

PARTIAL ANSWERS: LEGAL IMAGINATION
AND THE UNFINISHED ENVIRONMENTAL
HISTORY OF ADMINISTRATIVE LAW

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INTRODUCTION

Law has been the engine of both environmental destruction and protection throughout American history.¹ This central claim—developed at length in Brigham Daniels’s and my book on the history of United States environmental law—finds no more compelling illustration than in the story of administrative law itself. The administrative state did not emerge as a vehicle of environmental stewardship. It was constructed, across the Progressive Era and the New Deal, primarily to manage the nation’s relationship with industrial capitalism: to rationalize market competition, protect workers, stabilize financial institutions, and allocate the continent’s natural resources for development. That the same institutional architecture—the expert agencies, the notice-and-comment rulemaking process, the standards of judicial review—later became the indispensable platform for the most consequential burst of environmental legislation in American history may be among the defining ironies of U.S. legal development.²

Understanding how this repurposing occurred requires attention to a concept that threads through the history of American environmental law: legal imagination, the creative application of existing legal tools and the invention of new mechanisms to address seemingly intractable governance problems.³ Legal imagination was a vital precondition not only for the development of the administrative state itself, but also for the environmental laws that built upon it decades later, and for the adaptive governance innovations that followed. It is this capacity—and the conditions that enable or suppress it—that connects the era of the Interstate Commerce Commission to the era of the Environmental Protection Agency, and again to the unfinished challenges of climate governance and emerging technology regulation that

1. ALEJANDRO E. CAMACHO & BRIGHAM DANIELS, LESSONS FOR A WARMING PLANET: A VITAL HISTORY OF U.S. ENVIRONMENTAL LAW (2026).

2. Richard B. Stewart, *The Reformation of American Administrative Law*, 88 HARV. L. REV. 1667, 1669–701 (1975) (arguing that the structure of administrative law is the primary mechanism through which the regulatory state achieves constitutional legitimacy).

3. The concept of “legal imagination” as used throughout this essay denotes the creative application of existing legal tools and the invention of novel mechanisms to address seemingly intractable governance problems. See CAMACHO & DANIELS, *supra* note 1, at 10. See also ELIZABETH FISHER, RISK REGULATION AND ADMINISTRATIVE CONSTITUTIONALISM 24–27 (2007) (examining how legal imagination operates at the intersection of administrative law and environmental science, drawing on comparative analysis of U.S. and European regulatory frameworks).

confront administrative law today. That history reveals a recurring pattern: every era's most consequential administrative law innovations have been partial answers, addressing the problems they were designed to solve while surfacing new ones that later generations would in turn take up. The story is one not of arrival but of iterative and unfinished response.

This Essay proceeds in five parts. Part I examines the Progressive Era origins of American administrative law, using environmental law as its primary lens while attending to parallel developments in adjacent regulatory fields—labor, securities, food safety, and communications—that drew on the same institutional logic. Part II analyzes the New Deal's construction of the modern administrative state and the codification of administrative procedure in the Administrative Procedure Act of 1946 (APA)—an effort that was both theoretically ambitious and practically responsive, even as it remained constitutionally contested. Part III examines how the APA's procedural architecture served as the platform for the substantive environmental legislation of the 1960s and 1970s, and how that legislation transformed administrative law theory in turn. Part IV considers subsequent procedural innovations, such as collaborative governance and adaptive management, which emerged in response to the limitations of the dominant prescriptive model, drawing on the legal and ecology literature that provided their theoretical foundations. Part V argues that the scale of challenges posed by climate change and emerging technologies demands a new round of legal imagination that again builds on preexisting legal architecture but also may offer fundamentally new forms of governance adequate to the moment.

I. THE PROGRESSIVE ERA AND THE FIRST ADMINISTRATIVE ENVIRONMENTAL INSTITUTIONS

A. *Administrative Law and the Environmental Crisis of the Frontier*

The Progressive Era (roughly 1890–1920) represents the first major administrative response to what Americans recognized, with increasing urgency, as an environmental crisis of their own legal making. The closing of the frontier—announced by the Bureau of the Census and theorized by Frederick Jackson Turner in his celebrated 1893 address—forced a national confrontation with the consequences of a century of legally sanctioned resource exploitation.⁴ The rule of capture—whoever extracts first, owns it—had governed the exploitation of wildlife, fisheries, and minerals with virtually no legal constraint.⁵ The result, by 1890, was the near extinction of the bison, the collapse of Atlantic fisheries, the devastation of migratory bird

4. Frederick Jackson Turner, THE FRONTIER IN AMERICAN HISTORY 10–38 (1920).

5. See CAMACHO & Daniels, *supra* note 1, at 23–24.

populations, and the strip-mining of timber that had seemed inexhaustible to an earlier generation.⁶ The law had built this; only the law could address it.

The Progressive response was, at its core, an administrative response. It rested on a theory—shared by the era’s leading jurists, scientists, and reformers—that scientific expertise, channeled through government institutions, could rationalize and improve upon the chaotic exploitation that common law and laissez-faire policy had produced.⁷ In 1887, future President Woodrow Wilson penned an influential essay calling for the development of a science of public administration distinct from partisan politics, planting seeds that a generation of scholars and practitioners would cultivate into professional norms and institutional structures.⁸ The administrative agency represented something genuinely novel, albeit idealistic: a body composed of experts capable of developing the specialized knowledge that effective resource management required and of applying that knowledge with the prospectivity, flexibility, and continuity that episodic common law adjudication could not match. Public involvement in decision making was considered vital primarily as a conduit for managers to develop a more robust source of information for government policy supportive of expertise.⁹ This was legal imagination operating at institutional scale.

The conservation and preservation debates of this era embedded foundational questions of administrative law theory that persist to this day. Gifford Pinchot’s conservationist vision was premised on efficient use of resources for the greatest good of the greatest number, administered by the Forest Service under his direction.¹⁰ This was essentially the “transmission belt” model of administration—agency as the efficient implementer of a legislatively determined policy—before such a phrase was coined.¹¹ John Muir’s preservationist vision—keeping federal lands in their primeval state free from human intrusion—posed a harder

6. *Id.* at 64.

7. See generally JAMES M. LANDIS, *THE ADMINISTRATIVE PROCESS* (1938) (providing the foundational theoretical account of the administrative agency as an epistemic institution justified by specialized expertise that judicial and legislative processes cannot provide).

8. Woodrow Wilson, *The Study of Administration*, 2 *POL. SCI. Q.* 197, 210 (1887) (foundational essay calling for the development of a science of administration distinct from partisan politics, which seeded the professionalization of public administration as a discipline and practice over subsequent decades).

9. See ELIZABETH FISHER & SIDNEY A. SHAPIRO, *ADMINISTRATIVE COMPETENCE: REIMAGINING ADMINISTRATIVE LAW* 138–43 (2020).

10. See *Gifford Pinchot (1865–1946)*, FOREST HISTORY SOCIETY, <https://foresthistory.org/research-explore/us-forest-service-history/people/chiefs/gifford-pinchot-1865-1946/> [<https://perma.cc/8K46-JRBL>] (last visited Sep. 28, 2026).

11. Stewart, *supra* note 2, at 1675–76 (describing the “transmission belt” conception of administrative law, under which agencies are conceived as mechanisms translating legislatively determined policies into binding obligations, and documenting its inadequacy as the scope of administrative governance expanded).

administrative law question: when Congress delegates broad and potentially conflicting authority to an agency, what theory of administrative discretion governs its exercise?¹² The National Park Service Organic Act of 1916, which charged the National Park Service (NPS) to conserve natural objects while simultaneously providing for public enjoyment in a manner that would leave parks unimpaired for future generations, crystallized this tension in statutory form.¹³ The Act's purposeful ambiguity about how to resolve conflicts between preservation and use is an early instance of what administrative law scholars would later identify as the structural challenge of framework legislation: Congress's tendency to defer to administrative judgment precisely when the political system cannot resolve the underlying policy conflict.¹⁴

B. *The Progressive Administrative State Across Regulatory Domains*

Environmental law was not the only domain in which the Progressive Era was constructing novel administrative institutions. The Interstate Commerce Commission, established in 1887 to regulate railroad rates, was the first modern federal regulatory agency, and its early struggles—initially lacking effective enforcement authority, then gradually acquiring it through a series of statutory amendments—established a template for administrative capacity-building through iterative statutory revision that Progressive Era environmental reformers would follow.¹⁵ The Sherman Antitrust Act (1890), the Federal Trade Commission Act (1914), and the Federal Reserve Act (1913) extended the administrative impulse to the governance of market structure, consumer protection, and monetary policy.¹⁶ The Pure Food and

12. CAMACHO & DANIELS, *supra* note 1, at 58–59, 64.

13. National Park Service Organic Act, ch. 408, 39 Stat. 535, 535 (1916) (codified as amended at 54 U.S.C. §§ 100101–102). The Act charged the Service to conserve scenery, natural objects, and wildlife while simultaneously providing for public enjoyment in a manner that would leave parks “unimpaired for the enjoyment of future generations”—a mandate whose internal tension remains unresolved. *See* CAMACHO & DANIELS, *supra* note 1, at 66.

14. *See* Stewart, *supra* note 2, at 1676–77 (identifying the challenge of statutory delegation when Congress enacts broad framework legislation that defers contested policy decisions to administrative judgment, as a structural feature of environmental law that requires administrative law to develop accountability mechanisms beyond the transmission belt model).

15. Interstate Commerce Act of 1887, ch. 104, 24 Stat. 379 (codified as amended at 49 U.S.C. §§ 10101 *et seq.*). The ICC's initially limited enforcement authority and its gradual empowerment through amendments including the Hepburn Act of 1906, ch. 3591, 34 Stat. 584, established a template for administrative capacity-building through iterative statutory revision that Progressive Era environmental reformers would follow.

16. Sherman Antitrust Act of 1890, ch. 647, 26 Stat. 209 (codified as amended at 15 U.S.C. §§ 1–7); Federal Trade Commission Act, ch. 311, 38 Stat. 717 (1914) (codified at 15 U.S.C. §§ 41–58); Federal Reserve Act, ch. 6, 38 Stat. 251 (1913) (codified as amended at 12 U.S.C. §§ 221 *et seq.*).

Drugs Act of 1906 applied administrative regulation to the protection of public health from industrial food production.¹⁷ What united these regulatory projects, and what links them to the simultaneous development of conservation and natural resources law, was a shared theory of governance: that the complexity of industrial capitalism required administrative institutions capable of developing technical expertise that legislators and judges lacked.

The Legal Realist movement and the emerging disciplines of public administration provided the social science and jurisprudential foundations of this shared theory. The legal realist conviction that formal legal categories were inadequate to manage industrial social and economic problems—and that administrative discretion guided by expertise could produce outcomes that common law adjudication could not—provided the intellectual legitimation for administrative expansion across all these domains simultaneously.¹⁸ This convergence is significant: the development of American administrative law in the Progressive Era was not primarily driven by the environmental problems or by any single regulatory domain, but by a broader theory of governance that addressed industrial capitalism's consequences across sectors. Environmental law was one of the primary laboratories for this theory, but the results were designed to travel.

The constitutional questions raised by Progressive Era administrative expansion—particularly the nondelegation doctrine's application to broad congressional grants of regulatory authority—generated the era's most significant administrative law conflicts, and their resolution shaped the constitutional landscape on which all subsequent administrative innovation has occurred.¹⁹ The early New Deal's confrontation with a hostile Supreme Court, and the subsequent political resolution of that confrontation, would determine whether the Progressive Era's administrative experiments could

17. Pure Food and Drugs Act of 1906, ch. 3915, 34 Stat. 768; Federal Meat Inspection Act of 1906, ch. 3913, 34 Stat. 674.

18. See STEPHEN SKOWRONEK, *BUILDING A NEW AMERICAN STATE: THE EXPANSION OF NATIONAL ADMINISTRATIVE CAPACITIES, 1877–1920* (1982) (analyzing the political and institutional conditions that enabled Progressive Era administrative expansion and documenting the inadequacy of pre-administrative governance for managing industrial capitalism).

19. *Panama Refin. Co. v. Ryan*, 293 U.S. 388, 406–07 (1935); *Schechter Poultry Corp. v. United States*, 295 U.S. 495, 529 (1935) (invalidating broad congressional delegations under the nondelegation doctrine). The constitutional crisis these decisions produced was resolved through political pressure rather than theoretical clarification. See *W. Coast Hotel Co. v. Parish*, 300 U.S. 379, 390 (1937); *NLRB v. Jones & Laughlin Steel Corp.*, 301 U.S. 1, 41 (1937) (effectively abandoning nondelegation constraints). The theoretical question has remained contested. See *Whitman v. Am. Trucking Ass'n*, 531 U.S. 457, 472 (2001); *Gundy v. United States*, 588 U.S. 128 (2019) (plurality discussing renewed nondelegation concerns).

be scaled to the comprehensive regulatory programs that the country's environmental and economic challenges required.²⁰

The Progressive Era's administrative innovations also carried limitations that would prove consequential for environmental law. The benefits of conservation were distributed along explicitly racialized lines: the national forest system and the national parks were created for an implicitly white public, while Native Americans were dispossessed of the very lands being "preserved," and communities of color bore disproportionate shares of industrial pollution without access to the regulatory protections that were developing elsewhere.²¹ The administrative state's capacity for environmental protection was, from the beginning, shaped by whose environment was legible to the law.

II. THE NEW DEAL, THE APA, AND THE CONSTRUCTION OF THE MODERN ADMINISTRATIVE STATE

A. *The New Deal's Administrative Revolution*

The New Deal transformed the scale, scope, and theoretical ambitions of American administrative government. Between 1933 and 1938, Congress created an array of powerful agencies—the National Labor Relations Board, the Securities and Exchange Commission, the Federal Communications Commission, the Tennessee Valley Authority, and dozens of others—to restructure fundamentally the relationships between government, capital, labor, and the natural world.²² These agencies were built on and extended the Progressive Era's institutional

20. See *Schechter Poultry Corp.*, 295 U.S. at 537–38; see also *Jones & Laughlin Steel Corp.*, 301 U.S. at 37 (holding that Congress may regulate any activity that has a significant effect on interstate commerce).

21. See ROBERT D. BULLARD, *DUMPING IN DIXIE: RACE, CLASS, AND ENVIRONMENTAL QUALITY* xv–xvii, 139 (2d ed. 1990) (documenting the systematic concentration of environmental burdens in communities of color, a pattern rooted in legal structures the Progressive Era administrative state helped construct and perpetuate through explicitly racialized land, labor, and resource law). See also K. SABEEL RAHMAN, *DEMOCRACY AGAINST DOMINATION* 167–69, 171–73 (2017) (developing a critical theory of the administrative state that analyzes how regulatory institutions have historically structured racial and economic domination alongside their ostensibly neutral governance functions, and arguing for democratic alternatives that center accountability to those most affected by administrative decisions); JEDEDIAH PURDY, *AFTER NATURE: A POLITICS FOR THE ANTHROPOCENE* 189–220 (2015) (situating the racial history of environmental and administrative law within a broader account of the political economy of American environmental governance).

22. See Tennessee Valley Authority Act of 1933, Pub. L. No. 73-17, 48 Stat. 58 (codified as amended at 16 U.S.C. §§ 831–831ee); National Labor Relations Act of 1935, ch. 372, 49 Stat. 449, 449–51 (codified as amended at 29 U.S.C. §§ 151–69); Securities Exchange Act of 1934, ch. 404, 48 Stat. 881, 881–82, 885 (codified as amended at 15 U.S.C. §§ 78a *et seq.*); Communications Act of 1934, ch. 652, 48 Stat. 1064, 1064 (codified as amended at 47 U.S.C. §§ 151 *et seq.*).

scaffolding: the theory of expert agency governance, the federal-state regulatory coordination mechanisms, and the administrative capacity for resource management that the preceding generation had constructed. But Congress deployed that scaffolding at a scale and with an ambition that the Progressive Era's architects had not envisioned.

An important dimension of this period that is underappreciated in the standard administrative law literature was the emergence of public administration as a professional field that built upon President Wilson's 1887 essay.²³ By the New Deal period, this professionalization had advanced substantially: in 1937, a committee report commissioned by President Franklin D. Roosevelt articulated an influential vision of a professional executive branch staffed by career civil servants whose expertise and institutional memory would persist across changes in political leadership.²⁴ Scholars of public administration, including Luther Gulick and Lyndall Urwick, developed the organizational theory that animated the era's administrative reform agenda.²⁵

Yet the New Deal's environmental legacy is deeply paradoxical, and that contradiction is itself an important administrative law lesson. The TVA, the Bureau of Reclamation's dam-building program, the interstate highway system, and the Federal Housing Administration's subsidized mortgage programs remade the physical landscape of the United States, accelerating fossil fuel dependency, producing suburban sprawl, and excluding communities of color from the material benefits of federally subsidized development.²⁶ However, the institutional infrastructure these programs created—the administrative agencies, the rulemaking procedures, the federal capacity for large-scale resource planning—became the platform upon which modern

23. Wilson, *supra* note 8.

24. PRESIDENT'S COMMITTEE ON ADMINISTRATIVE MANAGEMENT, REPORT OF THE COMMITTEE WITH STUDIES OF ADMINISTRATIVE MANAGEMENT IN THE FEDERAL GOVERNMENT 33 (Comm. Print 1937) ("The Brownlow Committee Report").

25. Luther Gulick & Lyndall Urwick, eds., *Papers on the Science of Administration*, in THE EARLY SOCIOLOGY OF MANAGEMENT AND ORGANIZATIONS (Kenneth Thompson, ed., 1937) (collected essays developing the organizational theory that animated New Deal administrative reform).

26. See CAMACHO & DANIELS, *supra* note 1, at 90–92, 98–99, 105–06 (describing how New Deal and postwar federal housing, transportation, and energy programs produced suburban sprawl and accelerated fossil fuel dependency). The programs also systematically excluded communities of color from the benefits of federally subsidized development. See *id.*; see also Shelley v. Kraemer, 334 U.S. 1, 19–21 (1948) (invalidating judicial enforcement of racially restrictive covenants that had underpinned the racially exclusionary character of federally subsidized suburbanization). Rahman develops a racial capitalism critique of New Deal administrative institutions. RAHMAN, *supra* note 21. He argues that the expansion of the administrative state systematically extended economic and environmental benefits along racial lines while placing the costs of development on excluded communities. *Id.*

environmental law was constructed two decades later. The professionalization of bureaucracy produced a corps of career administrators whose professed expertise and continuity provided essential institutional capacity that would prove critical in developing agencies capable of exercising the technical judgment that effective environmental governance in the 1970s required.²⁷ The legal tools built for one purpose were available to be repurposed for another. This is the accretion dynamic that runs throughout American environmental legal history: institutional innovations accumulate across eras, serving different masters in different political moments, but rarely disappearing entirely.

Administrative law scholars have debated the New Deal's place in the longer history of American administrative governance. Jerry Mashaw's foundational reexamination of that history demonstrated that robust federal administrative practice predated the New Deal by generations—that the standard account treating the New Deal as the origin point of American administrative government substantially distorts the historical record.²⁸ But whatever the accuracy of the “New Deal origins” narrative as historical description, there is no disputing that the New Deal marked a qualitative change in the scale of federal administrative authority, the scope of agency regulatory power, and the ambitions of administrative governance. It also is clear that these changes were accompanied by resolute theoretical work about what justified them.

B. Landis, Legal Realism, and the Theoretical Grounding of the Administrative State

The most influential theoretical account of the New Deal administrative state is James Landis's *The Administrative Process*, derived from his 1937 Storrs Lectures at Yale Law School and published in 1938.²⁹ Landis's argument was both descriptive and normative: the administrative agency represented not a departure from constitutional governance but an evolution of it, justified by the practical necessity of bringing technical expertise to bear on

27. See Gulick & Urwick, *supra* note 25; PRESIDENT'S COMMITTEE ON ADMINISTRATIVE MANAGEMENT, *supra* note 24, at 52 (recommending reorganization of the executive branch around a professional career civil service insulated from partisan patronage). The professionalization of public administration as a driver of federal regulatory capacity in the Modernization Era is examined in ALEJANDRO E. CAMACHO & ROBERT L. GLICKSMAN, REORGANIZING GOVERNMENT (2019).

28. See JERRY L. MASHAW, CREATING THE ADMINISTRATIVE CONSTITUTION: THE LOST ONE HUNDRED YEARS OF AMERICAN ADMINISTRATIVE LAW 290–93 (2012) (demonstrating that robust federal administrative governance predated the New Deal by generations—dating to the early republic—and challenging the standard account that treats the New Deal as the origin point of American administrative government).

29. LANDIS, *supra* note 7.

problems that judicial and legislative processes were structurally incapable of addressing.³⁰ For Landis, the administrative agency was not merely an instrument of political will, but an epistemic institution—a body capable of developing specialized knowledge and institutional memory that neither courts nor legislatures could match, and of prospectively applying that knowledge with the flexibility and continuity that effective governance required.³¹

Landis's theoretical framework drew on two sources. The first was Legal Realism's conviction that formal legal categories were inadequate to the governance demands of the modern industrial state—that the pretense that common law doctrines could manage railroad rate discrimination, securities fraud, or resource depletion was an intellectual fiction that served entrenched interests at the expense of effective governance.³² The second was a sincerely held theory of democratic governance—that expertise in the service of the public interest was itself a form of democratic accountability, and that agencies staffed by skilled administrators devoted to the public welfare were more likely to advance the general good than legislatures subject to organized interest group pressure.³³ This second argument has been extensively criticized, but it was not disingenuous; it reflected an earnest, if naïve, Progressive faith in scientific management as a corrective to political corruption and capture.³⁴

The claim that the New Deal administrative state was grounded in sound legal theory requires an important qualification. The early New Deal agencies, mainly created between 1933 and 1935, were built on theoretical foundations that the Supreme Court promptly tested and found constitutionally wanting. The decisions in *Panama Refining Co. v. Ryan*³⁵ and *Schechter Poultry Corp. v. United States*,³⁶ invalidating major New Deal programs on nondelegation grounds in 1935, demonstrated that the theoretical case for broad administrative delegation did not persuade the courts.³⁷ The resolution of this

30. *Id.* at 136.

31. *Id.*

32. *See id.* at 155.

33. *See id.* at 154. Landis argued that the administrative agency was justified not merely by practical necessity but by a genuine theory of governance: that specialized agencies could develop the kind of technical expertise and institutional memory that neither courts nor legislatures could match, and that this expertise was essential to effective regulatory governance in a complex industrial economy. His argument drew explicitly on Legal Realist premises about the inadequacy of formal legal categories for managing social and economic problems.

34. Emily S. Bremer, *The Undemocratic Roots of Agency Rulemaking*, 108 CORN. L. REV. 69, 130 (2022).

35. 293 U.S. 388 (1935).

36. 295 U.S. 495 (1935).

37. *Schechter Poultry*, 295 U.S. at 541–42; *Panama Refin.*, 293 U.S. at 414, 430. These decisions invalidated central New Deal programs on nondelegation grounds, casting serious

constitutional crisis—through what historians have called the “switch in time” following Roosevelt’s court-packing proposal—was driven by political pressure rather than theoretical persuasion.³⁸ It would be more accurate to say that the administrative state that emerged from the New Deal combined genuine theoretical ambition—notably Landis’s account—with constitutional controversy that was resolved politically rather than doctrinally, leaving underlying theoretical questions open in ways that, particularly recently, have generated judicial and scholarly contestation.

C. *The Administrative Procedure Act as Theorized Synthesis*

The Administrative Procedure Act of 1946 represents the most carefully theorized product of the New Deal period and the institutional synthesis that made modern environmental law possible.³⁹ Enacted in the immediate aftermath of World War II, after nearly a decade of legislative effort to codify and regularize the administrative practice that New Deal expansion had generated, the APA was a genuine compromise: between New Dealers who wanted to protect agency flexibility and conservatives who sought to constrain administrative power through procedural requirements.⁴⁰ But it was a principled compromise, resting on a coherent theory of the relationship between administrative governance, democratic accountability, and judicial oversight that had been worked out through years of empirical study, legal argument, and political negotiation.

The APA’s procedural architecture established several foundations that would prove essential for environmental law. The Act’s codification of notice-and-comment rulemaking created the mechanism through which public participation in administrative policymaking would be channeled for decades—the same mechanism that environmental advocates would use, beginning in the 1970s, to challenge agency decisions and inject environmental values into

constitutional doubt over the administrative project before the Court’s 1937 shift effectively withdrew judicial enforcement of nondelegation limits.

38. *W. Coast Hotel Co. v. Parrish*, 300 U.S. 379, 398–99 (1937); *NLRB v. Jones & Laughlin Steel Corp.*, 301 U.S. 1, 41 (1937). The term “switch in time” refers to the Court’s pivot to upholding New Deal legislation, associated with Justice Roberts’s shift in *West Coast Hotel*, which came shortly after President Roosevelt announced his court-packing proposal in February 1937. The resolution left the nondelegation question legally open in ways that continue to generate judicial and scholarly controversy.

39. Administrative Procedure Act, Pub. L. No. 79-404, 60 Stat. 237 (1946) (codified at 5 U.S.C. §§ 551–706); see Attorney General’s Committee on Administrative Procedure, *Administrative Procedure in Government Agencies*, S. Doc. No. 77-8 (1941) (providing the foundational study of existing agency practice that preceded the APA’s enactment after nearly a decade of legislative effort to codify and regularize administrative procedure).

40. See Attorney General’s Committee on Administrative Procedure, *supra* note 39.

administrative processes.⁴¹ Its distinction between informal rulemaking and formal adjudication created procedural tracks calibrated to the different governance functions agencies perform.⁴² And its judicial review provisions—directing courts to set aside agency action found to be arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law—created the external accountability mechanism that gives the administrative state its constitutional legitimacy while preserving agency authority to make technical judgments that courts are not especially well positioned to rigorously second-guess.⁴³

The APA's enactment prompted a generation of administrative law scholarship that elaborated its theoretical implications and evaluated its practical operation. Walter Gellhorn, who had participated in the Attorney General's study of administrative procedure that preceded the Act, contributed foundational empirical analysis of how administrative agencies actually functioned on the ground.⁴⁴ Louis Jaffe developed the systematic account of the scope and standards of judicial review that remained the leading treatment of the subject for decades, and that provided the theoretical foundations on which environmental litigants would build when they began challenging agency action in the 1970s.⁴⁵ This body of scholarship—rigorous, theoretically ambitious, and seriously engaged with the practical challenges of administrative governance—represents the administrative law tradition's consolidation of the gains of the preceding four decades. It was the inheritance on which the Environmental Era's legal innovators would draw.

41. 5 U.S.C. § 553.

42. *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (requiring agencies to “examine the relevant data and articulate a satisfactory explanation for [their] action[s], including a rational connection between facts found and the choice made”); 5 U.S.C. § 706(2)(A) (directing courts to set aside agency action found to be “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law”).

43. 5 U.S.C. § 553 (informal, notice-and-comment rulemaking); *id.* §§ 554–57 (formal adjudication). The APA's distinction between these procedural tracks, and the question of which is required in a given regulatory context, has been a central preoccupation of administrative law for decades.

44. WALTER GELLHORN, *FEDERAL ADMINISTRATIVE PROCEEDINGS* 1–2 (1941).

45. LOUIS L. JAFFE, *JUDICIAL CONTROL OF ADMINISTRATIVE ACTION* 3 (1965) (developing a systematic account of the scope and standards of judicial review of administrative action that remained the leading treatment of the subject for decades after its publication).

III. THE ENVIRONMENTAL ERA AND THE APA AS PLATFORM FOR ENVIRONMENTAL LAW

A. *The APA's Procedural Legacy and the Environmental Movement*

The environmental legislation of the 1960s and 1970s did not emerge from a legal vacuum. It was built, with extraordinary creativity and energy, on the procedural architecture that the APA had established and the institutional infrastructure that the preceding decades of administrative development had created.⁴⁶ The cascade of major statutes—National Environmental Policy Act (NEPA) (1969), the Clean Air Act (1970), the Clean Water Act (1972), the Endangered Species Act (1973), the Resource Conservation and Recovery Act (1976), and Superfund (1980)—was constructed on APA foundations. Each statute created new regulatory programs administered by federal agencies largely operating under APA procedural requirements. Each used APA rulemaking or close analogs as the mechanism for translating broad statutory mandates into specific regulatory standards. And each relied on APA-based judicial review as the mechanism for holding agencies accountable to their statutory obligations—both when they were deemed to over-regulate and when they failed to act.

Richard Stewart's landmark 1975 article in the *Harvard Law Review* provides the most important theoretical account of what the Environmental Era produced in American administrative law.⁴⁷ Stewart argued that the New Deal's "transmission belt" conception of administrative law—treating agencies as implementers of legislative policy determinations—had given way under the pressure of environmental litigation to a new "interest representation" model, in which administrative law's primary function was to ensure that all affected interests had meaningful access to administrative proceedings. Environmental law was the primary driver of this transformation. The citizen suit provisions that began with the Clean Air Act, the procedural standing requirements of NEPA, and the broadly participatory notice-and-comment processes that environmental advocates deployed to challenge agency decisions all reflected and reinforced the shift. Stewart's account remains the essential theoretical framework for understanding the Environmental Era's contribution to administrative law.

46. See CAMACHO & DANIELS, *supra* note 1, at ch. 4.

47. Stewart, *supra* note 2, at 1712–40 (documenting the shift from the transmission belt to the interest representation model as the dominant conception of administrative law and identifying environmental law as the primary institutional driver of that transformation).

B. NEPA and the Information-Forcing Innovation

The National Environmental Policy Act of 1969 represents perhaps the most important and theoretically innovative administrative law contribution of the Environmental Era.⁴⁸ NEPA's requirement that federal agencies prepare environmental impact statements before taking major federal actions affecting the environment created a new theory of governance—information-forcing regulation.⁴⁹ It was designed to improve agency behavior and decisionmaking not by limiting agency authority through a substantive rule, but by requiring agencies to identify, evaluate, and disclose the environmental impacts and alternatives before taking action. The theory was a creative extension of the APA tradition: rather than merely requiring agencies to follow prescribed procedures in exercising their discretion, NEPA required them to generate and consider specific kinds of information as a precondition of action.⁵⁰ The procedural innovation would be premised on advancing both the expertise and interest representation models of administrative legitimacy. By requiring the generation, collection, and dissemination of information, agencies could both improve regulatory outcomes and enhance legitimacy by giving affected parties better information and greater opportunities to participate in decision making.⁵¹

NEPA's significance in administrative law extends well beyond the environmental law domain, as its impact assessment requirement applies to federal agencies across the administrative state.⁵² Additionally, NEPA's reliance on procedural governance to generate better substantive outcomes sought to

48. National Environmental Policy Act of 1969, Pub. L. No. 91-190, 83 Stat. 852 (codified as amended at 42 U.S.C. §§ 4321–47).

49. See Stewart, *supra* note 2, at 1711–12; National Environmental Policy Act of 1969, Pub. L. No. 91-190, 83 Stat. 852–53 (codified as amended at 42 U.S.C. §§ 4321–47).

50. See CAMACHO & DANIELS, *supra* note 1, at 130–32 (discussing NEPA's information-forcing theory and its influence on subsequent administrative law development across regulatory domains beyond the environmental).

51. See *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349–51 (1989) (characterizing NEPA's requirements as “action forcing” and procedural while recognizing that the environmental impact statement process serves the dual purposes of structuring agency deliberation and enabling meaningful public engagement with proposed federal actions); see also Thomas O. McGarity, *Some Thoughts on “Deossifying” the Rulemaking Process*, 41 DUKE L.J. 1385, 1385–87 (1992) (noting how procedural disclosure requirements restructure the information environment of agency decisionmaking).

52. 42 U.S.C. § 4332(2)(C) (requiring preparation of an environmental impact statement for all “major Federal actions significantly affecting the quality of the human environment”). NEPA's procedural mandate applies to the actions of virtually every federal department and agency, making it the closest approximation to a general procedural administrative law of environmental decisionmaking in American law. See *Dep't of Transp. v. Public Citizen*, 541 U.S. 752, 763 (2004); CAMACHO & DANIELS, *supra* note 1, at 132.

change what agencies actually do, not merely how they do it, by changing the information environment within which discretion is exercised.⁵³ This proceduralist theory has influenced subsequent administrative law developments across regulatory domains, from consumer financial protection to emerging debates about algorithmic accountability.⁵⁴ In the context of recent permitting reform debates, these longstanding purposes of NEPA seem to have been forgotten or ignored, with conservatives and moderate “abundance” progressives focusing more on approval efficiency than NEPA’s intrinsic democratic legitimacy and instrumental efficacy goals.⁵⁵

C. *Citizen Suits, Standing, and the Democratization of Administrative Enforcement*

The citizen suit provision, first incorporated in the Clean Air Act of 1970, represented a second major administrative law innovation.⁵⁶ By granting any person standing to sue polluters for statutory violations and to compel the Environmental Protection Agency (EPA) to perform non-discretionary duties, Congress created a private enforcement mechanism without precedent in the history of federal regulatory law.⁵⁷ The provision was, in effect, a legal innovation designed to solve an administrative capacity problem: federal agencies lacked the resources to identify and prosecute all violations of the new environmental statutes, and the traditional common law remedies were inadequate to address diffuse, large-scale pollution harms.⁵⁸ But it was also a theoretical innovation, reflecting a resolution of the debate between

53. See *Public Citizen*, 541 U.S. at 757–58 (explaining that NEPA requires agencies to consider detailed environmental information and disclose it to the public, thereby shaping decision making despite imposing no substantive mandates).

54. See Danielle Keats Citron, *Technological Due Process*, 85 WASH. U. L. REV. 1249, 1254–55 (2008) (drawing on proceduralist theories of administrative accountability like NEPA to argue for process-based constraints on algorithmic government decisionmaking). The broader diffusion of environmental law’s participatory procedural mechanisms across the regulatory state is analyzed in Stewart, *supra* note 2, at 1748–56, 1805–13.

55. See Robert L. Glicksman & Alejandro E. Camacho, *The Trump Card: Tarnishing Planning, Democracy, and the Environment*, 50 ENV’T L. REP. 10281, 10283 (2020); Alejandro E. Camacho & Robert L. Glicksman, *NEPA: The Accepted Lies and Mistakes About this Critical Environmental Law*, REVELATOR (June 27, 2025), <https://therevelator.org/nepa-lies-mistakes/> [<https://perma.cc/RJL6-5A5H>].

56. Clean Air Act § 304, 42 U.S.C. § 7604 (2018). Citizen suit provisions were subsequently incorporated in the Clean Water Act, the Endangered Species Act, and most major environmental statutes enacted through the 1970s.

57. *Id.*

58. Stewart, *supra* note 2, at 1723–28 (describing citizen suits as an expression of the interest representation model of administrative law).

the transmission belt and interest representation models in favor of a genuinely participatory conception of administrative law.⁵⁹

IV. COLLABORATIVE GOVERNANCE, ADAPTIVE MANAGEMENT, AND THE ECOLOGY OF ADMINISTRATIVE LAW

A. *The Structural Limitations of Prescriptive Regulation*

While ground-breaking, the pervasive prescriptive regulatory model of the 1970s rested on assumptions about administrative governance that implementation experience quickly began to complicate. The model, though incredibly varied in terms of the tools, standards, and structures employed to address diverse environmental problems, presumed that (1) federal agencies could prospectively identify and adopt clear pollution control standards; (2) the APA's prevailing rulemaking and permitting processes could provide quality opportunities for participation to affected parties; (3) these processes could offer functional pathways for implementing statutory regimes; and (4) agency monitoring and enforcement mechanisms, supplemented by citizen suits, would be adequate to ensure statutory goals.⁶⁰ Each assumption proved, in practice, substantially optimistic—and the limitations were not primarily failures of individual administrators or agencies but structural features of the prescriptive model itself.⁶¹

The administrative law literature in the beginning of the Contested Era—the 1980s and 1990s—engaged seriously with some of these structural limitations. For example, Stewart's 1975 article had already identified a risk of ossification: that increased elaboration of procedural requirements, particularly through expanding standards of judicial review, could make the regulatory process so burdensome as to impede effective administration.⁶² The Court's decision in *Vermont Yankee Nuclear Power Corp. v. NRDC*⁶³—prohibiting judicial imposition of procedures beyond the APA's requirements—

59. See *id.* (analyzing the citizen suit provision as an expression of the interest representation model of administrative law, in which the legitimacy of regulatory governance derives from the incorporation of affected interests into administrative processes).

60. See Jody Freeman, *Collaborative Governance in the Administrative State*, 45 UCLA L. REV. 1, 18–26 (1997).

61. See *id.* (documenting the structural limitations of prescriptive environmental regulation—its adversarial character, poor adaptation to local variation, and inadequacy for managing scientific uncertainty—that motivated the development of collaborative alternatives).

62. See Stewart, *supra* note 2, at 1805–13 (identifying the risk of procedural ossification due to growing burdens on the rulemaking process through the elaboration of notice-and-comment requirements and judicial review standards).

63. 435 U.S. 519 (1978)

represented a judicial recognition of this risk, though it did not eliminate the problem.⁶⁴ The adversarial posture of participation under the interest representation model increasingly generated litigation that impeded statutory implementation. Meanwhile, President Reagan's consequential executive order requiring agencies to submit major rules before promulgation to the Office of Management and Budget for cost-benefit review has been identified by many administrative law scholars as slowing rulemaking.⁶⁵

Others raised concerns regarding administrative accountability when agencies exercise broad discretionary authority under conditions of uncertainty, in domains where neither compliance nor effectiveness can be reliably measured.⁶⁶ It became clear that, particularly in environmental law, scientific uncertainty and the dynamic character of ecological systems undermined the prescriptive model's assumption of stable and objective regulatory targets. And the uniform national standards that gave the statutes their legal clarity proved poorly adapted to the heterogeneity of local environmental conditions. Indeed, this led to criticism on all fronts—from regulated industries, who argued they were overburdened by excessive centralization and rigidity, and from environmental advocates, who argued the core failure of environmental statutes was a gap between the laws as written and implemented.⁶⁷ Jerry Mashaw suggested that the prescriptive model's solution—procedural accountability through notice-and-comment rulemaking and judicial review of arbitrary and capricious decisions—was a partial answer at best.⁶⁸

At least part of the problem was the theoretical underdevelopment of the concept of expertise in administrative law—what it means, who possesses it,

64. *Id.* at 547–48 (warning against judicial imposition of procedures beyond the APA's requirements, a warning that has not uniformly been heeded in practice).

65. Exec. Order No. 12,291, 3 C.F.R. 127 (1981); *see also* William H. Rodgers, Jr., *Executive Orders and Presidential Commands: Presidents Riding to the Rescue of the Environment*, 21 J. LAND RES. & ENV'T L. 13, 16–17 (2001) (explaining Executive Order 12,291).

66. Jeremy Kessler & Charles Sabel, *The Uncertain Future of Administrative Law*, 150 DÆDALUS 188, 189–90 (2021).

67. *See* Dave Owen, *The Negotiable Implementation of Environmental Law*, 75 STAN. L. REV. 137, 141 (2023) (arguing that both critiques from regulated industries and environmental advocates about the failures of environmental statutes are implicitly about negotiated implementation, where the former's vie rigidity implies that very little is negotiable, and the latter critique argues that problematic negotiations are pervasive).

68. JERRY L. MASHAW, *DUE PROCESS IN THE ADMINISTRATIVE STATE* (1985); JERRY L. MASHAW, *BUREAUCRATIC JUSTICE: MANAGING SOCIAL SECURITY DISABILITY CLAIMS* (1983) (developing accountability frameworks applicable to administrative governance under conditions of broad delegated discretion and asking not merely how agencies can be made procedurally compliant but how they can be made genuinely responsive to the public values they are charged with serving).

and how it should be evaluated and appropriately constrained.⁶⁹ New Deal theoretical assumptions of scientific and technical expertise as objective or perfectly precise continued to dominate administrative literature, failing to account for the fact that expertise is often uncertain and iterative.⁷⁰ The prescriptive model as enshrined in the APA also offered at best limited and at worst empty opportunities for participation—not only in initial standard setting but also implementation, monitoring, and enforcement.⁷¹ This democracy deficit raised further questions about the legitimacy of environmental law's conventional model of administrative procedure. Though modest innovations were made to push the boundaries of this model—most prominently, President Clinton's executive order directing federal agencies to identify and address the disproportionate environmental effects of their actions on minority and low-income communities—grafting an equity analysis onto agency decisionmaking had glaring limits.⁷² The governance innovations of the Contested Era were, in important part, attempts to develop more adequate answers.

B. Collaborative Governance: Theory and Practice

Jody Freeman's foundational 1997 account of collaborative governance in the administrative state defined the approach as one in which private parties and government officials share regulatory responsibility across a variety of institutional arrangements—a reconceptualization of the agency's role from command authority to collaborative facilitator.⁷³ Freeman's account drew on empirical examples from environmental law—negotiated rulemaking experiments, collaborative watershed management, and Habitat Conservation Plans under the Endangered Species Act—to argue that collaborative governance represented not merely a procedural innovation but a reconceptualization of the administrative state's relationship to civil society.⁷⁴ Where the interest representation model assumed an adversarial relationship between agencies and affected interests, mediated by procedural requirements,

69. Sidney A. Shapiro, *The Failure to Understand Expertise in Administrative Law: The Problem and the Consequences*, 50 WAKE FOREST L. REV. 1097, 1097–98 (2015).

70. *Id.* at 1099–1100.

71. E. Donald Elliott, *Re-Inventing Rulemaking*, 41 DUKE L.J. 1490, 1492 (1992) (“Notice-and-comment rulemaking is to public participation as Japanese Kabuki theater is to human passions—a highly stylized process for displaying in a formal way the essence of something which in real life takes place in other venues.”).

72. Exec. Order No. 12,898, 59 Fed. Reg. 7,629, 7,629–31 (Feb. 16, 1994); *see also* Rodgers Jr., *supra* note 65, at 22 (explaining Executive Order 12,898).

73. Freeman, *supra* note 60, at 22.

74. *Id.* at 2, 22, 30.

collaborative governance was premised on bringing together agencies, regulated entities, and affected communities into constructive partnership for the joint development and implementation of regulatory standards.⁷⁵

The legal framework for collaborative governance in the environmental domain developed through several mechanisms. Most prominently, the Negotiated Rulemaking Act of 1990 formalized regulatory negotiation as an alternative to the prescriptive model's unilateral approach to agency rulemaking, creating a procedural structure for involving representatives of affected interests in the drafting of proposed rules.⁷⁶ Habitat Conservation Plans, authorized under a 1982 amendment to the Endangered Species Act, provided a different statutory vehicle for multiparty collaboration, with Section 10 allowing the agency, landowner-applicant, and other affected interests to negotiate conservation measures that would reconcile species protection with economic development in advance of an incidental take permit.⁷⁷ Third, the Clean Water Act's total maximum daily load program, as implemented from the 1990s onward, created opportunities for multi-stakeholder processes to allocate pollution reduction obligations among point and nonpoint sources within a watershed.⁷⁸ And novel institutional arrangements that extended collaborative governance into the oversight of individual projects also arose through settlements of major environmental disputes that conferred co-management roles on environmental groups—including design input, site access, and independent monitoring.⁷⁹

It is worth noting that while collaborative governance initiatives are amongst the most visible vehicles for negotiated governance, they are hardly the only ones. As Dave Owen has demonstrated, negotiation is a pervasive and defining feature of environmental law, operating across substantive subfields and at every

75. *Id.* at 23–30 (contrasting the adversarial structure of the interest representation model, in which affected parties participate by challenging agency decisions, with the constructive partnership model of collaborative governance, in which agencies, regulated entities, and affected communities jointly develop regulatory standards and implementation approaches).

76. Negotiated Rulemaking Act of 1990, Pub. L. No. 101-648, § 2(4), 104 Stat. 4969 (codified at 5 U.S.C. §§ 561–70); see also Philip J. Harter, *Negotiating Regulations: A Cure for Malaise*, 71 GEO. L.J. 1, 7 (1982) (advocating for regulatory negotiation in advance of the Negotiated Rulemaking Act).

77. Endangered Species Act of 1973, 16 U.S.C. § 1539(a)(2)(A)–(B) (2018) (authorizing permits for the incidental take of listed species in connection with otherwise lawful activities, conditioned on implementation of a Habitat Conservation Plan providing for conservation measures sufficient to minimize and mitigate the impacts of the taking).

78. Clean Water Act, 33 U.S.C. § 1313(d) (2018) (requiring states to establish total maximum daily loads for water bodies that fail to meet applicable water quality standards, creating a framework that has in practice often involved multi-stakeholder processes for allocating pollution reduction obligations among point and nonpoint sources).

79. See William H. Rodgers, Jr., *The Most Creative Moments in the History of Environmental Law: "The Whats,"* 2000 U. ILL. L. REV. 1, 26–27 (2000).

stage of the governance process—legislation, rulemaking, and the crafting of individual permit terms—even in regimes long regarded as “prescriptive and rigid.”⁸⁰ By his account, negotiation in environmental law frequently has been constitutive rather than merely evasive. In the absence of a predefined legal standard, agreement among the parties often determines what the law will be, how it applies, and what counts as compliance in the first place, helping to create obligations rather than simply fixing the degree of tolerated noncompliance.⁸¹ In this way, Owen argues that negotiation is often a prerequisite to, rather than an impediment to, effective environmental law.

That being said, challenges regarding the efficacy and legitimacy of collaborative governance have been thoroughly examined in administrative law literature. These include efficiency and regulatory capture concerns, with collaborative processes ostensibly more vulnerable to domination by well-organized groups at the expense of diffuse public interests.⁸² Others suggested that if consensus were required, as some collaborative processes presuppose, then agreement might occur only at the level of the lowest common denominator.⁸³ Some raised accountability concerns about displacement of agency authority through reliance on negotiated agreement by the affected parties as the basis for a regulatory standard or permit.⁸⁴ The mechanisms of democratic accountability that give the administrative state its constitutional legitimacy are complicated if authority for the rule or permit is not primarily housed in an accountable agency official.⁸⁵ Unsurprisingly, most

80. Owen, *supra* note 67, at 140–41.

81. *Id.* at 141.

82. See Cary Coglianese, *Assessing Consensus: The Promise and Performance of Negotiated Rule-making*, 46 DUKE L.J. 1255, 1280–90 (1997) (providing an empirical examination of negotiated rulemaking, finding it did not consistently reduce litigation rates or shorten rulemaking timelines and raising questions about adequate representation of diffuse public interests).

83. See *id.* at 1285–90, 1294–96, 1301, 1309, 1312 (finding that consensus requirements in negotiated rulemaking tended to produce agreement at levels insufficient to realize the full statutory goals achievable through conventional rulemaking); see also David A. Dana, *The New “Contractarian” Paradigm in Environmental Regulation*, 2000 U. ILL. L. REV. 35, 52–58 (2000) (examining the theoretical and practical implications of contractarian, consensus-based approaches to environmental regulation and their capacity to protect diffuse interests).

84. See William Funk, *When Smoke Gets In Your Eyes: Regulatory Negotiation and the Public Interest – EPA’s Woodstove Standards*, 18 ENV’T. L. 55, 92, 94–96 (1988).

85. See Freeman, *supra* note 60 at 23, 73–78, 83 (acknowledging the regulatory capture risk in collaborative processes and identifying design features—adequate representation of diffuse interests, independent facilitation, transparent deliberation—intended to mitigate it); see also MASHAW, *supra* note 68 (developing accountability frameworks applicable to administrative governance under conditions of broad delegated discretion). For additional empirical accounts of collaborative governance performance in environmental contexts, see Jody

adopted experiments embedded the collaborative governance process as an additional procedural step in an otherwise conventional administrative process, lodging final administrative approval in any negotiated agreement in the agency (often at the expense of efficiency).⁸⁶

Of course, adopting a multilateral, participatory, and adaptive model of administration does not require cooperation among affected interests. Habermas and others have long argued for the cultivation of participatory mechanisms in public decisionmaking even if they were not to reduce conflict.⁸⁷ Chantal Mouffe in fact argued that democratic participation primarily serves to mobilize productive dispute,⁸⁸ and Professor Daniel Walters built on such theory to suggest an array of creative strategies that would promote agonistic administrative procedure.⁸⁹

C. Adaptive Management: Ecology, Law, and the Challenge of Complexity

The second major administrative innovation of the Contested Era draws its theoretical foundations from a body of ecological science that has transformed how scientists and, increasingly, lawyers understand the relationship between governance and complex systems. The foundational contribution is C.S. Holling's 1973 paper, *Resilience and Stability of Ecological Systems*.⁹⁰ Holling's central insight departed from equilibrium-centered approaches that

Freeman & Daniel A. Farber, *Modular Environmental Regulation*, 54 DUKE L.J. 795, 805, 837–45, 866 (2005) (evaluating the conditions under which modular, collaborative approaches to environmental regulation produce superior implementation outcomes) and Daniel A. Farber, *Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law*, 23 HARV. ENV'T. L. REV. 297, 300–01, 303–05, 311 (1999) (examining empirically the systematic gap between formal regulatory standards and actual compliance performance, a central concern that collaborative governance proponents argue their approaches can reduce).

86. See Freeman & Farber, *supra* note 85 at 845, 860–65, 877 (analyzing the relationship between collaborative processes and conventional administrative law requirements and concluding that collaborative mechanisms function most effectively when integrated into, rather than substituted for, the accountability structures of conventional administrative procedures).

87. See JÜRGEN HABERMAS, BETWEEN FACTS AND NORMS: CONTRIBUTIONS TO A DISCOURSE THEORY OF LAW AND DEMOCRACY 358–60 (1996).

88. CHANTAL MOUFFE, THE DEMOCRATIC PARADOX 101–03 (2000).

89. Daniel E. Walters, *The Administrative Agon: A Democratic Theory for a Conflictual Regulatory State*, 132 YALE L.J. 1, 64–84 (2022) (recommending allowing openly political reasons to justify policy changes, “hardwiring conflict” through retrospective review, regulatory sunset provisions, and elevating “regulatory contrarians” such as ombudsmen, actively promoting representational balancing during public engagement processes, and reviving citizen-suit enforcement).

90. C.S. Holling, *Resilience and Stability of Ecological Systems*, 4 ANN. REV. ECOLOGY & SYSTEMATICS 1, 2, 15, 18, 21 (1973). Holling's concept of ecological resilience—the capacity of a system to absorb disturbance and reorganize while retaining essentially the same function and structure—was a foundational departure from equilibrium-centered approaches to ecosystem management.

had dominated ecological science and natural resource management: ecological systems are not characterized by a single stable equilibrium toward which management should aim but by multiple possible states, threshold effects that can produce rapid and irreversible transitions between those states, and a fundamental property—resilience—that describes a system’s capacity to absorb disturbance and reorganize while retaining essential function and structure.⁹¹ Management premised on the assumption of a single equilibrium and optimized for efficiency within that equilibrium systematically erodes resilience, making systems more vulnerable to collapse.

Holling developed the practical governance implications of this insight in subsequent scholarship.⁹² Adaptive management, as Holling conceived it, treats policy interventions as experiments rather than solutions: it requires the explicit articulation of the assumptions that a management policy embeds, the design of monitoring programs capable of testing those assumptions, and the institutionalization of adjustment processes that respond to what monitoring reveals.⁹³ The core commitment is learning rather than optimization—a fundamental reorientation for governance systems designed based on the premise of governmental capacity to prospectively determine and then implement the correct answer rather than of iteratively improving a provisional strategy made under conditions of uncertainty.⁹⁴

91. See *id.* at 15, 18.

92. INT’L INS. FOR APPLIED SYS. ANALYSIS, ADAPTIVE ENVIRONMENTAL ASSESSMENT AND MANAGEMENT 19–20 (C.S. Holling ed., 1978) (introducing adaptive management as a structured approach that treats policy interventions as experiments, requires systematic monitoring and evaluation, and adjusts management practices in response to results—a methodology premised on the irreducible uncertainty of complex ecological systems).

93. See Holling, *supra* note 90, at 21.

94. See PANARCHY: UNDERSTANDING TRANSFORMATIONS IN HUMAN AND NATURAL SYSTEMS (Lance H. Gunderson & C.S. Holling, eds., 2002) (Holling’s framework was substantially elaborated in the work he developed with ecologist Lance Gunderson. *Id.* Their 2002 volume *Panarchy: Understanding Transformations in Human and Natural Systems* introduced the concept of panarchy: a cross-scale theory of how ecological and social systems are organized through nested adaptive cycles operating at different temporal and spatial scales. *Id.* Each adaptive cycle passes through phases of exploitation (rapid growth), conservation (accumulation and stabilization), release (creative destruction), and reorganization (restructuring)—and the interactions between cycles operating at different scales determine the system’s overall capacity for both stability and transformation. Carl Walters’s development of the quantitative modeling framework for adaptive management extended Holling’s conceptual work to practical fisheries and wildlife management, providing the empirical and methodological tools that resource managers could deploy. See CARL WALTERS, ADAPTIVE MANAGEMENT OF RENEWABLE RESOURCES (1986) (developing the quantitative modeling framework for adaptive management in the natural resources context, extending Holling’s conceptual framework

The translation of adaptive management theory into law has been a central endeavor for numerous environmental legal scholars since the 1990s.⁹⁵ The challenges are substantial and structural. Adaptive management requires agencies to articulate the scientific assumptions underlying their decisions with a specificity that standard rulemaking does not demand—because it is only against those articulated assumptions that the need for adjustment can be assessed. It creates ongoing obligations to collect and analyze monitoring data, obligations that must be translated into enforceable legal commitments without creating perverse incentives to avoid the collection of inconvenient data. And adaptive management may require agencies to revisit and revise prior decisions in ways that implicate finality and reliance concerns that the APA's procedural structure initially sought to protect.

In this sense, adaptive management raises fundamental questions for judicial review. For instance, a reviewing court that treats every adjustment to an adaptive management plan as a fresh rulemaking, requiring notice and comment and substantive justification, would defeat the learning-orientation that adaptive management needs. Similarly, a court that defers entirely to adaptive adjustments would fail to constrain agency discretion in the ways that administrative accountability demands.⁹⁶ Building on Holling's resilience insight, Lance Gunderson and others developed panarchy theory, which conceives ecological systems as nested adaptive cycles operating at multiple temporal and spatial scales.⁹⁷ In contrast to existing administrative law frameworks, which largely are designed for uniform national application, panarchy theory suggests effective environmental governance requires organization across multiple scales, from international to ecosystem-specific.

Yet as in past eras, legal imagination through the judicial and legal academy skillfully offered adjustments to the theory and doctrine of

to practical fisheries and wildlife management applications, and elaborating the experimental design requirements for learning-oriented governance).

95. See generally Robert L. Glicksman & Jarryd Page, *Adaptive Management and NEPA: How to Reconcile Predictive Assessment in the Face of Uncertainty with Natural Resource Management Flexibility and Success*, 46 HARV. ENV'T. L. REV. 121, 127–52 (2022) (describing efforts by federal land management agencies to integrate adaptive management strategies into their NEPA compliance processes).

96. See PANARCHY: UNDERSTANDING TRANSFORMATIONS IN HUMAN AND NATURAL SYSTEMS, *supra* note 94, at 5–10 (discussing the institutional challenges of governance that must adapt across temporal and spatial scales and the pathologies of management regimes optimized for single-equilibrium conditions); see also ELIZABETH FISHER, *RISK REGULATION AND ADMINISTRATIVE CONSTITUTIONALISM* (2007) (analyzing from a comparative administrative law perspective the structural tensions between legal certainty demands and governance requirements in complex, uncertain domains).

97. See PANARCHY: UNDERSTANDING TRANSFORMATIONS IN HUMAN AND NATURAL SYSTEMS, *supra* note 94.

administrative law addressing and accommodating these tensions. Courts evaluated adaptive management commitments in environmental regulatory decisions, with some constraining but others enabling effective adaptive governance.⁹⁸ Scholars proposed an administrative law framework including judicial review that preserved learning capacity while maintaining appropriate accountability constraints.⁹⁹ Others identified circumstances under which the use of adaptive management protocols might be more effective and legitimate.¹⁰⁰ Scholars also have offered alternatives for integrating experimentalism and empiricism into administrative structures and processes beyond formal strict adaptive management protocols,¹⁰¹ perhaps through mechanisms like regulatory sandboxes.¹⁰²

V. THE NEXT FRONTIER: LEGAL IMAGINATION FOR CLIMATE CHANGE AND EMERGING TECHNOLOGIES

A. *Climate Change and the Limits of Existing Administrative Frameworks*

Climate change is the defining environmental challenge of the present Contested Era, and its relationship to administrative law illustrates both the power and the limits of the legal inheritance described in the preceding sections. The Clean Air Act has been pressed into service as a de facto climate statute—but imperfectly, at enormous legal and political cost. In *West Virginia v. EPA*,¹⁰³ the Supreme Court established and applied the “major questions doctrine,”

98. See J.B. Ruhl & Robert L. Fischman, *Adaptive Management in the Courts*, 95 MINN. L. REV. 424, 427, 444, 444 n.84, 445, 445 nn. 87–88 (2010).

99. See *id.* at 427, 444, 445, 445 nn. 87–88; J.B. Ruhl & Robin Craig, *Designing Administrative Law for Adaptive Management*, 67 VAND. L. REV. 1, 2, 4, 15, 51 (2014).

100. See Holly Doremus et al., *Making Good Use of Adaptive Management*, CTR. FOR PROGRESSIVE REFORM WHITE PAPER # 1104 (2011); J.B. Ruhl, *Regulation by Adaptive Management—Is It Possible?*, 7 MINN.J. L. SCI. & TECH. 21, 22–23, 25, 27–30, 31 n.22, 36–38 (2005) (examining the structural conditions under which administrative law can accommodate adaptive management requirements and identifying the principal legal obstacles to its implementation); Holly Doremus, *Adaptive Management, the Endangered Species Act, and the Institutional Challenges of “New Age” Environmental Protection*, 41 WASHBURN L.J. 50, 66, 75, 84, 86 (2001) (analyzing the institutional prerequisites for implementing adaptive management under the ESA, with particular attention to the procedural constraints that limit its application to listing and recovery plan decisions).

101. See, e.g., CAMACHO & GLICKSMAN, *supra* note 27, at 234–36 (detailing a structural adaptive governance framework that seeks to institutionalize experimentalism and empiricism into governmental assessments of allocations of regulatory authority).

102. See, e.g., Cristie Ford & Quinn Ashkenazy, *The Legal Innovation Sandbox*, 72 AM. J. COMP. L. 557, 580 (2024) (providing a design roadmap for regulatory sandboxes, i.e., supervised spaces for testing innovations under relaxed rules, from fintech to law).

103. 142 S. Ct. 2587 (2022).

limiting the EPA's authority to impose generation-shifting emissions reduction requirements.¹⁰⁴ The Court held that such a consequential restructuring of the national electricity grid required a clear congressional statement that the Court asserted the Clean Air Act does not provide.¹⁰⁵

The decision reflects a deeper structural challenge. The regulatory framework developed originally in the Progressive Era, matured in the Modernization Era, and applied in the Environmental Era to address environmental problems were not designed for the scale, the systemic character, or the inter-jurisdictional complexity of climate change. Prescriptive regulation of discrete pollution sources has unmistakably proven to reduce local air, water, and land pollution effectively and substantially.¹⁰⁶ The prescriptive model's structural limitations discussed in Part IV thus operated alongside genuine achievement: the model produced significant progress on the pollution problems for which it was designed, even as it struggled with the ossification, uncertainty, and participation deficits that motivated later procedural experimentation.

Addressing problems from more diffuse and disparate sources of pollution, such as nonpoint source water pollution, have proven more challenging but nonetheless targetable.¹⁰⁷ Yet climate change raises the complexity an order of magnitude, whether from the vast range of uncertain effects on ecological systems or its demand for systemic decarbonization of an economy and energy system embedded in global supply chains, trade, and long-lived investments. Reliance on conventional prescriptive administrative regulation and processes as well as the relatively modest collaborative and adaptive governance innovations will be vital but insufficient for managing the scientific and regulatory uncertainty, diversity, and complexity of climate change.

The mismatch is structural rather than merely operational. Prescriptive regulation works most effectively for managing discrete pollution sources whose emissions can be measured and jurisdictional boundaries within which

104. *Id.* at 2609.

105. *See id.* at 2614–16 (applying the major questions doctrine to hold that EPA lacked authority under Clean Air Act § 111(d) to adopt a generation-shifting approach to carbon emission reduction that would restructure the national electricity grid, absent a clear congressional statement authorizing regulation of such economic and political significance).

106. *See, e.g.,* Ann E. Carlson, *Iterative Federalism and Climate Change*, 103 NW. U. L. REV. 1097, 1104–05, 1107–08, 1113, 1116–17, 1144, 1160–61 (2009) (reviewing the record of Clean Air Act regulatory programs and documenting substantial reductions in criteria air pollutant concentrations since 1970).

107. *See* Clean Water Act § 319, 33 U.S.C. § 1329(a)-(b) (2018) (establishing the nonpoint source management program as the primary federal mechanism for addressing diffuse source water pollution, relying primarily on state plans rather than federal prescriptive regulation).

enforcement can operate.¹⁰⁸ Greenhouse gas emission reduction, on the other hand, involves diffuse sources across every sector of the economy, a stock pollutant whose effects accumulate globally across generations, and a governance problem that no single jurisdiction can resolve.¹⁰⁹ Adapting to the effects of climate change raises similarly complex governance issues.¹¹⁰ Collaborative governance can build cooperation among affected interests, but it cannot generate the systemic decarbonization that the scale of the problem requires. Adaptive management can produce learning within a program but cannot substitute for the ambition of the program itself.

What the moment appears to demand is neither a rejection of these tools nor faith that their incremental extension will suffice, but a wider aperture of legal imagination that develops new administrative architectures alongside them.¹¹¹ To date, however, the most innovative legal strategies employed remain modest. The Inflation Reduction Act of 2022 represents the most significant Congressional response to climate change in American history.¹¹² Its reliance on investment subsidies and tax incentives rather than regulatory mandates as the primary mechanism for transforming energy system economics reflects an attempt to achieve climate objectives through fiscal tools that do not require the kind of direct administrative command authority that *West Virginia* placed in question.¹¹³

Whether this approach proves adequate, and whether the administrative implementation of the IRA's investment programs can survive the political turbulence that has characterized the Contested Era, remain open questions at the time of this writing. The Supreme Court's subsequent decision in *Loper*

108. See Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1354, 1358 (1985).

109. See Jonathan B. Wiener, *Think Globally, Act Globally: The Limits of Local Climate Policies*, 155 U. PA. L. REV. 1961, 1962–63, 1965–66 (2007).

110. See Alejandro E. Camacho, *Adapting Governance to Climate Change: Managing Uncertainty through a Learning Infrastructure*, 59 EMORY L.J. 1, 25–27, 50 (2009) [hereinafter Camacho, *Adapting Governance*].

111. See, e.g., Carlson, *supra* note 106, at 1105–06 (noting structural limitations in translating past Clean Air Act success to addressing climate change).

112. Inflation Reduction Act of 2022, Pub. L. No. 117-169, 136 Stat. 1818. The IRA's approach—investment subsidies and tax incentives rather than regulatory mandates as the primary mechanism for transforming energy system economics—represents a significant departure from the Environmental Era's prescriptive regulatory model.

113. See Inflation Reduction Act of 2022, Pub. L. No. 117-169, §§ 13201–04, 13301, 13501, 136 Stat. 1818, 1931–32, 1941–44, 1969 (detailing investment subsidies and tax incentives for undertakings such as the use of renewable diesel, energy efficient home improvements, and clean energy manufacturing).

Bright Enterprises v. Raimondo,¹¹⁴ overruling the *Chevron* doctrine and directing courts to exercise independent judgment in interpreting agency-administered statutes, further constrains the administrative flexibility on which adaptive, cross-sectoral climate governance depends.¹¹⁵ In June 2026, the Court completed the trilogy begun in *West Virginia* and *Loper Bright*. In *Trump v. Slaughter*,¹¹⁶ the Court overruled *Humphrey's Executor v. United States*¹¹⁷ in its entirety, holding that Congress may not shield the heads of independent regulatory commissions from at-will presidential removal because the Constitution vests executive power in the President alone.¹¹⁸ Yet, it also seems clear that the shifts in private and public actions needed to reduce future greenhouse gas emissions and adapt to the full range of baked-in effects of past emissions on human and ecological systems will necessitate a wide range of governmental regulation to complement subsidy and tax incentives. What procedural and structural innovations in administrative law may be needed to promptly advance that evolution beyond more ambitious collaborative governance and adaptive management experiments remain unclear.

Several directions seem to merit additional scholarly attention. First, administrative law may need a range of mechanisms to coordinate governance across scales—international, federal, state, local, and ecosystem-specific—rather than the essentially uniform national framework that the APA presupposes.¹¹⁹ Second, the proliferation of experimentation across jurisdictions and program types has generated substantial learning that no institution is currently structured to aggregate, evaluate, and disseminate; as such, a learning infrastructure that would allow administrative innovation to compound rather than repeat itself seems essential.¹²⁰ Third, procedural regimes calibrated to conditions of deep uncertainty—combining precaution with revisability, and

114. 144 S. Ct. 2244 (2024).

115. *Id.* at 2273 (overruling *Chevron U.S.A., Inc. v. Nat. Res. Def. Council, Inc.*, 467 U.S. 837 (1984), and holding that courts must exercise independent judgment in determining the meaning of statutes administered by agencies, rather than deferring to reasonable agency interpretations of ambiguous provisions). The combined effect of *West Virginia v. EPA* and *Loper Bright Enterprises v. Raimondo* significantly constrains the administrative flexibility on which adaptive, cross-sectoral environmental governance depends.

116. 146 S. Ct. 2283 (2026).

117. 295 U.S. 602 (1935).

118. *See Slaughter*, 146 S. Ct. at 2304–05 (overruling *Humphrey's Executor* and holding that statutory for-cause removal protections for members of the Federal Trade Commission violate the constitutional separation of powers by impeding the President's Article II duty to supervise the execution of federal law). On the same day, the Court signaled a limited carve-out for the Federal Reserve Board in *Trump v. Cook*, 146 S. Ct. 2234 (2026).

119. *See* CAMACHO & GLICKSMAN, *supra* note 27, at 44–46, 50.

120. *See* Camacho, *Adapting Governance supra* note 110.

specifying in advance the conditions under which prior decisions will be reopened—remain underdeveloped in the American administrative tradition.¹²¹ These are merely provisional directions, but they suggest that the raw material for a next wave of legal imagination may be present already in the scholarly literature, awaiting synthesis, design, and implementation.

The history of U.S. environmental law also teaches an important lesson that this moment demands: effective environmental regulation depends not only on ambitious statutory programs and evolving judicial interpretations but on the preservation of the institutional infrastructure—professional expertise, procedural integrity, institutional memory, and fidelity to the rule of law—that makes administrative governance function. Innovation in administrative law must be evaluated not only by whether it grants administrative actors greater flexibility but by whether it preserves the accountability structures and institutional competence that distinguish legitimate administrative governance from unchecked executive command.

Defenders of a unitary executive have raised concerns that administrative insulation from presidential direction can attenuate the democratic accountability that flows from elections.¹²² Those concerns have taken on greater weight with the Court's recent adoption of unitary executive premises in *Slaughter*, which eliminated for-cause removal protections for the heads of independent regulatory commissions.¹²³ However, the history of environmental law demonstrates that the accountability mechanisms of the administrative state—procedural requirements, reasoned decisionmaking, judicial review, and professional expertise—are themselves constitutive of democratic governance in a complex regulatory state, not obstacles to it. Democratic accountability is not exhausted by presidential control; it also includes the transparency, participation, and reasoned justification that administrative procedure supplies—and that even the strongest executive command cannot. Executive action that systematically removes experienced administrators, compromises agency scientific capacity, or disregards procedural constraints does not represent legitimate administrative reform; it undermines the foundational preconditions of effective governance. The record of U.S. environmental law thus supports arguments for strengthening administrative institutions in ways commensurate with the scale of the problems the law is called upon to address.

121. *Id.* at 37–40.

122. See Steven G. Calabresi & Christopher S. Yoo, *THE UNITARY EXECUTIVE: PRESIDENTIAL POWER FROM WASHINGTON TO BUSH* (2008) (developing the constitutional foundations of unitary executive theory); Elena Kagan, *Presidential Administration*, 114 HARV. L. REV. 2245 (2001) (arguing that presidential direction of agency decisionmaking enhances democratic accountability through the only nationally elected official).

123. See *Trump v. Slaughter*, 146 S. Ct. 2283 (2026).

Any such strengthening must confront a challenge that has recurred across every era examined in this essay: the systematically unequal distribution of environmental burdens along lines of race and class. Progressive Era conservation was implicitly (or at times explicitly) created for a white public; New Deal administrative programs channeled the benefits of federal investment to some while concentrating the costs of industrial development on lower-income and non-white communities; the Environmental Era's pollution control statutes reduced aggregate exposures without appreciably closing the disparities in who bore what remained.¹²⁴ Climate change and emerging technologies are on track to reproduce this pattern at greater scale unless the next round of administrative innovation takes it seriously as a design constraint rather than an afterthought. Whose environment is legible to the law remains an open question, and legal imagination adequate to the moment will be necessary to answer it.

B. Emerging Technologies and the Frontier of Administrative Imagination

In addition to climate change, the emerging challenges of artificial intelligence, geoengineering, and synthetic biology present administrative law with problems that existing frameworks are even less equipped to address. These technologies raise environmental and governance risks that are, in important respects, unlike those that animated the development of the environmental regulatory state. The potential harms are global in scale, possibly irreversible, arising from activities that are geographically diffused and jurisdictionally complex, and are evolving faster than any regulatory process has historically been able to track.¹²⁵

The history of U.S. environmental law offers a warning that advocates of proactive governance would do well to internalize. As the five eras traced in our book demonstrate, the American legal system has consistently been slow to recognize emerging environmental risks and slower still to develop adequate legal responses.¹²⁶ The pattern recurs from the passenger pigeon to leaded gasoline to ozone depletion to climate change: scientific understanding of the risk precedes adequate legal response by decades, and that gap is paid for in irreparable harm.

The challenge for administrative law is genuinely difficult and does not have a historically tested answer. It will require a combining of precautionary governance under uncertainty with sufficient legal stability to enable compliance

124. See CAMACHO & DANIELS, *supra* note 1, at chs. 2–4.

125. See *id.*, at ch. 5 (discussing the governance challenges posed by artificial intelligence, geoengineering, and synthetic biology, and the inadequacy of existing administrative frameworks—designed for discrete pollution sources and known risk profiles—for managing technologies that are globally diffuse, rapidly evolving, and potentially irreversible in their effects).

126. See CAMACHO & DANIELS, *supra* note 1.

and investment, without creating barriers that foreclose beneficial innovation. Meeting this challenge will require a degree of legal imagination at least equal to that which produced the Progressive Era's administrative institutions, the New Deal's theoretical consolidation, and the Environmental Era's statutory cascade. The administrative law scholarship of this and the next generation has the opportunity, and the obligation, to develop that imagination. One instrument that may figure prominently in that next round of imagination — for good and for ill — is artificial intelligence.

The potential role of artificial intelligence (AI) deserves particular attention here. AI, of course, is no longer a hypothetical presence in the administrative state—it already is in use inside agencies,¹²⁷ and is beginning to migrate into key administrative law information-generating tasks, including environmental impact analysis, regulatory impact analysis, and permitting.¹²⁸ AI has the potential to extend administrative capacity, such as by modeling ecological outcomes and assisting with compliance efforts,¹²⁹ or increase meaningful participation for under-resourced communities long priced out of administrative proceedings.¹³⁰ On the other hand, it certainly has the capacity to harm the transparency, equity, and due process values underpinning the APA.¹³¹

Whether AI in fact catalyzes a new wave of administrative imagination or instead entrenches existing pathologies will depend on institutional choices that the administrative law scholarship of the next decade must help shape.

127. See, e.g., JOSHUA D. BLANK & LEIGH OSOFSKY, *AUTOMATED AGENCIES: THE TRANSFORMATION OF GOVERNMENT GUIDANCE* (2025) (exploring use of AI by agencies in guidance).

128. David Freeman Engstrom & Daniel E. Ho, *Algorithmic Accountability in the Administrative State*, 37 YALE J. ON REG. 800, 805 (2020) (documenting use of machine-learning tools already operating within federal agencies, including Social Security disability adjudication and SEC enforcement targeting, arguing that conventional APA oversight tools provide only limited accountability); see also Tuoya Saren, *Using AI in NEPA Review: Legal Challenges and Judicial Scrutiny*, 55 ENV'T L. REP. 10596 (2025) (describing AI's use to process large datasets, model ecological outcomes, and predict long-term impacts in environmental-impact-statement preparation).

129. See Steven J. Balla, Reeve Bull, Bridget C.E. Dooling, Emily Hammond, Michael Herz, Michael Livermore, et al., *Responding to Mass, Computer-Generated, and Malattributed Comments*, 74 ADMIN. L. REV. 95, 107, 110 (2022).

130. John J. Nay & Troy A. Paredes, *How Regulators Can Use AI*, 78 VAND. L. REV. EN BANC 63, 67, 70 (2025) (proposing AI-assisted regulatory impact analysis and government-hosted “regulatory-AI agents” for self-service compliance and permitting feedback); Carolyn Elephant, *Generative AI for the Energy Law Practitioner*, 46 ENERGY L.J. 119, 121 (2025) (suggesting AI could democratize access for under-resourced intervenors and environmental-justice communities historically priced out of administrative proceedings).

131. See Michael Martin Losavio, *Administrative Law and “Artificial Intelligence”—A Match Made in Heaven or in Hell?*, 86 LA. L. REV. 717 (2026) (cataloguing international examples of automated-decision failures that violated due-process and injured individuals).

What is certain is that emerging technologies will not answer these questions on their own. The human institutions that deploy them will. AI is only one illustration of this broader challenge; similar analysis applies to the governance of geoengineering and synthetic biology.¹³²

CONCLUSION

The history of U.S. environmental law, read through the lens of administrative law, is a story of repeated cycles of legal imagination followed by institutional consolidation, the discovery of limitations, and then further innovation. The administrative state did not arrive fully formed as the vehicle of environmental protection; it was built for other purposes and repurposed, extended, and reformed across generations in response to environmental challenges that its architects did not foresee. The innovations that produced modern environmental law—citizen suits, environmental impact assessment, collaborative governance, adaptive management, among others—were not inevitable outcomes of administrative development. They were the products of specific individuals, coalitions, crises, and political moments that aligned in ways that made change possible. Understanding that history means understanding that the administrative state's accountability mechanisms—notice-and-comment rulemaking, judicial review, scientific integrity requirements, and civil service protections—are not bureaucratic accretions to be cleared away in the name of efficiency. They are the accumulated product of legal imagination applied to the problem of making government both effective and accountable, and dismantling them produces governance that is less capable of serving the public interest and less constrained in its capacity for harm.¹³³

Of course, no procedural innovation ever fully resolved prior shortcomings or tensions inherent in managing complexity and conflicting interests. In the context of environmental law, administrative procedure has instead been an evolving effort to manage uncertainty and social and environmental change through a combination of expertise and public participation. Each deployment of legal imagination has only ever provided a partial answer. And the lack of a comprehensive legal architecture to monitor, assess, and adjust experimental strategies over time has only compounded its limitations.¹³⁴

132. See, e.g., Edward A. Parson & David W. Keith, *Solar Geoengineering: History, Methods, Governance, Prospects*, 49 ANN. REV. ENV'T & RES. 337 (2024) (exploring geoengineering); Alejandro E. Camacho, *In the Anthropocene: Adaptive Law, Ecological Health, and Biotechnologies*, 15 L., INNOVATION & TECH. 280 (2023) [hereinafter Camacho, *In the Anthropocene*] (examining the limitations of public governance in managing the risks and benefits of biotechnology for advancing conservation).

133. See Camacho, *In the Anthropocene*, *supra* note 132, at 76–77.

134. See Camacho, *Adapting Governance*, *supra* note 110.

The administrative law scholar who studies this history should see both the power and fragility of legal innovation. The APA's procedural architecture, constructed as a compromise between competing visions of administrative governance, became the platform for an environmental law revolution that its drafters could not have imagined. Landis's theory of the expert agency, written as a justification for the New Deal's institutional expansion, provided the intellectual foundation for an administrative environmental law that took thirty years to develop.¹³⁵ Holling's ecological theory of resilience, developed entirely outside the legal academy, became the scientific foundation for adaptive management frameworks that administrative lawyers are still working to translate into viable legal institutions.¹³⁶ Legal imagination is not produced on demand; it requires the accumulation of failed experiments, theoretical elaboration, and the alignment of practical necessity with institutional possibility.

The lesson for the present moment is not that institutional innovation will prevail over political opposition, or that legal imagination will prove equal to the challenges of climate change and emerging technologies. The history of U.S. environmental law offers no such guarantee; it records as many failures as successes, as many undercurrents that were submerged as waves that crested. What it does suggest is that the work of building the legal foundations for future environmental protection—the theoretical elaboration, the institutional experimentation, the coalition building—is never complete. Those who do it now, without certainty of result, are the ones who will have made the next wave possible. And both academic and governmental institutions will do well to invest in and develop a robust learning infrastructure that cultivates legal imagination and better prepares administrative and other law to manage the impending uncertainties from rapidly changing environments and technologies. Harnessing emerging technologies thoughtfully in that effort will be essential.

135. See LANDIS, *supra* note 7, at 1–2.

136. See Holling, *supra* note 90, at 1–2.