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**LEGAL ADAPTIVE CAPACITY:
HOW PROGRAM GOALS AND PROCESSES
SHAPE FEDERAL LAND ADAPTATION
TO CLIMATE CHANGE**

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The degree to which statutory goals are pliable is likely to significantly affect the ability of an agency with regulatory or management responsibilities to achieve those objectives in the face of novel challenges or changing circumstances. This Article explores this dynamic by comparing the degree of “give” provided by the goals of the regimes governing management of the five types of federal public lands in responding to the challenges posed by climate change. A comparative analysis of federal land adaptation to climate change demonstrates that a management regime’s legal adaptive capacity is influenced not only by procedural flexibility, but also by the flexibility the agency has in defining and pursuing a program’s substantive goals.

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Though a few scholars have explored the concept of adaptive capacity as it applies to law, most focus on the impact of procedural discretion on the ability to manage change. Counterintuitively, the land regimes most closely tied to resource preservation goals have generally lagged behind those with mixed conservation-commodity development mandates in preparing for climate change. Accordingly, this Article suggests ways to enhance the substantive legal adaptive capacity of land management agencies to promote ecological health in the face of climate change, and evaluates tradeoffs implicated when policymakers choose more appropriate levels of such adaptive capacity. More generally, the Article considers how effectively accommodating change may actually require legal constraints on when or how an agency may exercise that flexibility.

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INTRODUCTION

The pliability of statutory goals is likely to significantly affect the ability of an agency to achieve regulatory or management objectives in the face of novel challenges or changing circumstances. This Article explores this dynamic by comparing the degree of “give” provided by the management goals governing the five largest categories of federal public conservation lands in response to the challenges posed by climate change.¹ It asserts that the comparative rapidity and extent of climate change adaptation in which a natural resources management agency engages is influenced by the adaptability of the goals identified in its authorizing legal framework. This Article identifies this intrinsic mutability as a program’s *legal adaptive capacity*.

Though some scholars have explored the concept of adaptive capacity as it applies to law, almost all focus on the influence of agency procedural discretion on its ability to manage change.² However, a regulatory or management

1. The five types of public conservation lands are national parks, national forests, national wildlife refuges, public lands administered by the Bureau of Land Management, and wilderness areas, which may exist in any of the other four land systems.

2. See, e.g., Jody Freeman, *Collaborative Governance in the Administrative State*, 45 UCLA L. REV. 1, 21–22 (1997) (proposing normative model for more adaptive regulatory process); J.B. Ruhl & James Salzman, *Climate Change, Dead Zones, and Massive Problems in the Administrative State: A Guide for Whittling Away*, 98 CAL. L. REV. 59, 97–98 (2010) (proposing adaptive process for managing

regime's legal adaptive capacity is not only influenced by the extent of procedural flexibility the implementing agency enjoys under its organic statute and other sources of law. As demonstrated by a comparative analysis of federal land agency adaptation to climate change, legal adaptive capacity is also affected by the degree to which the underlying program's substantive goals are capable of accommodating shifts in management approaches in response to change. Accordingly, this Article recommends changes in the substantive legal adaptive capacity of federal land management agencies that are likely to enhance their ability to better address the considerable effects of climate change.

Various federal agencies manage approximately twenty-eight percent, or 635–640 million acres, of the surface land in the United States.³ The four largest landholders are natural resource management agencies. These include the United States Forest Service (USFS) in the U.S. Department of Agriculture (USDA), which manages nearly 193 million acres,⁴ and three agencies in the Department of Interior (DOI): the National Park Service (NPS), which manages approximately 80 million acres; the Bureau of Land Management (BLM), which manages nearly 248 million acres; and the Fish and Wildlife Service (FWS), which manages approximately 89 million acres of land as well as 217 million acres of marine refuges and monuments.⁵ Additionally, more than 109 million acres⁶ of

complex regulatory problems); Richard J. Lazarus, *Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*, 94 CORNELL L. REV. 1153, 1156–57 (2009) (advocating integration in climate change legislation of institutional design features that impede future alterations); Alejandro E. Camacho, *Can Regulation Evolve? Lessons from a Study in Maladaptive Management*, 55 UCLA L. REV. 293, 331, 349–51 (2007) [hereinafter Camacho I]; Alejandro E. Camacho, *Adapting Governance to Climate Change: Managing Uncertainty Through a Learning Infrastructure*, 59 EMORY L.J. 1, 36–40 (2009) [hereinafter Camacho II]; Robin Kundis Craig & J.B. Ruhl, *Designing Administrative Law for Adaptive Management*, 67 VAND. L. REV. 1, 4 (2014); Robert L. Glicksman & Sidney A. Shapiro, *Improving Regulation Through Incremental Adjustment*, 52 U. KAN. L. REV. 1179 (2004); Holly Doremus, *Adaptive Management as an Information Problem*, 89 N.C. L. REV. 1455 (2011); Donald T. Hornstein, *Complexity Theory, Adaptation, and Administrative Law*, 54 DUKE L.J. 913 (2005).

3. ROSS W. GORTE ET AL., CONG. RESEARCH SERV., R42346, FEDERAL LAND OWNERSHIP: OVERVIEW AND DATA 1 (Feb. 8, 2012), <http://fas.org/sgp/crs/misc/R42346.pdf> [<https://perma.cc/4MDS-9YD8>].

4. *Id.* at 1, 13.

5. *Id.*

6. See *The Beginnings of the National Wilderness Preservation System*,

federal conservation lands have been designated by Congress as federal wilderness, subject to an additional regulatory overlay under the Wilderness Act of 1964.⁷

Anthropogenic climate change will result in significant physical and biological effects on all of these federal land systems.⁸ These changes, in turn, will raise challenges to the capacity of the agencies under existing federal land management laws to manage uncertainty and promote effective conservation.⁹ Scholars and policymakers thus increasingly urge changes to existing natural resources laws and institutions to better manage these new fundamental challenges, largely highlighting the need for mechanisms that promote procedural adaptive capacity by increasing access to information and flexible implementation.¹⁰ Few, however, have considered how a legal regime's substantive goals may affect the adaptive capacity of that regime to respond to climate change.

To varying degrees, the federal government has slowly turned its attention to climate change adaptation planning and implementation, spurred by directives issued by President Obama between 2009 and 2015.¹¹ One might anticipate the pace and degree of climate change adaptation activity to largely track the historical orientation of each land

WILDERNESS.NET, <http://www.wilderness.net/index.cfm?fuse=NWPS&sec=fastfacts> [<https://perma.cc/D72L-YUGX>] (last updated Sept. 21, 2015).

7. 16 U.S.C. §§ 1131–1136 (2012).

8. Anthropogenic contributions to climate change are those caused by humans. See JAMES SALZMAN & BARTON H. THOMPSON, JR., ENVIRONMENTAL LAW AND POLICY 122 (3d ed. 2010) (listing the major “man-made (or ‘anthropogenic’) greenhouse gases”).

9. See *infra* Part II.

10. See, e.g., J.B. Ruhl, *General Design Principles for Resilience and Adaptive Capacity in Legal Systems - with Applications to Climate Change Adaptation*, 89 N.C. L. REV. 1373 (2011); W. Neil Adger et al., *Successful Adaptation to Climate Change Across Scales*, 15 GLOB. ENVTL. CHANGE 77 (2005); Daniel Schramm & Akiva Fishman, *Legal Frameworks for Adaptive Natural Resource Management in a Changing Climate*, 22 GEO. INT'L ENVTL. L. REV. 491 (2010).

11. See *infra* Section III.A; U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE ADAPTATION IN UNITED STATES FEDERAL NATURAL RESOURCE SCIENCE AND MANAGEMENT AGENCIES: A SYNTHESIS, at vi (Jessica E. Halofsky et al. eds., 2015), http://www.globalchange.gov/sites/globalchange/files/ASIWG_Synthesis_4.28.15_final.pdf [<https://perma.cc/T77A-H6CF>] [hereinafter USGCRP, SYNTHESIS] (“Although adequate scientific databases, analytical tools, and decision support aids are generally available to assist with adaptation, on-the-ground projects and plans relevant to resource management have been implemented unevenly across agencies.”).

management agency to ecological conservation given the risk that climate change will disrupt the ecological communities that these agencies manage. In particular, some might expect that, in light of their focus on resource preservation, the FWS and the NPS would be more attentive to the potential effects of climate change and more apt to embrace the task of preparing to adapt to these changes than the USFS and the BLM, which, for at least part of their histories, emphasized extractive and consumptive uses.¹²

We posit, however, that because the statutorily mandated goals under which the BLM and the USFS operate are pliant enough to accommodate changed conditions, these agencies actually have a greater legal adaptive capacity to engage in productive ecosystem protection in preparation for climate change than the FWS and the NPS. The multiple-use, sustained-yield mandates that govern the BLM and the USFS provide those agencies with broad authority to pursue management actions that maintain ecological function, notwithstanding physical changes that pose novel management challenges.¹³ The malleability of the goals set forth in these two agencies' organic statutes enables them to swiftly engage in meaningful climate change adaptation activities.¹⁴

In contrast, the FWS and the NPS are charged primarily with what we label "historical preservation"¹⁵—maintaining current ecological conditions or restoring managed lands to former ecological conditions.¹⁶ Thus, although the two agencies possess significant procedural flexibility to advance their statutory objectives,¹⁷ the substantive goals they are directed

12. See Robert B. Keiter, *Ecosystems and the Law: Toward an Integrated Approach*, 8 *ECOLOGICAL APPLICATIONS* 332, 335 (1998) (stating that "federal land-management agencies traditionally have relied upon the multiple-use concept to give priority to commodity production"); cf. Robert L. Fischman et al., *Planning for Adaptation to Climate Change: Lessons from the US National Wildlife Refuge System*, 64 *BIOSCIENCE* 993, 993 (2014) ("If any system of nature reserves in the United States could demonstrate best practices for climate-change adaptation, it would be the National Wildlife Refuge System (NWRS), managed by the [FWS].").

13. See *infra* Sections III.B, III.C.

14. See *infra* Sections III.B, III.C.

15. See Alejandro E. Camacho, *Going the Way of the Dodo: De-Extinction, Dualisms, and Reframing Conservation*, 92 *WASH. U. L. REV.* 849, 878 (2015) (defining "historical preservation" as "preserving fidelity to historical conditions and preexisting biota").

16. See *infra* Sections III.D, III.E.

17. See, e.g., *W. Watersheds Project v. Salazar*, 766 F. Supp. 2d 1095 (D.

to pursue may directly conflict with promoting ecological health and are increasingly difficult—if not impossible—to attain for some federal land units as climate changes.¹⁸ In addition, Congress established federally designated wilderness areas primarily to minimize active human management or disturbance—which we label “wildness preservation”¹⁹—and secondarily to promote historical preservation. As a result, all four land management agencies have limited capacity to actively manage wilderness areas in the face of the threats posed by climate change.

A review of existing climate change adaptation activities by the four federal land management agencies in general reflects the legal adaptive capacity that their respective organic statutes suggest. Agencies that manage federal lands subject to statutory goals that place more emphasis on promoting historical fidelity (such as national parks) or on minimizing active management (wilderness areas) have developed more modest adaptation measures.²⁰ In contrast, the USFS, which administers federal lands governed by statutory goals that place less emphasis on historical or wildness preservation, has engaged in more robust adaptation planning and

Mont. 2011), *aff'd in part*, 494 Fed. App'x 740, 742 (9th Cir. 2012) (concluding that supplemental environmental impact statement was not necessary in connection with the NPS's application of adaptive management plan to management of bison herds); *Defs. of Wildlife v. Salazar*, 698 F. Supp. 2d 141, 149 (D.D.C. 2010), *aff'd*, 651 F.3d 112 (D.C. Cir. 2011) (concluding that adaptive management plan in wildlife refuge incorporated adequate mitigation measures).

18. See Alejandro E. Camacho, *Transforming the Means and Ends of Natural Resources Management*, 89 N.C. L. REV. 1405, 1407 (2011) (arguing that “key preservationist goals of natural resources law premised on *historical preservation* (the protection of resources or landscapes in their historical condition) or *passive management* (minimizing human involvement with nonhuman systems) will be increasingly costly, difficult, and even impossible to meet” as a result of climate change); J.B. Ruhl & James Salzman, *Gaming the Past: The Theory and Practice of Historic Baselines in the Administrative State*, 64 VAND. L. REV. 1, 53 (2011) (“Building adaptation strategies around historic baselines to resist climate change thus is a losing proposition.”); *id.* at 56 (characterizing historic baselines as “maladapted” to climate change adaptation); *cf.* Robin Kundis Craig, “*Stationarity Is Dead*”—*Long Live Transformation: Five Principles for Climate Change Adaptation Law*, 34 HARV. ENVTL. L. REV. 9, 17 (2010) (arguing that existing preservationist natural resources laws “no longer reflect[] ecological realities”); *id.* at 34–35 (claiming that “preservation paradigm” “threatens to dislocate the goals of natural resources law from the ecological realities of a climate change era”).

19. See Camacho, *supra* note 15, at 879 (defining “natural” or “wildness preservation” as “preserving the ostensibly natural or wild character of reserved resources”); Camacho, *supra* note 18, at 1407.

20. See *infra* Sections III.D.2, III.E.2.

implementation, even if those measures did not take full advantage of the USFS's legal adaptive capacity.²¹ However, the BLM's analogous and relatively substantial legal adaptive capacity has not yet translated into significant adaptation planning or concrete adaptation activities.²²

Though the absence of clear and enforceable directives requiring the BLM to exercise legal adaptive capacity could have been a factor, it is evident that legal adaptive capacity alone does not determine the extent of adaptation actually pursued or achieved.²³ Factors like budgetary resources,²⁴ agency leadership, and entrenched culture and tradition can strongly influence how much a regime adapts, and we do not discount the role that such factors may have played in the degree to which the federal land management agencies have responded to the challenges posed by climate change.²⁵ Nonetheless, attending to a regime's substantive goals can help increase the likelihood that the program is able to effectively manage unanticipated challenges or changing circumstances

21. See *infra* Sections III.B.2.

22. See Kelli M. Archie et al., *Climate Change and Western Public Lands: A Survey of U.S. Federal Land Managers on the Status of Adaptation Efforts*, 17(4) *ECOLOGY & SOC'Y* 20 (2012), <http://www.ecologyandsociety.org/vol17/iss4/art20/ES-2012-5187.pdf> [<https://perma.cc/N8EM-LTH7>] (concluding based on surveys completed in 2011 by federal land managers in Colorado, Utah, and Wyoming that the BLM "has taken a less targeted approach to adaptation planning" than the other three land management agencies). Cf. Victor B. Flatt, *Adapting Laws for a Changing World: A Systemic Approach to Climate Change Adaptation*, 64 *FLA. L. REV.* 269, 291 (2012) ("In theory, such a [multiple use] legal mandate should be the 'best' option for climate change adaptation because it provides a 'resilient' law that can alter resource usage without statutory change. In practice, however, it has proven to be just the opposite, as agencies routinely cling to a static balance of uses.").

23. Agency management structure, which is an aspect of procedural legal adaptive capacity, may play a role in the BLM's slow response to the challenges posed by climate change. See *infra* notes 529–533 and accompanying text.

24. A survey of employees of the four land management agencies in three western states during 2011 identified budget constraints as one of the most significant barriers to both adaptation planning and implementation. See Archie et al., *supra* note 22. Another important factor was lack of information at relevant scales. *Id.* Additional factors included personnel constraints, lack of perceived importance to the public, and lack of public demand for action. *Id.*

25. See *infra* Part IV; USGCRP, *SYNTHESIS*, *supra* note 11, at vii ("Accomplishments in preparing for climate change differ across the many agencies responsible for managing land and water resources and for providing the science needed for resource management. This is to be expected, given the diversity of agency missions, organizational culture, programmatic structure, and scientific capability.").

and remove obstacles to doing so.²⁶ Indeed, if a statutory goal or management standard forbids the administering agency from altering its management approach in the face of change, then even an agency with leaders who prioritize responsiveness to climatic changes and a culture where employees throughout the agency commit to pursuing leadership goals is not likely to engage in effective climate change adaptation.

This Article proceeds in five parts. Part I discusses the concept of legal adaptive capacity in regulatory or management institutions. It distinguishes between the substantive and procedural dimensions of legal adaptive capacity, and assesses potential tradeoffs of integrating more legal adaptive capacity into a regulatory or management regime. Part II briefly relates the concept of legal adaptive capacity to anthropogenic climate change, explaining how this phenomenon is exerting enormous pressure not only on the federal lands but also the processes and goals of the regimes that manage them.

Part III assesses and compares the existing legal adaptive capacity and climate-related adaptation activities of the national forests, the BLM public lands, the national parks, the national wildlife refuges, and official wilderness areas, and of the agencies that manage those land systems. After briefly summarizing White House and department-wide directives by the Secretaries of the Interior and Agriculture, it considers lands administered by the USFS and the BLM that are governed by flexible multiple-use, sustained-yield mandates. It then discusses the legal adaptive capacity and adaptation activities provided for national wildlife refuges, national parks, and designated wilderness, which are subject to mandates that, to varying degrees, focus on historical or wilderness preservation. Part III illustrates that though the various federal agencies have similar procedural legal adaptive capacities, the relatively narrower substantive legal adaptive capacity afforded agencies in managing the national parks, national wildlife refuges, and wilderness areas is likely hindering their ability to effectively adapt those lands to climate change in ways consistent with applicable statutory goals and with promoting ecological health.

Based on the emerging federal experience with climate adaptation planning and implementation measures, Part IV

26. See *infra* Part V.

offers observations about the role of legal adaptive capacity in promoting timely and effective adaptation. We focus primarily on the significance of substantive legal adaptive capacity because the literature on the tradeoffs implicated by procedural adaptive capacity in environmental law is much more extensive. Though there undoubtedly are tradeoffs, Part V contends that the onset of anthropogenic climate change necessitates adjusting substantive legal adaptive capacity on the federal conservation lands. As that Part demonstrates, enhancing legal adaptive capacity is not the same as expanding agency discretion. A flexible process capable of accommodating change may nonetheless incorporate clear restrictions that constrain when or how the agency may exercise that flexibility. This distinction is important because alternative programmatic goals may be equally flexible, but some may prove more effective in accommodating change than others. We urge changes in the substantive standards that govern federal land management to enhance legal adaptive capacity by placing greater emphasis on promoting ecological function on lands governed by the multiple-use mandate, and by detaching management goals from strict adherence to historical or wildness preservation where climate change is likely to render those goals ineffective at promoting ecological health. Among other things, we argue that the emphasis should be on protecting the integrity of ecosystems or essential ecological processes and functions (such as biodiversity, carbon sequestration, water cleaning, waste decomposition, and nutrient cycling) instead of individual species or resources at risk because of climate change.

I. A THEORY OF LEGAL ADAPTIVE CAPACITY

The concept of legal adaptive capacity draws from the growing scholarly literature seeking to characterize and understand the dynamics of ecological systems.²⁷ Ecological literature has introduced the concepts of both resilience and adaptive capacity as phenomena in the natural world. A natural system's "resilience" is a measure of its ability "to absorb impacts and continue to function, while adaptive

27. See generally SOCIAL-ECOLOGICAL RESILIENCE AND LAW 235 (Ahjond S. Garmestani & Craig R. Allen eds., 2014).

capacity refers to a system's ability to change to adjust to new conditions."²⁸ Because of the convulsive changes associated with it, climate change will test the resilience and adaptive capacity of natural systems.²⁹

Scholars have also applied the concept of adaptive capacity to human social systems, including in the context of climate change adaptation. The Intergovernmental Panel on Climate Change, for example, defines adaptive capacity as "the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behavior and in resources and technologies."³⁰ Researchers have identified adaptive capacity as a "necessary condition for the design and implementation of effective adaptation strategies so as to reduce the likelihood and the magnitude of harmful outcomes resulting from climate change."³¹ In this context, scholars have studied the role of factors such as education, income, health, knowledge, technology, and institutions on the capability of communities to adapt to risks related to climate change.³² Limited attention, however, has

28. Craig, *supra* note 18, at 22. See also Barbara Cosens, *Transboundary River Governance in the Face of Uncertainty: Resilience Theory and the Columbia River Treaty*, 30 J. LAND RES. & ENVTL. L. 229, 230 (2010) ("Resilience as applied to ecological systems addresses the ability of the system to continue to provide, or return to a state in which it will provide, a full range of ecosystem services in the face of change."); W. Neil Adger et al., *Socio-Ecological Resilience to Coastal Disasters*, 309 SCI. 1036, 1036 (2005) (explaining that part of a linked socio-ecological system's capacity to absorb recurrent disturbances while retaining essential structures, processes, and feedbacks lies in "the regenerative ability of ecosystems and their capability in the face of change to continue to deliver resources and [essential] ecosystem services").

29. See Emma L. Tompkins & W. Neil Adger, *Does Adaptive Management of Natural Resources Enhance Resilience to Climate Change?*, 9(2) ECOLOGY & SOC'Y 1, 1 (2004), <http://www.ecologyandsociety.org/vol9/iss2/art10/print.pdf> [<https://perma.cc/N6SS-PKK3>] (arguing "that a system's capacity for resilience . . . is an important element of any sustainable response to climate change").

30. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: IMPACTS, ADAPTATION AND VULNERABILITY 727 (2007), https://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4_wg2_full_report.pdf [<https://perma.cc/EEEE-7CRP>].

31. *Id.*

32. *Id.* at 727–28. See also Nick Brooks et al., *The Determinants of Vulnerability and Adaptive Capacity at the National Level and the Implications for Adaptation*, 15 GLOB. ENVTL. CHANGE 151 (2005) (identifying forty-six variables that bear on a society's vulnerability to climate change); W. Neil Adger & Katharine Vincent, *Uncertainty in Adaptive Capacity*, 337 C.R. GEOSCIENCE 399, 401 (2005) (identifying generic features of societies' adaptive capacity to climate variability, including resource limits, the distribution of resources across landscapes and between population groups, institutions which mediate resources,

been given to the influence of the adaptive capacity of legal regimes in shaping climate change adaptation.

Like natural systems, legal systems may be more or less adaptive to change. When Congress creates an administrative agency, it typically identifies goals in the organic statute from which the agency derives its authority and prescribes standards to which the agency must conform in its pursuit of those goals.³³ As scholars of regulation in different contexts have recognized, “[a]ll regulators must adapt to change in order to remain effective.”³⁴ The same holds true for agencies acting as resource managers. As Karl Llewellyn recognized in describing the common law system of adjudication, “an adequately resilient legal system can . . . absorb the particular trouble and resolve it each time into a new, usefully guiding, forward-looking felt standard-for-action or even rule-of-law.”³⁵

Law can facilitate (or hamper) adaptation through both substantive and procedural means. We refer to this adaptability as *legal adaptive capacity*. In our conception, legal adaptive capacity denotes the formal regulatory or management regime’s capacity to adapt to new phenomena that affect the resource or activity it regulates or manages. For our purposes, this regime includes rules promulgated by public legal institutions, including legislatures, courts, and administrative agencies (including agency regulations, manuals, plans, and guidance). As we use the term, legal adaptive capacity does not refer to other factors, such as resource constraints or agency culture, which may nonetheless influence the adaptive capacity of a regulatory regime.³⁶

and coping with risk); Ralph Matthews & Robin Sydneysmith, *Adaptive Capacity as a Dynamic Institutional Process: Conceptual Perspectives and Their Application*, SPRINGER SERIES ON ENVTL. MGMT. 223, 239 (2010) (discussing social institutions “as normative brakes on change”).

33. In the absence of standards that supply an “intelligible principle” to guide agency discretion, the statute may violate separation of powers principles. *See Whitman v. Am. Trucking Ass’ns*, 531 U.S. 457 (2011).

34. Brett McDonnell & Daniel Schwarcz, *Regulatory Contrarians*, 89 N.C. L. REV. 1629, 1635 (2011). Among other things, “regulators’ failure to evolve can . . . [stem from] the continuation of rules or policies that have become ineffective or counterproductive in light of market change, or that were simply mistakes in the first place.” *Id.* at 1636.

35. KARL N. LLEWELLYN, *THE COMMON LAW TRADITION: DECIDING APPEALS* 513 (1960).

36. *See generally* CHRISTINE PARKER & VIBEKE LEHMANN NIELSEN, *EXPLAINING COMPLIANCE: BUSINESS RESPONSES TO REGULATION* (2011) (discussing formal and informal legal influences on regulatory compliance).

As this Part explores, the scope of a regime's legal adaptive capacity turns on two axes.³⁷ First, a legal regime, including one administered by an administrative agency, may have goals that are more or less capable of accommodating changed conditions. The degree to which statutory goals are capable of accommodating change measures the regime's *substantive legal adaptive capacity*. Second, an agency may have more or less flexibility in determining the processes or organizational structure it will use in pursuing organic statute goals. We refer to that kind of flexibility as *procedural legal adaptive capacity*. Thus, J.B. Ruhl has noted that it is "important to distinguish between the resilience of the legal system's underlying structure and processes and the stability of the substantive content of the law."³⁸ Nonetheless, the significance of legal adaptive capacity—and in particular substantive legal adaptive capacity—has been under-explored by the legal and broader scholarly literature. In particular, it is important to consider the tradeoffs of more or less procedural and substantive

Modern sociological literature draws "a central distinction" between social structure and culture. Alejandro Portes, *Institutions and Development: A Conceptual Reanalysis*, 32(2) POPULATION & DEV. REV. 233, 236 (2006); Gérard Roland, *Understanding Institutional Change: Fast-Moving and Slow-Moving Institutions*, 38 STUD. COMP. INT'L DEV. 109 (2004) (distinguishing between "slow-moving" institutions such as culture and "fast-moving" institutions such as legal rules). In discussing adaptive capacity, other scholars have used the term more broadly to encompass some of these other factors. See, e.g., Mostafa Mahmud Naser, *Climate Change, Environmental Degradation, and Migration: A Complex Nexus*, 36 WM. & MARY ENVTL. L. & POL'Y REV. 713, 756–57 (2012); Marissa Knodel, *Conceptualizing Climate Justice in Kivalina*, 37 SEATTLE U. L. REV. 1179, 1206 (2014) (discussing impact of limited resources on Arctic indigenous peoples' adaptive capacity and resilience in the face of climate change).

37. See, e.g., Ruhl, *supra* note 10, at 1379 ("The legal system, like any system, can be defined by its structure (e.g., constitutional division of powers) and processes (e.g., administrative decision procedures).").

38. *Id.* at 1383. See also Schramm & Fishman, *supra* note 10, at 497 (arguing that weaknesses in the ability of legal regimes to respond to climate change "stem from both rigidity in the administrative procedures of the law and the absence of mandates to achieve long-term tangible objectives"); Brooks et al., *supra* note 32, at 155, 159, 161 (listing "governance" among potential proxies for vulnerability to climate change, and distinguishing between barriers to adaptation arising from regulatory quality or effectiveness and the availability of participatory decision making).

Because this Article focuses primarily on substantive legal adaptive capacity, we do not dwell on the relationship between structural and procedural adaptive capacity. Differences in agency organizational structure nevertheless may affect a program's adaptive capacity. See *infra* notes 529–533 and accompanying text (discussing how the BLM's organizational structure may impair its capacity to respond to climate change).

adaptive capacity in designing a legal regime.

Drawing on the ecological concept of adaptability or resilience, this Part elaborates on these different components of legal adaptive capacity and provides examples of how the scope of an agency's legal adaptive capacity can affect its ability to successfully pursue statutory missions. In particular, we focus on how the scope of each kind of legal adaptive capacity can influence agency efforts to respond to novel challenges or changing circumstances such as changing ecological dynamics. We also consider potential generic tradeoffs of integrating more or less adaptive capacity into a regulatory regime.

A. *Substantive Legal Adaptive Capacity*

Substantive legal adaptive capacity refers to the extent to which a legal regime's goals are capable of responding to changed conditions. An agency with a high degree of substantive legal adaptive capacity has the authority under its organic legislation to adjust its interpretation of regulatory goals or the means of pursuing them to meet new challenges or accommodate changed circumstances.³⁹ At the other end of the spectrum, a program with limited substantive legal adaptive capacity has relatively rigid goals that do not allow agencies to alter regulatory or management approaches, notwithstanding changed conditions. Of course, substantive legal adaptive capacity is only meant to identify the extent of elasticity in regulatory goals; as such, two regulatory regimes may have similar levels of substantive legal adaptive capacity but regulatory goals that are significantly different.

The Clean Air Act (CAA) serves as an example of extensive substantive legal adaptive capacity, setting as its fundamental goal the protection and enhancement of air quality to promote the public health and welfare.⁴⁰ In *Massachusetts v. EPA*, the Supreme Court addressed a challenge to a denial by the Environmental Protection Agency (EPA) of a petition to regulate greenhouse gas (GHG) emissions from new motor

39. See J.B. Ruhl, *Thinking of Environmental Law as a Complex Adaptive System: How to Clean Up the Environment by Making a Mess of Environmental Law*, 34 HOUS. L. REV. 933, 938 (1997) ("Law . . . has the capacity to operate as a complex adaptive system.").

40. 42 U.S.C. § 7401(b)(1) (2012).

vehicles.⁴¹ The agency argued that GHGs did not qualify as “air pollutants” over which it had regulatory jurisdiction.⁴² It claimed, among other things, that climate change was such an important problem that unless the CAA “spoke with exacting specificity,” Congress could not have intended that EPA regulate GHGs that contribute to it.⁴³ The Court rejected EPA’s limited conception of its regulatory power.⁴⁴ It characterized the statutory definition of an “air pollutant”⁴⁵ as “sweeping” and “capacious.”⁴⁶ It made no difference that Congress may not have been cognizant when it adopted the statute in 1970 of the risks posed by GHG emissions:

While the Congresses that drafted § 202(a)(1) might not have appreciated the possibility that burning fossil fuels could lead to global warming, they did understand that without regulatory flexibility, changing circumstances and scientific developments would soon render the Clean Air Act obsolete. The broad language of § 202(a)(1) reflects an intentional effort to confer the flexibility necessary to forestall such obsolescence.⁴⁷

Other courts have similarly construed the CAA as affording the EPA broad flexibility to protect public health and welfare from air pollution in the face of uncertainty concerning evidence that is “on the frontiers of scientific knowledge.”⁴⁸

41. *Massachusetts v. EPA*, 549 U.S. 497 (2007).

42. The CAA requires EPA to limit emissions of “any air pollutant” from motor vehicles which may contribute to health or welfare endangerment. 42 U.S.C. § 7521(a)(1) (2012).

43. EPA also contended that Congress designed the CAA to address local air pollutants, not substances with consistent atmospheric concentrations, and that Congress declined to require EPA to regulate GHG emissions. *Massachusetts*, 549 U.S. at 512.

44. *Id.* at 528.

45. The Act defines an “air pollutant” to include any “substance or matter which is emitted into or otherwise enters the ambient air.” 42 U.S.C. § 7602(g) (2012).

46. *Massachusetts*, 549 U.S. at 528, 532.

47. *Id.* at 532. More generally, the environment’s responses to human activities “have a tremendous capacity . . . to take us by surprise despite our intensive efforts to study and predict them.” Ruhl, *supra* note 39, at 954.

48. *Ethyl Corp. v. EPA*, 541 F.2d 1, 28 (D.C. Cir. 1976) (concluding that a CAA provision authorizing regulation of fuel additives, 42 U.S.C. § 7543(c), authorizes EPA’s Administrator to “apply his expertise to draw conclusions from suspected, but not completely substantiated, relationships between facts, from trends among facts, from theoretical projections from imperfect data, from

The two different domestic regulatory regimes that govern the allocation of water provide a nice contrast between regulatory standards that provide more and less substantive legal adaptive capacity. As Tony Arnold has recognized, a critical question is “whether American water law regimes can become increasingly adaptive to changing conditions and sudden disturbances.”⁴⁹ Arnold’s answer is two-fold. He characterizes U.S. water law as “full of inflexible rules that inhibit adaptive responses to disturbances and changes,”⁵⁰ pointing specifically to the prior appropriation system of water rights that governs water allocation in most western states. In its traditional form, that system is composed of “a hard-edged, or ‘crystalline,’ set of rules[]” that, by creating vested property rights in permit holders, “locks in and protects historical uses, many of which were established over a hundred years ago in the western United States, without regard to whether those uses embody current views on the ‘highest and best use’ of limited water.”⁵¹ Among the advantages of the prior

probative preliminary data not yet certifiable as ‘fact,’ and the like”). Although the pliability of the CAA’s goals and the breadth of its definition of an air pollutant allowed EPA to regulate GHGs, air pollutants that were not the focus of congressional concern in 1970, nevertheless not all of the statute’s substantive regulatory programs are well-suited to tackling climate change. The national ambient air quality standards, for example, would not easily accommodate regulation of GHGs because they assume different localized pollutant concentrations, whereas GHG concentrations are uniform worldwide. See Holly Doremus & W. Michael Hanemann, *Of Babies and Bathwater: Why the Clean Air Act’s Cooperative Federalism Framework Is Useful for Addressing Global Warming*, 50 ARIZ. L. REV. 799, 821 (2008) (“The one conspicuous misfit between the present Clean Air Act and the global warming problem is the Act’s reliance on national air quality standards.”); cf. Jacob Kavkewitz, Comment, *Jamming the Square Peg through the Round Hole: EPA’s Options for Implementing Efficient Climate Change Regulation Under the Clean Air Act*, 4 ARIZ. J. ENVTL. L. & POL’Y 1001, 1002 (2013) (“Even though the CAA is not an ideal structure for addressing climate change, it is the most feasible option currently available domestically for making serious progress in reducing GHG emissions.”).

49. Craig Anthony (Tony) Arnold, *Adaptive Water Law*, 62 U. KAN. L. REV. 1043, 1043 (2014); see also *id.* at 1049–50 (“Society’s capacity to respond to disturbances and uncertainties is critical to navigating the dynamics of linked social and environmental systems, and water law plays an important role in either impeding or facilitating this adaptation.”).

50. *Id.* at 1057.

51. *Id.* Under a prior appropriation system, appropriators who secured their allocative rights before others did so are entitled to their full allocations before junior appropriators are entitled to any of theirs. See, e.g., *Aransas Project v. Shaw*, 930 F. Supp. 2d 716, 738 n.28 (S.D. Tex. 2013), *rev’d on other grounds*, 756 F.3d 801 (5th Cir. 2014), *opinion amended and superseded*, 774 F.3d 324 (5th Cir. 2014) (noting that under Texas’s version of prior appropriation, “[t]he holder of a

appropriation system are “predictability and certainty to support economic investment in consumptive uses of water.”⁵² Such advantages come at a substantial cost, however:

The rigidity of the priority system discourages or prevents adaptive sharing of water during shortages. The combination of measuring rights in specific quantities of appropriated water and the use-it-or-lose-it rule deter improved efficiencies and adaptive water conservation efforts. The persistence of defining beneficial uses by historic rules and uses prevents regulators or courts from determining that some water uses are no longer well-adapted to the conditions in which they occur.⁵³

Arnold contrasts this rigidity with “the looser ‘muddy’ riparian doctrine followed in more water-rich areas.”⁵⁴ Under that system for allocating access to water, a riparian owner’s rights are limited to reasonable water use, with reasonableness dependent “in part upon each riparian owner’s water use vis-à-vis other riparian owners, the public’s rights, and the circumstances of each case. The test is a flexible one capable of changing over time”⁵⁵

more senior water right is entitled to draw all of the water to which he or she is entitled before the holder of a more junior right is entitled to any”). Prior appropriation doctrine may have lost some of its hard edges over time, however. See Charles F. Wilkinson, *In Memoriam: Prior Appropriation, 1848-1991*, 21 ENVTL. L. v, xvi (1991). The incorporation of market mechanisms into prior appropriation systems, for example, may allow reallocation of water rights to those who now value them most highly. See A. Dan Tarlock, *The Future of Prior Appropriation in the New West*, 41 NAT. RES. J. 769, 772 (2001) (describing how “water markets emerged as a major allocation force”); see generally James L. Huffman, *Water Marketing in Western Prior Appropriation States: A Model for the East*, 21 GA. ST. U. L. REV. 429, 448 (2004) (asserting that “markets generally are far more efficient than regulation and planning”).

52. Arnold, *supra* note 49, at 1058.

53. *Id.*

54. *Id.* at 1057; see generally Joseph W. Dellapenna, *The Evolution of Riparianism in the United States*, 95 MARQ. L. REV. 53, 87 (2011) (discussing the history of the development of riparian rights doctrine).

55. Sherry A. Enzler et al., *Finding a Path to Sustainable Water Management: Where We’ve Been, Where We Need to Go*, 39 WM. MITCHELL L. REV. 842, 858 (2013); see also Andrew Gage, *Climate Change Litigation and the Public Right to a Healthy Atmosphere*, 24 J. ENVTL. L. & PRAC. 257, 277 (2013) (“The idea that a riparian owner is entitled to an unchanged quality of water has been quite flexible.”); Douglas W. MacDougal, *Private Hopes and Public Values in the “Reasonable Beneficial Use” of Hawaiï’s Water: Is Balance Possible?*, 18 U. HAW. L. REV. 1, 15–16 (1996) (“The concept of reasonable use in riparian jurisdictions

To the extent that substantive adaptive capacity includes not only the flexibility of a regime's fundamental goal but also the controls and strategies employed to achieve that goal, the familiar distinction between rules and standards is also relevant to an assessment of the scope of a legal regime's substantive adaptive capacity.⁵⁶ Rules tend to be "clearly defined [and] highly administrable," thus providing more certainty and regulatory efficiency, while standards "produc[e] *ad hoc* decisions with relatively little precedential value,"⁵⁷ and thus are more concerned with the effectiveness of decision making than efficiency.⁵⁸ Professor Arnold draws on this distinction in describing an adaptive legal system as one that adapts to changing conditions by using "context-regarding standards and flexible discretionary decision making, in contrast to legal abstractions, rigid rules, and excessive limits on action and authority."⁵⁹ Others regard "the levels of clarity and flexibility" provided as "crucial" to the "distinction between rules and standards."⁶⁰ As Kathleen Sullivan has recognized, "[r]ules tend toward obsolescence. Standards, by contrast, are flexible and permit decision makers to adapt them to changing circumstances over time."⁶¹ The distinction between rules and

always contemplated the need for certain adjustments among users to insure that one's reasonable use would not unreasonably harm others' reasonable uses. . . . This essentially tort concept created a flexible vehicle for maximizing uses of streams."); *Vill. of Four Seasons Ass'n v. Elk Mountain Ski Resort*, 103 A.3d 814, 820 (Pa. 2014) (stating that under riparian rights doctrine, a riparian owner's entitlement to water is "subject to the reasonable use of the water by those similarly entitled").

56. Frederick Schauer calls the distinction "tediously familiar." Frederick Schauer, *The Tyranny of Choice and the Rulification of Standards*, 14 J. CONTEMP. LEGAL ISSUES 803, 804 (2005).

57. Duncan Kennedy, *Form and Substance in Private Law Adjudication*, 89 HARV. L. REV. 1685, 1685 (1976). As Professor Schauer has put it, rule adopters make most of the substantive choices at the time of the drafting, while standards allow choices "to be made at the moment of application." Schauer, *supra* note 56, at 804.

58. See Russell B. Korobkin, *Behavioral Analysis and Legal Form: Rules vs. Standards Revisited*, 79 OR. L. REV. 23, 36 (2000) ("[B]ecause rules are specified *ex ante*, even complex rules will sometimes fail to take account of all factual variations that might arise *ex post* which might be relevant to optimal tailoring of legal boundaries.").

59. Craig Anthony (Tony) Arnold, *Resilient Cities and Adaptive Law*, 50 IDAHO L. REV. 245, 253 (2014).

60. Michael Faure et. al., *The Regulator's Dilemma: Caught Between the Need for Flexibility & the Demands of Foreseeability. Reassessing the Lex Certa Principle*, 24 ALB. L.J. SCI. & TECH. 283, 292 (2014).

61. Kathleen M. Sullivan, *Foreword: The Justices of Rules and Standards*,

standards blurs at the edges, however, as “the categorical distinctions being attempted are not binary but more akin to a pluralism, continuum or synthesis.”⁶²

B. Procedural Legal Adaptive Capacity

Procedural legal adaptive capacity measures the degree to which a legal regime’s process is able to adjust to new policy directions or information or changed factual circumstances. According to Professor Arnold, “[a]n adaptive law system recognizes and embraces iterative processes among multiple participants, instead of linear decision making and implementation processes by a single authority.”⁶³ At one end of the spectrum of procedural adaptability is the U.S. Constitution, which, among other things, creates a rigorous process for amendment.⁶⁴ The Constitution “displays little tolerance for structural or process change. It was designed to be hard to alter in design.”⁶⁵

Other forms of lawmaking tend to be more procedurally adaptable, but not uniformly so. The Anglo-American common law system, for example, is in some ways more procedurally adaptive than the legislative process. A common law court has the capacity to distinguish previous cases when addressing new factual circumstances.⁶⁶ If Congress wants to amend a statute

106 HARV. L. REV. 22, 66 (1992); see also Michael J. Burstein, *Rules for Patents*, 52 WM. & MARY L. REV. 1747, 1771 (2011) (“Rules are bright-line and clear. Standards are flexible and adaptable.”); Richard A. Posner, *The Constitution as an Economic Document*, 56 GEO. WASH. L. REV. 4, 7 (1987) (describing standards as more adaptable to changed circumstances than rules); Pierre J. Schlag, *Rules and Standards*, 33 UCLA L. REV. 379, 400 (1985) (claiming that “standards are seen as more appropriate when flexibility, individualization, open-endedness, and dynamism are important”).

62. Camacho, *supra* note 15, at 891.

63. Arnold, *supra* note 59, at 253.

64. See U.S. CONST. art. V.

65. Ruhl, *supra* note 10, at 1380. Cf. Lazarus, *supra* note 2, at 1180 (describing “strong structural bias within our existing lawmaking institutions in favor of government acting slowly and incrementally.”); *id.* at 1198 (arguing that the Constitution makes lawmaking difficult “to guard against potential overreaction to more immediate impulses of the moment”).

66. See, e.g., Ruhl, *supra* note 10, at 1381 (describing the American common law system as “an example of ecological resilience” with “a high capacity for swings in behavior in response to changing conditions without altering the system’s basic structure and process design”); see also Eric W. Orts, *Reflexive Environmental Law*, 89 NW. U. L. REV. 1227, 1256 n.118 (1995) (describing the common law of nuisance as “flexible with respect to different factual nuances”).

to address a new situation not covered by existing law, or because changed circumstances have undercut the effectiveness of existing law, it must follow the constitutionally prescribed method for changing the law—adoption of the same bill by both houses of Congress and either presidential signature or legislative override of a presidential veto by a two-thirds vote.⁶⁷

Within the realm of administrative law, statutes make it easier for agencies to shift course in some contexts than in others. The Administrative Procedure Act (APA), for example, imposes more rigorous procedural requirements for the adoption of formal than informal rules.⁶⁸ Thus, an agency subject to formal rulemaking procedure is likely to have to devote more time and resources to rule promulgation than if it need only comply with notice-and-comment procedures.⁶⁹ If an agency chooses to adopt a nonbinding non-legislative rule, most APA rulemaking requirements do not apply at all.⁷⁰

Another aspect of regulation that leads to differential procedural legal adaptive capacity is the extent to which it relies on what one of the authors has referred to as “front-end” decision-making processes or “back-end” adjustments.⁷¹ Front-end requirements are designed to rationalize regulation on the basis of rational choice theory, microeconomic efficiency models, and cost-benefit analysis.⁷² “Back-end” mechanisms

Justice Holmes’s “claim that legal doctrines evolve in response to changes in the social environment has become virtually a canon of professional faith for American lawyers.” E. Donald Elliott, *The Evolutionary Tradition in Jurisprudence*, 85 COLUM. L. REV. 38, 51 (1985). Cf. Hornstein, *supra* note 2, at 921 (describing view that when common law doctrines were inefficient and judges made mistakes, people adversely affected by those rules “would have a greater incentive to litigate and relitigate them”); *Tincher v. Omega Flex, Inc.*, 104 A.3d 328, 386 (Pa. 2014) (describing common law proximate cause doctrine as “allow[ing] periodic adjustment between recovery for wrong and limits upon liability to advance desirable policy outcomes”).

67. U.S. CONST. art. I, § 7, cl. 2.

68. Compare 5 U.S.C. §§ 556–557 (2012), with *id.* § 553(b)–(c).

69. Cf. ROBERT L. GLICKSMAN & RICHARD E. LEVY, ADMINISTRATIVE LAW: AGENCY ACTION IN LEGAL CONTEXT 378 (Foundation Press ed., 2d ed. 2014) (arguing that more extensive rulemaking procedures may “reduc[e] regulatory output” due to lengthier and more costly process); Jeffrey S. Lubbers, *The Transformation of the U.S. Rulemaking Process—For Better or for Worse*, 34 OHIO N.U. L. REV. 469, 473–74 (2008) (finding that hybrid procedures contributed to a decline in rulemaking output of agencies like EPA).

70. 5 U.S.C. § 553(b)(A) (2012).

71. Glicksman & Shapiro, *supra* note 2, at 1179.

72. *Id.* at 1183.

allow policymakers to make incremental adjustments in regulatory approaches or applications based on factors such as the actual impacts of regulation, changed circumstances, or information that was unavailable at the time of initial regulatory adoption.⁷³ Reliance on back-end adjustments, such as variances, exceptions, or deadline extensions, mitigates the problems resulting from the bounded rationality facing agencies when they seek to design a one-shot solution at the inception of the regulatory process.⁷⁴ The authority to make back-end adjustments creates regulatory flexibility that can mitigate unfair or unintended results, thereby increasing the legitimacy of regulatory efforts.⁷⁵ That enhanced flexibility may come at a price, however, as reliance on back-end adjustments can water down regulatory standards and allow regulators to cater to the desires of regulated entities or beneficiaries in ways that may not be transparent.⁷⁶

Professor Ruhl characterizes much of environmental law as fixated on reliance on front-end approaches such as environmental assessment and cost-benefit analysis, producing a system that “shows no signs of being flexible.”⁷⁷ He asserts that this lack of flexibility tends to thwart efforts to adjust laws and “move toward ecological resilience strategies when variability is on the rise and prediction is unreliable.”⁷⁸ Numerous other scholars have similarly criticized the procedural rigidity of environmental laws⁷⁹ and administrative regulation more generally.⁸⁰ One of the authors has previously

73. *Id.* at 1179.

74. See SIDNEY A. SHAPIRO & ROBERT L. GLICKSMAN, RISK REGULATION AT RISK: RESTORING A PRAGMATIC APPROACH 23 (Stanford Univ. Press ed., 2003) (describing bounded rationality as the result of “time, resources, and cognitive constraints that make it virtually impossible to verify that the solution [reflected in a regulation at the time of its adoption] chosen is optimal”); see also McDonnell & Schwarcz, *supra* note 34, at 1640 (“Bounded rationality—the cognitive limits of real individuals, as opposed to the unlimited cognitive powers of the rational actor featured in economic models—can undermine regulatory adaptation . . .”).

75. Glicksman & Shapiro, *supra* note 2, at 1185–87 (describing the potential benefits of back-end adjustments); see also Craig & Ruhl, *supra* note 2, at 4 (arguing that a decision-making process skewed towards front-end analysis “constrains agency flexibility by demanding hyperdetailed predecisional impact assessments, intense public participation during the decisionmaking process, and postdecision hard look judicial review”).

76. Glicksman & Shapiro, *supra* note 2, at 1222–23.

77. Ruhl, *supra* note 10, at 1392.

78. *Id.* at 1393.

79. See, e.g., Camacho II, *supra* note 2, at 36–40.

80. See, e.g., Freeman, *supra* note 2, at 3, 35; Michael C. Dorf & Charles F.

characterized current natural resource management laws as directing

virtually all agency attention and resources . . . [toward] the initial decision, regardless of how little information there is to make the decision. Once an initial decision is made, whether regarding an individual project or an entire program, the agency rarely revisits it in any systematic way to adjust the decision or learn from its successes or limitations for future actions.⁸¹

As a result, “natural resource decision making reflects a static, front-end approach to resource regulation and management.”⁸²

Many scholars urge greater reliance on a back-end technique that has received much attention in the environmental law literature—adaptive management.⁸³ Adaptive management allows incremental policy and decision adjustments at the back end, under a framework in which altering course if conditions warrant is an essential ingredient.⁸⁴ An adaptive management framework is “evolutionary . . . , relying on iterative cycles of goal

Sabel, *A Constitution of Democratic Experimentalism*, 98 COLUM. L. REV. 267 (1998).

81. Camacho, *supra* note 18, at 1414.

82. *Id.*

83. See, e.g., Ahjond S. Garmestani et al., *Panarchy, Adaptive Management and Governance: Policy Options for Building Resilience*, 87 NEB. L. REV. 1036 (2009); Hillary M. Hoffmann, *Climate Change and the Decline of the Federal Range: Is Adaptive Management the Solution?*, 15 VT. J. ENVTL. L. 36 (2014); Kai N. Lee & Jody Lawrence, *Adaptive Management: Learning from the Columbia River Basin Fish and Wildlife Program*, 16 ENVTL. L. 431, 435 (1986); Bryan G. Norton, *The Rebirth of Environmentalism As Pragmatic, Adaptive Management*, 24 VA. ENVTL. L.J. 353 (2005); J.B. Ruhl, *Taking Adaptive Management Seriously: A Case Study of the Endangered Species Act*, 52 U. KAN. L. REV. 1249 (2004); Courtney Schultz & Martin Nie, *Decision-Making Triggers, Adaptive Management, and Natural Resources Law and Planning*, 52 NAT. RES. J. 443 (2012); John M. Volkman & Willis E. McConnaha, *Through A Glass, Darkly: Columbia River Salmon, the Endangered Species Act, and Adaptive Management*, 23 ENVTL. L. 1249 (1993).

84. J.B. Ruhl, *Regulation by Adaptive Management—Is It Possible?*, 7 MINN. J.L. SCI. & TECH. 21, 30 (2005); see also Bradley C. Karkkainen, *Panarchy and Adaptive Change: Around the Loop and Back Again*, 7 MINN. J.L. SCI. & TECH. 59, 75 (2005) (describing adaptive management as “at bottom a set of procedural principles—simultaneously a method of inquiry and a procedural mechanism of agency decisionmaking, based on rigorous observation through monitoring (‘passive’) and experimentation (‘active’), reassessment, and adjustment in light of what is learned”).

determination, model building, performance, standard setting, outcome monitoring, and standard recalibration.”⁸⁵ It therefore provides greater adaptive capacity than a regulatory approach that creates procedural constraints on pursuing changes in initial regulatory strategies. However, adaptive management may not be appropriate in all circumstances,⁸⁶ and less rigorous alternatives to formal adaptive management, such as contingency planning,⁸⁷ also seek to incentivize iterative planning and periodic adjustments (and thus increase procedural adaptive capacity).⁸⁸

Other forms of flexible decision-making processes that have received attention in the environmental policy arena include new governance and dynamic federalism. “New governance” theory favors “collaborative, multi-party, multi-level, adaptive, problem-solving” governance, whose central organizing principles are “stakeholder participation, collaboration among interests, diversity of and competition between instruments, decentralization of governance structures, integration of policy domains, flexibility, and an emphasis on noncoerciveness and adaptation.”⁸⁹ Dynamic federalism, in which regulatory jurisdiction is presumptively within the authority of both the federal and state governments, “builds scalability, modularity, and response diversity into the system.”⁹⁰ Back-end adjustment regimes such as adaptive

85. Ruhl, *supra* note 10, at 1391.

86. See, e.g., HOLLY DOREMUS ET AL., CTR. FOR PROGRESSIVE REFORM, MAKING GOOD USE OF ADAPTIVE MANAGEMENT 5–9 (2011), http://www.progressivereform.org/articles/adaptive_management_1104.pdf [<https://perma.cc/E5XS-52CA>] (stating that adaptive management should only be used if there are information gaps, good prospects for learning, and opportunities for adjustment in the regulatory process).

87. See, e.g., Gregg P. Macey, *The Architecture of Ignorance*, 2013 UTAH L. REV. 1627, 1667 (discussing use of contingency planning to accommodate data gaps in environmental law).

88. Camacho, *supra* note 18, at 1449.

89. Ruhl, *supra* note 10, at 1397. See also Chelsea Rose Johansen, *Solving “the Gravest Natural Resource Shortage You’ve Never Heard of”: Applying Transnational New Governance to the Phosphate Industry*, 46 VAND. J. TRANSNAT’L L. 933 (2013). For skepticism about the value of “institutional experimentation . . . under the new governance banner,” see Donald T. Hornstein, *Resiliency, Adaptation, and the Upsides of Ex Post Lawmaking*, 89 N.C. L. REV. 1549, 1555–56 (2011); see also Douglas NeJaime, *When New Governance Fails*, 70 OHIO ST. L.J. 323 (2009).

90. Ruhl, *supra* note 10, at 1398, 1401. See generally Kirsten H. Engel, *Harnessing the Benefits of Dynamic Federalism in Environmental Law*, 56 EMORY L.J. 159 (2006); Xuan-Thao Nguyen, *Dynamic Federalism and Patent Law*

management or new governance are examples of regulatory approaches with a relatively high degree of procedural legal adaptive capacity.

The manner in which an agency's structure is prescribed by statute, regulation, or other sources of law is connected to its procedural legal adaptive capacity.⁹¹ Scholars have discussed the relationship between structure and process in other contexts.⁹² The nature of an agency's vertical hierarchy, for example, may determine the number of participating decision makers and the need for internal appeal or review procedures. Similarly, scholarship has noted that how well an agency integrates scientific information into decision making or the extent of intra-agency centralization or coordination can influence the agency's capacity to adapt.⁹³ Indeed, proponents of adaptive management have emphasized the development of formal organizational structures that can promote adaptive decision making.⁹⁴

C. *Legal Adaptive Capacity and Values Tradeoffs*

The absence of either substantive or procedural legal adaptive capacity may hinder an agency's ability to accommodate changed circumstances in pursuing statutory goals. The lack of adaptability is troublesome if existing legal rules produce outcomes that were once desired but are no longer acceptable.⁹⁵ As Richard Lazarus has argued,

Reform, 85 IND. L.J. 449 (2010).

91. As noted above, Professor Ruhl distinguishes between a legal system's structure and processes. See Ruhl, *supra* note 10, at 1379.

92. See, e.g., Jonathan Rothchild, *Law, Religion, and Culture: The Function of System in Niklas Luhmann and Kathryn Tanner*, 24 J.L. & RELIGION 475, 494 (2009) (referring to "the relationship between structure and operation (process), or norm and action, or rule and decision"). For further discussion of the manner in which agency structure can affect legal adaptive capacity, see *infra* notes 529–533 and accompanying text (discussing the impact of the BLM's decentralized structure on its approach to climate change adaptation).

93. See, e.g., Robert L. Fischman, *The National Wildlife Refuge System and the Hallmarks of Modern Organic Legislation*, 29 ECOLOGY L.Q. 457, 555 (2002) (discussing FWS's weak integration of data influencing its ability to respond to new circumstances); Lawrence Susskind et al., *A Critical Assessment of Collaborative Adaptive Management in Practice*, 49 J. APPLIED ECOLOGY 47 (2012) (discussing cases of weak integration of scientific information into decision making influencing capacity of a regulatory program to adapt).

94. See, e.g., Camacho II, *supra* note 2.

95. See Ruhl, *supra* note 39, at 1001 (noting that an adaptive legal system responds to the recognition that "efforts to cling to a highly predictable, stable,

“[f]lexibility is necessary to allow for the modification of legal requirements over time in light of new information.”⁹⁶ Yet, legal adaptive capacity is not uniformly desirable.⁹⁷ Donald Hornstein has noted that “there is such a thing as too much adaptivity” and substantive resilience and adaptability in a legal system is not “an unalloyed good.”⁹⁸ As the debate over the desirability of rules and standards reveals, adaptive and non-adaptive legal systems each have advantages and disadvantages. In choosing the desirable form and extent of adaptability, those designing a legal system need to assess and strike a balance between the benefits and costs of adaptability.

A regime with limited substantive legal adaptive capacity has certain advantages over a more loosely defined and adaptable system. Because decision makers, such as agencies, have less flexibility, they may apply legal rules more consistently than if their ability to craft contextual legal solutions is more expansive. Consistency in decision making may promote stability and fairness and protect against arbitrariness.⁹⁹ A non-adaptive system is also likely to generate more predictable results, creating a degree of certainty that an adaptive system likely cannot match.¹⁰⁰ Certainty, in turn, may create incentives for affected interests to commit to actions and investments they may avoid if legal outcomes are unpredictable.¹⁰¹ In addition, a non-adaptive system may be more efficient to administer because decision

rule-habituated system of law undermine the adaptability of law to its changing subject matter”).

96. Lazarus, *supra* note 2, at 1157.

97. *Id.* at 1205–07 (proposing limits on capacity for certain future alterations to legislation addressing climate change); *see also* Ruhl, *supra* note 10, at 1382 (explaining that highly resilient legal systems may produce potentially undesirable normative outcomes).

98. Hornstein, *supra* note 89, at 1552. Hornstein refers to a resilient legal system that returns to path-dependent roots or is based on “suspect or even despised intellectual foundations.” *Id.*

99. *See* Sullivan, *supra* note 61, at 62 (“The argument that rules are fairer than standards is that rules require decisionmakers to act consistently, treating like cases alike.”). Rules may generate unfair results, however. *See* Ruhl, *supra* note 10, at 1402 (noting tradeoffs between a legal system’s resilience and the stability of its substantive content).

100. *Cf.* Eric Biber, *Adaptive Management and the Future of Environmental Law*, 46 AKRON L. REV. 933, 948 (2013) (arguing that flexibility creates uncertainty, which “creates significant costs—economic, social, psychological” for communities in which adaptive management is occurring).

101. *See, e.g.*, Antonin Scalia, *The Rule of Law as a Law of Rules*, 56 U. CHI. L. REV. 1175, 1179 (1989) (arguing that rules promote desirable predictability).

makers such as agencies choose from a limited number of prescribed solutions rather than inventing new approaches on a case-by-case basis.¹⁰²

In contrast, a legal system characterized by significant substantive legal adaptive capacity is likely better at allowing decision makers such as agencies to reach results that promote relevant policy goals in unanticipated or changed circumstances. A regime that lacks such capacity is likely to sacrifice the potential to tailor decisions to changing conditions in ways that promote regulatory or management goals.¹⁰³ Thus, a substantively adaptive system can reduce the risk that the quest for consistency leads to the application of fixed and bright-line rules to factual contexts for which they were not designed or are otherwise ill-matched.¹⁰⁴

Significant substantive legal adaptive capacity also may increase the risk that agencies will abuse their discretionary authority. For example, flexible goals provide an increased capacity to promote the interests of favored constituencies instead of the broader public interest.¹⁰⁵ Statutory constraints on substantive flexibility can minimize such “slippage.”¹⁰⁶ One important question for policymakers, therefore, is whether they regard it as more important to create a substantively nimble legal system or to reduce the risk that agencies vested with broad flexibility to accommodate solutions to novel challenges will stray from or subvert statutory goals.¹⁰⁷

102. Sullivan, *supra* note 61, at 63 (explaining how rules promote economies for legal decision makers).

103. Camacho, *supra* note 15, at 890–91.

104. Sullivan, *supra* note 61, at 62 (noting that “bright-line rules are arbitrary at the border”).

105. See Craig, *supra* note 18, at 64 (“Of course, increasing regulatory flexibility always opens the door to potential abuse.”); see also Robert L. Glicksman, *Ecosystem Resilience to Disruptions Linked to Global Climate Change: An Adaptive Approach to Federal Land Management*, 87 NEB. L. REV. 833, 836–37, 862 (2009) (describing the problematic nature of excessive grants of discretion). Some have argued, for example, that the flexible multiple-use mandate that governs USFS and BLM land management has resulted in such a skewing of agency priorities. See, e.g., Jan G. Laitos & Thomas A. Carr, *The Transformation on Public Lands*, 26 ECOLOGY L.Q. 140, 212 (1999) (stating that the “‘capture’ of multiple use agencies is due in part to the broad authority afforded public lands managers, the courts’ refusal to overturn exercises of agency discretion that make commodity use a preferred multiple use, and relentless pressure by mining, timber, and stockman’s interests”).

106. Biber, *supra* note 100, at 949.

107. Cf. Jody Freeman & David B. Spence, *Old Statutes, New Problems*, 163 U. PA. L. REV. 1, 5 (2014) (identifying “the central challenge of the modern

Choosing the desirable level of a legal system's procedural legal adaptive capacity turns on similar tradeoffs. A non-adaptive system that relies on front-end decisionmaking is likely to be less resource intensive. An iterative process such as adaptive management has both direct implementation costs and opportunity costs,¹⁰⁸ as do information-sharing frameworks.¹⁰⁹ In addition, some forms of process flexibility (such as the authority to craft policy through non-legislative rules) can lead to reduced public participation, which can reduce accountability and impair the information base on which agencies make decisions.¹¹⁰ Further, flexibility and back-end techniques may delay decision making to a time when resource constraints prevent or impair the quality of agency management actions.¹¹¹ Agencies purporting to engage in adaptive management or other forms of iterative decision making may actually be "kicking the can down the road" by deferring difficult decisions to an undetermined future time. Such an approach obviously reduces accountability.¹¹² Policymakers should consider whether they are comfortable with the likelihood that experimentation with context-specific solutions will sometimes fail. Such failures may result in lost or impaired resources; however, reliance on an inflexible management regime to deal with changed circumstances may produce similar or even greater harm.¹¹³ Finally, reducing

administrative state: how to balance the pragmatic need for administrative flexibility with respect for the rule of law and democratic values").

108. Biber, *supra* note 100, at 945–46. For further discussion of the disadvantages of reliance on adaptive management and similar forms of process flexibility and dynamism, see DOREMUS ET AL., *supra* note 86, at 5–9.

109. See Flatt, *supra* note 22, at 284 (noting the detrimental impact of underfunding on information-sharing).

110. Biber, *supra* note 100, at 949. See also Gregory N. Mandel & Gary E. Marchant, *The Living Regulatory Challenges of Synthetic Biology*, 100 IOWA L. REV. 155, 195 (2014) (arguing that "soft law" measures "may not provide the normal procedural safeguards that are an important part of traditional regulation and may reduce transparency or exclude relevant stakeholders from the decisionmaking process").

111. Biber, *supra* note 100, at 950.

112. See DOREMUS ET AL., *supra* note 86, at 11 ("One of the most significant weaknesses of adaptive management to date has been that agencies have promised future adaptation but not delivered it."); J.B. Ruhl & Robert L. Fischman, *Adaptive Management in the Courts*, 95 MINN. L. REV. 440, 461 (2010) (discussing the "temptation of adaptive management . . . to lavish attention on the iterative process at the expense of addressing the substantive management criteria required by law").

113. Biber, *supra* note 100, at 947.

uncertainty beyond a certain point may be impossible, and problems may demand immediate attention without the luxury of learning through iterative approaches such as adaptive management.¹¹⁴

On the other hand, heightened procedural legal adaptive capacity may allow agencies to act more quickly than under a less adaptive system. An agency that has the choice of pursuing statutory policies through either legislative or non-legislative rules, for example, can respond more quickly to the need for action by avoiding the procedural steps that accompany adoption of a binding rule.¹¹⁵ Another important potential advantage of more iterative forms of expansive procedural legal adaptive capacity is that they afford agencies and other decision makers the flexibility to make decisions based on less-than-perfect information, monitor the results, re-evaluate the decision, and, if appropriate, adjust future management.¹¹⁶ Many scholars and policymakers have extolled the benefits of adopting processes that integrate continued monitoring and adjustment, including increased effectiveness, legitimacy, and reduced long-term implementation costs.¹¹⁷ The benefits of increased procedural adaptive capacity may be particularly strong in regulatory contexts where there is incomplete understanding and the regulated system is changing.¹¹⁸

114. *Id.* at 940–42.

115. *See* *Perez v. Mortg. Bankers Ass'n*, 135 S. Ct. 1199 (2015) (holding that agencies need not comply with notice and comment procedures when amending interpretive rules); Jessica Mantel, *Procedural Safeguards for Agency Guidance: A Source of Legitimacy for the Administrative State*, 61 ADMIN. L. REV. 343, 402 (2009) (characterizing non-legislative rules as “an efficient means for modifying agency rules quickly in response to emerging issues or changes in agency policy”).

116. *See* Craig & Ruhl, *supra* note 2, at 4–5.

117. *See, e.g.*, BYRON K. WILLIAMS ET AL., ADAPTIVE MGMT. WORKING GRP., U.S. DEP'T OF THE INTERIOR, ADAPTIVE MANAGEMENT: THE U.S. DEPARTMENT OF THE INTERIOR TECHNICAL GUIDE 17 (2009), <http://www.usgs.gov/sdc/doc/DOI-%20Adaptive%20ManagementTechGuide.pdf> [<https://perma.cc/B9SR-VYTL>] (“The flexibility of adaptive management to respond to changing environmental conditions and improved understanding can result in better decision making.”); Freeman, *supra* note 2, at 28 (“[A] flexible, adaptive system capable of responding to advances in science, technology, knowledge, and shifting human judgments will produce better rules that are more likely to accomplish legislative goals.”); Alejandro E. Camacho, *Mustering the Missing Voices: A Collaborative Model for Fostering Equality, Community Involvement and Adaptive Planning in Land Use Decisions, Installment Two*, 24 STAN. ENVTL. L.J. 269, 307–14 (2005) (detailing studies analyzing flexible, collaborative processes and finding better quality decisions, more public acceptability, and decreased long-term cost); Dorf & Sabel, *supra* note 80, at 285.

118. *See* DOREMUS ET AL., *supra* note 86, at 5.

In short, those designing or refashioning a legal regime, including one that governs natural resource management in the era of climate change, should consider the tradeoffs involved in identifying the appropriate degree of both substantive and procedural legal adaptive capacity. Of course, the desirability of more or less adaptive legal regimes will depend on context, and the assessment of such tradeoffs may itself vary if the regime's underlying circumstances fundamentally change. Adaptability, substantive or procedural, may be the superior choice in situations characterized by dynamism and complexity, but not where those features are lacking and malleability gains do not offset the loss of predictability and accountability.¹¹⁹

II. CLIMATE DISRUPTION AND LEGAL ADAPTIVE CAPACITY

Unfortunately, global climate change is shifting both the physical and regulatory landscape for federal conservation lands to such an extent that it makes reconsideration of the legal adaptive capacity of longstanding management regimes crucial. Over the next several decades, climate change is widely anticipated to have significant effects on the various federal lands.¹²⁰ Even if significant and widespread mitigation strategies are adopted that substantially reduce carbon emissions worldwide, federal lands will experience substantial and potentially detrimental effects for decades.¹²¹

All four major land systems, as well as the wilderness areas that may exist in any of the four, will be affected. In

119. See Biber, *supra* note 100, at 956–59. Biber adds, however, that “where dynamism and complexity [are] so high that learning is impossible, we might again be better off with relatively rigid, inflexible standards based on front-end analysis.” *Id.* at 958. See also Lazarus, *supra* note 2, at 1157–58 (arguing that both flexibility and “stickiness” are needed to effectively respond to climate change).

120. See Robert L. Glicksman, *Governance of Public Lands, Public Agencies, and Natural Resources*, in *THE LAW OF ADAPTATION TO CLIMATE CHANGE: U.S. AND INTERNATIONAL AGENCIES* 441, 442–46 (Michael B. Gerrard & Katrina Fischer Kuh eds., 2012); Robert L. Glicksman, *Facing Unprecedented Stewardship Challenges: Climate Change and Federal Land Management*, in *CLIMATE CHANGE: A READER* 422, 423–29 (William H. Rodgers et al. eds., 2011); Glicksman, *supra* note 105, at 839–51.

121. Cf. Robert L. Glicksman, *Climate Change Adaptation: A Collective Action Perspective on Federalism Considerations*, 40 *ENVTL. L.* 1159, 1160–62 (2010) (discussing climate change to which the world is already committed, notwithstanding future mitigation efforts).

federal wildlife refuges, physical changes may cause species to become separated from key habitat. For example, according to the U.S. Government Accountability Office (GAO), “projected sea level rise may significantly alter habitat at coastal refuges for certain protected plant and animal species.”¹²² Sea-level rise is expected to affect 173 wildlife refuges.¹²³ Climate change is also anticipated to significantly alter the natural resources in national parks. According to the U.S. Geological Survey (USGS), for example, some of the largest glaciers in Glacier National Park may melt by 2030.¹²⁴ On the BLM public lands, climate change may exacerbate existing stressors such as wildfires and invasive species, impairing the BLM’s ability to manage those lands for multiple uses.¹²⁵ Persistent droughts, for example, may force the BLM to limit livestock grazing to protect drought-stressed plant and animal species.¹²⁶ Similarly, wildfires, invasive species, and extreme weather events are already affecting national forests and will be exacerbated by climate change.¹²⁷ These physical and biological changes raise fundamental challenges to the resilience of natural ecosystems¹²⁸ and thus to the agencies charged with managing the nation’s federal public lands.

More fundamentally, there is growing recognition that these physical and biological effects are already putting substantial stress on existing natural resource legal regimes, and these regimes increasingly will have trouble coping with these stressors.¹²⁹ Increased complexity and various potentially

122. U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-13-253, CLIMATE CHANGE: VARIOUS ADAPTATION EFFORTS ARE UNDER WAY AT KEY NATURAL RESOURCES MANAGEMENT AGENCIES 12 (2013), <http://www.gao.gov/products/gao-13-253> [<https://perma.cc/ZRL7-YSQ3>] [hereinafter GAO].

123. *National Wildlife Refuge System: Climate Change Planning*, U.S. FISH & WILDLIFE SERV., <http://www.fws.gov/refuges/planning/ClimateChangePlanning.html> [<https://perma.cc/3TCJ-V3YL>] (last updated Sept. 15, 2015).

124. GAO, *supra* note 122, at 14.

125. See RANGELAND FIRE TASK FORCE, AN INTEGRATED RANGELAND FIRE MANAGEMENT STRATEGY: FINAL REP. TO THE SEC’Y OF THE INTERIOR 1, 14 (2015), http://www.forestsandrangelands.gov/rangeland/documents/IntegratedRangelandFireManagementStrategy_FinalReportMay2015.pdf [<https://perma.cc/S9VN-5XCZ>] [hereinafter FIRE MANAGEMENT].

126. GAO, *supra* note 122, at 16–17.

127. *Id.* at 9.

128. See Alejandro Camacho & T. Douglas Beard, *Maintaining Resilience in the Face of Climate Change*, in SOCIAL-ECOLOGICAL RESILIENCE & LAW, *supra* note 27, at 235.

129. See Craig, *supra* note 18, at 30 (asserting that climate change adaptation “challenges . . . the existing capacity of legal institutions”); Ruhl, *supra* note 10, at

confounding variables associated with climate change considerably elevate the level of uncertainty for resource management.¹³⁰ This increased uncertainty, when combined with the limited adaptive capacity of existing natural resource laws and management institutions,¹³¹ is a more serious concern than climate change's potential physical effects.¹³² Climate change raises serious impediments to the capacity of the laws and institutions governing public land management to serve the purposes for which they were established.¹³³

Various scholars thus assert that existing law and institutions need to adapt to effectively manage the challenges raised by climate change. More precisely, scholars and policymakers increasingly acknowledge that climate change necessitates improved procedural adaptive capacity.¹³⁴ Many have encouraged the integration of procedural or structural

1392–400.

130. J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. REV. 1, 17 (2008); Camacho II, *supra* note 2, at 13–15.

131. See ROBERT L. PETERS, DEFENDERS OF WILDLIFE, BEYOND CUTTING EMISSIONS: PROTECTING WILDLIFE AND ECOSYSTEMS IN A WARMING WORLD 20, 22 (2008), http://www.defenders.org/publications/beyond_cutting_emissions.pdf [https://perma.cc/66N5-XJM3]; THE WHITE HOUSE COUNCIL ON ENVTL. QUALITY, PROGRESS REP. OF THE INTERAGENCY CLIMATE ADAPTATION TASK FORCE 4 (2010), <http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100315-interagency-adaptation-progress-report.pdf> [https://perma.cc/4TF3-7HQF] (describing existing regulatory framework as lacking “[a] robust approach to evaluating and applying lessons learned”); Alejandro E. Camacho, *A Learning Collaboratory: Improving Federal Climate Change Adaptation Planning*, 2011 BYU L. REV. 1821, 1824–25 (arguing that insufficient information about the performance of management strategies and programs increases uncertainty and impedes the development of climate change adaptation strategies).

132. See Camacho II, *supra* note 2, 12–15 (demonstrating how existing governance is poorly equipped to deal with impediments to climate change adaptation due to unprecedented uncertainty).

133. Similar challenges to existing legal regimes are often posed by technological changes. See, e.g., Mandel & Marchant, *supra* note 110, at 162 (“Regulatory systems, almost always, are designed for technologies existing at the time of the regulatory systems’ formation and are based on the then-current understanding of that technology.”).

134. See, e.g., Camacho II, *supra* note 2, at 64; Craig, *supra* note 18, at 16 (“Climate change is creating a world of triage, best guesses, and shifting sands, and the sooner we start adapting legal regimes to these new regulatory and management realities, the sooner we can . . . help humans, species, and ecosystems cope with the changes that are coming.”); Victor B. Flatt & Jeremy M. Tarr, *Adaptation, Legal Resiliency, and the U.S. Army Corps of Engineers: Managing Water Supply in a Climate-Altered World*, 89 N.C. L. REV. 1499, 1500 (2011) (“Our laws must adapt when they can no longer serve their intended function in light of a climate-altered world.”).

adaptation strategies to increase regulatory institutions' ability to manage the uncertainty of climate change, such as scenario planning,¹³⁵ adaptive management,¹³⁶ or agency structures that promote learning through the collection, dissemination, and use of information about climate effects and management strategies.¹³⁷

However, few scholars or policymakers have paid sufficient attention to the significance of substantive legal adaptive capacity. Professor Craig has described a mismatch between climate change adaptation and the preservation and restoration goals in certain pollution control and natural resource laws.¹³⁸ Similarly, one of the authors has raised questions about the long-term compatibility of natural resources laws that primarily focus on promoting historical or wildness preservation with the promotion of ecological health in the face of climate change.¹³⁹ Eric Biber and Elisabeth Long have addressed the capacity of agencies managing wilderness to accommodate climate change.¹⁴⁰ The remainder of this

135. See generally ECOSYSTEMS AND HUMAN WELL-BEING: SCENARIOS, VOL. 2 (Steve R. Carpenter et al. eds., 2005).

136. Tompkins & Adger, *supra* note 29, at 1–2; J. Michael Scott et al., *National Wildlife Refuges*, in PRELIMINARY REVIEW OF ADAPTATION OPTIONS FOR CLIMATE-SENSITIVE ECOSYSTEMS AND RESOURCES 4-3 to 4-4, 4-27 to 4-28, 4-30, 4-35 (Susan Herrod Julius & Jordan M. West eds., 2008), <http://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=180143&CFID=49115190&CFTOKEN=84622519> [<https://perma.cc/T2R6-XYKV>]; Camacho II, *supra* note 2, at 70–76.

137. See Camacho II, *supra* note 2, at 1 (recommending development of “adaptive governance” framework); PROGRESS REP. OF THE INTERAGENCY CLIMATE ADAPTATION TASK FORCE, *supra* note 131, at 6 (recommending “a commitment to dynamic engagement, iterative understanding of results, and rigorous evaluation”); WHITE HOUSE COUNCIL ON ENVTL. QUALITY, PROGRESS REP. OF THE INTERAGENCY CLIMATE ADAPTATION TASK FORCE: RECOMMENDED ACTIONS IN SUPPORT OF A NATIONAL CLIMATE CHANGE ADAPTATION STRATEGY 10 (Oct. 5, 2010), <http://www.whitehouse.gov/sites/default/files/microsites/ceq/Interagency-Climate-Change-Adaptation-Progress-Report.pdf> [<https://perma.cc/CR8H-FTAL>] (“Adaptation plans should include measurable goals and performance metrics to continuously assess whether adaptive actions are achieving desired outcomes.”); Camacho, *supra* note 131, at 1825–31.

138. See Craig, *supra* note 18, at 31–39. Professor Craig’s prescriptions, however, largely focus on promoting procedural adaptive capacity. See *id.* at 40–69 (detailing climate change adaptation law principles of monitoring, promoting resilience, coordination, and principled flexibility).

139. See Alejandro E. Camacho, *Assisted Migration: Redefining Nature and Natural Resource Law Under Climate Change*, 27 YALE J. ON REG. 171, 244–45 (2010); Camacho, *supra* note 18, at 1426–36 (detailing the weak adaptive capacity of natural resources laws premised on historical and/or wilderness preservation goals).

140. Elisabeth Long & Eric Biber, *The Wilderness Act and Climate Change*

Article systematically evaluates the relationship between the goals of federal land laws and the production of effective responses to the impacts of climate change to illustrate how substantive legal adaptive capacity can influence responses to unanticipated regulatory challenges or changing circumstances.

III. ASSESSING FEDERAL LAND LEGAL ADAPTIVE CAPACITY AND CLIMATE ADAPTATION

Although Congress has not adopted comprehensive climate change adaptation legislation, federal agencies have engaged in adaptation planning activities for over a decade, to varying degrees. The five major federal natural resource management systems—national forests, public lands, national wildlife refuges, national parks, and designated wilderness—have been subject to a similar suite of initiatives at the White House or Departmental level to engage in climate change adaptation activities. The President, the DOI, and the USDA have repeatedly directed and provided guidance to agencies to integrate climate change adaptation into their policies and programs. Nonetheless, these five land management systems have been subject to a wide variation in the types and degree of climate change adaptation.¹⁴¹ This Part explores, based on representative, prominent, or significant initiatives to date, the extent to which legal adaptive capacity correlates with the extent of adaptation planning and implementation activities for each of the five land regimes.¹⁴²

Historically, the approaches to land and resource management have differed sharply among federal land systems. The BLM and the USFS, often referred to as multiple-

Adaptation, 44 ENVTL. L. 623, 627 (2014). For further discussion of their analysis, see *infra* notes 497–499 and accompanying text.

141. Cf. Archie et al., *supra* note 22, at 20 (finding that “[t]he only statistically robust predictor of being farther along in the adaptation process was the agency identity itself”).

142. This Part does not purport to painstakingly catalog each adaptation activity that federal land agencies, units, or individual managers have undertaken or are currently considering. Rather, it provides an overview of official adaptation initiatives, with an emphasis on those that have been adopted and publicized by the agency. In assessing the extent of adaptation activities, it places particular value on those strategies that serve to integrate adaptation into core management actions.

use agencies,¹⁴³ for significant parts of their histories, tended to be driven—and some assert captured—by consumptive uses.¹⁴⁴ The USFS has been considered by many to be primarily focused on timber harvesting.¹⁴⁵ The BLM has long been closely linked to facilitating grazing¹⁴⁶ and mineral development.¹⁴⁷ These two agencies' organic statutes, the National Forest Management Act (NFMA)¹⁴⁸ and the Federal Land Policy and Management Act (FLPMA),¹⁴⁹ are largely pragmatic, utilitarian, and instrumental.¹⁵⁰ They expressly endorse sustainability—which, under at least some interpretations, amounts to maintenance of ecological function or integrity¹⁵¹—and delegate broad discretion to do what is

143. See generally 3 GEORGE C. COGGINS & ROBERT L. GLICKSMAN, *PUBLIC NATURAL RESOURCES LAW* ch. 30 (2d ed. 2007).

144. See, e.g., Holly Doremus, *Science Plays Defense: Natural Resource Management in the Bush Administration*, 32 *ECOLOGY L.Q.* 249, 282 (2005) (describing the USFS and the BLM as agencies “whose history and culture puts furthering the interests of extractive industries and local communities first”).

145. See, e.g., Steven Daugherty, *The Unfulfilled Promise of an End to Timber Dominance on the Tongass: Forest Service Implementation of the Tongass Timber Reform Act*, 24 *ENVTL. L.* 1573, 1585 n.67 (1994) (“Principles of agency capture teach that the Forest Service . . . will attempt to protect the interests of the timber industry in any situation in which it perceives ambiguity as to the requirements imposed upon it.”); see also *Sierra Club v. Morton*, 405 U.S. 727, 748 (1972) (Douglas, J., dissenting) (“The Forest Service . . . has been notorious for its alignment with lumber companies, although its mandate from Congress directs it to consider the various aspects of multiple use in its supervision of the national forests.”).

146. See, e.g., Debra L. Donahue, *Western Grazing: The Capture of Grass, Ground, and Government*, 35 *ENVTL. L.* 721 (2005) (exploring reasons for ranchers' domination of BLM resource management policies).

147. See Kelly Nolen, *Residents at Risk: Wildlife and the Bureau of Land Management's Planning Process*, 26 *ENVTL. L.* 771, 776 (1996) (describing BLM's tendency to favor extractive industries); Harold J. Krent & Nicholas S. Zeppos, *Monitoring Governmental Disposition of Assets: Fashioning Regulatory Substitutes for Market Controls*, 52 *VAND. L. REV.* 1705, 1719–20 (1999) (referring to the use of oil and gas lotteries to give away government assets as a practice that is “notorious for [its] departure from revenue-maximizing principles”).

148. 16 U.S.C. §§ 1600–1687 (2012).

149. 43 U.S.C. §§ 1701–1787 (2012).

150. See George Cameron Coggins, *The Law of Public Rangeland Management IV: FLPMA, PRIA, and the Multiple Use Mandate*, 14 *ENVTL. L.* 1, 16 (1983) (“Multiple use, sustained yield is basically a utilitarian principle”); Scott W. Hardt, *Federal Land Management in the Twenty-First Century: From Wise Use to Wise Stewardship*, 18 *HARV. ENVTL. L. REV.* 345, 378 (1994) (“Recalling Pinchot's ‘greatest good of the greatest number’ maxim, but broadening his utilitarian interpretation, FLPMA requires BLM to provide a balance of uses”).

151. See Lia Helena Monteiro de Lima Demange, *The Principle of Resilience*, 30 *PACE ENVTL. L. REV.* 695, 808 (2013); Aphrodite Smagadi, *Analysis of the Objectives of the Convention on Biological Diversity: Their Interrelation and*

necessary to achieve it.¹⁵² The substantive management mandates under these two statutes are also highly flexible. The multiple-use, sustained-yield standards that govern the BLM and the USFS “breathe discretion at every pore.”¹⁵³ Accordingly, we argue that the BLM and the USFS have relatively expansive legal adaptive capacity and are therefore relatively well positioned to engage in meaningful climate change adaptation activities.¹⁵⁴

Wilderness management aside, the USFS has in fact responded with greater alacrity and precision to the White House or Departmental prompts than agencies responsible for managing any of the other land systems. This includes the BLM, even though presidential directives apply equally to the two agencies and the DOI began imposing adaptation mandates on its agencies about a decade before USDA. Though differences in the extent that goal modification was compulsory may account for these disparities, the BLM’s slower responsiveness is likely due in part to other factors, which hindered its willingness or ability to take advantage of its adaptive authority.¹⁵⁵

Other federal land systems are subject to different management prescriptions. The FWS¹⁵⁶ and the NPS,¹⁵⁷ which are sometimes characterized as dominant use agencies,¹⁵⁸ are

Implementation Guidance for Access and Benefit Sharing, 31 COLUM. J. ENVTL. L. 243, 263 (2006); Susan L. Smith, *Ecologically Sustainable Development: Integrating Economics, Ecology, and Law*, 31 WILLAMETTE L. REV. 261, 280 (1995).

152. 16 U.S.C. §§ 1600(3), 1604(e)(1) (2012); 43 U.S.C. §§ 1701(a)(7), 1702(c), (h), 1712(c)(1), 1732(a) (2012).

153. *Wyoming v. U.S. Dep’t of Agric.*, 661 F.3d 1209, 1235 (10th Cir. 2011) (quoting *Perkins v. Bergland*, 608 F.2d 803, 806 (9th Cir. 1976)); see also Flatt & Tarr, *supra* note 134, at 1501 (asserting that multiple-use mandates can provide resource management agencies “with maximum flexibility and discretion for managing resources when needs or resource amounts change”).

154. Cf. Archie et al., *supra* note 22, at 20 (arguing that institutional contexts, such as statutory mandates and missions, “also greatly affect how an agency can interpret . . . a more flexible fire management regime and potentially climate change adaptation”).

155. See *infra* notes 519–546 and accompanying text.

156. The FWS administers the national wildlife refuges through its authority under the National Wildlife Refuge System Improvement Act. 16 U.S.C. § 668dd (2012).

157. The NPS manages the national parks through the authority granted it under the National Park Service Organic Act, 54 U.S.C.A. § 100101(a) (West 2015).

158. See 3 COGGINS & GLICKSMAN, *supra* note 143, at pt. H (characterizing the organic statutes of the NPS and the FWS as dominant-use laws).

often regarded as more committed to the conservation of the natural resources they manage than the USFS or the BLM.¹⁵⁹ One might therefore expect the FWS and the NPS to be more attentive to the potential effects of climate change on their jurisdictional lands and to be more apt to embrace the task of preparing to adapt to these changes.¹⁶⁰

Yet, the rules governing the NPS's and the FWS's management authority afford them less substantive legal adaptive capacity than provided for national forests and BLM lands. The organic statute and interpretive policies that govern management of the national parks—and the FWS's implementing regulations and policies for the National Wildlife Refuge System (NWRS)—seek to preserve those lands, typically by reference to a historical baseline.¹⁶¹ Importantly, agency interpretations and management “ha[ve] historically been based on the idea of maintaining current environmental conditions or restoring species and habitats to some desired former condition.”¹⁶² In addition, the subset of NPS lands and wildlife refuges that are in Alaska, or that include official wilderness, also emphasize goals of minimalist management or non-intervention.¹⁶³ In particular, official wilderness that is part of the National Wilderness Preservation System is subject to management mandates under the Wilderness Act of 1964 that are most closely rooted in non-intervention.¹⁶⁴

Neither the historical nor wilderness preservation goal fits well with the management approaches needed to promote ecological health in a changing climate. Climate change may obliterate historical conditions, making management to retain them very costly, if not impossible. It also will increasingly require active management to retain or restore ecological

159. See, e.g., Robert B. Keiter, *Ecological Concepts, Legal Standards, and Public Land Law: An Analysis and Assessment*, 44 NAT. RES. J. 943, 956 (2004) (referring to the NPS's “historic commitment to nature preservation”); Sandra B. Zellmer, *Wilderness Management in National Parks and Wildlife Refuges*, 44 ENVTL. L. 497, 546 (2014) (noting the NPS's “pride in wearing the stewardship mantle”); Doremus, *supra* note 144, at 282 (describing the FWS as an agency whose mission is primarily resource conservation).

160. See Fischman, et al., *supra* note 12, at 993.

161. See *infra* Sections III.D.1, III.E.1.

162. GAO, *supra* note 122, at 19; see also Ruhl & Salzman, *supra* note 18, at 18 (“[T]he FWS strives to manage the nation's wildlife refuges toward a baseline of ‘historic conditions.’”).

163. See *infra* Sections III.D.1, III.E.1.

164. See *infra* Section III.F.1.

health. In short, the NWRs's integration of historical preservation with more flexible sustainability goals makes it subject to a moderate level of substantive legal adaptive capacity. National parks, which are more heavily tied to historical preservation, are governed under a regime with limited substantive legal adaptive capacity. The emphasis on non-intervention in official wilderness provides the least adaptive capacity.

It is therefore not surprising to us that these regimes have not yet incorporated climate change adaptation into their decision-making frameworks to the same extent that the USFS has. In fact, the extent of adaptation activities correlates with the substantive adaptive capacity of the land regime, with refuges having made more progress on adaptation, followed by national parks. In the context of wilderness management, climate change adaptation has essentially gone missing.

A. *Executive Branch and Department-Wide Initiatives*

President Barack Obama has consistently prioritized climate preparedness. He issued an executive order in 2009 establishing a task force to create an initial adaptation strategy and directing all federal agencies to develop vulnerability assessments and adaptation plans.¹⁶⁵ Subsequently, the President directed agencies to protect biodiversity and conserve natural resources in the face of climate change.¹⁶⁶ A second executive order issued in 2013 replaced the initial task force with a multi-agency Council on Climate Preparedness and Resilience tasked with recommending actions to encourage federal agencies, states, tribes, and local governments to prepare for the effects of a changing climate.¹⁶⁷

In 2014, the Council issued a report identifying priority

165. Exec. Order No. 13514, Federal Leadership in Environmental, Energy, and Economic Performance, 74 Fed. Reg. 52,117 (Oct. 8, 2009). This Order was revoked by Exec. Order No. 13693, Planning for Federal Sustainability in the Next Decade, 80 Fed. Reg. 15,871 (Mar. 19, 2015), and President Obama replaced the task force with another climate-related, multi-agency council. *See infra* note 167 and accompanying text.

166. EXEC. OFFICE OF THE PRESIDENT, THE PRESIDENT'S CLIMATE ACTION PLAN 15 (2013), <http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf> [<https://perma.cc/8FNM-H6TT>].

167. Exec. Order No. 13653, Preparing the United States for the Impacts of Climate Change, 78 Fed. Reg. 66,819 (Nov. 1, 2013), *as amended by* Exec. Order No. 13683, 79 Fed. Reg. 75,041 (Dec. 11, 2014).

strategies to make the nation's natural resources more resilient to climate change, including: (1) fostering climate-resilient lands and waters, and (2) modernizing federal programs to build resilience.¹⁶⁸ The report concluded that despite progress in pursuing the first strategy, "management at the landscape scale is not yet the norm."¹⁶⁹ It directed agencies to develop and provide decision-support tools to improve their capacity to manage for resilience and to select priority areas for conservation, restoration, or other investments to build resilience.¹⁷⁰ The report further directed specific agencies, including the DOI and USDA, to develop "resilience metrics."¹⁷¹ With respect to the second priority, the Council directed agencies with natural resources responsibilities to identify best practices for applying resilience criteria to program management.¹⁷² For the most part, the Council's directives apply to all federal agencies with natural-resources-related responsibilities. The details of implementation in many cases, however, are left to departments or individual agencies within departments.

The DOI has long engaged in department-wide climate change adaptation initiatives. In 2001, the Interior Secretary issued an order directing DOI agencies to consider climate change impacts in planning, priority-setting, and resource management.¹⁷³ In 2009, Interior Secretary Kenneth Salazar replaced that order with Secretarial Order 3289, which established a Climate Change Response Council (CCRP) to execute a coordinated Department-wide strategy.¹⁷⁴ The Secretary directed the CCRP to work with the USGS to rename previously created "regional hubs" as Regional Climate Change

168. COUNCIL ON CLIMATE PREPAREDNESS & RESILIENCE, PRIORITY AGENDA: ENHANCING THE CLIMATE RESILIENCE OF AMERICA'S NATURAL RESOURCES 14 (Oct. 2014), http://www.whitehouse.gov/sites/default/files/docs/enhancing_climate_resilience_of_americas_natural_resources.pdf [<https://perma.cc/U3WH-3TRM>].

169. *Id.* at 16–18.

170. *Id.* at 19–20.

171. *Id.* at 20.

172. *Id.* at 51.

173. DEPT' OF THE INTERIOR, SECRETARIAL ORDER 3226 (Jan. 19, 2001), <http://elips.doi.gov/ELIPS/0/doc/291/Page1.aspx> [<https://perma.cc/WX37-7V3D>].

174. DEPT' OF THE INTERIOR, SECRETARIAL ORDER 3289: ADDRESSING THE IMPACTS OF CLIMATE CHANGE ON AMERICA'S WATER, LAND, AND OTHER NATURAL AND CULTURAL RESOURCES § 3(a). (Sept. 14, 2009), <http://www.doi.gov/whatwedo/climate/cop15/upload/SecOrder3289.pdf> [<https://perma.cc/N2K6-SLM2>].

Response Centers (CSCs) to develop adaptation tools for use by DOI managers.¹⁷⁵ It also called for the development of Landscape Conservation Cooperatives (LCCs) to coordinate regional adaptation efforts.¹⁷⁶ With the FWS serving as primary coordinator, each LCC serves as a conduit for interagency communication on regional landscape conservation.¹⁷⁷ Like its predecessor, Order 3289 imposed uniform mandates on all DOI agencies.¹⁷⁸

In 2012, the DOI included in its Departmental Manual new provisions relating to climate change adaptation.¹⁷⁹ The provisions commit the DOI to integration of climate change adaptation strategies into its policies, planning, programs, and operations, including park, refuge, and public land management; habitat restoration; species and ecosystem conservation; water management; and land acquisition.¹⁸⁰ The Manual specifies that the DOI will manage uncertainty through tools such as scenario planning and adaptive management, and will promote landscape-scale, ecosystem-based management approaches to enhance resilience and sustainability of linked human and natural systems.¹⁸¹ It commits the DOI to develop performance metrics in management plans and regularly assess whether such measures are succeeding.¹⁸² Bureau and office heads must incorporate adaptation into planning processes, develop and implement adaptation plans, and update decision-making processes to integrate the policy's principles and values.¹⁸³

175. *Id.* § 3(b). The DOI subsequently created eight such Centers. *Climate Science Centers: CSC Regions*, DEP'T OF THE INTERIOR, <http://www.doi.gov/csc/centers> [<https://perma.cc/G3LQ-X6ZA>]. For a description of the CSCs, see USGCRP, SYNTHESIS, *supra* note 11, at 41–42.

176. SECRETARIAL ORDER 3289, *supra* note 174, § 3(c). For a description of the functions of the LCCs, see USGCRP, SYNTHESIS, *supra* note 11, at 39–41.

177. *About Landscape Conservation Cooperatives*, LANDSCAPE CONSERVATION COOPERATIVE NETWORK, <http://lccnetwork.org/about/about-lccs> [<https://perma.cc/E8HM-G8SV>].

178. See SECRETARIAL ORDER 3289, *supra* note 174, § 1 (stating that the Order “establishes a Department-wide approach”).

179. Climate Change Policy, 523 DM 1 (effective Dec. 20, 2012), http://www.fws.gov/mountain-prairie/science/documents/Climate%20Change%20Policy_DM_523.pdf [<https://perma.cc/YF4U-7S27>].

180. SECRETARIAL ORDER 3289, *supra* note 174, § 1.4.

181. *Id.* § 1.4A(7), (9).

182. *Id.* § 1.4B.

183. *Id.* § 1.5C. Agency heads also must ensure full engagement with LCCs and CSCs. *Id.*

However, the DOI specified that the policy is only designed to improve its internal management, creates no enforceable rights, and “does not alter or affect any existing duty or authority of individual bureaus.”¹⁸⁴

The DOI issued a Climate Change Adaptation Plan in 2013 that recognized that “[v]ulnerabilities to climate change impacts vary widely across the Department’s mission areas. Bureaus’ climate change adaptation priorities and needs depend on the particular vulnerabilities of their mission and assets.”¹⁸⁵ The plan nevertheless enunciated “guiding principles” for all bureaus and offices.¹⁸⁶ These included enhancing the ability of ecosystems and wildlife populations to absorb change and maintain key qualities through means such as protection and restoration of contiguous blocks of unfragmented habitat and enhanced connectivity among habitat blocks.¹⁸⁷ The plan also stated that the DOI would require individual agencies to establish adaptation-related planning priorities.¹⁸⁸

In 2014, the DOI issued a more elaborate plan, which described its “evolving” approach to climate change adaptation.¹⁸⁹ This plan identified climate adaptation priorities for the three DOI land management agencies.¹⁹⁰ For the BLM, these included conducting vulnerability assessments and strengthening landscape level planning efforts.¹⁹¹ For the NPS, they included developing guidance for the incorporation of climate change science into park and strategic plans and the implementation of those plans at the field level, as well as the evaluation of risk and prioritization of adaptation actions to protect facilities and cultural and historical resources.¹⁹² For the FWS, priorities included facilitating sustainable landscapes

184. *Id.* § 1.6.

185. DEPT OF THE INTERIOR, CLIMATE CHANGE ADAPTATION PLAN FOR FY 2013, at 1 (2013), http://www.doi.gov/greening/sustainability_plan/upload/DOI_Climate_Adaptation_Plan_for_FY2013_for_release.pdf [https://perma.cc/8UFC-6CC5].

186. *Id.*

187. *Id.* at 4–8.

188. *Id.* at 11–12.

189. DEPT OF THE INTERIOR, CLIMATE CHANGE ADAPTATION PLAN 2014, at 3 (2014), http://www.doi.gov/greening/sustainability_plan/upload/2014_DOI_Climate_Change_Adaptation_Plan.pdf [https://perma.cc/8NXW-XQXM].

190. *Id.* at 10–11.

191. *Id.* at 11.

192. *Id.* at 12–13.

through LCC-based collaborative planning and management and by developing a climate change policy framework.¹⁹³

The 2014 plan also identified five principal strategies for managing climate risks and building resilience.¹⁹⁴ One strategy is to mainstream and integrate climate change adaptation into both agency-wide and regional planning efforts.¹⁹⁵ An example is the FWS's efforts through LCCs and CSCs to develop shared adaptation goals with conservation partners and develop resilient landscape designs.¹⁹⁶ As of fiscal year 2014, the design of these efforts was either underway or project activity had been initiated.¹⁹⁷ Another strategy is to enforce protocols that reflect projected health and safety impacts of climate change.¹⁹⁸ One example is NPS efforts to factor sea level rise and storm surge science into hurricane response plans for coastal parks.¹⁹⁹ Progress is again seemingly described as rudimentary; design is either underway or project activity has been initiated.²⁰⁰ Yet another strategy involves updating external programs and policies (for example, through grants and technical assistance) to incentivize planning for and addressing climate impacts.²⁰¹ What is striking about all of these examples is how far from broad scale, on-the-ground implementation all of them appear to be.

The USDA began publishing agency-wide directives to plan for climate change about a decade after the DOI. Departmental Regulation 1070-001, issued in 2011, established a USDA-wide directive to integrate climate change adaptation planning and actions into programs, policies, and operations.²⁰² The Regulation required USDA agencies to analyze how climate

193. *Id.* at 13.

194. *Id.* at 26–30.

195. *Id.* at 26–27.

196. *Id.* at 27.

197. *Id.* at 26–27.

198. *Id.* at 28.

199. *Id.*

200. *Id.*

201. *Id.* at 29–30.

202. U.S. DEP'T OF AGRIC., DEP'T REG. 1070-001, POLICY STATEMENT ON CLIMATE CHANGE ADAPTATION 1 (June 3, 2011), <http://www.ocio.usda.gov/sites/default/files/docs/2012/DR%201070-001%20USDA%20Policy%20on%20Climate%20Change.pdf> [https://perma.cc/HD4M-MHZN].

The USDA had issued a strategic plan the year before which included as one of four strategic goals promoting resilience to climate change. It also released a Climate Change Science Plan that year, which sought to incorporate climate change into the USDA's scientific missions. USGCRP, SYNTHESIS, *supra* note 11, at 16–17.

change may affect missions and program objectives, identify necessary budgetary adjustments, and specify areas in which legal analysis is needed to implement the Regulation.²⁰³ It also directed agencies to consider climate impacts in long-term planning.²⁰⁴

Two years later, the USDA issued a Strategic Sustainability Plan that committed it to develop, prioritize, implement, and evaluate actions to minimize climate risks.²⁰⁵ The plan identified nine sustainability goals, the last of which was promoting climate change resiliency.²⁰⁶ By fiscal year 2014, the USDA would implement agency-specific adaptation plans.²⁰⁷ It would also incorporate preparedness and resilience into planning and implementation guidelines for specific projects.²⁰⁸

The USDA's 2014 Climate Change Adaptation Plan noted the need for flexibility to adapt to the uncertainty reflected in climate change projections.²⁰⁹ The Plan identified five strategic goals,²¹⁰ including ensuring that the national forests are "conserved, restored, and made more resilient to climate change."²¹¹ The Plan included adaptation plans by individual

203. USGCRP, SYNTHESIS, *supra* note 11, at 2.

204. *Id.* at 2–3.

205. U.S. DEP'T OF AGRIC., 2013 STRATEGIC SUSTAINABILITY PERFORMANCE PLAN, at iii (June 21, 2013), <http://www.dm.usda.gov/emd/docs/2013%20USDA%20Strategic%20Sustainability%20Performance%20Plan.pdf> [<https://perma.cc/A9CV-LP2M>].

206. *Id.* at xi–xii.

207. *Id.* at 33.

208. *Id.* at 34.

209. U.S. DEP'T OF AGRIC., CLIMATE CHANGE ADAPTATION PLAN 9 (June 2014), http://www.usda.gov/oce/climate_change/adaptation/adaptation_plan.htm [<https://perma.cc/6FAQ-HRDJ>] [hereinafter USDA CLIMATE CHANGE ADAPTATION PLAN].

210. USDA had previously identified these goals in its Strategic Plan for fiscal years 2014–2018. U.S. DEP'T OF AGRIC., STRATEGIC PLAN FY 2014–2018, at 3–4 (2014), <http://www.usda.gov/documents/usda-strategic-plan-fy-2014-2018.pdf> [<https://perma.cc/L33D-SBFS>] [hereinafter USDA STRATEGIC PLAN FY 2014–2018].

211. USDA CLIMATE CHANGE ADAPTATION PLAN, *supra* note 209, at 2. To achieve that goal, the USDA sought to improve forest and grassland health, lead efforts to mitigate and adapt to climate change, protect and enhance water resources, and reduce the risk of catastrophic wildfire. USDA STRATEGIC PLAN FY 2014–2018, *supra* note 210, at 3, 14–18; *see also* DANNY C. LEE ET AL., FOREST & RANGELANDS, A NATIONAL COHESIVE WILDLAND FIRE MANAGEMENT STRATEGY (2014), http://www.forestsandrangelands.gov/strategy/documents/reports/1_CohesiveStrategy03172011.pdf [<https://perma.cc/7A7W-56ML>] (collaborative effort by the USFS, among other public and private entities, to address wildfire

USDA agencies, including the USFS's plan,²¹² which is discussed below.²¹³

B. The National Forests

The USFS's management of national forests exhibits considerable legal adaptive capacity as a result of both flexible substantive management goals that focus on promoting sustainable ecological function and the integration of flexible processes for resource management. The USFS has leveraged this substantial legal adaptive capacity to engage in the most extensive climate-related planning of the four land management agencies. More importantly, it has begun to integrate consideration of and preparation for climate change into its core management processes.

1. Adaptive Capacity Under NFMA

The USFS derives its management and regulatory authority from the National Forest Management Act (NFMA).²¹⁴ NFMA's focus on promoting long-term ecological sustainability and diversity as part of a multiple-use, sustained-yield regime provides a flexible resource management goal that is able to accommodate ecological change.

In advancing its focus on long-term productive use of national forests, NFMA is replete with references to the need to accommodate change in management. The statute's very first subsection includes a congressional finding that "the

risks). The USDA established seven regional climate hubs to strengthen resource management under increasing climate variability. *Id.* at 20. These hubs involve USDA coordination with DOI CSCs and LCCs, as well as other agencies. *Id.* at 26–27. The USFS hosts five of the hubs. *Id.* at 67.

212. DANNY C. LEE ET AL., *supra* note 211, at 57–88.

213. *See infra* Section III.B.2. In 2015, the USDA issued a directive on the establishment and revision of its climate change adaptation plan. The directive requires USDA agencies to integrate climate change adaptation planning, implementing actions, and performance metrics into its programs, policies, and operations. It also requires agencies to identify areas in which budget adjustments or legal analysis is needed to carry out actions identified in the directive. U.S. DEP'T OF AGRIC., DEP'T REG. 1070-001, POLICY STATEMENT ON CLIMATE CHANGE ADAPTION (2015), <http://www.ocio.usda.gov/document/departmental-regulation-1070-001> [<https://perma.cc/7AUU-JTSU>].

214. 16 U.S.C. §§ 1600–1687 (2012).

management of the Nation's renewable resources is highly complex and the uses, demand for, and supply of the various resources are subject to change over time."²¹⁵ The statute enunciates that the public interest is served by the USFS's assessment of the nation's renewable resources and periodic preparation, review, and updating of a national renewable resource program.²¹⁶ Other indications that Congress sought to afford the USFS the tools to react to changing conditions and needs are reflected in congressional findings that new knowledge derived from scientific research will promote "a sound technical and ecological base for effective management, use, and protection of the Nation's renewable resources,"²¹⁷ and that the USFS has a responsibility and opportunity to "be a leader in assuring that the Nation maintains a natural resource conservation posture that will meet the needs of our people in perpetuity."²¹⁸ NFMA also directs the USFS to maintain on a continuing basis a detailed, comprehensive inventory of National Forest System lands that "reflect[s] changes in conditions and identif[ies] new and emerging resources and values."²¹⁹

Indeed, in a provision added by the Food, Agriculture, Conservation, and Trade Act of 1990,²²⁰ NFMA specifically requires the periodic resource assessment to include "an analysis of the potential effects of global climate change on the condition of renewable resources on the forests and rangelands of the United States."²²¹ Similarly, the 1990 amendments to NFMA require the USFS to periodically prepare and submit to the President a Renewable Resource Program, which must include management recommendations that "account for the

215. *Id.* § 1600(1).

216. *Id.* § 1600(2).

217. *Id.* § 1600(4).

218. *Id.* § 1600(6).

219. *Id.* § 1603.

220. Food, Agriculture, Conservation, and Trade Act of 1990, Pub. L. No. 101-624, § 2408(a)(3), 104 Stat. 3359. The committee reports provide relatively little explanation. *See* S. REP. NO. 107-357, 1990 U.S.C.C.A.N. 4656, 5001, 5251 (1990) (stating that § 1940 of the Senate bill "amends [NFMA] by requiring a detailed analysis of the potential effects of climate change on renewable resources [and] a detailed analysis of forestry opportunities to mitigate and reduce the risk of climate change from global climate change . . .").

221. 16 U.S.C. § 1601(a)(5) (2012). The statute also requires the agency to analyze forestry opportunities to mitigate the buildup of atmospheric carbon dioxide and reduce the risk of climate change. *Id.* § 1601(a)(6).

effects of global climate change on forest and rangeland conditions, including potential effects on the geographic ranges of species, and on forest and rangeland products.”²²²

The USFS’s authority (and duty) to manage the forests in light of changing conditions is also integrally woven into NFMA’s basic management standards. The statute declares a policy that the forests “shall be maintained in appropriate forest cover . . . to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans.”²²³ It requires the USFS to periodically adopt detailed management plans for each national forest and assure that the plans “provide for multiple use and sustained yield of the products and services obtained therefrom.”²²⁴ The USFS must “determine forest management systems” in light of multiple-use and sustained-yield principles,²²⁵ as borrowed from the Multiple-Use Sustained Yield Act of 1960.²²⁶ The 1960 Act defines multiple use as management of the national forests so that they are used in the combination that best meets the nation’s needs, providing “sufficient latitude for periodic adjustments in use to conform to changing needs and conditions.”²²⁷

NFMA therefore provides the USFS considerable flexibility in determining the appropriate balance of multiple uses in its planning and management activities.²²⁸ As indicated above, the courts have described the multiple-use, sustained-yield standards as “breathing discretion at every pore.”²²⁹ They also have characterized those standards as failing to provide any

222. *Id.* § 1602(5)(F).

223. *Id.* § 1601(d)(1).

224. *Id.* § 1604(e)(1). The statute identifies recreation, range, timber, watershed, wildlife and fish, and wilderness as relevant multiple uses. *Id.*

225. *Id.* § 1604(e)(2).

226. 16 U.S.C. §§ 528–531 (2012).

227. *Id.* § 531(a). The definition of multiple use also acknowledges that “some land will be used for less than all of the resources” and that the appropriate use combination for a particular parcel is not necessarily the one “that will give the greatest dollar return or the greatest unit output.” *Id.* The 1960 Act defines “sustained yield of the several products and services” as “the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land.” *Id.* § 531(b). Both the USFS and the BLM “have effectively applied that definition only in the context of one resource, timber.” 3 COGGINS & GLICKSMAN, *supra* note 143, § 32:27.

228. See JAN G. LAITOS, NATURAL RESOURCES LAW 163 (2002).

229. Perkins v. Bergland, 608 F.2d 803, 806 (9th Cir. 1979).

guidance on how to assess agency management activities.²³⁰

Nevertheless, NFMA imposes some substantive constraints on agency discretion. It requires that land and resource management plans “provide for diversity of plant and animal communities . . . in order to meet overall multiple-use objectives” in light of the suitability and capability of a particular national forest unit.²³¹ Further, the multiple-use, sustained-yield management mandate can be read to encompass management for ecosystem health.²³²

Even viewed from the narrowest perspective of its role—as an agricultural manager of timber production—sustainability and adaptation to future conditions that threaten to disrupt forest function has always been critical to the USFS’s mission.²³³ However, in recent years the USFS has demonstrated a much broader commitment to ecological sustainability, as reflected in its latest Planning and Roadless Rules. The stated purpose of the agency’s 2012 planning regulations is to produce plans that:

[P]romote the ecological integrity of national forests and grasslands and other administrative units of the [National Forest System (NFS)]. Plans will guide management of NFS lands so that they are ecologically sustainable and contribute to social and economic sustainability; consist of ecosystems and watersheds with ecological integrity and diverse plant and animal communities; and have the capacity to provide people and communities with ecosystem services and multiple uses that provide a range of social, economic, and ecological benefits for the present and into

230. *Sierra Club v. Marita*, 845 F. Supp. 1317, 1328 (E.D. Wis. 1994), *aff’d*, 46 F.3d 606 (7th Cir. 1995).

231. 16 U.S.C. § 1604(g)(3)(B) (2012). It also requires “to the degree practicable, for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan.” *Id.*

232. See 3 COGGINS & GLICKSMAN, *supra* note 143, § 30:5 (arguing that “multiple use, sustained yield” management “may implicitly encompass” ecosystem management).

233. See, e.g., Fred P. Bosselman & A. Dan Tarlock, *The Influence of Ecological Science on American Law: An Introduction*, 69 CHI.-KENT L. REV. 847, 860 (1994) (asserting that as far back as the 1930s, “[t]he renewability of resources (which today would be called sustainable development) became a key objective of the Forest Service”).

the future.²³⁴

Similarly, the USFS justified its 2001 regulations restricting timber harvesting and road construction as necessary to protect the social and ecological values and characteristics of roadless areas, whose watershed values and ecosystem health would be at risk without immediate action.²³⁵ These commitments increase the likelihood that the USFS will take rapid and extensive adaptation planning and implementation seriously.²³⁶

The USFS's expansive substantive legal adaptive capacity is accompanied by its embrace of procedural legal adaptive capacity through flexible adaptive management procedures in its planning rules. The USFS has integrated adaptive management and similar back-end mechanisms into and throughout its management process. The regulations, adopted in 2012, define the planning process as an "iterative" one comprised of assessment, plan development or revision, and monitoring.²³⁷ Indeed, one of the defects in the 1982 planning regulations that the 2012 regulations sought to remedy was their failure to reflect current adaptive management practices.²³⁸ Among other things, agency officials must prepare monitoring evaluations indicating whether or not a change to management activities may be warranted based on the new information, and use the results to inform adaptive management of the plan area.²³⁹ Courts have endorsed the

234. 36 C.F.R. § 219.1(c) (2015).

235. Special Areas; Roadless Area Conservation, 66 Fed. Reg. 3244, 3247 (Jan. 12, 2001).

236. Assessments of the success of the roadless rule in achieving its objectives have been mixed. *See, e.g.*, THE WILDERNESS SOC'Y, THE ROADLESS RULE: A TENTH ANNIVERSARY ASSESSMENT 6 (Michael Anderson ed., 2011), <http://wilderness.org/resource/roadless-rule-tenth-anniversary-assessment> [<https://perma.cc/2B9C-S89J>] (asserting that the rule "has had many positive ecological and socio-economic benefits," including "halting the harmful impacts of road building and logging within national forest roadless areas," but that "regulatory flexibility built into the Rule has allowed many thinning and other fuels reduction projects to be implemented").

237. 36 C.F.R. § 219.5(a) (2012). "Monitoring is continuous and provides feedback for the planning cycle by testing relevant assumptions, tracking relevant conditions over time, and measuring management effectiveness . . ." *Id.* § 219.5(a)(3).

238. National Forest System Land Management Planning, 77 Fed. Reg. 21,162, 21,164 (Apr. 9, 2012).

239. 36 C.F.R. § 219.12(d)(2) (2012).

USFS's use of adaptive management processes in national forest management.²⁴⁰ Both substantively and procedurally, the USFS has ample legal adaptive capacity that should situate it well to respond to changing needs and conditions arising from climate change.

2. Evaluating Adaptation Activities of the USFS

The USFS's legal adaptive capacity has translated into the most extensive adaptation planning and integration of adaptation into management processes of any of the federal land management agencies. As early as 2008, the USFS developed a Strategic Framework for responding to climate change.²⁴¹ That Framework characterized climate change as

one of the greatest challenges to sustainable management forests and grasslands and to human well-being we have ever faced, because rates of change will likely exceed many ecosystems' capabilities to adapt naturally. Without fully integrating consideration of climate change impacts into planning and actions, the Forest Service can no longer fulfill its mission.²⁴²

The agency recognized that many forest ecosystem services may be lost or significantly altered if forests are not managed adaptively.²⁴³ It asserted that "strategies based on historical or current conditions will need to be adjusted or replaced with approaches that support adaptation to the changing conditions of the future."²⁴⁴ The agency announced its intention to engage

240. See, e.g., *Klamath Siskiyou Wildlands Ctr. v. Grantham*, No. 2:11-cv-01647 MCE-CMK, 2013 WL 1420259, at *9 (E.D. Cal. Apr. 8, 2013) (mitigation features in grazing authorization amounted to appropriate adaptive management strategy), *aff'd in part, rev'd in part and remanded*, No. 13-16186, 623 Fed. Appx. 320, 2015 WL 7348980 (9th Cir. Nov. 20, 2015); cf. *W. Watersheds Project v. U.S. Forest Serv.*, 62 Env't Rep. Cas. (BNA) 1142, 2006 WL 292010 (D. Idaho 2006) (finding that the USFS violated a plan provision requiring monitoring of the effects of grazing on forest resources by stating in an environmental impact statement that it would develop and implement a monitoring plan through an "iterative process" that was part of an adaptive management strategy).

241. U.S. DEP'T OF AGRIC., FOREST SERV., STRATEGIC FRAMEWORK (2008), <http://www.fs.fed.us/climatechange/message.shtml> [<https://perma.cc/8KFZ-V689>].

242. *Id.* at 2.

243. *Id.* at 4.

244. *Id.* at 3-4.

in “facilitated adaptation,” which would include both anticipatory and opportunistic actions.²⁴⁵ The Framework enunciated principles to guide the agency in integrating responses to climate change into the core mission of sustaining forest and grassland health, diversity, and productivity.²⁴⁶ It also established seven goals, including understanding the environmental, economic, and social implications of climate change;²⁴⁷ enhancing the capacity of forests to adapt to climate stresses so as to maintain ecosystem services; and integrating climate change into USFS policies, program guidance, and communications.²⁴⁸ The Framework included five pages of specific recommendations to achieve the seven goals.²⁴⁹

In 2010, the USFS adopted a “performance scorecard” to be completed annually by each NFS unit.²⁵⁰ The scorecard provides an annual assessment of unit performance in four areas—organizational capacity, engagement, adaptation, and mitigation and sustainable consumption. Among the questions relating to adaptation is whether an adaptation strategy is in place that helps incorporate resource vulnerability into priority setting and management actions.²⁵¹ By 2015, each unit should have been able to answer “yes” to seven of the ten scorecard questions.²⁵²

245. For a description of the difference between anticipatory and opportunistic actions, see *id.* at 4.

246. The principles, unlike some of the examples of anticipatory and opportunistic actions provided in the Framework, were very general; for example, “[s]trategies, policies, and actions for addressing climate change will be integrated across all Deputy areas at all levels of the Forest Service.” *Id.* at 6.

247. In 2009, the USFS also issued its Global Change Research Strategy to guide its research efforts to bolster capacity to sustain and provide ecosystem services, including research concerning adaptation. USGCRP, SYNTHESIS, *supra* note 11, at 18–19.

248. U.S. DEP’T OF AGRIC., FOREST SERV., STRATEGIC FRAMEWORK, *supra* note 241, at 7. The document stated that “[t]he primary focus of efforts on National Forest System lands will be to facilitate the adaptation of ecosystems to the effects of climate change.” *Id.* at 8.

249. *Id.* at 14–18. For example, the agency recommended assessment of how management measures may be modified to facilitate adaptation at various spatial scales. *Id.* at 15.

250. U.S. DEP’T OF AGRIC., FOREST SERV., THE FOREST SERVICE CLIMATE CHANGE PERFORMANCE SCORECARD (2010), <http://www.fs.fed.us/climatechange/pdf/Scorecard.pdf> [<https://perma.cc/JQT2-HB8B>].

251. *Id.*

252. See U.S. DEP’T OF AGRIC., FOREST SERV., THE FOREST SERVICE CLIMATE CHANGE PERFORMANCE SCORECARD (2011), <http://www.fs.fed.us/climatechange/advisor/scorecard/The-Forest-Service-Climate-Change-Performance-Scorecard.pdf> [<https://perma.cc/MF3W-MF72>]. For a list of the ten questions, see U.S. DEP’T OF

The next year, the USFS issued a National Roadmap for Responding to Climate Change.²⁵³ It provided a litany of actions to facilitate adaptation in three areas: assessment of climate risks and knowledge gaps, engagement with employees and stakeholders, and management for resilience.²⁵⁴ In each area, the Roadmap identified ongoing, immediate, and longer-term initiatives. For example, the ongoing management actions included treating overgrown forests to make them less vulnerable to wildfire and insects, controlling invasive species, relocating roads and facilities to resist floods, and reforesting land damaged by fires or weather events.²⁵⁵ The immediate actions included connecting habitats through measures such as removal of impediments to the movement of species most likely to be affected by climate change.²⁵⁶ Longer-term initiatives included restoring disturbed areas by replanting stock from seed sources and species capable of adapting to changing conditions, developing seed and plant stocks appropriate for revegetation, and development of comprehensive strategies to maintain and restore habitat connectivity.²⁵⁷

In 2012, the USFS issued perhaps its most forceful adaptation initiative through its revised planning regulations.²⁵⁸ The regulatory preamble identified eight overriding purposes and needs, two of which relate explicitly to climate change: emphasize restoration of natural resources to enhance resilience; and contribute to sustainability by ensuring that plans will be responsive and can adapt to challenges such as climate change.²⁵⁹ Consistent with the Roadmap and Scorecard, the regulations incorporate a strategic framework for adaptive management to help determine if there are

AGRIC., FOREST SERV., NATIONAL FORESTS AND CLIMATE CHANGE: THE FOREST SERVICE CLIMATE CHANGE PERFORMANCE SCORECARD (2011), <http://www.fs.fed.us/climatechange/advisor/scorecard/FSCCpostcard.pdf> [<https://perma.cc/6GLL-RSPJ>].

253. U.S. DEPT OF AGRIC., FOREST SERV., NATIONAL ROADMAP FOR RESPONDING TO CLIMATE CHANGE (2011), <http://www.fs.fed.us/climatechange/pdf/Roadmapfinal.pdf> [<https://perma.cc/ZK7L-CU3W>].

254. *Id.* at 4. The three “modes of action” were meant to be “dynamic and mutually reinforcing.” *Id.*

255. *Id.* at 23.

256. *Id.* at 25.

257. *Id.* at 26.

258. National Forest System Land Management Planning, 77 Fed. Reg. 21,162 (Apr. 9, 2012).

259. National Forest System Land Management Planning, 77 Fed. Reg. at 21,173.

measurable changes related to climate change and other stressors that need to be addressed.²⁶⁰ Most significantly, the regulations require agency officials to take climate change into account when developing plan components for ecological sustainability.²⁶¹ Officials also must consider climate change when providing for ecosystem services and multiple uses.²⁶²

In 2015, the USFS issued Land Management Planning Directives that revised Forest Service Handbook and Manual provisions establishing procedures and responsibilities for implementing the planning regulations.²⁶³ The Directives address the role of climate change in the planning process in greater detail than the regulations. For example, the regulations require planners to identify and evaluate information for system drivers of key ecosystem characteristics, including a changing climate.²⁶⁴ The Directives elaborate:

The Interdisciplinary Team²⁶⁵ should assess predominant climatic regimes by reviewing existing information such as vulnerability assessments and scenario planning. . . . Note that climate change is both a system driver and a stressor.

260. National Forest System Land Management Planning, 77 Fed. Reg. at 21,176. *See also* 36 C.F.R. § 219.5(a) (2012) (“The intent of this framework is to create a responsive planning process that informs integrated resource management and allows the Forest Service to adapt to changing conditions, including climate change, and improve management based on new information and monitoring.”).

261. 36 C.F.R. § 219.8(a)(1)(iv) (2012).

262. *Id.* § 219.10(a)(8). In 2012, the USFS also issued a Climate Project Screening Tool that included a detailed list of recommended actions to address climate change in connection with activities such as fuels management, restoration, grazing, road maintenance and construction, recreation planning, and mitigation. TONI L. MORELLI ET AL., U.S. DEP’T OF AGRIC., PSW-RP-263, CLIMATE PROJECT SCREENING TOOL: AN AID FOR CLIMATE CHANGE ADAPTATION 6–7, 16–21 (2012), http://www.fs.fed.us/psw/publications/documents/psw_rp263/psw_rp263.pdf [<https://perma.cc/3F4N-B7B9>].

263. *See* National Forest System, Land Management Planning Directives, 80 Fed. Reg. 6683 (Feb. 6, 2015).

264. 36 C.F.R. § 219.6(b) (2015).

265. The USFS’s planning regulations require planning officials to “establish an interdisciplinary team” to prepare assessments and plan revisions and monitoring programs. *Id.* § 219.5(b). The regulations do not further define the term.

The Interdisciplinary Team shall document the assumptions used to assess predominant climate regimes.²⁶⁶

The Directives also guide agency officials in designing plan components to sustain functional ecosystems, defined as those that sustain critical ecological functions over time to provide ecosystem services.²⁶⁷ In doing so, planners must take into account the effects of a changing climate.²⁶⁸ Specific climate-related issues that may be relevant to planning and management decisions include the effects of climate change on stream flows that may affect the size of riparian management zones,²⁶⁹ changes in occurrence of extreme storm events that may affect soil productivity,²⁷⁰ and warming trends at higher elevations, which may alter the capability of some forests to provide ecological conditions needed to maintain viable populations of species such as the American pika.²⁷¹

Some national forests have already incorporated these requirements into specific management plans or otherwise addressed climate change.²⁷² The 2013 Land and Resource Management Plan for the San Juan National Forest in Colorado, for example, devotes an eight-page appendix to climate change trends and management strategies for species and ecosystems that are already changing.²⁷³ Other plans

266. U.S. DEP'T OF AGRIC., FOREST SERV., DIR. 12.31(2), LAND MANAGEMENT PLANNING HANDBOOK (2012), http://www.fs.fed.us/cgi-bin/Directives/get_dirs/fsh?1909.12 [<https://perma.cc/478W-BJ65>].

267. *Id.* 23.11.

268. *Id.* 23.11(2)(d).

269. *Id.* 23.11e(1)(f).

270. *Id.* 23.12b(2)(f).

271. *Id.* 23.13c(4)(c).

272. Officials at several national forests have entered partnerships with other federal agencies, states, tribes, and non-governmental organizations in community-based adaptation efforts. *See* USGCRP, SYNTHESIS, *supra* note 11, at 19–20. They also have partnered with scientists within the agency and at local universities to facilitate adaptation. *Id.* at 22–23.

273. U.S. DEP'T OF AGRIC., FOREST SERV., SAN JUAN NATIONAL FOREST LRMP (2013), <http://www.fs.usda.gov/detail/sanjuan/landmanagement/planning/?cid=stelprdb5432707> [<https://perma.cc/LL3W-SFZF>]. These strategies include: (1) securing a reliable source of local seed stock for native species to be used for revegetation and restoration after disturbance; (2) enhancing the resiliency of alpine ecosystems and providing refugia for alpine-dependent species by removing non-climate stressors such as unmanaged livestock grazing and motorized recreation from alpine habitat; (3) allowing fires to promote the heterogeneity of spruce-fir forests; and (4) eradicating invasive species. *Id.* Appendix G, at G-3 to G-4, http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5435653.pdf [<https://perma.cc/VT7S-AZUF>]. The descriptions in the appendix merely

address climate-related impacts, such as declines in permanent snowpack that provides a water source for wildlife²⁷⁴ or effects on wildlife habitat, physiology, phenology, and biotic interactions.²⁷⁵ The agency has developed a template for assessing climate change impacts and management options,²⁷⁶ and is applying it in revising land use plans.²⁷⁷ It has conducted vulnerability assessments at NFS units to identify management constraints and options.²⁷⁸ It has also conducted pilot assessments in at least eleven national forests of potential hydrologic changes and watershed vulnerability.²⁷⁹

summarize references to climate challenges and responsive management strategies discussed throughout the plan itself. *Id.* at G-2.

274. *E.g.*, U.S. DEP'T OF AGRIC., FOREST SERV., TONGASS NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN 6 (2008), https://fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5367422.pdf [<https://perma.cc/SSR8-WVEG>].

275. *See, e.g.*, U.S. DEP'T OF AGRIC., FOREST SERV., KAIBAB NATIONAL FOREST'S CLIMATE CHANGE APPROACH FOR PLAN REVISION 7 (2015), http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5446462.pdf [<https://perma.cc/RR9R-9J8Y>].

276. *Welcome to TACCIMO*, TACCIMO, http://www.taccimo.sgcp.ncsu.edu/tbl_sector_list.php [<https://perma.cc/625V-7UXW>] (“The Template for Assessing Climate Change Impacts and Management Options (TACCIMO) delivers access to the most current climate change science, including dynamically linked peer-reviewed publication findings describing effects and management options and interactive maps of climate projections and models that provide insight into climate influences on natural resources.”).

277. *See, e.g.*, *Francis Marion National Forest Land and Resource Management Plan Revision - Climate Change Integration*, U.S. FOREST SERV., <http://www.fs.usda.gov/ccrc/climate-projects/adaptation-examples/francis-marion-national-forest> [<https://perma.cc/4LJ3-AMX7>]. *See also* Dave Cleaves, *Engaging a Climate Ready Agency*, U.S. FOREST SERV. (July 30, 2014), <http://www.fs.fed.us/climatechange/updates/July%202014%20Climate%20Update.pdf> [<https://perma.cc/W35T-XW3E>] (description by the USFS Climate Change Advisor of examples of agency efforts to “bring climate change knowledge into our organizational expectations and actions”).

278. *See Climate Change Vulnerability Assessments: Synthesis*, U.S. FOREST SERV. (July 1, 2011), <http://www.fs.usda.gov/ccrc/topics/assessments/vulnerability-assessments> [<https://perma.cc/A7SG-6WPH>]. Examples of national forests with completed vulnerability assessments include Olympic National Forest, *Climate Change Adaptation in Olympic National Forest and Olympic National Park*, U.S. FOREST SERV. (2010), <http://www.fs.fed.us/ccrc/cases/olympic.shtml> [<https://perma.cc/7F2T-ERFD>], and Wisconsin Chequamegon-Nicolet National Forest, *Ecosystem Vulnerability Assessment and Synthesis: A Report from the Climate Change Response Framework Project in Northern Wisconsin*, U.S. FOREST SERV. (2011), <http://www.nrs.fs.fed.us/pubs/38255> [<https://perma.cc/D3Z3-R272>].

279. U.S. DEP'T OF AGRIC., FOREST SERV., PNW-GTR-884, ASSESSING THE VULNERABILITY OF WATERSHEDS TO CLIMATE CHANGE: RESULTS OF NATIONAL FOREST WATERSHED VULNERABILITY PILOT ASSESSMENTS (2013), http://www.fs.fed.us/pnw/pubs/pnw_gtr884.pdf? [<https://perma.cc/HYS9-CZNE>].

In its 2014–2018 Strategic Plan, the USDA estimated that as of 2012, 35% of national forests and grasslands were in compliance with a climate change adaptation and mitigation strategy.²⁸⁰ Its goal was 100% compliance by 2018.²⁸¹ The USDA also estimated that 58.5 million acres in the NFS were in a desired condition to reduce catastrophic wildfire risks in 2009, a figure it sought to increase to 60.7 million acres by 2018.²⁸² By the end of fiscal year 2013, 49% of NFS units had met the performance scorecard target.²⁸³ Specific initiatives had also made progress. For example, studies on how to conserve genetic diversity in the face of climate change were completed or underway.²⁸⁴ A climate-sensitive version of the agency’s Vegetation Simulator Model was implemented for the western conterminous United States.²⁸⁵ Resource constraints such as insufficient field resources, however, slowed the pace of land use plan revisions,²⁸⁶ restoration work needed to increase resilience,²⁸⁷ treatment of forests infested with western bark beetles,²⁸⁸ and conservation of genetic diversity.²⁸⁹

The USFS has clearly prioritized climate change adaptation, required that forest plans address it, established fairly specific guidance and tools to assist in planning, and begun to apply the guidance at the unit level. If not for budgetary constraints, the agency would have done even

See also Maria K. Janowiak et al., *A Practical Approach for Translating Climate Change Adaptation Principles into Forest Management Actions*, 112 J. FORESTRY 424, 427 (2014), http://www.fs.fed.us/nrs/pubs/jrnl/2014/nrs_2014_janowiak_001.pdf [<https://perma.cc/98WC-D8GD>] (referring to more than forty adaptation demonstration projects developed by the USFS in conjunction with public, private, nongovernmental, and tribal land managers to “serve as real-world examples of the integration of climate change information into forest management”).

280. U.S. DEPT OF AGRIC., STRATEGIC PLAN FY 2014–2018 13 (2014), <http://www.usda.gov/documents/usda-strategic-plan-fy-2014-2018.pdf> [<https://perma.cc/P3NY-STHV>].

281. *Id.*

282. *Id.* at 17.

283. USDA CLIMATE CHANGE ADAPTATION PLAN, *supra* note 209, at 69.

284. *Id.* at 86.

285. *Id.* at 87.

286. *Id.* at 74.

287. *Id.* at 78.

288. *Id.* at 79. On the manner in which available forest management strategies may affect the scope and distribution of forest damage caused by bark beetle infestations, see Charles Sims et al., *Complementarity in the Provision of Ecosystem Services Reduces the Cost of Mitigating Amplified Natural Disturbance Events*, 111 PROC. NAT’L ACAD. SCI. 16718 (2014).

289. USDA CLIMATE CHANGE ADAPTATION PLAN, *supra* note 209, at 86.

more.²⁹⁰ Though historically not an agency particularly associated with proactive ecological conservation, its relatively substantial legal adaptive capacity makes it less surprising that the USFS would be the resource agency most engaged in climate change adaptation planning and implementation.²⁹¹

The 1990 amendments to NFMA²⁹² added specific mandates that renewable resource assessments include an analysis of the effects of climate change on resource conditions.²⁹³ These statutory changes, and the USFS's periodic Renewable Resource Program recommendations that account for the effects of climate change on forest and rangeland conditions,²⁹⁴ may have driven the agency's efforts to address climate change. There is no evidence to support that hypothesis, however. The 2010 Strategic Framework, the 2011 National Roadmap and, most notably, the 2012 planning regulations and accompanying preamble all lack even a single reference to these statutory provisions relating to climate change.²⁹⁵ Indeed, the preamble to the planning regulations explains that provisions to meet the purpose and need of the environmental impact statement prepared in connection with the regulations "*but not otherwise required by NFMA*, were

290. The fiscal year 2016 budget justification for the Forest Service refers repeatedly to the need for actions to prepare for and respond to forest management challenges that are being exacerbated by climate change, including drought, invasive species, wildfires, and insect and disease outbreaks. U.S. DEPT OF AGRIC., FOREST SERV., FISCAL YEAR 2016 BUDGET OVERVIEW 6 (2015), <http://www.fs.fed.us/sites/default/files/media/2015/07/fy2016-budget-overview-update.pdf> [<https://perma.cc/3WNM-GR3T>]; *see also id.* at 9, 10, 12, 20, 30. The agency sought a \$20.7 million increase in funding above enacted 2015 levels for wildfire management, and a \$16.5 million increase for land acquisition, which it described as intended to meet the goals of the President's Climate Action Plan for species conservation. *Id.* at 10, A-1.

291. The USFS also has a history of leadership on some conservation issues, such as wilderness preservation, that may have contributed to its early commitment to addressing climate-related threats to ecological function. *See* Robert L. Glicksman, *Wilderness Management by the Multiple Use Agencies: What Makes the Forest Service and the Bureau of Land Management Different?*, 44 ENVTL. L. 447 (2014).

292. *See supra* notes 220–222 and accompanying text.

293. Renewable Resource Assessment, 16 U.S.C. § 1601(a)(5) (2012).

294. *Id.* § 1602(5)(F).

295. The preamble to the planning regulations cite as the underlying legal authority NFMA §§ 1604 and 1613, not 1601 or 1602. National Forest System, Land Management Planning, 77 Fed. Reg. 21,162, 21,260 (April 9, 2012). The preamble states that “[c]onsideration of changing conditions in planning is not new to the Forest Service,” but makes no reference to the 1990 amendments bearing on climate change. *Id.* at 21,176.

included . . . to ensure that plans would be responsive to the challenges of climate change”²⁹⁶ Instead, the agency attributed the planning requirements relating to climate change to the statutory multiple-use mandate.²⁹⁷ The agency’s expansive substantive legal adaptive capacity appears to be a more important factor in explaining its progress on planning and managing for climate change.

C. *The Public Lands*

In contrast with the USFS, the BLM has been much slower off the mark in engaging in climate change adaptation on the public lands it manages. The BLM has legal adaptive capacity that is analogous to that available to the USFS. Its parent agency, the DOI, began establishing mechanisms for integrating climate change adaptation considerations into its planning and management before the USDA did. As discussed in Part IV, we attribute the BLM’s hesitation to other factors.

1. Adaptive Capacity Under FLPMA

FLPMA, which is the chief statute governing BLM management of the public lands,²⁹⁸ imposes on the BLM essentially the same multiple-use, sustained-yield mandate that governs USFS management of the national forests. FLPMA lacks the many references found in NFMA to the need for management adjustments in response to changing needs and conditions, and it does not explicitly refer to climate change. Like NFMA, however, it dictates management on the basis of multiple-use, sustained-yield principles,²⁹⁹ and it requires the BLM to apply those principles through the adoption and implementation of land use plans called resource management plans.³⁰⁰ Moreover, FLPMA’s definition of “multiple use,” like the one that governs the USFS under the

296. *Id.* at 21,170 (emphasis added).

297. *Id.* (citing Multiple Use, 36 C.F.R. § 219.10 (2012), which requires that land and resource management plans “provide for ecosystem services and multiple uses”).

298. The Federal Land Policy and Management Act defines “public lands” as lands owned by the United States and managed by the BLM, with certain exceptions. 43 U.S.C. § 1702(e) (2012).

299. *Id.* § 1701(a)(7).

300. *Id.* § 1732(a).

1960 Multiple-Use Sustained Yield Act,³⁰¹ refers to management that “provide[s] sufficient latitude for periodic adjustments in use to conform to changing needs and conditions.”³⁰² The courts have construed the multiple-use, sustained-yield mandate to vest broad discretionary authority in the BLM, just as they have for the USFS under NFMA.³⁰³

FLPMA also incorporates very flexible ecological goals. The statutory definition of “multiple use” refers to “harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment.”³⁰⁴ BLM lands, however, are not subject to any requirement akin to NFMA’s diversity requirement; the only definitive BLM planning standards require the designation and protection of areas of critical environmental concern and compliance with pollution control laws.³⁰⁵ The statute requires that the BLM, in managing the public lands, “by regulation or otherwise, take any action necessary to prevent unnecessary or undue degradation of the lands.”³⁰⁶ In addition, the BLM must manage areas being studied for possible designation as wilderness so as “to prevent unnecessary or undue degradation of the lands and their resources or to afford environmental protection.”³⁰⁷

The lack of procedural specificity in FLPMA has likewise allowed the BLM to resort to procedural devices of its choosing. Within limits, the courts have often approved the BLM’s use of adaptive management measures, just as they have for the USFS.³⁰⁸

301. See *supra* notes 226–227 and accompanying text.

302. 43 U.S.C. § 1702(c). For FLPMA’s definition of “sustained yield,” see *id.* § 1702(h). FLPMA also requires the BLM to maintain a public lands inventory “so as to reflect changes in conditions and to identify new and emerging resource and other values.” *Id.* § 1711(a). The statute adds, however, that the inventory “shall not, of itself, change or prevent change of the management or use of public lands.” *Id.*

303. See, e.g., *Theodore Roosevelt Conservation P’ship v. Salazar*, 616 F.3d 497, 518 (D.C. Cir. 2010) (stating that the BLM has “wide discretion to determine how [these] principles should be applied”).

304. 43 U.S.C. § 1702(c).

305. *Id.* § 1712(c)(3), (8). Areas of critical environmental concern are defined at *id.* § 1702(a).

306. *Id.* § 1732(b).

307. *Id.* § 1782(c).

308. See, e.g., *Salazar*, 616 F.3d at 515–17 (approving of adaptive management as a strategy to monitor the effects of natural gas field development and craft necessary mitigation measures as the effects of development became clear);

FLPMA thus creates a flexible core mission for the BLM to manage the public lands to promote the sustainability of ecological resources in service of consumptive and other utilitarian goals, recognizing that the particular ecological constituents that promote this objective are likely to change over time. This malleable mandate, coupled with the agency's use of procedurally adaptive techniques such as adaptive management, appears to afford the BLM legal adaptive capacity perhaps even greater than the USFS's under NFMA. It ought to provide the BLM with the tools needed to manage in the face of climate change.

2. Evaluating the BLM's Adaptation Activities

Yet, the BLM's climate-related efforts appear to pale in comparison to the USFS's initiatives. The BLM claims to have embarked on a "landscape approach" comprised of five interconnected components: rapid ecoregional assessments (REAs),³⁰⁹ ecoregional direction, field implementation, monitoring for adaptive management, and science integration.³¹⁰ REAs map areas of high ecological value and gauge potential climate risks. Ecoregional direction seeks to use the results of the REAs to identify management priorities and priority areas for conservation and development and

Wilderness Soc'y v. U.S. Bureau of Land Mgmt., 822 F. Supp. 2d 933, 942–43 (D. Ariz. 2011), *aff'd on other grounds*, 526 Fed. Appx. 790 (9th Cir. 2013) (table) (approving the BLM's decision to use adaptive management to mitigate effects of off-highway vehicle use and livestock grazing in national monuments); *In re Mont. Wilderness Ass'n*, 807 F. Supp. 2d 990, 996 (D. Mont. 2011), *aff'd in part, rev'd in part on other grounds*, 725 F.3d 988 (9th Cir. 2013) (holding that resource management plan for national monument did not violate the duty under FLPMA to take necessary actions to prevent unnecessary or undue degradation because even if degradation were to occur, the BLM would monitor potential impacts under adaptive management to avoid degradation); *Or. Nat. Desert Ass'n v. Bureau of Land Mgmt.*, No. 08–1271–KI, 2011 WL 5830435, at *29 (D. Or. Nov. 15, 2011) (approving adaptive management as the only logical way the BLM could undertake habitat restoration). *But see* *Klamath Siskiyou Wildlands Ctr. v. Boody*, 468 F.3d 549, 555–60 (9th Cir. 2006) (refusing to allow timber sales inconsistent with a resource management plan on ground that sales were "adaptive management modifications" contemplated by the plan).

309. Citations to the reports on REAs are collected at USGCRP, SYNTHESIS, *supra* note 11, at 44–45.

310. *The BLM's Landscape Approach for Managing Public Lands*, BUREAU OF LAND MGMT., http://www.blm.gov/wo/st/en/prog/more/Landscape_Approach.html#secr [https://perma.cc/SV74-LV3V] (last updated Jan. 31, 2014).

provide a “blueprint” for implementing these priorities.³¹¹ Field implementation will put management strategies identified in ecoregional direction into practice on the ground, such as by amending resource management plans or revising mitigation measures for authorized land uses. Monitoring will provide information for adaptive management that refines implementation actions. Finally, science provided by the DOI’s CSCs and other sources should facilitate implementation of measures to adapt to climate impacts.³¹²

Unfortunately, these efforts largely are not yet reflected in significant management activities, such as resource management plans or project approvals. In particular, some of the actions taken are short on substantive analysis of climate change impacts or strategies for responding to them. A forty-seven-page report issued by the BLM in 2010 on “lessons learned” from ecological assessment processes included only two vague references to climate change, and one of those was in the literature review portion of the report.³¹³ Another report, issued in 2011, describing the BLM’s Assessment, Inventory and Monitoring Strategy (AIM) developed in connection with the monitoring component of the landscape approach referred to climate change just once.³¹⁴

Consistent with the cursory nature of these reports, the GAO concluded in May 2013 that the BLM lacked strategic direction to help guide field and district offices in addressing climate change.³¹⁵ The GAO opined that the BLM’s ecoregional assessments eventually “may prove useful in addressing

311. *Id.*

312. *Id.*

313. MARSHA BRACKE & MAGGIE MCCAFFREY, LESSONS LEARNED REPORT: ECOREGIONAL ASSESSMENT PROCESSES 6, 31 (2010), http://www.blm.gov/style/medialib/blm/wo/Communications_Directorate/public_affairs/landscape_approach/documents1.Par.51236.File.dat/20101110_EcoregionalAssessment_Lessons_Learned_Report_FINAL_v2.pdf [<https://perma.cc/94UG-BTCR>].

314. GORDON R. TOEVS ET AL., ASSESSMENT, INVENTORY, AND MONITORING STRATEGY: FOR INTEGRATED RENEWABLE RESOURCES MANAGEMENT 9 (Aug. 2011), http://www.blm.gov/style/medialib/blm/wo/Information_Resources_Management/policy/ib_attachments/2012.Par.53766.File.dat/IB2012-080_att1.pdf [<https://perma.cc/T7TV-XHJV>]. The BLM developed AIM in response to a directive from the Office of Management and Budget to develop a strategy to enhance the effectiveness of its resource monitoring activities. Assessment, Inventory, and Monitoring (AIM) Strategy Update, EMS Transmission 05/16/2012 (May 4, 2012), http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_information/2012/IB_2012-080.html [<https://perma.cc/TV5G-MNTH>].

315. GAO, *supra* note 122, at 51.

climate change adaptation.”³¹⁶ It also noted with approval the BLM’s pending adoption of a field guide for vulnerability assessments.³¹⁷ The GAO noted the BLM’s plans to develop a high-level climate adaptation strategy by the end of the summer 2013.³¹⁸ As of November 2015, however, no such strategy had been publicly released. The GAO also reported that the BLM had not provided guidance to its offices on how to incorporate climate change adaptation into natural resource planning and management, although agency guidance on issues such as drought and invasive species may indirectly help resource managers address climate change.³¹⁹

In addition, the little work the BLM is doing on climate change has mostly been limited to gathering information on resource vulnerabilities rather than developing management strategies. The GAO found that some of its REAs are important first steps. The Colorado Plateau REA, for example, notes that invasive species such as cheatgrass and tamarisk have the potential to shift their ranges in response to climate change.³²⁰ The agency considered multiple climate projections in

316. *Id.* at 52.

317. *Id.* at 54.

318. *Id.* at 51.

319. *Id.* See also Kerry B. Kemp et al., *Managing for Climate Change on Federal Lands of the Western United States: Perceived Usefulness of Climate Science, Effectiveness of Adaptation Strategies, and Barriers to Implementation*, 20(2) *ECOLOGY & SOC’Y* 17 (2015) (“Specific agency direction was a more significant barrier for individuals from the BLM than the USFS.”). A BLM official stated that the agency was waiting until CEQ finalized its draft NEPA guidance on how to consider the effects of climate change. *Id.* at 52. CEQ later issued draft guidance on how NEPA analysis should address GHG emissions and the effects of climate change. Revised Draft Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews, 79 Fed. Reg. 77,802 (Dec. 24, 2014); COUNCIL ON ENVTL. QUALITY, *THE GUIDANCE*, https://www.whitehouse.gov/sites/default/files/docs/nepa_revised_draft_ghg_guidance_searchable.pdf [<https://perma.cc/5DG4-X7VE>]. The draft guidance praised a document issued by the FWS: “Individual agency adaptation plans and interagency adaptation strategies, such as the National Fish, Wildlife and Plants Climate Adaptation Strategy, and the National Action Plan for managing freshwater resources in a changing climate, provide good examples of relevant and useful information that can be considered.” Revised Draft Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews, 79 Fed. Reg. 77,802.

320. BUREAU OF LAND MGMT., *COLORADO PLATEAU RAPID ECOREGIONAL ASSESSMENT REPORT*, at X (2012), http://www.blm.gov/style/medialib/blm/wo/Communications_Directorate/public_affairs/landscape_approach/documents1.Par.82149.File.dat/COP_1_Final_Ch_1_2_and_3.pdf [<https://perma.cc/FLH9-PMMD>].

preparing the REA,³²¹ and the resulting report includes a “climate change scenario” section that revealed that prairie dogs and sage grouse are at risk of very high climate stress by 2060, while big sagebrush and pinyon-juniper woodland also are likely to be adversely affected.³²² The REA poses a series of management questions, several of which focus on climate change.³²³ Other completed REAs include similar discussion.³²⁴ Such analyses are steps to assist BLM resource managers account for climate change, but they are assessments rather than decisions that reflect on-the-ground management.³²⁵

Though still inchoate, the BLM has issued a wildfire management strategy that recognizes a variety of stressors, including climate change, that are exacerbating fire risks and sketches out the broad parameters of an approach to manage those risks. In January 2015, Interior Secretary Jewell issued an order establishing a Rangeland Fire Task Force to reduce the likelihood and severity of rangeland fires and commit resources to preparation for and response to such fires.³²⁶ The Task Force issued a report later that year outlining a recommended strategy for managing wildfire risks in the 2015 and 2016 western fire seasons, although many of the actions discussed are not scheduled for completion until well after that time or are framed in broad generalities.³²⁷ Nonetheless, the

321. *Id.* See also *id.* at 37 (describing climate change modeling conducted); *id.* at 130–56 (describing climate projections and the uncertainties they reflect).

322. *Id.* at xi–xii.

323. *Id.* at 11 (including questions about where and how the distribution of dominant native and invasive species may change from climate change in 2060; where species distribution change between 2010 and 2060 will be; and which aquatic and riparian areas are at risk from climate change).

324. See, e.g., BUREAU OF LAND MGMT., SONORAN DESERT RAPID ECOREGIONAL ASSESSMENT REPORT 126–52 (2012), http://www.blm.gov/style/medialib/blm/wo/Communications_Directorate/public_affairs/landscape_approach/documents1.Par.39003.File.dat/SOD_1_Final_Ch_1_2_and_3.pdf [https://perma.cc/3YLG-ESWT]; BUREAU OF LAND MGMT., NORTHERN GREAT BASIN RAPID ECOREGIONAL ASSESSMENT 6-12 to 6-15 (2013), http://www.blm.gov/style/medialib/blm/wo/Communications_Directorate/public_affairs/landscape_approach/documents1.Par.76251.File.dat/NGB_REA_Main_Report_and_App_A1.pdf [https://perma.cc/VF5F-575U].

325. For links to REAs at various stages of completion, see *Rapid Ecoregional Assessments*, BUREAU OF LAND MGMT. (Jun. 5, 2015), http://www.blm.gov/wo/st/en/prog/more/Landscape_Approach/reas.html [https://perma.cc/W63Z-G99H].

326. Secretarial Order No. 3336 §§ 5–6 (Jan. 5, 2015), reprinted in FIRE MANAGEMENT, *supra* note 125, at 77–79.

327. See, e.g., FIRE MANAGEMENT, *supra* note 125, at 31 (recommending development of a conservation and restoration strategy for the sagebrush-steppe

report provides that the strategy should consider “risks from climate change, fire, invasive species, development, and other change agents.”³²⁸ Further, the task force identified focus areas for science and research, one of which is the “[i]mplications of climate change, grazing and other land uses.”³²⁹ A few of the climate-related recommendations are more specific, such as the development of a strategy to create a long-term seed bank to ensure conservation of germplasm to promote climate resilience and rangeland health.³³⁰ If adopted by the Secretary, the strategy represents a series of early steps in a recommended approach to managing climate-related threats to ecosystem health.

Significantly, in marked contrast to the USFS’s planning regulations, as of mid-2015, the BLM’s land use planning regulations did not include a *single reference* to climate change.³³¹ Neither did the BLM Manual provisions on land use planning.³³² In 2014, the BLM did unveil its “Planning 2.0” initiative,³³³ which seeks to create a more dynamic planning

“that considers emerging science, particularly ecological resistance, and resilience in habitat management, fuels treatment and restoration projects”).

328. *Id.* at 32. Similarly, the report recommends development of a national invasive species detection and response program in response to a directive in President Obama’s calls to increase the climate resilience of America’s natural resources. *Id.* at 37.

329. *Id.* at 39.

330. *Id.* at 42.

331. The authors conducted a search in Westlaw’s database for federal regulations for “43 C.F.R.” and “climate change.” The result produced no documents.

332. BLM MANUAL § 1601 (2000), http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/blm_manual.html [https://perma.cc/4EBJ-66LD]. The authors’ searched for “climate” in this document resulted in no hits. We got the same result when we searched the Manual provisions on Land Health. *Id.* § 4180 (2009). The provisions governing Forest Management, *id.* § 5000-1.12B(2)(b)(3), included one reference to “climatic trends” or conditions, requiring managers to consider what roles weather conditions played in the establishment of existing vegetation, and what those influences will be in the future. The provisions on National Landscape Conservation System Management, *id.* § 6100 (2012), Conducting Wilderness Characteristic Inventory of BLM Lands, *id.* § 6310 (2012), Considering Lands with Wilderness Characteristics in the BLM Land Use Planning Process, *id.* § 6320 (2012), Management of BLM Wilderness Study Areas, *id.* § 6330 (2012), Management of Designated Wilderness Areas, *id.* § 6340 (2012), and even Fire Planning, *id.* § 9211 (2012), all fail to include any mention of climate change.

333. *Planning 2.0: Improving the Way We Plan Together*, BUREAU OF LAND MGMT. (Feb. 18, 2015), http://www.blm.gov/wo/st/en/prog/planning/planning_overview/planning_2_0.html [https://perma.cc/DM4L-GG7P].

process and plan across landscapes and at multiple scales,³³⁴ but that initiative has not yet prompted any changes to the agency's planning regulations. In any event, the agency's Summary Report on the initiative made only one minor reference to climate change, noting that public comments urged the agency to designate in resource management plans restoration, innovation, and observation zones.³³⁵ Even on this issue, the report provides no indication of how the agency might respond.

At the individual unit level, adaptation planning by the BLM also appears embryonic. A 2013 draft RMP from the Billings Field Office identified as a goal the management of "diverse, healthy landscapes to be resilient to stresses, including climate change, and incorporate adaptive, flexible management actions to adjust to changing climatic conditions."³³⁶ It also endorsed the use of adaptive management.³³⁷ The draft plan is devoid of specific management components, however, providing only that the agency will "[p]rovide for flexible, adaptive management that allows for timely responses to changing climatic conditions" and that planning officials should "[a]djust the timing of BLM-authorized activities as needed to accommodate long-term changes in seasonal weather patterns."³³⁸ Other recently released draft plans include similarly vacuous prescriptions.³³⁹

334. *Id. Cf.* U.S. BUREAU OF LAND MGMT., DRAFT DESERT RENEWABLE ENERGY CONSERVATION PLAN: EXECUTIVE SUMMARY 19 (2014), http://www.blm.gov/style/medialib/blm/ca/pdf/pa/energy/drecp/draft_drecp.Par.97634.File.dat/0a_Executive%20Summary_508.pdf [<https://perma.cc/3JN4-2MNQ>] (identifying as one goal of draft plan for fostering renewable energy development in desert habitats on public lands the creation of a "landscape-scale reserve system consisting of a mosaic of large habitat blocks of constituent natural communities that maintains ecological integrity, ecosystem function, and biological diversity and that allows adaptation to changing conditions The reserve system should include temperature and precipitation gradients, elevation gradients, and a diversity of geological facets to accommodate range contractions and expansions in response to climate change.").

335. *Id.* at 7.

336. BUREAU OF LAND MGMT., BILLINGS DRAFT RESOURCE MANAGEMENT PLAN AND ENVIRONMENTAL IMPACT STATEMENT 2-52 (2013), http://www.blm.gov/mt/st/en/fo/billings_field_office/rmp/drmp.html [<https://perma.cc/F5XT-EZED>].

337. *Id.* ("Adapting management . . . allows the BLM to adjust management to best meet the challenges of climate change.").

338. *Id.* at 2-53.

339. *See, e.g.*, BUREAU OF LAND MGMT., WINNEMUCCA DISTRICT PROPOSED RESOURCE MANAGEMENT PLAN AND FINAL ENVIRONMENTAL IMPACT STATEMENT 4-12 (2013), http://www.blm.gov/style/medialib/blm/nv/field_offices/

In its budget request for fiscal year 2016, the BLM noted the need to support landscape-level conservation to address the impacts of stressors such as climate change.³⁴⁰ The budget purportedly sought to broaden the scope of BLM programs to enhance understanding of and preparation for climate change.³⁴¹ Yet, of the \$1.2 billion increase sought over the previous year's enacted budget, only \$10 million (or less than one percent) was specifically earmarked for these purposes, an amount that does not appear to prioritize climate-related initiatives.³⁴²

D. The National Wildlife Refuges

As compared to other federal land management agencies, the FWS has engaged in a relatively moderate level of adaptation planning and integration of adaptation measures into refuge management. This pace and extent of adaptation is congruent with the moderate level of legal adaptive capacity that the FWS enjoys in managing the national wildlife refuges.

1. The FWS's Adaptive Capacity

The goals and orientation of the National Wildlife Refuge System Improvement Act (NWRSIA)³⁴³ allow the FWS a moderate level of flexibility in selecting management goals and the means to achieve them, though the FWS has interpreted the NWRSIA to require an emphasis on historical preservation. The FWS must administer the NWRS “for the conservation, management, and where appropriate, restoration of the fish,

winnemucca_field_office/rmp/rmp_files.Par.73569.File.dat/Chapter_4_-_Part_1_-_Environmental_Consequences.pdf [https://perma.cc/F9HK-WP82] (“This RMP is also based on the concept of adaptive management, so it is dynamic enough to account for changes in resource conditions (such as changes due to climate change or large-scale wildfire), new information and science, and changes in regulation and policies.”).

340. BUREAU OF LAND MANAGEMENT, DEPT' OF THE INTERIOR, BUREAU HIGHLIGHTS BH-10, http://www.blm.gov/style/medialib/blm/wo/Communications_Directorate/public_affairs/news_release_attachments.Par.13179.File.dat/BLM_Budget%20Highlights.pdf [https://perma.cc/MJB8-BYKS].

341. *Id.*

342. *Id.* at BH-10, BH-16 (referring to increased funding for the Challenge Cost Share program and climate resilient landscapes).

343. Pub. L. No. 105-57, 111 Stat. 1252 (1997) (codified at 16 U.S.C. §§ 668dd to 668ee (2012)).

wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”³⁴⁴ It must “plan and direct the continued growth of the System in a manner that is best designed to accomplish” this mission, or, significantly, “to contribute to the conservation of the ecosystems of the United States.”³⁴⁵ In addition, the NWRSA directs the FWS to manage each individual refuge to fulfill not only the mission of the System as a whole, but also the specific purposes for which that refuge was established.³⁴⁶ Accordingly, the goals of individual refuges may vary depending on the specific purposes of that refuge. In this sense, the goals of NWRSA management are more individually tailored and fragmented than those of other federal lands.³⁴⁷

Considering only the language of the NWRSA, this management regime is not necessarily restricted to preserving historical ecological conditions. The FWS’s mandates include “conservation” and “restoration,”³⁴⁸ terms that might be interpreted as envisioning retention or recreation of historical conditions. However, the statutory definition of “conservation” is broader than historical preservation. The term means, “to sustain and, *where appropriate*, restore and enhance, healthy populations of fish, wildlife, and plants.”³⁴⁹ The statutory reference to conservation of ecosystems arguably reinforces the FWS’s duty to conserve function, not a pre-existing resource mix or state.³⁵⁰ Moreover, the statute authorizes the use of management methods and procedures “associated with modern scientific resource programs,” including propagation and transplantation.³⁵¹ The reference to transplantation seems

344. National Wildlife Refuge System, 16 U.S.C. § 668dd(a)(2) (2012).

345. *Id.* § 668dd(a)(4)(C).

346. *Id.* § 668dd(a)(3)(A). The term “purposes of the refuge” is defined by reference to the purposes derived from the law that established or authorized a refuge. *Id.* § 668ee(10). *See also id.* § 668dd(a)(4)(D) (“[I]f a conflict exists between the purposes of a refuge and the mission of the system, the conflict shall be resolved in a manner that first protects the purposes of the refuge, and, to the extent practicable, that also achieves the mission.”).

347. *Cf.* Fischman, *supra* note 93, at 463 (“Statutes attempting to provide comprehensive authority and management requirements for the Refuge System explicitly limit their application to circumstances where they do not conflict with the particular purposes established for individual refuges.”). Nonetheless, direct conflict between individual unit purposes and the NWRSA is rare. *See id.* at 592.

348. 16 U.S.C. § 668dd(a)(2).

349. *Id.* § 668ee(4) (emphasis added).

350. *Id.* § 668dd(a)(4)(C).

351. *Id.* § 668ee(4).

potentially broad enough to cover the movement into a refuge of species that were never there before. The statute directs the FWS to “ensure that the biological integrity, diversity, and environmental health of the System are maintained.”³⁵² While maintenance seems geared toward retention of the status quo, the FWS is supposed to maintain biological integrity and environmental health, not particular historical conditions. The FWS also has a little-used emergency power to “temporarily suspend, allow, or initiate any activity . . . if the Secretary determines it is necessary to protect the health and safety of the public or a fish or wildlife population.”³⁵³

Professor Fischman asserts that the mandate to ensure maintenance of the Refuge System’s biological integrity, diversity, and health is “the most ecologically informed[] of any legislative criterion for public land management. Congress clearly intended that the refuges should protect nature in accordance with the latest scientific understanding.”³⁵⁴ He argues that the 1997 amendments to the FWS’s organic statute reflect “a heightened emphasis on integrity as an overarching management goal.”³⁵⁵ He concedes that the meaning of the key statutory provision³⁵⁶ is “not self-evident.”³⁵⁷ He nevertheless concludes, after close parsing of the statutory text and analysis of context and legislative history, that the reference to integrity reflects “the emerging consensus meaning of ‘integrity,’ [which] encompasses all of the pieces now understood to constitute functioning landscapes.”³⁵⁸ According to Fischman, this provision has the potential to equal NFMA’s diversity provision as a strong constraint on agency discretion.³⁵⁹

Accordingly, notwithstanding a conservation-oriented mandate, the NWRSA provides the FWS some ability to manage wildlife refuges in ways that allow modification of

352. *Id.* § 668dd(a)(4)(B).

353. *Id.* § 668dd(k). Judicial interpretations of this provision provide limited direction on its scope. *See, e.g.*, *Wyoming v. United States*, 279 F.3d 1214, 1240 (10th Cir. 2002) (indicating only that because the program at issue was commenced “over a decade ago . . . the ‘temporary’ nature of FWS’s action has long since passed”).

354. Robert L. Fischman, *The Meanings of Biological Integrity, Diversity, and Environmental Health*, 44 NAT. RES. J. 989, 992 (2004).

355. *Id.* at 991.

356. 16 U.S.C. § 668dd(a)(4)(B).

357. Fischman, *supra* note 354, at 992.

358. *Id.* at 1024.

359. *Id.* at 1024–25.

ecological constituents over time. As a result, taken alone the statute appears to provide the agency a significant amount of substantive legal adaptive capacity in its management of refuges. That flexibility could be a valuable management tool as climatic changes make existing refuges less compatible with certain historically occurring species and more harmonious with others.

However, even Professor Fischman acknowledges that “[t]he temporal dimension of integrity and health addresses the dynamic variation in ecological processes through the limits of historic conditions.”³⁶⁰ Moreover, a review of the FWS’s internal rules interpreting Congress’s delegation reveals a reluctance by the FWS to recognize or take full advantage of its available statutory substantive legal adaptive capacity. The FWS’s current interpretation of the biological integrity provision is contained in the agency’s manual for refuge management, which serves as policy guidance to FWS officials.³⁶¹ It defines biological integrity as “[b]iotic composition, structure, and functioning at genetic, organism, and community levels *comparable with historic conditions*, including the natural biological processes that shape genomes, organisms, and communities,” and environmental health as “[c]omposition, structure, and functioning of soil, water, air, and other abiotic features *comparable with historic conditions*, including the natural abiotic processes that shape the environment.”³⁶² The agency defines “historic conditions” as “[c]omposition, structure, and functioning of ecosystems resulting from natural processes that we believe, based on sound professional judgment, were present prior to substantial human related changes to the landscape.”³⁶³ These definitions reflect a commitment to preserve historic conditions, which the statutory text arguably does not compel.

The agency’s treatment of non-native species points in the same direction as these manual definitions. The FWS has customarily been, and remains, largely focused on promoting

360. *Id.* at 1025.

361. Though not enforceable through judicial review, both the FWS Manual and FWS Refuge Manual strongly influence FWS actions. *See* McGrail & Rowley v. Babbitt, 986 F. Supp. 1386, 1394 (S.D. Fla. 1997).

362. *See* U.S. FISH & WILDLIFE SERV., BIOLOGICAL INTEGRITY, DIVERSITY, AND ENVIRONMENTAL HEALTH, 601 FW 3, <http://www.fws.gov/policy/601fw3.html> [<https://perma.cc/G6K7-CG3D>] (emphasis added).

363. *Id.*

native species and ecosystems where they have historically existed. It has interpreted the NWRSA, for example, to allow non-native introductions, but only in rare situations. Both the FWS's Manual³⁶⁴ and Refuge Manual³⁶⁵ address non-native introductions. The FWS Manual generally prohibits introduction of "species on refuges outside their historic range."³⁶⁶ However, an exception is made for circumstances in which "such introduction is essential for the survival of a species and prescribed in an endangered species recovery plan, or is essential for the control of an invasive species and prescribed in an integrated pest management plan."³⁶⁷ Even when undertaking such non-native introductions, the FWS states that it strives "to minimize unnatural effects and to restore or maintain natural processes and ecosystem components to the extent practicable without jeopardizing refuge purpose(s)."³⁶⁸ The FWS Refuge Manual is also restrictive, barring reintroduction of naturally extirpated exotics, exotic birds, or species anticipated to be invasive or to cause detrimental effects on the receiving area.³⁶⁹ Other provisions consistently emphasize that the primary ecological goal of the refuges is promoting historical conditions.³⁷⁰ Moreover, some individual units may have individual unit purposes that seek to promote particular preexisting species.³⁷¹

364. U.S. FISH & WILDLIFE SERV., FISH & WILDLIFE SERVICE MANUAL (1992), <http://www.fws.gov/policy/manuals/> [<https://perma.cc/RR4T-29LT>] [hereinafter FWS MANUAL].

365. See U.S. FISH & WILDLIFE SERV., NATIONAL WILDLIFE REFUGE SYSTEM MANUAL (2008), <http://www.fws.gov/policy/manuals/part.cfm?series=600&seriestitle=LAND%20USE%20AND%20MANAGEMENT%20SERIES> [<https://perma.cc/MVW2-D7L5>] [hereinafter FWS REFUGE MANUAL].

366. FWS MANUAL, *supra* note 364, at 601 FW 3, § 3.14(F).

367. *Id.*

368. See *id.* at 601 FW 3, § 3.11(C).

369. See FWS REFUGE MANUAL, *supra* note 365, at 7 §§ 8.6(B), 8.7.

370. FWS MANUAL, *supra* note 364, at 601 FW 3, § 3.10(B)(1) ("The System's focus is on native species and natural communities such as those found under historic conditions."); *id.* pt. 601, § 3.14 B; *id.* at 601 FW 1, § 1.9(A) ("The overarching goal of the Refuge System is to conserve a diversity of fish, wildlife, and plants and their habitats . . . with a focus on native species."); *id.* at 601 FW 3, § 3.15C ("We do not allow refuge uses or management practices that result in the maintenance of non-native plant communities unless we determine there is no feasible alternative."); FWS REFUGE MANUAL, *supra* note 365, at 7, § 8.1; *id.* pt. 7, § 12.2.

371. See, e.g., Richard L. Schroeder et al., *Managing National Wildlife Refuges for Historic or Non-Historic Conditions: Determining the Role of the Refuge in the Ecosystem*, 44 NAT. RES. J. 1185, 1199 (2004) (describing FWS decision that the goal of managing the Sherburne National Wildlife Refuge should be "the

The FWS has at times decided to “privilege (sometimes outdated) individual [unit] purposes over the superb (modern) system ones to a greater extent than that required by legislation.”³⁷²

This focus on historical fidelity had the advantage of serving as a clear and concrete counterweight to those interests more focused on maximizing refuges for hunting uses.³⁷³ However, the FWS’s focus on promoting native species and ecosystems where they have historically existed may also be in part a product of its dual role as refuge manager and principal implementer/enforcer of the Endangered Species Act (ESA)³⁷⁴ for land and freshwater species.³⁷⁵ The FWS’s implementation of the ESA has traditionally been heavily based on maintaining historical baselines, protecting species in their pre-existing range, and conserving and restoring native ecosystems and native species.³⁷⁶ For example, the ESA’s extensive protections only apply if a species is listed as “endangered,” which is expressly defined as occurring only if the species is “in danger of extinction throughout all or a significant portion of its range.”³⁷⁷

Moreover, the ESA heavily focuses its conservation and recovery activities in historically native areas. FWS regulations implementing the ESA make clear that non-native introduction

restoration and maintenance (as close as possible with present constraints) of the historic upland landscape, including the globally endangered oak savanna ecotype, while providing migratory habitat for waterfowl”).

372. Robert L. Fischman, *From Words to Action: The Impact and Legal Status of the 2006 National Wildlife Refuge System Management Policies*, 26 STAN. ENVTL. L.J. 77, 94 & n.63 (2007) (providing specific examples). Individual refuge unit purposes “may be as much as a century old.” *Id.* at 116; *see also id.* at 80 (noting that “individual refuge purposes, which tend to focus more on traditional fish and game concerns than on the newer 1997 systemic mission”); *id.* at 86 (referring to “the centrifugal tendency of refuges to hew to local custom and individual purposes at the expense of promoting distinctive system goals”).

373. *See* Camacho, *supra* note 139, at 245–46. *See also infra* note 567 and accompanying text.

374. 16 U.S.C.A. §§ 1531–1544 (West 2015).

375. *See id.* § 1532(15); *id.* § 1533(a)(2). The FWS shares responsibility for implementing the ESA with the Commerce Department’s National Marine Fisheries Service. The FWS’s historical focus also may stem from its commitment to maintaining a network of migratory bird habitats that meets “important life history needs” of these species. *See* FWS MANUAL, *supra* note 364, at 601 FW 1, § 1.8 (describing the goals of the refuge system).

376. *See* Camacho, *supra* note 15, at 863. As two prominent scholars put it, the ESA “offers a minefield of historic baselines.” Ruhl & Salzman, *supra* note 2, at 38.

377. 16 U.S.C. § 1532(6).

is supposed to be very rare, and the FWS goes to great pains to limit such introductions. ESA regulations allow the introduction of an experimental population “outside of the species’ current natural range,” but generally only “within its probable historic range.”³⁷⁸ The only circumstance in which an introduction outside of a species’ historical native range is allowed is in “the extreme case that the primary habitat of the species has been unsuitably and irreversibly altered or destroyed.”³⁷⁹ The FWS, in adopting this regulation, emphasized that nonnative introductions should be extremely rare,³⁸⁰ and the agency in fact has only allowed non-native introductions in two circumstances, both of which were supposed to be temporary.³⁸¹ In doing so, the FWS affirmed the importance of focusing conservation efforts on promoting species where they existed historically and minimizing exotic species.³⁸² Perhaps as a result of this dual role, the FWS’s management of the NWRS has also been heavily influenced by promoting historical fidelity.³⁸³ Thus, though the NWRSIA may allow the FWS to actively manage national wildlife refuges away from historical conditions, the FWS rules and policies have cabined this substantive legal adaptive capacity to a moderate degree.

The NWRSIA affords the FWS procedural legal adaptive capacity that is not unlike the capacities of the USFS under NFMA and the BLM under FLPMA. The statute requires the FWS to adopt a conservation plan for each refuge or complex of refuges and revise the plan “as may be necessary,” but at least once every fifteen years.³⁸⁴ Notably, the statute directs the FWS to revise a plan “at any time if [it] determines that conditions that affect the refuge or planning unit have changed significantly.”³⁸⁵ It must then manage the refuge in a manner consistent with the plan.³⁸⁶ The statute establishes procedural requirements for the planning process, but they do not appear

378. 50 C.F.R. § 17.81(a) (2015).

379. *Id.*

380. *See* Endangered and Threatened Wildlife and Plants; Experimental Populations, 49 Fed. Reg. 33,885, 33,890 (Aug. 27, 1984).

381. *See* Camacho, *supra* note 139, at 203.

382. *See* Endangered and Threatened Wildlife and Plants; Experimental Populations, 49 Fed. Reg. at 33,890.

383. *See supra* notes 364–370 and accompanying text.

384. 16 U.S.C. § 668dd(e)(1)(A)(iii)–(iv) (2012).

385. *Id.* § 668dd(e)(1)(E).

386. *Id.*

to be particularly onerous, encompassing the usual inter-agency coordination and public participation opportunities.³⁸⁷ The NWRSA also provides a boilerplate general grant of rulemaking authority to the FWS in its management of the refuges.³⁸⁸

The FWS has also embraced iterative decision-making processes. Of the eight goals of refuge planning it identified after adoption of the NWRSA, one is providing a basis for adaptive management.³⁸⁹ One study found, however, that the FWS's recently adopted land use plans tend to lack specific criteria for success, making it difficult for refuge managers to know whether and how to adjust management actions on the basis of information generated by monitoring.³⁹⁰ The FWS nevertheless has ample procedural legal adaptive capacity, both under the NWRSA and its own planning regulations, to pursue the changes needed to effectively respond to climate change.

2. Evaluating the FWS's Adaptation Activities

In light of this moderate level of substantive legal adaptive capacity, it makes sense that the FWS has taken significant steps to engage in climate change adaptation, but has mostly confined these measures to conceptual organizational initiatives, vulnerability assessments, and vague goals that have yet to lead to concrete integration of climate change adaptation into land management. Other than serving as the

387. *Id.* § 668dd(e)(3)–(4).

388. *Id.* § 668dd(b)(5).

389. Refuge Planning Policy Pursuant to the National Wildlife Refuge System Administration Act as Amended by the National Wildlife Refuge System Improvement Act of 1997, 65 Fed. Reg. 33,892, 33,906 (May 25, 2000). The FWS defines adaptive management as “[t]he rigorous application of management, research, and monitoring to gain information and experience necessary to assess and modify management activities.” *Id.* The FWS has embraced adaptive management in its administration of the ESA, too. *See, e.g.*, In re Polar Bear Endangered Species Act Listing & 4(d) Rule Litig., 794 F. Supp. 2d 65, 112 (D.D.C. 2011), *aff’d on other grounds*, 709 F.3d 1 (D.C. Cir. 2013) (finding that it was not arbitrary for the FWS to rely on adaptive management principles to justify listing polar bears as threatened rather than endangered under the ESA).

390. Fischman, et al., *supra* note 12, at 999; *see also* Vicky J. Meretsky & Robert L. Fischman, *Learning from Conservation Planning for the U.S. National Wildlife Refuges*, 28 CONSERVATION BIOLOGY 1415 (2014) (discussing obstacles to adaptive management arising from lack of specific criteria in FWS comprehensive conservation plans).

primary facilitator for the DOI's LCCs,³⁹¹ the FWS's primary climate change adaptation activities in its capacity as manager of the national wildlife refuges has been drafting the National Fish, Wildlife, and Plants Climate Adaptation Strategy finalized in 2012.³⁹² The 2012 Strategy establishes seven broad climate adaptation goals: (1) enhancing the capacity for effective management; (2) supporting adaptive management; (3) increasing knowledge on impacts to and responses of fish, wildlife, and plants; (4) increasing awareness and motivating action to safeguard fish, wildlife, and plants; (5) reducing non-climate stressors to help ecosystems adapt; (6) conserving habitat to support healthy fish, wildlife, and plant populations and ecological functions; and (7) managing species and habitats to protect ecological function and provide sustainable cultural, subsistence, recreational, or commercial use.³⁹³ Encouragingly, the last two goals suggest a possible re-thinking of conservation approaches. The Strategy explains that the goal "will not be to keep current conservation areas as they are, but rather to ensure there is a network of habitat conservation areas that maximizes the chances that the majority of species will have sufficient habitat somewhere."³⁹⁴ However, this broad policy document has yet to affect any existing management processes used by the FWS.

Until recently, most of the agency's focus has been on facilitating assessments of the potential effects of climate change on NWRS resources. The FWS has published guidance documents aimed at promoting climate change vulnerability assessments by individual refuges.³⁹⁵ However, in 2013 the

391. See *supra* notes 176–177 and accompanying text.

392. NAT'L FISH, WILDLIFE & PLANTS CLIMATE ADAPTATION P'SHIP, NATIONAL FISH, WILDLIFE, AND PLANTS CLIMATE ADAPTATION STRATEGY (2012), <http://www.wildlifeadaptationstrategy.gov/pdf/NFWPCAS-Final.pdf> [<https://perma.cc/46RU-ZK75>] [hereinafter FWS CLIMATE ADAPTATION STRATEGY]. The FWS prepared a Strategic Plan for Responding to Accelerated Climate Change in 2010, which addressed the effects of climate change on fish and wildlife. A draft action plan for implementing the strategic plan was never finalized, although the draft continues to provide guidance. See USGCRP, SYNTHESIS, *supra* note 11, at 51.

393. FWS CLIMATE ADAPTATION STRATEGY, *supra* note 392, at 54.

394. *Id.*

395. See, e.g., *Refuge Resource Vulnerability Assessments*, FWS.GOV (2012), <http://www.fws.gov/refuges/whm/refugeResourceVulnerabilityAssessments.html> [<https://perma.cc/R455-NNKV>] (last updated July 10, 2015); P.J. CRIST ET AL., THE REFUGE VULNERABILITY ASSESSMENT AND ALTERNATIVES TECHNICAL GUIDE: ASSESSING VULNERABILITY FOR REFUGES AND LANDSCAPES AND DEVELOPING

agency adopted a new chapter in the FWS Manual that established overarching FWS policy and staffing responsibilities on climate change adaptation.³⁹⁶ These manual provisions tend to be couched in broad generalities. For example, the manual establishes a policy “to effectively and efficiently incorporate and implement climate change adaptation measures into the Service’s mission, programs, and operations.”³⁹⁷ It requires the agency to use the best available science in coordinating appropriate adaptive responses; integrate adaptation strategies into all aspects of policy, planning, programs, and operations; work with partners and LCCs; “[d]eliver landscape conservation actions that build resilience or support the ability of fish, wildlife, and plants to adapt to climate change”; and “monitor populations and habitats to assess the impacts of management strategies in the face of climate change.”³⁹⁸

Segments of new FWS guidance attempt to grapple with the difficulties of managing climate change, including the challenge of promoting historical fidelity despite a changing climate. In July 2014, the FWS published guidance for resource managers across agencies on scenario planning for managing uncertainty, including from climate change.³⁹⁹ Later that year,

ALTERNATIVES FOR MANAGEMENT (2012), http://www.fws.gov/refuges/whm/pdfs/RefugeVulnerabilityAssessmentTechnicalGuide_FINAL.pdf [<https://perma.cc/XT33-2EFD>] (providing scientific and technical guidance to help refuges better develop responses to climate change during comprehensive conservation planning and management planning); P.J. CRIST ET AL., FWS, MANAGER’S GUIDE TO REFUGE VULNERABILITY ASSESSMENT & ALTERNATIVES: OVERVIEW AND PRACTICAL CONSIDERATIONS (2012), <http://www.fws.gov/refuges/whm/pdfs/RefugeVulnerabilityAssessmentManagersGuide.pdf> [<https://perma.cc/L7QE-7PRY>] (explaining how a refuge manager could set up a vulnerability assessment using the methodology described in the Technical Guide, including an overview, timeframes, estimated costs, and other practical considerations).

396. U.S. FISH & WILDLIFE SERV., THE FISH AND WILDLIFE SERVICE MANUAL 056 FW 1 (July 22, 2013), <http://www.fws.gov/policy/056fw1.html> [<https://perma.cc/HE86-333Z>].

397. *Id.*

398. *Id.* § 1.6 (F)–(G). Another new Manual chapter, issued in 2014, established the FWS Climate Adaptation Network to guide the agency “to enhance preparedness, adaptation, and resilience in the face of the impacts of climate change and its interaction with non-climate influences on fish, wildlife, plants, [and] ecosystems.” U.S. FISH & WILDLIFE SERV., THE FISH AND WILDLIFE SERVICE MANUAL 056 FW 2 (June 20, 2014), <http://www.fws.gov/policy/056fw2.html> [<https://perma.cc/WGG2-TXTV>].

399. ERICA L. ROWLAND ET AL., CONSIDERING MULTIPLE FUTURES: SCENARIO PLANNING TO ADDRESS UNCERTAINTY IN NATURAL RESOURCE CONSERVATION (2014), <http://www.fws.gov/home/feature/2014/pdf/Final%20Scenario%20>

it issued generalized guidance to NWRS managers that illustrates the challenges the FWS faces in dealing with substantially changing conditions given its internal constraints on substantive legal adaptive capacity.⁴⁰⁰ The guidance provides examples of potentially appropriate management actions to adapt to climate change, such as revision of land acquisition plans and restoration of acquired lands to enhance resilience.⁴⁰¹ The FWS also issued a progress report in 2014 on its implementation of the 2012 Climate Adaptation Strategy.⁴⁰² The report describes fifty projects in which the FWS, with public and private partners, has begun to implement some of the recommendations of the 2012 Strategy to address habitat loss and degradation in wildlife refuges and elsewhere resulting from climate change and other factors.⁴⁰³ Almost all of the projects described involve either (1) the development of models for predicting future species population dynamics that will inform future management decisions to protect ecosystems,⁴⁰⁴ or (2) other kinds of assessments of effects, such as sea level rise on the refuges, to lay the groundwork for future planning activities.⁴⁰⁵ One, however, entails at least preliminary management steps to protect shorelines along a coastal refuge in the face of rising sea levels.⁴⁰⁶

Importantly, the FWS continues to assert that the framework for fulfilling the NWRSIA's mandate to maintain biological integrity, diversity, and environmental health is to maintain "historic conditions," but it reframes historical

Planning%20Document.pdf [https://perma.cc/3XMV-S5JM]. The guidance provides several examples of scenario planning. *Id.* at 89, 101, 129, 137.

400. B. CZECH, FWS, PLANNING FOR CLIMATE CHANGE ON THE NATIONAL WILDLIFE REFUGE SYSTEM (2014), <http://www.fws.gov/refuges/vision/pdfs/PlanningforClimateChangeontheNWRS.pdf> [https://perma.cc/F4WT-XDH4].

401. *Id.* at 9. In describing several case studies, the guidance provided examples of possible management actions to address particular problems. *See, e.g., id.* at 40–41 (discussing the construction of deep wetlands); *id.* at 49 (discussing strategic fire management).

402. NAT'L FISH, WILDLIFE & PLANTS CLIMATE ADAPTATION JOINT IMPLEMENTATION WORKING GRP., NATIONAL FISH, WILDLIFE & PLANTS CLIMATE ADAPTATION STRATEGY: TAKING ACTION (2014), <http://www.wildlifeadaptationstrategy.gov/pdf/Taking-Action-progress-report-2014.pdf> [https://perma.cc/AR9H-Z7LA].

403. *Id.* at 5.

404. *Id.* at 18–19 (Florida Keys and Florida Coasts); *id.* at 37 (utilizing the bioenergetics model to assess effects of sea level rise and land-use change on black duck habitat in various refuges along the Chesapeake Bay).

405. *Id.* at 36 (various refuges along the Pacific coast).

406. *Id.* at 13 (Alligator River National Wildlife Refuge).

conditions to focus on preexisting processes rather than particular constituents of the ecosystem. The agency defines “historic conditions” as the “[c]omposition, structure, and functioning of ecosystems resulting from natural processes that we believe . . . were present prior to substantial human related changes to the landscape.”⁴⁰⁷ The agency added that its goal is “to induce management for natural conditions and with natural processes, using historic conditions to help identify such conditions and processes.”⁴⁰⁸ The FWS expressly acknowledged that “[t]he concept of ecological integrity and the cohesion of ecological integrity policies are challenged and undermined by anthropogenic climate change.”⁴⁰⁹ It also noted that managers have “a certain degree of latitude and flexibility in responding to climate change,” and that “prospective adaptation” may be appropriate to “‘fit’ ecologically with climate change trajectories.”⁴¹⁰ The FWS thus continues to treat retention of historical conditions as the key substantive goal, but it is attempting to reinterpret a fixed historical baseline to allow more flexible application as ecological conditions change.

Despite this activity, relatively little of this guidance has found its way into refuge management plans—the core management regime for national wildlife refuges. A 2014 study found that many NWRS units lack land use plans that meaningfully address climate change adaptation.⁴¹¹ Only 73 of the 185 refuges for which comprehensive conservation plans (CCPs) were completed between 2005 and 2011 even mentioned

407. U.S. FISH & WILDLIFE SERV., THE FISH AND WILDLIFE SERVICE MANUAL pt. 601 FW 3 § 3.6(d) (2001), <http://www.fws.gov/policy/601fw3.html> [<https://perma.cc/DXL9-9AFU>]. As Professors Ruhl and Salzman have argued, “There is no other way to manage for historic conditions than to use a historic baseline.” Ruhl & Salzman, *supra* note 18, at 18. The FWS’s frame of reference extends from 88 to 1800 AD. *Id.* at 14.

408. CZECH, *supra* note 400, at 14.

409. *Id.* at 15.

410. *Id.* The FWS 2014 progress report on its implementation of the 2012 Climate Adaptation Strategy describes projects in which the FWS has begun to implement some of the 2012 Strategy’s recommendations. NAT’L FISH, WILDLIFE & PLANTS CLIMATE ADAPTATION JOINT IMPLEMENTATION WORKING GRP., *supra* note 402, at 4–5.

411. See Fischman, et al., *supra* note 12, at 994; cf. Archie et al., *supra* note 22 (finding that the FWS may “be the farthest along” of the four land management agencies in incorporating climate change adaptation in its land use planning, based on surveys and interviews conducted in 2011 (before the USFS amended its planning regulations) in three western states)).

prescriptions for climate change.⁴¹² Coastal refuges were most advanced, integrating planning for rises in sea level, but many refuges failed to consider sufficiently the spread of harmful parasites and diseases and the potential increase in wildfires.⁴¹³ Of those that prescribe adaptation measures, most focused on additional monitoring and assessment or continuing to promote the same conservation activities intended to maintain resilience generally.⁴¹⁴ The plan prescriptions generally did not meet the FWS's own criteria that prescriptions be specific, measurable, achievable, results-oriented, and time-fixed.⁴¹⁵ Scenario planning, which can describe plausible futures using quantitative or qualitative data, was not evident in the plans.⁴¹⁶ The study concludes that the CCPs adopted between 2005 and 2011 increased the extent to which they described climate change impacts,⁴¹⁷ but did not consistently respond to those impacts with prescriptions for adaptive responses to monitoring results.⁴¹⁸

412. Fischman, et al., *supra* note 12, at 994. Later plans were more likely to address management actions than earlier ones. *Id.* (“The proportion of CCPs providing prescriptions addressing climate-change impacts on refuge resources increased from 6.3% in 2005 to 79.3% in 2010 and then fell to 65% in 2011 . . .”).

413. *Id.* at 995 tbl.1.

414. *Id.* at 994 (stating that “[t]he climate-change prescriptions favored studies or plans over actions or modeling.”); *id.* (“Although the majority of plans prescribed monitoring, much less than half indicated an intent to act on the results of monitoring or described specific actions that should follow from monitoring results.”).

415. *Id.* The plans’ lack of specificity in describing management actions is not confined to actions that are designed as responses to climate change. *See* Robert L. Fischman, *Leveraging Federal Land Plans into Landscape Conservation*, 6 GEO. WASH. U. J. ENERGY & ENVTL. L. 46, 54 (2016) (concluding that FWS CCPs “are much more thorough in their descriptions of refuge threats and concerns than they are in specifying prescriptions to address the problems”).

416. Fischman, et al., *supra* note 12, at 997.

417. *See also* Meretsky & Fischman, *supra* note 390, at 1418 (calculating proportion of CCPs completed between 2005 and 2011 that addressed various climate change threats). The authors of that study noted in particular that “[t]he trend of increasing proportions of CCPs addressing aquatic connectivity is a promising signal of improving landscape-scale conservation, particularly as a means of addressing climate-change stress.” *Id.* at 1423. A dip in 2011 in the percentage of plans that included climate-related prescriptions may have been due to the agency’s haste to meet statutory deadlines for completing plans. *Id.* at 1426.

418. Fischman, et al., *supra* note 12, at 1003. At the same time, however, the study postulates that “the CCPs tend to be more current than plans for other public land systems and are therefore more likely to address climate change.” *Id.* at 994. That assessment, however, relates to plans prepared before the 2012 amendments to the USFS planning regulations described above. *See supra* notes

The agency's commitment to pursuing concrete measures to facilitate adaptation fortunately appears to be increasing. In September 2014, the FWS incorporated a new Strategic Growth Policy in the FWS Manual.⁴¹⁹ Among its objectives are ensuring that future growth of the refuge system furthers "an ecologically-connected network of public and private lands that are resilient to climate change and support a broad range of species under changed conditions."⁴²⁰ Even though this reference to changed conditions appears in a portion of the Manual governing new additions to the refuge system, it may reflect an emerging broader recognition that movement away from a solely historic focus is necessary in an era of disruptive climate change.⁴²¹

In addition, in its fiscal year 2016 budget request, the FWS identified climate change adaptation as a priority goal. In particular, it indicated that by September 2015, the Interior Department would "demonstrate maturing implementation of climate change adaptation . . . when implementing strategies in its Strategic Sustainability Performance Plan."⁴²² The agency plans to track progress on a quarterly basis to consider the incremental level of accomplishment achieved in development of policies or processes, or the number of "deliverables" or completed projects.⁴²³ The strategic goals include mainstreaming and integrating climate change adaptation into agency-wide and regional planning actions, ensuring that agency principals demonstrate commitment to adaptation efforts through internal communications and policies, ensuring that workforce protocols reflect projected health and safety impacts of climate change, constructing or modifying facilities

258–262 and accompanying text. As Professor Fischman has noted elsewhere, "the prescriptive sections [of CCPs] are the engines that generate real management actions." *See also* Meretsky & Fischman, *supra* note 390, at 1423.

419. U.S. FISH & WILDLIFE SERV., THE FISH AND WILDLIFE SERVICE MANUAL 602 FW 5 (2014), <http://www.fws.gov/policy/602fw5.html> [<https://perma.cc/HAP8-NLUP>].

420. *Id.* § 5.2 (E).

421. *See id.* § 5.5 (A)(1) (noting the increasing importance in planning and directing the growth of the Refuge System in recognizing the "[u]nparalleled challenges related to climate change and non-climate change stressors").

422. U.S. DEPT OF THE INTERIOR, FISH & WILDLIFE SERV., BUDGET JUSTIFICATIONS AND PERFORMANCE INFORMATION, FISCAL YEAR 2016, at EX-19, http://www.fws.gov/budget/2015/FY2016_FWS_Greenbook.pdf [<https://perma.cc/F8GC-TN9R>].

423. *Id.*

and infrastructure with consideration for potential climate impacts, and updating external programs and policies to incentivize planning for and addressing the impacts of climate change.⁴²⁴ The FWS also requested budget increases for specific activities linked to climate change adaptation, including fish passage improvements, ecosystem restoration, and development of adaptive science.⁴²⁵

In sum, the FWS has engaged in a moderate level of climate change adaptation planning, which has recently accelerated as the agency has completed CCPs. The NWRSIA and the FWS's interpretive regulations provide the FWS with some substantive legal adaptive capacity that may be useful in adapting to climate change, even if that capacity is less than that provided by the statutes that govern management of the multiple-use lands. The FWS also has committed to the use of adaptive management (and, to a lesser extent, scenario planning), thereby affording itself procedural legal adaptive capacity, though the absence of meaningful metrics has detracted from the value of these iterative processes.

Nevertheless, the agency's evaluation of the threats to refuge resources posed by climate change has, by and large, not yet translated into specific management prescriptions, even in most recently adopted CCPs. Moreover, the FWS's adaptation efforts have been restrained, at least until very recently, by a fundamental focus on promoting ecological historical fidelity, so that it arguably has not taken full advantage of the substantive legal adaptive capacity that its organic statute provides. The agency may have begun to remove these self-imposed shackles, as its Strategic Growth Policy and most recent budget request seem to indicate. Resource constraints may have limited the FWS's progress in incorporating adaptation goals into plans and management actions, and may continue to do so even if the agency does more fully shift away from a focus on historic preservation.⁴²⁶

E. The National Parks

The NPS has engaged in considerable information-gathering efforts and has begun to integrate the fruits of those

424. *Id.* at EX-19 to EX-20.

425. *Id.* at EX-11, ES-18 (California Bay Delta restoration), SS-3.

426. *See* GAO, *supra* note 122, at 44-45.

efforts into its planning processes. It is not as far along, however, in adopting or implementing concrete management measures for the National Park System. This relatively limited on-the-ground adaptation activity is consistent with the System's fairly limited substantive legal adaptive capacity due to longstanding agency interpretations that primarily focus on promoting historical conditions.

1. The NPS's Adaptive Capacity

The NPS must manage the National Park System under the National Park Service Organic Act's core preservation mandate to "conserve the scenery, natural and historic objects, and wild life in the System units and to provide for the enjoyment of the scenery, natural and historic objects, and wild life in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."⁴²⁷ Like the FWS, the NPS "is primarily a nature preservation agency."⁴²⁸ Although the NPS has broad discretion in interpreting its statutory authority,⁴²⁹ it is constrained in the ways it can use that authority to address climate change. Climate change is causing and will continue to cause fundamental ecological changes from prior conditions, creating tension with the Organic Act's historical preservation mandate.⁴³⁰

427. 54 U.S.C. § 100101(a) (2014). *See also* U.S. NAT'L PARK SERV., MANAGEMENT POLICIES 10 (2006), <http://www.nps.gov/policy/MP2006.pdf> [<https://perma.cc/PC4R-3MBZ>] [hereinafter NPS MANAGEMENT POLICIES] ("The fundamental purpose of the national park system, established by the Organic Act . . . , as amended, begins with a mandate to conserve park resources and values."). The NPS defines "conserve" to mean "to protect from loss or harm; preserve. Historically, the terms conserve, protect, and preserve have come collectively to embody the fundamental purpose of the NPS—preserving, protecting and conserving the national park system." *Id.* at 156 (Glossary).

428. Keiter, *supra* note 159, at 955.

429. *See* Davis v. Latschar, 202 F.3d 359, 365 (D.C. Cir. 2000) (explaining that discretion may be constrained by other environmental statutes applicable to NPS decisions that push the agency toward conservation of park resources or by the organic legislation that created individual park units, which sometimes but not invariably require the agency to take steps to accommodate recreational use and enjoyment of the unit); John Copeland Nagle, *How National Park Law Really Works*, 86 U. COLO. L. REV. 861, 861 (2015).

430. Camacho, *supra* note 18, at 1426 (arguing that prioritizing preservationism and minimizing human interaction with natural systems "is incongruent with the dynamic nature of ecosystems and the pervasiveness of the human-nature relationship, particularly in light of modern anthropogenic climate

The NPS has long interpreted the Organic Act to require it to focus on protecting historical conditions and preexisting biota.⁴³¹ Established NPS interpretations stipulate that the NPS should take a historical preservationist approach to existing natural resources in national parks.⁴³² If any management strategy or adaptation measure could lead to the impairment of park resources or values, it cannot be approved.⁴³³ As such, the NPS often engages in active steps to promote or restore pre-existing ecological conditions.⁴³⁴ This focus on preserving historical conditions is congruent with the NPS's other programs directed at historic preservation of the built environment. These include administering National Historical Parks, National Historic Landmarks, National Heritage Areas, the National Register of Historic Places, and historic preservation grants and historic rehabilitation tax credits.⁴³⁵

Paired with that historical goal is a secondary presumption that the agency must protect existing natural resources from

changes”).

431. See NPS MANAGEMENT POLICIES, *supra* note 427, at 42 (“The National Park Service will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems.”); *id.* § 4.1, at 36 (“[P]reserving park resources and values unimpaired is the core or primary responsibility of NPS managers.”). See also A. Starker Leopold et al., *Wildlife Management in the National Parks*, in TRANSACTIONS OF THE TWENTY-EIGHTH NORTH AMERICAN WILDLIFE AND NATURAL RESOURCES CONFERENCE 29, 29–44 (James B. Trefethen ed., 1963).

432. See, e.g., *Bluewater Network v. Salazar*, 721 F. Supp. 2d 7, 20–21 (D.D.C. 2010) (noting that the NPS “has consistently interpreted the Organic Act to prioritize conservation” over visitor recreation, and quoting NPS Policy construing congressional intent to protect park resources and values for future generations as requiring that “the superb quality of park resources and values is left unimpaired”).

433. NPS MANAGEMENT POLICIES, *supra* note 427, at 36.

434. See *id.* § 4.4.2.2, at 45 (stating that the NPS “will strive to restore extirpated native plant and animal species”); *id.* at 46 (“In altered plant communities managed for a specified purpose, plantings will consist of species that are native to the park or that are historically appropriate for the period or event commemorated.”); *id.* at 45 (“The Service will survey for, protect, and strive to recover all species native to national park system units that are listed under the [ESA] [T]he Service will inventory other native species that are of special management concern to parks . . . and will manage them to maintain their natural distribution and abundance.”); *id.* at 43 (“The Service will strive to protect the full range of genetic types (genotypes) of native plant and animal populations in the parks”).

435. See NORMAN TYLER ET AL., *HISTORIC PRESERVATION: AN INTRODUCTION TO ITS HISTORY, PRINCIPLES, AND PRACTICE* 33 (2d ed. 2009).

human activity or management,⁴³⁶ as well as a strong preference for relying on “natural” processes for protecting and restoring pre-existing native species.⁴³⁷ Yet even then, historical preservation remains the primary goal;⁴³⁸ the agency has declared that it will not intervene in natural biological or physical processes except “to restore natural ecosystems functioning that has been disrupted by past or ongoing human activities.”⁴³⁹ If biological or physical processes have been altered in the past by human activities, active management may be appropriate, but the goal of such action is fundamentally historical preservation: “to restore them to a natural condition or to maintain the closest approximation of the natural condition when a truly natural system is no longer attainable.”⁴⁴⁰ Legislation creating individual NPS units may reinforce the agency’s focus on maintaining historic conditions.⁴⁴¹

436. See NPS MANAGEMENT POLICIES, *supra* note 427, at 36 (“In cases of uncertainty as to the impacts of activities on park natural resources, the protection of natural resources will predominate.”); *cf. id.* (Introduction) (“The Service recognizes that natural processes and species are evolving, and the Service will allow this evolution to continue—minimally influenced by human actions.”); *id.* (“[N]atural change will also be recognized as an integral part of the functioning of natural systems,” and the NPS will seek to preserve components and processes “in their natural condition.”). The agency defines “natural condition” as “the condition of resources that would occur in the absence of human domination over the landscape.” *Id.* (Introduction).

437. See *id.* at 44 (“Whenever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species.”).

438. In fact, by purporting to promote historically native species *through* minimizing human management, some NPS policies seek to advance historical preservation via non-intervention. See *id.* at 43 (“The Service will strive to protect the full range of genetic types (genotypes) of native plant and animal populations in the parks by perpetuating natural evolutionary processes and minimizing human interference with evolving genetic diversity.”).

439. *Id.* at 37. Additional limited justifications for such intervention include: congressional authorization, emergencies that pose risks to human life and property, and as needed to protect other park resources, human health and safety, or facilities. *Id.*

440. *Id.*

441. See, e.g., 16 U.S.C. § 79a (2012) (stating the purpose of creating Redwood National Park as “preserv[ing] significant examples of the primeval coastal redwood (*Sequoia sempervirens*) forests and the streams and seashores with which they are associated for purposes of public inspiration, enjoyment, and scientific study”); *id.* § 160 (stating that the purpose of establishing Voyageurs National Park “is to preserve, for the inspiration and enjoyment of present and future generations, the outstanding scenery, geological conditions, and waterway system which constituted a part of the historic route of the Voyageurs who contributed significantly to the opening of the Northwestern United States”). The

The NPS's approach to its statutory management mandate generally functions to minimize the possibility of proactive management to promote future ecological function. NPS managers have the discretion (and sometimes obligation) to reintroduce extirpated populations of vulnerable native species.⁴⁴² NPS managers generally may not introduce non-native species except when necessary to meet a specific management need, all feasible measures are taken to reduce the risk, and the introduced species is closely related to an extirpated native species or improved variety of a native species where the natural variety cannot survive current, human-altered environmental conditions.⁴⁴³ NPS managers are expected to actively seek to remove any non-native species.⁴⁴⁴

This focus on promoting historical fidelity provides limited substantive legal adaptive capacity for NPS managers to engage in proactive adaptation measures. The tension between fostering active climate change adaptation strategies that seek to advance future ecological health and the NPS's fundamentally historical preservation goals is obvious.⁴⁴⁵ The agency is not similarly saddled with low procedural legal adaptive capacity, however. NPS policies encourage the "appropriate" use of adaptive management in general management plans for park units⁴⁴⁶ as "a means for providing

historic preservation focus is even more explicit for units such as national historical parks. *See, e.g., id.* § 282 (describing the purpose of San Juan Island National Historical Park as "interpreting and preserving the sites of the American and English camps on the island, and of commemorating the historic events that occurred from 1853 to 1871 on the island in connection with the final settlement of the Oregon Territory boundary dispute").

442. *See* NPS MANAGEMENT POLICIES, *supra* note 427, at 27 ("Implementation plan details may vary widely and may direct a finite project (such as reintroducing an extirpated species . . ."); *id.* at 42 ("The Service will successfully maintain native plants and animals by . . . restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions."); *id.* at 45 (stating that the NPS will "reestablish extirpated populations as necessary to maintain the species and the habitats upon which they depend").

443. *Id.* at 47.

444. *Id.* at 48.

445. *But cf.* Keiter, *supra* note 12, at 334 (citation omitted) (arguing that the non-impairment mandate of the NPS's organic statute "constitutes a clear, substantive standard that gives priority to protecting the ecological health of national parks over other considerations in the event of a conflict").

446. The Organic Act mandates the adoption of general management plans "for the preservation and use of each unit of the National Park System." 16 U.S.C. § 1a-7(b) (2012).

flexibility in the face of changing natural conditions.”⁴⁴⁷ In addition, NPS policies appear to leave agency officials considerable flexibility in determining the appropriate nature and extent of public participation in agency planning endeavors.⁴⁴⁸ They also leave decisions about the frequency of general management plan revisions largely to agency discretion.⁴⁴⁹ The processes for implementation of general management plan provisions are even more amorphous than the ones that apply to plan adoption.⁴⁵⁰

2. Evaluating the NPS’s Adaptation Activities

The NPS’s climate change adaptation activities in managing the National Park System have primarily focused on developing science and data on the possible effects of climate change, educating the public about climate change’s effects, and crafting general objectives to integrate climate change into management actions.⁴⁵¹ The agency promoted better monitoring of ecological responses to climate change⁴⁵² and distributed information about climate change effects.⁴⁵³ It has

447. NPS MANAGEMENT POLICIES, *supra* note 427, at 27. For the NPS’s definition of “adaptive management,” see *id.* at 156 (Glossary).

448. *Id.* at 24 (“Public involvement strategies, practices, and activities will be developed and conducted within the framework of civic engagement.”).

449. *Id.* at 26 (stating that if conditions remain substantially unchanged, deferring review of existing plans beyond ten to fifteen years would be “acceptable”).

450. See *id.* at 27; *cf.* 2 COGGINS & GLICKSMAN, *supra* note 143, § 16:4 (referring to “the wide discretion enjoyed by park managers in preparing individual unit plans” and stating that “the subjects to be covered and degree of specificity remains largely within local prerogative”).

451. See, e.g., *Climate Change: Effects in Parks*, NAT’L PARK SERV., <http://www.nps.gov/subjects/climatechange/effectsinparks.htm?maxrows=5&showall=0&startrow=1> [<https://perma.cc/39WV-U5N2>] (last updated Jan. 24, 2016) (linking to almost entirely descriptive illustrations of the manner in which climate change is affecting the parks).

452. E.g., BRUCE BINGHAM ET AL., NPS, ENHANCED MONITORING TO BETTER ADDRESS RAPID CLIMATE CHANGE IN HIGH-ELEVATION PARKS: A MULTI-NETWORK STRATEGY (2011), NPS_HighElevParks_ClimateMonitoring_Strategy_NRR_2011_285.pdf [<https://perma.cc/PL9E-NQWT>].

453. E.g., *Relative Coastal Vulnerability Assessment of National Park Units to Sea-Level Rise*, U.S. GEOLOGICAL SURV., <http://woodshole.er.usgs.gov/project-pages/nps-cvi/> [<https://perma.cc/7JQC-M5SL>] (last updated May 8, 2014) (including maps of vulnerable coastal areas that quantify future physical changes on shorelines due to sea level rise). An entrée into the agency’s climate change activities is provided on its website, *Climate Change and Your National Parks*, NAT’L PARK SERV., <http://www.nps.gov/subjects/climatechange/index.htm>

begun compiling data on the risks from sea level changes on park infrastructure and historic and cultural resources,⁴⁵⁴ and on storm surges that may be useful in crafting hurricane response plans for coastal parks in the Southeast and Northeast Regions.⁴⁵⁵

The NPS's principal guidance document relating to climate change is its Climate Change Response Strategy, issued in 2010, which established general adaptation goals and identified approaches for on-the-ground planning.⁴⁵⁶ The Strategy characterized climate change as "fundamentally the greatest threat to the integrity of our national parks that we have ever experienced," and, consistent with administration and departmental directives, established responding to it as a high priority.⁴⁵⁷ It also specified fourteen climate-related goals, three of which involve adaptation to protect natural resources within the parks. These general prescriptions included incorporating climate change considerations and responses in all levels of NPS planning; implementing adaptation strategies that promote ecosystem resilience and enhance restoration, conservation, and preservation of park resources; and developing and implementing management strategies to preserve climate-sensitive resources.⁴⁵⁸

[<https://perma.cc/5S4U-PJJX>] (last updated Feb. 10, 2016); *see also* *NPS Climate Change Response Resources*, NAT'L PARK SERV., <http://science.nature.nps.gov/climatechange/> [<https://perma.cc/426Z-2VAD>] (last updated Oct. 14, 2015) (listing NPS scientific research publications produced by its Climate Change Response Program).

454. KATIE MCDOWELL PEEK ET AL., NPS, ADAPTING TO CLIMATE CHANGE IN COASTAL PARKS: ESTIMATING THE EXPOSURE OF PARK ASSETS TO 1 M OF SEA-LEVEL RISE, at ix, 22 (2015), http://www.nature.nps.gov/geology/coastal/coastal_assets_report.cfm [<https://perma.cc/8U5S-KBRA>] [hereinafter NPS, ADAPTING TO CLIMATE CHANGE IN COASTAL PARKS] (concluding that over thirty-nine percent (valued at more than \$40 billion) of park infrastructure and historic and cultural resources in forty coastal NPS units are at high risk to long-term sea-level rise).

455. *See* NPS, COASTAL CHANGE RESPONSE PROGRAM; SEA LEVEL CHANGE AND STORM SURGE PROJECTIONS (2015), <http://www.nps.gov/subjects/climatechange/upload/Sea-Level-Rise-Project-Brief-MAR-2015.pdf> [<https://perma.cc/EG84-YBDG>].

456. NPS, CLIMATE CHANGE RESPONSE STRATEGY 14–16 (Sept. 2010), http://www.nps.gov/orgs/ccrp/upload/NPS_CCRS.pdf [<https://perma.cc/2HDL-YDLJ>].

457. *Id.* at 1.

458. *Id.* at 14–17. A fourth adaptation-related goal is to enhance infrastructure design, construction, and implementation in the face of climate change. *Id.* at 18. According to NPS officials with whom we communicated during the preparation of this Article, updates to the Strategy are in preparation.

Two years later, the NPS published a Climate Change Action Plan.⁴⁵⁹ The Plan lists several high-priority areas in general terms.⁴⁶⁰ These include enhancing workforce climate literacy, engaging youth and families, developing effective planning frameworks and guidance, providing climate change science to parks, fostering robust partnerships, applying appropriate adaptation tools and options, and strengthening communication.⁴⁶¹ The Plan also notes the need to “rethink traditional planning processes” in light of climate change.⁴⁶²

These measures may provide a necessary underpinning for future unit-specific management decisions to deal with climate change, but they are couched in very general terms. Though the NPS has acknowledged elsewhere that “[i]t is important that NPS begin to put together national and regional plans for climate change adaptation,”⁴⁶³ as of February 2016, NPS core management policies on Park System Planning, as well as other major planning guidelines and handbooks, make minimal reference to climate change.⁴⁶⁴ The agency’s recent

459. NPS, CLIMATE CHANGE ACTION PLAN 2012–2014 (2012), http://www.nps.gov/orgs/ccrp/upload/NPS_CCActionPlan.pdf [https://perma.cc/F4ZN-A9YS].

460. *Id.* at 7.

461. *Id.* at 14, 20–26.

462. *Id.* at 15, 20–22. The adaptation tools provided as examples include “listening sessions” with NPS employees, pilot adaptation planning processes that connect vulnerability assessments and scenarios to park planning, decision frameworks for navigating resource adaptation options and practices, and a national interpretive plan for climate change. *Id.* at 25–26.

463. NPS, ADAPTING TO CLIMATE CHANGE IN COASTAL PARKS, *supra* note 454, at 18.

464. *See* NPS MANAGEMENT POLICIES, *supra* note 427, at 22–27. The 2006 Management Policies do have a brief subsection in the section on Natural Resource Management on weather and climate which notes that “accelerated climate change may significantly alter park ecosystems. Thus, parks containing significant natural resources will gather and maintain baseline climatological data for reference.” *Id.* at 53. *See also*, NPS, DEPT OF THE INTERIOR, HANDBOOK 12 (2011), <http://www.nps.gov/policy/DOrders/RM12.pdf> [https://perma.cc/QA2B-69HU] (describing NPS and NEPA processes for issuing environmental impact statements, but making no mention of climate change); NPS, NATURAL RESOURCES INVENTORY AND MONITORING GUIDELINES 13, <http://www.nature.nps.gov/nps75/nps75.pdf> [https://perma.cc/NC7E-AAZP] (referring to global climate change merely as an example of how priority resource management issues can be used to provide important direction to the structure of an inspection and maintenance program). The NPS’s NEPA Handbook, issued in 2015, refers to climate change briefly in only two places in its nearly 100 pages. NPS, NEPA HANDBOOK 60, 62 (2015), http://www.nps.gov/orgs/1812/upload/NPS_NEPAHandbook_Final.pdf [https://perma.cc/B642-5DB4]. An agency official informed the authors of this Article that the NPS is waiting for further guidance

interpretation of these management policies is probative. In 2012, the NPS Director issued a policy memorandum seeking to clarify these management policies in light of climate change.⁴⁶⁵ Encouragingly, it recognized that “natural conditions’ may be both increasingly difficult to characterize and ineffective as a guide for desired future conditions” as a result of climate change.⁴⁶⁶ Despite this acknowledgement, the memorandum does not offer any substitute targets centered on promoting ecological health, instead stating that “traditional practices targeted to maintain ‘natural conditions’ in parks . . . remain as viable management strategies that are also consistent with our need to adapt to climate change.”⁴⁶⁷

At the unit or regional level, the agency is promoting scenario planning,⁴⁶⁸ and some units are beginning to adopt climate action plans. Concrete adaptation strategies, however, often remain relatively inchoate and unspecific, reflecting only broad adaptation instructions. For example, the Northeast Region has adopted a climate change strategy and action plan with relatively general objectives that include incorporating climate change considerations and responses at all levels of planning, incorporating adaptive management into planning to facilitate flexible responses to climate change, conducting scenario planning, and implementing adaptation strategies that promote ecosystem resilience and enhance resource restoration and preservation.⁴⁶⁹

from the CEQ on how to factor climate change into NEPA documents.

465. Memorandum, Applying National Park Service Management Policies in the Context of Climate Change 1 (Mar. 6, 2012), <http://www.nps.gov/policy/MPandCC.pdf> [<https://perma.cc/TXE4-LLYF>].

466. *Id.* at 2.

467. *Id.*

468. Even before the FWS did so, the NPS issued a guide for conducting climate change scenario planning. NPS, USING SCENARIOS TO EXPLORE CLIMATE CHANGE: A HANDBOOK FOR PRACTITIONERS (2013), <http://www.nps.gov/subjects/climatechange/upload/CCScenariosHandbookJuly2013.pdf> [<https://perma.cc/AE95-TH2G>]; *id.* Appendix I (2014) (on file with authors); See also USGCRP, SYNTHESIS, *supra* note 11, at 50–51. The NPS has described scenario planning as “a process for developing a science-based decision making framework in the face of futures with high uncertainty and lack of control.” Dep’t of the Interior, Nat’l Park Serv., Flexible Planning in an Era of Uncertainty, at 2 (on file with authors). Various units have engaged in scenario planning, including all of the Alaskan parks. See “*Rehearsing the Future*” – Scenario Planning in Alaska, NAT’L PARK SERV., <http://www.nps.gov/akso/nature/climate/scenario.cfm> [<https://perma.cc/U8JM-57MF>] (last updated Sept. 22, 2014).

469. Dep’t of the Interior, Nat’l Park Serv., Northeast Region, Climate Change Strategy and Action Plan 2011–2014, at 8 (May 25, 2009) (on file with authors).

Some parks have advanced a little further. Officials at Glacier National Park, for example, as early as 2012 engaged in research to establish baseline measures of species abundance and distribution to detect changes in populations of at-risk species such as pika.⁴⁷⁰ Park officials at Glacier have also begun “planting trees in new habitats, managing invasive plants, and restoring native vegetation.”⁴⁷¹ They indicated, however, that they had no current plans to revise the park’s general management plan because they deemed it an adequate management tool, even though it does not directly address climate change.⁴⁷² They did mention that they would develop a foundation plan describing the park’s purpose, significant resources, and planning needs which “likely” will address climate change.⁴⁷³ It remains to be seen whether plans such as

The Pacific West Region also has developed a climate action plan whose objectives include planning for continuous and dynamic change and increasing capacity for adaptive management of ecosystems. The plan identifies actions to advance these goals, such as completing foundation documents and associated resource stewardship strategies that recognize climate change challenges and needs, and “respond[ing] to climate change effects with specific strategies and actions.” Dep’t of the Interior, Nat’l Park Serv., Pacific West Region, Climate Change Response: Regional Office Action Plan 9 (on file with authors). Other identified actions include reviewing regional strategies and guidance on invasive species, plant pathogens, and integrated pest management to ensure climate change considerations are included, facilitating landscape-level and cross-boundary conservation, and participating in collaborative Land and Water Conservation Fund nominations to expand habitat corridors and protect endangered species in the region’s parks. *Id.* at 10.

470. GAO, *supra* note 122, at 48.

471. *Id.*

472. *Id.* at 50.

473. *Id.* The NPS has begun to devise strategies to address climate change in preparing its National Long Range Transportation Plan, and is working on “foundation documents” describing priority issues and planning needs, which are supposed to be completed for all parks by 2016. It has released foundation documents, on which all subsequent unit-specific planning activity will rest, for some of the parks. The documents identify development of a climate change adaptation strategy as planning needs, but do not indicate whether those strategies are in place or what they will look like when they are. *See, e.g.*, Dep’t of the Interior, Nat’l Park Serv., Foundation Document: Black Canyon of the Gunnison National Park 27, 37 (Dec. 2013) (on file with authors); Dep’t of the Interior, Nat’l Park Serv., Foundation Document: Cape Lookout National Seashore 22, 26 (Oct. 2012) (on file with authors). The NPS is also preparing a “State of the Park” report for each NPS unit, which will incorporate information on historical climate observations and projections. *See* USGCRP, SYNTHESIS, *supra* note 11, at 50–51.

The agency also has issued a guidance document for a resource stewardship strategy, which is a long-range planning tool that is designed to serve “as a bridge between the park’s foundation document, other plans, and everyday management

these will be fully integrated into core management plans for affected units.

The NPS has begun implementing on-the-ground management actions in some coastal units of the System. In September 2015, it released a report describing efforts at parks in fifteen states to address coastal resources in units threatened by sea level rise, shoreline erosion, ocean acidification, and other climate-related changes.⁴⁷⁴ Some of the responses appeared to involve only information gathering and sharing and the creation of work groups,⁴⁷⁵ while in other cases, the agency has engaged in more concrete response actions such as strengthening and stabilizing eroding sites through soft armoring and “living shoreline techniques”;⁴⁷⁶ moving sand to bolster barrier islands;⁴⁷⁷ and rehabilitation of water crossings to help restore aquatic animal passages and natural hydrological processes for impaired stream systems.⁴⁷⁸ These examples indicate that the NPS is engaging in active strategies to respond at some coastal units to climate-related threats such as sea level rise and erosion. There is little evidence, however, that these strategies represent a meaningful reconsideration of the agency’s prioritization of historical preservation toward management actions that are

of its natural and cultural resources.” Dep’t of the Interior, Nat’l Park Serv., Development Guide: Resource Stewardship Strategy 1 (on file with authors). The guidance instructs agency officials how to conduct workshops to help develop stewardship strategies. In doing so, it refers briefly to climate change. To prepare for such workshops, officials should collect data that enable them to develop “a range of plausible climate futures based on credible observations and modeled projections,” and a list of priority resource impacts associated with climate stressors. *Id.* at 13. At the workshops, officials should “brainstorm” about how climate change may affect park visitors. *Id.* at 46. Criteria for prioritizing activities may include the degree to which activities are resilient to climate change. *Id.* at 54.

474. DEPT OF THE INTERIOR, NAT’L PARK SERV., COASTAL ADAPTATION STRATEGIES: CASE STUDIES 2015, at 1 (2015), <http://www.nps.gov/subjects/climatechange/upload/2015-11-25-FINAL-CAS-Case-Studies-LoRes.pdf> [<https://perma.cc/PT35-LTUQ>].

475. *See, e.g., id.* at 5–6 (Olympic National Park). *See also id.* at 10–11 (describing GIS-based vulnerability assessments at Cape Krusenstern National Monument); *id.* at 24–25 (describing research related to impacts of climate change on coral reef health at National Park of American Samoa).

476. At the Canaveral National Seashore, for example, officials have pursued a hybrid approach that involves planting of cordgrass and mangroves in the intertidal zone, deploying bags of oyster shells seaward of the cordgrass, and placing oyster restoration mats seaward of the bags. *Id.* at 8.

477. *Id.* at 34–35 (Gulf Islands National Seashore).

478. *Id.* at 36–37 (Acadia National Park).

primarily designed to promote ecological health, even if the latter requires departing from pre-existing resource conditions. Indeed, the repeated references in the September 2015 report to restoration of previous conditions indicate continued emphasis on maintenance or restoration of a historical baseline, rather than a concerted shift toward ecological health as the principal thrust of climate-related management actions.⁴⁷⁹

The NPS's adaptation efforts, like those of the other agencies, have suffered from resource limitations. In fiscal year 2011, the NPS was allocated \$10 million for adaptation activities.⁴⁸⁰ That figure dropped to \$3 million the next year.⁴⁸¹ Efforts to address climate-related threats to park resources at Glacier National Park, for example, have suffered due to lack of adequate funding for monitoring, vulnerability assessments, and responses to insect infestations.⁴⁸² For fiscal year 2016, the NPS requested \$16.4 million for climate change-related activities (out of a total of \$213.4 million in targeted programmatic increases for all NPS activities), representing an increase of \$13.5 million over the enacted budget for 2015.⁴⁸³ Of that amount, \$3.5 million would be to implement resiliency-building natural resources projects, assist planning efforts, help agency communications with the public, and collaborate

479. *See id.* at 1 (noting that “[t]he adaptation efforts described here include . . . habitat restoration, engineering solutions, . . . and development of broad management plans that consider climate change”); *see id.* at 8 (stabilization of eroding sites); *see id.* at 27 (restoration of wetlands in a eutrophic urban estuary through sediment addition and plantings); *see id.* at 29 (restoration of tidal wetlands from diked agricultural lands to mitigate previously lost coastal habitat); *see id.* at 34 (use of sediment to restore geomorphic integrity of islands); *see id.* at 38 (rehabilitation of water crossings to restore aquatic animal passages); *see id.* at 53 (managed retreat, infrastructure relocation, beach nourishment, and dune restoration). *Cf. id.* at 30 (noting use of adaptation strategies that included increasing biodiversity by creating restored wetland habitat).

480. GAO, *supra* note 122, at 47.

481. *Id.*

482. *Id.* at 51. This constraint is not limited to the NPS. *See* USGCRP, SYNTHESIS, *supra* note 11, at vi (“Federal agencies are making significant progress in climate change adaptation, although lack of financial resources has slowed implementation of climate-focused activities.”). *But cf. id.* at viii (“The number and quality of adaptation efforts that have evolved during a period of declining Federal budgets are encouraging, signaling that adaptation has moved from conceptual to real.”).

483. DEPT OF THE INTERIOR, NAT'L PARK SERV., FISCAL YEAR 2016 BUDGET JUSTIFICATIONS Overview-6, Overview-11 (2015), <http://www.nps.gov/aboutus/upload/FY-2016-Greenbook.pdf> [<https://perma.cc/7NAU-DVSE>].

with other agencies and academics in designing science-based resiliency-building projects in the parks. An additional \$10 million would support partnerships with non-federal entities on projects to increase landscape resilience to extreme weather events and the challenges posed by wildfire, flooding, and drought.⁴⁸⁴ Congressional failure to fund such ongoing and planned future adaptation efforts will impair climate change adaptation in the parks, even if the agency were to shift its management philosophy away from maintaining historical preservation as the touchstone of natural resource management.

F. Federal Wilderness Areas

Wilderness is a special designation Congress overlays on parts of already existing federal lands.⁴⁸⁵ Congress may designate portions of each of the four principal federal land systems—the national parks, the national forests, the national wildlife refuges, or the public lands—as official wilderness.⁴⁸⁶ The federal agency that managed a particular tract before Congressional designation is charged with continued responsibility to manage it as wilderness after designation.⁴⁸⁷ Because wilderness areas were established primarily to minimize active human management and secondarily to promote historical conditions, they generally have the least legal adaptive capacity of all federal conservation lands.⁴⁸⁸ A prohibition on active resource management severely restricts management alternatives in response to the effects of climate change. Moreover, a historical baseline for whatever management occurs is likely to create a conundrum if climate change precludes retention of or return to that baseline. Unsurprisingly, therefore, wilderness lands have been subject to virtually no climate change adaptation planning or incorporation of climate change concerns into its on-the-ground management by any of the federal land agencies.

484. *Id.* at ONPS-ResStew-5 to -6.

485. 16 U.S.C. 1131(b) (2012).

486. *Id.*

487. Glicksman, *supra* note 291, at 448–49.

488. Camacho, *supra* note 18, at 1405, 1426–27 (describing the Wilderness Act as the primary federal example of a passive resource management statute).

1. Adaptive Capacity Under the Wilderness Act

The Wilderness Act of 1964⁴⁸⁹ is not primarily concerned with promoting ecological health. Areas designated by Congress as official wilderness must be protected above all to preserve their natural conditions and wild character. The Act defines “wilderness” as:

[A]n area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. [It is] an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which . . . generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable.⁴⁹⁰

Federal agencies must ensure that wilderness areas are administered to “leave them unimpaired for future use and enjoyment as wilderness” and “so as to preserve [their] natural conditions.”⁴⁹¹

The objectives of the Wilderness Act appear to be limited to either minimizing human management (wildness preservation) or active management to maintain or restore historical conditions (historical preservation). On the one hand, the statute could be construed to prohibit substantial active management.⁴⁹² Alternatively, it could be understood to require active agency management to ensure that human activities do not interfere with the statutory goals of preserving wilderness character and natural conditions.⁴⁹³ The Act

489. 16 U.S.C. §§ 1131–36 (2012).

490. *Id.* § 1131(c).

491. *Id.*

492. *See Wilderness Soc’y v. U.S. Fish & Wildlife Serv.*, 316 F.3d 913, 923–24 (9th Cir. 2003) (discussing these alternative interpretations).

493. *Wilderness Watch, Inc. v. U.S. Fish & Wildlife Serv.*, 629 F.3d 1024, 1033 (9th Cir. 2010) (concluding that Congress did not intend “a museum notion of wilderness”); *Izaak Walton League of Am., Inc. v. Kimbell*, 516 F. Supp. 2d 982, 988–89 (D. Minn. 2007) (concluding that the duty to preserve wilderness character may extend beyond wilderness boundaries); *see also* Daniel Rohlf & Douglas L. Honnold, *Managing the Balances of Nature: The Legal Framework of Wilderness Management*, 15 *ECOLOGY L. Q.* 249, 259 (1988) (“Significantly, Congress phrased this preservation mandate affirmatively, suggesting that

implicitly contemplates some level of temporary, ancillary, and insubstantial human interference.⁴⁹⁴ As such, it is not completely opposed to human interaction with and management of wilderness areas. In a few instances, the Act provides explicit authorization for active management. It allows the USFS, for example, to take necessary measures “in the control of fire, insects, and diseases.”⁴⁹⁵

The statute and judicial interpretations, however, do not provide definitive guidance on how much active management is generally allowed or required in wilderness areas.⁴⁹⁶ Eric Biber and Elisabeth Long contend that the Wilderness Act provides significant discretion for agencies to engage in active management, stating that “the vast majority of management options are available to management agencies in wilderness areas.”⁴⁹⁷ Nonetheless, even their analysis found that some of

wilderness managers may be obligated to take affirmative actions to preserve or even restore wilderness character.”); Robert L. Glicksman & George Cameron Coggins, *Wilderness in Context*, 76 DENV. U. L. REV. 383, 403–07 (1999) (arguing that the Wilderness Act creates an affirmative preservation duty).

494. See 16 U.S.C. § 1131(c) (2012) (emphasis added) (excluding only “permanent improvements or human habitation” and ensuring that an area “generally appears to have been affected *primarily* by the forces of nature, with the imprint of man’s work *substantially* unnoticeable”).

495. *Id.* § 1133(d)(1). See also *Sierra Club v. Lyng*, 694 F. Supp. 1260 (E.D. Tex. 1988) (approving USFS insect control program). Compare *Californians for Alts. to Toxics v. U.S. Fish & Wildlife Serv.*, 814 F. Supp. 2d 992, 1024 (E.D. Cal. 2011) (blocking joint USFS and FWS project to restore cutthroat trout to its historic range by eradicating non-native trout through pesticide applications).

496. In *Wilderness Soc’y v. U.S. Fish & Wildlife Serv.*, 353 F.3d 1051, 1062 (9th Cir. 2003) (en banc), one of the few reported cases considering if active management of wilderness is permissible, the court addressed whether a fishery enhancement project was allowed in a wilderness area. The initial Ninth Circuit panel considered the permissible level of human interference in wilderness areas. See *Wilderness Soc’y*, 316 F.3d at 924 (concluding that “[w]hile the wilderness must be ‘protected’ so that its natural processes dominate, it also must be ‘managed’ so that human activities from outside the area do not interfere unduly”). The ultimate en banc decision, however, sidestepped this issue, concentrating instead on the project’s violation of the Wilderness Act’s prohibition on commercial enterprises. *Wilderness Soc’y*, 353 F.3d at 1067.

497. Long & Biber, *supra* note 140, at 627; see also John Copeland Nagle, *Wilderness Exceptions*, 44 ENVTL. L. 373, 392–412 (2014) (discussing general exceptions to the mandate that wilderness areas be managed to preserve wilderness character, as well as additional exceptions found in statutes designating specific areas as wilderness). The NPS appears to take a more restrictive view, at least as a matter of policy discretion. See NPS MANAGEMENT POLICIES, *supra* note 427, at 83 (“Management intervention [in wilderness areas] should only be undertaken to the extent necessary to correct past mistakes, the impacts of human use, and the influences originating outside of wilderness boundaries.”); see also NAT’L PARK SERV., APOSTLE ISLANDS NATIONAL SEASHORE:

the more active management strategies are not allowed in wilderness and that the other strategies that might be allowed could be subject to “some procedural and substantive hoops.”⁴⁹⁸ The statute might allow active management of wilderness, but its express language indicates an agency may do so only in furtherance of the preservation of pre-existing wilderness character and natural conditions. As such, agencies in charge of wilderness preservation may not rely on robust activities primarily oriented toward promoting future ecological function at the expense of historical fidelity.⁴⁹⁹

Regardless of the exact scope of the land management agencies’ authority to actively manage to preserve wilderness character, climate change makes achieving both wilderness preservation and historical preservation goals increasingly costly or impossible. It also pits the Wilderness Act’s tandem objectives of passive management and historical preservation increasingly against each other, as it will be impossible to concurrently leave ecosystems alone and keep things as they were.⁵⁰⁰ More significantly, climate change makes each goal increasingly at odds with promoting ecological health.⁵⁰¹ Wilderness areas thus have the least substantive legal adaptive capacity of any federal conservation lands. They also have the least procedural legal adaptive capacity, with minimal integration of adaptive management or other flexible processes into wilderness management protocols.⁵⁰²

GENERAL MANAGEMENT PLAN, WILDERNESS MANAGEMENT PLAN, ENVIRONMENTAL IMPACT STATEMENT 82 (2011), <http://www.nps.gov/apis/upload/APIS-FINAL-GMP-WMP-EIS-April-2011-Chapters-1-6.pdf> [https://perma.cc/S2KE-HHXX] (stating that “the threshold for taking management actions (intervention) is particularly high in wilderness. Managers should err on the side of intervening as little as possible in wilderness”).

498. Long & Biber, *supra* note 140, at 627.

499. See Camacho, *supra* note 139, at 199.

500. Camacho, *supra* note 18, at 1435.

501. See Craig, *supra* note 18, at 18 (urging “an across-the-board shift in legal objectives, from preservation and restoration to the improvement of resilience and adaptive capacity”).

502. BLM, FWS, and NPS wilderness regulations and policies do not refer to adaptive management. See Wilderness Management, 65 Fed. Reg. 78,358 (Dec. 14, 2000) (codified at 43 C.F.R. part 6300 (2013)); FWS, Wilderness Stewardship, 610 FWS 1, <http://www.fws.gov/policy/610fw1.pdf> [https://perma.cc/6RKQ-S3BY]; NAT’L PARK SERV., DIRECTOR’S ORDER NO. 41: WILDERNESS PRESERVATION AND MANAGEMENT (1999), <http://www.nps.gov/yose/learn/management/upload/DOrder41.pdf> [https://perma.cc/M9HN-AJEX] [hereinafter NPS, WILDERNESS PRESERVATION & MGMT.]; NAT’L PARK SERV., DIRECTOR’S ORDER NO. 41: WILDERNESS STEWARDSHIP (2013), http://www.nps.gov/policy/DOrders/DO_41.pdf

2. Adaptation Activities in Wilderness

Congruent with this incompatibility between wilderness goals and climate change, the agencies charged with implementation of the Wilderness Act have engaged in the least amount of climate change adaptation planning and proactive adaptation measures in their respective wilderness lands. When faced with ecological risks from climate change, wilderness managers appear to avoid engaging in active measures that would promote ecological health.

USFS, BLM, and NPS wilderness management policies fail to even refer to climate change.⁵⁰³ The one agency that has staked out a position, the FWS, seems committed to a non-interventionist approach that may not bode well for its ability to nimbly and effectively respond to climate-related threats.

Wilderness preservation allows refuge managers to hedge their bets against the possibilities of inaccurate climate change projections and experimental management techniques that could lead to unintended consequences. . . .

However, the congruence of wilderness preservation and ecological integrity is not always perfect or absolute, because in designated wilderness *there is also the need to avoid manipulative management to the extent possible*. This is challenging to managers who attempt to maintain natural species assemblages for purposes of ecological integrity, but find it difficult to accomplish without hands-on management. Most controversial wildlife management activities result from the need to balance the ideals of natural and non-natural manipulated conditions. . . .

[<https://perma.cc/J2NZ-SHCQ>] [hereinafter NPS, WILDERNESS STEWARDSHIP]. *But see* U.S. FOREST SERV., WILDERNESS STEWARDSHIP DESK GUIDE: MANAGEMENT PRACTICES FOR WILDERNESS IN THE NATIONAL FORESTS 85 (2010), <http://www.wilderness.net/NWPS/documents/FS/FS%20Stewardship%20of%20Wilderness%20Desk%20Guide.pdf> [<https://perma.cc/9QAX-DVRQ>] [hereinafter WILDERNESS STEWARDSHIP DESK GUIDE] (describing wilderness managers' use of adaptive management).

503. *See* WILDERNESS STEWARDSHIP DESK GUIDE, *supra* note 502; Wilderness Management, 65 Fed. Reg. at 78,358; NPS, WILDERNESS PERSERVATION & MGMT., *supra* note 502; NPS, WILDERNESS STEWARDSHIP, *supra* note 502.

However, *in the context of climate change, the non-manipulation ideal of wilderness offers one distinct advantage over the natural conditions ideal.* The non-manipulation ideal is stable and clear in any context, whereas anthropogenic climate change results in confusion about the appropriateness and techniques for maintaining natural conditions. . . . In such cases, *the non-manipulation ideal tilts the scales toward leaving species and community evolution to take its own course.* . . .⁵⁰⁴

To date, agencies with wilderness management duties have done little to adapt to the effects of climate change in wilderness areas. For example, as of April 2015, the wolf population on Isle Royale National Park in Lake Superior had been reduced to a record low of three individuals.⁵⁰⁵ In the past, wolves from the mainland introduced new genes into the isolated population by migrating to the island over the frozen lake.⁵⁰⁶ Climate change has decreased the formation or persistence of ice bridges that allow such migrations, and these bridges are not expected to form after 2040.⁵⁰⁷ Ostensibly to promote wilderness values of passive management, the NPS has not intervened.⁵⁰⁸ One wilderness advocacy group opposes genetic rescue, even with the threat of genetic and harmful trophic cascades. It asserts that wilderness conservation should not include active management because wilderness in national parks must be kept “untrammelled.”⁵⁰⁹ This approach appears to be representative of how the land management agencies are preparing for climate-related threats to wilderness areas.

The agency that appears to have done the most to accommodate wilderness management policies to climate change is the USFS, but even its actions are of limited scope. In

504. CZECH, *supra* note 400, at 70–71 (emphasis added).

505. Keith Matheny, *Only 3 Wolves Left on Michigan's Isle Royale*, DETROIT FREE PRESS (Apr. 20, 2015), <http://www.freep.com/story/news/local/michigan/2015/04/17/isle-royale-wolf-wolves-population-decline-moose-superior/25950511/> [<https://perma.cc/HA7Z-ZEEC>]. The number had been eight just 14 months earlier. Phil Bencomo, *What This Winter's Ice Bridge to Isle Royale Means for the island and its Wolves*, LAKE SUPERIOR MAG. (Feb. 17, 2014), <http://www.lakesuperior.com/the-lake/natural-world/isle-royale-ice-bridge-climate-change-and-wolves-140217/> [<https://perma.cc/RC2W-JB5B>].

506. Bencomo, *supra* note 505.

507. *Id.*

508. *Id.*

509. *Id.*

2012, the USFS Climate Change Resource Center published a report on wilderness and climate change.⁵¹⁰ It recognized the incongruity between the Wilderness Act's "hands-off" approach to management and maintaining "natural conditions" in light of climate change.⁵¹¹ It also argued for the need to redefine what it means to maintain and protect natural conditions to include active management.⁵¹² Yet even this analysis is merely exploratory. No agency, including the USFS, has demonstrated a sustained effort to consider how, if at all, to incorporate strategies for adapting to the extensive effects of climate change on valued wilderness resources.

IV. LEGAL ADAPTIVE CAPACITY AND OTHER FACTORS SHAPING CLIMATE CHANGE ADAPTATION

As Part III illustrates, there appears to be a significant relationship between legal adaptive capacity and the extent to which federal land management agencies have engaged in climate change adaptation. With one key exception, the range of progress in adaptation largely reflects the adaptive capacity of the various governing laws or regulations to address dynamic ecological change. Of the land management systems considered in Part III, wilderness areas are subject to the legal regime that is most tied to non-interventionist management structures. Because wilderness management requirements are least congruent with active management, the agencies that manage wilderness have very little substantive legal adaptive capacity. Wilderness areas to date are virtually devoid of any climate change adaptation. This inaction in the face of climate-related threats to wilderness areas reflects that limited capacity.

The national parks are managed under a statute that reflects a historical preservation priority and, to a somewhat lesser extent, a presumption against active management. The NPS Organic Act and NPS policies interpreting and applying it primarily focus on keeping preexisting resources where they

510. David Cole & Steven Boutcher, *Wilderness and Climate Change*, CLIMATE CHANGE RESOURCE CTR. (May 17, 2012), <http://www.fs.usda.gov/ccrc/topics/wilderness> [<https://perma.cc/7C3N-5MGF>].

511. *Id.*

512. *Id.*

are and keeping out those not there before.⁵¹³ This focus on historical and wildness preservation, however, is in tension with managing for future ecological conditions. The NPS's previous management strategy may have worked well for much of the past century, when ecological conditions varied within a relatively narrow range, but it is not well suited to promoting long-term ecological health in the context of unprecedented ecological stress resulting from global climate change.

Not surprisingly, the NPS, which lacks substantive legal adaptive capacity, has perhaps not responded as quickly as it might have to the threats posed to the national parks by climate change. As at least a partial consequence of this limited legal adaptive capacity, the NPS has developed broad planning goals in its action plan, and more recently some individual units have created climate action plans.⁵¹⁴ However, identification and implementation of concrete adaptation strategies, particularly their integration into core management actions, are much less further along at most park units. The NPS has undertaken active management responses in units such as coastal parks facing climate-related threats.⁵¹⁵ Many of these actions, however, still seem rooted in an effort to restore conditions that existed before the adverse effects of climate change began to occur. The agency's longstanding interpretations of its organic legislation as focused primarily on historical fidelity likely hinder, and certainly do not facilitate, the development of adaptation strategies principally directed at fostering future ecological health as climate changes.

Federal wildlife refuge goals provide moderate flexibility to manage as needed for future ecological conditions. The NWRSIA's mandate to ensure maintenance of the biological integrity and environmental health of the national wildlife refuges affords the FWS more expansive substantive legal adaptive capacity than that provided by either the Wilderness

513. A report prepared by the Science Committee of the NPS Advisory Board at the NPS's request on the agency's stewardship responsibilities reflects a somewhat different approach in urging that the "overarching goal of NPS resource management should be to steward NPS resources for continuous change that is not yet fully understood, in order to preserve ecological integrity." NAT'L PARK SYS. ADVISORY BD., SCI. COMM., REVISITING LEOPOLD: RESOURCE STEWARDSHIP IN THE NATIONAL PARKS 11 (2012), http://www.nps.gov/calltoaction/PDF/LeopoldReport_2012.pdf [<https://perma.cc/8WW2-M9H3>].

514. See *supra* notes 459–468 and accompanying text.

515. See *supra* notes 474–479 and accompanying text.

Act or the NPS Organic Act.⁵¹⁶ Consistent with our thesis that the scope of an agency's substantive legal adaptive capacity affects its ability to integrate climate change adaptation into management policies and programs, the FWS has taken climate change adaptation planning and implementation further for federal wildlife refuges than the NPS has for national parks or any agencies have in their management of wilderness areas. Its actions include establishing agency-wide adaptation goals and proposed adaptation requirements for new acquisitions.⁵¹⁷ Moreover, the FWS's commitment to meaningful analysis of and responses to the effects of climate change on the wildlife refuges appears to be accelerating.

Nevertheless, the FWS's interpretations of the NWRSA as requiring it to rely on a historical management approach has constrained its ability to move forward with its climate change adaptation commitments. Moreover, the NWRSA's commitment to decentralized goal setting, in which place-based individual refuge goals take precedence over system-wide objectives,⁵¹⁸ further limits the program's legal adaptive capacity. This fragmented approach to goal-setting is of particular concern in an era of climate change; if shifting climatic conditions radically alter the ecological characteristics of a refuge, the original individualized purpose for creating that refuge is particularly vulnerable to not being achievable.⁵¹⁹ Consistent with this level of substantive legal adaptive capacity, the FWS has only moderately adapted its management decisions to climate change.

As indicated above, the DOI's 2014 climate change adaptation plan enunciated the priorities of the NPS and the FWS in preparing to manage for climate change.⁵²⁰ The plan's identification of the need for development of NPS guidance for incorporating climate change science into planning and developing a FWS climate change policy framework is particularly striking. The DOI has demanded these initiatives of its component agencies since at least 2001.⁵²¹ That these

516. 16 U.S.C. § 668dd(a)(4)(B) (2012).

517. See *supra* notes 393–410 and accompanying text.

518. See *supra* notes 346–347 and accompanying text.

519. Changes in temperature or precipitation, for example, have the potential to alter refuge habitat in ways that drive out species that historically populated a refuge and facilitate invasion and entrenchment by non-native species.

520. See *supra* notes 189–193 and accompanying text.

521. See *supra* Section II.A.

fundamental tasks remain unaccomplished after fourteen years reflects poorly on the status of climate change adaptation policy efforts at both agencies.

The USFS and the BLM both have broader substantive legal adaptive capacity to adjust to changing conditions than the NPS or the FWS. In the past, this flexibility has allowed these agencies to be less conservation-oriented. However, it also provides the most adaptive capacity to manage the effects of climate change on vulnerable ecological resources. The USFS has taken advantage of this capacity, most notably by requiring development of responses to climate-related threats in the 2012 planning rule, as well as in early efforts to craft management approaches for individual projects that take account of climate change. The U.S. Global Change Research Program has singled out the USFS for developing systematic accountability for developing adaptation strategies, requiring field units to assess resource sensitivity to climate change and develop adaptation responses (as reflected in the USFS Climate Change Performance Scorecard), and adopting regulations that require that climate change be considered in development of target conditions and management actions in restoration planning.⁵²²

In contrast, the BLM has apparently taken no concrete steps other than conducting some vulnerability assessments. FLPMA's goals and delegations of management authority afford the BLM substantive legal adaptive capacity in its management of the public lands that is analogous to the USFS's adaptive capacity under NFMA. In addition, the BLM seems as committed to the use of adaptive management processes as the USFS. Yet, the BLM has lagged behind its sister multiple-use agency in its climate change adaptation planning and implementation.

The absence of clear and enforceable directives to exercise legal adaptive capacity is a potential factor in explaining the difference between BLM and USFS adaptation. The criteria for development and revision of land use plans are much more amorphous under FLPMA than under NFMA,⁵²³ arguably affording the BLM that much more freedom to determine

522. USGCRP, SYNTHESIS, *supra* note 11, at 62.

523. Compare 43 U.S.C. § 1712(c) (2012) with 16 U.S.C. § 1604(g) (2012). See also 2 COGGINS & GLICKSMAN, *supra* note 143, § 16:19 (noting FLPMA § 1712's "open-ended" planning mandate and stating that, unlike NFMA, "FLPMA does not require promulgation of substantive, detailed planning regulations").

appropriate management policies and uses for particular parcels. As one court put it, the BLM planning process acts as nothing more than a “course filter.”⁵²⁴ FLPMA’s mandate “to prevent unnecessary or undue degradation” of the public lands⁵²⁵ could easily be construed to require the BLM to take affirmative steps to tackle climate-related threats to the public lands with the potential to cause resource degradation. The BLM, however, has at times interpreted this mandate narrowly,⁵²⁶ and the judicial interpretation has significantly weakened, if not eliminated, this anti-degradation duty.⁵²⁷

Whether regulatory adaptation is permissive or mandatory may affect legal adaptive capacity and the extent to which an agency actually uses it to address changed conditions. Thus, the permissiveness in the BLM’s legal framework toward adapting its substantive goals may account for its failure to translate delegated adaptive authority into adaptation activities as extensively as the USFS has done under NFMA’s imperatives to adjust its management strategies as uses, demand for, and supply of forest resources change.⁵²⁸

Although the focus of this Article is on substantive legal adaptive capacity, two aspects of procedural adaptive capacity bear mentioning as possible explanations for the BLM’s relatively poor record on adaptation compared to that of the

524. *Chihuahuan Grasslands All. v. Norton*, 507 F. Supp. 2d 1216, 1221 (D.N.M. 2007), *vacated and remanded on other grounds*, *Chihuahuan Grasslands All. v. Kempthorne*, 545 F.3d 884 (10th Cir. 2008).

525. 43 U.S.C. § 1732(b) (2012).

526. *See, e.g.*, Gregory M. Adams, *Bringing Green Power to Public Lands: The Bureau of Land Management’s Authority and Discretion to Regulate Wind-Energy Developments*, 21 J. ENVTL. L. & LITIG. 445, 473 (2007) (arguing that regulation interpreting § 1732(b) in the context of mining activities established a “prudent operator standard” that “completely ignored the requirement for prevention of undue degradation”).

527. In *Theodore Roosevelt Conservation Partnership v. Salazar*, 661 F.3d 66 (D.C. Cir. 2011), for example, the court equated section 1732(b)’s anti-degradation mandate with FLPMA’s overarching multiple-use, sustained-yield standard:

[B]y following FLPMA’s multiple-use and sustained-yield mandates, the Bureau will often, if not always, fulfill FLPMA’s requirement that it prevent environmental degradation because the former principles already require the Bureau to balance potentially degrading uses—e.g., mineral extraction, grazing, or timber harvesting—with conservation of the natural environment. If the Bureau appropriately balances those uses and follows principles of sustained yield, then generally it will have taken the steps necessary to prevent unnecessary or undue degradation.

Id. at 76.

528. 16 U.S.C. § 1600(1) (2012).

USFS. First, agency organizational structure may have played a role in the delayed BLM response to climate change. The BLM has a more decentralized decision-making structure,⁵²⁹ which may have contributed to its delays in prioritizing climate change adaptation for two reasons. Local officials may have greater discretion to choose not to respond to changes in policy direction at the top,⁵³⁰ leading to a less widespread inculcation of the importance of adaptation throughout the agency.⁵³¹ Second, a local decision-making locus may have made BLM resource managers more susceptible to capture by proponents of consumptive and extractive uses important to local economies.⁵³² The interests of these parties do not necessarily align with the changes in management approaches that may be needed to respond effectively to climate change.⁵³³

The second aspect of procedural adaptive capacity that may be relevant relates to the manner in which the two multiple-use agencies factor scientific considerations into their decisional processes. NFMA integrates scientific input into the USFS's decision-making processes in a way that FLPMA does not. NFMA requires the Secretary of Agriculture to appoint a committee of scientists not employed by the agency to provide scientific and technical advice to assure that "an effective

529. See Tomas M. Koontz & Jennifer Bodine, *Implementing Ecosystem Management in Public Agencies: Lessons from the U.S. Bureau of Land Management and the Forest Service*, 22 CONSERVATION BIOLOGY 60, 67 (2008) (noting perceived tendency of BLM managers "to manage their district or state like a 'fiefdom' "); 1 COGGINS & GLICKSMAN, *supra* note 143, § 7:8 (citing descriptions of the BLM as "highly decentralized" and as a "line-and-staff organization").

530. BLM land managers reported in 2011 that lack of specific agency direction was the most important barrier to adaptation planning. Archie et al., *supra* note 22. The percentage of BLM employees identifying this factor as a barrier to adaptation planning was higher than for any of the other three agencies. *Id.* at Fig. 7.

531. In contrast, the congressional practice of dictating USFS decisions line by line in the agency's budget may have contributed to the absence of comparable local discretion in USFS officials. See 1 COGGINS & GLICKSMAN, *supra* note 143, § 7:11 (citing John H. Cushman, *Forest Service Is Rethinking Its Mission*, N.Y. TIMES (Apr. 24, 1994), <http://www.nytimes.com/1994/04/24/us/forest-service-is-rethinking-its-mission.html> [<https://perma.cc/TN7N-G2SF>]).

532. Cf. Keiter, *supra* note 12, at 336 ("[L]ong accustomed to meeting the commodity needs of local Western communities, some agency employees harbor the suspicion (shared by many local residents) that ecosystem-management proposals will ignore local economic concerns").

533. Cf. Glicksman, *supra* note 121, at 465–69 (describing the impact of different agency cultures and organizational structures on wilderness management policies).

interdisciplinary approach” is used in the adoption of USFS planning regulations.⁵³⁴ The committee has induced the agency to pursue management approaches that are responsive to changed conditions.⁵³⁵ FLPMA does not institutionalize the role of scientific input into BLM decision-making processes in a similar manner, and, according to at least some observers, the result has been that the agency sometimes pays less attention to current science than it should, in part because of the influence of consumptive users referred to above.⁵³⁶

The difference between the climate adaptation track records of the USFS and the BLM may also be the result of factors that have nothing to do with either the substantive or procedural legal adaptive capacities of the two agencies.⁵³⁷ The

534. 16 U.S.C. § 1604(h)(1) (2012).

535. See Erin Madden, *Seeing the Science for the Trees: Employing Daubert Standards to Assess the Adequacy of National Forest Management Under the National Forest Management Act*, 18 J. ENVTL. L. & LITIG. 321, 332 (2003) (“In the Committee’s opinion, a regulatory system that required ‘continued evaluation and periodic revisions’ when new information became available was critical. Moreover, the Committee understood the vital role that research would play in managing forests based on the evolving body of scientific knowledge of forest ecosystems.”); cf. Robert B. Keiter, *Taking Account of the Ecosystem on the Public Domain: Law and Ecology in the Greater Yellowstone Region*, 60 U. COLO. L. REV. 923, 969 (1989) (“The NFMA’s mandate to appoint an independent committee of scientists to provide ‘scientific and technical advice’ on the proposed implementing regulations reflects a serious congressional commitment to integrating ecologically based management principles into the Forest Service’s multiple-use practices.”). The USFS also may be better situated than the Interior Department agencies to integrate the latest science into its management decisions. The Interior Secretary in the 1990s transferred most FWS scientists, for example, to the National Biological Survey, which Congress then incorporated into the U.S. Geological Survey. As a result, as the leading legal academic on the national wildlife refuges has surmised, the FWS “suffers from . . . a dearth of scientists. . . . So, without sufficient scientific expertise to determine the full range of consequences of a use, and without funding for new studies to better understand impacts, the Service may fail to forecast many interferences with or detractions from the purposes of the refuge.” Fischman, *supra* note 93, at 555. The NPS’s science arm suffered a similar fate. See Paul C. Pritchard, *Our National Parks: Assumptions, Metaphors and Policy Implications*, 8 FORDHAM ENVTL. L.J. 421, 424 (1997) (stating that the NPS’s “research function has been decimated in recent years,” with “many Park Service researchers hav[ing] been transferred to the National Biological Survey (NBS) in the interest of efficiency and increased effectiveness”). The level of scientific input into NPS management decisions dropped sharply after those shifts. *Id.* at 424–25.

536. See, e.g., Donahue, *supra* note 146, at 782 (“Of all federal agencies, however, the BLM best epitomizes rancher capture. Its bias is frequently apparent in management decisions that disregard available science and policy guidance.”).

537. Others have noted the role of extra-statutory factors in these and other agencies’ failure to pursue adaptive approaches. See Archie et al., *supra* note 22

USFS has long had a top-down management culture, which places a premium on following policy directions established by agency leadership.⁵³⁸ Relatedly, one possibility is that the BLM historically has a less robust tradition of natural resource protection even as compared to the USFS. The USFS, for example, has long played a leadership role in wilderness preservation that the BLM has not.⁵³⁹ Similarly, it is possible that there has been a mistaken belief that natural resources on BLM lands—such as range—are not as vulnerable to a changing climate as USFS lands, or that, even if they are, they are less ecologically valuable and therefore not worth devoting as many resources to save. Some have referred to the BLM lands as “the lands no one wanted,” having been unclaimed and unreserved during the federal government’s disposition of the public domain, and “many viewed them as a vast arid wasteland of little use to anyone.”⁵⁴⁰ The wooded areas and spectacular scenery characteristic of some national forest tracts, on the other hand, may more readily prompt the conclusion that adaptation to preserve ecological function is

(concluding that “[d]ifferences between the . . . BLM and USFS were apparent [in survey responses from land managers at the two agencies] despite their similar multiple use mandates,” and attributing dissimilar management practices to different “structure and culture, funding, use of science, collaboration with stakeholders, and political power”); Flatt & Tarr, *supra* note 134, at 1499 (attributing U.S. Army Corps of Engineers’ failure to use statutory flexibility in managing water storage to factors such as the absence of analogous past challenges, inertia, close relationships with interests that benefit from entrenched ways of doing things, resource constraints, and decentralized decision-making structures). *See also* Terra Bowling, *Parting Thoughts from the Sea Grant Law and Policy Journal’s 2010 Symposium on Adaptive Management*, 3 SEA GRANT L. & POL’Y J. 1 (2010) (describing the reluctance of agencies managing the Florida Everglades to use adaptive management strategies as due partly to “too much emphasis [being] placed on maintaining stakeholders’ economic interests,” which thwarts experimentation, learning, and adaptation).

538. Glicksman, *supra* note 291, at 468–69; 1 COGGINS & GLICKSMAN, *supra* note 143, § 7:11 (concluding that, despite the USFS’s professed adherence to a strong tradition of delegated authority, “for a variety of reasons,” including “the professionalism and esprit de corps that are also a part of the Forest Service tradition,” local officials tend to conform to policies established at higher levels within the agency). Another reason for this tendency of local officials to defer to policies and decisions of higher-level officials is the agency’s decision to pattern decision-making practices “on the top-heavy, hierarchical business management practices of the 1940s and the 1950s.” *Id.*

539. *See* Glicksman, *supra* note 291, at 460. According to Archie et al., *supra* note 22, “more robust leadership in natural resource management can facilitate improved transitioning to new management styles.”

540. Nolen, *supra* note 147, at 774; *see also* John D. Leshy, *Contemporary Politics of Wilderness Preservation*, 25 J. LAND RES. & ENVTL. L. 1, 6 (2005).

critical.⁵⁴¹

The BLM lands do have ecological value, however, and one of FLPMA's goals is management that protects ecological and environmental values.⁵⁴² Moreover, even if some BLM lands may be less ecologically rich than other federal lands, this may change (or need to change) as the climate does. The nearly 248 million acres of BLM lands—the largest of the federal land agencies⁵⁴³—may be essential components of a resilient approach to resource management as climate conditions shift and biota need to migrate to more compatible locations. Finally, the degree of historical commitment to resource preservation is not itself determinative—the NPS and, to a somewhat lesser extent, the FWS, have lagged in their management responses to climate change, notwithstanding strong resource protection traditions. Perhaps the Forest Service's more robust response to the challenges of climate change stems from the highly visible adverse impacts already being experienced in the national forests from drought, heat, insect infestation, and disease.⁵⁴⁴ The threats that climate change poses to some of the national parks and wildlife refuges, such as glacial melting and saltwater intrusion from sea level rise,⁵⁴⁵ are more gradual, more geographically confined, and perhaps, at least to some, more contestable as to causation.

Resource constraints also may contribute to the BLM's less impressive performance.⁵⁴⁶ Congress provided significantly higher levels of discretionary funding to the USFS than the BLM between 2001 and 2014. The USFS received \$63.5 billion dollars in discretionary spending, compared to \$21.3 billion for the BLM for the same period,⁵⁴⁷ even though the BLM

541. Cf. Glicksman, *supra* note 291, at 459 (noting that the national forests “tend to feature more spectacular scenery and opportunities for hiking and camping in wooded areas” than the public lands).

542. 43 U.S.C. § 1701(a)(8) (2012); *see also* Carlos R. Romo, *Rethinking the ESA's “Orderly Progression”—Recovery Credit Systems and Energy Development on Public Lands*, 49 IDAHO L. REV. 471, 477 (2013) (“The FLMPA charges the BLM to manage federal lands in a manner that will protect, among other resources, their ecological value . . .”).

543. Gorte et al., *supra* note 3, at 13.

544. *See supra* note 127 and accompanying text.

545. *See supra* notes 122–124 and accompanying text.

546. Cf. Ruhl & Fischman, *supra* note 112, at 442 (“[W]e cannot expect agencies to carry out projects for which they have no funding.”).

547. *See* DEP'T OF THE INTERIOR, OFFICE OF BUDGET, <http://www.doi.gov/budget/index.cfm#> [<https://perma.cc/V5LC-5HGG>]; DEP'T OF AGRICULTURE, BUDGET AND PERFORMANCE, <http://www.fs.fed.us/about-agency/budget->

manages more acreage.⁵⁴⁸ This differential seems consistent with a longer pattern of congressional failure to adequately fund the BLM, which may have forced it to prioritize some management goals and initiatives at the expense of others.⁵⁴⁹ It would not be surprising if the BLM were to respond to resource shortages by moving climate change adaptation, a task with which it is relatively unfamiliar, to the back burner.⁵⁵⁰

Regardless of the persuasiveness of these potential alternative explanations, the salient point here is that differences between the two agencies do not seem linked to significant differences in their substantive legal adaptive capacities. Substantive legal adaptive capacity may therefore be a necessary but not sufficient precondition to effective land management agency responses to climate change. Without sufficient substantive legal adaptive capacity, even agency personnel committed to accommodating climate change will be unable to do so in a manner that conforms to rigid, inapt goals. If, however, statutory goals are expansive and malleable enough to permit management shifts to meet the challenges of climate change, an agency's recalcitrance to make those shifts can stymie significant progress in implementing adaptation measures.

performance [<https://perma.cc/HGD8-4XFF>]; see also Michael C. Blumm & Sherry L. Bosse, *Norton v. SUWA and the Unraveling of Federal Public Land Planning*, 18 DUKE ENVTL. L. & POL'Y F. 105, 122 (2007) (finding that the BLM's annual budget was less than half of that of the Forest Service in 2008).

548. Glicksman, *supra* note 291, at 450 (193 million acres for the USFS, compared to 247 million acres for the BLM).

549. See, e.g., Archie et al., *supra* note 22 (quoting BLM employee, who identified as significant resource-based barriers to additional progress in climate change adaptation because the agency lacks "the capacity to fund adaptation projects, or to hire the staff to participate in the projects"); see also George Cameron Coggins & Parthenia Blessing Evans, *Multiple Use, Sustained Yield Planning on the Public Lands*, 53 U. COLO. L. REV. 411, 447–48 (1982) (attributing the BLM's inability to plan in part to inadequate funding); Edith Sanders, *Alternative Ranch Experiments: Better than the BLM*, 27 WM. & MARY ENVTL. L. & POL'Y REV. 265, 276 (2002) (noting repeated cuts during the 1970s to BLM budgets and personnel, which "reflected the control of ranch interests").

550. Cf. Kemp et al., *supra* note 319 (noting budget constraints as perceived barrier to adaptation planning for both the BLM and USFS).

V. IMPROVING FEDERAL LAND LEGAL ADAPTIVE CAPACITY

Climate change poses significant challenges to management of all the major federal natural resource systems. It would have been surprising if the management agencies had responded to these challenges with equal alacrity and enthusiasm, notwithstanding government-wide presidential decrees to anticipate climate change. If differences were to exist, one might have expected the land systems most closely tied to resource protection—the national parks, the national wildlife refuges, and official wilderness areas—to best reflect integration of climate change adaptation considerations into management decisions. That is not what has happened. Climate change adaptation has been almost entirely absent from wilderness management, the NPS has not moved much beyond information-gathering and establishment of planning frameworks, and the FWS has gone somewhat (but not considerably) further than the NPS. Instead, the agency that is most advanced in its commitment to climate change adaptation is the USFS, an agency maligned for much of its history as a captured agency concerned more with maximizing timber cuts than protecting ecological forest health. The only agency whose climate-related posture is neither notably beyond nor behind what its past management priorities might have predicted is the BLM.

We suggest that these largely counterintuitive results stem from the four agencies' relative legal adaptive capacities. Although scholars have recognized the role of legal adaptive capacity in the pursuit of statutory goals, their focus on procedural adaptive capacity has obfuscated another, perhaps more important, factor—substantive legal adaptive capacity. The disparate responses of the land management agencies to climate-related threats demonstrates the critical role that factor plays in an agency's response to changed circumstances such as those caused by global climate change. The statutory regimes that govern management of official wilderness and the national parks are rooted in historical and wilderness preservation goals that impair agencies' ability to meet climate-related threats. The FWS's organic statute seems more amenable to addressing climate change given its emphasis on protection of ecological function, but the FWS has to a certain degree tied its own hands by interpreting its mandate as

oriented toward historical preservation. The USFS and the BLM operate under mandates that afford them ample authority to adjust management strategies as resource conditions change, positioning them well to prepare for climate-related impacts. The USFS has taken advantage of this substantive legal adaptive capacity, setting an example for the other agencies. The BLM has not, for reasons that may include agency culture, organizational structure, and resource limitations.

This Part explains how, in light of emerging and projected effects from global climate change, the substantive legal adaptive capacity of these diverse federal land management regimes can and should be refashioned to promote ecological health. It also considers the inevitable tradeoffs from such increases in legal adaptive capacity, nonetheless concluding that these tradeoffs will often militate toward modifications or interpretations in substantive legal adaptive capacity that promote ecological health. The Part then explores how these choices about the level of substantive legal adaptive capacity are distinct from the amount of agency discretion, as illustrated by the experience of federal land agencies with climate change adaptation.

A. *Enhancing Legal Adaptive Capacity on Federal Lands to Promote Ecological Health*

Given these differential responses, and in light of the pervasive threats that climate change poses to all federal lands systems, we urge refashioning the standards, statutory and otherwise, that govern federal lands to enhance the land management agencies' substantive legal adaptive capacity. The reforms we envision would remove the shackles that currently create a mismatch between the relatively constrained legal adaptive capacity of some agencies and their duties to achieve applicable management goals in a changing world.

The fact that the USFS, which has expansive adaptive capacity, has done the most to date to integrate climate change considerations into its policies and programs does not suggest that the only or best way to enhance the adaptive capacity of the other agencies to manage climate change is through adoption of multiple-use, sustained-yield goals for all land systems. Instead, we favor as the touchstone the promotion of

ecological health on all federal land systems.⁵⁵¹ Moreover, the emphasis should be on protecting the integrity of ecosystems or essential ecological processes and functions (such as biodiversity, carbon sequestration, water cleaning, waste decomposition, or nutrient cycling) instead of individual species or resources at risk because of climate change.⁵⁵² The question is how to craft management regimes that afford the agencies adequate legal adaptive capacity to pursue that goal without unduly sacrificing other valuable ends, such as historical or wildness preservation, with which efforts to promote ecological function may conflict in the climate change era.

Put differently, not all substantive legal capacity is created equal; the flexibility of the goal is just one factor to be considered in evaluating how much and what kind of adaptive capacity to provide. In the federal lands context, two flexible goals might differ and have different results. For example, a consumptive but flexible goal (such as that sometimes pursued by the USFS and the BLM under multiple-use, sustained-yield management standards) might be harmful to ecological health, but a flexible goal that requires promoting future ecological health or biodiversity might be beneficial for ecological function. Similarly, historical preservation and wildness preservation are both rigid goals, but they are very different from each other.

To make the legal regimes governing national parks, national wildlife refuges, and wilderness areas more responsive to climate change, we recommend at least a partial shift away from current mandates that premise management strategies primarily on preservation of obsolete historical norms or non-interventionist approaches of questionable efficacy that increasingly may be harmful to ecological health. The use of historical baselines, while useful in some contexts (such as historical preservation), limits government's adaptive capacity in a dynamic world to conserve healthy ecological resources. Similarly, a hands-off posture is increasingly likely to disrupt the functioning of climate-challenged systems in ways that

551. See Camacho, *supra* note 18, at 1407–08 (urging legal changes to permit better adaptation to a dynamic world, “includ[ing] an increased emphasis not on preserving the past or minimizing human involvement, but rather on limiting bad interactions and promoting the function of valuable ecological processes and constituents”).

552. Glicksman, *supra* note 105, at 881–84; Camacho, *supra* note 139, at 249–50.

interfere with continued ecological health. These changes may come in the form of statutory amendments to the Park Service Organic Act or the Wilderness Act to require primacy for promoting long-term ecological health, articulated through the protection of specific ecological processes. In some cases, however, the changes could originate administratively. The NWRSA's substantive goals and mandates are flexible enough to accommodate a shift by the FWS away from its past emphasis on maintenance of historical baselines and toward protecting the integrity of ecosystems or essential ecological processes and functions.⁵⁵³

The changes we recommend in the governing mandates of the multiple-use agencies would not all result in an expansion of their substantive legal adaptive capacity, which is already ample. Rather, they would shift from one flexible substantive mandate to another. The multiple uses to which the national forests and the public lands are committed include various extractive uses. These lands have mineral and renewable resources from which the nation should continue to benefit. If multiple-use management on either land system interferes with ecological health, however, it should yield to strategies that preserve the health of the affected lands and resources.⁵⁵⁴ One way to accomplish that would be to replace the goal, reflected in the current definition of “sustained yield,” of maintaining “a high-level annual or regular periodic *output*” of renewable resources on the public lands⁵⁵⁵ with a goal of maintaining well-functioning ecological processes or ecosystem

553. For a discussion of the FWS's commitment to preserving historical baselines, see *supra* notes 364–383 and accompanying text. Fischman and Adamcik argue that, in addressing climate-related threats, the FWS's management objectives for the national wildlife refuge system “can no longer rely solely upon past population levels and habitat relationships or even upon heretofore known species assemblages and biotic communities.” Robert L. Fischman & Robert S. Adamcik, *Beyond Trust Species: The Conservation Potential of the National Wildlife Refuge System in the Wake of Climate Change*, 51 NAT. RES. J. 1, 26 (2011). Instead, they posit that “[a] core complementary focus” on protecting trust species and “ecosystem function and services, ecological integrity, and natural systems” is better suited to providing a “robust response to climate change.” *Id.* at 27. “The adaptation actions commonly recommended for protected areas, such as connectivity enhancement and protection of climate change refugia, more directly emerge from an ecological approach than one primarily prioritizing species.” *Id.*

554. Cf. Glicksman, *supra* note 105, at 876–77 (urging a change in the balance of permitted federal land uses).

555. 43 U.S.C. § 1702(h) (2012) (emphasis added).

services.⁵⁵⁶ Additionally, as detailed below, the BLM's experience suggests that a further desirable change unrelated to the scope of its legal adaptive capacity may be to reduce or eliminate agency discretion *not* to manage adaptively.⁵⁵⁷

B. Goals and Values Tradeoffs

Just as there are tradeoffs implicated by expanding procedural legal adaptive capacity through techniques such as adaptive management,⁵⁵⁸ similar tradeoffs necessarily accompany expansion or contraction of substantive legal adaptive capacity.⁵⁵⁹ Richard Lazarus has argued that “making it easy for subsequent lawmakers to unravel, undermine, or even formally change existing law is not always desirable.”⁵⁶⁰ He asserts, for example, that climate change legislation should include “precommitment strategies that deliberately make it hard (but never impossible) to change the law” in the pursuit of short-term economic pressures in ways that compromise the ability to achieve the legislation's overriding goal of minimizing the adverse effects of climate change for the benefit of future generations unable to protect their own interests.⁵⁶¹ At the same time, Lazarus recognizes the value of incorporating into climate legislation

contrasting precommitment strategies that deliberately make it easier to change the law in response to other longer-term concerns that are in harmony with the law's central purpose, which is to achieve and maintain greenhouse gas emissions reductions over time. Such concerns are otherwise less likely to have powerful voices in lawmaking fora.⁵⁶²

556. The uses that in particular contexts might clash with ecological health are not limited to resource extraction; certain forms of intensive recreational use also may do so.

557. See *infra* notes 580–584 and accompanying text.

558. See, e.g., Doremus, *supra* note 2, at 1460 (“Both the decision to employ adaptive management and decisions about how to implement it involve tradeoffs.”); Biber, *supra* note 100, at 955 (discussing “tradeoffs [that] are present in making decisions about whether and how to pursue adaptive management”).

559. See *supra* Section I.C.

560. Lazarus, *supra* note 2, at 1156.

561. *Id.* at 1157 (internal quotation marks omitted).

562. *Id.* at 1158.

Thus, there may be persuasive reasons to craft legislation that is adaptive in some respects but that is resistant to change in others as a means of enhancing the prospects of achieving statutory goals and promoting the values reflected in that legislation.⁵⁶³ The onus for legislators is to integrate into conservation laws a suite of both flexible and inelastic mechanisms that put adaptive pressure on agencies to evolve implementing strategies in ways that promote long-term conservation goals rather than other political agendas.⁵⁶⁴

In the federal land management context, rigid goals that require maintaining a historical baseline or that require non-intervention in federal lands have value. For historical baselines, one possible set of benefits mirrors the reasons for historic preservation law generally.⁵⁶⁵ There may be cultural, educational, aesthetic, or economic reasons for maintaining or restoring property or resources to a prior state, as a reminder of how things are or used to be.⁵⁶⁶ Furthermore, a rigid historical baseline is relatively clear, and at least previously proponents may have considered it a rough but sufficient proxy

563. In the context of climate change, Lazarus elaborates as follows:

[F]or climate change legislation to be successful, the new legal framework must simultaneously be flexible in certain respects and steadfast in others. Flexibility is necessary to allow for the modification of legal requirements over time in light of new information. Steadfastness or “stickiness” is important to maintain the stability of a law’s requirements over time. The need for both is particularly great for climate change legislation. Flexibility is absolutely essential for climate change legislation in light of the enormity of the undertaking, both in its temporal and spatial reach, and the surrounding uncertainty concerning the wisdom of specific regulatory approaches. Yet the basic legal framework and legal mandate must also be steadfast enough to be maintained over the long term notwithstanding what will be an unrelenting barrage of extremely powerful short-term economic interests that will inevitably seek the mandate’s relaxation.

Id. at 1157–58. *See also* Craig, *supra* note 18, at 17 (arguing that climate change legislation “will have to embrace flexibility and adaptive management in the implementation of specific adaptation measures. However, it will simultaneously need to limit actors’ discretion to do nothing or to deviate materially from general regulatory and management precepts and goals.”).

564. *Cf.* Camacho I, *supra* note 2, at 344–45 (proposing legislative correctives to the Endangered Species Act that seek to put adaptive pressure on achieving a “program’s substantive goals, and less on simply dampening or displacing political controversy”).

565. *See, e.g.*, National Historic Preservation Act, 16 U.S.C. § 470(b)(4) (2012) (finding that the preservation of “irreplaceable” heritage is in the public interest).

566. Camacho, *supra* note 18, at 1435.

for guarding ecological health against consumptive use.⁵⁶⁷

For passive wildness preservation, many have identified economic,⁵⁶⁸ scientific,⁵⁶⁹ psychological,⁵⁷⁰ spiritual,⁵⁷¹ and existence value⁵⁷² from the maintenance of undisturbed landscapes. In light of the pervasiveness of global anthropogenic climate change—making virtually every land at least indirectly shaped by human activities⁵⁷³—those benefits might more appropriately be identified as the value of maintaining less disturbed, or at least less directly disturbed, lands. Moreover, the rigidity of at least the strictest version of non-intervention is well-defined, providing relative ease in its application. A baseline of minimal management also by definition helps ensure relatively low administrative costs for management activities.

Efforts to increase substantive legal adaptive capacity by allowing agencies to deviate from historical or wildness preservation dictates in the face of climate change will necessarily diminish or forfeit some of these benefits. In their analysis of the Wilderness Act, Eric Biber and Elisabeth Long queried whether the procedural and substantive barriers to

567. Ruhl & Salzman, *supra* note 18, at 14 (noting that a historic baseline can provide “a clear goal and temporal reference point”); Camacho, *supra* note 139, at 245–46.

568. See Jan G. Laitos & Rachael B. Gamble, *The Problem with Wilderness*, 32 HARV. ENVTL. L. REV. 503, 511–12 (2008) (describing tangible economic benefits to non-users from the existence of wilderness).

569. CHRIS MASER, *THE REDESIGNED FOREST* 174 (R&E Miles 1988) (“[W]e have to maintain some original, unmanaged old-growth forest, mature forest, and young-growth forest as parts catalog, maintenance manual, and service department from which to learn to practice restoration forestry.”).

570. See William Cronon, *The Trouble with Wilderness*, in *THE GREAT NEW WILDERNESS DEBATE* 471, 483 (J. Baird Callicott & Michael P. Nelson eds., 1998) (“[W]ilderness offers us the illusion that we can escape the cares and troubles of the world in which our past has ensnared us.”).

571. See, e.g., John Copeland Nagle, *The Spiritual Value of Wilderness*, 35 ENVTL. L. 955, 979–84 (2005) (detailing the repeated emphasis on the spiritual significance of wilderness in congressional hearings on the Wilderness Act).

572. See, e.g., John V. Krutilla, *Conservation Reconsidered*, 57 AM. ECON. REV. 777, 781 (1967) (“There are many persons who obtain satisfaction from mere knowledge that part of wilderness North America remains . . .”).

573. Camacho, *supra* note 139, at 225–26; Camacho, *supra* note 18, at 1432–33; see also Erica Goode, *A Shifting Approach to Saving Endangered Species*, N.Y. TIMES (Oct. 5, 2015), <http://www.nytimes.com/2015/10/06/science/a-shifting-approach-to-saving-endangered-species.html> [https://perma.cc/BF32-ENYF] (noting view of some ecologists that conservation efforts “will be more effective if they accept humans as a part of nature and come to terms with the fact that they have irrevocably altered the landscape”).

active management “might still be too much of a constraint to allow for effective adaptation to climate change.”⁵⁷⁴ However, stating that they “do not think so,” they argue that the costs from the Wilderness Act’s constraints on legal adaptive capacity are worth the “substantial benefits to restraint and passive management for climate change adaptation—at least in the particular context of wilderness areas.”⁵⁷⁵

Though we agree that there undoubtedly are benefits to more passive and reactive strategies as well as tradeoffs from more active management, with the projected rapid and even convulsive effects of climate change we think the scales tilt heavily toward adjusting public land laws more toward substantive legal adaptive capacity at the expense of rigid adherence to historical preservation or non-intervention. Climate change substantially increases the costs in ecological function of absolute bars and/or significant impediments to active management strategies. Relying on inflexible regulatory goals that emphasize stasis and/or minimal management will severely limit the ability of resource managers to manage the detrimental ecological effects of climate change.⁵⁷⁶ Perhaps the starkest quandary facing an agency subject to those constraints will be choosing between translocating endangered species to lands upon which they have never previously existed or presiding over species extinction.⁵⁷⁷ Moreover, climate change will increasingly render the two goals of wilderness preservation and historical preservation irreconcilable. Additionally, each will be increasingly incompatible with the need of promoting ecological functions in a rapidly changing world.⁵⁷⁸ As such, we maintain that the ecological costs of non-intervention or historical fidelity will increasingly outweigh the precautionary or cultural benefits.

Nonetheless, the general expansion of substantive legal

574. See Long & Biber, *supra* note 140, at 627.

575. *Id.*

576. Cf. IRIS BRAVERMAN: WILD LIFE: THE INSTITUTION OF NATURE 9–10 (2015) (arguing that climate change is among the factors making existing species’ habitats less viable, so that “[i]n many cases, what conservationists refer to as natural habitat must be actively managed alongside the construction of an alternative one”).

577. Camacho, *supra* note 139, at 181–83.

578. See Camacho & Beard, *supra* note 128, at 235 (urging a shift away from maintaining historical baselines and avoiding human management and toward maximizing ecological function in light of climatic and other changing environmental conditions).

adaptive capacity we favor need not, and probably should not, apply uniformly, even to lands currently governed by historical or wildness preservation mandates. For some landscapes, the historical and cultural benefits of historical preservation and the lower administrative costs of wildness preservation may trump the benefits of a more flexible, adaptive management approach. Such an approach, for example, might be appropriate when an area is expected to be fairly ecologically stable notwithstanding climate change, is exceptionally pristine, or has poorly understood ecological functions.⁵⁷⁹ For other lands, maintaining historical conditions will be increasingly costly and even impossible. Avoiding human disturbance will almost always be possible, but it, too, may generate unacceptable costs. Thus, if historical or wildness preservation remains the goal, it should be because policymakers decide that pursuit of that goal is worth the resulting loss of ecological diversity and/or productivity.

C. The Relationship Between Substantive Legal Adaptive Capacity and Delegated Agency Discretion

Finally, this Article's analysis of substantive legal adaptive capacity provides broader insights about the contours of delegated agency discretion generally. As illustrated through the federal lands context, agency discretion and legal adaptive capacity are related but distinct phenomena. In the context of procedural legal adaptive capacity, there is a temptation to equate more management flexibility with more agency discretion.⁵⁸⁰ However, a process may be flexible but still promote accountability through constraints on when or how the agency is allowed to exercise that flexibility.⁵⁸¹ For example, a governing authority may compel stakeholder participation, use of adaptive management, or the integration of clear triggers within an adaptive management process, rather than make them optional.⁵⁸²

579. Camacho, *supra* note 18, at 1446–47.

580. DOREMUS ET AL., *supra* note 86, at 3 (discussing risk that adaptive management will promote unbounded agency discretion).

581. *Cf.* Craig, *supra* note 18, at 64 (describing ways to minimize potential for abuse of discretion from regulatory flexibility).

582. *See, e.g.*, Camacho I, *supra* note 2, at 331, 349–51 (detailing the limited effectiveness of an adaptive management experiment that allowed but did not require procedural adaptation); DOREMUS ET AL., *supra* note 86, at 11 (calling for

Likewise, the comparison of BLM and USFS management in the face of climate change illustrates that the effectiveness of substantive legal adaptive capacity may vary depending on whether it is mandatory or permissive. The absence of directives in the BLM's governing legal regime requiring the agency to adjust management strategies in response to changes in information or circumstances may have played a role in its failure to engage in adaptation activities. In one sense, *requiring* compliance with a flexible substantive goal reduces agency discretion, but in a way that minimizes the potential for other factors to derail effective adaptation to change. For example, if a statute requires an agency to use its adaptive capacity, it is less likely that the agency will respond to budgetary constraints by deferring or giving short shrift to efforts to adapt to change than if the agency has unconstrained discretion to take advantage of its adaptive capacity or leave it lying dormant. Similarly, if a statute demands that an agency take an adaptive posture, agency leadership may face less resistance in imposing top-down directives to alter management approaches to address novel challenges. Such directives may generate buy-in throughout the agency even if, like the BLM, the agency has a decentralized structure that tends to hinder changes in policy direction from the top or deviations from traditional operating practices. Required flexibility also may promote accountability by providing a basis for more meaningful judicial review.⁵⁸³

It therefore may be desirable to reduce an agency's "regulatory discretion" by precluding it from deciding not to act adaptively, even when a change in "legislative discretion" is not needed because the agency operates under a substantive mandate that affords it adequate flexibility to respond to changing needs and conditions.⁵⁸⁴ Mandating the advancement

integration in adaptive management of clear benchmarks mandating when decisions must be adapted to account for new information or changed circumstances).

583. A mandate to act adaptively may check agency discretion by facilitating suits to compel agency action unlawfully withheld or unreasonably delayed. 5 U.S.C. § 706(1) (2012). Similarly, such a mandate may increase accountability by triggering less deferential review under the arbitrary and capricious test. *Id.* § 706(2)(A).

584. See Sidney A. Shapiro & Robert L. Glicksman, *Congress, the Supreme Court, and the Quiet Revolution in Administrative Law*, 1988 DUKE L.J. 819, 821 (1988) (distinguishing between an agency's "regulatory discretion," or its authority to determine whether to regulate, and its "legislative discretion," or its

of, and periodic re-assessment against, a flexible regulatory goal—such as the promotion of ecological health in light of changing conditions—may maximize the chance for effective adaptation to change rather than impede it.

CONCLUSION

The degree of an agency's flexibility, procedural and substantive, in implementing its statutory mandate can significantly influence both its capacity and willingness to adapt to changing needs and circumstances. As a rich literature attests, an agency's exercise of procedural legal adaptive capacity through techniques such as adaptive management can facilitate its responsiveness to change, albeit at the potential cost of a loss of accountability.⁵⁸⁵ Our comparative analysis of the five federal land systems illustrates that substantive legal adaptive capacity plays at least as significant a role in supplying an agency with the tools it needs to meet the challenges posed by changing conditions such as those arising from climate change. Policymakers designing the contours of substantive legal adaptive capacity must make several judgments. They need to consider the tradeoffs implicated in affording more or less legal adaptive capacity. If such capacity is desirable, they should recognize that alternative programmatic goals may be equally flexible, but that some may prove more effective in accommodating change than others. Finally, unused legal adaptive capacity, no matter how it is defined, will not effectively accommodate change, so it may be appropriate to narrow agency discretion to decide whether or not to act adaptively.

authority to determine how to regulate. Congress can choose constraints that maximize or minimize each type of discretion”).

585. See *supra* Section I.C.