Science Plays Defense:

Natural Resource Management in the Bush Administration

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The Bush administration has been heavily criticized by scientists for its use of science in the policy arena generally, including in natural resource management. The most widely circulated criticisms have accused the administration of politicizing science. The fundamental problem, though, is the opposite, the scientizing of politics. Political actors are often tempted to describe their decisions as scientific, but science is not, and cannot be, the primary driver of most regulatory decisions. The long history of scientific leadership within the conservation community has produced a sense in that community that emphasizing the scientific aspects of natural resource management necessarily works to their advantage. The current administration, however, has shown that the rhetoric of science can also be used defensively, as a barrier to regulation. This Article details several key methods the administration has used to pursue its strategy of defensive science in natural resource management. It concludes with the suggestion that a more normatively defensible, and perhaps also a more politically effective, strategy for conservationists would emphasize the need to bring two key procedural aspects of scientific practice, transparency and a commitment to updating, more strongly into the regulatory arena.

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These departments can no longer be trusted to make fair or competent decisions about our nation’s resources. The lynx scandal underscores everything that’s wrong with Fish & Wildlife and the Forest Service. It shows how the agencies succumbed to a Clinton-era culture that puts ideology ahead of science. It demonstrates the undue influence environmental groups hold over the departments. It also shows how vaguely written laws like the Endangered Species Act can be used to further political agendas, even in the complete absence of hard science.1

Within hours of moving into the White House, the Bush Administration put a hold on numerous regulations that had been in the making for years. . . . These actions were warranted according to Administration officials because they wanted to ensure that the best possible science was used to support new regulations. Yet time and time again the Administration has put politics and corporate interests

above the ‘best science.’ Over the past two years, the Administration has ignored, manipulated, challenged, suppressed and dictated scientific analysis in order to implement an agenda harmful to the environment and roll back Clinton-era protections.²

INTRODUCTION

Complaints about “political science” in natural resource management are by no means new.³ But they have reached an unusually strident pitch in the last four years. Politicians, environmental groups,⁴ and prominent scientists,⁵ have all excoriated the Bush administration’s use of science in a variety of regulatory contexts.

The harsh tone has spilled over into peer-reviewed scientific journals, which are usually fairly staid. A recent paper in the journal Conservation Biology, for example, comes close to accusing the administration of practicing Lysenkoism.⁶ Lysenko was a Russian plant breeder, without formal scientific training, who believed that acquired traits could be inherited, rejecting the already well-established evidence


⁶. Carl N. McDaniel, The Human Cost of Ideology as Science, 18 CONSERVATION BIOLOGY 869 (2004). See also David W. Orr, The Corruption (and Redemption) of Science, 18 CONSERVATION BIOLOGY 862, 862 (2004) (if allowed to continue, the administration’s “corruption of science and public information for political ends . . . will, like Lysenkoism in the Soviet Union, demoralize scientists, degrade the reputation of science, and discredit the information necessary to a free society.”).
that genes control inheritance. Promising great gains in desperately needed agricultural production, Lysenko managed to persuade the Soviet Union not only to adopt his views, but to actively suppress the teaching and study of conventional genetics for more than thirty years. Needless to say, crop yields did not improve, and progress in biological research in the Soviet Union stagnated. A charge of Lysenkoism is the strongest possible scientific condemnation of policy decisions; it accuses policymakers of being blinded by ideology to readily accessible and agreed-upon facts.

I am no fan of the Bush administration’s record on management of natural resources, or of its use of science in that context. Nonetheless, I believe that the extraordinarily harsh criticisms, just like those flung at the Clinton administration from the opposite side, aim at the wrong target. This administration does not systematically deny or ignore well-established scientific facts, as Lysenko did. I do not mean to claim that this administration (or others, for that matter) never falsifies or conveniently misinterprets scientific data. Surely such incidents occur, and have serious repercussions. My argument here, though, is that the administration does not need to falsify or misrepresent scientific evidence in order to effectively fly the banner of science over its anti-conservation agenda.

The persistence and intensity of controversy over the scientific basis of natural resource regulation are instructive. These controversies show how much value both sides place on laying claim to the mantle of science. At the same time, looked at more closely, they reveal how much more than science goes into regulatory decisions. The vast majority of the


8. Perhaps surprisingly, charges of Lysenkoism turn out not to be unique to this administration. They were, for example, leveled against the Clinton administration by critics of its biotechnology policy. See generally Henry I. Miller, USA Biotechnology Policy: The Ghost of Lysenko?, 6 CURRENT OPINION IN BIOTECHNOLOGY 255 (1995).

9. One notable example comes from Florida, where FWS biologist Andrew Eller was fired in November 2004 after publicly challenging his agency’s use of data to minimize the limits Florida panther recovery would place on development. Eugene Russo, The Plight of the Whistleblower, 19 THE SCIENTIST 39 (2005). In evaluating threats to the panther, FWS had considered only data concerning activity during the day, when the panthers are least active. Jac Wilder VerSteeg, Endangered Species: Good Science, PALM BEACH POST, Apr. 7, 2005, at A18. Responding to Eller’s Data Quality Act challenge, FWS later conceded that the panther data had been misinterpreted, but declined to reinstate Eller or reconsider decisions allowing development in panther habitat. Id. The highest-profile case of misrepresentation in the news lately, though, dates to the Clinton administration. In a series of e-mail messages between 1998 and 2000, “[i]t[wo employees [of the U.S. Geological Survey] discussed falsifying records and manipulating data to ensure that water infiltration and climate studies for Yucca Mountain met quality assurance standards for the site.” Mike Ferullo, Energy, Interior Officials Defend Efforts to Probe Charges of Falsified Yucca Data, 36 Env’t Rep. (BNA) 692 (Apr. 8, 2005).
disagreements are not over the data themselves. They are instead over what actions are justified by imperfect data, and how much and what type of data to collect or demand.

Both sides in these disputes decry the politicization of science. I would flip that description around. The fundamental problem is the "scientizing" of politics or, in the wonderfully evocative phrase coined by Wendy Wagner, the "science charade." When scientific data are limited and legislative value judgments have been made only at the broadest level, political choices necessarily, and legitimately, factor into natural resource decisions. The core of the problem is not the involvement of politics but its concealment behind a cloak of science. Conservation advocates may once have thought that emphasizing the scientific aspects of natural resource decisions would systematically work to their advantage, but the Bush administration has shown that is not the case. Moreover, scientizing these decisions systematically retards needed learning by deflecting attention away from the gaps in available information and the potential value of additional data.

Focusing more directly on the key elements of the scientific process could provide a response to the administration's strategy that is certainly more normatively defensible and might even prove more politically effective. The essence of scientific decision making is not certainty or perfect objectivity. It is transparency and learning over time. The Bush administration's approach to natural resource management is unscientific, and even anti-scientific, in the sense that it rejects or ignores those key aspects of the scientific process. Bringing them more strongly into natural resource management would both enhance political legitimacy and improve the likelihood of achieving society's substantive conservation goals.

I. THE LIMITS, AND THE LURE, OF SCIENCE

No one disputes that science is an essential element of effective natural resource policy. Whatever society's goals, their achievement will depend upon the availability and application of reliable information about the natural world. If harvests of fish or timber are to be sustainable over time, rates of production and the effects of harvest must be understood. If endangered species are to be protected, their population dynamics and vulnerability to threats must be recognized.

Science, however, is typically not the decisive element in regulatory decisions. It is a truism that the scientific information available about environmental problems is incomplete, inconclusive, and ambiguous. In that context, sharply contrasting decisions can be defended with the claim

that they are grounded in science. As the Office of Management and
Budget put it in a recent report to Congress:

When dealing with uncertain scientific issues, it is possible to draw
several reasonable inferences depending on the perspective of the
reviewer. Thus, more than one plausible answer ... may exist.\textsuperscript{11}

In the face of scientific uncertainty, regulatory outcomes depend
critically upon what conclusions are drawn from the data, and upon what
level of certainty is required as a prerequisite to regulatory action. The
process of interpreting and applying incomplete data is full of judgments,
some of the type familiar to research scientists, others of the type familiar
to political actors. To the extent that these judgments are not objectively
determined by the data, they are not scientific in the sense that dominates
popular mythology. To the extent that factors other than scientific
evidence inform them, they are not scientific even in an expansive sense.

Frequently, the available scientific data sets broad boundaries (the
greater the uncertainty, the broader the boundaries), within which a
range of choices can be defended. Those choices are political in a non-
pejorative sense; they necessarily depend upon the values and priorities
of the decision maker. Nonetheless, the political appeal of science has
long encouraged overemphasis of the role of science in regulatory
choices. Both regulators and their critics are tempted to scientize
regulatory decisions, falsely claiming that science is or should be the
determinative factor.\textsuperscript{12}

\textsuperscript{11} OFFICE OF MANAGEMENT AND BUDGET, INFORMATION QUALITY: A REPORT TO
CONGRESS 8 (April 30, 2004). Science policy scholars recognized this indeterminacy long before
OMB did, of course. See, e.g., SHEILA JASANOFF, THE FIFTH BRANCH: SCIENCE ADVISERS AS
POLICYMAKERS (1990) ("There is ... general agreement that ... decisions have to be made on
the basis of available facts, supplemented in large measure by judgement.").

\textsuperscript{12} Both proponents and opponents of environmental regulation have also tried to respond
to claims that science justifies regulation or the lack of regulation by attacking the claims of
scientists to disinterestedness. See, e.g., Douglas A. Kysar & James Salzman, Environmental
Tribalism, 87 MINN. L. REV. 1099, 1127 (2003); Robert R. Kuehn, Suppression of Environmental
Science, 30 AM. J.L. & MED. 333 (2004); Thomas O. McGarity, Our Science is Sound Science and
their Science is Junk Science: Science-Based Strategies for Avoiding Accountability and
Responsibility for Risk-Producing Products and Activities, 52 U. Kan. L. Rev. 897, 917-918
(2004); Wendy Wagner & David Michaels, Equal Treatment for Regulatory Science: Extending
the Controls Governing the Quality of Public Research to Private Research, 30 AM. J.L. & MED.
119 (2004). It is difficult to tell whether that tactic is eroding public trust in scientists. In a
November 2002 Harris Poll, 68% of respondents said they would generally trust scientists, down
from 79% in 1998. Humphrey Taylor, Trust in Priests and Clergy Falls 26 Points in Twelve
Months: The Harris Poll #63 (Nov. 27, 2002), available at
http://www.harrisinteractive.com/harris_poll/index.asp?PID=342. Trust also declined over that
time for most other occupations, though, so that scientists continued to rank relatively high on
the trust scale, above judges, civil servants, and military officers, and well above members of
Congress or journalists. Scientist has ranked as the occupation having highest prestige in a
recurring Harris Poll since 1977, but the absolute number of respondents describing scientists as
having "very great prestige" has fallen over the years. Humphrey Taylor, Scientists, Firemen,
Science is a politically appealing justification because it promises objective, rational decisions. It is supposed to be free of emotion. That characteristic may look especially important to those championing protection of environmental features that lack obvious utilitarian value. The semblance of scientific objectivity helps them avoid uncomfortable and difficult debates over underlying values.\(^{13}\) Without the cover of science, they might face the difficult prospect of defending public implementation of what appears to be nothing more than their (perhaps quirky) taste for environmentalism.\(^{14}\)

Science also promises decisions free of the corrupting influences of politics and money. Science-based decisions are far less likely to appear tied to the interests of a narrow special-interest group than decisions openly based on economics.\(^{15}\) Probably because they are seen as above the ordinary political fray, scientists enjoy a high level of public trust.\(^{16}\) Decisions that can be presented as scientific therefore instantly gain a level of respectability that other decisions do not have. Republican consultant Frank Luntz described the benefits of framing decisions in scientific terms in an infamous memorandum:

The most important principle in any discussion of global warming is your commitment to sound science. Americans unanimously believe all environmental rules and regulations should be based on sound science and common sense. Similarly, our confidence in the ability of science and technology to solve our nation’s ills is second to none. Both perceptions will work in your favor if properly cultivated.\(^{17}\)

Finally, scientizing regulatory decisions can insulate decision makers from the political consequences of their judgments. The American public is notoriously scientifically unsophisticated.\(^{18}\) Few Americans are able to evaluate claims that particular policy decisions are objectively required by available scientific data. Even public interest groups may have a

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16. See supra note 12.


18. See NATIONAL SCIENCE BOARD, SCIENCE AND ENGINEERING INDICATORS 2002 at 7-9 to 7-12 (collecting information on the level of public knowledge of science and technology).
difficult time overcoming this hurdle, because highly specialized knowledge and a sizeable investment of time may be needed to unpack scientized decisions. As a result, agencies can use the cloak of scientific objectivity to hide, and therefore to evade political responsibility for, their value choices.19

Both the Bush administration and its critics are guilty of scientizing natural resource decisions. A battle for the scientific high ground is in full swing, as is apparent from the juxtaposition of a series of statements by administration officials strongly endorsing the importance of science to policy choices against the harsh criticisms of its use of science.

According to Presidential Science Advisor John Marburger, for example:

President Bush believes policies should be made with the best and most complete information possible, and expects his Administration to conduct its business with integrity and in a way that fulfills that belief. I can attest from my personal experience and direct knowledge that this Administration is implementing the President's policy of strongly supporting science and applying the highest scientific standards in decision-making.20

The President's natural resources team echoes those sentiments. From the beginning of her tenure, Interior Secretary Gale Norton has repeatedly stressed the importance of basing policy decisions on the best available science.21 Craig Manson, Assistant Secretary for Fish and Wildlife and Parks, has endorsed Norton's call for sound science.22 FWS Director Steven Williams said that "from day one as Director, I have

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emphasized the paramount importance of scientific excellence."\textsuperscript{23} Williams describes the key challenge in implementation of the Endangered Species Act\textsuperscript{24} (ESA) as being able "to understand, apply and explain why science drives our wildlife management decisions... Our credibility as professionals... derives from this commitment to science."\textsuperscript{25} By his own description, one of Williams' primary policy initiatives has been a "Science Excellence Initiative" intended "to provide managers better access to the best available science and better ability to apply that science toward adaptive management."\textsuperscript{26}

Both sides probably do sincerely believe in the importance of science for natural resource decisions, although (as further described below) they would assign very different roles to science. But both are also quite willing to overemphasize the role of science where they see political advantage. Perhaps the strongest evidence of this sort of exaggeration is the use of the same incidents by advocates on both sides of conservation conflicts as proof that their opponents are misusing science.\textsuperscript{27}

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\item 16 U.S.C. §§ 1531-1544.
\item Williams, supra note 23.
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II. ONE TOOL, TWO VERY DIFFERENT ENDS

Science is just a tool; like other tools, it can be turned to a variety of ends. Conservationists are accustomed to thinking of science-based claims as peculiarly adapted to justifying protective regulations. But, as this administration is devoted to demonstrating, the rhetoric of science is just as suited to blocking conservation measures as it is to facilitating them. The public expects science to provide objective and certain answers to binary questions. Both the answers and the clarity of the evidence, however, are hardly ever so straightforward. The combination of actual uncertainty and public expectations of certainty makes the rhetoric of science equally available to the regulatory offense and defense.

A. Offense: Science for Conservation

The iconic heroes of the conservation movement in the United States have primarily been natural scientists, from Aldo Leopold to Rachel Carson to Edward O. Wilson. Even John Muir, the preservationist who emphasized awareness of the non-material, aesthetic value of nature, was scientifically trained. The incorporation of accurate, up-to-date scientific knowledge into resource management decisions has been the key demand of conservationists from the start. John Wesley Powell, second director of the U.S. Geological Survey, argued unsuccessfully that development of the arid West ought to be adapted to its climate, fighting the popular myth that rain would follow the plow. George Perkins Marsh called attention to the scientific shortcomings of

28. For purposes of this paper, I have intentionally lumped together "conservation," in the sense of sustainable use of resources over time, and "preservation," in the sense of setting resources entirely aside from extractive or destructive use. Those two are sometimes at odds, but not with respect to the current administration, which favors short-term exploitation over either conservation or preservation.


30. Author of Silent Spring, the 1962 best-seller that first brought to public attention the environmental impacts of pesticide use, Carson was a marine biologist with the U.S. Fish and Wildlife Service. Naomi Oreskes, Science and Public Policy: What's Proof Got to Do With It?, 7 ENVTL. SCI. & POL'Y 369, 372 (2004).


forest management in the United States. Gifford Pinchot later brought Marsh's work into the policy world, applying science to forest management in order to prevent short-sighted overexploitation of the nation's forest resources.

These scientist-advocates, and their many successors, have used insights from the natural sciences, particularly ecology, to argue for environmental protection. The standard-bearers of this tradition have made the public and policymakers acutely aware of the extent of connectedness in the natural world; of the limits of natural resilience and the possibility of irreversible harm; and of the unexpected material benefits of some of the most seemingly insignificant parts of nature. They have used their scientific expertise to weave effective stories about the disastrous consequences of careless treatment of the environment.

The mix of conservation science and conservation advocacy is so pervasive that it has produced a quiet confidence within the conservation community that they hold the scientific high ground almost as a matter of natural law. That confidence springs in part from an assumption that those with the relevant scientific expertise will favor a particular political point of view – that conservation should be a high societal priority, taking precedence over development in many circumstances. If that assumption is correct, emphasizing the scientific aspects of resource decisions should advance the conservation position by increasing the relative power of persons who can be expected to value conservation highly.

Conservation-oriented scientist-advocates have sometimes exaggerated the role of scientific data in their calls for resource protection. Consider, for example, the history of forest planning regulations. The National Forest Management Act (NFMA), adopted in 1976, requires that the Forest Service periodically prepare land-use management plans for the lands under its supervision. The NFMA left

36. GIFFORD PINCHOT, BREAKING NEW GROUND 114-280 (1947).
38. See, e.g., Eric Bailey, Outside Group to Review Status of 3 Fish Species, L.A. TIMES, Oct. 3, 2001, at B7 (quoting Glen Spain of the Pacific Coast Federation of Fishermen's Associations as saying his group welcomes the NRC review of the Klamath Project biological opinions because "the science is bulletproof").
39. The prevalence of conservation scientists in the conservation movement has naturally nurtured this view. For a detailed description of the advocacy of a large number of prominent conservation scientists, including their self-conscious coining of the term "biodiversity" as a political tool, see generally DAVID A TAKACS, THE IDEA OF BIODIVERSITY: PHILOSOPHIES OF PARADISE 9-99 (1996).
the details of this requirement to be specified by the Forest Service in regulations, but Congress mandated the empanelment of a Committee of Scientists to provide advice on those initial regulations. The Committee self-consciously provided more than technical advice, encouraging the Forest Service to resolve policy questions left unsettled by NFMA in ways that favored conservation. Most notably, the Committee proposed, and the Forest Service then adopted, regulations giving strong regulatory content to NFMA's vague statutory direction to maintain a diversity of species on these lands. When it decided to revise the forest planning regulations, the Clinton administration convened a new Committee of Scientists, even though NFMA did not require it to do so. The Committee's charter called on it to provide "scientific and technical advice," but it was also told "to develop a set of concepts and principles" to guide land and resource planning. This Committee recommended that the Forest Service redraw its planning regulations to give priority to ecological sustainability over all other goals, a major shift from the traditional interpretation of NFMA's multiple use mandate. That recommendation rested on the values of the Committee members, rather than on scientific data.

There is nothing unusual about resource management choices resting on values. While they are often based on the available scientific data, natural resource management decisions are typically not determined by

41. 16 U.S.C. § 1604(h).
42. George Hoberg quotes Arthur Cooper, the Committee chair, as saying that the Committee "understood that we were helping to resolve policy issues that had been sidestepped by policymakers." George Hoberg, Science, Politics, and U.S. Forest Service Law: The Battle Over the Forest Service Planning Rule, 44 NAT. RES. J. 1, 6 (2004).
those data. Instead, they are determined by the perspective through which inconclusive data are interpreted. Filtering limited information through the high value they place on natural resources, conservation scientists frequently conclude that protective or restorative measures are required. Their own conservationist values may be so invisible to some that they genuinely believe the scientific data compels specific regulatory steps. Others may understand the role of values but seek to conceal that role in order to gain the perceived political advantages of science-based decision making.

B. Defense: Science Against Regulation

Science can also be turned to the very different purpose of protecting against unnecessary regulation. Justice Scalia articulated this view of science in *Bennett v. Spear*:47

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.48

The rhetoric of science lends itself well to this purpose, as tort reform advocates and opponents of pollution regulation discovered more than a decade ago. Their rhetorical gambit endorses the use of “sound science” while warning against “junk science.”

Publication of Peter Huber’s book *Galileo’s Revenge* brought the term “junk science” into wide use.49 Huber, a lawyer with engineering training, described junk science as lacking any informational value.50 According to Huber, junk science “is a hodgepodge of biased data, spurious inference, and logical legerdemain, patched together by researchers whose enthusiasm for discovery and diagnosis far outstrips their skill. It is a catalog of every conceivable kind of error: data dredging, wishful thinking, truculent dogmatism, and, now and again,

47. 520 U.S. 154 (1997).
48. Id. at 176-77. Justice Scalia’s view ignores both the ESA’s overriding conservation purpose and the history of its science requirements. 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). I am not endorsing Scalia’s specific exercise in statutory interpretation, simply noting that in the abstract his description of the purpose of science requirements in regulatory statutes is a plausible one.
50. He equated it with astrology or patently false tabloid stories. Id. at 1-2.
outright fraud." His book maintained that courtrooms across the country were full of such "scientific humbuggery" being used by tort plaintiffs to fleece corporations out of millions of dollars. Huber's junk science category included any claims not supported by a general consensus among scientists. He therefore endorsed the public misperception of science as a binary enterprise, essentially dividing scientific assertions neatly into two categories: those conclusively proven and those patently false. If one accepts Huber's binary premise, his conclusion follows ineluctably. Of course courtrooms should allow in only proven scientific claims, if that means excluding only false ones.

Huber directed his polemic only at courtroom science. But the implications of his argument were obviously much broader. If "junk science" is every bit as reliable as astrology, it has no place in administrative decisions either. Indeed, the campaign against junk science quickly expanded to the regulatory arena, accompanied by an added rhetorical element. Not only must "junk science" be kept out of regulatory decisions, regulations must be justified by "sound," meaning proven, science.

These anti-regulatory tactics have enjoyed remarkable success, at least in part because the language and culture of research science are comfortably adapted to its claims. Research scientists are used to dealing with a world of uncertainty and error. They know that their measurements are not perfect, that many features of the natural world can be highly variable, and that factors outside of their control may confound their results. They also know that incorrect claims hold the potential to sidetrack a field into unproductive byways. Yet the incentives of the profession encourage early claims of proof, which can bring prestige and recognition. In order to counter those incentives, research scientists have evolved norms for the level of certainty needed to support an outright claim that an individual study has "proven" a cause-and-effect relationship. Frequently, especially in fields where experimental conditions can be closely controlled, those norms require that statistical

51. Id. at 3.
52. Id. at 6.
53. Id. at 194-98. See also id. at 219 ("Science is what scientists do . . . – the process and findings accepted by the scientific community.").
tests demonstrate at least a 95% probability that the observed relationship did not arise by chance.

Research scientists know that statistics can only show probabilities, and that unrecognized problems with data or interpretations can confound either positive or negative statistical results. They also know that there is a large middle ground where the data do not either prove or disprove a hypothesis. Nonetheless, they often speak in binary shorthand, describing a hypothesis as true or false, proven or unproven, depending upon whether or not it passes conventional statistical tests. Those shorthand descriptions are readily picked up by the popular culture.

Following Huber's lead, opponents of regulation make two arguments that rest on the shorthand version of these norms. First, they argue that individual studies falling short of the level of certainty demanded to support claims of proof in research circles are "junk science" which must not be given any weight in regulatory decisions. Second, they claim that "sound science" requires that regulations be affirmatively supported by data that does satisfy the stringent burden of proof applied in research science. Both claims are wrong, albeit for different reasons. The first is inconsistent with ordinary scientific practice. The second inappropriately extrapolates research norms across the board to all regulatory settings.

As a matter of professional practice, research scientists do not ignore studies that fail to "prove" a hypothesis to a 95% certainty level. Data falling short of that level of certainty may indicate that the hypothesis is worthy of further study. Moreover, if enough different suggestive studies accumulate, or if a convincing mechanistic explanation of the phenomenon is developed, scientists may accept a hypothesis as proven without a single statistically significant study.5

Even if "junk science" claims reflected an accurate picture of research practice, it would not make sense to blindly transfer research norms to the regulatory arena. The high burden of proof conventionally applied in the research world represents the collective judgment of research scientists that the relative cost to the research enterprise of falsely claiming an issue is resolved is generally much higher than that of believing incorrectly that it remains uncertain. It also takes into account incentives that push asymmetrically toward premature claims of certainty.

56. See, e.g., Thomas O. McGarity, Our Science is Sound Science and Their Science is Junk Science: Science-Based Strategies for Avoiding Accountability and Responsibility for Risk-Producing Products and Activities, 52 U. KAN. L. REV. 897, 923-24 (2004) (explaining that scientists evaluate the weight of all the evidence, rather than judging individual studies one by one); Holly Doremus, Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy, 75 WASH. U. L. Q. 1029, 1071 (1997) (noting that a series of studies, no one of which produces statistically significant results, may persuade scientists that a hypothesis is correct).
Both the relative costs of error and the incentives are quite different in the regulatory context.

Unlike the costs of research mistakes, those of over- and under-regulation are context-specific. Consequently, decisions about burdens of proof should not be made across the board. The environmental costs of under-regulation can be irreversible, while the economic costs of over-regulation will often be reversible. The costs of mistaken over-regulation therefore will not always (as the advocates of defensive science assume) exceed those of mistaken under-regulation. Recognizing that, Congress has in some cases made the judgment that mistakes of resource under-protection are more to be avoided than the opposite. The incentives, too, are more context-specific in the regulatory arena. If anything, however, they are more likely to systematically disfavor regulation than to favor it. The status quo holds considerable political and psychological power, and opponents of regulation are likely to have organizational advantages over its proponents. Overall, the rationale for imposing high burdens of proof in research science does not always, and may not even often, translate to the regulatory context.

Those making "junk science" arguments, of course, have political rather than scientific agendas. Herrick and Jamieson found that "junk science" claims in the popular media are almost never accompanied by evidence of scientific flaws. Instead, they generally rest either on unsupported assertions of scientific falsity or on explicit disagreement with the values underlying policy choices, such as the extent of consideration given to the economic implications of those choices. Most articles criticizing junk science, they concluded, "were critiques of environmental or public health policies based on politics or values rather than on science. In other words, the imprimatur of science is being smuggled into deliberations that actually deal with values and politics."

The rhetoric of "junk science" is well calculated to turn exaggerated claims of scientific certainty against conservation advocates. If

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57. The ESA is the most obvious example. See Tennessee Valley Auth. v. Hill, 437 U.S. 153, 184 (1978) ("The plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, whatever the cost."); id. at 187 ("The plain language of the Act, buttressed by its legislative history, shows clearly that Congress viewed the value of endangered species as 'incalculable.'").


62. Id. at 15 (emphasis in original).
conservationists, as they seem to claim, want only to impose regulations objectively required by scientific data, they can have no objection to demands that the science in fact meet high standards of certainty.

C. Change in Administration, Change in View of Science

Clinton's policymaking appointees, several of whom worked for environmental groups before or after their stint in government, were committed to the goal of conservation. They viewed science as an important tool toward that end. Secretary of the Interior Bruce Babbitt in particular, with graduate-level training in geology, came from the line of conservation scientist-advocates. Although they were also sensitive to what they saw as the political vulnerability of the resource-protection statutes, Clinton's appointees were inclined to see science as an affirmative tool for protecting the environment to the extent they believed the political climate allowed.

In sharp contrast, the Bush administration believes firmly that the function of science in the regulatory process is to make sure that regulatory restrictions are not lightly imposed. Prior to his election in 2000, candidate Bush endorsed the rhetoric of "sound science" in an interview with Science, the journal of the American Association for the Advancement of Science. His appointees in the natural resources area share that perspective. Many of them have backgrounds in extractive industries. Their values incline them to impose a high burden of proof on the imposition of conservation regulations, to confer decision-making


64. Leshy, supra note 63, at 201.
65. See generally id.
66. The editors of Science interviewed both candidates before the 2000 election. Bush referred to "sound science" three times, once to say that "sound science—not politics—should" control decisions about whether or not to open a high-level radioactive waste disposal facility at Yucca Mountain, and twice while criticizing European barriers to the import of genetically modified crops. Gore did not use the term "sound science." Gore and Bush Offer Their Views on Science, 290 SCIENCE 262-69 (2000).

authority on agencies and persons likely to share their industry-friendly orientation, and to resist the production of new information that might help conservation advocates meet that high burden.

III. SCIENCE, VALUES, AND DECISION MAKING IN THE BUSH ADMINISTRATION

The Bush administration's natural resource policies both use and defuse science in ways that advance its anti-regulatory, anti-conservation agenda. Science is used defensively by imposing high burdens of proof as barriers to regulation. At the same time, the offensive use of science by conservationists is neutralized by subtle value choices that minimize the importance of specific types of data, by moving decision-making authority away from scientists, and by discouraging collection of data. These strategies are far more subtle than Lysenkoism. None of them requires falsification or outright rejection of clear scientific data, yet together they allow the administration to undermine conservation efforts without openly acknowledging its disdain for conservation values.68

A. It's the Burden of Proof, Stupid

When available scientific information is thin, demands for scientific certainty, or even for clear scientific support for regulatory decisions, can sharply limit regulation. The Bush administration has made considerable use of the trope of sound science to justify curtailing conservation measures. The administration's implementation of the ESA most clearly illustrates this strategy.

The ESA places heavy emphasis on science, mandating that federal agencies consider the best available scientific data when making key decisions, and requiring that listing decisions be based solely on that data.69 The ESA has been controversial almost since its inception; much of the controversy has revolved around perceived flaws in the scientific basis for implementing decisions. In reality, though, the fundamental disagreements have always been about the relative importance of species protection and economic activity, rather than about the data themselves. Those who place a high value on conservation would impose a low burden of proof on listing decisions, and vice versa. Because the available

68. As John Leshy has pointed out, the Bush administration has been highly skillful at deflecting political opposition through a variety of strategies. John D. Leshy, Natural Resources Policy in the Bush (II) Administration: An Outsider's Somewhat Jaundiced Assessment, 14 DUKE ENVT'L. L. & POL’Y F. 347, 352-54 (2004). Its use of the rhetoric of science is one aspect of that larger effort.

data is incomplete, the burden of proof turns out to be the key determinant of many listing decisions.

Listing decisions necessarily combine available data with policy judgments about the level of acceptable risk and the appropriate burden of proof. Congress has made these judgments only in the vaguest of terms. On the question of risk, an endangered species is "in danger of extinction throughout all or a significant portion of its range" and a threatened species is "likely to become an endangered species within the foreseeable future." The regulatory agencies have not supplied any more specific guidance, either through a general rulemaking or in the course of individual listing decisions. On the burden of scientific proof, the Administrative Procedure Act sets a nebulous lower bound; the regulatory agency’s judgment that a species is endangered or threatened must be supported by some evidence or it will be deemed arbitrary and capricious. The ESA’s conservation purpose suggests a similarly indeterminate upper bound; the listing agencies may not require "conclusive evidence" that a species is near extinction in order to list it.

Within this fuzzy range, the executive branch enjoys a great deal of discretion to determine whether the available evidence is sufficient to justify listing or not. No administration has ever articulated, in binding regulations, policy statements, or even individual listing determinations, consistent standards with respect to either the acceptable risk level or the burden of scientific proof. The Clinton administration used this discretion to roughly calibrate listing activity based on the level of political opposition. The Bush administration has exploited it to avoid listing species at all.

With the exception of a brief hiccup in the Reagan era, the pace of listing had gradually but steadily increased until the current administration took over. No domestic species were added to the protected list in 1974, the first full year in which the modern version of the ESA was in effect, and only eight in 1975. From 1976 through 1980, 70.

75. See Holly Doremus, Listing Decisions Under the Endangered Species Act: Why Better Science Isn't Always Better Policy, 75 WASH. U.L.Q. 1029, 1122-27 (1997) (detailing the regulatory agencies' ad hoc approach to viability determinations). NMFS did once articulate a standard for listing of less than 95% probability of survival for 100 years, but it did not apply that standard in another decision only a few months later. Id. at 1123.
76. All of these numbers are for species that live in the United States. Foreign species can be listed, but only domestic listings bring controversial regulatory restrictions on activities that may indirectly harm species by destroying their habitat. Data on the number of domestic species listed per calendar year are compiled by FWS, and posted at
listings averaged 30 species per year. In the first three years of the Reagan administration, the average fell to about 7 species per year. Congress responded by amending the ESA to require that listing decisions be made "solely on the basis of the best scientific and commercial data available." That language was inserted in order to prohibit the administration from openly relying on economic arguments against listing.

The pace of listing quickly rebounded. For the last five years of the Reagan administration it averaged more than 32 species per year, under George H.W. Bush it accelerated to 57 per year, and under Clinton, even with a temporary moratorium imposed by Congress, it hit a peak of 66 per year. Since the inauguration of George W. Bush in 2001, however, listing has stopped even more completely than it did in the early Reagan years. An average of only 7 species per year have been listed over the past four years, and only a total of 8 in the last two years. Every one of


79. The amendments responding to the slowdown in listings were signed into law on October 13, 1982, but the pace of listings did not pick up noticeably until 1984, presumably because the listing process takes time and the Reagan administration had simply not begun that process for many species until Congress stepped in.
81. Data for 2003 and 2004 are not yet available at the FWS web site. I generated these numbers through a Westlaw search for final ESA listing rules issued in 2003 and 2004. The slowdown is even more extreme than those numbers make it appear. Four of the five listings in 2004 were subspecies of the island fox, found on California's Channel Islands. They could easily have been listed as a single entity. Endangered and Threatened Wildlife and Plants; Listing the San Miguel Island Fox, Santa Rosa Island Fox, Santa Cruz Island Fox, and Santa Catalina Island Fox as Endangered, 69 Fed. Reg. 10335 (Mar. 5, 2004) (to be codified at 50 C.F.R. pt. 17). The other 2004 listing was the California tiger salamander, which was designated as a threatened species throughout its range. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the California Tiger Salamander; and Special Rule Exemption for Existing Ranching Activities, 69 Fed. Reg. 47212 (Aug. 4, 2004) (to be codified at 50 C.F.R. pt. 17). That action was in key part a downlisting, because two salamander populations had previously been listed as endangered. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Sonoma County Distinct Population Segment of the California Tiger Salamander, 68 Fed. Reg. 13498 (Mar. 19, 2003) (to be codified at 50 C.F.R. pt. 17); Endangered and Threatened Wildlife and Plants; Final Rule to List the Santa Barbara County Distinct Population of the California Tiger Salamander as Endangered, 65 Fed. Reg. 57242 (Sept. 21, 2000) (to be codified at 50 C.F.R. pt. 17). It increased, rather than decreased, regulatory flexibility, because threatened species need not be given the full protection of ESA section 9, prohibiting take. See 16 U.S.C. § 1533(d) ("Whenever any species is listed as a threatened species . . . the Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation of such species.").
the tiny number of listing rules finalized in the last two years has been driven by litigation.\textsuperscript{82}

The numbers alone suggest that the current administration is imposing a higher burden of proof on listing decisions.\textsuperscript{83} More direct evidence of the administration's strongly defensive view of science can be found in congressional testimony, guidance letters, and regulatory determinations.

Bills calling for "sound science" in ESA decision making have been introduced in the last several Congresses.\textsuperscript{84} In the House, where Resources Committee Chairman Richard Pombo is a big proponent, a "sound science" bill seems likely to come to the floor in the next Congress. These bills generally contain two types of provisions. First, they seek to override the existing general requirement that the regulatory agencies base listing decisions on the best available scientific evidence by imposing a preference, or even a requirement, for field survey data, as


opposed to models and mechanistic inferences. Second, they would mandate external peer review of certain regulatory decisions, generally in an asymmetric manner. For example, the latest version, dubbed the Endangered Species Data Quality Act, would mandate peer review of decisions that a species qualifies for listing or that a federal action would jeopardize the continued existence of a listed species, but not of decisions that a species does not merit listing or that an action would not cause jeopardy.

In March 2002, Interior Assistant Secretary Manson made the administration's defensive view of science plain in testimony in favor of one of these bills. He noted that, "given the impact that our resource management decisions can have on communities and individuals, the species conservation decisions we make must be based on the best available science." Manson later acknowledged that resource management decisions could also have significant effects on species, but it is clear that economic impacts weigh more heavily in the administration's calculations.

The administration has soundly rejected calls for a precautionary view of science in the listing context. Early in 2003, Manson sent a guidance letter intended to clarify administration policy on critical habitat designation to FWS offices around the country. Explaining how science should be used in that process, Manson wrote:

[T]he designation of critical habitat must be founded on the best available science, an accurate assessment and characterization of existing management and protection measures, and a sound economic

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85. See, e.g., Critical Habitat Reform Act of 2004, H.R. 2933, 108th Cong. § 5 (2004) (limiting definition of critical habitat to areas “within the geographical area determined by field survey data to be occupied by the species”).
89. On this subject the administration, despite its vaunted central control, has not spoken with a single voice. NOAA Fisheries, which is responsible for marine and anadromous species under the ESA, has opposed proposals to require reliance on field data in preference to other types of information. Testifying before the House Resources Committee in 2002, NOAA Fisheries Director William Hogarth explained,

We support the goal of basing our decisions on sound and peer-reviewed science, and we agree that empirical field-tested data are important. However, we would not want to diminish the use of models of populations, habitats, and/or life histories, which frequently do represent the best available science and are based on field-collected data.

analysis. Where there is no data available, or the available data is flawed, speculation must not be substituted.

The "precautionary principle" is not used as a scientific tool in our critical habitat designations. Policymakers may weigh precautionary approaches in the context of risk-based management decisions.90

As a practical matter, this amounts not merely to rejection of the precautionary principle but to its affirmative use against regulation. The data available to support critical habitat designations, or species listings, can always be said to be "flawed," a term Manson did not attempt to define. Under the circumstances, calling for scientific certainty as a precondition to regulatory action virtually assures regulatory stalemate.

Two reversals of course on listing decisions illustrate the defensive approach to science in action. The first is the withdrawal of a proposal to list the slickspot peppergrass (*Lepidium pappiliferum*), a foot-high white-flowered plant found only in the sagebrush steppe habitat of southwestern Idaho. FWS identified this species as qualifying for listing in 1999, but declared that its listing would have to await action on higher priority species.91 In 2001, several environmental groups filed suit over FWS’ failure to list the slickspot peppergrass. In accordance with a court-approved settlement agreement, FWS proposed in July 2002 to list the species as endangered.92 After postponing a decision while it gathered additional data, in January 2004 FWS withdrew the proposal, concluding that the species is neither endangered nor threatened.93

FWS explained that its change of heart was based on its “conclusion that there is a lack of strong evidence of a negative population trend,” and its conviction that other protective efforts would be effective.94 The biological evidence had hardly changed, but the burden of proof imposed had. Field surveys undertaken between the proposed rule and its withdrawal had identified five additional occurrences, on top of 70 that were already known.95 Some of the known habitat was found to have improved in quality, but an equal amount was found to have declined.96 The key changes were greater willingness to interpret the available data

94. Id. at 3094.
95. Id. at 3096.
96. Id. at 3097-98.
optimistically and a newly-signed Candidate Conservation Agreement\textsuperscript{97} with Idaho, the Idaho Army National Guard, and the Bureau of Land Management.

FWS went to substantial lengths to gather scientific data that might make listing unnecessary, but did not explain how it interpreted that data. The agency delayed issuance of a final rule because, although there were acknowledged threats to the sagebrush steppe ecosystem, data were "lacking from which to draw strong inferences about population trends across the entire range."\textsuperscript{98} FWS sought peer review from twelve experts, of whom five responded. It accepted a scientific review conducted by the Air Force, and solicited a risk assessment by six additional experts.\textsuperscript{99} But the final decision reveals nothing about what information all these outside experts provided, or what use FWS made of their views.\textsuperscript{100}

Similarly, although the Service says it asked the experts to evaluate risks to the species with and without the Candidate Conservation Agreements,\textsuperscript{101} the decision does not disclose the response. The conclusion that listing is not justified comes almost as a non sequitur at the end of the discussion. Although it concedes that it knows little about the biology of the species or threats to its survival, the agency says it is confident the Candidate Conservation Agreements will provide adequate protection.

The second instructive decision concerns the Sacramento splittail, a small fish native to the Sacramento River and San Francisco Bay estuary. The Clinton administration listed the splittail as threatened in 1999.\textsuperscript{102} The California Farm Bureau successfully challenged the listing, winning a district court ruling that FWS had failed to consider all relevant data and had insufficiently explained its conclusion.\textsuperscript{103} On remand, the Bush

\textsuperscript{97.} Candidate Conservation Agreements are voluntary contracts through which landowners promise to take steps to protect species in return for the Service's commitment not to list them under the ESA. See U.S. Fish and Wildlife Serv., \textit{Candidate Conservation Agreements with Assurances for Non-Federal Property Owners} (Feb. 2002), http://endangered.fws.gov/listing/cca.pdf (last visited Dec. 5, 2004); Francesca Ortiz, \textit{Candidate Conservation Agreements as a Devolutionary Response to Extinction}, 33 GA. L. REV. 413 (1999).


\textsuperscript{99.} \textit{Id.}

\textsuperscript{100.} \textit{Id.} The rule acknowledges that the final decision was made by employees of FWS on the basis of the data and expert interpretation, but says nothing about what judgments were made or why.

\textsuperscript{101.} \textit{Id.} at 3099.

\textsuperscript{102.} Determination of Threatened Status for the Sacramento Splittail, 64 Fed. Reg. 5963 (Feb. 8, 1999).

administration backed away from the earlier conclusion, finding that the species was not threatened. 104

The splittail decision shows just how thin the data relevant to listing determinations can be. Splittail are difficult to sample; no surveys have been designed specifically to look for the species. In its decision, FWS acknowledged that lack of firm data about the species 105 precluded a defensible estimate of the absolute population size, 106 its rate of decline, minimum viable population, or extinction risk. 107 Using a newly-developed model to evaluate abundance trends on the basis of this scant evidence, FWS concluded that fifteen of the twenty data sets available from surveys showed declining trends. Each of the surveys was flawed in some respect. Only five of the trends were statistically significant at the 95% confidence level, but nine were significant at the “conservative” 80% significance level the agency deemed more appropriate. 108 The agency concluded, on the basis of that analysis, that the species probably was declining.

Despite this conclusion, FWS decided the splittail did not qualify for listing because conservation efforts under the CALFED Bay-Delta

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105. See Endangered and Threatened Wildlife and Plants; Notice of Remanded Determination of Status for the Sacramento Splittail (Pogonichthys macrolepidotus), 68 Fed. Reg. 55140, 55142 (Sept. 22, 2003) ("The data available even today on splittail abundance are not optimal. There are a number of survey programs which generate data, each of which have more or less limiting factors. This has made analysis of the status of the species based on this survey data problematic.").

106. Id. at 55150

(To date, there remains no proven scientific method for determining the current splittail population size primarily because no extant survey was designed specifically to monitor splittail populations or to determine their absolute numbers. Further, the splittail exhibits relatively wide variation in annual abundance in response to prevailing hydrologic conditions; it is likely that the population size exhibits appreciable year to year variability which would confound size estimates.).

107. Id. ("Calculating the current population’s risk of and/or time to extinction would require estimates of absolute population size, rate of decline, and minimum viable or sustainable population size, none of which currently exist in a scientifically defensible form.").

108. Id. at 55145

([W]e accepted a 20 percent risk that we would wrongly conclude there is a downward trend in the population for each of the 20 data sets in order to reduce the risk that we would fail to detect a trend if, in fact, one exist. [sic] We used this approach in order to ensure our assumptions were conservative.)

The relatively generous risk level adopted in this decision does not reflect central administration policy. It probably reflects both institutional discomfort with disavowing Clinton-era policy that had been presented as science- rather than value-driven and the inability, at least at the time, to impose fully effective central control on field and regional office career employees. For more discussion of the respective roles of career employees and political appointees in natural resource decisions, see infra, Part III(C)(2).
Program\textsuperscript{109} and the Central Valley Project Improvement Act\textsuperscript{110} would adequately protect it.\textsuperscript{111} FWS reached this conclusion even though it recognized that the CALFED and CVPIA programs were untested, and indeed undefined; that their full implementation remained uncertain; and that other threats to the species would remain even if these programs were fully implemented.\textsuperscript{112}

**B. Values Determine What Science Matters**

The vague legislative mandates in most natural resource statutes leave a great deal of room for unacknowledged value choices. Those choices can determine what science is relevant to regulatory decisions. Those on both sides of the value question can be left believing, with some justification, that the available science supports their preferred policy choice. Arguments about the science in such situations simply cross in the ether, because the parties are talking about different questions.

A good illustration of this phenomenon is the treatment of hatchery salmon in ESA listing decisions. Hatcheries have long been used to supplement or replace wild fish runs affected by dams and water projects. There is both scientific uncertainty and a deep value dispute in the hatchery issue. There are two different scientific questions: the first concerns the type and extent of differences between hatchery and wild fish, the second the effect of hatchery supplementation on wild runs. The policy questions are about whether hatchery fish are an adequate substitute for their wild cousins, and what costs are worth bearing to keep the wild fish around. Both sets of questions are worth fighting about because hatchery fish can be produced in large numbers even if habitats essential to natural spawning are allowed to deteriorate. If hatchery fish are either not meaningfully distinct from or an acceptable substitute for wild fish, then regulatory restrictions on logging, construction, and other habitat-degrading activities can be relaxed.

The ESA allows the listing of species, subspecies, or “distinct population segments” of vertebrate fish or wildlife.\textsuperscript{113} It has never been clear what Congress meant to protect under the rubric of distinct

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\textsuperscript{109} CALFED is a state-federal cooperative program for management of the San Francisco Bay-Delta ecosystem. \textit{See} California Bay-Delta Authority, \url{http://calwater.ca.gov/CBDA/NewCBDA.shtml} (last visited Apr. 1, 2005).


\textsuperscript{111} \textit{Id.} at 55161-62.

\textsuperscript{112} \textit{Id.} at 55165. The new proposed hatchery policy shows similar optimism in favor of steps that reduce regulatory restrictions. The scientific review panel would bar reliance on hatcheries because they have not been proven to be compatible with maintenance of wild runs. The Bush administration, however, is prepared to believe that hatcheries can be operated in ways consistent with maintenance of the wild runs until the opposite is proven.

\textsuperscript{113} 16 U.S.C. § 1532(16).
population segments, a term not used by scientists. In 1991, NMFS issued a policy statement explaining how it would identify distinct population segments of Pacific salmon. The policy uses the term “evolutionarily significant unit” (ESU) to describe populations that qualify for listing. To be recognized as an ESU, a population must be “substantially reproductively isolated” from others, to the point that it promises to evolve as a separate lineage. In addition, it must “represent an important component in the evolutionary legacy of the species.” The ESU policy does not directly address the effects of hatchery supplementation.

Two years after issuing its ESU policy, NMFS announced a second policy for taking into account artificial propagation in decisions about the listing or recovery of Pacific salmon. This hatchery policy declared that the ESA mandates restoration of self-sustaining populations in their natural habitats, and detailed the potential deleterious effects of hatchery supplementation. It called for inclusion of hatchery fish in an ESU if the available information indicated that they were of the same genetic lineage as, and had not appreciably diverged from, the wild stock. But even if they were part of the same ESU, hatchery fish would “not be included as part of the listed species” unless they were essential for recovery. In one respect, that maximized management flexibility: because they were not part of the listed unit, hatchery fish could be harvested without regard to the law’s restrictions on “take” of listed species. On the other hand, by excluding hatchery fish from the listing decision, the hatchery policy increased the likelihood that artificially supplemented runs would be listed.

The hatchery policy was thrown into question by a federal district court in Alsea Valley Alliance v. Evans. The court held that it was unlawful for NMFS to include hatchery fish in the Oregon coastal coho ESU, but to list only the naturally spawning portion of the ESU. NMFS

115. Id. at 58618.
116. Id.
117. When it promulgated the policy, NMFS did note in passing that a population “affected by artificial propagation” would be subjected to the same ESU test as any other population. Id. at 58617.
119. Id. at 17573-74.
120. Id. at 17574.
121. Id.
122. 161 F. Supp. 2d 1154 (D. Or. 2001), appeal dismissed, 358 F.3d 1181 (9th Cir. 2004).
123. The court noted that the listing decision might have been supportable if NMFS had classified hatchery salmon as a different population than the wild fish, but read the ESU policy as precluding that approach. Id. at 1162.
declined to appeal the Alsea Valley decision, instead notifying the court that it would reconsider its treatment of hatchery fish for all Pacific salmon runs.124

In June 2004, NMFS proposed a revised hatchery policy, which has yet to be finalized.125 The policy is so vague that it is nearly impossible to predict how it will be implemented.126 The most striking difference between the new and old policies is not in its operative terms but in the level of enthusiasm it displays for protecting wild populations. The 1993 policy began with the assumption that protecting naturally spawning populations was the fundamental goal. The newly proposed policy is equivocal on the importance of wild fish. It asserts that “the ESA does not preclude NMFS from giving special recognition to naturally spawned fish as a measure of the sustainability of natural ecosystems,”127 and claims to be consistent with a joint FWS/NMFS policy on artificial propagation which stresses “that recovery of wild populations in their natural habitat is the first priority.”128 NMFS no longer seeks to make the viability of natural populations the determinative factor for listing, however. The status of the entire ESU is now the key. Hatchery fish, according to the proposed policy, might either improve that status by increasing abundance and productivity or degrade it by reducing genetic diversity.129

The hatchery fish issue has been played in the popular and scientific media as a scientific one, because NMFS rejected the advice of a scientific advisory panel when it issued its proposed revised hatchery policy. Under the Clinton administration, NMFS established a Recovery Science

124. Environmental intervenors sought to appeal, but the Ninth Circuit held that they would have to wait until NMFS issued a new rule with regard to the affected salmon populations. Alsea Valley Alliance v. Dept. of Commerce, 358 F.3d 1181 (9th Cir. 2004).
126. At about the same time it issued the proposed policy, NMFS published a proposed rule that would reaffirm the listing of all previously listed Pacific salmon stocks, although some would be downlisted from endangered to threatened. Proposed Listing Determinations for 27 ESUs of West Coast Salmonids, 69 Fed. Reg. 33102 (June 14, 2004). That rule is expected to be finalized in June 2005; the final version will be based in part on the final policy NMFS adopts for consideration of the contribution of hatchery fish. The Pacific Legal Foundation has already announced that it will sue if NMFS finalizes the proposed policy as it stands. Press Release, Pacific Legal Foundation, PLF to File Lawsuit Challenging Proposed Hatchery Policy and ESA Relistings of Salmon and Steelhead Throughout the West, Nov. 16, 2004, available at http://www.pacificlegal.org/view_PLFNews.asp?id=262&sTitle=PLF+to+File+Lawsuit+Challenging+Proposed+Hatchery+Policy+and+ESA+Relistings+of+Salmon+and+Steelhead+Throughout+the+West.
128. Id.
129. Id. at 31358-59.
Review Panel of six distinguished scientists "to help guide the scientific and technical aspects of recovery planning for listed salmon and steelhead species throughout the West Coast."\(^{130}\) That panel advised the Bush administration that hatchery fish should be entirely excluded from ESUs considered for listing. When that advice was neither followed nor made public, the panel published its conclusions in *Science*.\(^{131}\) Members of the panel also complained to the press and to environmental groups that their advice had been suppressed for political reasons.\(^{132}\) According to one: "This is a direct political decision, made by political people to go against the science."\(^{133}\)

The scientific dispute in this case, however, boils down to disagreement over which scientific question, and consequently which scientific evidence, matters. The two sides focus on different technical issues because they have different values. The advisory panel started from the value-based premise that wild fish must be protected.\(^{134}\) For them, the key scientific evidence dealt with the impact of hatchery fish on wild stocks. As the panel chair put it, "The science is clear and unambiguous—as they are currently operated, hatcheries and hatchery fish cannot protect wild stocks."\(^{135}\) But that issue simply does not arise under the Bush administration's view of the problem. The administration starts with the question of whether there are differences between hatchery and wild fish that justify assigning different values to the two. It has a ready-made argument that the scientific answer is no: the 1991 ESU policy makes genetic make-up the linchpin, and the old hatchery policy explained that the genetic differences between wild and hatchery fish are sometimes no greater than differences between wild runs that are lumped together. The way the administration defines the problem, the only relevant scientific data is genetic analysis of hatchery and wild runs.

By failing to clearly address the question of whether natural breeding itself might be important, the earlier policies invited the present conclusion. In fact, the ESA is not agnostic on that question. NMFS had

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133. Timothy Egan, *Shift on Salmon Reignites Fight on Species Law*, N.Y. TIMES, May 9, 2004, at A1. See also Craig Welch, *Salmon Panel Goes Public in Dispute Over Hatchery Fish*, SEATTLE TIMES, Mar. 26, 2004, at B1 (quoting panel chair Robert Paine as saying "We felt our report was being censored.").
134. See Myers et al., supra note 131, at 1980 (criticizing the Alsea Valley decision on the basis that it "could have devastating consequences: Wild salmon could decline or go extinct while only hatchery fish persist.").
135. Egan, supra note 133.
it right in its earlier policy. The law expresses a strong, albeit not fully explicit, commitment to protecting species in the wild, and reproduction without the need for human assistance is a fundamental aspect of wildness. But the importance of wildness is a value question not fully answerable by any scientific data, and one that must be resolved in order to determine the significance of the available scientific data.

C. The Judgment Depends Upon the Judge

If natural resource management decisions were fully determined by objective scientific data, it would not matter who was assigned the task of actually making those decisions. But because the data are far from determinative, the decisions are far from ministerial. The Bush administration has tilted decisions away from conservation by limiting the role of conservation scientist-advocates in regulatory decisions.

Judgments about how to interpret and apply limited data frequently control regulatory outcomes. Those judgments inevitably depend upon the values, experience, and professional norms of the decision maker. Well-known cognitive biases skew judgments in predictable ways that depend critically on the perspective of the judge. People tend to interpret


137. The dispute over the status of the marbled murrelet, Brachyramphus marmoratus, is similar. The murrelet, a seabird that nests in old-growth forests, ranges from coastal Alaska to California. The U.S. population has been listed as threatened since 1992. Determination of Threatened Status for the Washington, Oregon, and California Population of the Marbled Murrelet, 57 Fed. Reg. 45328 (Oct. 1, 1992). Together with the northern spotted owl, it has been an impediment to logging in those forests since its listing. In 2004, FWS released a status review concluding that the U.S. population remained at risk of extinction. Marbled Murrelet 5-Year Review Process: An Overview, at http://pacific.fws.gov/ecoservices/endangered/recovery/pdf/MAMU%205-Year%20Review%20Final.8.31.04.pdf (last visited Apr. 9, 2005). However, FWS added that it no longer believed the U.S. population should be considered in isolation from the Canadian population, and indicated that it would undertake a rangewide status review. Like the hatchery fish conflict, this one includes both scientific and non-scientific components. On a scientific basis, FWS’ current conclusion that the U.S. population, or at least some parts of that population, is not “discrete” seems inconsistent with its statement that several studies “indicate statistically significant genetic structure exists in murrelets, with populations from California and the Aleutian Islands differing both from each other and from populations in British Columbia and mainland Alaska.” Id. But several value questions that have never been fully explored are critical to deciding whether the U.S. population of the murrelet should or should not be listed. They include: what types and extent of genetic difference should justify differential treatment under the ESA; what role international borders should play in listing determinations; and what constitutes a significant part of a species’ range sufficient to justify listing. In this particular case, the administration will find it hard to show that the species U.S. range is not a significant portion of its overall range, since it encompasses roughly one-third of the geographic area occupied by the species, and FWS has previously concluded that it is a significant portion of the range. 57 Fed. Reg. at 45330. On the question of international boundaries, this administration takes a very narrow view of when protection ought to be given the U.S. population of a more broad-ranging species. See Murrelet Review, supra, at 15-17.
equivocal evidence in ways that are most consistent with their interests.\textsuperscript{38} That means not only their individual interests, but what they perceive as their professional mission.\textsuperscript{39} It likely also means the communities they identify with, not only professionally but personally.

It is not surprising that in 2001 the wildlife agencies and the Bureau of Reclamation arrived at very different estimates of the amount of water that could be delivered to farmers from the Klamath Project while adequately protecting listed fish. The limited data available did not come close to objectively determining the regulatory outcome; there was plenty of room for the operation of conflicting agency cultures and biases. Those play out very differently in the different agencies. The Bureau views Project farmers as its clients; its first priority is providing them with water. Nationally, the Bureau has steadfastly resisted incorporating wildlife concerns into its operations.\textsuperscript{40} In the minds of regional Bureau officials, the highest priority of the Klamath Project was maintaining water deliveries; the ESA was at best a nuisance that must be dealt with.\textsuperscript{41} FWS and NMFS officials had a very different perspective, because their mission is dramatically different. They cared more about fish than about farmers.\textsuperscript{42}

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140. See, e.g., \textit{Rio Grande Silvery Minnow v. Keys}, 333 F.3d 1109 (10th Cir. 2003), \textit{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).

141. \textit{See Hearing before the House Subcomm. on Water and Power} (July 17, 2004) (Statement of Kirk Rodgers, Regional Director, Mid-Pacific Region, Bureau of Reclamation) ("we are working hard to protect Project operations and provide water levels that, based on sound, peer reviewed science, are necessary to meet ESA requirements."), available at \url{http://www.doi.gov/ocir/2004/ESA30YearsLater.htm}.

142. Although the wildlife agencies do tend to want to protect wildlife even at some cost to industry and human communities, they are not by any means immune to political pressures against regulation. There is strong evidence that the regulatory agencies do not readily list
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Disciplinary training also plays a role, both directly and indirectly, in the exercise of judgment. Directly, disciplinary training inculcates norms about required levels of proof and preferred types of evidence, which tend to become almost invisible to their holders. Indirectly, disciplinary training can either influence or be a marker for values, which themselves will influence judgments not closely constrained by data.

As an example, it is easy to see how both professional acculturation and underlying values distinguish economists from ecologists. Persons trained in economics are more likely to adopt the norm common to economic models that self-interestedness is at least a neutral aspect of human behavior and might even be the "rational," and therefore presumably normatively desirable approach. Ecologists are more likely than the general public to assign intrinsic value to the natural world. Economists differ profoundly from ecologists in their views about the availability of substitutes. Economists devote their professional lives to studying trade-offs of limited resources. The concept of fungibility is a basic tenet of their discipline. The wider the areas of fungibility, the greater their influence on society. Economists are therefore professionally inclined to believe that all resources are fungible. If resources are fungible, it follows that they are not unique, and therefore that acceptable substitutes will be developed for them at the right price point. Ecologists, in sharp contrast, devote their professional lives to the

species whose conservation predictably conflicts with economic activities. See, e.g., Amy Whitenour Ando, Waiting to Be Protected Under the Endangered Species Act: The Political Economy of Regulatory Delay, 42 J. L. & ECON. 29 (1999); J.R. DeShazo & Jody Freeman, The Congressional Competition to Control Delegated Power, 81 TEX. L. REV. 1443 (2003). The evidence is less overwhelming with respect to section 7, perhaps because evaluation is more difficult, but biological opinions rarely find jeopardy, and when they do they go out of their way to devise RPAs that will impose as little regulatory burden as possible. 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).

143. See, e.g., Oreskes, supra note 30, at 375 (explaining that professional and personal "references and prejudices affect how scientists weigh evidence," encouraging them to give greater cognitive weight to types of evidence most familiar in their field); Daniel Sarewitz, How Science Makes Environmental Controversies Worse, 7 ENVTL. SCI. & POL'Y 385, 390-92 (2004) (noting that disciplinary orientation can determine interpretation of scientific data).

144. This example is deliberately painted with a very broad brush. It accurately reflects the dominant views in the worlds of economics and ecology, although of course there are economists who recognize some resources as unique, and ecologists willing to consider the possibility of substitutes for or trade-offs between some resources.


147. I am indebted to John Yoo for this framing of the professional biases of economists.
study of particular creatures or systems. Not surprisingly, they are inclined to believe deeply that there can be no adequate substitute for those resources.\textsuperscript{148}

Important differences in professional culture and values can divide people even in much more closely related fields. All natural scientists do not see the world through the same lenses. For example, marine biologists and physical oceanographers had very different reactions to proposals to use sound waves to test changes in global ocean temperatures.\textsuperscript{149} The speed of sound in water depends upon water temperature. Because there are fewer potential confounding factors, measuring sound transmission at several points around the world’s oceans should give a more accurate average global temperature estimate than atmospheric measurement. In the 1980s, oceanographers proposed periodic ocean acoustic measurements that might gradually but unambiguously reveal a trend toward global warming. Marine biologists, however, were concerned about the potential impact of the sound signal on whales and other marine mammals. The National Research Council empanelled a committee to evaluate the evidence. Its report concluded that there was no statistically significant evidence of harm to marine mammals, but that a real effect might be missed by the very limited data. “Oceanographers working on the experiment interpreted the report as a green light for [it], while biologists saw it as a vindication of their opposition.”\textsuperscript{150} Both would have said they were simply making scientific judgments, but in each case those judgments were affected by the relative level of importance placed on protecting marine mammals and on learning the ocean’s average temperature.\textsuperscript{151}

When decisions are made under conditions of substantial scientific uncertainty, particularly in the context of legislation that leaves significant room for unacknowledged policy judgments, the substantive outcomes depend strongly on the distribution of regulatory authority.

\textsuperscript{149} See Sarewitz, \textit{supra} note 143, at 390; Oreskes, \textit{supra} note 30, at 377-79.
\textsuperscript{150} Sarewitz, \textit{supra} note 143, at 390.
\textsuperscript{151} Sarewitz also notes the very different views of genetically modified crops that have been expressed by molecular biologists (who create and work with genetically modified organisms) and ecologists. \textit{Id.} at 391-92. For the most part, molecular biologists have been boosters of GM crops, focusing on the potential benefits of increased yields, expanded environmental tolerance, and changes to less toxic chemical applications. Ecologists have been far more skeptical, focusing on the possibility of gene flow and impacts on non-target organisms. The differing perspectives came to loggerheads in a conflict over publication of claims of gene flow from transgenic to non-engineered corn in Mexico in the prestigious peer-reviewed journal \textit{Nature}. As Sarewitz notes, participants in this conflict “insisted that the issue was simply one of the quality of the science, but in reality the dispute was inextricably intertwined in the larger controversy over biotechnology.” \textit{Id.} at 391.
The Bush administration has adjusted power relationships within and between agencies in ways that systematically favor development interests.

1. **Shifting Power Away from Conservation Agencies**

   In several situations, this administration has quietly transferred responsibility for decisions from conservation agencies to agencies whose mission is primarily furthering economic development or resource extraction. These moves decrease the likelihood that conservation-oriented regulations will be imposed.

   Under the administration's so-called Healthy Forests Initiative, for example, responsibility for some ESA implementation decisions has been shifted from FWS and NMFS, regulatory agencies whose mission is primarily conservation of the resources under their stewardship, to the Forest Service and Bureau of Land Management, agencies whose history and culture puts furthering the interests of extractive industries and local communities first.

   The ESA requires that federal agencies, in consultation with FWS or NMFS, ensure that their actions do not jeopardize the continued existence of listed species. In general, the consultation process proceeds in three steps. First, the action agency inquires of the regulatory agency whether any listed species are found in the action area. If the answer is yes, the action agency prepares a biological assessment to determine whether listed species "are likely to be adversely affected by the action." The biological assessment must be submitted to the regulatory agency for review. If it concludes that the proposed action is likely to adversely affect any listed species, the action agency must enter into formal consultation with the regulatory agency. Formal consultation requires the regulatory agency to review all relevant information, make its own evaluation of the status of the species and the effects of the action, and prepare a written biological opinion determining whether the proposed action is or is not likely to jeopardize a listed species. Formal consultation is not required if the regulatory agency concurs in writing with an action agency's conclusion, on the basis of its biological assessment, that the action is not likely to adversely affect any listed species. In general, then, formal consultation is required if any listed species is found in the action area unless the regulatory agency has

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154. 50 C.F.R. § 402.12(a); 16 U.S.C. § 1536(c)(1).
155. 50 C.F.R. § 402.12(j).
156. 50 C.F.R. § 402.14(a), (g).
157. 50 C.F.R. § 402.12(k)(1).
agreed in writing with an action agency's determination that the action is not likely to adversely affect the listed species.

Regulations issued in 2003 relax that general requirement of written concurrence on "not likely to adversely affect" findings for certain actions carried out by the Forest Service or Bureau of Land Management (BLM). The new regulations apply to any actions "determined by the Action Agency to be within the scope" of the National Fire Plan. The Plan itself began with a report issued during the Clinton administration, but for purposes of these regulations is vaguely described as encompassing "any amendments" to that report, budget requests, strategies, plans, and direction. As the government currently describes the National Fire Plan, it would appear to encompass virtually any logging project that can be described as reducing fuel loads. The justification for the new regulations is that fire-risk reduction projects need to be carried out quickly, and the new procedures will speed the process of consultation. There is room for skepticism about this justification, of course, since the generic regulations already include an emergency exception. If that exception is not broad enough, it is not clear why consultation could not be speeded up just as effectively by adding staff at the regulatory agencies.

The regulations allow the Forest Service and BLM to enter into Alternative Consultation Agreements with the regulatory agencies with respect to projects within the scope of the National Fire Plan. Once an Agreement is in place, the action agency can determine that formal consultation is not required for those actions without the written concurrence of the regulatory agency. The Agreements must describe
the standards the action agency will apply, and a list of staff positions within the action agency that will be authorized to make the determinations. They must also describe procedures the action agency will implement to ensure that its employees develop and maintain the necessary skills to make these determinations.167 Both the Forest Service and BLM have entered into Alternative Consultation Agreements with FWS and NMFS.168

These regulations, although they potentially apply to a broad swath of forest management actions, appear at first glance limited and innocuous. They allow the action agency to determine whether formal consultation is required, but they require that those decisions be made under the same standards the regulatory agencies currently apply;169 that they be made by biologists, botanists, or ecologists170 who undergo a training program approved by the regulatory agencies;171 that they be documented;172 and that the program be evaluated after the first year of implementation and every third year thereafter.173 Yet environmental organizations have been sharply critical of the Joint Counterpart Regulations.174 Those objections arise in part because environmentalists believe that negotiations between the regulatory and action agencies over whether or not formal consultation is required often produce important mitigation measures.175 In addition, they fear that biologists working in the mission-oriented culture of the BLM or Forest Service will be more vulnerable to pressures to “get out the cut” than those working in the conservation agencies,176 and therefore that formal consultation simply...
will not occur under the new regime. There may also be a disciplinary concern that biologists in the land-management agencies are more likely to be game specialists, and may not be as sensitive as wildlife-agency biologists to the needs of non-game species.177

A similar set of Joint Counterpart Regulations for ESA consultations has been issued for pesticide registration decisions made by the Environmental Protection Agency (EPA) under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA).178 This set of regulations seems even less problematic, since the mission of EPA ought to coincide with those of the Services. But in this particular case the difference between the agencies is not trivial. EPA, despite its name, has always emphasized human health rather than environmental protection. It therefore could be expected to favor pesticide use over protection of endangered species where pesticides are applied to control threats to human health.179 Moreover, EPA is a highly fragmented agency. The office responsible for pesticide registration has long had a reputation for being industry friendly.180

EPA has consistently resisted ESA consultation in any form on its pesticide decisions, maintaining that its FIFRA analysis adequately accounts for all environmental impacts.181 Experience suggests otherwise, however. Pesticide-related impacts are cited by the regulatory agencies as threats to species in roughly 15% of species listings and critical habitat designations.182 An outside report in 2002 was highly critical of EPA’s

177. See id. at 68261 (in response to comment calling for the required training programs to “include principles of conservation biology, the life history of the species of which the determinations will be made, animal ecology, plant ecology, and environmental impact analysis” Services are noncommittal).


process for reviewing the ecological impacts of pesticides. One of the
comments on the Joint Counterpart Regulations captures the essence of
environmentalist concerns: "EPA fails to apply the precautionary
principle to its regulation of pesticides. EPA assumes no risk to listed
species when EPA lacks data." Environmentalists believe, with good
reason, that EPA will impose a higher standard of proof of adverse
effects than FWS would as a prerequisite to formal consultation.

The Data Quality Act represents a more general attempt to move
regulatory authority away from conservation (and other) agencies in
favor of the economics-oriented Office of Management and Budget
(OMB). The Data Quality Act directs OMB to issue guidelines for
"ensuring and maximizing the quality, objectivity, utility, and integrity of
information . . . disseminated by Federal agencies." It also requires that
all federal agencies establish procedures for correction of such
information on the demand of an affected person.

Bush's OMB has interpreted the Act aggressively, sweeping within
its ambit virtually any data used in a rulemaking or other regulatory
decision. OMB's guidelines require that each federal agency issue
written standards for assuring data quality. Agencies must reveal the
data and methods used to generate "influential" information sufficiently
to make reanalysis possible, and also subject such information to
independent peer review. Influential information would appear to
include, for example, studies relied upon by federal agencies in making
most listing or consultation decisions under the ESA.

When it issued its Data Quality Act guidelines, OMB asserted that
they would have a significant impact on agency rulemaking, making the

\[\text{183. Id.}\]
\[\text{184. 69 Fed. Reg. at 47746.}\]
\[\text{186. Id. § 515(a).}\]
\[\text{187. Id. § 515(b)(2)(B).}\]
\[\text{190. Influential information is information reasonably expected to "have a clear and substantial impact on important public policies or important private sector decisions." Id. at 8460 (Feb. 22, 2002). The peer review requirements are set out in OFFICE OF MANAGEMENT & BUDGET, FINAL INFORMATION QUALITY BULLETIN ON PEER REVIEW (Dec. 15, 2004), available at http://www.whitehouse.gov/omb/inforeg/peer2004/peer_bulletin.pdf.}\]
\[\text{191. Additional peer review generally would not be required for studies that had already undergone peer review prior to journal publication. Revised Information Quality Bulletin on Peer Review, 69 Fed. Reg. 23230 (Apr. 28, 2004).}\]
resulting rules "more competent and credible" and less vulnerable "to political and legal attack." 192 No doubt OMB also expected the guidelines to strengthen its anti-regulatory leverage against mission-oriented agencies. So far, though, the Data Quality Act appears to have had little substantive impact. The vast majority of challenges to information disseminated by federal agencies have been rejected. 193 Courts have refused to get involved. 194

2. Limiting the Role of Conservation Scientists

The entire executive branch is nominally under the President's direction and control, but federal regulatory agencies are large bureaucracies which cannot be turned on a dime. A new administration can replace only the top employees at each agency; the rest enjoy civil service protection. There are a good many career employees, therefore, at federal natural resource agencies who do not share this administration's anti-regulatory bent. There are also numerous advisory committees of outside scientists that cannot be easily or quietly disbanded. 195

One way to reduce the influence of career employees and outside advisors is to centralize decision making authority, requiring that recommendations move up the chain of command to political appointees before they can become official agency policy. This strategy is not new; natural resource regulatory decisions with a high potential for controversy have long been under the control of political appointees. At FWS, for example, a decision to issue a jeopardy opinion must be signed


194. See Salt Inst. v. Thompson, 345 F. Supp. 2d 589, 592-3 (E.D. Va. 2004); In re Operation of the Missouri River System, No. 03-MD-1555, 2004 WL 1402563, at *77-80 (D. Minn. 2004) (both holding that judicial review of requests for information correction is not available under either the DQA or the APA).

195. Sometimes, of course, agencies have the freedom to simply decline to seek outside scientific advice if that advice might not be politically convenient. A conspicuous example is the forest planning regulations. NFMA required that a Committee of Scientists be consulted on the initial set of rules, but left the Secretary of Agriculture free to convene a new committee or not when considering revisions. 16 U.S.C. § 1604(h). The Clinton administration did convene a new committee when it began the process of revising the forest planning rules in 1997. The committee was heavily loaded with conservation scientists (and a conservation-oriented law professor); it could be counted on to give political cover to the tightening of conservation requirements the administration intended. When the Bush administration decided to revise the rules again, however, it did not either empanel a new committee or seek the advice of the Clinton committee.
by the regional director, who must obtain the approval of the Washington office. No-jeopardy opinions, which are less likely to be controversial, can be issued directly by the field offices.

Naturally, procedures that limit their influence on decisions have always rankled career biologists. Tension between agency scientists and the political appointees responsible for making or defending policy decisions is neither novel nor surprising. The level of tension, however, is particularly high in this administration, probably because the contrast in values is so stark.

In the summer of 2004, disputes between agency scientists and politicians boiled over in two well-publicized incidents. First, Gary Frazer, Assistant Director of FWS for endangered species, was moved out of that position to a new liaison with the U.S. Geological Survey, a position without policy significance. It was widely rumored that the move followed Frazer's reluctance to support the decisions of his political masters.

At nearly the same time, environmental groups charged that Julie MacDonald, Deputy Assistant Secretary for Fish and Wildlife and Parks, was helping the Farm Bureau in its efforts to overturn protection for the Delta smelt. The Farm Bureau had sued, demanding that FWS perform a status review of the smelt, in the hope that the species would be delisted. The review released by FWS' Pacific Regional office recommended that the smelt remain on the protected list. MacDonald, a political appointee who is not trained as a biologist, sent the regional office a highly critical e-mail, calling the smelt review "oversimplified and misleading," and provided the Farm Bureau with a copy of her e-mail.

198. See id.
Earthjustice accurately summarized the conflict between MacDonald and the regional biologists. It was not about the data, but about what to do with the data:

Reading between the lines, it appears as if there were two dramatically different approaches at work here. The scientists appear to have taken the position that, in the face of incomplete data, there was no justification for removing the smelt from the protective umbrella of the Endangered Species Act. MacDonald, on the other hand, seems to be suggesting that, given meager data, there's no justification for keeping the species on the protected list.\textsuperscript{204}

The disagreement was all about the burden of proof, with agency scientists committed to giving the benefit of the doubt to the species, and the political appointee seeing it the other way.

In December, MacDonald was again in the news. This time it was reported that her comments were included in information provided to a group of FWS biologists and managers responsible for determining whether the greater sage grouse should be listed under the ESA.\textsuperscript{205} The group did recommend against listing, but according to one group member MacDonald's comments were not the determinative factor.\textsuperscript{206}

There have also been a series of charges that political appointees have overridden the views of agency biologists as key biological opinions have moved up the chain of command. Michael Kelly, a NMFS biologist, asserted that the agency's 2002 biological opinion on the Klamath Project (which for the most part endorsed the Bureau of Reclamation's ten-year operations plan) was softened by agency managers without consulting the biologists.\textsuperscript{207} Kelly later resigned from the agency after complaining that another biological opinion he drafted was similarly altered.\textsuperscript{208} In October, even before NMFS issued its no-jeopardy opinion allowing substantial increases in pumping from the Sacramento-San Joaquin River Delta, newspapers learned that an earlier draft had reached a jeopardy conclusion.\textsuperscript{209} A group of Democratic members of Congress, led by George Miller of California, called for an investigation of the changes between the draft and final biological opinions.\textsuperscript{210}

\begin{thebibliography}{99}
\bibitem{204} Id.
\bibitem{206} Id.
\bibitem{208} Kelly, \textit{supra} note 207.
\bibitem{210} Mike Taugher, \textit{Dems Demand Inquiry Into Salmon Study}, \textit{CONTRA COSTA TIMES}, Oct. 9, 2004.
\end{thebibliography}
It is clear that top officials at Interior and NMFS in this administration have played, and are continuing to play, key roles in both listing and consultation decisions. It seems equally clear that their participation leads to less regulatory protection than agency scientists would prefer. Whether or not that amounts to abuse of science is a different question. Answering it definitively would require careful review of the decisions before and after comment or action by the political appointees. It is at least conceivable, however, that many of the changes address political elements in the scientists' opinions, such as choices about the degree of acceptable risk.

"Abuse of science" is not the right charge to make against this type of infusion of politics into the decision-making process. Political choices cannot be removed from the process. Instead of trying to remove them, it would be more helpful to focus on making the political elements of these decisions more transparent. At the moment, the determinative points in the decision making process tend to be hidden from public view, so that the public never has the opportunity to untangle the contributions of career scientists and political appointees to the ultimate decision. That can allow decisions that are in fact primarily political to be disguised as scientific ones.

3. Applying Daubert within Agencies?

Anti-regulatory advocates of "sound science," who favor very high barriers to regulation, can increase the likelihood that regulatory outcomes will go their way if they can limit the information available for use by the regulatory agencies. "Sound science" ESA reform bills and the Data Quality Act are both strategies toward that end, neither of which has yet had much success.

A more systematic strategy, not just for reducing the weight given information but for preventing it from being considered at all, may be brewing. That strategy is administrative adoption of something akin to the evidentiary standard established by Daubert v. Merrell Dow Pharmaceuticals, Inc. In Daubert the Supreme Court, driven by concerns that juries might be easily swayed by unreliable scientific claims,
directed federal judges to act as gatekeepers for expert scientific testimony. Interpreting the Federal Rules of Evidence, *Daubert* held that trial judges must ensure that scientific evidence is both relevant and reliable.\textsuperscript{214} Factors contributing to that judgment might include, but are not limited to: falsifiability; peer review; whether the error rate has been estimated; and the degree of acceptance of the technique or theory in the relevant scientific community.\textsuperscript{215}

Some commentators have argued that the *Daubert* standard should apply to judicial review of agency decisions.\textsuperscript{216} No reported decision has yet endorsed that proposal, although at least one federal appeals court has indicated its sympathy with the idea that “junk science” should be kept out of agency decisions.\textsuperscript{217} It strikes me as unlikely that the courts will adopt a “regulatory *Daubert*” doctrine. The doctrinal underpinnings of *Daubert* have no application to informal rulemaking, which obviously is not subject to the Federal Rules of Evidence. The rationale underlying *Daubert* is equally inapplicable to decisions within the scientific or technical expertise of an administrative agency.\textsuperscript{218}

The current administration, however, may be seeking to impose internal *Daubert*-like limits on the information agencies consider in their decisions, or share with each other and with outsiders. So far, the evidence is fragmented and mostly in the form of rumors, but there are enough of those rumors to give cause for concern. There are rumors, for example, that scientists at the U.S. Geological Survey are not being allowed to discuss their findings until they have been through a peer review step. One sign that some of the rumors may be true is that EPA has just issued a call for information to support revisions of its air quality criteria for lead, inviting submission only of “research studies that have been published, accepted for publication, or presented at a public scientific meeting.”\textsuperscript{219}

If administrative agencies impose *Daubert*-like restrictions on themselves, the courts can, and should, reject those restrictions.

\textsuperscript{214} Id. at 589.
\textsuperscript{215} Id. at 593-94.
\textsuperscript{217} Niam v. Ashcroft, 354 F.3d 352, 360 (7th Cir. 2004) (“Junk science has no more place in administrative proceedings than in judicial ones.”).
Considering only peer-reviewed studies would violate "best available science" requirements. It would also fall below the APA's "arbitrary and capricious" threshold if there was good reason to suspect those studies did not reflect the current state of the science. In areas where only limited data is available, and where many of the studies have been done outside the academic world, that is probably not an unusual situation. For example, the taxonomy of the orca whale (Orcinus orca) has not been revised through peer-reviewed publication in many years. When NMFS received a petition to list the "Southern Resident orcas" as a distinct population segment, it convened a biological review team of NMFS scientists to conduct a status review. The team determined that published "orca taxonomy is outdated and inaccurate." Nonetheless NMFS, relying on the published standard of a single global species, declined to list the Southern Residents. A reviewing court properly overturned that decision.220 Exactly the same result should be reached if an agency declines to consider scientific data which its experts deem reliable and relevant because that information has yet to be published or peer-reviewed. In general, peer-reviewed studies may merit greater weight than others, but all information should be considered for whatever light it may shed on the problem.

D. What Regulators Don't Know Can't Hurt the Regulated Community

The Bush administration's demands that regulations be supported by scientific information satisfying a high burden of proof and its delegation of the task of interpreting and applying ambiguous information to persons unsympathetic to conservation, dovetail nicely with its disinterest in improving the scientific information base. Together, they make an almost impervious barrier against regulation.

Forest policy provides two conspicuous examples of the administration's strategies to limit the information supply. It has limited application of the National Environmental Policy Act222 (NEPA), the broadest directive for gathering and disclosing information about the environmental impacts of federal activities, to forest management and it has reversed Clinton-era requirements that biological surveys precede timber harvest under the Northwest Forest Plan.

1. Limiting NEPA

The cornerstone of the Bush administration's forest policy in its first term was the Healthy Forests Initiative, a combination of legislative and
administrative changes allegedly developed to address the risk of catastrophic wildland fires. The Initiative substantially alters the process of environmental review for forest management activities with a nexus to fire-hazard reduction, reducing the likelihood that inconvenient information will force a change in management direction.

NEPA requires that federal agencies prepare an environmental impact statement (EIS) before taking any action that may have substantial environmental impacts. The EIS must describe the affected environment, and evaluate the environmental impacts of the proposal and alternatives to it. The point of NEPA analysis is two-fold. First, it ensures that federal agencies are aware of the impacts of their actions and of other ways they might achieve their goals. That should encourage them to avoid unnecessary or ill-considered environmental harm. Second, NEPA analysis ensures that the public also understands the environmental choices federal agencies make, so that it can bring political pressures to bear.

The Healthy Forests Initiative cuts back on NEPA both administratively and legislatively. Administratively, in 2003 the Forest Service and Bureau of Land Management adopted regulations categorically excluding hazardous-fuel reduction projects and fire rehabilitation activities from NEPA analysis. Categorical exclusions are supposed to be limited to actions, which, as a class, do not individually or cumulatively have significant environmental effects, and therefore do not merit environmental analysis. Yet these new categorical exclusions permit logging of up to 1000 acres at a time, provided the agency can say with a straight face that the purpose of the project is hazardous-fuel reduction. It is hard to take this broad exemption seriously as anything other than an attempt to avoid discovering information about environmental impacts that might complicate logging proposals.

Congress has aided and abetted the administration in this particular endeavor. The Healthy Forests Restoration Act of 2003 allows reduced NEPA analysis for hazardous fuel reduction projects. Although an environmental assessment or environmental impact statement must be prepared, it need not consider alternatives to the project. Alternatives analysis is ordinarily “the heart of the environmental impact

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223. 40 C.F.R. Pt. 1502.
225. 40 C.F.R. § 1508.4.
228. Id. § 104(c).
statement," because by presenting the environmental impacts of the proposal and potential alternatives it "sharply define[s] the issues and provid[es] a clear basis for choice among options by the decisionmaker and the public." The Healthy Forests Restoration Act allows the agencies to bypass that comparative analysis, virtually ensuring that they will never consider steps that might make their management plans less environmentally damaging.

Even when it produces NEPA documents, this administration is not necessarily enthusiastic about disclosing the data underlying its conclusions. For example, a recent district court decision found that an EIS for a salvage logging operation, the stated purpose of which was to reduce wildfire risk, relied on the unsupported opinion of the Forest Service that the project would reduce fire risk, and ignored substantial evidence that it would instead increase that risk. Of course, the previous administration didn’t always confront and disclose scientific information contrary to its preferred position in NEPA documents. But this kind of behavior appears to be routine in the Bush administration.

2. Who Needs Monitoring?

The administration has also revealed its hostility to information that might be used to restrict extractive activities in an amendment to the Northwest Forest Plan. Adopted in 1994 at the height of the spotted owl crisis, the Northwest Forest Plan governs management of federally owned forest lands within the range of the owl. Although the Plan was developed primarily to protect the spotted owl, it followed an ecosystem approach, attempting to provide for the conservation of a variety of habitat types and their dependent species. Toward that end, it included requirements, known as the “survey and manage” requirements, that the land management agencies conduct surveys for a number of rare and

230. Id.
232. See, e.g., Center for Biological Diversity v. U.S. Forest Service, 349 F.3d 1157 (9th Cir. 2003) (holding that EIS produced during the Clinton administration for a land management plan amendment failed to disclose and discuss relevant scientific studies).
233. See DEFENDERS OF WILDLIFE, WEAKENING THE NATIONAL ENVIRONMENTAL POLICY ACT: HOW THE BUSH ADMINISTRATION USES THE JUDICIAL SYSTEM TO WEAKEN ENVIRONMENTAL PROTECTIONS 5, available at http://www.defenders.org/publications/nepareport.pdf (last visited Apr. 9, 2005) (claiming that fewer NEPA suits were brought against the Clinton administration, and the administration prevailed in a larger proportion of those cases).
234. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl (April 13, 1994).
uncommon (but not threatened or endangered) species before conducting habitat-disturbing activities.\textsuperscript{235}

In 2001, two timber companies filed suit against the Forest Service, claiming that the survey and manage requirements had effectively converted 81,000 acres of federal productive timberland into permanent reserves, in violation of several federal laws.\textsuperscript{236} Implausible as this claim seems, the Bush administration quickly settled the suit, agreeing to undertake NEPA analysis and make a decision on whether to remove the survey and manage requirements. In March 2004, BLM and the Forest Service entirely dropped the survey and manage requirements from the plan.\textsuperscript{237} The agencies admitted that this change was likely to result in elimination of 57 species from the Plan area, and that for another 28 there was not enough information available to predict the outcome.\textsuperscript{238}

The reasoning supporting rescission of the survey and manage requirements should by now be familiar. The Clinton Plan was too cautious.\textsuperscript{239} Risk “is an inherent factor of resource management . . . There is no way to avoid all risk to the continued persistence of species.”\textsuperscript{240} It is possible that various species, even if eliminated from logged areas, will persist in the old-growth reserve areas of the plan, which have not been exhaustively surveyed.\textsuperscript{241} The agencies will save money by not doing surveys, and timber-dependent income will go up, because surveys not done won’t provide information that would have stopped timber harvests.\textsuperscript{242} This is quintessential Bush administration science: the administration will not impose regulation unless strong data supports the need for regulation, nor will it actively seek that data.

IV. RESPONDING TO DEFENSIVE USE OF SCIENCE

A fair examination of the Bush administration’s natural resources record shows not that the administration is following in the path of Lysenko but instead that it can sharply curtail conservation regulation without needing to drastically misuse scientific data. The vast majority of natural resource decisions are underdetermined by the data, leaving

\begin{itemize}
\item \textsuperscript{235} BLM, Forest Service, Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (Mar. 2004).
\item \textsuperscript{236} Id. at 2.
\item \textsuperscript{237} Id. at 7.
\item \textsuperscript{238} Id. at 10.
\item \textsuperscript{239} Id. at 1 (The survey and manage standards “represent a cautious approach to rare species management that attempts to reduce risk to species by gathering exhaustive data prior to making a land management decision.”).
\item \textsuperscript{240} Id. at 11.
\item \textsuperscript{241} Id.
\item \textsuperscript{242} Id. at 12.
\end{itemize}
room for operation of the decision maker's values. The Bush administration has simply taken full advantage of those opportunities.

Conservationists looking for a way to effectively respond to this administration's approach need to move beyond simplistic accusations of misuse of science and futile calls for purely objective decision making. That strategy made them vulnerable to defensive science in the first place.

One possible response is an appeal to the precautionary principle, the notion that, where scientific evidence is uncertain, society should err on the side of overprotection. A precautionary approach to regulation can often be justified, by showing either that the long-term societal value of resource protection likely exceeds that of unsustainable exploitation, that precaution is needed to combat predictable slippage in the regulatory process, or simply that Congress itself has mandated a cautious approach.

Effective appeals to precaution, however, must begin with a different view of the scientific underpinnings of natural resource decisions, one that openly concedes the uncertainties of existing scientific information. Conservationists have been loath to admit to uncertainty. Perhaps they would be more willing to take that plunge if they understood that doing so would enhance their ability to appeal to precaution without ceding the political power of their claim to be seeking scientifically legitimate regulatory decision making.

A more honest, and in the long run probably more effective, conservation strategy would begin with a more accurate description of what it means for regulatory decisions to be "scientific." That clearer picture would allow conservationists to expose the administration's hidden anti-conservation value choices as well as its fundamentally unscientific approach to regulatory decision making. It would also provide the foundation for addressing a longstanding fundamental problem, the need for learning to support improved natural resource (and other) regulatory decisions.


244. According to the Supreme Court, for example, Congress deliberately adopted a policy of "institutionalized caution" in the ESA. Tenn. Valley Auth. v. Hill, 437 U.S. 153, 194 (1978).
A. Bringing Scientific Values Into Regulatory Decision Making

Given the historic development of the conservation movement, it was probably inevitable that conservationists would emphasize the role of science. Given the perceived political advantages, and the naiveté of the American public about science, it may also have been inevitable that they would come to characterize scientific decision making as providing objective, certain answers to regulatory questions. That sort of scientizing makes conceptual sense as a weapon for conservation, since conservation scientists are systematically more committed to conservation values than the general public. While it is not entirely honest, it may have political legitimacy as a way to counteract focused economic pressures.

Legitimate or not, however, scientizing seems to have run its course as a conservation tool. It requires that the conservation community endorse an inaccurate picture of science as a binary activity that produces clean yes or no answers to questions about the necessity or effectiveness of regulation. That picture plays right into the hands of the anti-regulatory "sound science" strategy, which demands that conservation measures await a clean "yes" answer science is frequently unable to provide. Furthermore, because agency scientists do not in fact control regulatory decisions, as a practical matter, the science charade does not necessarily increase the power of conservation interests. Currently, by reducing the accountability of regulatory agencies to the public, it is increasing the power of the focused economic interests.

Scientizing misrepresents both the enterprise of science and the ways that enterprise can best serve the regulatory process. The essence of science is not objective certainty. It is, instead, a process carefully designed to illuminate the extent and reliability of knowledge about studied systems, and to increase the reliability and extent of that knowledge over the course of time.

As touched on earlier, the limits of scientific information are particularly acute in the context of natural resource regulation and management. Regulators frequently, and almost unavoidably, work at the frontiers of scientific knowledge. Regulation typically is not imposed until the political community perceives a crisis. The availability of funding for, and interest in, research on the scientific questions regulators must resolve also are typically low before that point. For example, little is

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245. As others have pointed out, scientizing value choices can distort the scientific as well as the political process but the scientific one as well. "In the end, the entire scientific field . . . could turn into a political battleground, with disagreements framed as issues of science standing as surrogates for arguments that chiefly reflect differing perspectives on human utility, morals, and the wisdom of acting humbly." Eric T. Freyfogle and Julianne Lutz Newton, Putting Science in its Place, 16 CONSERVATION BIOLOGY 863, 871 (2002).

246. See supra Part I.
known about many endangered and threatened species before they are listed. Listing provides an incentive for additional study, but it takes time and research effort to accumulate information.

Furthermore, in the conservation context scientific information will almost never reach the levels of certainty that might be expected of, for example, studies of readily observable physical phenomena. With the right equipment, the speed of light, the pull of gravity, and the atomic weight of hydrogen, for instance, can all be measured to a very high degree of both precision and accuracy. Biological phenomena, even at the level of a single organism, are more complicated, more variable, and therefore inherently more difficult to obtain highly certain information about. Moving to the community or ecosystem level adds yet another level of variability. Unlike some physical scientists, conservation scientists often cannot, as a practical matter, test their hypotheses under closely controlled laboratory conditions. They must rely upon observations of the natural world which are both difficult to make and subject to a high degree of background variation in order to try to understand complex biological processes. Under those circumstances, while a very strong consensus may develop around the existence and general outline of general principles such as heredity or evolution, science may never produce certainty about the extent, or even the existence, of causal relationships between ecosystem decline and specific human activities.

That means that science cannot fully determine regulatory choices. Ultimately, those choices must rest upon value judgments about what actions to take in the face of uncertainty. That is not to say, however, that science offers no benefits for natural resource regulation. The scientific process can make two important contributions to regulation. First, it can clarify the regulatory trade-offs, and therefore the value judgments made by regulators, by illuminating what is known, and what is not known, about the resource or system of interest. Second, it can, at least in some situations, ensure that the information base on which regulations are based becomes more complete and more certain over time, so that those regulations become more and more likely to achieve societal goals. Making natural resource regulatory decisions more scientific would therefore increase both their political legitimacy (in the sense that the inevitable value choices would become more open to public view) and their conservation effectiveness.

Regulatory decisions are not made more scientific by demanding that they be more objective or more certain. The level of both objectivity and certainty in science varies with the available data. Rather, regulatory decisions can be made more scientific by bringing the key elements of the scientific process into the regulatory arena. Those key elements are open, transparent communication and a firm commitment to a dynamic process of testing initial understandings and assumptions against additional
information as it becomes feasible to gather that information. Because the context is different, those elements will play out a bit differently in regulation than they do in research science. But they will serve the same functions, subjecting both political and scientific judgments to critique and helping knowledge to progress over time.

B. Open Communication: Making Political Choices Visible

Focusing on the communication element of the scientific process highlights the importance and the difficulty of bringing political decisions into the sunshine. The norms of research science require that scientists communicate both the methods and results of their studies to the scientific community, in sufficient detail to facilitate review, critique, and extension of that work. In the regulatory context, transparency means revealing scientific judgments, so that they can be subjected to scientific evaluation, and also revealing political judgments so that they can be evaluated through the political process. While scientific transparency can be a challenge, political transparency is notably more difficult to achieve. Political judgments are often closely bound up with scientific ones, and even where they are conceptually distinct technical complexity can make the political judgments easy to submerge. Legislatures, agencies, and even outside critics of regulatory decisions frequently have (or believe they have) incentives to conceal those judgments.

Perhaps the most likely source of increased political transparency, therefore, is the courts. They could, consistent with current doctrine, do far more to expose the political judgments inherent in regulatory decision making. Standard APA “hard look” review allows courts to encourage, and even to require, that agencies reveal the value choices that determine their regulatory decisions. A good starting point is the decision in Fishermen’s Dock Cooperative, Inc. v. Brown. In Fishermen’s Dock, a coalition of commercial fishers challenged a quota for summer flounder set by the Department of Commerce under the Magnuson Fishery

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248. Another possibility is that the executive branch could, through a centralized process, impose uniform transparency requirements on all executive agencies. The Office of Management and Budget, for example, provides guidance to all agencies on procedures for carrying out the regulatory analysis required by Executive Order 12866. Office of Management and Budget, Office of Information and Regulatory Affairs, Circular A-4 (Sept. 17, 2003), available at http://www.whitehouse.gov/omb/circulars/a04/a-4.pdf. OMB may be able to overcome the agency-specific political incentives that discourage transparency. Circular A-4 directs agencies to post their regulatory analyses, with supporting documents, on the internet for public review, and to disclose their assumptions, methods, and data. Id. at 17. A similar set of directives could be developed under the aegis of the Data Quality Act or a new Executive Order for disclosure of the data and policy choices upon which science-intensive decisions are based.

249. 75 F.3d 164 (4th Cir. 1996).
Conservation and Management Act. The quota originated with a scientific advisory committee, which evaluated data generated at a scientific workshop, with the goal of producing a mortality rate that would not exceed a specified target level. The committee had chosen 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 the use of the geometric mean recruitment, which would have resulted in a higher quota.

The court disagreed. It noted that use of the best scientific data need not mandate "one and only one possible quota." The committee had chosen a quota with an 81% chance of producing an ultimate mortality below the agency's target level, whereas the quota sought by the fishermen had only a 59% chance of keeping mortality below the target level. Under the circumstances, "the Agency's decision makers necessarily had some discretion to decide what precise degree of assurance it would seek within the uncertainty of the data." The agency had explained its reasons for choosing the lower recruitment estimate, essentially noting that its primary goal was to stay below the target mortality, and that some of the assumptions of the model could be optimistic. The court noted that the choice of any specific quota could be attacked as arbitrary, since there was nothing in the data that pointed to a single unique quota. It held that the agency must be allowed some reasonable exercise of discretion, at least in this case where it had adequately explained the basis for its discretionary choices. It was enough for the court that the record showed the quota decision was "made in good faith, with a proper understanding of the law, based on the best scientific information available, and adequately justified by the agency."

This decision is a good model in two respects. First, the court recognized that the best science will rarely point to a single, clearly identifiable management choice. It will allow a range of possible choices. But second, the court gave the agency's decision greater deference because the scientific and value bases for the particular choice within that range were explained. In Fishermen's Dock, the agency's openness
bought its decision additional respect. Courts can and should take the next step, remanding decisions where such transparency is lacking.

So far they have not done so, perhaps because they simply have not recognized such decisions for what they are. Courts should be on the lookout for (and litigants should point out) circumstances in which regulatory decisions necessarily involve value choices, but those choices and the grounds for them have not been explained. Agencies should have to provide that explanation, 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, agencies should be assured that revealing their political choices will not undermine their judicial position. Those choices deserve judicial deference, provided they are within the boundaries allowed by the relevant legislation. Agencies should not feel pressured to engage in a science charade to avoid intrusive judicial review. Instead, courts should provide incentives to bring political choices to light so they can be subjected to political review.259

Courts should also require, as a condition of deference to “scientific” decisions, that the experts articulate and apply at least a basic conceptual model of the system. The model need not be elaborate if the available information will not support a detailed technical model. The point is to articulate the best current understanding of how the system works, and employ that understanding in the decision-making process. Models do not always make expert judgments more accurate, but they do help ensure that, to the extent possible, those judgments are based on what is known about the system, rather than on the political preferences of the experts.260 Moreover, requiring articulation of the model employed will both facilitate scientific oversight of that model and further highlight policy judgments that have been used to fill knowledge gaps.

The vision of judicial review articulated here does not invite “ossification” by too-intrusive judicial review forcing agencies to endlessly put off the development of major rules while they gather more data.261 Technically intensive natural resource decisions, unlike the open-

259. The model of judicial review I have in mind here is akin to that articulated by Judge Bazelon in Ethyl Corp. v. EPA, 541 F.2d 1, 66-68 (1976) (Bazelon, J., concurring). It does not require that judges be more technically expert than the agency, only that they become sufficiently versed in the evidence and the decision made to insist that the agency openly acknowledge and explain the policy judgments that underlie the decision.


ended environmental and workplace regulations that have given rise to concerns about ossification, are focused on relatively narrow circumstances and are required by law and practical circumstances to be made and to be made quickly. Moreover, they are frequently governed by a "best available scientific information" standard that plainly contemplates some level of uncertainty. Currently, the agencies are a long way from overly detailed consideration and justification of their actions. They frequently provide absolutely no acknowledgement of political choices necessarily required by the underlying statutory regime, much less any explanation of the basis for those choices. The problem is not that they have avoided regulatory action but that they have avoided rulemaking that might explain the general purposes applied in individual regulatory actions, leaving those decisions almost entirely ad hoc and subject to the political whims of the moment. Forcing those ad hoc value choices more clearly into the open would be the reverse of ossification. It might make regulatory agencies uncomfortable, but it would not make their decisions any more difficult than Congress necessarily contemplated.

Peer review of agency decisions by individual scientists or review committees can, under the best circumstances, also increase transparency by pointing out limitations in the data, unconventional scientific judgments, or places where policy judgments must have been made. But peer review is no panacea. Individual reviewers from the same discipline as the decision maker may not even recognize, and therefore are unlikely to expose, the background disciplinary judgments that inform the regulatory decisions. Committees, especially multidisciplinary committees, are more likely than individual reviewers to detect and expose policy judgments, but committee reviews are time-consuming and resource-intensive. Moreover, any review is as capable as the regulatory decision reviewed of hiding policy judgments, deliberately or not. Committee reviews can in theory address that objection by carefully balancing the policy views of members, but the selection of reviewers is


inevitably a critical step, and one that itself is likely not to be transparent.264

C. Commitment to Learning: Seeking Better Informed Decisions

The second key feature of the scientific process is its firm commitment to improving knowledge of the natural world over time by continually gathering additional information and re-evaluating beliefs about the system in light of that new information. Tested against this feature, the Bush administration’s natural resource policies are unscientific or even anti-scientific, because the administration has minimized opportunities for collecting additional information,265 and has made no effort to fund studies that might meet its call for highly certain scientific proof as a necessary prerequisite to regulation.

Increasing data can help to increase the accuracy, and therefore the effectiveness, of regulatory actions. It also can decrease uncertainty, which in turn tightens legal constraints on the exercise of agency political judgments. The vast majority of regulatory decisions will never be fully determined by the data, but better data can provide tighter boundaries, limiting the role of unacknowledged value judgments.

Precisely what information should be sought, at what cost, and at whose expense, are complex questions that will necessarily turn on the specific context and are beyond the scope of this article. But it is surely unscientific to make decisions without attempting to gather information that appears to be both readily available and obviously relevant to the decision being made. For example, EPA’s pesticide registration process currently does not require testing of the impacts of the pesticide on amphibians.266 In light of several studies suggesting that some pesticides may adversely affect amphibians,267 not undertaking those studies seems like a glaring omission for pesticides that will be used in and around aquatic habitats. Testing on every organism that might be exposed need not be a prerequisite to registration, but leaving out entire classes of

264. The National Research Council, in particular, makes a strong effort to discover and balance the “biases” of review committee members, but that process occurs in closed session. Members of the public do have an opportunity to comment on committee membership before membership is finalized. 5 U.S.C. App. 2 § 15. For a careful study of the attractions and risks of advisory committees, and particularly the importance of the selection of their members in a very different context, see Christopher S. Elmendorf, Representation Reinforcement Through Advisory Commissions: The Case of Election Law, unpublished manuscript (on file with author).
265. See supra Part III(D).
266. See 40 C.F.R. § 158.490 (tests are required on fish and aquatic invertebrates).
organisms that seem likely to be exposed and susceptible should make EPA a ready political target.

In order to maintain both scientific and political credibility, calls for additional data-gathering efforts should be symmetric, based on a commitment to sound decision making rather than on opposition to any activity with potential environmental impacts. The Bush administration cares about scientific certainty only when that suits their pre-formed political views. True science, however, seeks knowledge whether or not that knowledge is politically convenient. The administration’s critics should be willing to support information-gathering efforts that will illuminate the needs of the resources being managed, even if those efforts might reduce the regulatory pressure on some development or extractive activities. That means not shying away from studies that might show, for example, that shortnose suckers in Upper Klamath Lake don’t need water levels as high as had been supposed, or that delta smelt population levels are not strongly linked to water project pumping activities.

Conservationists should not limit themselves to seeking additional information in the context of specific regulatory decisions that must be made on short timelines. They should make a political pitch for wide baseline information collection before regulatory decisions are necessary, so that regulation begins on sounder informational ground. Of course, Bruce Babbitt tried this pitch in the early 1990s when he proposed a National Biological Survey, and it went down in flames. Even if it does not produce substantial new funding for data gathering, though, hammering on the theme of the need for baseline data could help keep the anti-conservation values of the administration in the spotlight. It is even possible that a commitment to lightening regulatory restrictions when new information warrants could help calls for targeted funding of regulation-relevant research gain some traction.

Desirable as it might be, the political and fiscal barriers to a broad, government-funded, baseline research program are painfully obvious. Conservationists, therefore, should not wait for the government to step up to the data-gathering task. Much could be done through privately funded efforts, in laboratories, through universities, on public lands, and on lands owned by conservation sympathizers. Willingness to devote their own resources to these tasks will help establish environmentalist’s good faith, and their genuine concern for the resources.


269. As EPA’s Science Advisory Board recently put it in a draft report urging the agency to seek more funding for scientific research, “Failure to fund a credible science and research program will lead to greater, not reduced, regulatory burdens.” Pat Phibbs, EPA Advisory Board Expresses Concern About Adequate Knowledge on New Issues, 36 Env’t Rep. (BNA) 715, Apr. 8, 2005.
CONCLUSION

The lure of scientizing natural resource decisions has long drawn environmentalists. It may be that in the past this approach produced more positive conservation results, with less political hassle, than would have followed from frank confession of the limits of scientific information. If they ever existed, however, those days are gone. The Bush administration's success in halting and reversing conservation efforts shows just how effectively defensive science can be deployed to counter those strategies. A more sophisticated approach is needed, one that grapples openly with the limits of scientific data, and the values that necessarily inform interpretation and application of limited data.

Environmentalists need not take that step unilaterally. This administration has been even less transparent than its predecessors, and has been openly hostile to the development of new information that might show the need for regulatory intervention. Conservationists can point out how inconsistent those features of this administration's natural resource policy are with a commitment to scientific decision making.

Over the long run, learning over time is likely to be essential to actually achieving the goals of conservation. Resource management decisions are frequently iterative. The information supporting them should become stronger, and the political discretion permitted the decision maker correspondingly narrower, over time. Learning has too often been impeded by the unwillingness of environmentalists to concede the limits of the currently available scientific information. Letting go of spurious claims of scientific certainty would allow them to press far more strongly for increasing the information available to support management decisions, through targeted research funding, baseline data collection efforts, and regulatory incentives for information production.

None of this will be easy. Perhaps it will not succeed. Surely it will not hand conservationists every battle. But there is little to lose by trying it, given the success of the present administration at countering the more traditional offensive use of science. If progress can be made toward a more truly scientific regulatory process, that would be a substantial step forward, providing a firmer base for long-term conservation efforts when a more conservation-friendly administration eventually returns to power.