

The Divides of Environmental Law and the Problem of Harm in the Endangered Species Act

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INTRODUCTION

In environmental policy, the data gaps between what the law demands and what science supplies reflect the disparate objectives and epistemological approaches of the two fields. While existing scholarship has begun illuminating the causes and consequences of the data gaps, progress in bridging the divide requires a better understanding of how the gaps differ across the full spectrum of environmental law. This Article probes the variations in information policy challenges that arise from different types of environmental law. Scientific information policy serves as a prism for disaggregating environmental law into component parts.

Whether abating sulfur emissions from power plants, controlling pesticide exposures to children, administering national parks, or regulating habitat destruction, all varieties of environmental law illustrate the common problem of enlisting, integrating, and evaluating science to serve social goals. Despite the disciplinary gulfs that separate, for instance, public land administrators from toxic tort lawyers, all environmental law participants suffer from the disconnects between science and law. All of the programs within environmental law illustrate the two overwhelmingly important themes of the data gap literature. First, the world (including our bodies) is a tremendously complex system that defies comprehension in a proximate cause-and-effect framework. Our best current guesses about how human activities translate into environmental impacts are nearly swamped by the pervasive uncertainties and simplifying assumptions of applied science. Second, the reality of policy implementation presents the challenge of funding research to improve understanding of the environment. Spending on applied science to answer the policy questions posed by law is such a tiny fraction of what would be needed for good approximations that many of the debates about information policy are of only marginal practical significance.

However, the particular problems that arise from data gaps do differ along lines that parallel some of the common distinctions in environmental law. For instance, the reductionist, controlled experiments of chemistry and toxicology provide a different set of challenges for integrating information into law than do the ecological issues associated with conservation biology. And it isn't just the nature of the science that is important. The proprietary tasks of administering a public land system to achieve certain statutory goals demand different kinds of information from science than do the regulatory tasks of protecting the public from pollutant-induced health effects. The

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Endangered Species Act¹ does not fit neatly into any of these categories. It is at the crossroads of many of the divisions of environmental law, and thus it illustrates many of the information policy problems common to the entire field.

Part I of this Article teases apart the strands of environmental law in an attempt to distinguish among the different types of data gaps manifest in this symposium. After discussing the divides of environmental law that persist despite its holistic ambition, Part I focuses on the subject matters, regulatory approaches, and legislative attributes that distinguish different types of environmental law programs. Part II then examines the harm problem in the Endangered Species Act: how courts have addressed the vast data gaps in resolving cases seeking to enjoin activities that adversely modify habitat. The intractable problems of proof and causation illustrate common difficulties that pervade information policy across the divides. The Article concludes with some general observations about the divides and affinities among environmental law programs, and their relation to information policy.

Environmental law suffers from a lack of cohesion. For many, including the U.S. Supreme Court, environmental law is a mere aggregation of statutes, rules, and programs dealing with pollution and conservation.² By expanding the taxonomy in which we can usefully analyze differences in approaches to the field, we can synthesize a more coherent understanding of environmental law in all its dazzling, infuriating variations.

I. THE DIVIDES OF ENVIRONMENTAL LAW

For many years, scholars have described the attributes common to environmental law problems. Professor Lazarus captures most of the distinguishing features of environmental law in his characterization of environmental injury as the central concept in the field: “irreversible, catastrophic, and continuing injury”; “physically distant injury”; “temporally distant injury”; “uncertainty and risk”; “multiple causes”; and “non-economic, nonhuman concerns.”³ Professor Latin highlights many of the same points in five fundamental dilemmas faced by environmental law: multiplicity of legally protected interests; pervasive complexity and uncertainty; inappropriate political and temporal boundaries; transition from perceived abundance to perceived scarcity; and reversing prodevelopment policies embedded in legal doctrines.⁴ While attempts to specify what is distinctive about environmental law are important, they do not offer much help in understanding the internal organization of the field.

In this Part, I take a different approach to expounding environmental law. I explore what attributes distinguish the two main lines of environmental law *from each other*, rather than from law that is not “environmental.” I concern myself exclusively with the distinctions *within* environmental law to devise a taxonomy to explore often-observed features of the field.

1. Endangered Species Act of 1973, 16 U.S.C. §§ 1531–1544 (2000).

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

3. *Id.* at 744–48.

4. Howard Latin, *Fundamental Dilemmas of Environmental Law* (Nov. 5, 2001) (unpublished thematic essay, on file with the *Indiana Law Journal*).

John Muir, one of the principal founders of the environmental movement, famously observed that “[w]hen we try to pick out anything by itself, we find it hitched to everything else in the universe.”⁵ Thus, some of the adjectives commonly describing the aims of environmental law are: holistic,⁶ integrated,⁷ and interconnected.⁸ However, like many aspirational goals of environmental law, these expressions of seamless coverage do not accurately describe the practice. As implemented, environmental law suffers from discontinuities and incompatibilities.

Though there are many advantages to the holistic view, we divide environmental law into a number of pigeon holes. The most fundamental dichotomy in environmental law separates pollution control from resource management.⁹ Put simply, pollution control addresses use of the environment as a sink to control disposal of bads. Resource management addresses the use of the environment as a source of goods. Pollution control concerns itself primarily with limitations on activities that create incidental contamination. Resource management concerns itself primarily with direct allocation of goods. Another way of understanding this dichotomy is that pollution control seeks to prevent harms, while resource management seeks to allocate benefits. Often, resource management is implemented through property rights, while pollution control almost always involves regulation or tort liability. Although a less reliable guide, pollution control is more preoccupied with human health concerns, resource management with ecological health.

5. JOHN MUIR, *MY FIRST SUMMER IN THE SIERRA* 110 (1990). Indeed, one of the leading environmental law casebooks begins with an authors’ preface quoting this famous Muir phrase. ZYGMUNT J.B. PLATER, ROBERT H. ABRAMS, WILLIAM GOLDFARB & ROBERT L. GRAHAM, *ENVIRONMENTAL LAW & POLICY: NATURE, LAW, AND SOCIETY* xxxi (2d ed. 1998).

6. Peter J. Fontaine, *EPA’s Multimedia Enforcement Strategy: The Struggle to Close the Environmental Compliance Circle*, 18 COLUM. J. ENVTL. L. 31, 100 (1993); Lakshman Guruswamy, *Integrating Thoughtways: Re-opening of the Environmental Mind?*, 1989 WIS. L. REV. 463, 480 (1989); Douglas R. Porter, *Reinventing Growth Management for the 21st Century*, 23 WM. & MARY ENVTL. L. & POL’Y REV. 705, 737 (1999); Jonathan B. Wiener, *Something Borrowed for Something Blue: Legal Transplants and the Evolution of Global Environmental Law*, 27 ECOLOGY L.Q. 1295, 1317 (2001).

7. U.S. EPA SCI. ADVISORY BD., *REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION* 1 (1990); Terry W. Frazier, *The Green Alternative to Classical Liberal Property Theory*, 20 VT. L. REV. 299, 341 (1995); John R. Nolon, *Summary of the United States Seminar on Our National Environmental Laws*, 13 PACE ENVTL. L. REV. 567, 569 (1996); see also Frances H. Irwin, *An Integrated Framework for Preventing Pollution and Protecting the Environment*, 22 ENVTL. L. 1 (1991) (arguing that an integrated framework should be utilized to solve environmental issues).

8. Joseph A. Hoffman, *Negotiating Settlements at New Jersey’s Contaminated Sites: Navigating an Unchartered Sea*, 21 SETON HALL L. REV. 988, 988 (1991); see also Robert L. Glicksman, *Pollution on the Federal Lands I: Air Pollution Law*, 12 UCLA J. ENVTL. POL’Y 1, 5 (1993).

9. Robert L. Fischman, *The Problem of Statutory Detail in National Park Establishment Legislation and Its Relationship to Pollution Control Law*, 74 DENV. U. L. REV. 779, 784–85 (1997); Glicksman, *supra* note 8, at 1–5; Richard J. Lazarus, *The Tragedy of Distrust in the Implementation of Federal Environmental Law*, 54 LAW & CONTEMP. PROBS. 311, 317–18. See generally Robert L. Fischman, *What Is Natural Resources Law?*, 78 U. COLO. L. REV. 717 (2007).

Dividing environmental law into its two subject-matter strands may hinder integrated understanding and resolution of environmental problems. It is frequently difficult or impossible to achieve the aims of resource management without addressing pollution problems. For instance, the maintenance of healthy populations of animals in Chesapeake Bay, including sustainable populations of commercial shellfish, requires the control of sources of pollution.¹⁰ Similarly, maintaining viable populations of wildlife essential to a national park may require restrictions on air emissions. Atmospheric deposition of mercury, for example, interferes with the reproductive success of Florida panthers in Everglades National Park.¹¹ For aquatic animals, such as amphibians and fish, pollution is the second most common cause of listing under the Endangered Species Act, after habitat loss.¹²

Conversely, pollution goals are often dependent on good resource management. The attainment of water quality standards in Chesapeake Bay requires controlling the harvest of and maintaining the habitat for oysters, which feed by filtering (and thus cleaning) the water.¹³ In many places, attaining water quality standards requires restrictions on logging in the watershed as well as the application of best technology to dischargers along the river.¹⁴

Unfortunately, our cognitive limitations inhibit us from grasping completely the seamless whole of environmental law, in its unity and “one-ness.” Charles Lindblom long ago recognized that attempts to manage programs with comprehensive rationality

10. On “integrated, holistic” management of the Chesapeake Bay, see Jon Cannon, *Choices and Institutions in Watershed Management*, 25 WM. & MARY ENVTL. L. & POL’Y REV. 379, 380, 387 (2000). More generally, Barnett M. Lawrence persuasively argues that “national coastal policy, however, requires greater coordination of pollution control efforts with land use management and preservation programs.” Barnett M. Lawrence, *Towards a National Coastal Policy*, 17 ENVTL. L. REP. 10,404, 10,411 (1987).

11. C. Facemire, T. Augspurger, D. Bateman, M. Brim, P. Conzelmann, S. Delchamps, E. Douglas, L. Inmon, K. Looney, F. Lopez, G. Masson, D. Morrison, N. Morse & A. Robison, *Impacts of Mercury Contamination in the Southeastern United States*, 80 WATER AIR & SOIL POLLUTION 923, 925–26 (1995). For other examples of pollution problems faced by public land managers, see Glicksman, *supra* note 8, at 5–6.

12. David S. Wilcove, David Rothstein, Jason Dubow, Ali Phillips & Elizabeth Losos, *Quantifying Threats to Imperiled Species in the United States*, 48 BIOSCIENCE 607, 609 (1998).

13. TOM HORTON & WILLIAM M. EICHBAUM, TURNING THE TIDE: SAVING THE CHESAPEAKE BAY 174–78 (1991); U.S. ARMY CORPS OF ENG’RS, DEVELOPMENT OF A SUSPENSION FEEDING AND DEPOSIT FEEDING BENTHOS MODEL FOR THE CHESAPEAKE BAY 3-1 (2000), available at http://www.chesapeakebay.net/pubs/subcommittee/mdsc/hqi_benthos_model.pdf.

14. See, e.g., *Pronsolino v. Marcus*, 91 F. Supp. 2d 1337 (E.D. Cal. 2001) (noting that the Garcia River water quality standard was not attained because of sedimentation from logging). Siltation is the leading cause of impairment of rivers and streams in the United States. U.S. ENVTL. PROT. AGENCY, THE QUALITY OF OUR NATION’S WATER 11 (1992), available at <http://www.epa.gov/305b/92report/92summ.pdf>. In its 1992 inventory, the EPA attributed impairment through silviculture as the source of 7 percent, and resource extraction as the source of 11 percent, of the assessed river miles impaired by pollution. *Id.* at 12. Prescribed burning for agriculture and silviculture contributes to air pollution problems in many parts of the country. JANICE PETERSON & DAROLD WARD, AN INVENTORY OF PARTICULATE MATTER AND AIR TOXIC EMISSIONS FROM PRESCRIBED FIRES IN THE UNITED STATES FOR 1989 (USDA Forest Service Pacific Northwest Research Station).

generally fail.¹⁵ We have little choice but to fragment environmental law into manageable pieces. While holism is an attractive philosophy, solving real-world problems requires discrete actions. Implementation of environmental law—the translation of goals into behavioral constraints on human behavior—demands specialized information in such divergent areas as industrial engineering and aquatic ecology. It also requires a diverse array of administrative tools and decisional standards.

To understand and improve the complex landscape of environmental law (the “field”), we need a vocabulary to describe and classify its features. The great cleft separating pollution control and resource management is evident in the way law professors divide their curriculums and organize themselves through the Association of American Law Schools (AALS) sections.¹⁶ Though there is some overlap, the practices in the two areas remain distinct and most attorneys who specialize in one typically do not practice in the other. In the main, the EPA implements the pollution control statutes while the resource management statutes distribute implementation to a variety of cabinet departments, principally the Department of the Interior, the Department of Agriculture, and the Department of Commerce.

Distinguishing environmental law by the subject matter it addresses is helpful and serves as a surrogate for other important stylistic characteristics. Most important for this symposium is that the divide in subject matter often corresponds to a divide in the most relevant scientific discipline. But, it is only one of three dimensions along which we can characterize the divide in environmental law. To think of environmental law *solely* along the lines of pollution control versus resource management oversimplifies a more nuanced field and overlooks important lessons. In addition to the subject matter, the divide in environmental law also plays out in regulatory approaches and statutory (detail versus discretion) attributes.

Over all three dimensions, the divides slow the diffusion of good ideas and the revision of poor choices. Actual integration of environmental law presents serious risks of conceptual hubris, catastrophic failure, and political capture.¹⁷ However, greater cross-fertilization would invigorate each subfield with fresh ideas and perspectives.¹⁸ Each of the strands of environmental law can learn from the other to avoid unnecessary re-invention of approaches to problems seemingly unique to the sub-specialty but really part of a common, cross-cutting attribute of environmental law. Cross-fertilization and hybridization can help apply the lessons from one category of environmental law across the divide to improve information policy on the other side.

15. Charles E. Lindblom, *The Science of “Muddling Through”*, 19 PUB. ADMIN. REV. 79, 79–80 (1959); Charles E. Lindblom, *Still Muddling, Not Yet Through*, 39 PUB. ADMIN. REV. 517, 518 (1979).

16. The term “environmental law” is often used to refer solely to the pollution control side of the divide. *See, e.g.*, WILLIAM H. RODGERS, JR., ENVIRONMENTAL LAW ix–x (2d ed. 1994). In this Article, I use the term in its more comprehensive, inclusive meaning. On course content and the AALS, see Fischman, *What is Natural Resources Law?*, *supra* note 9, at 717, 723–727.

17. *See, e.g.*, James E. Krier & Mark Brownstein, *On Integrated Pollution Control*, 22 ENVTL. L. 119 (1991) (discussing some of these dangers).

18. Fischman, *The Problem of Statutory Detail*, *supra* note 9, at 784–85 (noting that “fruitful cross-fertilization may result from efforts to reweave” pollution control and resource management law); David J. Hayes, *Cross-Pollination*, ENVTL. F., July–Aug. 1998, at 28.

Though environmental law comes in many forms, statutes are the major currency of control and commentary. Certainly, the common law of property and torts, which includes the public trust doctrine, nuisance, and negligence, is important. Regulatory innovations promulgated by agencies through rulemaking also comprise an important source of environmental law. However, statutes are the single most important category and hew to a level of generality that permits comparison and serves as a barometer of the state of the field. Of course, environmental statutes are not monolithic. Different parts of the same statute sometimes coexist on different sides of the divide. And, judicial interpretation of statutes may have as much to say about the attributes of environmental law as Congress. Part II will focus on the way courts meld common law with statutes in the context of information policy.

This Part seeks to tease out the dimensions along which environmental law cleaves. By expanding on the characteristics that separate environmental law programs, I hope to reveal new features of the terrain. Recognizing the affinities and distinctions can lead to better innovations that apply the lessons learned from one area of environmental law to another that might otherwise not seem comparable. However, in order to categorize the styles of environmental law, generalization is a necessary hazard. No dichotomy described in this Article is a rule without exception. Indeed, several exceptions reveal the potential benefits of hybridization. Moreover, recent trends indicate that the two styles are converging. The better we understand the real, persistent divide in environmental law, the brighter our prospects will be for effective reform.

A. Subject Matters: Pollution Control Versus Resource Management

This first, and most fundamental, divide sorts environmental law by subject matter. The classic pollution control laws concern themselves with abating environmental contamination. Examples include the Clean Air Act;¹⁹ the Clean Water Act;²⁰ the Resource Conservation and Recovery Act;²¹ the Comprehensive Environmental Response, Compensation, and Liability Act;²² and the Toxic Substances Control Act.²³ The statutes generally focus on regulating the emission, discharge, and disposal of contaminants that have adverse effects when released into the environment.

The pollution control restrictions on casting off material into the public sink are oriented toward protecting the public health from harm. Most pollution control standards are set based on medical rather than ecological considerations. Even when a pollution control statute such as the Clean Air Act includes a program for establishing ecological harm prevention standards, it is seldom implemented. While *primary* air quality standards are set to protect public health with an “adequate margin of safety,” *secondary* air quality standards for broader environmental and economic objectives are

19. 42 U.S.C. §§ 7401–7671q (2000).

20. 33 U.S.C. §§ 1251–1387 (2000).

21. 42 U.S.C. §§ 6901–6992k (2000).

22. 42 U.S.C. §§ 9601–9675 (2000).

23. 15 U.S.C. §§ 2601–2692 (2000).

set at whatever level is “requisite to protect public welfare.”²⁴ But, the EPA has set all but one secondary ambient standard at the same level as the primary standard.²⁵

The classic resource management laws concern themselves with allocating rights of property use for such purposes as mining (e.g., General Mining Law of 1872,²⁶ Mineral Leasing Act²⁷), grazing (e.g., Taylor Grazing Act²⁸), logging (e.g., National Forest Management Act²⁹), and recreation (e.g., Federal Land Policy & Management Act,³⁰ Refuge Improvement Act³¹). These goods, or beneficial uses, are allocated directly through the law. All of the public land system organic acts are types of resource management laws. In general, all laws concerning public lands or public property are a form of resource management law. In addition, laws protecting wildlife and other scarce or highly valued resources, such as the Migratory Bird Treaty Act,³² the Endangered Species Act,³³ or the Wild and Scenic Rivers Act,³⁴ also concern themselves with allocating the public benefits. The strength of the resource management law is in programs directly allocating the resource (e.g., setting hunting seasons) or public works programs to enhance the resource (e.g., constructing fish hatcheries). Where the resource management programs are called upon to regulate an activity indirectly using a resource of concern, they are generally less effective (e.g., controlling incidental harms to species caused by housing developments).

Another aspect of the subject matter dichotomy in environmental law emerges when one asks: to what does a program apply? One category of programs applies to things uniformly across the country. This approach corresponds closely with pollution control law. Uniform approaches can be by activity, medium, or chemical substance. Some of these programs apply to a particular activity, such as surface coal mining, or operating an oil tanker. These laws follow in the tradition of sectoral economic regulation that has been in the mainstream of modern administrative law from the beginning (with the establishment of the Interstate Commerce Commission) and that grew substantially during the New Deal. Other statutes concern themselves with a particular medium, such as air or water. The Toxic Substances Control Act employs the chemical substance approach to achieve a uniform, national regulatory system for particularly dangerous substances that have commercial application.³⁵

The benefit of an activity focus is that it directly addresses a particular set of actions that cause a predictable suite of problems for the environment. Because environmental law is about controlling human behavior with respect to the environment, there is a logic to organizing its programs around types of activities. Shipping oil in tankers, after all, raises a recurring and discrete, if complex, set of problems. One prime

24. 42 U.S.C. § 7409(b) (2000).

25. 40 C.F.R. §§ 50.4–.12 (2000). Sulfur dioxide is the only ambient air pollutant with a different secondary standard. Carbon monoxide has a primary but no secondary standard.

26. 30 U.S.C. §§ 21–42 (2000).

27. 30 U.S.C. §§ 181–287 (2000).

28. 43 U.S.C. §§ 315–315r (2000).

29. 16 U.S.C. §§ 1600–1614 (2000).

30. 43 U.S.C. §§ 1701–1784 (2000).

31. 16 U.S.C. §§ 668dd–ee (2000).

32. 16 U.S.C. §§ 703–712 (2000).

33. 16 U.S.C. §§ 1531–1543 (2000).

34. 16 U.S.C. §§ 1271–1287 (2000).

35. 15 U.S.C. §§ 2601–2692 (2000).

weakness of activity-based control is that it risks capture if the administering agency is organized around the industry engaged in the activity. Another problem is that the central focus of these programs may miss the mark of maintaining the health of the environment. Without performance goals or ambient measures, activity-based laws can drift away from the ultimate goals of environmental quality.

Media-based laws are best represented by the classic pollution control trio: the Clean Water Act,³⁶ Clean Air Act,³⁷ and Solid Waste Disposal Act.³⁸ Each of these laws seeks to integrate a wide variety of activity controls around a core concern to maintain clean and healthful water, air, and land, respectively. The water and air media are the most comprehensively covered by federal programs. Federal land protection law is limited to abating only the most egregious insults to land health. One might even categorize the ESA as a medium-based statute because of its focus on the full range of activities that impinge on species viability, or the resource of species diversity, without regard to geographic location. Species viability may serve as a rough surrogate for biosphere health.

Media-based laws penetrate deeply into our core objective in environmental law. The quality of air, water, and land, and the viability of species, provide good bottom lines for evaluating effectiveness. These programs may tailor controls to the particular properties of different media. For instance, water tends to move in more predictable ways than air. Local air quality tends to rebound after severe pollution episodes, but species often fail to recover after severe depopulation.

Nonetheless, reaction against the media ghettos of environmental law stresses the shell game that shuffles problems, such as toxic contaminants, from one medium to another. And, the media are not as distinct as they may appear at first blush. Much pollution in large bodies of water, such as Lake Superior and the Chesapeake Bay, is deposited from polluted air.³⁹ Water pollution contributes to biodiversity loss in many areas of the country. For instance, diminishing populations of large fish in the Adirondacks and the Poconos-Catskills have been attributed to widespread, pollution-induced losses of mollusks, leeches, insects, algae, crustaceans, and cyprinid fish.⁴⁰ Various species of birds have similarly declined due to the cascading effects of environmental degradation from pollution.⁴¹

One response to the media shell game is multi-media permitting. This cross-media approach works because key programs divide regulations by activity. For instance, the Clean Water Act, though a medium-based statute, operates primarily through technology-based effluent limitations derived from individual categories of industrial

36. 33 U.S.C. §§ 1251–1387 (2000).

37. 42 U.S.C. §§ 7401–7671q (2000).

38. 42 U.S.C. §§ 6901–6992k (2000).

39. U.S. ENVTL. PROT. AGENCY, DEPOSITION OF AIR POLLUTANTS TO THE GREAT WATERS: THIRD REPORT TO CONGRESS (2000), available at <http://www.epa.gov/oar/oaqps/gr8water/3rd rpt/execsum.html>.

40. D.W. Schindler, *Biotic Impoverishment at Home and Abroad*, 39 *BIO SCIENCE* 426 (1989). Other studies have blamed the decrease in sunfish and small mouth bass populations on the destruction of food chains by airborne acid deposition. D.W. Schindler, *Effects of Acid Rain on Freshwater Ecosystems*, 239 *SCIENCE* 149, 154 n.43 (1988).

41. Jon R. Luoma, *Black Duck Decline: An Acid Rain Link*, *AUDUBON*, May 1987, at 19, 22 (citing studies showing that acidification's impacts on the food chain account for a sixty percent decrease in the growth rate of young ducks).

activities.⁴² The over five hundred categories of technology standards represent a nationally uniform approach to regulating particular activities.

Place-based environmental laws depart from the three uniform types of subject focus in that they are tailored to particular locales. In general, place-based environmental law corresponds to the resource management branch. Natural resources law is more concerned with the special than the ordinary.⁴³ The paradigmatic place-based statutes are the public land organic acts that require unit-level planning. The idea behind planning, which originated with the agencies themselves, is to translate general principles into timelines for actions and zones of use. In 1976, the Federal Land Policy and Management Act (FLPMA) and the National Forest Management Act (NFMA) required unit-level plans of the multiple-use, sustained-yield federal public lands.⁴⁴ Other planning mandates followed.⁴⁵ Location-specific plans are also central to other public resource management laws. For instance, development and approval of plans for leased oil, or plans of operation for hardrock mining, are pivotal for applying national standards to particular projects.⁴⁶

Other resource management statutes, such as the Coastal Zone Management Act (CZMA) and the National Environmental Policy Act (NEPA), also require plans that place broader goals into the context of a specific area.⁴⁷ The CZMA is concerned with a number of issues, including the control of nonpoint sources of water, in the coastal regions of the country. It would be a stretch to classify the coast as a medium, though. The CZMA does require individual state plans, which must address a number of development and water quality issues. The states tailor these plans to the particular circumstances of their coasts. From that perspective, the CZMA fits most comfortably in the place-based corner. Though programmatic environmental impact statements (EISs) may address proposed federal actions that are not tied to a specific location, most NEPA environmental impact analyses address the site-specific effects of particular projects.⁴⁸

The trend toward ecosystem management is, in part, an effort to make environmental law more location specific. From public land management to the Comprehensive Environmental Response, Compensation, and Liability Act's (CERCLA's) remediation of Superfund sites, place-based programs have experienced a surge in interest because they focus on the actual, on-the-ground (or on-the-water) needs of a particular community of living things. Both the EPA, through its "place-based" initiative,⁴⁹ and the resource agencies, through "ecosystem management"

42. 33 U.S.C. §§ 1311–1314(b) (2000).

43. Holly Doremus, *Biodiversity and the Challenge of Saving the Ordinary*, 38 IDAHO L. REV. 325, 325–27 (2002); Fischman, *What Is Natural Resources Law?*, *supra* note 9, at 717.

44. 16 U.S.C. § 1604 (2000) (NFMA); 43 U.S.C. § 1712 (2000) (FLPMA).

45. 16 U.S.C. §§ 1a–7 (2000) (national park plans); 16 U.S.C. § 668dd (2000) (national wildlife refuge plans).

46. *See, e.g.*, 43 C.F.R. § 3809 (2000).

47. 16 U.S.C. § 1455(d) (2000) (CZMA); 42 U.S.C. § 4332 (2000) (NEPA).

48. *See, e.g.*, EXECUTIVE OFFICE OF THE PRESIDENT, COUNCIL ON ENVTL. QUALITY, THE NATIONAL ENVIRONMENTAL POLICY ACT: A STUDY OF ITS EFFECTIVENESS AFTER TWENTY-FIVE YEARS 11 (1997); THE NEPA TASK FORCE, REPORT TO THE COUNCIL ON ENVIRONMENTAL QUALITY: MODERNIZING NEPA IMPLEMENTATION 35–43 (2003).

49. *See, e.g.*, U.S. ENVTL. PROT. AGENCY, ECOSYSTEM PROTECTION WORKGROUP, TOWARD A PLACE-DRIVEN APPROACH: THE EDGEWATER CONSENSUS ON AN EPA STRATEGY FOR ECOSYSTEM

policies,⁵⁰ have declared their allegiance to this ecological world view. Whether for the long-term restoration of ecological integrity, for the sustainable flows of renewable resources, or for the provision of nature's services, ecosystem management focuses the law on the actual operation of nature, in all its biodiversity.⁵¹

Certainly, the appeal of fine-tuning the application of national goals to the individual circumstances of watersheds, basins, regions, neighborhoods, and biomes, has a strong basis in science. However, the place-based program risks instigating a race to the bottom, as national standards recede. Tailoring through public participation invites local preferences to have greater sway over final decisions. Many environmental groups fear capture of local processes by developmental interests. Environmental groups simply do not have the resources to participate in every site-specific debate over development, clean-up, or restoration. Short-staffed organizations do better leveraging their resources through rulemakings establishing nationally applicable substantive standards. This is one reason why so many environmental groups opposed the Quincy Library Project, a place-based, multi-stakeholder collaboration on national forest management in a region of the Sierra Nevada.⁵² The resource management laws have struggled for years to strike an appropriate balance between national or regional guidelines and location-specific projects and plans. Under the Clean Air Act, the individual state implementation plans (SIPs) are place-based applications of national medium-specific goals. But, the Clean Air Act also has its fair share of activity-specific technology-based standards. Indeed, the ambient environmental tailoring of SIPs and water quality standards are the weaker siblings to the technology-based effluent limitations in pollution control law.

B. Regulatory Approaches: Categorical Versus Utilitarian

An important ongoing debate in the pollution control area concerns the choice between categorical and utilitarian approaches to promote environmental quality. Categorical approaches in environmental law limit uses based on their attributes as environmentally disfavored behavior. These are the "bads" we seek to avoid, minimize, and mitigate. In environmental law, we often make broad judgments about actions such as road-building, hunting, or emitting pollution, without regard to the actual consequences of the particular application. In contrast, utilitarian approaches are less concerned with the nature of the activity itself and more concerned with the effects produced by the activity, such as risks of cancer, death, eutrophication, or extinction. Even where environmental law fails to measure and balance all the relevant costs and benefits of an action, it may nonetheless take a utilitarian posture if it focuses on outcome over behavior.

A more moderate way to understand this dichotomy is to view categorical approaches as hazard-avoiding techniques.⁵³ Once we identify that an activity (or

PROTECTION (March 15, 1994 draft).

50. See, e.g., U.S. FISH & WILDLIFE SERV., AN ECOSYSTEM APPROACH TO FISH AND WILDLIFE CONSERVATION (1995); U.S. FOREST SERV., A NATIONAL FRAMEWORK: ECOSYSTEM MANAGEMENT (1994).

51. See R. Edward Grumbine, *What is Ecosystem Management?*, 8 CONSERVATION BIOLOGY 27, 31 (1994).

52. ROBERT B. KEITER, KEEPING FAITH WITH NATURE 274-99 (2003).

53. See John S. Applegate, *Introduction* to 1 ENVIRONMENTAL RISK (John S. Applegate ed., 2004).

pollutant) can cause a hazard we wish to avoid, then we take the precaution of banning or minimizing most occurrences. At the very least, we shift the burden of proof to the promoter of the activity to show lack of potential harm. In contrast, the utilitarian approach seeks to balance risk to optimize our policy choices. It requires more information to implement because it demands proportionate controls, limits, or encouragement of activities to balance the probable costs with the benefits.

Professor Mark Sagoff has contrasted these two approaches philosophically. He describes utilitarian decision making as relying on the cumulative preferences of individuals. The right utilitarian decision maximizes the satisfaction of preferences. Categorical decision making is “judged on the basis of reasons rather than wants.” This view maintains “a notion of the common good as an object posited and understood by reason;” this is different from thinking of the public interest as a matter to be measured in terms of subjective wants.⁵⁴

The dichotomy between the two approaches may be traced to the historical origins of much of natural resources law in Progressive Era utilitarianism. The professional-expert, economic decision-making model that went along with this movement accounts for much of the content of natural resources law before 1960. Professionals and experts are the ones trained in the science of ascertaining and cumulating preferences and risks in a utilitarian approach.⁵⁵ In contrast, laws that grew out of the grassroots social movements of the 1960s have a stronger flavor of the categorical judgments of romanticism and populism. Though we associate this historical movement with the rise of federal pollution control statutes, some resource management laws, such as the Wild and Scenic Rivers Act and the Wilderness Act, can fairly be classified as clustering along the categorical pole at least in part due to their historical origins.⁵⁶ Stephen Fox has persuasively argued that the divide in environmental policy in the United States is characterized by the gulf between professional modes of decision making and generalist (amateur) grassroots activism.⁵⁷ This, more than the common conservationist versus preservationist distinction, accurately reflects the origins of the categorical-utilitarian dichotomy.

Many statutes employ both the categorical and the utilitarian approaches. The key practical question in environmental law is what balance to strike between the two in order to achieve a fair and effective program. Consider the Clean Water Act (CWA). Parts of the CWA carry on the utilitarian tradition of pollution control by limiting discharges only to the extent that they impair beneficial uses of water. The “fishable-swimmable” water quality goal of the statute neatly summarizes the utilitarian facet of the CWA.⁵⁸ Operationally, the establishment of water quality standards provides the touchstone for evaluating whether discharges need to be abated. The utilitarian approach applies controls only to the extent that discharges frustrate the attainment of water quality standards.

54. MARK SAGOFF, *THE ECONOMY OF THE EARTH: PHILOSOPHY, LAW, AND THE ENVIRONMENT* 43–46 (1988).

55. *Id.* at 47.

56. *See, e.g.*, STEPHEN FOX, *THE AMERICAN CONSERVATION MOVEMENT* 289 (1981).

57. *See* STEPHEN FOX, *JOHN MUIR AND HIS LEGACY: THE AMERICAN CONSERVATION MOVEMENT* (2d prtg. 1981).

58. 33 U.S.C. § 1251(a).

Nonetheless, like most pollution control statutes, the dominant approach of the CWA is categorical, limiting actions that are deemed “bad” types of behavior. The historical precedent for this facet of the CWA is the 1899 “Refuse Act” (section 13 of the Rivers and Harbors Act) that prohibited the discharge of “any refuse matter of any kind” that may impede navigation.⁵⁹ Its modern guise is the CWA permit requirements that point-source dischargers employ various versions of best-available technology to abate pollution. The technology-based effluent limitations are a form of categorical mandate requiring people to minimize their environmentally bad activities, regardless of the specific effects manifested.

The conflict over these two approaches in pollution control law is robust and longstanding. Professor Rodgers writes that the two approaches disagree on economic and environmental policy. The approaches disagree about whether pollution is just a negative externality or if a greater moral obligation exists, and how to effect environmental reform (e.g., through market incentives or command and controls).⁶⁰ However, the resource management strand of environmental law has taken little notice of these arguments despite the presence of very similar choices in that subfield.

The public land and resource management statutes also rely on categorical approaches by specifying prohibited, subservient, multiple, dominant, or primary uses. In tension with these approaches are utilitarian baselines that place the burden of proof on an agency seeking to impose restrictions or limitations on use. Consider the balance between categorical and utilitarian approaches in the NFMA. Like most resource management statutes, the NFMA places utilitarian limits on uses of federal land. So, for instance, timber harvests must meet a number of requirements to ensure that their effects are not too severe. These requirements include encouragement of plant and animal diversity,⁶¹ ensuring that lands can be restocked within five years,⁶² and preventing irreversible damage to soils.⁶³ Coexisting with this, though, is the categorical approach, which overlays much national forest decision making. Forest Service planning must be consistent with the congressional policy that designates national forests for “outdoor recreation, range, timber, watershed, and wildlife and fish purposes.”⁶⁴ More specifically, the NFMA generally prohibits timber harvesting that

59. 33 U.S.C. § 407 (2000). This belies the general historical rule that associates utilitarian approaches with the Progressive Era. Another version of the two views is described by Professor Sax as the transformative (utilitarian) economy versus the (categorical) economy of nature. Joseph L. Sax, *Property Rights and the Economy of Nature: Understanding Lucas v. South Carolina Coastal Council*, 45 STAN. L. REV. 1433, 1442–46 (1993).

60. RODGERS, *supra* note 16, at 259.

61. 16 U.S.C. § 1604(g)(3)(B) (2000). This is the provision on which the Forest Service based its famous 1982–2001 management requirement to ensure the maintenance of minimum viable populations of most vertebrate species. That regulation proved to be the single most important factor in the judicial suspension of old-growth logging in the Pacific Northwest.

62. 16 U.S.C. § 1604(g)(3)(E)(ii) (2000).

63. 16 U.S.C. § 1604(g)(3)(E)(i) (2000).

64. National Forest Management Act of 1976, 16 U.S.C. § 1604(g) (2000) (incorporating the multiple use and sustained yield of the products and services obtained from the Multiple-Use Sustained-Yield Act of 1960, 16 U.S.C. § 528 (2000)).

deviates from the principle of nondeclining even flow⁶⁵ or that takes trees that have not reached their culmination of mean annual increment.⁶⁶

Much turns on the relative weight given to the two approaches. For instance, in debating the proposed legislation for management of the National Wildlife Refuge System, Congress had to decide whether to adopt a categorical approach and outright ban all recreational uses not dependent on wildlife or instead permit the low-priority uses, conditioned upon a non-degradation performance standard. Ultimately, Congress enacted the latter approach in its 1997 Refuge Improvement Act.⁶⁷ Therefore, rather than categorically banning jet-skiing from the refuges, Congress permitted the activity as long as, in its particular application, it is compatible with the refuge purposes and does not prevent the attainment of “biological integrity, diversity, and environmental health.”⁶⁸

As with most distinctions in environmental law, the disparity between utilitarian and categorical approaches dissolves at the margins when we look at particular applications more closely. This is because most environmental programs soften both approaches, employing hybrids based on one approach, while moderating by reference to the other. For instance, several technology-based pollution abatement programs, such as the regulation of thermal discharges under the CWA, allow waivers or variances from the categorical imperative of minimization where the polluter can show the absence of harm to the environment.⁶⁹ Similarly, national forest timber management may deviate from the nondeclining even flow or the culmination of mean annual increment categorical requirements when faced with the need to salvage diseased or burned trees.

While the categorical approach in environmental law generally specifies classes of disapproved activities, the natural resources strand illustrates that it can be used to single out particular classes of activities to be encouraged. The Refuge Improvement Act establishes a class of preferred activities when it gives preference to wildlife-dependent recreation.⁷⁰ This is characteristic of “dominant use regimes.” Other statutes, such as the 1872 general mining law, employ a categorical approach to make basic policy without looking to the particular effects of an activity in place.⁷¹ The mining law favors hard rock mineral extraction even where the environmental costs outweigh the benefits or where alternative uses of land would generate greater benefits.⁷²

The categorical approach of the mining law is related to its adoption of property rights to allocate the goods. In general, property law (like natural resources law) is strongly tied to the categorical, rather than the utilitarian approach. In addition to the

65. 16 U.S.C. § 1611 (2000).

66. 16 U.S.C. § 1604(m) (2000).

67. 16 U.S.C. § 668dd(d) (2000).

68. 16 U.S.C. § 668dd(d)(3)(A)(i), (a)(4)(B) (2000).

69. Clean Water Act, ch. 758, § 316, 86 Stat. 876 (current version at 33 U.S.C. § 1326 (2000)); *Chem. Mfrs. Ass'n v. Natural Res. Def. Council*, 470 U.S. 116 (1985); *Seacoast Anti-Pollution League v. Costle*, 572 F.2d 872, 874–75 (1st Cir. 1978).

70. 16 U.S.C. § 668ee(2) (2000); see also Robert L. Fischman, *The National Wildlife Refuge System and the Hallmarks of Modern Organic Legislation*, 29 *ECOLOGY* L.Q. 457, 526–38 (2002).

71. 30 U.S.C. §§ 21–42 (2000).

72. See, e.g., *In re Pac. Coast Molybdenum Co.*, 90 Interior Decisions 352 (1983).

historical explanations for this, commentators have also justified property law's bright-line drawing of the *numerus clausus* principle as reducing the information burden on the large numbers of people who must be able to recognize property types in order to understand their rights and obligations.⁷³ Professors Merrill and Smith explain that this limitation on tailoring property types is "a deep design principle." Though Merrill and Smith are interested primarily in private property, the design principle is manifest in natural resources law that governs public property as well. It favors clearly bounded categorical tools over utilitarian approaches.

Professor Houck has persuasively argued that the evolution of pollution control law has been toward more effective categorical, technology-based standards (what he calls "alternatives") and away from ambient, risk-balancing standards.⁷⁴ Problems with data gaps largely drove this historic shift. Emerging from the common law burdens of proving causation and harm, and the early federal efforts at promoting ambient-based regulation of water pollution, the 1972 Clean Water Act shifted strategies and effectively employed the categorical approach of minimizing discharge.⁷⁵ The Clean Air Act's adoption of a categorical strategy as central to the program came later, but was largely cinched by the 1990 Amendments.⁷⁶

In recent years, however, both pollution control and resource management law have experienced a renaissance of interest in utilitarian approaches. The total maximum daily load (TMDL) program is probably the most important new water pollution control development of the past decade. It revisits the ambient water quality standards provisions of the CWA and seeks to translate those goals into allocations of pollutants for individual bodies of water.⁷⁷ Similarly, ecosystem management in natural resources law has emerged as a cutting-edge development that seeks to control activities based on their impacts on various indicia of ecosystem health and integrity, such as species populations, forest vitality, and habitat quality.

It will be important in exploring the new utilitarianism, or risk-balancing, revival in environmental law to maintain a sound balance between the two approaches. Because utilitarian risk-balancing is so information demanding, we often cannot conclusively show where the balance falls. Therefore, burdens of proof often become the determinative, de facto decision makers. If an environmental program has a default mode allowing an activity to go forward unless shown to trigger a utilitarian-based control, then most activities will go forward for lack of proof. Cumulatively, this can

73. Thomas W. Merrill & Henry E. Smith, *What Happened to Property?*, 111 YALE L.J. 357, 359 (2001) ("[P]roperty is required to come in standardized packages that the layperson can understand at low cost."); see also Thomas W. Merrill & Henry E. Smith, *Optimal Standardization in the Law of Property: The Numerus Clausus Principle*, 110 YALE L.J. 1 (2000) (analyzing the theoretical and practical features of the *numerus clausus*). The categorical thrust of property law may also be articulated as a preference for rules over standards. Kathleen M. Sullivan, *The Supreme Court 1991 Term*, 106 HARV. L. REV. 22, 51–55 (1992).

74. Oliver A. Houck, *Of Bats, Birds, and B-A-T: The Convergent Evolution of Environmental Law*, 63 MISS. L.J. 403, 407 (1994); see also Adam Babich, *Too Much Science in Environmental Law*, 28 COLUM. J. ENVTL. L. 119 (2003) (discussing the difference between technology-based and risk-based environmental standards).

75. 33 U.S.C. §§ 1131, 1314(b) (2000).

76. See, e.g., 42 U.S.C. §§ 7411–12 (2000).

77. 33 U.S.C. §§ 1311(m), 1313(d) (2000).

cause piecemeal degradation. Certainly, it fails to institutionalize caution⁷⁸ or to meet the precautionary principle.⁷⁹ On the other hand, environmental law, through prohibitions, sometimes reverses the usual common law, liberal presumption that allows an activity to go forward unless it is shown to be harmful.

In describing his superb book, *The Control of Nature*, John McPhee explains that his title phrase came from a limestone etching on the engineering building at the University of Wyoming. McPhee noted the bilateral ambiguity of the phrase that “could with equal speed travel in opposite directions.”⁸⁰ In environmental law, the phrase “to permit activities” carries a similarly delicious irony. One reading of the phrase is to allow activities. However, the phrase also means to regulate activities through government issued licenses. In this Part, I use the phrase in its second sense.

Pollution control law has routinely employed prohibitions as a basis for shifting the burden to potential emitters, disposers, or dischargers to come to the government to get a permit in order to proceed with a desired activity. With a few exceptions for phase-outs of egregiously risky things, such as lead in gasoline, DDT applications, and open dumps, prohibitions in pollution control law seldom actually ban activities. Instead, the permit programs allow otherwise prohibited activities to proceed in accordance with restrictions written into the permit or license. Permits are the critical link between general regulations and the specific circumstance of particular activities in a certain location. Prohibitions shift the burden to the permittee.

Although natural resource law has had some permit programs for quite some time, such as those for grazing on public lands, they have played a less important role. Compared to pollution control, resource management prohibitions often do operate to ban activities. For instance, roads may not be constructed in areas designated “wilderness areas” under the Wilderness Act of 1964,⁸¹ and coal deposits on “unsuitable” land may not be mined.⁸² Prohibitions in this way are used as a basis for rare categorical disapproval of types of activities.

By focusing on the categorical-utilitarian dimension of environmental law, we can see a different pattern of variation from the pollution control-versus-resource management distinction. On the categorical-utilitarian continuum, the ESA permit program has more in common with the CWA permit program than with the Wilderness Act or even other wildlife protection statutes, such as the Migratory Bird Treaty Act. Similarly, the Refuge Improvement Act scheme of dominant use has as much in common with technology-based limitations than with the NFMA management criteria. This shift in perspective becomes important for considering a response to the judicial difficulties in establishing a standard of proof for private ESA liability, explored in Part II.

78. *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 194 (1978).

79. Applegate, *supra* note 53, at xii–xxi.

80. JOHN MCPHEE, *THE CONTROL OF NATURE*, at back cover (1989).

81. *Wild Free-Roaming Horses and Burros Act*, 16 U.S.C. §§ 1331–1340 (2000).

82. 30 U.S.C. § 1272 (2000).

C. Legislative Attributes: Detail Versus Discretion

1. Statutory Detail vs. Agency Latitude

All environmental programs vary in the degree of detail that Congress provides to guide and bind implementing agencies. However, many programs do cluster at the ends of the continuum and create a dichotomy between statutory detail (where Congress is quite specific and therefore restrictive) and agency latitude (where Congress is quite permissive). Pollution control legislation correlates to the detail pole, while resource management law tends toward agency latitude.

The two classic examples of statutory detail come from pollution control law: the 1984 Amendments to Resource Conservation and Recovery Act (RCRA) and the 1990 Amendments to the Clean Air Act. In both cases, statutory detail arose from distrust between Congress and the administration. Congress enacted the more striking of the two examples, the 1984 RCRA Amendments, in the wake of scandals at the EPA involving administration of programs relating to hazardous waste site clean-ups. Because RCRA deals with the prevention of future hazardous waste sites, Congress feared that the Reagan administration would not adequately implement legislation written with a broad brush. In particular, Congress feared that the Reagan administration would continue the tradition, which predated his election, of issuing pollution-controlling regulations well after the deadline Congress established for the EPA. By 1984, Congress had placed hundreds of deadlines on the EPA for implementation of environmental programs. The agency missed most of these deadlines.⁸³

The 1984 RCRA Amendments limited EPA discretion through statutory detail principally by enacting “hammers” that establish concrete consequences for noncompliance.⁸⁴ A hammer provision operates by providing a draconian (prohibitive) rule that will take effect on a particular date unless the agency has promulgated a substitute regulation. For instance, the RCRA Amendments would have virtually banned the land disposal of any hazardous waste for which the EPA had not promulgated a treatment standard by specified dates.⁸⁵ A hammer provision creates incentives for regulated entities to promote compromise to ensure swift agency action rather than delay. The hammer provisions of RCRA were entirely successful in spurring the EPA to meet the deadlines for promulgating treatment standards.⁸⁶

Surprisingly, a precedent for the RCRA hammer provisions can be found across the subject matter divide, in the 1962 Refuge Recreation Act. This statute established a default prohibition on recreational uses of refuges until the Secretary of the Interior determined that funds were available for the development, operation, and maintenance

83. Richard J. Lazarus, *The Tragedy of Distrust in the Implementation of Federal Environmental Law*, 54 *LAW & CONTEMP. PROBS.* 311, 326–27 (1991). Lazarus generally ascribes congressional distrust to the “seemingly never-ending onslaught of impossible agency tasks” from Congress as well as administration-created implementation problems and institutional limitations. *Id.*

84. *See, e.g.*, 42 U.S.C. § 6924 (2000).

85. *Id.*

86. ROBERT L. FISCHMAN, MAXINE I. LIPELES & MARK S. SQUILLACE, *AN ENVIRONMENTAL LAW ANTHOLOGY* 131 (1996).

of a particular form of proposed recreation.⁸⁷ Conditioning recreational use on adequate funding was a clever way to create a constituency for operational appropriations, which often take a back seat to the more glamorous monies for new acquisitions and facilities. A group wishing to open up a refuge to a certain type of recreation, for example, snowmobiling, would have to lobby Congress to appropriate funds for the attendant administrative costs. Conditioning recreation on an administrative finding of adequate funds also gave the Fish & Wildlife Service, generally a timid agency, a statutory scapegoat to better justify administratively sensible, but unpopular, decisions.⁸⁸ Moreover, it relieved some of the pressure on the agency to divert funds from conservation to recreation.⁸⁹ The fiscal criterion in the Recreation Act is an overlooked antecedent tool for shifting the political dynamic of interest group lobbying (whether generators of hazardous waste regulated under RCRA or snowmobilers seeking to ride in refuges) from avoidance, delay, and budgetary austerity, to prompt appropriation of the necessary funds to make and implement determinations.⁹⁰

In some instances, Congress goes beyond time frames and specifies in detail which substances the EPA should regulate. This is what Professors Shapiro and Glicksman label restriction of regulatory discretion.⁹¹ While Congress determines for the agency whether to regulate certain pollutants, it gives the agency discretion over how to regulate the pollutants. For instance, in the 1984 RCRA amendments, Congress specified particular solvents, dioxins, and “California-list” wastes for which the EPA had to establish treatment standards by certain dates.⁹² The EPA, though, retained a great deal of control over the process for setting the treatment standards themselves. Similarly, the 1990 Clean Air Act amendments listed 189 hazardous air pollutants for the EPA to establish emission standards.⁹³ Before Congress established the list of pollutants, the EPA had promulgated emission standards for only six hazardous air pollutants since Congress first authorized it to regulate these contaminants.⁹⁴

87. 1962 Refuge Recreation Act, Pub. L. No. 87-714, § 1, 76 Stat. 653 (1962).

88. See STEVEN L. YAFFEE, PROHIBITIVE POLICY 149–50 (1982) (providing an excellent description of the way the Fish & Wildlife Service, in its regulatory capacity, favored clear, prohibitive guidelines because they give unambiguous direction and allow the Fish & Wildlife Service to deflect criticism by maintaining that its hands are tied by a statute).

89. The legislative history of the Recreation Act indicates that Fish and Wildlife Services had been diverting funds in this manner. S. REP. NO. 87-1858 (1962), as reprinted in 1962 U.S.C.C.A.N. 2723, 2725–26 (report of the Assistant Secretary of the Interior); see also Richard J. Fink, *The National Wildlife Refuges: Theory, Practice, and Prospect*, 18 HARV. ENVTL. L. REV. 1, 28 (1994).

90. Inadequate funding for the full range of determinations under the Endangered Species Act is a particularly acute implementation constraint today. See, e.g., Alejandro E. Camacho, *Can Regulation Evolve? Lessons From a Study in Maladaptive Management*, 55 UCLA L. REV. 293, 348 (2007); Robert L. Fischman, *Predictions and Prescriptions for the Endangered Species Act*, 34 ENVTL. L. 451, 471–75 (2004).

91. Sidney A. Shapiro & Robert L. Glicksman, *Congress, the Supreme Court, and the Quiet Revolution in Administrative Law*, 1988 DUKE L.J. 819, 822 (1988).

92. 42 U.S.C. § 6924(e)–(f) (2000). “California-list” wastes were regulated at the time under a California state land disposal program. *Id.*

93. Clean Air Act of 1990 § 112(b), 42 U.S.C. § 7412(b) (2000). The EPA can modify or accept petitions to modify the list. *Id.*

94. RODGERS, *supra* note 16, at 135–37.

In other instances, Congress specified how the EPA should regulate pollution. This type of statutory detail restricts what Shapiro and Glicksman call legislative discretion.⁹⁵ For instance, in the 1984 RCRA Amendments, Congress gave the EPA some discretion in classifying certain substances as hazardous. But, once the agency classifies a substance as hazardous, it must require tanks used to store the substance to obtain approved leak detection and other protective systems.⁹⁶

More commonly in pollution control statutes, when Congress restricts legislative discretion it also restricts regulatory discretion.⁹⁷ For instance, the 1984 RCRA amendments banned outright the disposal of bulk or noncontainerized liquid hazardous wastes in any landfill.⁹⁸ This approach leaves virtually no discretion for the agency outside of enforcement. Congress was exceedingly specific on what the regulations regarding disposal of containerized liquid hazardous wastes in landfills should state: “Such regulations shall also prohibit the disposal in landfills of liquids that have been absorbed in materials that biodegrade or that release liquids when compressed as might occur during routine landfill operations.”⁹⁹ In these 1984 RCRA Amendments, Congress went so far as to set out design standards for hazardous waste landfills.

In contrast to modern pollution control statutes, the federal land management laws have historically clustered around the agency latitude pole. This is best exemplified by the Multiple-Use Sustained-Yield Act of 1960,¹⁰⁰ which instructs the Forest Service to manage its lands sustainably for a number of uses without providing any binding substantive standards. In interpreting the statute, the Ninth Circuit famously stated that the Act’s provisions “breathe discretion at every pore.”¹⁰¹ Accompanying the scant statutory detail is a tradition of particularly deferential judicial review.¹⁰² Other resource management statutes, such as the National Environmental Policy Act, also grant a great deal of latitude to agencies.¹⁰³

However, the statutory detail-agency latitude distinction grows ever less congruent with the pollution control-resource management divide. Many modern public land statutes reflect a trend in statutory detail similar to pollution control laws. As I have shown elsewhere, there exists a distinct recent trend for Congress to specify management tasks for newly established units of the National Park System.¹⁰⁴ In its simplest form, establishment legislation would specify the metes and bounds of an area to be reserved or acquired for management by the Park Service under the Organic Act.¹⁰⁵ However, during the past twenty-five years, Congress has rarely limited its

95. Shapiro & Glicksman, *supra* note 91, at 822.

96. 42 U.S.C. § 6924(o)(4)(A); *see also* Shapiro & Glicksman, *supra* note 91, at 837 n.86 (discussing the practical application of the U.S. Code provisions).

97. Shapiro & Glicksman, *supra* note 91, at 837.

98. 42 U.S.C. § 6924(c)(1) (2000).

99. *Id.* § 6924(c)(2).

100. 16 U.S.C. §§ 528–531 (2000).

101. *Strickland v. Morton*, 519 F.2d 467, 469 (9th Cir. 1975); *see also* 3 GEORGE C. COGGINS & ROBERT L. GLICKSMAN, *PUBLIC NATURAL RESOURCES LAW* § 16.5 (2007).

102. *See, e.g.*, *Udall v. Tallman*, 380 U.S. 1 (1965); *United States v. Grimaud*, 220 U.S. 506 (1910).

103. *See, e.g.*, *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332 (1989).

104. Fischman, *The Problem of Statutory Detail*, *supra* note 9.

105. The establishment legislation for Haleakalā National Park illustrates this bare-bones approach. 16 U.S.C. § 396(b)–(c) (2000).

lawmaking to simple area designation in establishment legislation. Congress increasingly tailors management instructions for each unit established. Congress specifies management constraints on park administration with respect to visitor activities such as fishing, hunting, or grazing.¹⁰⁶ It also sets out particular processes for planning, involving public hearings and consultations; and, it requires the management plans themselves to address certain issues.¹⁰⁷

Like the 1984 RCRA amendments, establishment statutes increasingly employ deadlines to constrain resource management agency discretion.¹⁰⁸ The use of deadlines in establishment legislation was unusual before 1980. But today Congress commonly sets time limits on public land managers to publish mandated studies and management plans.

Just as Congress has restricted the EPA's regulatory discretion by specifying what substances will be subject to restrictions, so too it has restricted the Park Service's discretion by specifying what uses studies and plans will address. Commentators frequently call for more research on the condition of park resources and the effects of visitors and environmental stressors on the National Park System.¹⁰⁹ Chronically tight budgets make the congressionally mandated studies the top funding priorities. Common subjects specified in establishment legislation for study are suitability of lands for inclusion in a park unit,¹¹⁰ potential wilderness designations,¹¹¹ transportation,¹¹² and park resources.¹¹³ In the absence of this statutory detail, the Park

106. The establishment legislation for Great Basin National Park, for instance, discusses zoning waters for fishing and limiting grazing. 16 U.S.C. §§ 410mm(a), 410mm-1(a)–(e) (2000).

107. The establishment legislation for Channel Islands National Park, for instance, provides a deadline for a management plan, requires consultation with certain interested parties, mandates certain contents of the plan, requires public hearings in particular locations to discuss certain issues, specifies low-intensity and limited entry management, prohibits entry fees, and mandates certain studies. 16 U.S.C. § 410ff (2000).

108. Nat'l Park Serv., Management Policies 2:6 (1988) (“[C]ongressionally directed plans will be given a priority.”).

109. See NAT'L PARKS AND CONSERVATION ASS'N, NATIONAL PARKS: FROM VIGNETTES TO A GLOBAL VIEW 6–8 (1989) (calling for broad-based, ongoing research by the NPS.); NAT'L PARK SERV. STEERING COMM., NATIONAL PARKS FOR THE 21ST CENTURY: THE VAIL AGENDA 36 (1993) (“The National Park Service must engage in a sustained and integrated program of natural, cultural, and social science resource management and research aimed at acquiring and using the information needed to manage and protect park resources.”); Dennis J. Herman, Note, *Loving Them to Death: Legal Controls on the Type and Scale of Development in the National Parks*, 11 STAN. ENVTL. L.J. 3, 6–11 (1992); Nat'l Parks and Conservation Ass'n, *Parks in the Next Century*, NAT'L PARKS, Mar.–Apr. 1988, at 18 (calling for “a threefold increase in natural, cultural, and social science research staff”).

110. See, e.g., 16 U.S.C. § 228b(c) (2000) (Grand Canyon National Monument).

111. See 16 U.S.C. § 160f(b) (2000) (Voyageurs National Park); *id.* § 410ff-5 (Channel Islands National Park); *id.* § 410gg (Biscayne National Park); *id.* § 410aaa (Death Valley National Park); *id.* § 431 (note) (Congaree Swamp National Monument).

112. See 16 U.S.C. § 160j (2000) (discussing roads in the Voyageurs National Park); *id.* § 228g (discussing solutions for dealing with the dangerous or detrimental use of aircrafts around the Grand Canyon National Park); *id.* § 271c (discussing construction of roads in the Canyonlands National Park); *id.* § 272c (discussing use of driveways around Arches National Park).

Service would have greater discretion for setting its research priorities systemically. In many cases, the subjects mandated by Congress reflect key issues that the Park Service would be remiss in neglecting, such as the study of rock art in the Petroglyph National Monument or erosion and sedimentation in Redwood National Park. However, Congress does mandate action on other subjects that might not warrant a great deal of attention from the standpoint of system management in an era of fiscal austerity. One example is the 1988 mandate in amendments to the Olympic National Park establishment legislation to study the location, size, and costs of a year-round visitor center in the Kalaloch area.¹¹⁴

In organic legislation, a similar trend toward statutory detail belies the notion that Congress reserves its legislative drafting energies for pollution control. Organic legislation establishes comprehensive management guidance for public land systems, such as the National Forest System, the National Wildlife Refuge System, and the National Wilderness Preservation System. Modern organic legislation now is distinguished by statutory detail that falls into five basic categories that now serve as hallmarks for legislation deserving the title “organic act.” They are: purpose statements, designated uses, comprehensive planning, substantive management criteria, and public participation.¹¹⁵

For example, the fourth hallmark, substantive management criteria, provides standards against which agency decisions can be measured. The rise in statutory detail in this area has constrained agency discretion in public land management and invited citizens and courts to intervene in agency priorities. The most recent organic statute, the National Wildlife Refuge System Improvement Act of 1997,¹¹⁶ binds the Fish and Wildlife Service to implement a complex, five-level hierarchy of categorical preferences for uses of the Refuge System. It also has substantive management mandates to ensure the maintenance of “biological integrity, diversity, and environmental health,”¹¹⁷ acquire water rights needed for refuge purposes,¹¹⁸ and “monitor the status and trends of fish, wildlife, and plants in each refuge.”¹¹⁹

Though the reasons for statutory detail are different for RCRA, national park establishment legislation, and public land organic legislation, their affinities are important because they present similar problems for agencies and law reformers. In an era of perennial austerity for agencies, there are often few resources remaining after addressing legislative mandates. Statutory detail tends to freeze agency priorities and make it difficult for agencies to respond to new developments. In particular, statutory

113. See 16 U.S.C. § 79k (2000) (discussing erosion and sedimentation in reference to the pending Redwood National Park); *id.* § 273(b) (discussing the effects of grazing in the Capitol Reef National Park); *id.* § 410ff-2 (discussing depletion of natural resources in the Channel Islands National Park); *id.* § 431 (note) (discussing rock art at the Petroglyph National Monument).

114. Washington Park Wilderness Act of 1988, Pub. L. No. 100-668, 102 Stat. 3961 (codified as amended at 16 U.S.C. § 251).

115. Robert L. Fischman, *The National Wildlife Refuge System and the Hallmarks of Modern Organic Legislation*, 29 *ECOLOGY* L.Q. 457 (2002).

116. National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. §§ 668dd-ee (2000).

117. *Id.* § 5(a)(4)(B).

118. *Id.* § 5(a)(4)(G).

119. *Id.* § 5(a)(4)(N).

detail hinders cross-cutting agency initiatives, such as Project XL in the EPA,¹²⁰ or the Vail Agenda¹²¹ in the NPS. When Congress micro-manages individual media- or place-based programs, it thwarts administrative experiments that cut across media or places. This is a particularly difficult hurdle for the implementation of adaptive management, which most commentators regard as a requirement of ecosystem management. Ecosystem management must draw heavily on scientific principles and research so that management “can be designed and adjusted to minimize disruption of natural processes.”¹²² In other words, agencies must be flexible.

On the other hand, statutory detail can provide good political cover for agency officials too weak to make good decisions on their own. The RCRA hammer provisions strengthened the EPA’s ability to support stringent treatment standards.¹²³ The commands of establishment legislation forced the Park Service’s hand to make the controversial decision to allow hunting and trapping in a national historical park and preserve.¹²⁴ Substantive management criteria have restricted commodity development in public lands. As a representative democratic institution, Congress has greater legitimacy in setting priorities and specifying environmental practices than agencies, except where they concern pure questions of science.¹²⁵

Dividing environmental law along the statutory detail versus agency latitude distinction helps clarify these broad consequences and separate them from the particular causes of the congressional micro-management. It also shows how the original divide in legislative styles between pollution control and resource management law has narrowed in recent years. From the information policy perspective, greater statutory detail often worsens data gaps for agencies that may not proceed with actions until fulfilling statutory criteria. On the other hand, certain kinds of details such as hammer provisions, may shift information burdens to alleviate data gaps for an agency.

120. See generally Rena I. Steinzor, *Regulatory Reinvention and Project XL: Does the Emperor Have Any Clothes?*, 26 ENVTL. L. REP. 10,527 (1996); Rena I. Steinzor, *Reinventing Environmental Regulation: The Dangerous Journey from Command to Self-Control*, 22 HARV. ENVTL. L. REV. 103 (1998); Lawrence E. Susskind & Joshua Secunda, “Improving” Project XL: *Helping Adaptive Management to Work Within EPA*, 17 UCLA J. ENVTL. L. & POL’Y 155 (1998); Lawrence E. Susskind & Joshua Secunda, *The Risks and the Advantages of Agency Discretion: Evidence from EPA’s Project XL*, 17 UCLA ENVTL. L. & POL’Y 67 (1998).

121. The Vail Agenda was a Park Service self-evaluation on the occasion of its 75th anniversary. The Agenda cited “new, costly, and sometimes ill-conceived responsibilities” that thwart the Service’s ability to set funding priorities. NAT’L PARK SERV. STEERING COMM., NATIONAL PARKS FOR THE 21ST CENTURY: THE VAIL AGENDA 36 (1993).

122. Robert B. Keiter, *Beyond the Boundary Line: Constructing a Law of Ecosystem Management*, 65 U. COLO. L. REV. 293, 302 (1994).

123. See, e.g., 42 U.S.C. § 6924 (2000).

124. Jean Lafitte National Historical Park, Pub. L. No. 95-625, 92 Stat. 3536 (1978) (codified as amended at 16 U.S.C. § 230).

125. But see Jerry L. Mashaw, *Prodelegation: Why Administrators Should Make Political Decisions*, 1 J.L. ECON. & ORG. 81, 95 (1985) (noting that the President, who controls agency appointees, is elected to serve the national interest, not parochial legislative districts); Richard B. Stewart, *Beyond Delegation Doctrine*, 36 AM. U. L. REV. 323, 332 (1987) (commenting that statutory details are created in “a submerged micropolitical process without open and regular procedures”).

2. Commerce Clause vs. Property Clause

Because federal statutes dominate the environmental law scene, the enumerated powers the Constitution granted to Congress can highlight legal differences between programs. Though the spending and treaty powers support some environmental legislation, most statutes rely on either the Commerce Clause or the Property Clause. The Commerce Clause first affiliated with environmental concerns through the regulation of navigable waters. Indeed, the Clean Water Act continues to employ the term “navigable waters,” even while it defines its scope in broader terms.¹²⁶ The modern era of environmental law builds on the New Deal expansion in the range of the Commerce Clause.¹²⁷ All of the pollution control statutes rely on the Commerce Clause for their constitutionality.

The lesser-known Property Clause authorizes Congress to make “all needful rules and regulations respecting . . . property belonging to the United States.”¹²⁸ This is the basis for all of the federal public land laws. However, some resource management statutes, such as the ESA and SMCRA, rely on the Commerce Clause. Still other resource management statutes, such as NEPA, are most squarely authorized by the Necessary and Proper Clause of Article I.¹²⁹

As the Supreme Court narrows the breadth of Congressional power under the Commerce Clause, the resource management programs relying on that clause become especially vulnerable. Because the ESA and section 404 of the CWA, for instance, focus on the target resource to be protected (species and wetlands) and not traditional economic activity regulation (in contrast to, say, the NPDES permit program), they are particularly close to the Court’s chopping block. This was evident in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps. of Eng’rs*, where the Court interpreted the Clean Water Act to exclude isolated wetlands from federal protection.¹³⁰ The Court justified this narrow reading of the CWA on the constitutional questions that would be raised by including non-navigable, non-adjacent wetlands in a Commerce Clause statute. Thus far, Commerce Clause challenges to the validity of the ESA have failed, but by narrow margins.¹³¹ The vulnerability of these two environmental law programs illustrates the uneasy fit between resource management or

126. Compare 33 U.S.C. § 1251(a)(1), (5) (establishing statutory goals to eliminate the discharge of pollutants into navigable waters), and 33 U.S.C. § 1362(12) (defining “discharge of a pollutant” to mean the addition of any pollutant to “navigable waters”), with 33 U.S.C. § 1362(7) (defining “navigable waters” as “waters of the United States”).

127. See, e.g., *Hodel v. Va. Surface Mining & Reclamation Ass’n*, 452 U.S. 264 (1981).

128. U.S. CONST. art. IV, § 3, cl. 2. See Peter A. Appel, *The Power of Congress “Without Limitation”: The Property Clause and Federal Regulation of Private Property*, 86 MINN. L. REV. 1 (2001) (providing a comprehensive analysis of the Property Clause).

129. U.S. CONST. art. I, § 8, cl. 18.

130. 531 U.S. 159 (2001). More recently, the Court divided over the question of whether the CWA regulates wetlands without continuous surface connections to navigable waters. *Rapanos v. United States*, 126 S. Ct. 2208 (2006). Questions remain about whether the Court’s limited reading of statutory jurisdiction in these wetland cases applies to the NPDES program. Robin K. Craig, *Which Way Federalism Under Section 402?*, 22 *Natural Resources and Environment*, Summer 2007, at 20.

131. See *Gibbs v. Babbitt*, 214 F.3d 483 (4th Cir. 2000); *Nat’l Ass’n of Home Builders v. Babbitt*, 130 F.3d 1041 (D.C. Cir. 1997).

place-based statutes and the Commerce Clause. The Commerce Clause “fit” is much closer for pollution control or activity-based statutes.

One solution to this problem is to justify more resource management and place-based statutes on the Property Clause. For federally owned resources (such as those governed by the 1872 General Mining Law) or places (such as the national forests), Congress already does this. For resources not owned by the federal government, this approach raises interesting constitutional issues. Where Congress can relate the target of protection or management to federal property, as it did in the Wild Free-Roaming Horses and Burros Act,¹³² the Court has upheld the statute.¹³³ However, the connection between the quality of federally owned ecosystems and some isolated wetlands or endangered species might be too attenuated to support a Property Clause justification. Though the leading Court cases on the extent of the Property Clause are extremely permissive and broad,¹³⁴ they predate the recent trend of the Court to limit congressional power.¹³⁵ A court that is cutting back on the extent of Congress’ power under the Commerce Clause may be equally assertive about retracting the Property Clause platform. Nonetheless, there is no analogously stringent “substantially affects” or “economic enterprise” tests,¹³⁶ which attach to review of Commerce Clause programs, for Congress’ exercise of the Property Clause. And, there is a much stronger tradition of favoring national over state and local authority in interpreting the Property Clause.¹³⁷

The constitutional clause supporting an environmental law statute does not dictate the information policies and problems that manifest in implementation. But, the constitutional divide will grow more important if the Supreme Court tightens its limits on Commerce Clause authority. To maintain current programs, Congress would have either to provide the information establishing the significant connections that the Court demands under the Commerce Clause or tie environmental concerns to federal properties.

D. Conclusion

Scholars and practitioners most frequently divide environmental law into its subject matter categories. But other differences are important in understanding how information policy plays out. Regulatory approaches and statutory attributes may have an even more powerful influence on the information demands of law and the resulting data gaps between science and implementation. The next Part illustrates a particularly intractable information problem in the Endangered Species Act that does not

132. 16 U.S.C. §§ 1331–1340 (2000).

133. *Kleppe v. New Mexico*, 426 U.S. 529, 540–47 (1976).

134. *Id.* at 540; *see also* *United States v. California*, 332 U.S. 19, 40 (1947) (explaining that the Court will not assume that Congress will use its power over federal property to cause injustice to the states).

135. *See, e.g.*, *United States v. Morrison*, 529 U.S. 598 (2000); *United States v. Lopez*, 514 U.S. 549 (1995).

136. *Lopez*, 514 U.S. 549, at 559–60.

137. John D. Leshy, *A Property Clause for the Twenty-first Century*, 75 U. COLO. L. REV. 1101, 1101 (2004); *see, e.g.*, *United States v. Little Lake Misere Land Co.*, 412 U.S. 580 (1973) (holding that a federal conservation easement preempts hostile state law).

comfortably fit within any of the established categories. A close look at the problem also invites an exploration of the role that the judiciary plays in mediating data gaps.

II. A DATA GAP ACROSS THE DIVIDE: THE ESA HARM PROHIBITION

As a statute dealing with biological resources, the ESA is often grouped with the public land and extraction laws.¹³⁸ The duty that the ESA imposes on federal agencies to engage in a consultative analysis to avoid authorizing actions that jeopardize the continued existence of a listed threatened or endangered species shares a strong affinity with the National Historic Preservation Act,¹³⁹ the National Environmental Policy Act,¹⁴⁰ and other non-regulatory statutes. However, the hotly contested ground of ESA regulation of private activities, especially land use, belongs with the categorical mandates of pollution control law, authorized by the Commerce Clause. Particularly in the past fifteen years, with the rise of the ESA incidental take permit program, this hybrid statute shares many attributes of the statutes that the EPA implements.¹⁴¹ More than any other single law, the ESA challenges the conventional divisions of environmental law.

This Part looks at one particularly vexing ESA problem: the data gap between what science provides and what courts demand in resolving cases dealing with the harm prohibition. Section 9 of the ESA prohibits the “take” of any endangered species.¹⁴² “Take” in the ESA means “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”¹⁴³ Because the element of harm (along with harass) is the most broad in this “take-out” menu, it has been the subject of much litigation, regulation, and controversy. In *Sweet Home*,¹⁴⁴ the Supreme Court upheld the regulatory definition of harm that includes “significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.”¹⁴⁵ But lower courts struggle with the application of the definition in uncertain circumstances.¹⁴⁶

138. See, e.g., GEORGE CAMERON COGGINS ET AL., *FEDERAL PUBLIC LAND AND RESOURCES LAW* 271–328 (6th ed. 2007). See Fischman, *What Is Natural Resources Law?*, *supra* note 9, at 725.

139. 16 U.S.C. §§ 470–470w-6.

140. 42 U.S.C. §§ 4321–4370f.

141. See Fischman, *What Is Natural Resources Law?*, *supra* note 9, at 725, 727.

142. Endangered Species Act (ESA) of 1973 § 9(A)(1)(B), 16 U.S.C. § 1538(a)(1)(B) (2000). For a discussion of data gaps and the ESA administrative programs, especially listing, see Kristin Carden, *Bridging the Divide: The Role of Science in Species Conservation Law*, 30 HARV. ENVTL. L. REV. 165 (2006); Holly Doremus, *The Purposes, Effects, and Future of the Endangered Species Act's Best Available Science Mandate*, 34 ENVTL. L. 397 (2004); Holly Doremus, *Listing decisions under the Endangered Species Act: Why Better Science Isn't Always Better Policy*, 75 WASH. U. L.Q. 1029 (1997).

143. Endangered Species Act (ESA) of 1973 § 3(14), 16 U.S.C. § 1532(19) (2000).

144. *Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687, 696–703 (1995).

145. 50 C.F.R. § 17.3 (2006).

146. See, e.g., Michael J. Bean, *The Endangered Species Act and Private Land: Four Lessons Learned from the Past Quarter Century*, 28 ENVTL. L. REP. 10,701 (1988) (reviewing lower court decisions); Steven G. Davidson, *The Aftermath of Sweet Home Chapter:*

A. Courts and Modern Ecology

Courts are institutions that arose from the foundation of what has been described as the “Newtonian” structure of the U.S. Constitution.¹⁴⁷ They operate in a mechanical universe that recognizes direct, linear causes and effects. In assigning liability, courts have traditionally, and correctly, safeguarded a defendant from responsibility for actions that are not directly attributable to his behavior. Even as they increasingly apply statutes in resolving disputes, courts hew to their customary reluctance to assign fault without proximate causation.

If Einstein was correct that God does not play dice with the universe,¹⁴⁸ then an understanding of modern ecology recruits the divine spirit for some other game of chance. One of the deep, defining characteristics of the current ecological paradigm is that nature operates stochastically.¹⁴⁹ The linear, deterministic models of cause and effect in common law fail to describe the behavior of natural systems. As with dice, roulette, or any other game of chance, the best we can do about predicting outcomes or explaining occurrences is to describe relative likelihoods. Stochastic systems may behave predictably in aggregate, but defy identification of direct cause-effect for their components. They are complex, disorderly, and erratic.

Common law is based on judicial principles, and derives its authority from custom and usage rather than statute. Tort law is primarily concerned with remedying past harms, and may grant compensation, restitution, and punitive awards for violations of the duty of care.¹⁵⁰ Damage awards modify future behavior indirectly by providing disincentives for future conduct that is unduly risky.¹⁵¹ The common law framework also includes proximate causation, which courts employ to prevent unfairness in attaching liability, and a “preponderance of the evidence”¹⁵² standard of proof.

Usually, Congress assigns ecological issues to agencies for implementation. For example, the National Forest Management Act requires the Secretary of Agriculture to

Modification of Wildlife Habitat as a Prohibited Taking in Violation of the Endangered Species Act, 27 WM. & MARY ENVTL. L. & POL'Y REV. 541 (2003); Steven P. Quarles, John A. MacLeod & Thomas R. Lundquist, *Sweet Home and the Narrowing of Wildlife “Take” Under Section 9 of the Endangered Species Act*, 26 ENVTL. L. REP. 10,003 (1996); Ray Vaughan, *Proof of “Prohibited Takings” Under the Endangered Species Act*, in 27 AM. JUR. PROOF OF FACTS 421 (3d ed. 1994).

147. Laurence H. Tribe, *The Curvature of Constitutional Space: What Lawyers Can Learn from Modern Physics*, 103 HARV. L. REV. 1, 3–4 (1989).

148. RONALD W. CLARK, *EINSTEIN: THE LIFE AND TIMES* (1972).

149. The stochastic, non-equilibrium paradigm is explained by DANIEL B. BOTKIN, *DISCORDANT HARMONIES: A NEW ECOLOGY FOR THE TWENTY-FIRST CENTURY* (1990); DONALD WORSTER, *NATURE'S ECONOMY: A HISTORY OF ECOLOGICAL IDEAS* 388–420 (2d ed. 1994); A. Dan Tarlock, *The Nonequilibrium Paradigm in Ecology and the Partial Unraveling of Environmental Law*, 27 LOY. L.A. L. REV. 1121, 1123 (1994).

150. Compensation is payment of damages or any other act that a court orders to be done by a party who injures another. BLACK'S LAW DICTIONARY 301 (8th ed. 2004). Restitution is disgorgement of benefit wrongly taken. *Id.* at 1309.

151. Courts may also provide injunctions as equitable relief for claims of potential future harm.

152. The preponderance of the evidence standard is equivalent to the more likely than not standard, and reflects a burden of fifty-one percent.

prepare comprehensive plans that provide for biodiversity.¹⁵³ Then, courts know how to handle resulting disputes: defer to the agency's plausible interpretation.¹⁵⁴ But, citizen suit provisions, such as section 11(g) of the ESA,¹⁵⁵ may present an ecological dispute to the courts without the benefit of an expert agency determination. Without a deference principle on which to rely, courts must make their own determinations, linking available evidence with legal standards. In such cases, the common law concept of proximate causation fails to jibe with the way nature works. As a result, courts face a dilemma: either apply a legal doctrine that does not recognize/comprehend the mechanisms that lead to an alleged harm, or improvise the basis for a decision using the underlying statute in a way that does not conform with common law notions of causation, or precedent.

By far the most common and important situation in which courts face this dilemma is under section 9 of the Endangered Species Act.¹⁵⁶ The history of take prohibitions, the language used in the Department of the Interior's regulations for section 9, and the U.S. Supreme Court opinion in *Sweet Home* all suggest that section 9 be applied using a common law framework.¹⁵⁷ Most commentators and courts agree that, at least when filling in the gaps in the statutory scheme, courts should borrow from the common law.¹⁵⁸ Whether it is the best choice or not, common law principles, especially proximate cause, are the default governing principles for judicial resolution of disputes over section 9.¹⁵⁹

B. The Harm Problem

To understand the problem of harm in the ESA, it is important to understand the reasons why species decline to the point of endangerment. Just as "every unhappy family is unhappy in its own way,"¹⁶⁰ every species on the list, has its own woeful tale to tell. But, it is possible to generalize five different forces driving anthropogenic extinction. These are what E.O. Wilson and David Wilcove call the mindless horsemen of the environmental apocalypse: over-harvest, habitat alteration, invasive species, disease vectors, and pollution.¹⁶¹ Of these culprits, habitat alteration, sometimes

153. 16 U.S.C. § 1604(g)(3)(B) (2000).

154. *Sierra Club v. Marita*, 46 F.3d 606, 619 (7th Cir. 1995) (explaining that plaintiffs face a "high bar" when challenging the Forest Service).

155. 16 U.S.C. § 1540(g).

156. Endangered Species Act (ESA) of 1973 § 9, 16 U.S.C. § 1538 (2000).

157. *See Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687, 718 (1995) (explaining that it is obvious that the meaning of the word "take" is "deeply embedded" in the common law).

158. *See, e.g., Strahan v. Coxe*, 127 F.3d 155 (1st Cir. 1997); Paul Boudreaux, *Understanding "Take" in the Endangered Species Act*, 34 ARIZ. ST. L.J. 733, 734 (2002) (explaining that the take provision of the ESA should not be read "in isolation from" the common law); Quarles et al., *supra* note 146, at 10003; James R. Rasband, *Priority, Probability, and Proximate Cause Lessons from Tort Law About Imposing ESA Responsibility for Wildlife Harm on Water Users and Other Joint Habitat Modifiers*, 33 ENVTL. L. 595 (2003).

159. 16 U.S.C. § 1538.

160. LEO TOLSTOY, ANNA KARENINA I (Richard Pevear & Larissa Volokhonsky trans., Penguin Books 2003) (1873).

161. DAVID S. WILCOVE, THE CONDOR'S SHADOW 8 (1999); EDWARD O. WILSON, THE

obliteration, is the most important. It is a factor in the decline of eighty-five percent of listed species.¹⁶²

How to reverse habitat degradation causing extinctions is the single most difficult challenge to the ESA. The problem of habitat degradation is particularly vexing because its agents are generally diffused over a wide area. There may be no single actor creating a significant problem. Rather, many people engaging in small, incremental habitat modifications cumulate into a problem for species viability. Also, most land use is a local matter not otherwise under the control of federal power or the ESA. Unless a federal permit, contract, or grant is involved, the ESA does not directly regulate the land disturbing activity. Finally, the adverse effects of habitat modification on individual animals may not be immediately visible. The link between habitat modification and species decline might not be understood until well after the harm has been done. Like all harm-based (utilitarian) approaches in environmental law, ESA take determinations demand a great deal of information, generally much more than is convincingly supplied by scientific data.¹⁶³

Private land logging illustrates these frustrating attributes and is a frequent activity challenged in section 9 litigation. Consider the facts from *Forest Conservation Council v. Rosboro Lumber Co.*, a key Ninth Circuit decision that established an important test for injunctive relief under section 9.¹⁶⁴ The lumber company intended to log trees on a privately owned, forty-acre site adjacent to nesting habitat of the threatened northern spotted owl. An environmental group sued Rosboro, seeking to enjoin the timber harvest.

Three difficult features of this case characterize many of the take cases and open gaps between science and the law. The first thing to notice about these facts is that nobody alleged that a take occurred. Rather, the environmental group sought to prevent a take from occurring in the future. Therefore, the court had to consider evidence predictive of the effects of logging on nesting owls. Second, any harm to the owl would be incidental to some other lawful activity. Nobody accused the lumber company of intending to injure owls. The felling of trees itself would not be a cause of injury. No occupied or nest trees would be harvested. From a moral and causative perspective, any harm to owls is incidental and indirect. It is the change in the habitat from old-growth forest to clear-cut, and ultimately young, even-aged forest that raises the risk that an owl will be injured through impairment of an essential behavior. The clear-cutting of the timber stand near a nest might make feeding more difficult by eliminating habitat for the owl's prey, or it might deprive the owl of shelter during feeding, making the owl more vulnerable to its predators. This kind of disturbance of the owl's preferred habitat happens all the time in nature. Where there is an abundance of old-growth habitat, a forty-acre clear-cut adjacent to a nest would likely have little effect on the owls' behavior. However, the owls are on the verge of extinction precisely because so much old-growth forest has been eaten away by forty-acre clear-cuts. This leads to the third key observation: habitat alteration today may constitute a take because species have nowhere else to go. An activity that would have been perfectly benign three decades ago today might injure an animal.

DIVERSITY OF LIFE 253 (1992).

162. WILCOVE, *supra* note 161, at 8.

163. On harm in environmental law, see generally Albert C. Lin, *The Unifying Role of Harm in Environmental Law*, 2006 WIS. L. REV. 897 (2006).

164. 50 F.3d 781, 782–83 (9th Cir. 1995).

The kind of evidence relevant to the court's determination included not only information about the particular pair of owls nesting adjacent to the logging site, but also studies of owl behavior generally, especially owl responses to nearby logging. The northern spotted owl is an unusual listed species because it has received so much scientific attention. More typically, for a species such as a sea turtle, a mouse, or a snake, it is exceedingly difficult for a plaintiff to proffer more than just the educated judgment of scientific experts.¹⁶⁵

The *Rosboro* court applied the common law of proximate cause to this problem and arrived at the most common formulation for determining when to issue an injunction under section 9. According to the *Rosboro* test, a court may enjoin an activity that poses a reasonably certain threat of imminent harm. The court chose the relatively stringent "reasonably certain" language because the harm regulation demands that the habitat modification "actually" kill or injure wildlife.¹⁶⁶ The appeals court remanded the case for the district court to determine whether the evidence met the proximate cause standard.¹⁶⁷ The next year, in *Marbled Murrelet v. Babbitt*, the Ninth Circuit affirmed the continued vitality of the *Rosboro* test against a challenge that it failed to accord with *Sweet Home*.¹⁶⁸ *Marbled Murrelet* upheld findings that evidence of observed birds in the area, combined with more general ecological observations about the effects of certain kinds of logging on the species, met the injunctive standard that the logging posed a reasonably certain threat of imminent harm through impairment of breeding.

C. Proximate Cause

Common law proximate cause refers to reasonably anticipated consequences or the lack of intervening forces between the challenged activity and harm.¹⁶⁹ The best argument for applying the proximate cause limit to section 9 cases is that it is not fair to hold actors responsible for every effect that could be causally linked to their conduct regardless of how remote, unusual, or unforeseeable the consequence.¹⁷⁰ *Sweet Home* clearly meant to provide some constraints on the potentially expansive reach of section 9 liability. The court's holding is based, in part, on the emphasis in the harm regulation on the word "actually." However, another powerful argument recommending proximate cause is that, as a common law concept, it is well tested by far more cases than will ever be brought under the ESA.

Nonetheless, there are perils for courts employing common law proximate cause because the concept is never precisely defined.¹⁷¹ And it is notoriously unreliable when dealing with risk.¹⁷² A doctrine invented to limit liability in situations not involving

165. See, e.g., *United States v. W. Coast Forest Res. Ltd. P'ship*, No. Civ. 96-1575-HO, 2000 WL 298707 (D. Or. 2000).

166. 50 C.F.R. 17.3 (2006).

167. *Rosboro*, 50 F.3d 781.

168. *Marbled Murrelet v. Babbitt*, 83 F.3d 1060, 1066 (9th Cir. 1996).

169. DAN B. DOBBS, 1 THE LAW OF TORTS 443 (2001).

170. See *Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687, 713 (1995).

171. See Patrick J. Kelley, *Proximate Cause in Negligence Law: History, Theory, and the Present Darkness*, 69 WASH. U. L.Q. 49, 51-52 (1991) (citing two prominent treatises giving conflicting definitions of proximate cause).

172. See Nancy Levit, *Ethereal Torts*, 61 GEO. WASH. L. REV. 136, 155 n.104 (1992) (giving

such complex interactions as occur in ecosystems may not serve well the interests of justice in take litigation. Moreover, the ESA's statutory purpose demands a standard of proof more protective of species. Professor Lin suggests a standard of liability "defined in terms of whether a person's conduct was—or is likely to be—a substantial factor in harm to a species."¹⁷³ Courts have modified the traditional proximate cause standard in Superfund cases in order to fulfill the purposes of that statute.¹⁷⁴ Some form of proportionate liability might result.¹⁷⁵

But, a court must decide the cases presented to it with the tools available. For most judges that means adapting proximate cause to decide whether a prospective harm allegation deserves an injunctive remedy. Is the *Rosboro* standard the best adaptation of proximate cause? Professor Paul Boudreaux argues that the Ninth Circuit's "reasonably certain" standard is a relatively strict standard of proof, and that in section 9 cases the courts should instead use the traditional tort law preponderance of the evidence criterion.¹⁷⁶ While that may recalibrate the test to protect more wildlife, it nonetheless suffers from the same infirmity as the *Rosboro* standard: it is one-dimensional. The concentration on a single standard of proof from tort law is indicative of the limitations of the common law approach. A test that better matches the kind of information science provides would include a confidence interval. In addition to the probability of harm, courts also need to grapple with the confidence, or uncertainty, of the probability estimate. Most courts fail to distinguish between these two concepts in take litigation. But those courts could learn from the deeper exploration that courts reviewing public health risks under administrative law have undertaken to reconcile the statutory triggers with statistical realities.¹⁷⁷

A large sample size, numerous studies, and small variations among multiple studies are examples of factors that would increase the confidence of an estimate of the probability of harm as a result of a proposed activity. Alas, information available on most endangered species is generally based on only a few observations. Confidence is generally low for predicting harm. As Professor Craig Pease has observed, the regulation's preoccupation with "actual harm" often translates into a need for plaintiffs

examples of confusion between proximate cause and probability in the medical context); W. Kip Viscusi, *Jurors, Judges, and the Mistreatment of Risk by the Courts*, 30 J. LEGAL STUD. 107, 111–12 (2001) (explaining that high-cost, low-probability events create trouble for decision making); Richard W. Wright, *Causation, Responsibility, Risk Probability, Naked Statistics, and Proof: Pruning the Bramble Bush by Clarifying the Concepts*, 73 IOWA L. REV. 1001, 1002 (1988) (explaining that confusion exists between the concepts of responsibility, risk, and responsibility).

173. Albert C. Lin, *Erosive Interpretation of Environmental Law in the Supreme Court's 2003–04 Term*, 42 HOUS. L. REV. 565, 617 (2005).

174. 4 WILLIAM H. RODGERS, JR., ENVIRONMENTAL LAW: HAZARDOUS WASTES AND SUBSTANCES § 8.11 (1992); William H. Rodgers, Jr., *Improving Laws, Declining World: The Tort of Contamination*, 38 VAL. U. L. REV. 1249, 1259 (2004).

175. Rasband, *supra* note 158, at 630–37 (advocating a form of proportionate liability in take cases in the environmental context); David Rosenberg, *The Causal Connection in Mass Exposure Cases: A "Public Law" Vision of the Tort System*, 97 HARV. L. REV. 849, 866 (1984) (explaining that proportionality is ideally suited to resolving problems of causal indeterminacy).

176. Boudreaux, *supra* note 158, at 770.

177. See, e.g., *Natural Res. Def. Council v. EPA (Vinyl Chloride)*, 824 F.2d 1146 (D.C. Cir. 1987).

to demonstrate imminent harm to “an identifiable animal.”¹⁷⁸ This can be an impossible burden to meet. It also demands a probability estimate that likely is quite uncertain. Some of this uncertainty arises from the dearth of information generated by scientists. But even for the northern spotted owl, a species subject to much scientific study, uncertainty remains from the stubborn indeterminacy of complex natural systems.¹⁷⁹ A few courts have introduced an additional showing that gestures toward the confidence level of a predicted likelihood of harm. For example, in *Defenders of Wildlife v. Bernal* the court reiterated the “reasonably certain” standard,¹⁸⁰ but added that plaintiffs “had the burden of proving by a preponderance of the evidence that the proposed construction would harm a pygmy-owl by killing or injuring it, or would more likely than not harass a pygmy-owl by annoying it to such an extent as to disrupt its normal behavioral patterns.”¹⁸¹ Similarly, in *West Coast Forest Resources*, the district court repeated the *Marbled Murrelet* standard but added that the plaintiff must also prove by a preponderance of the evidence that this interference will “actually kill or injure the owls.”¹⁸²

Courts seldom engage in a focused discussion of risk. In *West Coast*, the district court rejected as too speculative a hypothesis of plaintiff’s expert that the logging could harm the owls indirectly by increasing their energy expenditure in foraging.¹⁸³ In *Greenpeace Found. v. Mineta*, plaintiffs claimed that the lobster fishery adversely modified the habitat of monk seals by depleting the lobster population upon which the seals preyed.¹⁸⁴ The *Greenpeace* court’s requirement that lobster be “absolutely critical to the diet of the monk seal”¹⁸⁵ indicates that the level of risk necessary to prove a “take” (i.e., the threshold probability of harm) was relatively high.¹⁸⁶ Sometimes in establishing a high risk threshold, however, courts go even further, for instance in requiring the harm to individuals to rise to the level of jeopardy to the existence of the species,¹⁸⁷ or retarding recovery of the species.¹⁸⁸

178. Craig M. Pease, *Viewpoint: In Defense of $N > 1$* , 55 *BIOSCIENCE* 100 (2005) (quoting *United States v. W. Coast Forest Res. Ltd. P’ship*, No. Civ. 96-1575-HO, 2000 WL 298707, at *5 (D. Or. 2000) (denying the plaintiff federal agency an injunction against a clear-cut for failure to demonstrate with reasonable certainty that the timber harvest would result in a take of a northern spotted owl)).

179. Joel A. Tickner, *The Role of Environmental Science in Precautionary Decision Making*, in *PRECAUTION, ENVIRONMENTAL SCIENCE, AND PREVENTIVE PUBLIC POLICY* 3, 4–5 (Joel A. Tickner ed., 2003).

180. 204 F.3d 920, 925 (9th Cir. 2000).

181. *Id.*

182. *W. Coast Forest Res. Ltd. P’ship*, 2000 WL 298707, at *5.

183. *Id.*

184. 122 F. Supp. 2d 1123, 1127 (D. Haw. 2000).

185. *Id.* at 1134.

186. The strength of the seal’s dependence on lobster as a food source would be a parameter in a model used to estimate risk.

187. *Morrill v. Lujan*, 802 F. Supp. 424, 432 (S.D. Ala. 1992).

188. *W. Coast Forest Res. Ltd. P’ship*, 2000 WL 298707, at *5 (quoting *Nat’l Wildlife Fed’n v. Burlington N. R.R.*, 23 F.3d 1508, 1512–13 (9th Cir. 1994)).

D. The Data Gaps for Harm: Easing the Burden for Courts

Should the judiciary reinterpret the common law concept of proximate cause in harm cases to fit the information science provides? The ESA is silent on this question. But the structure of the ESA (one of the elements the Court used to support the harm regulation in *Sweet Home*) provides a basis for relaxing somewhat the common law grip on take cases. Understanding the structural argument requires rethinking the ESA's place in the subject matter divide and instead seeing its regulatory attributes. Courts and commentators should remove their natural resources law blinders. Even though the ESA concerns nature protection, the solution to the section 9 puzzle comes from EPA-administered pollution control law.

Most courts view the take prohibition as a strict ban on an activity and are quite concerned about the severe consequences on a defendant of finding a take. However, habitat owners seeking to proceed with a harm-causing activity have an attractive alternative: apply for an incidental take permit. Section 9 serves as a gatekeeper for incidental take permits. Indeed, the piecemeal nature of habitat fragmentation means that some coordination in the geographic range of a listed species is needed for recovery. Incidental take permits can help promote this through both mitigation programs as well as multi-party plans.

This interpretive gloss on the functional meaning of the take prohibition comes from pollution control law, where similarly draconian provisions operate to condition rather than prohibit economic activities. The ESA section 10 permit program ought to be viewed in the same light. Viewing the take prohibition as a trigger rather than a draconian proscription is more consistent with pollution permitting laws and with a somewhat more relaxed approach to proximate cause.¹⁸⁹

Section 9 does trace its roots to simple, strict prohibitions of take.¹⁹⁰ And, until 1982, the ESA had no mechanism for allowing takes. However, today the principal use of section 9 is not to wipe the landscape clean of all actions that would harm species. Instead, section 9 functions as a sorting mechanism to identify those activities that require an incidental take permit before they may proceed. In this respect, section 9 operates much like section 301 of the Clean Water Act, which appears superficially to be an outright prohibition on discharge of pollutants into water.¹⁹¹ In practice, though, CWA section 301 serves as a mechanism to force dischargers to the negotiating table to acquire permits. Similarly, cases alleging harm are now ultimately about whether defendants need to acquire permits or not. The determination of harm is a determination about whether the permitting requirements, such as minimizing and mitigating adverse effects on listed species, will apply.¹⁹² Courts misconceive the ESA when they view the harm determination as fundamentally about whether the activity may precede at all. This either/or approach mirrors the unidimensional understanding of risk that pervades most of the reported take cases. A multidimensional risk

189. See, e.g., *Riverside Irrigation Dist. v. Andrews*, 758 F.2d 508, 512–13 (10th Cir. 1985) (refusing to overturn an agency determination that a reservoir project failed to qualify for automatic approval despite attenuated causation).

190. Michael E. Field, *The Evolution of the Wildlife Taking Concept from Its Beginning to Its Culmination in the Endangered Species Act*, 21 HOUS. L. REV. 457, 459–64 (1984).

191. 33 U.S.C. § 1311(a) (1995).

192. 16 U.S.C. § 1539(a)(2) (2000).

assessment better matches the nature of the problem, the uncertainties of predicting ecological effects, and the other environmental law programs with close affinities to the ESA.

The analogy to pollution control law suggests not only this interpretive gloss for courts. It also suggests a better way of framing the regulatory definition of harm. A regulatory change simplifying the showing required to prove harm would reduce litigation and induce more land disturbers to acquire incidental take permits.

One approach would bar any significant disturbance of habitat of any listed species for which habitat is a contributing factor for its decline. The Services could, at listing or shortly thereafter, indicate what extent of habitat disturbance is significant: some measure of size and intensity.¹⁹³ This would ameliorate both the difficulties of proof and would bring the section 9 trigger for permitting more in line with other environmental laws. However, it would encourage gaming the regulatory system. A logger, for instance, faced with a threshold of harm set at a twenty-acre clear-cut might choose a series of nineteen-acre timber harvests to come in just under the trigger. In this respect, rules specifying the thresholds for take become road maps for evasion.¹⁹⁴ Another approach would use best management practices to condition harm-threatening activities in order to minimize the significance of habitat disruption. However, even a well-tailored description of best practices might be too coarsely grained to apply easily to all of the potential sites and sizes of disturbance. Nonetheless, these pathways of regulatory reform hold promise to ease the burden on the courts and advance the purpose of the ESA. This is a circumstance where bridging the divides of environmental law reveals a constructive recommendation for reform. In pollution control, courts have long accepted the notion that there is a difference between statutory causation and tort proximate cause.¹⁹⁵

CONCLUSION

Though different kinds of environmental law may display different versions of information policy problems, all divisions of the field manifest the data gaps between what science supplies and environmental law demands. The harm problem in ESA section 9 take litigation shows how the divides of environmental law can blind courts and other institutions to alternative approaches for dealing with scientific information (or the lack thereof). Viewing the ESA take prohibition as a natural resource topic leads courts to limit injunctions to just those rare circumstances of fairly high certainty. But, if one shifts perspectives and regards the ESA provision as a trigger for a utilitarian, place-based permit program, the stakes for injunctive relief diminish. That

193. In fact, the Interior and Commerce Departments pledged to do something very close to this in 1994, when they announced a joint policy to provide greater certainty under section 9 by identifying at the time of listing activities that would or would not likely constitute a take. Notice of Cooperative Policy for Endangered Species Act Section 9 Prohibitions, 59 Fed. Reg. 34,373-01 (July 1, 1994).

194. Cf. Mark A. Sargent, *The New Regulation D: Deregulation, Federalism and the Dynamics of Regulatory Reform*, 68 WASH. U. L.Q. 225, 298 (1990) (discussing the similar problems with detailed SEC rules).

195. See, e.g., *United States v. Alcan Aluminum Corp.*, 964 F.2d 252, 264-65 (3d Cir. 1992); Robert L. Glicksman, *CERCLA Reauthorization and Natural Resource Damage Recovery*, 9 J. NAT. RES. & ENVT. L. 313, 318-19 (1993-94).

could make the information burdens of proving harm more manageable. Bridging the divide allows us to reconfigure key assumptions about how information in environmental law operates. A broader, omnivorous view illustrates solutions to similar difficulties that are at hand in other areas of environmental law.

The divides of environmental law are real enough. The characteristic differences that separate subject matters, regulatory styles, and legal authorities do have important ramifications for understanding and implementing law. But the reduction necessary to make practical progress in advancing environmental programs should never obscure the affinities across the divides that offer rich possibilities for law reform. One of those important affinities is the persistent gap between the information science can provide and what law demands. The similarities of this gap throughout environmental law overwhelm the differences, which can obscure comprehensive reform. Environmental law may work well in theory, but in practice the information problems overwhelm the ability of agencies and courts to make the kind of progress envisioned by Congress and the public.