

The hard reality is that the scientific information available to support environmental and natural resource policy decisions is frequently incomplete, ambiguous, and contested. An array of critical interpretive judgments, not fully determined by the data, are needed to translate that kind of science into policy. Furthermore, when societal goals must be balanced, there is no reason *a priori* to believe that they will strike the same balance as the larger society. The Klamath Basin water conflict[23] illustrates the inevitable role of judgment in natural resource regulation.

A. *The Klamath Basin Water Conflict*

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[21] Daniel Sarewitz, *How Science Makes Environmental Controversies Worse*, 7 Envtl. Sci. & Pol'y 385 (2004).

[22] *See id.* at ___.

[23] For a detailed description of this conflict, see Holly Doremus & A. Dan Tarlock, *Fish, Farms, and the Clash of Cultures in the Klamath Basin*, 30 Ecology L.Q. 279 (2003).

The Klamath Basin, straddling the Oregon-California border, contains two distinctly different parts. The inland Upper Basin is high, flat, and arid, with a climate similar to the Great Basin. Near the coast, the Lower Basin is characterized by steep mountains and abundant rainfall. Until white settlement of the area in the late 19th century, the Upper Basin landscape was a system of interconnected shallow wetlands – the Everglades of the west. The vast majority of those wetlands were drained early in the 20th century for conversion to agriculture. The federal Klamath Project, operated by the Bureau of Reclamation, irrigates the highest-value farm land in the Upper Basin. The major natural waterbody in the Upper Basin, Upper Klamath Lake, serves as the primary storage reservoir for the Project. Upper Klamath Lake is extensive but very shallow, averaging only eight feet deep. It cannot store enough water to carry over from year to year. As a result, Klamath Project water supplies are always at the mercy of the highly variable annual precipitation.

Three species of fish in the Klamath Basin are protected by the ESA: the Lost River and shortnose suckers, which inhabit Upper Klamath Lake and other water bodies of the Upper Basin; and the Southern Oregon / Northern California coastal coho salmon, which range up the Klamath River and its tributaries as far as Iron Gate Dam, the unofficial dividing point between the Upper and Lower Basins. The ESA requires that all federal agencies ensure that their actions do not jeopardize the continued existence of listed species.[24] With listed species both in the Upper and Lower Basins, the Bureau of Reclamation for the first time had to consider subordinating irrigation deliveries to species conservation. Its decisions were made through a prescribed process of consultation with two wildlife agencies: the U.S. Fish and Wildlife Service (FWS), which is responsible for the endangered suckers; and NOAA Fisheries (also known as the National Marine Fisheries Service), which oversees the threatened salmon. The action agency provides the wildlife agencies with a "biological assessment," its written evaluation of the effects

[24] 16 U.S.C. § 1536(a)(2).

of its action on listed species.[25] After reviewing that assessment, the wildlife agencies issue a "biological opinion" concluding that the action as proposed either will or will not violate the prohibition on jeopardy. If they find jeopardy, the wildlife agencies must suggest "reasonable and prudent alternatives" consistent with the proposed action and within the action agency's authority, that will not cause jeopardy.[26] The action agency ultimately makes the decision whether or not to proceed with the action, and in what form, but if it proceeds in the face of a jeopardy opinion it can expect at least a skeptical review from the courts.[27]

In 2001, a drought intensified competition for the Klamath Basin's limited water resources. The Bureau prepared a biological assessment calling for maintaining distribution of water to farmers, at the cost of reducing water levels in Upper Klamath Lake and flows in the Klamath River below those at which the Project had traditionally been operated. FWS found that the Bureau's proposal would jeopardize the listed suckers; in order to protect them, it called for maintaining higher water levels in Upper Klamath Lake. NOAA Fisheries concluded that the coho would also be jeopardized by the Bureaus's proposal; it prescribed higher seasonal flows in the Klamath mainstem than the Bureau proposed. Although it did not concede that the wildlife agencies' analyses were correct, the Bureau believed it was effectively bound by the two biological opinions. It therefore agreed to follow them. Doing so left no water available from Upper Klamath Lake for project irrigators. For the first time, the headgates of a federal irrigation project were closed in order to protect fish.

The resulting outcry focused on the extent of scientific support for the biological opinions. The Bush administration sought review of the science by the National Research Council (NRC), the policy advice arm of the independent National Academies. The NRC

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[25] 16 U.S.C. § 1536(c).

[26] 16 U.S.C. § 1536(b)(3)(A); 50 C.F.R. 402.02.

[27] *See* Bennett v. Spear, 520 U.S. 154, 169 (1997) (explaining that a biological opinion "theoretically serves an 'advisory function,'" but actually has a powerful coercive effect because it will influence reviewing courts).

followed its usual procedure, appointing a committee of experts from a variety of disciplines to spend several months reviewing the Klamath biological opinions. The committee's preliminary report concluded, in terms far less nuanced than most NRC reports, that there was "no substantial scientific support" for either FWS' demands for higher lake levels or NOAA Fisheries' demands for higher river flows.[28] The committee also noted that there was no substantial scientific support for the Bureau of Reclamation's proposal to reduce lake levels and instream flows.[29] Subsequently, in a much more detailed final report, the committee reiterated and expanded upon its conclusions.[30] Because the Klamath conflict has been used by critics of the ESA to argue that regulatory decisions are not sufficiently scientific,[31] it makes a useful example of the inevitable role of non-scientific judgments in the regulatory process.

B. *A Taxonomy of Judgment in the Regulatory Process*

The Klamath conflict illustrates the three types of judgment needed to translate scientific data into regulatory decisions. It also vividly demonstrates that natural resource conflicts are typically fundamentally about the judgments applied to the existing scientific data, rather than about the data themselves or the methods by which they are derived.

1. *Scientific judgments*

The scientific process is an extraordinarily powerful method of generating strongly reliable, objective information about the natural world over time. Scientists gather data through

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[28]NATIONAL RESEARCH COUNCIL, INTERIM REPORT FROM THE COMMITTEE ON ENDANGERED AND THREATENED FISHES IN THE KLAMATH RIVER BASIN, SCIENTIFIC EVALUATION OF BIOLOGICAL OPINIONS ON ENDANGERED AND THREATENED FISHES IN THE KLAMATH RIVER BASIN 2 (2002).

[29]*Id.*

[30]NATIONAL RESEARCH COUNCIL, ENDANGERED AND THREATENED FISHES IN THE KLAMATH RIVER BASIN: CAUSES OF DECLINE AND STRATEGIES FOR RECOVERY (2004) [hereinafter "FINAL NRC REPORT].

[31]*See, e.g.*, Juliet Eilperin, *House Panel Approves Species Act Changes*, WASH. POST, July 22, 2004, at A19; Natalie M. Henry, *Walden to Tout ESA Reform at Klamath Basin Field Hearing*, ENVT. & ENERGY DAILY, July 16, 2004.

observations or experimental manipulations. They then communicate their results, with an explanation of the methods used to generate them, to the relevant scientific community. That allows other scientists to review and critique the work, and to repeat, refute, or extend the observations. As observations accumulate, this process builds a tentative consensus in the scientific community. Eventually, with enough research effort producing consistent results, this tentative consensus can mature into strong confidence among scientists that they understand how parts of the natural world work.

Judgment is an inherent aspect of the scientific research process. In the early stages or at the frontiers of knowledge, science is a messy process characterized by competing explanations. Research scientists must constantly exercise judgment – in deciding what to test, what explanations to accept, and which data to prefer when some are consistent with their preferred explanation and others are not.

Scientific judgments are closely intertwined with judgments about the desirability of avoiding different types of error, which are not "scientific" at all. Research scientists in many fields, by convention, do not claim that they have "proven" their point unless the data reaches a specific level of statistical significance, providing 95% confidence that their observations are not attributable to chance alone. There is nothing magic about that confidence level. It has become customary because it serves the goals of research science. It keeps scientists in the field from prematurely accepting a hypothesis as proven and moving on, likely down an unproductive research path. But, as Professor McGarity so aptly put it twenty-five years ago, "statistical significance is an issue of pure policy."[32] Furthermore, scientific conventions about statistical significance have limited force; they foreclose only claims of proof on the basis of single studies. They do not prevent scientists from believing a connection is real on the basis of far less conclusive evidence, or from acting on that belief in, for example, choosing their next research

[32]Thomas O. McGarity, *Substantive and Procedural Discretion in Administrative Resolution of Science Policy Questions: Regulating Carcinogens in EPA and OSHA*, 67 GEO. L.J. 729, 748 (1979).

project. Nor do they prevent an accumulation of studies, each of which falls short of statistical significance, from being taken as a whole to prove the connection.[33] Even without additional studies, a persuasive explanation of the relationship between an alleged cause and effect may lead scientists to accept to its existence without strong data.

An additional scientific judgment step, beyond those inherent in the research process, is often required when research science is applied to resource management. Much of the ecological research which forms the fundamental basis for resource management efforts is conducted by academics, and funded by general research programs. Not surprisingly, academic researchers focus on locations and systems that are convenient to study and fit their research goals. Those are not necessarily the same systems that require management.[34] Management controversies may bring targeted research funding but quite often, especially early in the management cycle, agency personnel must extrapolate results from small scale manipulation to large scale management, or from one location, system, or species to a very different one..[35]

The Klamath biological opinions required numerous scientific judgments. Those most directly connected to the controversy were about the effect of water levels in Upper Klamath Lake on the endangered suckers and of flows levels in the mainstem Klamath River on the threatened coho salmon. As is so often the case in natural resource management, those judgments had to be made on the basis of very limited information.

Scientific interest in the suckers and salmon was not high until they were listed under the Endangered Species Act. The earliest data correlating environmental conditions with the status

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[33]*See* Doremus, *supra* note 16, at 1070-71, and sources cited therein.

[34]When Professor Tarlock taught at Indiana University, Bloomington, he was involved in coordinating the University response to a proposal by a public utility to run a power line through a University-owned hardwood forest. A young professor of biology offered to brief the Board of Trustees on the adverse environmental impacts of power lines, but he had to be dissuaded from talking about the interruption of mountain lin and grizzly bear migration patterns, since those species were not known to exist in southern Indiana.

[35]Gordon L. Baskerville, *Advocacy, Science, Policy, and Life in the Real World*, 1 CONSERVATION ECOLOGY 9 (1997), http://www.consecol.org/vol1/iss1/art9.

of the suckers, therefore, dated only to 1990. Even for that brief period, the available data were spotty and had not been collected systematically. When it produced its biological opinion in 2001, therefore, FWS knew it was working with limited data. It had to make very specific judgments on the basis of that very limited data, deciding whether the operation of the Klamath Project as proposed by the Bureau of Reclamation would impermissibly affect the suckers, and further deciding how proposed operations could be modified to lessen those impacts enough. Applying its established interpretation of the ESA that the benefit of the doubt in section 7 consultation must go to the listed species,[36] FWS called for lake levels to remain higher than the Bureau proposed, and even higher than they had been kept in recent dry years.

Reviewing that decision later, the NRC committee criticized the agency's scientific judgments, purporting to put to one side the agency's policy decision to impose some unspecified level of caution. The committee felt that the available data contradicted FWS' claim that low water levels in Upper Klamath Lake might contribute to adult mass die-offs or impede juvenile recruitment, and therefore that even a cautious interpretation of those data could not support FWS' call for higher water levels. The committee's view was surely tenable one, but not incontestable. It turns out that is not always easy to tell whether the available data confirm or refute a particular hypothesis, and that this was situation was a difficult one to sort out. The data, limited as they were, showed that adult fish kills had occurred in years of high, low, and average summer lake levels.[37] That data straightforwardly supports the NRC committee's interpretation that lake levels are not the crucial factor in mass mortality events.[38] The picture is more

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[36]U.S. Fish & Wildlife Serv. and Nat'l Marine Fisheries Serv., Endangered Species Act Consultation Handbook: Procedures for Conducting Section 7 Consultations and Conferences 1-6 (Mar. 1988).

[37]NRC FINAL REPORT, *supra* note 29, at 239

[38]In its preliminary report, the NRC committee noted that there were no fish kills in low water years in the 1990s. NATIONAL RESEARCH COUNCIL, SCIENTIFIC EVALUATION OF BIOLOGICAL OPINIONS ON ENDANGERED AND THREATENED FISHES IN THE KLAMATH RIVER BASIN: INTERIM REPORT 17 (2002).

complicated with respect to the impacts of low spring lake levels on recruitment. Because lake levels are closely related to the availability of spawning habitat, the NRC committee agreed that it was "a reasonable hypothesis" that lake levels might suppress spawning.[39] There was some data available to test that hypothesis, but not very much: six years of data comparing April lake levels with larval abundance; and relative abundance data for eight older year classes in mass mortality events, which could be compared with water levels when those fish were spawned.

Looking at those data, the committee found that they suggested that any relationship between lake levels and larval recruitment is weak or indirect.[40] With respect to the larval abundance data, the committee noted that measurements of larval abundance had a high degree of sampling variance, so that it was difficult to have confidence in the accuracy of any particular point.[41] Five of six points on the graph of spring water levels versus larval abundance suggested a reasonably strong correlation between the two. Discounting the outlying sixth point as either wrong (due to sampling error) or anomalous (due to the chance variation allowed even by the most stringent statistical significance tests) probably would have been within the bounds of accepted scientific practice, particularly since, as the committee pointed out, the conclusion that spawning success is not related to the availability of spawning habitat "seems counterintuitive."[42] The committee's interpretation that lake levels at the time of spawning were not crucial to later population levels was bolstered by the year class evidence from fish kills, which did not show a correlation with mean water level during spawning.

The regulatory agencies and the NRC committee agreed that the available data did not conclusively prove or conclusively disprove the supposition that higher spring lake levels improved recruiting success. Scientific judgments interpreting such limited and equivocal data

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[39] *Id.* at 225.

[40] *Id.* at 226.

[41] *Id.* at 225.

[42] *Id.*

reflect the educated intuition of the scientists making them, but are also nearly inextricably bound up with those scientists' views about the appropriate degree of risk of either ecological or economic harm. Any judgment based on such a small amount of data has a high probability of being wrong. There is some evidence, though, that such judgments are less affected by policy preferences if they are made with explicit consideration of a model, even a crude one, of the system concerned.[43]

2. *Management judgments*

Management judgments are judgments about the amenability of various aspects of a managed system to manipulation, and about the likely response of the system and the political community to the variety of possible perturbations. Management decisions, such as choices of priorities among several possible approaches to solving a problem, are necessarily made in light of those judgments. Management judgments are frequently informed by, but hardly ever wholly determined by, the available scientific evidence. There can be a strong feedback loop; once management judgments are made, they can strongly influence the collection and interpretation of scientific data, which in turn can tend to entrench the original management decisions.

In the Klamath Basin, FWS and NMFS had to make management judgments about where to focus their regulatory efforts. Both chose to focus heavily on the Klamath Project, relying on the section 7 consultation process to drive changes in Project operations. Other possibilities, including section 9 enforcement proceedings against private irrigators who divert water above Upper Klamath Lake,[44] or section 7 consultation for other federal actions such as management of national forest lands in the Lower Basin, were essentially ignored. That choice came in for considerable criticism in the final NRC report,[45] because the committee believed that regulation

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[43]Michael A. McCarthy et al., *Comparing Predictions of Extinction Risk Using Models and Subjective Judgment*, 26 ACTA OECOLOGIA 67 (2004).

[44]The Klamath Project irrigates only a fraction of the irrigated acreage in the Upper Basin. Doremus and Tarlock, *supra* note 22, at 345.

[45]NRC FINAL REPORT, *supra* note 29, at 323-39

of the Klamath Project alone would be both inequitable and ineffective.[46] Before the committee issued its final report, we ourselves had called for a broader approach to the Basin's problems.[47]

We remain persuaded that any lasting solution to the Klamath conflict must extend beyond the boundaries of the Klamath Project. That does not, however, mean that the regulatory agencies made improper, or even incorrect, management judgments. The rule of law requires that regulators enforce applicable statutes, but those statutes often leave them considerable discretion. In deciding how to exercise that discretion, they understandably, and appropriately, take into account both the accessibility to intervention and the leverage provided by different parts of the system. In the Klamath situation, regulators were entitled to consider that section 7 consultation proceedings, as angry as they might make people, would almost certainly be less controversial than section 9 enforcement. After all, section 7 operates through the intermediary of another federal agency. When the section 7 process produced a judgment that the headgates at Upper Klamath Lake had to be closed, that judgment was endorsed not only by the regulatory agencies, but also by the Bureau of Reclamation, an agency Project irrigators had every reason to believe would give full consideration to their interests. Even so, closure of the headgates produced a firestorm of outrage that reverberates even today on the web and in the local community. A direct attack on irrigators above the Project through section 9 probably would have produced an even more extreme reaction, likely including charges of black helicopters.

The regulatory agencies also had reasonable grounds to believe that targeting the Klamath Project would provide the greatest conservation return on enforcement efforts. The Project, unlike private irrigators, has a direct line to federal budget decisions. Its operation is the highest-profile ongoing federal action in the Basin, and the one with the strongest local political support. Reducing federal water deliveries was calculated to bring both attention and a substantial infusion of federal conservation dollars to the Basin. Indeed, the water crisis of 2001 appears to

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[46]*See id.* at 327-29.

[47]Doremus & Tarlock, *supra* note 22, at 343-49.

have had precisely that effect. Congress and the Department of Interior have pumped money into a new basin-wide restoration program being developed by the Bureau of Reclamation.[48] Oregon and California have agreed to join the federal government in a new cooperative approach to addressing the Basin's environmental woes.[49] Even with the benefit of hindsight, it cannot be said that regulators made a clear error in focusing their efforts on the Klamath Project. They had every reason to suppose that the Project, the single largest diverter in the system and a pipeline to federal funding, would provide the most bang for the regulatory buck.

3. *Policy judgments*

Policy judgments are judgments about social goals, the relative importance of those goals, and the importance of avoiding specific types of errors. Choices about the extent of scientific certainty required to justify regulatory action, for example, are policy judgments. By their very nature, policy judgments cannot be made on any objective basis.

The sequence of regulatory events that produced the controversial biological opinions of 2001 included a number of policy judgments. Those policy judgments logically precede, and provide the context for, the scientific judgments. Congress has provided vague indications of how many of these judgments should be made, but has generally left a broad space for agency discretion. The regulatory agencies, in turn, frequently leave their policy judgments unexplained, and even unacknowledged.

The first set of policy judgments in the Klamath sequence were those required in order to list the suckers and salmon under the ESA. First, FWS and NOAA Fisheries had to decide which fish to group together as "species." The statute provides only that the term "species" includes

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[48]U.S. Bureau of Reclamation, Klamath Basin Area Office, Klamath River Basin Conservation Implementation Program (Program Document, Second Draft, Feb. 2004), available at http://www.usbr.gov/mp/kbao/CIP/docs/CIP-ProgramDoc.pdf (last visited Jan. 29, 2005).

[49]Klamath River Watershed Coordination Agreement, available at http://www.doi.gov/news/klamathagreement.pdf (last visited Jan. 29, 2005).

subspecies and, for vertebrates, "distinct population segments," a term not further defined.[50] Identifying groups for protection has been particularly challenging for Pacific salmon. The genetic basis of much of the observed life history and morphological variation in salmon is poorly understood. Within recognized salmon species, sruns are often largely reproductively isolated from one another by the time and location of spawning. Believing that runs should be protected if they represented a unique evolutionary unit, in 1991, NOAA Fisheries developed a policy for identifying distinct population segments of salmon.[51] The policy provides for protection of groups that are "substantially reproductively isolated" from others, so that they promise to evolve as a separate lineage,[52] and "represent an important component in the evolutionary legacy of the species."[53] In 1995, NOAA Fisheries identified the coho salmon stocks in the Rogue, Klamath, Trinity, and Eel River basins, together with those in several smaller basins in the same area, as a single distinct population segment.[54] The agency found a relatively large genetic distance between these fish and those from rivers to the north and south of them,[55] and noted that tagged fish from this group were more likely than those from further north to spend the ocean portion of their life cycle off the California coast than their cousins from more northerly rivers.[56] Neither of these distinguishing traits amounted to a bright line. The

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[50]16 U.S.C. § 1532(16).

[51]Dept. of Commerce, Nat'l Oceanic & Atmospheric Admin., Policy on Applying the Definition of Species Under the Endangered Species Act to Pacific Salmon, 56 Fed. Reg. 58612 (Nov. 20, 1991).

[52]*Id.* at 58618.

[53]*Id.*

[54]Dept. of Commerce, Nat'l Oceanic & Atmospheric Admin., Endangered and Threatened Species: Proposed Threatened Status for Three Contiguous ESUs of Coho Salmon Ranging from Oregon Through Central California, 60 Fed. Reg. 38011 (July 25, 1995).

[55]*Id.* at 38013.

[56]*Id.* at 38014.

recognized DPS itself showed considerable genetic diversity,[57] and the ocean distributions overlapped.[58] Faced with groups of fish that were not perfectly distinct from each other, genetically or in their ocean behavior, NOAA Fisheries had to make judgments about where to draw lines. It might have excluded the Rogue River salmon from this group, or included those in the Elk River to the south.[59] Because nature itself has not provided bright lines, any choice the agency made could be criticized as arbitrary. As is typical of these decisions, the agency provided essentially no explanation for its particular choice, sticking with general references to the genetic and ocean distribution patterns.

Once they had identified listable "species," FWS and NOAA Fisheries had to make policy judgments about the degree of acceptable risk to those species. The statute defines a species as "endangered" if it is "in danger of extinction throughout all or a substantial portion of its range,"[60] and as threatened if it is "likely to become endangered in the foreseeable future."[61] That language makes it clear that endangered species must be in worse condition than threatened ones, but can hardly be considered a definitive explanation of the degree of risk needed to support listing in either category. The listing agencies have not made any effort to describe in general terms what degree of risk over what period of time they think makes a species endangered or threatened. Their individual listing decisions are also frequently quite opaque on the issue, no doubt in part because the data are often so limited that robust estimates of probability of extinction are difficult or impossible. In listing the coho salmon, NOAA Fisheries noted that the population had dramatically declined from historic levels, although the Rogue

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[57] *Id.* at 38013.

[58] *Id.* at 38014.

[59] *See id.* at 38016 (noting that some genetic samples from the Rogue were similar to those from Columbia River fish, and one sample from the Elk clustered with Umpqua River fish).

[60] 16 U.S.C. § 1532(6).

[61] 16 U.S.C. § 1532(20).

River population had recently bounced back a bit; that coho were absent from many streams in the region that had once harbored them; and that a high proportion of the naturally spawning fish in the region were first-generation hatchery fish.[62] In listing the suckers, FWS noted that the populations had declined drastically (by as much as 50%) in the last several years, and that no significant recruitment of young fish had been observed for 18 years.[63]

Once the species were listed and consultation was begun on the effects of the Klamath Project, NMFS and FWS had to determine what level of risk it would consider to fall below the jeopardy threshold and precisely what it means to "insure" that jeopardy is "not likely."[64] The Services' joint regulations suggest considerable caution in this determination: actions that "*appreciably reduce* the likelihood of survival and recovery in the wild" are considered to jeopardize the continued existence of the species.[65] As with their listing determinations, the regulatory agencies did not clearly address, however, the extent to which they believed the Bureau's proposed operation of the project would reduce the likelihood either of survival or of recovery of the listed species.

4. *Inevitable intertwining*

As these examples should make clear, even with the best of intentions it is very difficult to separate out the three different kinds of judgment. When the Services opined that the Bureau's proposed operation of the Project would cause jeopardy, although they did not openly say so they were necessarily making both scientific and policy judgments, and undoubtedly those judgments

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[62]Dept. of Commerce, Nat'l Oceanic and Atmospheric Admin., Endangered and Threatened Species: Threatened Status for Southern Oregon/Northern California Coast Evolutionarily Significant Unit (ESU) of Coho Salmon, 62 Fed. Reg. 24588-24591 (May 6, 1997).

[63]Dept. of Interior, Fish and Wildlife Serv., Endangered and Threatened Wildlife and Plants: Determination of Endangered Status for the Shortnose Sucker and Lost River Sucker, 53 Fed. Reg. 27130, 27131 (July 18, 1988).

[64]This is the operative language of ESA § 7(a)(2), 16 U.S.C. § 1536(a)(2).

[65]50 C.F.R. § 402.02 (emphasis added).

were influenced by unstated management judgments about the reaction their decisions would provoke.[66] The NRC review committee may also have had a hard time separating out these distinct judgments. The committee was formally asked only to review the science underlying the 2001 biological opinions.[67] The committee read that charge (unnecessarily, in our view) as requiring that, in deciding whether scientific evidence adequately supported the regulatory requirements, it apply norms of research science that require high levels of certainty to support a claim of "proof."[68] In addition, the committee's evaluation of the science may have been affected by its policy preferences. The committee chair wrote in an exchange in the journal *Fisheries* that "it is obvious" that the regulatory agencies will make professional judgments in a way that privileges the species they are charged with protecting, but that "where the economic stakes are high," special attention should be given to the role of speculation in those decisions.[69] It seems that the committee chair, at least, believed that over-regulation would generally be the norm,[70] and that regulators would need to be reined in when their zeal threatened to impose high economic costs on society. That the committee as a whole may have shared this view is supported by its divergent treatment of the lake level and diversion point screening requirements in the 2001 FWS biological opinion. The call for higher lake levels was criticized because it lacked substantial scientific support. But the committee endorsed FWS' call to screen the main diversion point from Upper Klamath Lake to the Project's irrigation works. The committee

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[66]It is hardly surprising that FWS will not release jeopardy opinions (unlike no-jeopardy opinions) without the signature of the regional director. U.S. Fish & Wildlife Serv. and Nat'l Marine Fisheries Serv., Endangered Species Act Consultation Handbook: Procedures for Conducting Section 7 Consultations and Conferences 1-4 (Mar. 1988) [hereinafter Consultation Handbook].

[67]NRC FINAL REPORT, *supra* note 29, at 4.

[68]*Id.* at 314.

[69]William M. Lewis, Jr., *Klamath Basin Fishes: Argument is No Substitute for Evidence*, 28(3) FISHERIES 20, 21 (Mar. 2003).

[70]As explained below, the available empirical evidence is directly to the contrary. *See infra* notes 97-99 and accompanying text.

acknowledged that the "benefits of this measure to the population are unknown;"[71] presumably it felt this less controversial step, which did not threaten to deprive farmers of their livelihood, required less supporting evidence. If the committee was indeed inclined to demand clearer scientific support for the biological opinions because of their perceived economic consequences, that policy judgment may have affected its scientific judgments.[72]

IV. CONTROLLING REGULATORY JUDGMENT

As these examples drawn from the Klamath conflict illustrate, the real battleground in arguments about the use of science in natural resource regulation is typically not the data themselves but the judgments, scientific, management, and regulatory, used to interpret the data and translate them into regulations. Environmentalists calling for more or better science do so because they think current science mandates have not done enough to achieve substantive conservation goals. Critics in the regulated community, by contrast, believe current science mandates have not done enough to protect against unnecessary and unproductive regulation. Both sides claim to want more science and less judgment, but a more accurate assessment is that both want the inevitable judgments to be more closely aligned with their policy preferences. The fundamental disagreement is over the appropriate burden of proof. Environmentalists want regulatory agencies to be more cautious about approving activities that may affect listed species, applying the precautionary principle to impose protective regulations even if the supporting evidence is less than certain. The regulated community, on the other hand, wants the agencies to be more cautious about imposing regulatory restrictions on their actions, and therefore calls for application of the very demanding standards of certainty imposed in the research science

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[71]NRC FINAL REPORT, *supra* note 29, at 237.

[72]In fact that particular policy judgment, although tenable and perhaps even appealing on its face, is rejected by the ESA, which establishes a uniform federal duty to avoid jeopardy and adverse modification of critical habitat, independent of the economic benefits of the proposed action.

community on claims of proof.[73]

Both sides, however, tend to frame their arguments in the political arena as calls for more scientific decisionmaking, relying on a widespread misperception (which they may share) that science can provide objective, perfectly rational, decisions. Both, therefore, end up promoting a debate about "good" versus "bad" (or "sound" versus "junk") science. That debate, which has taken on Miltonic proportions, is rooted in the endless and futile search for a perfect world. The horror and brutality of the 20th century destroyed the progressive vision of progress through science, reason and technology. Chicago school economics destroyed the idea of an objective, expert public interest. The Enlightenment idea that the physical sciences can be the basis of perfect rationality, though, lives on. As John Passmore observed, "the Enlighteners accepted the Socratic doctrine that vice is always a form of ignorance, that if man once learns what is best for him to do, he will necessarily act in that way."[74]

Proponents of science-based decisionmaking on both the right and left look to science to produce the perfect decision; both sides apparently will accept nothing less. Opponents of specific conservation actions want to know exactly how many species those species or individual members of protected species those actions will save; and opponents of risk-based conservation decisions want to know exactly how many will be killed.[75] The search for scientific perfection in this context, however, is misguided for two fundamental reasons. First, as sensible ecologists have constantly warned, ecology and the related biological sciences will never reach the precision and elegance of physics and mathematics. Second, the search for the perfect science-based

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[73]For a general explanation of these contrasting approaches to regulation, see J.B. Ruhl, *The Battle Over Endangered Species Act Methodology*, 34 ENVTL. L. 555 (2004). For a comparison of the incentives and costs of error that might call for differing standards of proof in regulatory as opposed to research science, see Holly Doremus, *The Purposes, Effects, and Future of the Endangered Species Act's Best Available Science Mandate*, 34 ENVTL. L. 397 (2004).

[74]JOHN PASSMORE, THE PERFECTIBILITY OF MAN 204 (1970).

[75]*See* Gifford Pinchot Task Force v. U.S. Fish & Wildlife Serv., 378 F.3d 1059 (9th Cir. 2004).

decision deflects attention from the real issue, which is whether the decision is legitimate. One of the strengths of the law is that it has never sought perfection or even truth in the absolute sense, being satisfied with the more attainable goal of legitimacy. The scientific attributes of reason and accuracy are necessary components of legitimacy, but we have only traditionally expected that decisionmakers make a good faith effort to reach a justifiable decision in light of available information. In the context of natural resource regulation, the key legitimacy question is not whether the variety of judgments that go into regulatory decisions are objectively correct or certain, but whether they are adequately serving legitimately chosen societal goals.

A. *Conventional Controls Do Not Closely Constrain Judgments*

As we have seen, natural resource regulation and management decisions are typically not closely constrained by the available data, because those data are so incomplete and ambiguous. It is not surprising that people on both sides of the political spectrum, distrusting the regulatory agencies, want regulatory decisions to be more closely constrained. Indeed, the science mandates that pepper conservation statutes were originally intended in large part to increase agency accountability to oversight. In practice, however, they can have precisely the opposite effect, insulating agency judgments from oversight by the courts and the political process.

Courts consider themselves ill-suited to intervene in the situations which leave the greatest room for judgment: when agencies make decisions with a highly technical content in the face of substantial uncertainty. Judges are acutely aware that they lack specialized scientific expertise, and therefore are not well qualified to oversee the exercise of scientific judgment.[76] They are also reluctant to impose limits on agency policy judgments where Congress appears to have delegated to the agency responsibility for striking the balance between competing policy

[76] *See* International Harvester Co. v. Ruckelshaus, 478 F.2d 615, 650-51 (D.C. Cir. 1973) (Bazelon, J., concurring) ("Socrates said that wisdom is the recognition of how much one does not know. I may be wise if that is wisdom, because I recognize that I do not know enough about dynamometer extrapolations, deterioration factor adjustments, and the like to decide whether or not the government's approach to these matters is statistically valid.").

goals.[77]

Natural resource regulatory decisions often share both of these attributes. Courts therefore tend to approach them gingerly. Scientific judgments are generally set aside only in the most egregious situations, as when it is clear that there is a major inconsistency between the underlying information and the ultimate conclusion. Federal agencies may not ignore a clear scientific consensus, especially if their own experts agree with that consensus.[78] They may not entirely ignore relevant scientific information.[79] Finally, they must offer a coherent explanation of how their decision rationally follows from, or at least is consistent with, the available evidence.[80] The policy judgments that are necessarily implied or closely intertwined with scientific judgments in natural resource regulatory decisions are often simply not recognized, or

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[77]Chevron U.S.A., Inc. v. Natural Resources Defense Council, 467 U.S. 837, 865 (1984).

[78]Examples include Northern Spotted Owl v. Hodel, 716 F. Supp. 479, 483 (W.D. Wash. 1988) (holding that FWS acted arbitrarily and capriciously in failing to list the northern spotted owl in the face of unanimous expert opinion, "including that of its own expert, that the owl is facing extinction"); and Center for Biological Diversity v. Lohn, 296 F. Supp. 2d 1223, 1236-40 (W.D. Wash. 2003) (remanding decision not to list orca population because decision rested on assumption that all orcas worldwide belong to the same taxon, an assumption the agency's scientific advisory panel had unanimously rejected).

[79]*See, e.g.,* Conner v. Burford, 848 F.2d 1441, 1454 (1988) ("In light of the ESA requirement that the agencies use the best scientific and commercial data available to insure that protected species are not jeopardized, the FWS cannot ignore available biological information," or refuse to use that information to develop projections about the impact of proposed actions on listed species); San Luis & Delta-Mendota Water Auth. v. Badgley, 136 F. Supp. 2d 1136, 1151 (E.D. Cal. 2000) ("there is no indication that Defendants considered substantial evidence that suggests that the splittail should not be listed, despite the significant contrary data and opinion" of the state fish and wildlife agency).

[80]*See, e.g.*, National Association of Home Builders v. Norton, 340 F.3d 835 (9th Cir. 2003) (holding that FWS inadequately explained its designation of Arizona population of cactus ferruginous pygmy owl as a distinct population segment); Natural Resources Defense Council v. United States Dept. of the Interior, 113 F.3d 1121, 1125-26 (9th Cir. 1997) (holding that FWS had failed to adequately explain its conclusion that designation of critical habitat would not be beneficial to the coastal California gnatcatcher); American Rivers v. United States Army Corps of Engineers, 271 F. Supp. 2d 230, 255-57 (D.D.C. 2003) (finding that FWS had failed to adequately explain why recent improvements in the condition of listed species justified "dramatic departure" from the conclusions of an earlier biological opinion); American Wildlands v. Norton, 193 F. Supp. 2d 244, 254 (D.D.C. 2002) (finding that FWS had failed to offer "a scientifically based explanation" for its decision to include hybrid fish in its assessment of the status of the westslope cutthroat trout).

perhaps not acknowledged, by the courts.

Management judgments, which deal with which parts of a problem to tackle first and how fiercely to tackle them, are also resistant to judicial review. The courts recognize that agencies must enjoy enforcement discretion, and discretion to set priorities as to how to address multi-faceted problems. Holding otherwise could make it impossible to address these problems by allowing all the multiple responsible parties to escape responsibility by pointing fingers at others' contributions. So courts have ruled, for example, that plaintiffs concerned that they may be forced to protect salmon habitat cannot challenge the regulatory agencies' alleged failure to adequately restrict fishing pressure,[81] and that species can be listed under the ESA without necessarily showing that listing will ameliorate all threats.[82] **something about Natomas Basin decision here?**

The political process does affect agency judgments, but not in a way that is likely to accurately reflect societal goals. Although conservation statutes generally provide opportunities for public input, it is extraordinarily difficult for the lay public to play an effective role in shaping highly technical regulatory decisions.[83] The barriers to participation are exacerbated by the tendency of agencies to hide the policy judgments they make behind the scientific ones. Those decisions may be difficult to recognize, let alone challenge.[84] Taking the example of the Klamath conflict, few members of the public are likely to have the expertise, or the patience, to grapple with the details of the available evidence about the relationship between lake levels and sucker well-being.

That highly technical regulatory judgments are not accessible to the general public does

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[81]Common Sense Salmon Recovery v. Evans, 329 F. Supp. 2d 96 (D.D.C. 2004).

[82]City of Las Vegas v. Lujan, 891 F.2d 927 (DC Cir. 1989).

[83]Wendy E. Wagner, *The Science Charade in Toxic Risk Regulation*, 95 COLUMBIA L. REV. 1613, 1674-77 (1995).

[84]*See id.* at 1627-28.

not make them immune to political pressures. Instead, it skews those pressures. Only the best-funded interests, which are not likely to favor conservation, will be effectively represented in regulatory proceedings that turn on those sorts of issues.[85] Moreover, the opacity of technical decisions can allow agencies to hide their political choices from the view of courts or voters. The technical nature of natural resource regulatory decisions, therefore, can actually undermine the ability of courts and the public to hold agencies to the goals articulated by Congress.[86]

B. *Do Regulatory Judgments Fit Societal Goals?*

That natural resource regulatory decisions involve a substantial measure of judgment, and that the exercise of that judgment is not likely to be closely overseen by courts or voters, are not causes for concern in and of themselves. Those aspects of regulatory decisionmaking are worrisome only if and to the extent that agency judgments in practice run counter to societal goals reflected in legislation. Our analysis here is intentionally descriptive, rather than normative. We believe it is possible to identify at least roughly the trade-offs Congress directed the regulatory agencies to make, and that the degree of correspondence between agency decisions and that direction is a legitimate test of whether agency judgments are being made appropriately.

Federal natural resource laws often have multiple, even competing goals. But basically the modern statutes embody a commitment to give the environment more weight than it traditionally had been given when it comes into conflict with extractive or development interests. They were adopted when it became clear that pursuing economic goals without adequate attention to the environment was causing serious environmental degradation. They exist to counteract what would otherwise be unopposed economic pressures.[87] Their science mandates

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[85] *See id.* at 1677.

[86] Even individual legislators, particularly those with powerful committee positions, can exert political pressures that push the agencies toward actions inconsistent with the intent of seemingly clear statutes like the ESA. *See generally* J.R. deShazo and Jody Freeman, *The Congressional Competition to Control Delegated Power*, 81 TEXAS L. REV. 1443 (2003).

[87] **Dan will supply a note on how cost-benefit analysis plays into this mix**

were primarily intended to serve that goal by limiting the role of economic and political pressures in the regulatory process.

The ESA, source of the most frequent and intense controversies over natural resource management in the United States, is perhaps the clearest example. It was enacted in 1973 specifically because earlier, less strongly regulatory, federal statutes had failed to stem the tide of extinctions.[88] Its regulatory provisions are supported by an explicit Congressional finding that "various species of fish, wildlife, and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern and conservation."[89] The first time the Supreme Court encountered the ESA, it famously described the law as giving endangered species "the highest of priorities"[90] and requiring their protection "whatever the cost."[91] The law has since been amended so that it is no longer so single-minded. It now allows development so long as it that development is compatible with conservation,[92] and provides a narrow exemption procedure if, after a trial-type hearing, a cabinet-level committee finds that the benefits of a project clearly outweigh those of any alternative consistent with conservation.[93] Those changes have not altered the basic ordering of priorities; the overriding goal of the law remains conservation in the face of development pressures.

This history explains why the ESA is not neutral about the use of a precautionary framework. It requires some degree of caution in order to achieve the overriding goal of conservation. That's why it requires that decisions rest on the "best *available* science," instead

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[88]Holly Doremus, *Patching the Ark: Improving Legal Protection of Biological Diversity*, 18 ECOLOGY L.Q. 265 (1991).

[89]16 U.S.C. § 1531(a).

[90]Tennessee Valley Auth. v. Hill, 437 U.S. 153, 194 (1978).

[91]*Id.* at 184.

[92]16 U.S.C. § 1539(a)(1)(B).

[93]16 U.S.C. § 1536(h).

of mandating some specific threshold level of scientific support. That does not mean that species cannot be subjected to any risk; the agencies retain significant discretion as to how much risk is acceptable. But it does mean there has to be a finger on the scale, of some indeterminate size, on the side of the species. The regulatory agencies cannot, for example, require conclusive evidence as a prerequisite to listing a species.[94] It also means that, at a minimum, the economic costs of protection cannot by themselves be the basis of a less protective stance unless the statutory exemption process is invoked or Congress grants a legislative exemption. When the regulated community demands "sounder science," it is trying to replace the current, vaguely precautionary, direction of the statute with the very high threshold of certainty that characterizes claims of "proof" in controlled research science.

Of course, without going to the extreme of requiring virtual certainty to justify regulation, one could worry that the underspecified ESA directive to use caution invites unnecessary over-regulation by a mission-driven regulatory agency. The chair of the Klamath NRC committee shared that concern.[95] On its face, that is a plausible initial assumption. The available evidence, however, contradicts it. There is strong evidence that the regulatory agencies do not list species whose conservation predictably conflicts with economic activities unless and until forced to do so by litigation.[96] The evidence is less overwhelming with respect to section 7, perhaps because evaluation is more difficult, but it is clear that biological opinions rarely find jeopardy, and when they do they then go out of their way to devise RPAs that will impose as little regulatory burden

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[94]Defenders of Wildlife v. Babbitt, 958 F. Supp. 670, 679 (D.D.C. 1997).

[95]*See supra* note 68 and accompanying text.

[96]*See, e.g.*, deShazo & Freeman, *supra* note 85; Amy Whritenour Ando, *Waiting to Be Protected Under the Endangered Species Act: The Political Economy of Regulatory Delay*, 42 J.L. & ECON. 29 (1999); Andrew Metrick & Martin L. Weitzman, *Patterns of Behavior in Endangered Species Preservation*, 72 LAND ECON. 1 (1996); David S. Wilcove, *What Exactly Is an Endangered Species? An Analysis of the U.S. Endangered Species List, 1985-1991*, 7 CONSERVATION BIOLOGY 87 (1993); U.S. General Accounting Office, Endangered Species: Factors Associated with Delayed Listing Decisions (1993); STEVEN L. YAFFEE, PROHIBITIVE POLICY: IMPLEMENTING THE FEDERAL ENDANGERED SPECIES ACT (1982); U.S. General Accounting Office, Endangered Species: A Controversial Issue Needing Resolution (1979).

as possible.[97] In the Klamath context, for example, NMFS in its 2002 biological opinion found that Project operations would jeopardize the coho, but required only that the Bureau provide roughly half the water flow NMFS thought the fish required in the mainstem Klamath.[98] While the regulatory agencies may well perceive conservation as their primary mission, they are clearly vulnerable to focused political pressure against conservation measures. In that broad sense, therefore, agency judgments appear to be less conservation-oriented than is called for by legislated societal goals.

Furthermore, limitations in the available information can lead to inaccuracies in scientific judgments, which in turn can infect regulatory decisions. Where that is the case, even if regulatory agencies summon the political courage to mandate conservation measures, those measures might not prove effective. That would obviously decrease the likelihood that societal conservation goals would be met. In addition, it would tend to increase the level of political controversy over time, as the regulated community's losses are not balanced by conservation benefits.

It is very difficult to evaluate the accuracy of regulatory decisions, but we suspect it may be a far more significant shortcoming than conscious overregulation, which appears quite rare. Most outside evaluations have given at least a qualified endorsement to the science behind regulatory decisions.[99] But several have noted how little information is available, and few have

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[97]Oliver A. Houck, *The Endangered Species Act and Its Implementation by the U.S. Departments of Interior and Commerce*, 64 U. COLO. L. REV. 277, ___ (1993).

[98]Nat'l Marine Fisheries Svc., Biological Opinion: Klamath Project Operations 55-56 (May 31, 2002). The justification for this limitation was that the Project should only have to provide additional water in proportion to the extent of its withdrawals of water within the watershed. That portion of the 2002 Biological Opinion was subsequently overturned by a reviewing court, because there was no assurance that the additional water necessary to assure salmon persistence would be forthcoming. Pac. Coast Fed'n of Fishermen's Ass'ns v. U.S. Bureau of Reclamation, No. C 02-2006 SBA (July 15, 2003).

[99]Independent peer reviews sought by the regulatory agencies for ESA listing decisions, critical habitat designations, and recovery plans have almost always agreed with the agency decision. U.S. General Accounting Office, GAO-03-803, Endangered Species: Fish and Wildlife Service Uses Best Available Science to Make Listing Decisions, But Additional Guidance

tried to evaluate the likelihood of conservation success. Data on the status of listed species show that many are not noticeably improving.[100] That data is difficult to interpret, however. It could simply confirm that the regulatory agencies are too timid to require needed measures, it could reveal that the agencies lack authority over important threats, or it could indicate that required conservation measures are not working as expected.

C. *How Might Regulatory Judgments Be Tied More Closely to Societal Goals?*

In theory, Congress could readily solve the problem of regulatory agencies which enjoy too much discretion and cannot be counted upon to exercise that discretion appropriately in the service of societal goals. The statutes could be amended to be much more prescriptive. That has sometimes been done in the pollution context; for example, when EPA moved too slowly to regulate hazardous air pollutants, Congress enacted a list of such pollutants and ordered EPA to regulate them on a specific schedule.[101] Without getting quite that prescriptive, Congress can be clearer about how agencies should treat uncertainty. It has done that, for instance, in the Clean Air Act by requiring that EPA set National Ambient Air Quality Standards that "allowing an adequate margin of safety, are requisite to protect the public health,"[102] and in the Clean Water Act's Total Maximum Daily Load provision, which directs EPA to set TMDLs with "a margin of safety which takes into account any lack of knowledge concerning the relationship between

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Needed for Critical Habitat Designations 21–22 (Aug. 2003), available at http://www.gao.gov/cgi-bin/getrpt?GAO-03-803. The regulatory agencies also fare well in most NRC reviews. There have been at least six NRC reviews of specific ESA decisions. Only one, the Klamath review, has disagreed fundamentally with the regulatory action taken.

[100]FWS must report every two years on the status of all species listed under the ESA. The most recent report shows 21% of listed species delining, 30% stable, and only 6% improving. The status of 39% of listed species is reported as "uncertain." U.S. Fish & Wildlife Serv., Recovery Report to Congress, Fiscal Years 2001-2002, at 10 (undated), available at http://endangered.fws.gov/recovery/reports_to_congress/2001-2002/report_text.pdf (last visited Jan. 29, 2005).

[101]42 U.S.C. § 7412.

[102]42 U.S.C. § 7409(b)(1).

effluent limitations and water quality."[103]

A legislative solution of this sort is not likely for the ESA, or for that matter for the federal land management statutes or other natural resource laws. Lists are simply impractical. Numerical bounds, such as requirements that species face a prescribed extinction risk before they can be listed, are not useful in the face of very weak scientific information because extinction probabilities cannot be calculated with any accuracy. Finally, Congress has shown no interest in facing up to the political costs of making these choices explicitly. It is more politically advantageous to declare aspirational goals in ringing terms, but leave the implementing agencies with the hard task of determining the extent to which those goals will be achieved.[104]

Without openly addressing the exercise of agency discretion, however, Congress and the executive branch make numerous decisions that affect that discretion. Making effective policy use of scientific information is as much an institutional challenge as it is a scientific one. Decisions about how to structure agencies, advisory committees, and interactions with various constituencies might seem like very indirect and incomplete means of controlling agency judgments, but they may be the strongest tools available in the context of natural resource regulation under uncertainty.

1. *The choice of decisionmaker*

The first key choice is the assignment of decisionmaking authority. Regulatory outcomes may strongly depend upon which of two or more competing agencies is delegated authority to determine what scientific information to collect, interpret, and apply scientific information. Even within a single agency, the distribution of authority can be critical.

Most obviously, if conservation is the primary, or even an important secondary, goal,

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[103] 33 U.S.C. § 1313(d)(1)(C).

[104] *See, e.g.*, Wendy E. Wagner, *Congress, Science, and Environmental Policy*, 1999 U. ILL. L. REV. 181; William H. Rodgers, Jr., *The Lesson of the Owl and the Crows: The Role of Deception in the Evolution of the Environmental Statutes*, 4 J. LAND USE & ENVTL. L. 377 (1989).

decisionmaking authority must not rest with those whose economic interest depends upon development or extractive activities. Even scientific judgments must be dissociated from economic self-interest. Where the evidence is equivocal or even short of overwhelming, people tend to interpret it as consistent with their own interests.[105] Short-term self-interest can also drive management and policy judgments in directions that systematically disfavor conservation, even in the face of an apparent long-term financial interest in conservation.

A striking illustration comes from fisheries regulation in the United States, where putting the power to make initial decisions on annual quotas in the hands of the fishing industry, even subject to oversight by a regulatory agency, has been a conservation disaster. Under the Magnuson-Stevens Fishery Conservation and Management Act,[106] regional Fishery Management Councils propose annual quotas, on the basis of stock assessments performed by NOAA scientists and reviewed by scientific advisory bodies to the Councils.[107] Council membership is dominated by fishing interests, commercial and recreational.[108] Quotas must be based on the best available scientific evidence.[109] They are supposed to prevent overfishing or, in the case of already overfished stocks, provide for recovery to maximum sustainable yield. In two case studies, Eagle and Thompson found regulatory judgments contributed to significant overfishing.[110] In one of their two case studies, the initial scientific assessments appeared to be

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[105] *See, e.g.*, Jeffrey J. Rachlinski, *The Psychology of Global Climate Change*, 2000 U. ILL. L. REV. 299, 305; Russell B. Korobkin & Thomas S. Ulen, *Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics*, 88 CAL. L. REV. 1051, 1093 (2000).

[106] 16 U.S.C. § 1801 - 1883.

[107] *See* Josh Eagle & Barton H. Thompson, Jr., *Answering Lord Perry's Question: Dissecting Regulatory Overfishing*, 46 OCEAN & COASTAL MGMT. 649, 654-55 (2003).

[108] *Id.*; National Marine Fisheries Service, 1999 Report to Congress on Apportionment of Membership on the Regional Fishery Management Councils (2000).

[109] 16 U.S.C. § 1851(a)(2).

[110] Eagle & Thompson, *supra* note 106, 654-55.

reasonably accurate, but the regional Council systematically proposed quotas either above those recommended by the scientific advisory bodies or at the very top of the range deemed scientifically plausible. In the other, the scientists appear to have systematically overestimated the available catch, and in addition the Council exceeded their recommendations for several years.[111]

Financial conflicts are not the only source of biases that can skew regulatory judgments. Agency mission and culture can have a similar effect. It is not surprising, for example, that FWS and the Bureau of Reclamation came to very different conclusions about the needs of the endangered suckers in the Klamath Basin based on the same underlying data. Experts are no more immune to interpretive biases than lay persons.[112] Recent news coverage of the Food and Drug Administration's drug review process illustrates the extent to which the perceived organizational mission can override individual views. A survey conducted by the inspector general of the Department of Health and Human Services found that nearly one in five FDA scientists had felt pressured to recommend approval of a new drug against their own best judgment.[113]

The extent to which decisions are centralized or decentralized may also be important, as may the geographic location of the office where decisions are made. Greater decentralization is likely to weaken the extent of control exercised by the political appointees at the top level of

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[111]Eagle and Thompson note in this case study that the Pacific Fishery Management Council appeared to become more conservation oriented in the early 1990s. They do not offer an explanation for the shift. *Id.* at 670.

[112]*See* NATIONAL RESEARCH COUNCIL, UNDERSTANDING RISK: INFORMING DECISIONS IN A DEMOCRATIC SOCIETY 11-13 (1996); Daniel Kahneman & Amos Tversky, *Subjective Probability: A Judgment of Representativeness*, *in* JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 32, 46 (Daniel Kahneman et al. eds., 1982); Daniel Kahneman & Amos Tversky, *On the Psychology of Prediction*, *in* JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 48, 68 (Daniel Kahneman et al. eds., 1982).

[113] Dept. of Health and Human Servs., Office of Inspector General, FDA's Review Process for New Drug Applications: A Management Review 12 (Mar. 2003), available at http://oig.hhs.gov/oei/reports/oei-01-01-00590.pdf (last visited Dec. 20, 2004).

agency administration. Central political control will be especially difficult to maintain if judgments are delegated to the field office level, where they will be made by career employees rather than political appointees.[114] The substantive effect of such weakened control will depend, obviously, on both the views of the administration and those of the local agency officials.

Where the field office is located in a resource-dependent community and agency personnel tend to have long tenure in a single location, regulatory judgments made by local career employees are likely to favor local interests. That should be even more true if the agency views its mission as promoting or supporting local industry. The Bureau of Reclamation, for example, in its 2001 biological assessment for operation of the Klamath Project, interpreted the scientific evidence to permit water deliveries to Project irrigators that would reduce lake levels and river flows below historic minimums. The Bureau has long perceived irrigators served by its projects as its clients; it works hard to satisfy their needs.[115] Compounding that mission orientation, the biological assessment was prepared by the Klamath Falls office that operates the Project. Bureau employees living in Klamath Falls are acutely aware of the social value of agriculture to the local community, and have absorbed local beliefs about the economic value of agriculture. By contrast, the FWS and NOAA Fisheries biological opinions, which called for considerably lower deliveries, were prepared for agencies with important conservation missions, by employees in Sacramento and Long Beach, respectively. Those employees would have been insulated by both mission and distance from the economic impacts on upper Basin agricultural

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[114]The Army Corps of Engineers, for example, which administers the Clean Water Act's wetlands filling permit provisions, is highly decentralized. A recent General Accounting Office study found that district offices, which are responsible for most decisions to assert federal jurisdiction over wetlands, interpreted the scope of federal jurisdiction very differently. General Accounting Office, Waters and Wetlands: Corps of Engineers Needs to Evaluate Its District Office Practices in Determining Jurisdiction (GAO 04-297) (Feb. 2004). The Bush administration has tried to exert tighter control over decisions to regulate at the boundary of federal authority by issuing a memorandum requiring that such decisions be elevated to Corps headquarters in D.C. *Id.* at 14.

[115]*See, e.g.*, Rio Grande Silvery Minnow v. Keys, 333 F.3d 1109 (10th Cir. 2003), vacated as moot 355 F.3d 1215 (10th Cir. 2004) (Bureau argued that its irrigation contracts left no discretion, and therefore its operations were not subject to ESA consultation requirements).

interests.

Finally, the training and professional identity of the individuals who make judgments should be expected to play a role. In particular, the extent to which the decisionmakers are trained in the natural sciences, and identify themselves as biologists, will likely play an important role in their scientific and their policy judgments. On the one hand, research scientists, those trained to the level of a doctoral degree or with equivalent professional research experience, are likely to have strongly internalized research norms against prematurely asserting that a connection has been established between a specific action and species decline. That acculturation might work against conservation. On the other hand, scientists tend to be unusually devoted to their work, and intensely focused on the particular area or system which they choose to study.[116] For those who study ecology, conservation biology, or an individual endangered species, that absorption in their work tends to bring with it a correspondingly intense interest in the long-term health of the environment in general and their focal interests in particular. It still may not be the norm for these scientists to be politically active, but most of them share the view that conservation is more important than economic development.[117] That view will tend to push their judgments in a more protectionist direction.

We suspect that those scientists who choose to go into agency, rather than academic, jobs, will feel more strongly about protecting species, and less strongly about the norms of academic science. On balance, therefore, we would expect science mandates, because they tend to strengthen the role of agency scientists relative to other career employees and political appointees, to encourage more strongly conservationist regulatory judgments. That effect should be intensified by decisionmaking structures that give agencies with a conservation mission a

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[116]GERALD HOLTON, THE SCIENTIFIC IMAGINATION 241 (1998 ed.).

[117]Ecologists are more likely than the general public to assign intrinsic value to the natural world. *See* Paul A. Sabatier & Matthew Zafonte, *The Views of Bay/Delta Water Policy Activists on Endangered Species Issues*, 2 HASTINGS WEST-NORTHWEST J. ENVTL. L. & POL'Y 131, 145 (1995); ERNST MAYR, TOWARD A NEW PHILOSOPHY OF BIOLOGY: OBSERVATIONS OF AN EVOLUTIONIST 89 (1988).

strong role, such as the ESA's consultation procedures. The Bush Administration, which does not favor conservation, has made considerable use of the converse approach, shifting decisionmaking power away from conservation agencies to agencies with extractive missions and away from minimizing the role of conservation scientists through aggressive oversight by political appointees.[118]

2. *Tools for increasing transparency*

We explained earlier that agency scientific, management, and policy judgments may escape public oversight yet remain vulnerable to focused political pressures, because they are hidden under a veneer of scientific opacity and claims of objectivity. Any steps that make the various types of judgment that go into regulatory decisions more openly apparent should help balance the political scales. Transparency is, of course, not a panacea. Disclosure does not solve, and can even exacerbate, political conflict. But by revealing informational gaps and political judgments, it can focus the debate, and potentially reveal an expanded menu of choices.

a. *Demanding transparency through judicial review*

Transparency is difficult to achieve, given that both Congress and the agencies seem to believe that hiding their judgments is in their best political interest, and that agencies fear that candor will increase their vulnerability to judicial reversal. Courts could increase transparency by demanding clearer explanations of the policy judgments that necessarily underlie regulatory decisions, and deferring to those judgments when they are explained. For example, FWS and NOAA Fisheries have typically avoided explaining in ESA listing or consultation decisions what degree of risk they regard as unacceptable. They have explained in their Section 7 Handbook that they believe they must give the benefit of the doubt to the species when faced with data gaps.[119] They have not, however, explained what gaps give rise to that duty, or how much doubt

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[118] *See* Holly Doremus, *Science Plays Defense: Natural Resource Management in the Bush Administration*, __ ECOLOGY L.Q. __ (forthcoming 2005).

[119] Consultation Handbook, *supra* note 65, at 1-6.

can be overcome by this precautionary approach. In individual decisions, they do not explain to what extent they believe they are giving the benefit of the doubt to the species, or what uncertainties prompt them to do so.

Courts, which seem quite prepared to demand careful, coherent explanations of the scientific leaps the agencies make,[120] surely could be just as demanding with respect to policy judgments. Like the parents of teenagers, courts should reinforce socially desirable behavior by rewarding candor and punishing secretiveness. Congress has done precisely that by mandating environmental review of proposed federal actions under the National Environmental Policy Act.[121] Where Congress has not directly demanded candor, courts can and should take up the slack. One good example from the natural resources context is *Fishermen's Dock Cooperative, Inc. v. Brown*.[122] A coalition of commercial fishers challenged a quota for summer flounder set by the Department of Commerce. A scientific advisory committee had selected a quota one standard deviation below the mean estimated recruitment over the previous five years. Plaintiffs claimed that the Magnuson Act's requirement that quotas be set using the best scientific data available mandated that the quota be set instead at the mean annual recruitment level.

The court disagreed. It noted that use of the best scientific data need not mandate "one and only one possible quota."[123] The court noted that, given the uncertainty of the data, any specific quota could be attacked as arbitrary. Under the circumstances, the agency "necessarily had some discretion to decide what precise degree of assurance it would seek within the uncertainty of the data."[124] It had explained why it chose the lower quota, essentially noting that its primary goal was to stay below the target mortality and that some assumptions in the model it

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[120] *See supra* note 79.

[121] 42 U.S.C. § 4321 - 4370d.

[122] 75 F.3d 164 (4th Cir. 1996).

[123] *Id.* at 169.

[124] *Id.* at 171.

used could be optimistic.

The *Fishermen's Dock* decision is a good model in three respects. First, the court recognized that the best available science frequently will not point to a single, clearly identifiable management choice. Second, it realized that the selection of a particular choice within the range identified by the available science depended upon value choices. Third, the court gave the agency's decision greater deference because it had explained both the scientific and value bases for the particular choice made. Courts should also take the next step, remanding decisions where such transparency is lacking. Courts should be on the lookout for (and litigants should point out) circumstances in which regulatory decisions necessarily involve value choices. Agencies should have to explain those choices, with reference to their goals, their understanding of the degree of uncertainty in the data, and the extent to which they have employed a precautionary approach. At the same time, courts need to rein in their own tendency to interfere with agency policy judgments within boundaries left open by the legislature. Agencies must be assured that revealing their political choices will not undermine their judicial position. Instead of effectively pressuring agencies to engage in a science charade, courts should provide incentives for the agencies to reveal their political choices, thereby facilitating political accountability.

b. *Making the views of scientists public*

Requiring that the unvarnished views of agency scientists or advisory panels, as well as the final agency decision, be publicly revealed would also significantly increase transparency and accountability. Conservationists have always assumed, or at least hoped, that science mandates would strengthen the hand of conservation scientists in natural resource regulation. In practice, this effect has been limited because control of agency decisions ultimately rests with political appointees. Those political appointees have proven themselves quite willing to reject the recommendations of agency scientists, especially in the last four years. They can frequently do so with political impunity because the public generally lacks access to those recommendations unless they are leaked to the press.

Currently, agency scientific recommendations may not even be discoverable in litigation; some courts have ruled that they are covered by the deliberative process privilege,[125] which protects internal pre-decision discussions in order to allow agencies to engage in frank and complete consideration of the decision. Ideally, Congress would mandate public disclosure of the recommendations or reports of agency scientists. It would be simple enough to require that agency biologists make their drafts public, and that supervisors who make or require changes in the original analysis publicly acknowledge and explain those changes. Failing congressional action, courts could exclude such recommendations or reports from the deliberative process privilege. Where Congress has directed agencies to use the best available scientific information in their decisions, the public is entitled to know what agency scientists think of the scientific data, without filtering by political appointees.

That does not mean that agency scientists must always control the ultimate decisions, or even that they can necessarily be trusted not to mix policy judgments into their scientific evaluations. Making the reports of agency or advisory scientists immediately public could invest those reports with unjustified power. Scientific judgments are most likely to be accurate if they are made by scientists with both broad experience in the relevant field and specific knowledge of this system or species. But, as explained above, scientific judgments can be difficult to untangle from policy or management judgments. Delegation of policy judgments to agency scientists can be defended as a needed counterweight to development pressures from mission-oriented agencies and financial beneficiaries. We tend to think that in the end that will prove a self-defeating proposition, however. Agencies may find ways to select for scientists who fall on the less conservation-oriented, or at least on the less activist side of the political spectrum. Alternatively, supervisors may begin to openly reject scientific advice because they believe that advice is

[125]Center for Biological Diversity v. Norton, 336 F. Supp. 2d 1155 (D.N.M. 2004); Greenpeace v. National Marine Fisheries Serv., 198 F.R.D. 540 (W.D. Wash. 2000); Center for Biological Diversity v. Norton, No. Civ. 01-409 TUC ACM (D. Ariz. 2002), 2002 WL 32136200.

deliberately skewed.[126]

We suggest that both the scientific and policy advice of agency scientists should be exposed, to the extent possible, to public view. That might be done, for example, by requiring that the evaluations of agency scientists be included in the public record, but also structuring those evaluations to separate scientific from other judgments. Even if agency scientists are just as inclined as agency politicians to hide their political judgments, and just as skilled at doing so, mandating public release of their advice should help expose those judgments. Agency decisionmakers who must disclose internal scientific advice counter to their ultimate decision will face political and judicial pressures to explain the discrepancy. That will give them incentives to reveal the policy judgments both in their ultimate decision and in the recommendations of their scientists.[127]

c. *Outside scientific review*

It is difficult to object to the concept of peer review. Outside review is viewed, both within and beyond the scientific community, as a tool for increasing the accuracy of scientific judgments, and for holding those judgments within accepted professional boundaries. It is generally required prior to publication of results in scientific journals. The Supreme Court has endorsed its role in assuring scientific credibility.[128] Reformers, particularly those from the anti-regulatory camp, have focused on requiring peer review of highly technical regulatory

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[126]Eagle & Thompson, *supra* note 106, at ___ provide data suggesting just such an effect when fishery science advisors consciously reduced their estimates of allowable catch in an effort to combat the tendency of managers to set regulatory targets too high.

[127]These documents must be practically, as well as legally, accessible. In their evaluation of fisheries regulation, Eagle and Thompson noted how difficult it was for them to find and dig out of the extensive record the advice of NOAA's Fishery Science Centers and regional council advisory committees on appropriate quotas. They suggested that the practical unavailability of that information might contribute to the willingness of the regional councils to ignore scientific advice. *Id.* at 676.

[128]Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579, 593 (1993).

decisions.[129]

Peer review on the journal model, however, is not an effective method of constraining regulatory judgments within the broad sideboards already established by judicial review under the APA's arbitrary or capricious standard. Journals typically send a submitted paper to several experts in the field. Reviewers evaluate the paper's quality on the basis of the methods used to collect data, statistical analyses, whether prior studies have been appropriately acknowledged, and whether claims based on the data fall within professional boundaries. Journal-style peer review is routinely sought on ESA listing decisions, critical habitat designations, and recovery plans.[130] It almost never finds flaws in the agency action.[131] That should surprise no one. Journal-style peer review is designed to keep scientific judgments within very broad professional boundaries. The threat of judicial review and professional norms together already provide sufficient incentives to keep agencies within those broad boundaries; journal-style peer review adds very little to the equation. **Dan can add a fn on NRC report on peer review of Corps decisions**

Appropriate outside review which generates a publicly-available report can, however, make scientific, political, and even management judgments more transparent. Journal-style review is not the best model for this purpose. Review by a committee with the ability to interact

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[129]These calls for peer review often betray their antiregulatory leanings through their asymmetric structure. The Sound Science and Endangered Species Act Planning Act, HR 1662, for example, which emerged from the House Resources Committee in the 108th Congress but never made it to floor action, would have required peer review of decisions to add a species to the protected list after review, but not of decisions not to list a species, and of jeopardy but not of no-jeopardy consultation decisions.

[130]Notice of Interagency Cooperative Policy for Peer Review in Endangered Species Act Activities, 59 Fed. Reg. 34270 (July 1, 1994). The wildlife agencies apply this policy to critical habitat designations as well as proposals to add species to the protected lists.

[131]U.S. General Accounting Office, GAO-03-803, Endangered Species: Fish and Wildlife Service Uses Best Available Science to Make Listing Decisions, But Additional Guidance Needed for Critical Habitat Designations 21–22 (Aug. 2003), available at http://www.gao.gov/cgi-bin/getrpt?GAO-03-803.

with the decisionmakers and other interested persons will be more effective. Committee, rather than individual, review allows representation of diverse disciplines, and discussion among reviewers from various perspectives. A multi-disciplinary committee is far more likely than individuals experts in a single field to uncover and question the policy and management judgments agencies have used to define the problem, and to offer for public consideration alternative definitions of the problem with accompanying alternative solutions. A review committee will be most effective at increasing transparency if it has both the opportunity to question decisionmakers (rather than having to rely on the written record alone), and the authority to compel responses. Of course, committee review is a resource-intensive step; it should be used only where the levels of controversy and of uncertainty justify it.[132]

The NRC's Klamath committee illustrates the benefits of a committee approach to review. Had the biological opinions been sent out by the agency for peer review, they would almost certainly have been sent to two or three experts in fish biology and conservation, or population viability. The NRC committee included not only experts in these areas, but also a limnologist, a resource economist, a forest biologist, a consulting engineer, a geomorphologist, a law professor, and others.[133] That make-up both qualified the committee to take a broad look at the system and virtually guaranteed that it would do so. **Dan will provided a sentence about the Glen Canyon NRC committee as an example of give and take** The committee's final

[132]It is difficult to prescribe blanket rules for the appropriate use of intensive committee-style peer review. Perhaps the current practice of seeking NRC review when a decision is sufficiently controversial to need the added credibility that review can provide is as good a method as any other. J.B. Ruhl has tried to explore in more detail and on a more general level the question of when the benefits of any kind of peer review of ESA regulatory decisions will outweigh its costs. J.B. Ruhl, *Prescribing the Right Dose of Peer Review for the Endangered Species Act*, 83 NEBRASKA L. REV. __ (2005). He suggests peer review of decisions with very high economic costs (exceeding $100,000,000) and some random sample of other decisions. We would add that high-intensity peer review is appropriate only if the decision is characterized by a high level of uncertainty.

[133]*See* NRC FINAL REPORT, *supra* note 29, at 381-84 (brief biographies of the committee members).

report documented a variety of actions, both past and present, within the Klamath watershed that have contributed to the decline of the listed species, and a similar range of steps that might help move those species toward recovery. It is highly unlikely that individual peer reviewers, no matter how dedicated, would have brought such a broad view of the problem to their task.

Effective outside reviews can also spur learning, by inspiring new thinking, demanding accountability, and highlighting gaps in the existing data base that could be filled. That seems to be one positive outcome of the Klamath NRC review. The committee's final report included a detailed set of recommendations for research and monitoring.[134] The report triggered, for the first time, meetings focusing on the science of the upper and lower basin (unfortunately so far only separately). It remains to be seen whether sufficient resources will be devoted to these efforts, and what new information they will produce, but at the very least the NRC Klamath report raised the awareness of everyone studying the ecology of the basin of unanswered, important questions.

Review committees can either be *ad hoc*, as is typical of those regularly convened by the National Research Council, or long-term, like the review committees used by the CALFED Bay-Delta Authority.[135] Where regulatory decisions are taken repeatedly over a period of years, a standing committee can better ensure that the agency does not fall into the same mistakes year after year. A standing committee, with the benefit of repeated meetings, may also have the opportunity to become better educated itself about the system over time, and to refine its interpersonal operations. On the other hand, it may be difficult to get experts to make the multi-year commitment necessary for a standing committee. Over time, members of a standing committee also may become undesirably close to the regulators whose actions they are supposed to be overseeing, or to their appointing body.

While they can be very useful in highlighting the judgments made by regulators, if not

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[134] *Id.* at 345-50.

[135] *See* CALFED Bay-Delta Authority, ISB, http://www.science.calwater.ca.gov/sci_tools/isb.shtml (describing CALFED's Independent Science Board, a standing multi-disciplinary review body) (last visited Jan. 29, 2005).

carefully performed and presented outside reviews can themselves serve to hide the policy judgments of the reviewers. Review committees should not simply be invited to critique an agency decision. They should be asked instead to: evaluate the degree of scientific support for a particular decision; identify gaps or weaknesses in the available data; highlight what interpretive judgments were made and how the agency dealt with uncertainty; if possible, quantify at least roughly the likelihood of errors of over- and under-regulation; and consider whether and at what cost data gaps could be filled, and what value additional data would carry for the regulatory decision. Explicitly charging the review committee with revealing policy judgments made in course of the regulatory process should discourage the committee from simply substituting its own policy views for those of the regulatory agency under the guise of scientific review. It can also help avoid mischaracterization and misunderstanding of the review. The worst aspect of the Klamath NRC review was the way the committee's interim report was portrayed as showing that the regulatory agencies had engaged in "junk science." Had the committee been from the outset more conscious of explicitly separating its review of the scientific support for the regulatory decisions from review of the decision itself, and of highlighting the non-scientific aspects of the decision, its interim report might have been less vulnerable to such misuse.

It is also important that outside review not turn into a fly-specking exercise. No decision is perfect, especially when made in the face of sharply limited information. Outside reviews by "hired guns" often turn into exercises in identifying every small criticism to which the decision might be subject, even if those flaws had no discernible impact on the decision. Regulatory decisions, because of the notice and comment procedure prescribed by the APA, are always subject to that kind of review if there is an interested party with the resources to finance it. When submitted as mere comments on a rulemaking, those criticisms do not carry the authority of an independent scientific review. When a committee review is carried out, however, interested parties can bury the committee with those sorts of criticisms, hoping to get the committee to sign

on.[136] The review will be most useful if committee members are both capable of viewing the decision at a broad level, and inclined to do so. The committee charge can help to insure that attitude, but it is also important that committee members be selected not only for their independence and specific expertise but also to some extent for their ability to see the larger picture. We believe the NRC selection process seeks that quality, although like anything else it is not infallible.

Finally, outside reviews may by their very nature carry more credibility than they deserve. Outside reviewers may be expert in fields implicated by a regulatory decision, but they will frequently be relative newcomers to the details of the particular system, with limited time and resources to devote to getting up to speed. They can provide a valuable additional perspective, but they will not be infallible, and they might easily miss or misunderstand important details. Just as the authors of journal articles have the opportunity to respond to negative reviews, regulatory agencies should have the opportunity to respond to external reviews. Reviews of regulatory decisions should move the conservation forward, not be expected to end it.

3. *Strengthening the institutional role of science*

We also believe that agencies can be structured more self-consciously to strengthen the institutional role of science, not merely that of conservation-minded scientists. The CALFED Bay-Delta program is a deliberate effort to do just that. The key elements are a science program independent of any regulatory function, led by a strong director with impeccable scientific credential, and standing advisory panels of outside experts who regularly interact both with the science program and with the agency's regulatory arms. Strong, credible agency science assisted by committed outside reviewers can increase the accuracy and transparency of agency regulatory decisions, and can have the added bonus of promoting effective and efficient learning, which

[136]Professor Doremus experienced this kind of trivial data overload as a member of an NRC committee reviewing ESA decisions in the Platte River basin. A consulting firm hired by water users sought to overwhelm the committee with detailed, but ultimately not important, criticisms of the regulatory agency's conclusions about the Platte's channel dynamics.

over time will more closely constrain scientific judgments.

The CALFED experience also shows the difficulty of making that structure effective over the long run. Substantial resources must be devoted to the scientific enterprise; just as CALFED has struggled overall to maintain funding at a credible level, the Science Program has struggled to capture the resources promised in the original Record of Decision. The political benefits of spending on research will often be less attractive than spending on "pork-barrel" restoration projects whose effectiveness is never subjected to close scrutiny. Furthermore, outside review by CALFED's standing panels is hard work. The most recent report by the Environmental Water Account panel reveals the frustrations of the reviewers with their inability to control the review agenda, which has left much of their time at the mercy of agency presentations that can be more self-serving than informative.[137] In order to be most effective, outside review panels should themselves control the agenda of presentations (as NRC panels do), should be involved in the assembly of review materials prior to their meetings, and should be supported by an agency supervisor with the authority to demand that their recommendations be followed.

V. CONCLUSION

Science is a necessary element of natural resource management decisions, but it is rarely decisive. The available scientific information is hardly ever sufficient to objectively determine those decisions. Substantial doses of judgment are needed to interpret incomplete information, identify elements of the regulated system most likely to respond to management intervention, and clarify the goals of regulation. Those judgments simply cannot be removed from the equation, and in most cases they, rather than the underlying data, are determinative. Rather than

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[137] *See* Review of the 2003-04 Environmental Water Account (EWA), Submitted by the 2004 EWA Review Panel 15-17 (1/17/05), available at http://science.calwater.ca.gov/pdf/ewa/EWA_technical_review_final_011705.pdf (last visited Jan. 29, 2005). Professor Doremus served on the CALFED EWA review panel for three years, until she concluded that the committee's limited impact on agency attitudes and actions did not justify the time and effort its members were expending.

demanding perfectly rational regulatory decisions, those seeking reform of regulation (from either side of the political spectrum) would be better served by a closer examination of the judgments that go into regulatory decisions.

Those critical judgments are only very loosely constrained, allowing the regulatory agencies substantial discretion to exercise their biases and policy preferences. The extent of the range of judgments allowed by existing legislation and regulation is strikingly illustrated by the ability of the Bush administration to halt and reverse many Clinton administration conservation efforts.[138] Courts and the conventional political process have not been very effective in overseeing these regulatory judgments, in large part because the technical nature of the decisions allows many of them to be hidden. Unrealistic demands for perfect scientific, objective decisionmaking will only exacerbate this problem by driving judgments further underground.

Congress could act to more closely constrain agency regulatory judgments, but is not likely to do so. We suggest that any steps that either make the variety of judgments that go into these decisions more transparent or encourage focused acquisition of relevant data will help put sideboards on agency judgments, making it more likely that society's substantive conservation goals will be met. Courts could help force regulatory judgments into the open through conscious application of existing hard-look review. Peer review by independent experts, appropriately conducted, can both expose regulatory judgments and encourage learning. Institutional structures that encourage agencies to focus on what they do and do not know about the systems they regulate can also have a role.

Because judgments will always be an important part of natural resource management, we believe the institutions responsible for management and regulation should be consciously designed and evaluated with an eye to the effect of agency structure on those judgments. It clearly matters how decisionmaking authority is divided between agencies with conservation

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[138] *See generally* John D. Leshy, *Natural Resources Policy in the Bush (II) Administration: An Outsider's Somewhat Jaundiced Assessment*, 14 DUKE ENVTL. L. & POL'Y F. 347, 352-54 (2004).

missions and those with extractive or development missions. It matters whether and how the extent of uncertainty in the information supporting regulation is made apparent to the political communicy. It matters whether regulatory decisions are subject to outside review, by whom, and how that review is structured. All of these institutional factors, and others, matter not because they will facilitate or impeded perfect scientific decisionmaking, but because they will inevitably affect the way judgments are made. They debate over natural resource management and regulation needs to be expanded beyond the futile search for perfect rationality to encompass a more realistic discussion of how to make the best possible decisions in an inevitably imperfect world.