Adapting to Climate Change with Law That Bends Without Breaking

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TABLE OF CONTENTS

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I. INTRODUCTION

Climate change, the key environmental challenge of this century, is a tough problem for law in many ways. The topic of this panel, instrument choice, highlights a particularly difficult, important, and under-recognized aspect of the climate change challenge: the difficulty of devising a system of environmental law that combines the flexibility necessary to deal with a changing world with the rigidity and accountability essential to hold us to the difficult task of environmental protection.

Most of the presentations at this symposium focused on what policy instruments might be best adapted to dealing with the problem of greenhouse gas emissions over time. Controlling greenhouse gas emissions is essential, but it is not enough. We must also think about climate adaptation. The climatic changes to which we are already committed seriously complicate our efforts to conserve something approaching a "natural" world. If we are to have any hope of meeting our conservation goals in the warmer world of the future, we will need conservation policy instruments capable of rising to that challenge.

For purposes of this paper, I take for granted that Americans overwhelmingly view environmental protection as a worthy goal. That assumption is supported by the durability of our environmental laws and by public opinion polling. Of course, Americans have other goals as well, and would balance and prioritize those goals in various ways. My point here is not to debate the appropriate level of conservation concern. It is, rather, to take note of the difficulties we face in translating even real and widely shared concern into sustained practice. As in other areas of our life, short-term temptations can easily turn us from our long-term goals.

Environmental law in general, and the conservation side of environmental law in particular, have always been about finding ways to resist temptation so that we might better achieve our sincerely-held environmental goals. Environmental law is designed as a precommitment device, deliberately tying us to our goals in ways that are difficult to undo so that we might control our natural impulses to take more in the short run than the earth can spare in the long term.

Societal precommitment is difficult under the best of circumstances, because our governance system cannot literally tie us to the mast in

imitation of Ulysses. It is even more difficult in a world that is changing rapidly, and to some extent unpredictably, because we need to preserve enough flexibility to respond to those changes.

In 1981, Barbara Walters caught flak for asking Katherine Hepburn on national television what kind of tree she was.[1] At the risk of inviting the same sort of ridicule, I'll use a tree metaphor. Environmentalists have long idealized the law they prefer as an oak,[2] standing strong to weather the storms of short-term political temptation. Laws modeled on oaks feature clear, enforceable mandates that allow little or no exception. They eschew cost-benefit analysis, and limit implementing agency discretion.[3] As a model for law, oaks have both appealing and problematic features. They are famously strong, but also rigid. They can stand unswayed in powerful winds, but when the winds reach gale strength the limbs of oaks may break off, and their trunks may topple.

Today we need a different tree model. The facile counterpart to the rigid oak is the willow, whose limbs and trunk are said to bend enough to withstand high winds but recover once the storm subsides. The willow of this conventional tale displays part of what we need. Our legal standards must be *plastic* in the sense of being able to deform without breaking, but not so plastic that they take any form that seems momentarily appealing.

The willow is not the perfect example, though, because it shows *resilience*, returning to its prior equilibrium form once the wind eases. Law in the form of a willow might provide an emergency exemption or other by-pass procedure to be used in case of a short-term political storm, reverting to its prior provisions once the storm passed. That is not quite what climate change demands because the storm winds of climate change, whether that refers to the changed climate itself or the political pressure the changes will put on conservation efforts, will be steady and unabating.[4] A better tree model for that context is the conifers that grow

1. The question has since been repeatedly described as "what kind of tree would you like to be?" Actually, Hepburn described herself as a tree, and Walters asked only "What kind of tree are you?" YouTube, http://www.youtube.com/watch?v=M_X2Xd1iOmM.

2. Coincidentally, Hepburn told Walters she would choose to be like an oak. *See id.*

3. "Legal oaks" are essentially what Amy Sinden calls "absolutes" or legal "trumps." Amy Sinden, *In Defense of Absolutes: Combating the Politics of Power in Environmental Law*, 90 IOWA L. REV. 1405, 1489 (2005).

4. As Richard Lazarus puts it with respect to climate legislation, any legislative mandate will inevitably face "an unrelenting barrage of extremely powerful short-term

on wind-swept ridges. Such trees adapt to the harsh conditions they face, deforming permanently in the direction of the prevailing winds. They look stunted by comparison to similar trees growing in more placid locations, but they maintain their identity as trees and their ability to hold together the soil, provide food and shelter for birds and animals, and protect other plants from the fiercest gales. Laws based on the conifer model are able to withstand sustained pressures by conforming to external realities, but still bind us to long-term goals that are difficult to achieve and in conflict with short-term economic interests. We have little experience with that sort of law, and no clear model to follow. We will need sustained and creative thinking to develop it. Here, I take a first stab at that task—explaining why we have gravitated toward oak-like laws, showing why wind-swept pines are now a better model, and offering some initial thoughts on what the sustained-wind-tolerant laws of the future might look like.

II. ENVIRONMENTAL LAW AS PRECOMMITMENT

Precommitment is a strategy long familiar to people who know they may be tempted to take action they will later regret. Most famously, it is the strategy of Ulysses, who had his sailors bind him to the mast of his ship as it passed by the island of the Sirens, whose irresistibly beautiful song caused sailors who heard it to throw themselves into the sea and captains to wreck their ships trying to follow it.[5] Of course, Ulysses' strategy was not entirely rational. He could have stopped his own ears with wax, as he did those of his sailors, to escape temptation altogether. But Ulysses wanted to hear the sirens' song without being harmed by it. Perhaps we don't always court temptation as directly as Ulysses did, but often we find that temptation is essentially unavoidable.

A. Precommitments and Law

People use a variety of precommitment strategies to deal with temptations they expect to encounter but fear they may not have the discipline to resist.[6] Precommitment simply means doing something now

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economic interests" seeking its relaxation. Richard J. Lazarus, *Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*, 94 CORNELL L. REV. 1153, 1158 (2009).

5. HOMER, THE ODYSSEY 141–42 (W.H.D. Rouse trans., Signet Classic ed. 1999) (1937).

6. For detailed descriptions and taxonomies of precommitment, see, *e.g.*, Jon Elster, *Don't Burn Your Bridge Before You Come To It: Some Ambiguities and Complexities of Precommitment*, 81 TEX. L. REV. 1751 (2003); Thomas Schelling, *Enforcing Rules on Oneself*, 1 J. L. ECON. ORG. 357 (1985); JON ELSTER, ULYSSES AND THE SIRENS: STUDIES

in order to increase the likelihood of taking (or not taking) another action later. It may take the form of physically putting an act one wants to avoid out of reach, like Ulysses having himself bound to the mast to keep him from leaping overboard, or an army burning bridges behind it to foreclose retreat.[7] Where it is difficult to make an action physically impossible, people may take a variety of steps that increase the costs of changing their mind, such as telling other people about a commitment to lose weight or quit smoking, joining a forced savings program, or agreeing to exercise with others. Law is not necessarily a part of individual precommitments, but it can play a role, providing enforceable sanctions to back up a voluntary precommitment.[8]

Law itself can be the subject of collective precommitment. Indeed, law, by its very nature, is precommitment, creating rules at one point in time that determine the consequences of actions in the future with the intent of encouraging or discouraging those future actions.[9] The "rule of law" promises those subject to the law that their future actions will not be treated according to the political mood of those future times.[10]

Law is deliberately an imperfect precommitment device. It cannot be made immune from change. Legal rules must always be subject to revision and updating so that society can respond to changes in circumstances, knowledge, and goals. But the difficulty of changing legal mandates can

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IN RATIONALITY AND IRRATIONALITY 9–11, 36–37 (Maison des Sciences de l'Homme and Cambridge University Press 1979) (1940).

7. *See* Elster, *supra* note 5, at 1761 (citing historical examples of armies burning the means of retreat).

8. Some states, for example, have "casino self-exclusion" laws, which allow individuals to formally place their names on a list of people who are subject to sanctions if found in a casino are supposed to deny entry. *See* Cecil VanDevender, *How Self-Restriction Laws Can Influence Societal Norms and Address Problems of Bounded Rationality*, 96 GEO. L. J. 1775, 1779–81 (2008); Kurt Eggert, *Lashed to the Mast and Crying for Help: How Self-Limitation of Autonomy Can Protect Elders from Predatory Lending*, 36 LOYOLA L.A. L. REV. 693, 748–54 (2003). A few others have adopted "covenant marriage laws" allowing couples to choose a form of marriage that is more difficult to terminate. *See* Chauncy E. Brummer, *The Shackles of Covenant Marriage: Who Holds the Keys to Wedlock?*, 25 U. ARK. LITTLE ROCK L. REV. 261 (2003).

9. John A. Robertson, *"Paying the Alligator": Precommitment in Law, Bioethics, and Constitutions*, 81 TEX. L. REV. 1729, 1745 (2003).

10. *See, e.g.*, William W. Buzbee, *Asymmetrical Regulation: Risk, Preemption, and the Floor/Ceiling Distinction*, 82 N.Y.U. L. REV. 1547, 1600 (2007) (listing as "rule-of-law values" "clear mandates, legal stability, and distinct lines of accountability"); Antonin Scalia, *The Rule of Law as a Law of Rules*, 56 U. CHI. L. REV. 1175, 1179 (1989) ("[r]udimentary justice requires that those subject to the law must have the means of knowing what it prescribes").

be roughly calibrated to their intended durability. Constitutions are often deliberately made difficult to change, so that the core values they embody will not be undermined in the future by transitory passions.[11] Supermajority voting requirements are a popular procedural device to limit constitutional amendments.[12] Taxes may also be subjected to supermajority requirements if voters suspect that they are otherwise too easily imposed,[13] and decisions to fund favored programs can be entrenched through similar requirements.[14] Even without any special procedural barriers, law is always difficult to change,[15] requiring either overwhelming interest for a short period of time or strong interest for a more sustained period.

Credible precommitment through law should provide two distinct benefits. First, it should strengthen societal resolve, making it more likely that we act in accordance with our professed societal goals, even in the face of conflicting short-term desires or economic costs. Second, by providing advance notice of the importance of following those goals, it should encourage planning that can help us achieve them in a manner that interferes as little as possible with other goals. Precommitment does, however, pose the tricky challenge of striking the right balance between rigid enforceability and flexibility. Commitments which are too rigid can inhibit adaptive responses to new conditions.[16] On the other hand, commitments which are too tractable may be overcome by even mild temptation.[17]

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11. *See, e.g.*, Robertson, *supra* note 9, at 1740–43.

12. *See, e.g.*, Lazarus, *Super Wicked*, *supra* note 4, at 1197–1200.

13. *See, e.g.*, CAL. CONST. art. XIIIA, § 3 (requiring a two-thirds vote in each house of the legislature for "any changes in State taxes enacted for the purpose of increasing revenues collected pursuant thereto").

14. California's Proposition 98, passed in 1988, requires minimum funding for K-14 education. Funding levels are determined by a complex series of formulas, and can be reduced by a two-thirds vote of the legislature. LEGISLATIVE ANALYST'S OFFICE, ANALYSIS OF THE 2008-2009 BUDGET BILL, EDUCATION, INTRODUCTION: PROPOSITION 98, http://www.lao.ca.gov/handouts/education/2010/Overview_of_the_Prop_98_Budget_52710.pdf.

15. *See* Lazarus, *Super Wicked*, *supra* note 4, at 1180 (describing the lawmaking process in the U.S. as "deliberately cumbersome"); Holly Doremus, *Takings and Transitions*, 19 J. LAND USE & ENVTL. L. 1, 21–24 (2003) (explaining how both human nature and politics make law inherently resistant to change).

16. California's supermajority requirements for raising taxes and approving budgets, both imposed by initiative, are widely regarded as having rendered the state "dysfunctional." *See, e.g.*, Ronald M. George, *Initiatives Render California Dysfunctional*, S.F. CHRONICLE, Nov. 1, 2009, *available at* http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2009/11/01/IN3H1ABI0R.DTL.

17. Rebecca Kysar notes, for example, that procedural rules intended to limit the use of earmarks in Congress are frequently evaded. She attributes the ineffectiveness of earmark rules primarily to the lack of extra-congressional enforcement mechanisms. Rebecca M. Kysar, *Listening to Congress: Earmark Rules and Statutory Interpretation*, 94 CORNELL L. REV. 519, 542 (2009). Another example is the escape valve for California's greenhouse gas emission reduction law, AB 32, which allows the governor to "adjust" the law's deadlines "[i]n the event of extraordinary circumstances, catastrophic events, or

B. Precommitment in Environmental Law

Environmental conflicts have several distinctive characteristics. They typically involve harm to the surrounding world that affects persons only indirectly.[18] Environmental injury often is slow to fully manifest,[19] and its nature, extent, and causes are frequently poorly understood.[20] Environmental harm is typically the collective result of multiple incremental actions, none of which individually appears blameworthy. Moreover, the costs and benefits of environmental protection are frequently asymmetrically distributed.[21] In part as a result of that distribution, despite a societal consensus that the environment merits some level of protection, individuals strongly disagree about the desirable extent of protection and what trade-offs it justifies.

Finally, much environmental protection and restoration work is valuable only if it is durable over time.[22] Temporal lags are one reason durability is important. For example CO_2, the most important of the greenhouse gases, remains in the atmosphere for a century or more, and its impacts on the climate persist even longer.[23] Restricting emissions for a short time, therefore, would impose costs without providing significant benefits; only long-term restraint can make a meaningful difference in the eventual climate equilibrium, and that difference will not be detectable for some time.[24] The same is true for short-term attention to climate adaptation problems.

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threat of significant economic harm," with none of those terms defined or limited. CAL. HEALTH & SAFETY CODE § 38,599(a).

18. Richard J. Lazarus, *Restoring What's Environmental About Environmental Law in the Supreme Court*, 47 UCLA L. REV. 703, 744–45 (2000).

19. *Id.* at 746.

20. *E.g.*, *id.* at 747; Holly Doremus, *Constitutive Law and Environmental Policy*, 22 STAN. ENVTL. L.J. 295, 318–20 (2003).

21. Lazarus, *supra* note 18, at 746; *see* Henry N. Butler & Jonathan R. Macey, *Externalities and the Matching Principle: The Case for Reallocating Environmental Regulatory Authority*, 14 YALE J. ON REG. 23, 29–31 (1996).

22. Doremus, *supra* note 20, at 326–27; DANIEL A. FARBER, ECO-PRAGMATISM: MAKING SENSIBLE ENVIRONMENTAL DECISIONS IN AN UNCERTAIN WORLD 199, 202 (Univ. of Chicago Press 1999).

23. *See* Susan Solomon et al., *Irreversible Climate Change Due to Carbon Dioxide Emissions*, 106 PROC. NAT'L ACAD. SCI. 1704, 1704–05 (2009).

24. Eric Biber, *Climate Change and Backlash*, 17 N.Y.U. ENVTL. L.J. 1295, 1316 (2009). Greenhouse gas accumulation in the atmosphere is a "stock/flow" or more colorfully a "bathtub" problem. Since CO_2 is only very slowly removed from the atmosphere, the level in the atmospheric "bathtub" will continue to increase even if the rate of input is drastically cut. Lazarus, *supra* note 4, at 1164–66; John D. Sterman & Linda Booth Sweeney,

But the need for durability can also be associated simply with the difficulty and expense of reversing environmental harm, or with the intangible nature of the rewards of environmental protection. I may be willing to give up some economic benefits in order to protect the Delta smelt, the American pika, or the Delhi sands flower-loving fly, but I would feel like a prize chump if, despite my sacrifice, the next generation carelessly destroyed those species. A big part of the point of protecting the natural world now is to help future generations build the kind of relationship with the natural world that will make them want to carry on the protections. There is, therefore, an important sense in which environmental law cannot accomplish its aims unless it persists for generations.

Unfortunately, environmental problems are especially difficult to grapple with, both initially and over time. The limitations of human rationality are on full display in dealing with environmental harm. Several psychological biases complicate our ability to respond rationally to evidence of environmental harm, even when environmental protection is recognized as an important goal. Temporal distance between action and environmental effect plays into reluctance to accept immediate and obvious costs in order to prevent longer-term and probabilistic risks.[25] Uncertainty gives us room for wishful thinking, allowing us "to underestimate the seriousness of problems, to overestimate the effectiveness of efforts to solve them, and to assume that the future will make them easier to solve."[26] Furthermore, environmental problems are almost by definition collective action problems, resulting from overconsumption of common resources. No individual can solve them alone, and no "rational" self-interested individual will voluntarily reduce her contribution without assurances that others will also do their part.[27]

Just as environmental problems bring out our individual human failings, they also highlight the shortcomings of our political system. As Richard Lazarus has pointed out: "Environmental protection laws are invariably redistributive; they impose substantial costs on some and confer substantial benefits on others. For that reason, the institutional barriers to the enactment of such laws are particularly high."[28] That the

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Understanding Public Complacency About Climate Change: Adults' Mental Models of Climate Change Violate Conservation of Matter, 80 CLIMATIC CHANGE 213, 215–16 (2007).

25. Richard J. Lazarus, *Human Nature, the Laws of Nature, and the Nature of Environmental Law*, 24 VA. ENVTL. L.J. 231, 237–39 (2005).

26. Doremus, *supra* note 20, at 320–21.

27. *Id.* at 324–26.

28. Richard J. Lazarus, *A Different Kind of "Republican Moment" in Environmental Law*, 87 MINN. L. REV. 999, 1000 (2003).

beneficiaries may be distant in both time and space from those who bear the costs makes the political situation even more daunting.[29]

The passage of environmental legislation is always a minor political miracle, but it is never the end of the story. Once law is enacted, it benefits from the same barriers to lawmaking that make it difficult to enact; it is tough to substantively amend existing law, even law that faces serious political challenges. In order to achieve its goals, however, environmental law must also resist the variety of under-the-radar tools Congress has to draw the sting of facially powerful legislation, including appropriations riders, funding limitations, and unpleasant oversight hearings. That sort of durability has been challenging to engineer. As a result, even ardent environmentalists are sometimes afraid to push the law to its apparent environmental protection limits for fear that might lead to repeal.[30]

Furthermore, there are many opportunities for "slippage" between environmental law on the books and its implementation on the ground.[31] Environmental problems are sufficiently complex, technical, and poorly understood that the details of implementing environmental law must generally be left to expert agencies, providing plenty of opportunities for legislative purposes to be "lost or misdirected in the vast hallways of the [. . .] bureaucracy."[32]

The early architects of environmental law understood the danger of slippage. They saw that agencies responsible for environmental laws would be subject to political pressures from focused economic interests

29. *Id.*

30. *See* John Leshy, *The Babbitt Legacy at the Department of Interior: A Preliminary View*, 31 ENVTL. L. 199, 212–13 (2001); *and see* Holly Doremus, *Adaptive Management, the Endangered Species Act, and the Institutional Challenges of "New Age" Environmental Protection*, 41 WASHBURN L.J. 50, 60–61 (2001). One recent study suggests that this phenomenon is not limited to political actors. *See* Lochran W. Traill et al., *Pragmatic Population Viability Targets in a Rapidly Changing World*, 143 BIOLOGICAL CONSERVATION 28, 29 (2010) (asserting that conservation organizations and conservation scientists are underestimating conservation needs in their zeal to recognize political and financial realities).

31. *See* Daniel A. Farber, *Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law*, 23 HARV. ENVTL. L. REV. 297, 298 (1999) ("Slippage between regulatory standards and the actual conduct of regulated parties is far from being a peripheral element of the legal regime. What environmental lawyers do much of the time could be considered 'slippage management.'").

32. Calvert Cliffs Coordinating Committee Inc. v. U.S. Atomic Energy Commission, 449 F.2d 1109, 1111 (D.C. Cir. 1971).

seeking relief from regulatory mandates.[33] They therefore built in a series of precommitment devices designed to make it more difficult for agencies to shirk their implementation duties. Citizen suit provisions allow individuals to take enforcement into their own hands. Statutory deadlines and mandates for agency action, coupled with judicial review provisions and the availability of attorney fees to successful plaintiffs, help interested parties hold the feet of reluctant agencies to the regulatory fire.[34]

C. Sturdy Environmental Law Oaks

The most powerful way to combat slippage is to erect sturdy, inflexible oak-like mandates. By limiting agency discretion, such mandates help ensure that progress will be made toward environmental goals even in the face of strong temptations to stray from the environmental mission. Two well-known examples of such oaks are the Endangered Species Act's mandate to protect all species and the Clean Water Act's anti-degradation provisions.

1. Conserving the Uncharismatic

One way Congress has used regulatory oaks as precommitment devices is to establish uncompromising goals before it is obvious who will bear the costs of achieving those goals. A conspicuous example is the Endangered Species Act's requirement that virtually all species be protected against human-caused extinction. The Act mandates the listing of all species of animals or plants, no matter how uncharismatic, which are in danger of extinction or likely to become so in the foreseeable future.[35] The only species ineligible for listing are insect pests "whose protection . . . would present an overwhelming and overriding risk to man."[36] Once listed, species are entitled to substantive protections strong enough to have earned the ESA the sobriquet "pit bull of environmental

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33. JOSEPH L. SAX, DEFENDING THE ENVIRONMENT 88, 108–09, 239 (Alfred A. Knopf, Inc. 1971) (1970) (advancing the idea that relying solely on administrative agencies to secure greater protections for the environment is misguided, and suggesting that the role of the courts in such efforts might be profitably enhanced).

34. Even with such oversight mechanisms, slippage is possible at the level of the courts. Farber, *supra* note 31, at 311–15.

35. *See* 16 U.S.C. § 1532(6) (2006) (defining an "endangered species" as one which is "in danger of extinction throughout all or a significant portion of its range"); *id.* § 1532(20) (defining a "threatened species" as one which "is likely to become an endangered species within the foreseeable future"); *id.* § 1533(a)(1) (requiring that implementing agencies "determine whether any species is an endangered species or a threatened species").

36. 16 U.S.C. § 1532(6).

law."[37] They may not be harmed without a permit,[38] and federal agencies may not take any action, including issuing such a permit, that would jeopardize their continued existence or adversely modify their critical habitat.[39] The duty to list and the resulting regulatory protections are enforceable through citizen suits if the agencies prove unwilling,[40] and citizen plaintiffs have not been reluctant to step forward.

There is a pressure relief valve on the prohibition against jeopardy, but it is so difficult to use that it has almost never come into play. The Act creates an elaborate process for invoking a group officially called the Endangered Species Committee, popularly known as the "God Squad." Congress created the exemption process in 1979,[41] in the wake of the Supreme Court's ruling that the Act prohibited completion of the Tellico Dam.[42] It allows federal agencies to ask the Secretary to empanel the God Squad, which is composed of seven cabinet-level officials and a representative from each affected state. The God Squad can grant an exemption only if it finds, by a supermajority vote, that the project is of regional or national significance, there is no reasonable or prudent alternative, and the benefits of the project clearly outweigh those of any alternative consistent with conservation of listed species.[43] The process has only been invoked a handful of times, and only once has it produced an exemption.[44] The God Squad therefore "satisfies one desideratum of a good escape clause, namely, that it will never be used."[45]

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37. Donald Barry, then of World Wildlife Fund but later Assistant Secretary for Fish and Wildlife and Parks in the Clinton Administration, is usually credited with coining this description. *See, e.g.*, Timothy Egan, *Strongest U.S. Environmental Law May Become Endangered Species*, N.Y. TIMES, May 26, 1992, at A1.

38. *See* 16 U.S.C. §§ 1538(a) (prohibiting take); 1532(19) (defining "take" to include harm); 1539(a)(1)(A) (authorizing issuance of incidental take permits).

39. 16 U.S.C. § 1536(a).

40. 16 U.S.C. § 1540(g); 5 U.S.C. §§ 704, 706; Bennett v. Spear, 520 U.S. 154, 171–76 (1997).

41. Endangered Species Act Amendments of 1978, Pub. L. No. 95-632, 92 Stat. 3751 (codified as amended in scattered sections of 16 U.S.C).

42. Tennessee Valley Auth. v. Hill, 434 U.S. 153, 193–95 (1977).

43. 16 U.S.C. § 1536(h)(1).

44. *See* Holly Doremus, *The Story of TVA v. Hill: A Narrow Escape for a Broad New Law*, *in* OLIVER A. HOUCK & RICHARD J. LAZARUS, ENVIRONMENTAL LAW STORIES: AN IN-DEPTH LOOK AT TEN LEADING CASES ON ENVIRONMENTAL LAW 132 (Foundation Press 2005).

45. Jon Elster, *Don't Burn Your Bridge Before You Come To It: Some Ambiguities and Complexities of Precommitment*, 81 TEX. L. REV. 1751, 1776 (2003).

Installing a safety valve that does not turn easily always carries the risk that pressure may build up sufficiently to cause a blow-out elsewhere. For legislation, there is always the less controlled option of congressional repeal or targeted exemption. For the ESA, however, that avenue too has been used only sparingly.[46] Given the ferocity and persistence of controversy over ESA implementation, the law has proven remarkably durable.

There has of course been some regulatory slippage. The implementing agencies have frequently fallen short, bowed to political pressures, or attempted to soften the law's impact.[47] Slippage is invited by the high degree of public controversy that has long attended the ESA, which weakens the hand of the implementing agencies.[48] But citizen litigation

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46. *Id.* In addition, Congress authorized the Attorney General to waive the provisions of the ESA and National Environmental Policy Act to the extent necessary "to ensure expeditious construction" of a fence at the U.S.-Mexico border, Pub. L. No. 104-208 (1996), Div. C, § 102(c), 110 Stat. 3009 (1996) (codified as amended sporadically in U.S.C.) and subsequently expanded that authority to allow the Secretary of Homeland Security to waive "all legal requirements" that might stand in the way of fence construction, Pub. L. No. 109–13, Div. B, § 102, 119 Stat. 23 (2005) (codified as amended sporadically in U.S.C). In the mid-1990s, Congress also placed a temporary moratorium on new listings, but that freeze lasted only one year. Marcilynn Burke, *Much Ado About Nothing: Kelo v. City of New London, Babbitt v. Sweet Home, and Other Tales from the Supreme Court*, 75 U. CIN. L. REV. 663, 677 n.83 (2006).

47. *See, e.g.*, Holly Doremus, *Scientific and Political Integrity in Environmental Policy*, 86 TEX. L. REV. 1601, 1604–09, 1613–17 (2008); *see* U.S. DEPT. OF THE INTERIOR, OFFICE OF INSPECTOR GENERAL, REPORT OF INVESTIGATION: THE ENDANGERED SPECIES ACT AND THE CONFLICT BETWEEN SCIENCE AND POLICY (Dec. 2008), *available at* http://www.doioig.gov/images/stories/reports/pdf/Endangered%20Species%20FINAL%20REDACTED5%20w_TOC_encryption.pdf; U.S. DEPT. OF THE INTERIOR, OFFICE OF INSPECTOR GENERAL, REPORT OF INVESTIGATION, JULIE MACDONALD, DEPUTY ASSISTANT SECRETARY, FISH, WILDLIFE AND PARKS (Mar. 2007), *available at* http://doi.bluewatermedia.com/pdf/Macdonald.pdf; J.R. DeShazo & Jody Freeman, *The Congressional Competition to Control Delegated Power*, 81 TEX. L. REV. 1443, 1444 (2003); Amy Whritenour Ando, *Waiting to Be Protected Under the Endangered Species Act: The Political Economy of Regulatory Delay*, 42 J. L. & ECON. 29, 30 (1999); Mary Christina Wood, *Reclaiming the Natural Rivers: The Endangered Species Act as Applied to Endangered River Ecosystems*, 40 ARIZ. L. REV. 197, 237–45 (1998); Andrew Metrick & Martin L. Weitzman, *Patterns of Behavior in Endangered Species Preservation*, 72 LAND ECON. 1, 9–11 (1996); David S. Wilcove, Margaret McMillan, & Keith C. Winston, *What Exactly Is an Endangered Species? An Analysis of the U.S. Endangered Species List, 1985-1991*, 7 CONSERVATION BIOLOGY 87, 89–90 (1993); 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, 280, 288–89 (1993); U.S. GENERAL ACCOUNTING OFFICE, ENDANGERED SPECIES: FACTORS ASSOCIATED WITH DELAYED LISTING DECISIONS 2 (1993); STEVEN L. YAFFEE, PROHIBITIVE POLICY: IMPLEMENTING THE FEDERAL ENDANGERED SPECIES ACT (The MIT Press 1982); U.S. GENERAL ACCOUNTING OFFICE, CED-79-65, ENDANGERED SPECIES: A CONTROVERSIAL ISSUE NEEDING RESOLUTION (1979).

48. *See, e.g.*, Sinden, *supra* note 3, at 1507 ("Thus, even though Congress only rarely steps in to directly alter the outcome of a dispute under the ESA, the knowledge of that possibility colors virtually all negotiations under the Act, providing additional leverage to economic interests.").

has frequently picked up the slack. Overall, there have been very few extinctions on the ESA's watch, many fewer than would have been expected without the law.[49]

Conservation advocates are justifiably proud of the ESA's success, and rightly attribute that success largely to the rigidity of its oak-like mandates. As Amy Sinden has explained, "absolute" environmental mandates like the ESA help to correct the political power imbalance that generally favors development over environment.[50] Imagine that the law merely required that the potential for adverse impacts on species be studied and considered in deciding whether to act. Or even more starkly, imagine that every conservation requirement had to pass a quantitative cost-benefit test. I have little doubt that projects that seem economically or socially important, or have a strong political constituency, would move ahead under such a law, and uncharismatic or seemingly unimportant species like fairy shrimp, suckers, and the Delhi Sands fly would disappear. That would not indicate that development is always somehow "better" for society than conservation, just that short-term focused interests tend to enjoy greater political success than long-term diffuse ones.

How did such a tough and inflexible precommitment ever become law? Part of the story is that the Congress that enacted the ESA did not fully understand its scope or consequences. Although the language of the statute is clear, some of its toughest provisions were added late in the process, and departed substantially from past conservation practices.[51] But even if the ESA's strength had been fully anticipated, the law might not have faced insurmountable political barriers. Its goal of preventing extinction is one that few are willing to publicly oppose, and it was not at all clear at the time of its passage, before species were listed or projects affecting them identified, who would bear the costs of the conservation it demands.

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49. Mark W. Schwartz, *Choosing the Appropriate Scale of Reserves for Conservation*, 30 ANN. REV. ECOLOGY & SYSTEMATICS 83, 86–87 (1999); J. Michael Scott et al., *By the Numbers*, *in* THE ENDANGERED SPECIES ACT AT THIRTY, VOL. 1 (Dale D. Goble, J. Michael Scott, and Frank W. Davis, eds., 2006).

50. Sinden, *supra* note 3.

51. The history of the ESA's enactment is discussed in some detail in Holly Doremus, *The Endangered Species Act: Static Law Meets Dynamic World*, 32 WASH. U. J. L. & POL'Y 175, 186–92 (2010). *See also* Holly Doremus, *Adaptive Management, the Endangered Species Act, and the Institutional Challenges of "New Age" Environmental Protection*, 41 WASHBURN L.J. 50, 57 (2001).

2. Maintaining Existing Environmental Quality

Another oak-like strategy is to demand that regulatory agencies or states set standards based on current conditions, and to erect substantive or procedural barriers against relaxing those standards. The Clean Water Act provides an example. The Act mandates that states set water quality standards for the waters within their boundaries.[52] Those standards must be sufficiently high to protect all existing uses,[53] defined by regulation to mean all uses actually attained on or after November 28, 1975.[54] Uses cannot be strategically broadly defined in order to make protecting them easy; if a state has only one "fishable" designation, the standards it imposes must protect its most sensitive fish.[55] Each state must have an antidegradation policy which "shall, at a minimum," ensure that "[e]xisting instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected."[56] There is no provision for removing existing uses.[57] Designated uses which have not been attained since 1975 can be removed, but only if their attainment has become infeasible or if the controls that would be required to attain them"would result in substantial and widespread economic and social impact."[58]

Although the water quality standard and anti-degradation requirements have been strong on paper for decades, until recently they played relatively little role in federal pollution policy. In the early years of the Clean Water Act, the EPA concentrated on developing and imposing technology-based discharge limits on point sources, which must obtain permits under the Act's National Pollutant Discharge Elimination System (known as NPDES permits). Recently, however, as it has become increasingly apparent that technology-based requirements would not be sufficient to achieve the Act's objective of restoring and maintaining the chemical, physical and biological integrity of the nation's waters,[59]

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52. 33 U.S.C. § 1313(a).

53. 40 C.F.R. §131.10. Uses may include such things as recreation, fish and wildlife production, and water consumption for various purposes. A use is considered to exist if the water is of high enough quality to support it. For example, shellfish production may be an "existing use" even if no one has yet harvested the shellfish from that location. EPA, WATER QUALITY STANDARDS HANDBOOK (2d ed. 1994) § 4.4, *available at* http://www.epa.gov/waterscience/standards/handbook/chapter04.html#section4.

54. 40 C.F.R. § 131.3(e).

55. Craig N. Johnston, *Salmon and Water Temperature: Taking Endangered Species Seriously in Establishing Water Quality Standards*, 33 ENVTL L. 151, 161 (2004) (citing EPA's Water Quality Standards for Idaho, 62 Fed. Reg. 41,162, 41,167–68 (July 31, 1997)).

56. 40 C.F.R. § 131.12(a).

57. 40 C.F.R. § 131.10(h)(1) (states may not remove existing uses unless they are substituting a use requiring higher water quality).

58. 40 C.F.R. § 131.10(g).

59. 33 U.S.C. § 1251(a).

attention has turned to water quality standards. NPDES permits are supposed to include water-quality based limits, in addition to technology-based requirements, if necessary to meet water-quality standards.[60] In addition, states are supposed to develop Total Maximum Daily Loads (TMDLs), which set a budget for pollutant inputs from all sources, whether subject to permit requirements or not, for waters not meeting their water quality standards.[61] The TMDL program was virtually ignored by EPA and the states until the mid-1990s when citizen litigation forced it onto the front burner.[62] It still suffers from a conspicuous Achilles heel—there is no clear legal mandate for states to actually implement or enforce their TMDLs.[63] Nonetheless, environmental groups have come to see water quality standards, coupled with the antidegradation requirement, as another oak-like standard capable of forcing reluctant states to hold the line at least against water pollution from point sources.

III. THE CLIMATE CHANGE CHALLENGE

Greenhouse gas emission control, with all its political and psychological complications, is the paradigmatic environmental problem. It highlights the need for precommitment, as environmental law has always done. The problem of conserving nature in the face of climate change adds another twist. Climate change will make it impossible to achieve some current conservation goals or meet some current standards. The climate change conservation problem, therefore, highlights both the importance of precommitment and the perils of rigidity. It calls for law in the form of wind-swept pine rather than rigid oak.

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60. 33 U.S.C. §§ 1311(b), 1312(a); 40 C.F.R. §§ 122.4(d), 122.44(d). Regulatory slippage from this requirement has been rampant, but is now beginning to get attention. A recent EPA review of NPDES permits for mountaintop removal coal mining operations found that many of those permits lacked water-quality based provisions. U.S. EPA, Detailed Guidance: Improving EPA Review of Appalachian Surface Coal Mining Operations Under the Clean Water Act, National Environmental Policy Act, and the Environmental Justice Executive Order, Apr. 1, 2010, at 8–13, *available at* http://www.epa.gov/owow/wetlands/guidance/pdf/appalachian_mtntop_mining_detailed.pdf. EPA has also promised to review compliance of those permits with antidegradation requirements more carefully. *Id.* at 13–14.

61. 33 U.S.C. § 1313(d); Pronsolino v. Nastri, 291 F.3d 1123, 1127–28 (9th Cir. 2002).

62. OLIVER A. HOUCK, THE CLEAN WATER ACT TMDL PROGRAM: LAW, POLICY, AND IMPLEMENTATION 75–76 (Environmental Law Institute 2002) (1999).

63. *See, e.g.*, Dave Owen, *Probabilities, Planning Failures, and Environmental Law*, 84 TUL. L. REV. 265, 300 (2009).

A. Controlling Greenhouse Gas Emissions

It is hardly new ground at this point to say that climate change mitigation, meaning the control of atmospheric greenhouse gas levels, is the perfect storm of a political problem. Richard Lazarus calls it "environmental lawmaking's worst nightmare."[64] Jeffrey Rachlinski pointed out ten years ago that climate change is a "social trap, a morass that, because of its psychological characteristics, society is unlikely to resolve through conventional approaches."[65] Buzz Thompson describes it as "a classic example of the tragedy of the commons."[66]

Biased assimilation of evidence about the causes, effects, magnitude, and rate of global warming has, just as Professor Rachlinski predicted,[67] polarized views about climate change to the extent that it is difficult to have a civil, much less a productive, conversation about it in the political arena. The invisibility, intangibility, and abstractness of climate change combines with uncertainties to make it easy to ignore.[68] Furthermore, greenhouse gas emissions come primarily from deeply entrenched activities, things we are used to doing and not used to regarding as harmful or wrong.[69] The losses from giving up, or even limiting, activities like driving or using our electric devices appear far more real and immediate than the potential gains of limiting climate change, especially when the

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64. Lazarus, *Super Wicked*, *supra* note 4, at 1184.

65. Jeffrey J. Rachlinski, *The Psychology of Global Climate Change*, 2000 U. ILL. L. REV. 299, 300 (2000).

66. Barton H. Thompson, Jr., *Tragically Difficult: The Obstacles to Governing the Commons*, 30 ENVTL. L. 241, 253 (2000).

67. *Id.* at 305–07.

68. Richard J. Lazarus, *Super Wicked*, *supra* note 4, at 1176–78; *see also* Rachlinski, *supra* note 65, at 306 ("global climate change is a somewhat intangible harm that can only be understood in the context of scientific theory"). This sort of invisibility seems to have played a role in the vulnerability of belief in climate change to the political whims or news stories of the moment. According to respected polls, American's confidence that climate change is a real phenomenon has fluctuated widely over the last few years. Gallup reported in March 2010 that the percentage who believe the media generally exaggerates the seriousness of global warming is up to 48%, and that although 53% still believe that global warming is real, that number is at its lowest value since 1997. Frank Newport, *Americans' Global Warming Concerns Continue to Drop*, GALLUP, Mar. 11, 2010, http://www.gallup.com/poll/126560/americans-global-warming-concerns-continue-drop.aspx. The most recent Pew Research Center poll found that only 37% of Americans see climate change as a very serious problem, down from 47% in 2007. PEW RESEARCH CTR, PEW GLOBAL ATTITUDES PROJECT (2010), http://pewglobal.org/2010/06/17/obama-more-popular-abroad-than-at-home/9/#chapter-8-environmental-issues. On the other hand, in a June 2010 Stanford University poll, 74% of respondents said that in their personal opinion global warming is happening, 75% of those attributed it primarily to human action or to human and natural causes equally. STANFORD UNIVERSITY, GLOBAL WARMING POLL (2010), http://woods.stanford.edu/docs/surveys/Global-Warming-Survey-Selected-Results-June2010.pdf.

69. Biber, *supra* note 24, at 1317–20.

losses must be suffered now and the gains will not be realized until the distant future.[70]

One of the biggest challenges climate change poses is to the durability of policy efforts. Global warming didn't happen quickly; it has been building since the industrial revolution, when anthropogenic emissions of greenhouse gases began to accelerate. Nor can it be reversed quickly, because of the bathtub effect and the difficulties of reversing macro climatic changes. That means that the economic costs of climate mitigation policy must be borne for many years before they produce tangible environmental or economic benefits.[71]

That temporal disconnect makes it especially tempting to ignore the problem, and therefore makes precommitment especially important. Richard Lazarus has proposed an ingenious "chutes and ladders" approach, coupling strategies designed to inhibit legal change benefitting disproportionately powerful short-term economic interests with other strategies designed to ease legal changes benefitting the objectives of more diffuse long-term interests.[72] Eric Biber agrees that it would be desirable to "lock-in" emission regulations through law and other mechanisms.[73]

B. Conservation in a Changing World

The other side of the climate change coin is sometimes called "adaptation"—learning to live with the changing climate.[74] Adaptation, broadly speaking, encompasses adjustment to the many impacts greenhouse gas accumulation will bring, including temperature change, sea level rise,

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70. Biber, *supra* note 24, at 1320–21; Thompson, *supra* note 66, at 262–64; Gordon C. Winston, *The Reasons for Being of Two Minds: A Comment on Schelling's "Enforcing Rules on Oneself,"* 1 J. L. ECON. & ORG. 375, 377–78 (1985) (noting that people myopically discount future benefits); R.H. Strotz, *Myopia and Inconsistency in Dynamic Utility Maximization*, 23 REV. ECON. STUD. 165, 165–68 (1955).

71. *See* Lazarus, *Super Wicked*, *supra* note 4, at 1167 ("The time lag is at the very least longer than the lifetime of any adult. The upshot is that no one who is asked to curtail activities to reduce greenhouse gas concentrations will be likely to live long enough to enjoy the benefits of that curtailment.").

72. Lazarus, *Super Wicked*, *supra* note 4, at 1206–30.

73. Biber, *supra* note 24, at 1338–42. Because he is skeptical that any of these mechanisms will prove effective, however, Professor Biber also suggests that costly regulations should be coupled with efforts to make more rapid inroads on the most obvious problems caused by climate change. *Id.* at 1342–60.

74. *See, e.g.*, U.S. GLOBAL CHANGE RESEARCH PROGRAM, GLOBAL CLIMATE CHANGE IMPACTS IN THE UNITED STATES (2009), *available at* http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts.

precipitation shifts, more intense storm events, potential shifts in disease ranges, increased fire risk, and more.[75] Much adaptation work is, not surprisingly, focused on climate change's impacts on human health, water supply, agriculture, transportation systems, and urban communities. For purposes of this paper, however, I am particularly interested in a different aspect of adaptation: conservation of the non-human world.

Conservation, because it is at best only tenuously connected to tangible benefits to people, has always been an especially challenging political sell. Its advocates, therefore, have been especially enamored of rigid, oak-like legal mandates. But climate change promises to bring the kind of sustained high winds that threaten to topple those oaks, leaving nothing standing in their stead.

Climate change dramatically expands the scale on which conservation policy needs to be conducted. Many current climatic conditions will disappear entirely, while conditions with no current analogue will appear.[76] Based on these changes, one widely-cited study estimates that eighteen to thirty-five percent of species worldwide may already be committed to extinction.[77] That study provides only a rough guess; it has been criticized for failing to take into account the ability of species to disperse to new areas, adapt to environmental change, or evolve in response to selection pressures.[78] It and other climate envelope models "provide an upper limit on the number of extinctions that might be possible rather than the number that might be expected."[79] While a great deal of uncertainty remains,[80] it is generally expected that climatic shifts will tear ecological communities apart, placing many more species and ecosystems at risk than are currently protected.[81] There is little doubt

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75. *Id.*

76. John W. Williams, Stephen T. Jackson and John E. Kutzbach, *Projected Distributions of Novel and Disappearing Climates by 2100 AD*, 104 PROC. NAT. ACAD. SCI. 5738 (2007).

77. Chris D. Thomas et al., *Extinction Risk from Climate Change*, 427 NATURE 145 (2004).

78. Luis-Miguel Chevin, Russell Lande & Georgina M. Mace, *Adaptation, Plasticity, and Extinction in a Changing Environment: Towards a Predictive Theory*, 8 PLOS BIOLOGY 1, 1 (2010), *available at* http://www.plosbiology.org/article/info:doi%2F10.1371%2Fjournal.pbio.1000357.

79. Nigel E. Stork, *Re-assessing Current Extinction Rates*, 19 BIODIVERSITY CONSERVATION 357, 364 (2010).

80. It is extremely difficult to model adaptive responses, especially on the scale of large number of species, although work is beginning on that task. Chevin et al., *supra* note 78. On the other hand, synergistic interactions between climate change and more traditional threats might make the effects of climate considerably worse than anticipated. Stork, *supra* note 79, at 367.

81. Stork, *supra* note 79, at 364; Stuart L. Pimm, *Climate Disruption and Biodiversity*, 19 CURRENT BIOLOGY R595, R597–98 (2009); JB Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. REV. 1, 17–26 (2008); Robert L. Glicksman, *Ecosystem Resilience to Disruptions Linked*

that future demands will strain the resources available for conservation, which have long been stretched thin.[82]

Climate change challenges current conservation methods and goals. Current goals are commonly tied to the preservation of existing conditions, or the restoration of conditions thought to have existed at some historical reference point. Examples include the preservation or recovery of viable populations of native species,[83] the preservation of iconic landscapes in what is believed to have been their historical condition,[84] and the maintenance of biological integrity, diversity and environmental health.[85] The reality of climate change untethers conservation goals from history. It simply will not be possible to protect the world that has been. Not all species can be saved from extinction in a rapidly-changing world, even with strong regulatory restrictions and expensive restoration measures.

The same is true for water quality; the lessons of the past no longer predict the world of the future. As a result, standards bent on preserving or restoring the past are likely to become uncomfortable strait jackets. As described above, water quality standards must protect existing uses,[86]

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to Global Climate Change: An Adaptive Approach to Federal Land Management, 87 NEB. L. REV. 833, 844–49 (2009).

82. *See, e.g.*, John Copeland Nagle, *Playing Noah*, 82 MINN. L. REV. 1171 (1998).

83. The purposes of the ESA are "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species," and to fulfill the purposes of international agreements. 16 U.S.C. § 1531(b). The ESA defines both conserve and conservation as "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which" it no longer qualifies as endangered or threatened. 16 U.S.C. § 1532(3).

84. The purpose of the national parks is "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." 16 U.S.C. § 1.

85. This is the current mandate of the National Wildlife Refuge System. 16 U.S.C. § 668dd(a)(4)(B). Although it sounds more expansive and less tethered to historic conditions than the others, the directive to "maintain" integrity, diversity and health points to a historic conditions mindset. That certainly appears to be the way the Fish and Wildlife Service understands it. The agency has issued a policy defining both biological integrity and environmental health by reference to historic conditions, which are defined as the "[c]omposition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related changes to the landscape." U.S. FISH AND WILDLIFE SERVICE MANUAL, 601 FW 3, *available at* http://www.fws.gov/policy/601fw3.html. *See also* Brian Czech, *A Chronological Frame of Reference for Ecological Integrity and Natural Conditions*, 44 NAT. RESOURCES. J. 1113 (2004) (arguing that the relevant reference period is just prior to the industrial revolution).

86. *See supra* text accompanying notes 52–57.

which effectively means that they must maintain historic water quality conditions that supported those uses. That is an entirely sensible demand with respect to pollution from factory outfalls, or even nonpoint source pollution from farm or timber harvest operations. It is problematic, however, for water quality conditions that are directly sensitive to climate change. Air temperature, which is increasing worldwide as a result of the greenhouse effect, directly affects water temperatures. In streams that support cold-water fish, notably salmonids, water temperature is an important quality parameter.[87] Furthermore, as the temperature warms, oxygen is driven out of the water, reducing its availability for aquatic life.[88]

Concurrently, as atmospheric carbon dioxide increases, more of it dissolves in water. The oceans are the major sink for removing anthropogenically-generated carbon dioxide from the atmosphere.[89] That has moderated the warming effects of greenhouse gas emissions to this point, but at the cost of significantly altered ocean chemistry.[90] Dissolved carbon dioxide reacts with water to form carbonic acid, lowering the pH of the water and reducing the availability of calcium carbonate, a key ingredient in the shells of many marine organisms.[91] The pH of the oceans has fallen noticeably since the industrial revolution, and continues to decrease. The ecological effects of ocean acidification are complex and still poorly understood,[92] but appear significant.

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87. EPA, REGION 10, OFFICE OF WATER, EPA REGION 10 GUIDANCE FOR PACIFIC NORTHWEST STATE AND TRIBAL TEMPERATURE WATER QUALITY STANDARDS, EPA 910-B-03-002, iii (Apr. 2003), *available at* http://yosemite.epa.gov/R10/water.nsf/6cb1a1df2c49e4968825688200712cb7/b3f932e58e2f3b9488256d16007d3bca/$FILE/TempGuidanceE PAFinal.pdf ("Water temperature is a critical aspect of the freshwater habitat of Pacific Northwest salmonids. Those salmonids listed as threatened or endangered under the ESA and other coldwater salmonids need cold water to survive."). *See also* Craig N. Johnston, *Salmon and Water Temperature: Taking Endangered Species Seriously in Establishing Water Quality Standards*, 33 ENVTL. L. 151, 153–54 (2004) ("High temperatures can lead to a host of ill effects in salmon, including elevated risks of disease, fatality, increased predation, and barriers to migration."). Johnston describes Oregon's temperature standards, which establish a series of temperature tiers depending on the species and what they use the area for, and EPA's guidance document, which has an even more elaborate set of tiers. *Id.* at 156.

88. Robin Kundis Craig, *The Clean Water Act on the Cutting Edge: Climate Change and Water Quality Regulation*, 24 NAT. RESOURCES & ENV'T., 14, 14 (Fall 2009); *E.g.*, Gary Shaffer, Steffen Malskaer Olsen & Jens Olaf Pepke Pedersen, *Long-Term Ocean Oxygen Depletion in Response to Carbon Dioxide Emissions from Fossil Fuels*, 2 NATURE GEOSCIENCE 105, 105–09 (Jan. 25, 2009).

89. Christopher L. Sabine et al., *The Oceanic Sink for Anthropogenic CO2*, 305 SCIENCE 367, 367 (2004).

90. Scott C. Doney et al., *Ocean Acidification: The Other CO2 Problem*, 1 ANN. REV. MARINE SCI. 169, 170 (2009).

91. *Id.* at 172–74.

92. *Id.* at 174–80.

Water quality is also affected by sea level rise, which will increase salt concentrations in estuaries and coastal aquifers. "Because many species have a limited tolerance for salinity change, a long-term salinity increase may irreversibly damage estuarine ecosystems. . . . Rising salinity may also contaminate water supplies for drinking and industry, jeopardizing the livelihood of coastal communities."[93] Where climate change reduces precipitation or alters its timing, reduced river flows into estuaries could exacerbate increased salinity.[94] Climate change is also expected to alter the mixing behavior of lakes, making some more likely to completely mix throughout the year and others more likely to stratify into distinct temperature and water quality zones.[95]

Finally, climate change will alter runoff and streamflows, changing water quality both directly and indirectly. Many regions, including the southwestern U.S., are expected to become more arid over the next several decades. Reducing streamflows, which are already stressed by high demand for water for human use, will further concentrate pollutants. Climate change is also expected to increase the vulnerability of some areas to extreme storm events.[96] More intense storms will increase run-off, and the pollution load run-off carries to streams.[97]

Climate-driven water quality changes will challenge adherence to water quality standards in much the same way that climate-driven threats to the biota will challenge the ESA's mandate to protect all species. Consider, for example, management of the Central Valley Project and State Water Project in California. The two projects divert enormous quantities of water from the Sacramento-San Joaquin River system for irrigation and municipal use. Water quality standards for salinity in the San Francisco Bay-Delta estuary into which the rivers empty, are a key

93. T.W. Hilton et al., *Is There a Signal of Sea-Level Rise in Chesapeake Bay Salinity?*, 113 J. GEOPHYSICAL RESEARCH C09002 (2008).

94. JAY LUND ET AL., ENVISIONING FUTURES FOR THE SACRAMENTO-SAN JOAQUIN DELTA 52–54 (2007).

95. Peeter Noges, et al., *Impact of Climatic Variability on Parameters Used in Typology and Ecological Quality Assessment of Surface Waters—Implications on the Water Framework Directive*, 584 HYDROBIOLOGIA 373, 376–77 (2007).

96. U.S. Climate Change Science Program, Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems, Synthesis and Assessment Product 4.6, at 20–22 (Sept. 2008), *available at* http://downloads.climatescience.gov/sap/sap4-6/sap4-6-final-report-all.pdf.

97. Craig, *Cutting Edge*, *supra* note 88.

constraint on project operations,[98] and have been a focal point of political controversy for many years.[99] Initially, the salinity standards were adopted to protect farmers who draw irrigation water directly from the Delta. Today, however, they are also considered important to protecting the Delta smelt, which is listed as threatened under the ESA.[100]

By making it more difficult to achieve the salinity standards, climate change will make the pumps increasingly vulnerable to legal challenges under the CWA, ESA, and California's analogous state laws. The pumps are crucial to California's water supply, supplying not only the lion's share of agricultural irrigation water but also municipal supplies for more than half of California's population.[101] Any legal decision that significantly reduces pumping puts the laws that produce it at as much risk as the water supply.[102]

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98. *See, e.g.*, Letter from Lester Snow, Director, California Department of Water Resources, and Don Glaser, Regional Director, U.S. Bureau of Reclamation, to Dorothy R. Rice, Executive Director, California State Water Resources Control Board, (Feb. 5, 2009) (requesting temporary urgency relief from salinity standard), *available at* http://www.water.ca.gov/news/newsreleases/2009/020509dwrswrcb.pdf.

99. *See* Michael Hanemann and Caitlin Dyckman, *The San Francisco Bay-Delta: A Failure of Decision-Making Capacity*, 12 ENVTL. SCI. & POL'Y 710, 710 (2009); Elizabeth Ann Rieke, *The Bay-Delta Accord: A Stride Toward Sustainability*, 67 U. COLO. L. REV. 341, 345–46 (1996).

100. In its most recent Biological Opinion on operation of the water projects, FWS imposed a number of controversial restrictions on pumping designed to maintain "X2," the point in the Delta where the salinity level is two parts per thousand, at specific locations. *See* U.S. DEPT. OF THE INTERIOR, FISH AND WILDLIFE SERVICE, FORMAL ENDANGERED SPECIES ACT CONSULTATION ON THE PROPOSED COORDINATED OPERATIONS OF THE CENTRAL VALLEY PROJECT (CVP) AND STATE WATER PROJECT (SWP), http://www.fws.gov/sacramento/es/documents/SWP-CVP_OPs_BO_12-15_final_OCR.pdf; FINDINGS OF FACT AND CONCLUSIONS OF LAW, THE CONSOLIDATED DELTA SMELT CASES, 1:09-CV-00407 OWW DLB (E.D. Cal., May 27, 2010).

101. GOVERNOR'S DELTA VISION BLUE RIBBON TASK FORCE, OUR VISION FOR THE CALIFORNIA DELTA 2–3 (Jan. 29, 2008), *available at* http://deltavision.ca.gov/BlueRibbonTaskForce/FinalVision/Delta_Vision_Final.pdf.

102. When biological opinions issued by the Fish and Wildlife Service and National Marine Fisheries Service required that pumping be ramped down to protect endangered and threatened fish, several California legislators called for amendment of the ESA or convening of the God Squad. Press Release, Radanovich: CA Agriculture Victim of Economic Eco-Terrorism in the Form of the Endangered Species Act, Feb. 4, 2009, http://radanovich.house.gov/News/DocumentSingle.aspx?DocumentID=110301; Press Release, Hollingsworth, Republicans Urge Governor to Call for Convention of "God Squad," Feb. 11, 2009, http://cssrc.us/web/36/ news.aspx?id=5422. After first demanding a National Research Council review of the biological opinions, Democratic Senator Diane Feinstein joined the call to relax the ESA's restrictions. Bettina Boxall, *Feinstein Seeks to Ease Curbs on Water Delivery to Farmers*, L.A. TIMES, Feb. 12, 2010. The law has so far withstood these attacks, but its supporters can't be blamed for being nervous.

IV. DESIGNING MORE PLASTIC LAWS

It has never quite been true that we could preserve or restore the nature of the past. But it has been close enough to the truth that mandates to protect all species and maintain all water quality have served as effective aspirational commitments,[103] helping us hew to our conservation goals in the face of economic temptations. They have, in other words, been sturdy oaks.

In the warming future, however, reality will be so distant from those goals that rather than stiffen our resolve they are likely to incite their own rejection. As Robin Craig has pointed out, the familiar goals of preservation and restoration are so far from being attainable in our changing world that clinging to them risks making law and the conservation effort behind it appear futile.[104] Politically, it seems that nothing could be worse these days than for legally mandated and costly environmental protection efforts to be proven ineffective, or even not proven effective.[105] To avoid that fate, standards must acknowledge the new reality without making our conservation commitment completely illusory.

There is reason to be skeptical that law can produce the needed combination of flexibility and rigidity. As Robert Frank has said in a different precommitment context: "any contract lenient enough to allow termination of a hopeless marriage cannot at the same time be strict enough to prevent opportunistic switching."[106] Clever governance strategies will never be sufficient by themselves to combat temptation. Unless people care, now and in the future, about conservation, society simply will not bear the costs conservation imposes. The first concern of

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103. Nagle, *supra* note 82 (noting the usefulness of ESA's aspirational goals); Christopher T. Giovinazzo, *Defending Overstatement: The Symbolic Clean Air Act and Carbon Dioxide*, 30 HARV. ENVTL. L. REV. 99, 120–24 (2006) (explaining that Clean Air Act's "overstated mandates" to limit air pollution to unachievable levels have served as a "thumb on the scales" helping to correct political power asymmetries).

104. Robin Kundis Craig, *"Stationarity is Dead"—Long Live Transformation: Five Principles for Climate Change Adaptation Law*, 34 HARV. ENVTL. L. REV. 9, 33–35 (2010); *see also* J.B. Ruhl, *Climate Change Adaptation and the Structural Transformation of Environmental Law*, 40 ENVTL. L. 363, 394 (2010) ("The stationarity premise and all on which it is based, however, are going to fall to pieces in the era of climate change.").

105. *See, e.g.*, Craig Manson and Brandon Middleton, *Shutting Off the Water Pumps to Save Delta Smelt Unwarranted*, S.F. CHRON., Jan. 8, 2009 (complaining that "there is nothing close to a guarantee that increased pumping restrictions will help the delta smelt").

106. ROBERT H. FRANK, PASSIONS WITHIN REASON: THE STRATEGIC ROLE OF THE EMOTIONS 195 (1988).

conservation advocates, therefore, should be to facilitate and build emotional connections between people and nature.[107] That does not mean, however, that law is unimportant. Although they are not sufficient by themselves, legal pre-commitments remain necessary because we can be distracted from our genuine commitments by other interests that appear more pressing at the moment. While law cannot substitute for emotional attachment, it can limit the extent to which we stray from the goals dictated by that attachment.

A combination of substantive and procedural strategies are needed to create and sustain law in the form of wind-swept pines.[108] Below I outline some possibilities. This is, of course, only a first cut at a vexing question. No doubt others will have more creative strategies to propose.

A. Avoiding Temptation

Before discussing what less rigid conservation laws might look like, it is worth briefly considering a different sort of precommitment strategy. In addition to steeling our resolve to withstand temptation, we should avoid temptation to the extent possible. Avoidance can be an effective strategy for those who lack the strength of will to resist temptation; indeed it may be the only effective method if a strong precommitment strategy cannot be devised. Conservation is a prime candidate for an avoidance strategy, because we know we are likely to be vulnerable to the temptation to forego it in favor of short-term economic benefits, and we also know that our precommitment mechanisms can no longer be as unbending as oaks.

In this context, avoidance implies three things. First, it means bringing the entire range of policy instruments into play, so that political stress is shared rather than being concentrated on a few burly regulatory oaks.[109] Second, it means reducing traditional stresses as much as possible, so that systems are better able to withstand the stresses associated with climate change.[110] Third, it means minimizing the extent of climate change through robust efforts to control greenhouse gas emissions.

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107. Law can have a role in that process. *See generally* Holly Doremus, *Shaping the Future: The Dialectic of Law and Environmental Values*, 37 U.C. DAVIS L. REV. 233 (2003).

108. Combining substantive and procedural measures to achieve effective environmental protection is, of course, not a new idea. *See, e.g.*, Sinden, *supra* note 3, at 1492 (noting that ESA's procedural provisions make the substantive standards "difficult to evade").

109. Pat Parenteau has explained some of the potential pathways of adaptation for water resources involving mechanisms other than familiar regulatory law. *See* Patrick Parenteau, *Come Hell and High Water: Unavoidable Consequences of Climate Disruption*, 34 VT. L. REV. 957 (2010).

110. *See* Glicksman, *supra* note 81, at 889 (recommending that federal land managers "buttress natural capacity to withstand climate change stresses" by addressing other stresses).

Although we cannot wholly avoid climate change and its consequences for nature, any limit on emissions will limit the extent of those consequences. That, in turn, will reduce the number of unpalatable choices we must make between conservation and economic benefits or societal comfort.

Of course, there are already numerous efforts underway to craft climate mitigation policy. The point here is two-fold. First, mitigation and adaptation policy are intimately linked; the more aggressively we approach the former, the less need we will have for the latter. Second, our conservation oaks may have a role to play in catalyzing mitigation efforts. Rigid legal mandates, even when they cannot alone develop effective policy for the future, can draw needed attention to the shortcomings of current policy. The ESA has, for example, helped trigger reform of Texas water law, and several creative federal restoration efforts.[111] The apparent impossibility of meeting the ESA's mandate to save all species and the CWA's antidegradation requirement indicates how serious the conservation problem has become. Those mandates can bring to the table interests that otherwise might be inclined to ignore the conservation problem. It is no impediment to this function that neither the ESA nor the CWA provides a workable structure for prioritizing greenhouse gas reductions.[112] Indeed, the misfit between legal mandates and desirable mitigation policy may even strengthen their catalytic effect.[113]

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111. *See, e.g.*, Joseph L. Sax, 41 WASHBURN L.J. 1, 1 (2001) (ESA has been the catalyst for dramatic shift in environmental law to focus on restoration); Todd H. Votteler, *Raiders of the Lost Aquifer? Or the Beginning of the End of the Fifty Years of Conflict Over the Texas Edwards Aquifer*, 15 TUL. ENVTL. L.J. 257, 276–78 (2002) (ESA litigation requiring protection of endangered species living in springs in Edwards Aquifer triggered Texas legislation to regulate pumping from the aquifer for the first time in the state's history); Robert Jerome Glennon and John E. Thorson, *Federal Environmental Restoration Initiatives: An Analysis of Agency Performance and the Capacity for Change*, 42 ARIZ. L. REV. 483, 523 (2000) (noting that federal restoration efforts have been triggered by violations of water quality and endangered species laws). *But see* Holly Doremus and A. Dan Tarlock, *Fish, Farms, and the Clash of Cultures in the Klamath Basin*, 30 ECOLOGY L.Q. 279, 348 (2003) (experience in the Klamath River Basin "suggests that, at best, the ESA is an uneven, weak catalyst").

112. *See, e.g.*, Ruhl, *supra* note 81, at 40–49 (noting difficulties of applying ESA to limit greenhouse gas emissions).

113. *See* Holly Doremus, *Polar Bears in Limbo: How a Legal Morass Could Save the Environment*, SLATE, May 20, 2008, http://www.slate.com/id/2191707/pagenum/all/#p2 ("Laws that don't quite fit can force us to pay attention to important problems and develop better tools for dealing with them."). Of course, if the mandate is too unyielding and appears too ill-suited to the problem, the response might instead be its immediate

While the ESA and CWA oaks are no doubt not sustainable in the long run in a warming world, in the short run they remain sticky. Indeed, they may be more firmly entrenched than many other mandates because they have dedicated environmental interest support, and because they embody intuitively appealing goals. They will eventually have to be relaxed, but they should not be lightly surrendered. They should be bargained away only for the right price, which should include significant and credible greenhouse gas emission reductions.

B. Substantive Strategies

While avoidance is worth pursuing, it cannot be a complete solution given the extent of the climatic changes to which the globe is already committed. We must also plan to replace our legal oaks with wind-swept pines that will be more durable for the long term. The most difficult challenge of that process is devising substantive standards that relax the oak-like rigidity sufficiently to pragmatically accommodate the conditions of the real, warming world, yet remain clear and meaningful enough to provide some check on administrative discretion.[114] There is no need to find a single, silver bullet standard with just the right amount of plasticity. Combining a variety of standards, and adding on procedural protections, will likely prove necessary.

1. Moving Baselines

One possibility is to adopt goals which themselves shift to acknowledge climate change, much as the branches of a pine growing on a windy ridge grow in the direction of the prevailing winds rather than constantly fighting those winds. That might imply accepting the impacts of climate change as part of the "natural" background, and therefore exempting them from regulation. Robin Craig has generally suggested this approach,[115] but has not evaluated precisely how it would play out in the current legal environment. Characterizing climate change as natural

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repeal. That calculation can be difficult to make. A somewhat cautionary note comes from the Clean Air Act, where EPA, despite moving fairly gingerly with respect to greenhouse gas regulation in the wake of Massachusetts v. EPA, 549 U.S. 497 (2007), barely survived an attempt to repeal that regulatory authority in the U.S. Senate. Carl Hulse, *Senate Rejects Republican Effort to Thwart Carbon Limits*, N.Y. TIMES, June 11, 2010, at A22.

114. As Oliver Houck has written, we need standards sufficiently precise and robust that they are capable of wrestling "potentially limitless questions of scale, time, baselines, and scientific complexity to the ground" and "the most powerful economic forces in the country, if not to the ground, to something closer to a draw." Oliver A. Houck, *On the Law of Biodiversity and Ecosystem Management*, 81 MINN. L. REV. 869, 883 (1997).

115. Craig, *Stationarity*, *supra* note 104, at 38.

would make no legal difference to ESA implementation, because the ESA requires listing of species threatened by *any* cause, whether natural or anthropogenic.[116] It would be easier to work a "moving baseline" into the CWA's antidegradation requirement, but regulatory changes would still be required. As explained earlier, the antidegradation rules do not permit the removal of designated uses that are being achieved, or have been since 1975.[117] They do permit removal of uses that have been designated but not yet achieved if, among other things, natural conditions make their achievement infeasible. If climate change were recognized as making "nature" a moving target, it would make conceptual sense to apply the same "natural conditions" exception to uses that were once established.

A "moving baseline" approach to climate change impacts has been proposed for the European Water Framework Directive.[118] Like the Clean Water Act's antidegradation policy, the Water Framework Directive requires that European states prevent deterioration of the quality of their water bodies.[119] Further, it requires that member states "protect, enhance and restore" their waters "with the aim of achieving good surface water status" by 2015,[120] subject to certain exceptions, particularly for waters so physically modified that their character has been substantially changed.[121] Annex V to the Directive details the elements to be considered in evaluating the status of a water body. Essentially, water bodies are classified by type, and their condition compared to reference conditions for that type of water body in a pristine state.[122] Good ecological status is achieved when there is only slight deviation from the quality expected for those elements "under undisturbed conditions."[123]

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116. *See* 16 U.S.C. § 1533(a)(1)(E) (requiring that Secretaries of Interior and Commerce determine whether species are endangered or threatened by reason of, among other things, "other natural or manmade factors affecting its continued existence").

117. *See supra* notes 56–57 and accompanying text.

118. THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION, DIRECTIVE 2000/60/EC: ESTABLISHING A FRAMEWORK FOR COMMUNITY ACTION IN THE FIELD OF WATER POLICY, *available at* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:327:0001:0072:EN:PDF.

119. *Id.* Art. 4, § 1(a)(i).

120. *Id.* Art. 4, § 1(a)(ii).

121. *Id.* Art. 2, § 9; William Howarth, *Aspirations and Realities Under the Water Framework Directive: Proceduralisation, Participation and Practicalities*, 21 J. ENVTL. L. 391, 412 (2009).

122. Brian Moss, *The Water Framework Directive: Total Environment or Political Compromise?*, 400 SCI. TOTAL ENVTL. 32, 34 (2008).

123. EUROPEAN PARLIAMENT, *supra* note 118, Annex V, Table 1.2.

Putting aside the fact that the classification system in the Directive may be both overly complex and ecologically naive,[124] the Directive's "undisturbed conditions" touchstone poses problems in the context of any dynamic system.[125] It is particularly challenging in the context of climate change, since it implies a level of fidelity to pre-industrialization conditions that may literally prove unattainable. To reduce that problem, some have argued that the classification system and reference conditions should be periodically updated to take climate change into account.[126] The Directive, then, would tie water quality standards to a "new normal," which would change over time, rather than to historic conditions.

The moving baseline approach has substantial intuitive appeal. It does not demand the impossible.[127] Furthermore, it recognizes the limited reach of natural resource management authority, and avoids unfairly penalizing resource managers for effects they cannot prevent. Germany, for example, and its hydropower operators, can hardly be held fully responsible for ecological changes in German rivers caused by fossil fuel combustion in the United States and China.

But implementing a moving baseline poses daunting technical problems, and provides ample opportunity for the sorts of political manipulation that oak-like standards are intended to prevent. The further the inquiry moves from the direct physical effects of climate change toward the indirect ecological consequences, the trickier the technical questions become. Because the ecological effects of climate change are poorly understood and overlap with those of other threats,[128] it will be difficult to separate out climate change impacts. That presents regulators

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124. *See* Moss, *supra* note 122, at 34–35 (criticizing reliance on water body typology, lack of clear distinctions between "good" and "moderate" status, and use of ecological quality ratios).

125. William Howarth, *The Progression Towards Ecological Quality Standards*, 18 J. ENVTL. L. 3, 23–27 (2006).

126. Peeter Noges et al., *Impact of Climate Variability on Parameters Used in Typology and Ecological Quality Assessment of Surface Waters—Implications on the Water Framework Directive*, 584 HYDROBIOLOGIA 373, 375–77 (2007); *see also* Tristan Hatton-Ellis, *The Hitchhiker's Guide to the Water Framework Directive*, 18 AQUATIC CONSERVATION: MARINE AND FRESHWATER ECOSYSTEMS 111, 113 (2008). Actually, it is not quite clear what rule Noges et al. would establish with respect to updating reference conditions; they call for careful analysis of "which aspects of water quality might be given some flexibility and which standards are so essential to our use and appreciation of water bodies that they should be fixed, despite the impacts of climate change. Noges et al., *supra*, at 374.

127. That seems likely to be especially politically salient in light of the fact that the majority, and in some cases the overwhelming majority, of waters in the member states are not meeting their ecological objectives. Moss, *supra* note 122, at 38.

128. For a detailed analysis of the multiple potential effects of climate change on European waters, see STEVEN J. EISENREICH, ED., CLIMATE CHANGE AND THE EUROPEAN WATER DIMENSION, E.U. REPORT NO. 21553 (2005), *available at* http://ccu.jrc.it/Pubblications/Climate_Change_and_the_European_Water_Dimension_2005.pdf.

with the strong temptation to maximize the extent to which changes are attributed to climate change, minimizing the extent to which restrictions are imposed on other stressors.[129]

That sort of temptation would be even greater in the endangered species context, because species are frequently threatened by a combination of factors. Salmon, which are impacted by ocean conditions, spawning habitat alteration, hatchery operations, harvest, and hydropower development, are the classic example.[130] Another current example is the Delta smelt, which is impacted by pumping that diverts water for agricultural and municipal use, but also by the presence of invasive species, which have altered the food chain, by pesticide and nutrient pollution, and by habitat modification.[131] The relative contribution of those various factors is difficult to evaluate, leading those who would bear the costs of regulation of one factor to point fingers at, and demand regulation of, the others.[132]

Indeed, the challenge of assigning responsibility is even greater in this context, because other stressors may cause precisely the same effects as climate change. Water temperatures, for example, can be increased by flow alterations, diversions, removal of streamside vegetation, or industrial

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129. Already, some observers see "a concerted attempt to minimise the effects of the Directive." Moss, *supra* note 122, at 39. Baseline revision in the face of uncertain evidence would present a prime opportunity for that sort of minimization.

130. *See, e.g.*, COMM. ON PROT. & MGMT. OF PAC. NW. ANADROMOUS SALMONIDS, NAT'L RESEARCH COUNCIL, UPSTREAM: SALMON AND SOCIETY IN THE PACIFIC NORTHWEST 39–74 (1996) (detailing the effects of changing ocean conditions and a variety of human activities on salmon).

131. *See* NATIONAL RESEARCH COUNCIL, COMMITTEE ON SUSTAINABLE WATER AND ENVIRONMENTAL MANAGEMENT IN THE CALIFORNIA BAY-DELTA, A SCIENTIFIC ASSESSMENT OF ALTERNATIVES FOR REDUCING WATER MANAGEMENT EFFECTS ON THREATENED AND ENDANGERED FISHES IN CALIFORNIA'S BAY DELTA 33–36 (2010) (noting stressors other than water diversion that may have large effects on fish in the Bay-Delta).

132. The Coalition for a Sustainable Delta, composed of water users dependent on Delta exports, has brought a series of lawsuits against those responsible for some other stressors. *See* COALITION FOR A SUSTAINABLE DELTA, SACRAMENTO-SAN JOAQUIN DELTA CRISIS, LEGAL, http://www.sustainabledelta.com/legal.html (providing documents related to several lawsuits); Coalition for a Sustainable Delta v. FEMA, No. 1:09-CV-2024 OWW DLB, 2010 WL 1904824, at *19 (E.D. Cal. May 10, 2010) (holding that organization lacked standing to raise conservation and esthetic interests of its members). They and others successfully advocated for appointment of a National Research Council committee to review, among other things, the relative impacts of various stressors. The National Academies, Current Projects System, Project Information, Sustainable Water and Environmental Management in the California Bay-Delta, http://www8.nationalacademies.org/cp/projectview.aspx?key=49175.

discharges.[133] The problem, therefore, is not simply to identify the extent to which each stressor contributes, it is to allocate the acceptable increment among the various stressors. In setting a budget for other stressors, regulators will have strong incentives to underforecast the likely extent of climate change in order to maximize the space available to permit conventional impacts. Experience under the Clean Air Act suggests that temptation will be very difficult to resist.[134] By the time it becomes apparent that optimistic forecasts are wrong, it may be too late to avoid overruns that carry irreversible impacts.

In order to address the serious political risks of a moving baseline strategy, any such strategy would have to be accompanied by a range of procedural safeguards. I discuss below what sort of procedural safeguards might be possible and how they might help. Before getting to that, however, there are other substantive strategies to consider.

2. Leaving Room for Nature

Another approach is to concentrate our conservation efforts on leaving as much of the earth as untrammeled as we can manage, allowing nature to respond in its own ways to climate change. Surely one of our important conservation goals is simply to have some part of the world moving to its own rhythms rather than to ours. Much of the esthetic and spiritual value of nature, its ability to inspire and captivate us, is due to the fact that it is not of our making or under our control.

Global warming is a powerful reminder that no part of today's world is unaffected by human actions, but that does not mean that wildness has disappeared. Wildness persists anywhere people do not intentionally control animals or direct the future of ecosystems. Where the local flora and fauna decide for themselves where to forage, who to mate with, and when to migrate, hibernate, or breed, nature remains wild, and retains its capacity to inspire and instruct.

Focusing on protecting wild, autonomous nature also carries a pragmatic benefit. Even if its rhythms have been drastically changed by

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133. Johnston, *supra* note 87, at 155–56.

134. *See* Thomas O. McGarity, *Missing Milestones: A Critical Look at the Clean Air Act's VOC Emissions Reduction Program in Non-Attainment Areas*, 18 VA. ENVTL. L.J. 41 (1999) (detailing the extent to which both non-attainment states and EPA have engaged in optimistic projections about the extent of pollution and effectiveness of control measures); James D. Fine and Dave Owen, *Technocracy and Democracy: Conflicts Between Models and Participation in Environmental Law and Planning*, 56 HASTINGS L.J. 901, 959 (2005) (pointing out that air pollution authorities in California's San Joaquin Valley "placed heavy reliance upon emissions reductions from rules imposed by other regulatory entities, and in particular assumed that declining emissions from upwind areas would provide an important boost toward compliance").

human impacts to the planet, nature which remains autonomous will develop its own strategies for responding to human encroachment.

That may be especially important in a world going through an unprecedented transition. Our ability to predict how climate disruption will affect local temperature and precipitation patterns remains incomplete, and we know very little about how the biota will respond to climatic alterations. Our active management choices, therefore, might easily be wrong. Leaving some places where nature, rather than humanity, determines the details of the response to climate change is only sensible under the circumstances.

Keeping some large areas as wild as possible should be an important part, but not the totality, of our conservation strategy. Paleoecologist Tony Barnosky makes a strong case for a dual focus in future conservation policy.[135] One prong, he says, should concentrate on creating, maintaining, and connecting wildland reserves that would be managed with a hands-off approach. A network of wildland reserves would begin with the most pristine current protected areas, joined to the extent possible by corridors through which species could migrate to newly suitable climates, and supplemented by the addition of new protected areas selected not for their current inhabitants but for their lack of human manipulation. The goal of the wildland reserves would be "to preserve ecological interactions that have not been heavily influenced or managed by people, that is, a fundamental wildness." They would also supply open space and accommodate low-impact recreation. The other focus would remain where it currently is, on species protection.

The wildlands strategy, because it assumes that we would still want to protect at least some current species or assemblages, would not wholly solve the problem of what should replace the ESA oak. It might, however, combine well with the moving baseline strategy, making it less frightening to give up some of the ESA's rigidity by offering a replacement strategy that promises to be effective without being slavishly tied to history. Having a strong wildlands strategy in the background might also increase our willingness to engage in new forms of active management like managed relocation for our highest priority species. Managed relocation, also known as assisted migration, involves moving species to areas outside their historic range in search of a suitable long-term

135. ANTHONY D. BARNOSKY, HEATSTROKE: NATURE IN AN AGE OF GLOBAL WARMING 193–209 (2009).

climate niche.[136] The strongest argument against managed relocation is that it might unpredictably destabilize the receiving system. Knowing that wildland reserves would be off-limits for such introductions could facilitate experimentation in other places.[137] Perhaps, too, reducing active management of lower priority species or places could free up some funding for creating and connecting new wildland reserves.

The wildlands strategy, as Barnosky describes it, has the great advantage of not depending upon vague or indeterminate definitions, which have plagued calls to protect ecosystems instead of, or in addition to, species. The wildlands approach does not require that regulators determine what qualifies as an "ecosystem" or what qualities one should display. They would simply identify and set aside those lands least encroached upon by human civilization.

Nonetheless, implementing the wildlands strategy would pose some major challenges. The key questions would be which species or places to give up on, what that would mean, and how much wildland to designate in return. Like the moving baseline strategy, the wildlands strategy would present the temptation to give up too much too easily, in return for too little. It too, therefore, would require the institution of additional procedural measures to ensure that it effectively disciplines, rather than facilitates, careless development.

3. Other Management Endpoints

A variety of other conservation management targets have been suggested. None seem to me attractive. They are either fundamentally misdirected in the context of climate change, or too formless to sufficiently constrain discretion in the face of high political winds.

The one that seems misdirected is resilience. Resilience is generally understood to mean the ability to recover from a disturbance to something close to the predisturbance condition.[138] So defined, it is a poor primary target for conservation in a world of change. Under climate change,

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136. For a description of managed relocation and the risks it presents, see Alejandro E. Camacho et al., *Reassessing Conservation Goals in a Changing Climate*, ISSUES IN SCI. & TECH. 21 (Summer 2010).

137. *See* BARNOSKY, *supra* note 136, at 207 (suggesting that it might be appropriate to transplant a desired species from its historic range to another area "where human impact on the landscape already has been heavy," but not to the more pristine areas he would designate as wildland preserves).

138. *See, e.g.*, U.S. CLIMATE CHANGE SCIENCE PROGRAM & THE SUBCOMMITTEE ON GLOBAL CHANGE RESEARCH, PRELIMINARY REVIEW OF ADAPTATION OPTIONS FOR CLIMATE-SENSITIVE ECOSYSTEMS AND RESOURCES 9–16 (2008) (Resilience is the ability of a system to return to its initial state and function in spite of some major perturbation."), *available at* http://www.climatescience.gov/Library/sap/sap4-4/final-report/sap4-4-final-report-Ch9-Synthesis.pdf.

departure from historic conditions is the new normal, not a temporary aberration. We must learn to manage free of the mooring of historical conditions, rather than obsess over returning to them. It is true, as my colleague Dan Farber reminds me, that climate disruption will increase the frequency of disturbances like storms, fires, and floods. It will be even more important than it currently is to ensure that our conserved areas and systems can withstand such events. But the term resilience is easily misinterpreted as calling for maintaining systems in relatively static condition outside such disturbance events, which is no longer a viable strategy. The promoters of a resilience strategy may well envision something much like the wildlands strategy, focused simply on maintaining natural systems that can function without constant human oversight and intervention. That is a useful strategy, but the rhetoric of resilience does not advance its cause.

Robin Craig has suggested "adaptive capacity" as an additional management goal.[139] Professor Craig does not argue that adaptive capacity itself provides a measurable or enforceable target, but rather sees it as the basis for some general management principles.[140] She first describes adaptive capacity by borrowing a definition of resilience,[141] but then distinguishes it from resilience in the following terms: "Resilience reflects a system's ability to absorb impacts and continue to function, while adaptive capacity refers to a system's ability to change to adjust to new conditions."[142] That sounds more like what is needed in the face of climate change than resilience. As Professor Craig envisions it, "adaptive capacity" seems closely related to the wildland, "hands-off," strategy of letting nature be natural: "we should restructure environmental and natural resources law to give as many species and systems as possible the best chance to survive and adapt to whatever changes come."[143] The easiest way to do that, it would seem, is to set aside as much space as

139. Craig, *Stationarity*, *supra* note 104, at 39.
140. *Id.* at 40–70.
141. *Id.* at 22: "[A]daptive capacity refers to 'the regenerative ability of ecosystems and their capability in the face of change to continue to deliver resources and ecosystem services that are essential for human livelihoods and societal development.'" The quote comes from W. Neil Adger et al., *Socio-Ecological Resilience to Coastal Disasters*, 309 SCIENCE 1036, 1036 (2005), but the quoted passage is explaining what the authors mean by "resilience."
142. Craig, *Stationarity*, *supra* note 104, at 22.
143. *Id.* at 39.

possible for nature to run with minimal interference. An adaptive capacity framework probably would look much like a wildland-focused strategy.

Others have suggested that biodiversity, ecological processes, or ecosystem services should be targets of conservation policy. Each of these concepts, however, suffers from a notorious lack of clarity, making them far less than ideal as enforceable targets of law.[144] Turning them into useful standards would require specifying much more clearly what range of creatures, types of processes, or ecosystem services we want to protect. Without that, they cannot hold a reluctant agency's feet to the regulatory fire.

4. Focusing on Feasibility

An altogether different type of strategy would focus on the feasibility of conservation efforts rather than trying to set a firm conservation endpoint. Just as technology-based pollution regulation avoids the difficulty of identifying health-based standards, feasibility-based conservation could evade the challenge of setting conservation endpoints. While the information demands of feasibility standards are not insignificant, they are less than those of identifying endpoints.[145] Feasibility-based standards are also potentially clearer, easier to enforce, and less subject to the agency discretion that courts political temptation.[146] Furthermore, they invoke what Carol Rose calls the "rhetoric of responsibility—a principle that everyone should be doing her best *not* to pollute."

Feasibility standards might seem less well fitted for conservation than for pollution control, but that is not necessarily the case. Best management practices, for example, are no mystery for many activities with conservation implications, including land development, timber harvest, and agriculture.[147]

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144. As Oliver Houck might say, these concepts are sufficiently malleable that, without further definition, they provide little or no "law to apply." Houck, *supra* note 114, at 871. *See also* Dale D. Goble, *What Are Slugs Good For? Ecosystem Services and the Conservation of Biodiversity*, 22 J. L. USE & ENVTL. L 411, 414–17 (2007) (describing the lack of clarity of "biodiversity"); *id.* at 417 (noting that "ecosystem services" cannot be objectively measured); *id.* at 423 ("definitions of ecosystem services tend to be overly general").

145. *See, e.g.*, Howard Latin, *Ideal Versus Real Regulatory Efficiency: Implementation of Uniform Standards and "Fine-Tuning" Regulatory Reforms*, 37 STAN. L. REV. 1267 (1985); Sidney A. Shapiro & Thomas O. McGarity, *Not So Paradoxical: The Rationale for Technology-Based Regulation*, 1991 DUKE L. J. 729; Wendy E. Wagner, *The Triumph of Technology-Based Standards*, 2000 U. ILL. L. REV. 83, 96.

146. Wagner, *supra* note 146, at 103.

147. *Cf.* OLIVER A. HOUCK, THE CLEAN WATER ACT TMDL PROGRAM: LAW, POLICY, AND IMPLEMENTATION 87 (2d ed., 2002) (noting that control technologies for nonpoint source water pollution "are anything but unknown, complex, technologically difficult, or even very costly").

They have not been aggressively required because the political will and institutional structure to mandate them have been lacking. One could imagine much more aggressive use of feasibility-based standards, such as mandating that irrigators who use water from projects that affect endangered species implement efficient water practices, or even that they grow water-efficient crops.

While feasibility standards could be more of a factor, they cannot provide a complete answer to conservation problems. Feasibility standards cannot ensure that any particular substantive thresholds are not crossed. They cannot resolve problems where the fundamental conflict is competition for limited resources. If our conservation goals include keeping a minimum amount of any kind of nature around, feasibility standards alone will not be enough. They should be seen, therefore, as a useful supplement to other standards, but not as a stand-alone strategy.

5. Combining Strategies

The moving baseline, wildlands, and feasibility strategies could usefully be combined. For example, the beneficiaries of moving baselines could be required to mitigate the impacts of activities they gain permission to conduct by contributing funds to the purchase of wildlands. Baseline migration should not be free to the beneficiaries, lest they demand too much of it. Attaching mitigation costs would not be unfair because the beneficiaries are, by definition, undertaking activities with harmful environmental consequences. The only uncertainty is whether some level of harm would be unavoidable even without their contribution. For much the same reason, the beneficiaries should be required to minimize and mitigate their impacts to the extent feasible.

C. Procedural Strategies

Giving up the rigidity of oak-like standards is frightening for conservation advocates, and properly so. Those standards have a history of being the only effective mechanism for forcing agencies who would otherwise bow to the prevailing political winds to fulfill their conservation mandates. Even with them in place there has been considerable slippage. At this point, however, there is no choice but to sacrifice some rigidity. Rigid standards based on the past can no longer stand. Perhaps the best we can do is to adopt standards that are flexible but not formless, such as moving baselines, wildlands set-asides, and feasibility-based requirements,

and combine them with procedures that will encourage their robust implementation.

1. Adaptive Management

Virtually all observers agree that adaptive management must have a role in conservation policy in the warming world.[148] Adaptive management means "learning while doing."[149] It calls on resource managers or regulators to monitor the outcomes of their choices, evaluate those outcomes in light of their conceptual understanding of the system, and adjust both their understanding and their next round of management choices accordingly.[150] Conceptually, it is obviously a good fit for a world in transition.

But adaptive management can be the flimsiest of reeds when the political winds come up. "Agencies can use claims of adaptive management as a ploy to placate demands for environmental protection without actually imposing any enforceable constraints on themselves."[151] And so they have done. In practice, adaptive management "has descended into a vague promise of future adjustments without clear standards."[152] Rather than facilitating learning and adjustment, adaptive management in practice "may be a pretext for postponing difficult but important decisions in order to dodge the constraints of budgets, politics, or scientific uncertainty."[153] Adaptive management is not a bulwark that can help stiffen the resolve of an agency whose discretion is not constrained by indeterminate substantive standards. Rather, the inevitability of incorporating adaptive management in future conservation policy increases the need for other strengthening procedural mechanisms.

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148. *E.g.*, Craig, *Stationarity*, *supra* note 104, at 65 ("climate change adaptation is the quintessential adaptive management problem); Glicksman, *supra* note 81, at 868; Alejandro E. Camacho, *Adapting Governance to Climate Change: Managing Uncertainty Through a Learning Infrastructure*, 59 EMORY L.J. 1, 39 (2009) ("Adaptive management is a particularly useful strategy for managing the uncertainty of climate change.").

149. Holly Doremus, *Precaution, Science and Learning While Doing in Natural Resource Management*, 82 WASH. L. REV. 547, 550 (2007).

150. For a more elaborate description, see J.B. Ruhl and Robert L. Fischman, *Adaptive Management in the Courts* 7–9, (Minn. L. Rev. Working Paper, Vol.5 No. 2, Jan. 26, 2010), *available at* http://ssrn.com/absrtact=1542632.

151. Holly Doremus, *Adaptive Management, the Endangered Species Act, and the Institutional Challenges of "New Age" Environmental Protection*, 41 WASHBURN L.J. 50, 53 (2001).

152. Ruhl and Fischman, *supra* note 151, at 13.

153. *Id.* at 22.

2. Chutes and Ladders

Richard Lazarus advocates a political system of "chutes and ladders" for climate change regulation, employing asymmetric barriers to increase the power of diffuse environmental interests and decrease the power of focused economic interests to help the present protect the future.[154] The chutes and ladders concept recognizes that some change will be needed, trying to facilitate desirable (strengthening) changes while impeding undesirable (weakening) ones.

Professor Lazarus's framework is useful for adaptation as well, but that context is an especially challenging one because it requires allowing some weakening changes without letting those changes be made too easily or go too far. Because some discretion must be allowed, procedural strategies should seek to level the political playing field to protect the agencies from pressure to underestimate conservation opportunities or overestimate conservation challenges. Indeed, the political playing field ought to be skewed to some extent in favor of conservation, since we know that temptations enjoy a natural political and psychological advantage.

Congress will have to be involved in this process, because the mandates that will have to be relaxed are statutorily grounded.[155] Environmental interests must closely monitor the legislative process, but they are relatively good at that at the national level. They will want to make sure that the terms of any relaxation do not go too far, and that it is accompanied by needed procedural constraints.

Nonetheless, most key conservation decisions in the coming decades will be made at the administrative agency level, as they have been for the last several decades. Procedural strategies, therefore, should be primarily aimed at agency actors, and designed to be effective as precommitments. Four general strategies are likely to be useful: putting a thumb on the commitment side of the scales; placing people and

154. Lazarus, *Super Wicked*, *supra* note 4, at 1194–95.

155. The rigid mandates of the ESA are entirely statutory. The Clean Water Act's antidegradation provisions are made explicit only in EPA's regulations, but the statute explicitly requires that "any water quality standard . . . may be revised only if such revision is subject to and consistent with the antidegradation policy established under this section." 33 U.S.C. § 1313(d)(4)(B) (2000). Furthermore, the antidegradation policy precedes the modern Clean Water Act, and "the existence of some form of antidegradation requirement under the Act is evident" from its goals of restoring and maintaining the integrity of the nation's waters. Jeffrey M. Gaba, *Federal Supervision of State Water Quality Standards Under the Clean Water Act*, 36 VAND. L. REV. 1167, 1191 (1983).

agencies with a conservation mission in key decisionmaking roles; enhancing the political independence of those conservation decisionmakers; and facilitating outside oversight by conservation interests.

a. Put a Thumb on the Scales

As explained earlier, there is a great deal of uncertainty about the effects of climate change on natural systems, and about the relative effects of climate change and more traditional impacts.[156] Because the uncertainties are so great, technical expertise, while important, will not be the critical factor in decisionmaking. Instead, two types of judgments will be critical: judgments interpreting the uncertain evidence, and judgments about the appropriate burden of proof. Because we know, from psychology and from history, that conservation is likely to be undervalued in those judgments, the burden of proof should favor conservation. If a moving baseline is adopted, for example, the baseline should not be adjusted without clear and convincing evidence that changes are in fact attributable to climate change. If feasibility-based standards are used, the burden should be on the regulated community to establish that they cannot do more, rather than on the government to establish that they can.

Another aspect of putting a thumb on the scales in favor of conservation is making it difficult to escape our conservation commitments. If emergency relief valves are necessary they should be, like the God Squad, difficult to invoke. We should also avoid relying on relief valves as flexibility mechanisms. While they may forestall the repeal of key statutes in times of temporary stress, pressure relief valves are not designed as planning devices. In the warming world, we will have to choose some species over others and decide when to relax requirements to maintain baseline environmental conditions. We should design mechanisms for addressing those difficult choices in advance rather than facing them only at moments of crisis, when tensions between conservation and other goals reach a boiling point. Advance planning can help us avoid or reduce crises, as well providing opportunities for taking input and considering the big picture. Reacting to crisis is not a recipe for thoughtful decisionmaking when tradeoffs are necessary.

b. Choose Conservation-Minded Decisionmakers

Judgments about how to interpret equivocal data "inevitably depend upon the values, experience, and professional norms of the decision

156. *See supra* notes 129–32 and accompanying text.

maker."[157] Key decisions about whether and to what extent to relax baseline regulatory standards, therefore, should rest with agencies and decisionmakers who can be counted on to put their conservation mission ahead of political pressures or economic convenience. That means that conservation agencies, rather than those with a development, water supply, or resource extraction mission, should have primary decisionmaking authority. It also means that conservation scientists, rather than political appointees, should have the first opportunity to make decisions. There is little danger that economic interests will be given insufficient weight; should that genuinely be the case it would always remain open to Congress to change the regulatory landscape.

c. Provide Political Insulation

Any steps that insulate those charged with key decisions such as whether to relax a conservation baseline from focused political pressures would help strengthen precomittment. Giving those decisions in the first instance to career employees provides one measure of insulation. To make it effective, that step should be combined with transparency, allowing the public to see what decision the career employees would have made and how the political appointees altered that decision. Involving outside expert committees or reviewers can also provide a measure of political cover. It will be easier for an agency to make a politically tough decision in accordance with the public recommendation of independent experts than on its own initiative.[158]

d. Facilitate Outside Oversight

Finally, facilitating oversight of decisions can help ensure that agencies follow their mission rather than responding to political pressures in tension with that mission. Involvement of environmental groups has been crucial to the success of environmental law throughout its history, as has involvement of the courts. Oversight is complicated by two factors, each of which should be addressed. First, diffuse environmental interests tend to lack resources, especially at the level of the agency field office, where key management decisions are often

157. Holly Doremus, *Science Plays Defense: Natural Resource Management in the Bush Administration*, 32 ECOLOGY L.Q. 249, 278 (2005).
158. Lazarus, *Super Wicked*, *supra* note 4, at 1220–21.

made. Grants and technical assistance aimed at local citizen groups or local chapters of national groups could help reduce that barrier.[159] Second, judicial review will inevitably become more difficult if more discretionary standards are adopted. Congress can reduce this problem by directing courts to apply searching review to decisions relaxing environmental protection. The standard of judicial review should be deliberately made asymmetric, so that courts stand as a barrier to unnecessary relaxation of standards, but not to decisions to stiffen or maintain standards.[160]

V. CONCLUSION

The accumulation of greenhouse gases in the atmosphere is bringing climatic changes that will severely challenge human and non-human communities alike. Human needs will bring a response, even if they are recognized late and even if the costs of responding are high.[161] Nature, however, is a different matter. Unless we plan now to resist future temptation, it will be all too easy to ignore the gathering problems until a crisis hits, and at that point to abandon our conservation commitment in favor of nature will be all too easily ignored until a crisis hits, and then decried as too expensive to save. Strong precommitment is therefore even more essential to conservation in the warming world than it has been in the past.

Unfortunately, climate disruption makes effective precommitment more difficult. The warming world can no longer be protected by our established regulatory oaks. Rather than wait until they topple to plant alternatives, we should identify and begin cultivating those replacements now. We need standards that better match a world in transition, which means we need standards that can change to reflect new realities. But malleable standards are just that: malleable. They are potentially subject to manipulation when agencies face difficult choices. That makes them imperfect, to say the least, as precommitment devices. Nonetheless, it may be that a combination of substantive and procedural strategies can be used to construct law that acknowledges the prevailing winds of

159. *See* Lee P. Breckenridge, *Nonprofit Environmental Organizations and the Restructuring of Institutions for Ecosystem Management*, 25 ECOLOGY L.Q. 692, 695–99 (1999).

160. *Cf.* Lazarus, *Super Wicked*, *supra* note 4, at 1229–31 (arguing that judicial review should be preferentially available for some decisions but not for others).

161. *See* Holly Doremus and Michael Hanemann, *The Challenges of Dynamic Water Management in the American West*, 26 UCLA J. ENVTL. L. & POL'Y 55, 60 (2008) ("As a species, *Homo sapiens* is nothing if not adaptable, and the United States has the additional advantage of wealth. We are confident that America will respond to the most important of human needs for water.").

climate change without toppling or becoming utterly formless. Intimidating as it seems, we have no choice but to begin a serious search for law modeled on the wind-swept pine to replace our doomed oaks.