

GRAZING 2.0: THE VALLES CALDERA NATIONAL PRESERVE

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TABLE OF CONTENTS

I. THE VALLES CALDERA NATIONAL PRESERVE.....	349
II. NEPA AND ADAPTIVE MANAGEMENT	354
III. MONITORING, MITIGATION, AND THE ROLE OF SCIENCE IN THE ADMINISTRATIVE HIERARCHY .	361
IV. ADAPTIVE MANAGEMENT IN ACTION.....	365
V. CONCLUSION	371

At a time when public lands and their management remain as controversial as ever,¹ success stories allow us to look at old and entrenched conflicts in a new way. Management of the Valles Caldera National Preserve as a “working ranch” provides one such example, modeling an innovative approach to livestock grazing on public lands.² Congress created Valles Caldera National Preserve in 2000, a vast landscape encompassing over 89,000 acres in northern New Mexico.³ As part of a legislative compromise, the Preserve

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1. John B. Wright, *Land Tenure: The Spatial Musculature of the American West*, in WESTERN PLACES, AMERICAN MYTHS: HOW WE THINK ABOUT THE WEST 85, 88 (Gary J. Hausladen ed., 2003). See generally DYAN ZASLOWSKY & TOM H. WATKINS, THESE AMERICAN LANDS (1994); RANDALL K. WILSON, AMERICA’S PUBLIC LANDS: FROM YELLOWSTONE TO SMOKEY BEAR AND BEYOND (2014) (providing an overview of public land history by land type).

2. See WILLIAM DEBUYS & DON J. USNER, VALLES CALDERA: A VISION FOR NEW MEXICO’S NATIONAL PRESERVE (2006).

3. *Id.*

became a neoliberal experiment in public land management.⁴ Instead of being managed by a federal agency, the Preserve was designated as a wholly-owned federal corporation guided by a Board of Trustees.⁵ The Trust was statutorily required to operate a “working ranch,” while protecting and preserving the health of the land and its resources.⁶ In addition, the Trust had an explicit mandate to become financially self-sufficient.⁷

Early on, many looked to the grazing program to meet this financial directive from Congress.⁸ For its own purposes, the Trust defined “working ranch” as “an operation that places its primary emphasis on the stewardship of resources as the foundation for both ecological and economic sustainability.”⁹ It then took an innovative and experimental approach to its grazing program. It made a commitment to offset environmental impacts from grazing, and successfully engaged in adaptive management to guide its decision making.¹⁰ The experiment ended in December 2014, when President Barack Obama signed legislation transferring management

4. See Brian Yablonski, *Valles Caldera Nat'l Preserve: A New Paradigm for Public Land?*, 22 PERC REP. 3, 5 (2004) (newsletter of the Property and Environment Research Center, a conservative environmental think tank seeking market solutions to environmental problems). Early on, there was some interest among legal scholars regarding the experiment. See, e.g., Sally K. Fairfax et al., *Presidio and Valles Caldera: A Preliminary Assessment of Their Meaning for Public Resource Management*, 44 NAT. RES. J. 445 (2004); James L. Huffman, *Limited Prospects for Privatization of Public Lands: Presidio and Valles Caldera May Be as Good as It Gets*, 44 NAT. RES. J. 475 (2004).

5. The experiment began in 2000, when Congress passed the Valles Caldera Preservation Act and purchased the Baca Ranch from the Dunigan family, moving the Preserve into public ownership under a trust model. For a full account, see Melinda H. Benson, *Shifting Public Land Paradigms: Lessons from the Valles Caldera National Preserve*, 34 VIRGINIA ENVTL. L. J. 1 (2016). Use of sections from that article in this manuscript takes place with permission per copyright agreement.

6. *Id.* at 5.

7. See *id.* at 6.

8. See U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-06-98, VALLES CALDERA TRUST HAS MADE SOME PROGRESS, BUT NEEDS TO DO MORE TO MEET STATUTORY GOALS 1 (2005) [hereinafter GAO 2005].

9. See VALLES CALDERA TRUST, VALLES CALDERA NATIONAL PRESERVE: FRAMEWORK AND STRATEGIC GUIDANCE FOR COMPREHENSIVE MANAGEMENT 57 (2005) [hereinafter FRAMEWORK AND STRATEGIC GUIDANCE].

10. *Id.* at 60.

to the National Park Service.¹¹ The lessons learned, however, remain and provide insights that can benefit all public land managers.

This Article reports on the innovative approach to livestock grazing that became a part of the experiment. It begins with a brief overview of the Preserve's creation and management. It then turns to the grazing program, which involved a strong science component and adaptive management as part of its compliance with the National Environmental Policy Act (NEPA). This Article argues that the Trust's use of science-based adaptive management as part of its NEPA process demonstrates that NEPA can live up to its original mandate without legislative reform. It also provides an example of how NEPA can be used both effectively and efficiently to guide iterative decision making. This article also examines how the management program reduces conflict; as Jorge Silva-Bañuelos, the Executive Director of the Trust explains: "Managers from other agencies have asked me how we justify the amount of money we invest in our science programs. I tell them to think about all the money we save in litigation costs."¹²

I. THE VALLES CALDERA NATIONAL PRESERVE

Located in New Mexico's Jemez Mountains, the land now known as the Valles Caldera National Preserve was private property for many decades.¹³ It was known as "the Baca Ranch," a land grant by Spain to the Baca family during its colonial period.¹⁴ The

11. See Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015, Pub. L. No. 113-291, § 3043(b)(6), 128 Stat. 3292, 3794 (2014); see Susan Montoya Bryan, *New Mexico's Valles Caldera Looks to Future as National Park*, DENVER POST (Jan. 1, 2015), http://www.denverpost.com/travel/ci_27241867/new-mexicos-valles-caldera-looks-future-national-park.

12. Interview with Jorge Silva-Bañuelos, Executive Director, Valles Caldera National Preserve (Apr. 7, 2014).

13. See Yablonski, *supra* note 4, at 3.

14. Large private holdings, such as the Baca Ranch, are not uncommon in New Mexico. The property was given to the Baca family as a part of settlement of lands claims that took place when the United States took over ownership of the territory under the 1848 Treaty of Guadalupe Hidalgo. The legitimacy of this settlement is currently under litigation in a case brought by the Jemez Pueblo, who claims aboriginal title to the land. See *Pueblo of Jemez v. United States*, No. CIV 12-0800 RB/RHS, at 1 (D.N.M. Sept. 24, 2013). New Mexico's history

breathtakingly beautiful area is known for its numerous “valles,” open valleys, and high altitude meadows resulting from volcanic eruptions over a million years ago.¹⁵ Not surprisingly, given its spectacular beauty and unique geological features, this area had long been considered a candidate for public ownership.¹⁶ In *Valles Caldera: A Vision for New Mexico’s National Preserve*, Bill DeBuys describes in detail the numerous efforts over the course of decades to place the property under public ownership.¹⁷ There were some concerns about the venture, particularly by key player and then U.S. Senator from New Mexico, Pete Domenici. He was not enthusiastic about the addition of more public land in New Mexico. “The Senator, who sat on the Interior Appropriations Subcommittee, didn’t like the idea of a longtime working ranch being consumed by the federal land management bureaucracy”¹⁸ In addition, conflicts over public land grazing, endangered species protection, and other management issues were a constant source of controversy in the state.¹⁹ Senator Domenici was not happy with grazing lands

of Spanish and Mexican land grants, including their subsequent and often fraudulent adjudication, is an important aspect of the state’s public land history. See U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-04-59, TREATY OF GUADALUPE HIDALGO: FINDINGS AND POSSIBLE OPTIONS REGARDING LONGSTANDING COMMUNITY LAND GRANT CLAIMS IN NEW MEXICO, 40–41 (2004); Federico M. Cheever, *A New Approach to Spanish and Mexican Land Grants and the Public Trust Doctrine: Defining the Property Interest Protected by the Treaty of Guadalupe-Hidalgo*, 33 UCLA L. REV. 1364, 1383 (1986); see generally MALCOLM EBRIGHT, LAND GRANTS AND LAWSUITS IN NORTHERN NEW MEXICO (1995) (detailing the history of Spanish and Mexican land grants and subsequent adjudication).

15. About 1.2 million years ago, a volcano erupted and collapsed inward, forming the crater now known as the Valles Caldera, located in north-central New Mexico. This geologically and ecologically unique area covers about 89,000 acres of meadows, pine forests, hot springs, volcanic domes, and streams that support elk herds and other wildlife and fishery resources. GAO 2005, *supra* note 8, at 5.

16. See DEBUYS & USNER, *supra* note 2.

17. See *id.*

18. Peter L. Gess, A Grand Experiment in Public Lands Management: Responsiveness in the National Caldera National Preserve 44 (Aug. 2006) (unpublished Ph.D. dissertation, University of Georgia) (on file with the Main Library, University of Georgia) (citing Annette McGivney, *The Yellowstone of the Southwest*, BACKPACKER: THE MAGAZINE OF WILDERNESS TRAVEL, Aug. 2001, at 39). Gess’ dissertation examines whether the unique management structure for Valles Caldera leads to a higher level of responsiveness to important stakeholders than typically found under the usual bureaucratic approaches. See *generally id.*

19. See *generally id.*

managed by the U.S. Forest Service, and he was concerned that management by the National Park Service would exclude livestock grazing and hunting.²⁰ The idea of a financially driven trust model for the Preserve was created as a compromise: the Preserve would be public land, but it would not be managed by a typical federal agency.²¹ Handing management of the land over to a Board of Trustees was intended to provide a more inclusive and innovative form of governance.²²

Political momentum and public support for the purchase of the Baca Ranch culminated in the late 1990s.²³ A bipartisan agreement was reached, and the government acquired the property for approximately \$97 million.²⁴ As Professor Larry Gess describes, there was a “belief and hope that the Valles Caldera National Trust [could] represent something new and different.”²⁵ It reflected a sense that “the conversation can be moved from that of environment versus economic opportunities, to one in which environmental protection, wise natural resource use, and economic progress can be accomplished.”²⁶ “In other words, board members, staff members, and external stakeholders buy into win-win ecology.”²⁷ By moving to a more collaborative model, there was hope that the experiment could “circumvent some of the political deadlock, stagnation, and litigation facing the National Park and Forest Services. ‘Congress wanted to use Valles Caldera to blaze a fresh trail

20. *See id.* at 44.

21. *See id.* at 1.

22. *See id.* In addition to the current Supervisor of the Santa Fe National Forest and the Superintendent of the Bandelier National Monument—both of whom manage public lands bordering the Preserve—the board included seven individuals with specific expertise representing stakeholder interests. The required areas of expertise were in (1) domesticated livestock management, (2) wildlife management, (3) forestry, (4) conservation, (5) financial management, and (6) cultural and natural history. 16 U.S.C. § 698v-5(2) (repealed Dec. 19, 2014).

23. *See* DEBUYS & USNER, *supra* note 2.

24. *See* GAO 2005, *supra* note 8, at 1.

25. Gess, *supra* note 18, at 171.

26. *Id.*

27. *Id.*

through the tangled politics of managing federal land in the West.”²⁸

Management of the Preserve was statutorily required to include: (1) “operation of the Preserve as a working ranch”; (2) “the protection and preservation of the scientific, scenic, geologic, watershed, fish, wildlife, historic, cultural, and recreational values”; (3) “multiple use and sustained yield of renewable resources”; (4) “public use of and access to the Preserve for recreation”; (5) “renewable resource utilization and management alternatives”; and (6) “optimizing the generation of income based on existing market conditions, to the extent that it does not unreasonably diminish the long-term scenic and natural values of the area, or the multiple use and sustained yield capability of the land.”²⁹ The statutory mandate was a tall order.

The core idea was that “a working ranch under a unique management regime . . . would protect the land and resource values of the property and surrounding ecosystem while allowing and providing for the ranch to eventually become financially self-sustaining.”³⁰ The statute defined “financially self-sustaining” to mean that “management and operating expenditures [are] equal to or less than proceeds derived from fees and other receipts for resource use and development and interest on invested funds.”³¹

The Trust inherited a long history with respect to ranching. Livestock grazing was part of the landscape in the many decades prior to public ownership. Early Spanish settlement began in New Mexico when Don Juan de Oñate arrived in 1598, bringing with him the first wave of colonial settlement.³² The Spanish brought

28. *Id.* at 49 (quoting Cyril T. Zaneski, *Taming the West*, 35 GOV'T EXEC. 1, 17 (2003)).

29. 16 U.S.C. § 698v-6(d), *repealed by* Act of Dec. 19, 2014, Pub. L. No. 113-291, 128 Stat. 3798 (codified as 16 U.S.C. § 698v-(d)(1), titled “Repeal of Valles Caldera Preservation Act”).

30. *Id.* § 698v-(a)(8) (repealed 2014).

31. *Id.* § 698v-1(4) (repealed 2014).

32. KURT F. ANSCHUETZ & THOMAS MERLAN, U.S. DEPT OF AGRICULTURE, MORE THAN A SCENIC MOUNTAIN LANDSCAPE: VALLES CALDERA NATIONAL PRESERVE LAND USE HISTORY 107 (2007) (providing a detailed summary of the cultural-historical environment of the Preserve).

with them cattle, sheep, goats and horses.³³ Pastoral grazing became a primary means of subsistence for both Spanish settlers and many Native Americans.³⁴ “By 1757 the Pueblos and Hispanics of New Mexico together owned significant numbers of livestock, including seven times more sheep than cattle: 7,356 horses, 16,157 cattle, and 112,182 sheep.”³⁵ During this time, sheep grazing was the dominant land use activity at the Preserve.³⁶ The arrival of the Santa Fe Railroad in the 1880s brought with it access to Eastern markets.³⁷ Consequently, both cattle and sheep grazing boomed.³⁸ By 1950, owners of the Baca ranch were grazing 30,000 sheep and 5,000 cattle.³⁹

By the time the Trust inherited the Preserve it was heavily overgrazed.⁴⁰ In addition, “[o]ver 1,400 miles of roads were built on the Preserve in the 20th century and about 60% of the forests were harvested. Subsistence hunting, which began in pre-historic times, increased in the late 19th and early 20th centuries and decimated wildlife populations”⁴¹ The Preserve was in rough shape both ecologically and in terms of infrastructure.⁴² “Shortly after the federal government assumed ownership of the Caldera, the Trust learned that the existing infrastructure—roads, buildings, fences, and water treatment facilities—[were] seriously degraded”⁴³

33. *Id.*

34. *Id.* at 108.

35. *Id.*

36. *See id.*

37. *See id.* at 109.

38. *See* ANSCHUETZ & MERLAN, *supra* note 32.

39. *See id.* at 112.

40. *See id.* at 41.

41. *See* Valles Caldera Trust, 2012 State of the Preserve at iii (2012) [hereinafter State of the Preserve 2012].

42. *See id.*

43. GAO 2005, *supra* note 8, at 11; *see also* U.S. Gov’t Accountability Office, The Trust Has Made Progress but Faces Significant Challenges to Achieve Goals of the Preservation Act 15 (2009) [hereinafter GAO 2009].

Additionally, most of the existing buildings from previous ranching operations were in various states of disrepair.

The grazing program faced the challenge of running a working ranch on this degraded landscape by integrating adaptive management as a core management principle:

Adaptive management is not a new concept in ranching. Ranchers practice adaptive management every day, taking into consideration such factors as wind, rain, temperature, and livestock markets. Ranchers learn to be conservative, inventive, and flexible to manage effectively, especially in times of drought. At the preserve, we have the opportunity to enhance and expand such adaptive management through the availability of scientific monitoring. Through a variety of scientific experiments and monitoring protocols, we have a tremendous opportunity to understand the workings of the preserve's ecosystems.⁴⁴

The Trust's embrace of adaptive management is inextricably linked to its unique approach to NEPA and the placement of the science program within the administrative hierarchy. In addition to defining a "working ranch as an operation [that] plac[es] its primary emphasis on stewardship of . . . resource[s] as the foundation for both ecological and economic sustainability,"⁴⁵ the Trust's framework for management further defined a working ranch as one that "[r]uns a sustainable level of livestock, adjusting numbers as necessary; [m]akes resources available for other revenue-generating activities such as bird watching, hunting, fishing, and other low-impact recreational activities; [a]pplies *adaptive management on a day-to-day basis* to ensure resource protection; and [m]onitors the impacts of its activities."⁴⁶ The following two sections detail the legal context and the Trust's approach to adaptive management, monitoring, and other aspects of its science-based approach.

II. NEPA AND ADAPTIVE MANAGEMENT

44. See FRAMEWORK AND STRATEGIC GUIDANCE, *supra* note 9, at 57.

45. *Id.*

46. *Id.* (emphasis added).

The National Environmental Policy Act is the most pervasive environmental law in the United States. Its broad, sweeping influence on environmental regulatory regimes prompted Professor Karkkainen to observe that NEPA has “assumed quasi-constitutional status as one of the foundational laws of the modern administrative state.”⁴⁷ Despite its general stature, however, there is a general consensus that NEPA’s actual influence falls short of its potential.⁴⁸ NEPA established a national policy to “encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; [and] to enrich the understanding of the ecological systems and natural resources important to the Nation”⁴⁹

Section 101 of NEPA declared that the federal government should “use all practicable means and measures . . . to foster and promote the general welfare, [and] to create and maintain conditions under which man and nature can exist in productive harmony . . . [for] present and future generations of Americans.”⁵⁰ This section is sometimes referred to as the “substantive provision” of NEPA. This provision was eviscerated by early U.S. Supreme Court interpretations of the law, which reduced NEPA requirements to a series of procedural steps outlined in NEPA’s Section 102.⁵¹ Steps under Section 102 involve a “hard look” at the environmental impacts of a proposed agency action, but do not provide

47. Bradley C. Karkkainen, *Whither NEPA?*, 12 N.Y.U. ENVTL. L.J. 333, 333 (2004).

48. See generally Melinda Harm Benson & Ahjond Garmestani, *Embracing Panarchy, Building Resilience and Integrating Adaptive Management Through a Rebirth of the National Environmental Policy Act*, 92 J. ENVTL. MGMT. 1420 (2011); K. Jack Haugrud, *Perspectives on NEPA: Let’s Bring a Bit of Substance to NEPA -- Making Mitigation Mandatory*, 39 ENVTL. L. REP. NEWS & ANALYSIS 10638 (2009); Sam Kalen, *Ecology Comes of Age: NEPA’s Lost Mandate*, 21 DUKE ENVTL. L. & POL’Y F. 113 (2010); Daniel R. Mandelker, *Thoughts on NEPA at 40*, 39 ENVTL. L. REP. 10640 (2009); Julie Thrower, *Adaptive Management and NEPA: How a Nonequilibrium View of Ecosystems Mandates Flexible Regulation*, 33 ECOL. L.Q. 871 (2006).

49. 42 U.S.C. § 4321 (2012).

50. *Id.* § 4331(a).

51. See Kalen, *supra* note 48 at 162.

substantive protection for the environment.⁵² For decades, scholars have bemoaned the Court's reduction of NEPA's influence and provided various proposals for bolstering its potential. Suggestions include requiring the mitigation of environmental damages identified by Environmental Impact Statements (EISs),⁵³ integrating NEPA implementation more effectively into planning processes,⁵⁴ and establishing monitoring protocols for agency actions.⁵⁵ Proposed reforms designed to make NEPA processes more effective and efficient are ongoing.⁵⁶

In its fourteen years of management, the Preserve was *never* the subject of a lawsuit by environmentalists, ranchers, or other interested stakeholders involved in public land management in the American West.⁵⁷ This is largely due to the Preserve's approach to NEPA. The Preserve board members and staff saw NEPA as an opportunity rather than a burden. Rather than viewing compliance as yet another administrative task, the Preserve looked at NEPA as an opportunity to establish mechanisms that would implement its guiding principles for management.⁵⁸ The board and staff worked closely with the Council on Environmental Quality (CEQ) to develop the Preserve's NEPA procedures. These procedures not only outlined the process for development of EISs, as required by NEPA, but also articulated a commitment to have its analysis guide management.

The Trust's NEPA regulations state that "the procedures are intended to integrate NEPA with the planning and decision making of the Trust, make NEPA more useful to decision makers and

52. LINDA LUTHER, CONG. RESEARCH SERV., RL33152, THE NATIONAL ENVIRONMENTAL POLICY ACT: BACKGROUND AND IMPLEMENTATION 9 (2005).

53. See generally Haugrud, *supra* note 48.

54. See generally Oliver A. Houck, *How'd We Get Divorced?: The Curious Case of NEPA and Planning*, 39 ENVTL. L. REP. 10645 (2009).

55. See Karkkainen, *supra* note 47.

56. See generally Aliza M. Cohen, *NEPA in the Hot Seat: A Proposal for an Office of Environmental Analysis*, 44 U. MICH. J.L. REFORM 169 (2010); Helen Leanne Serassio, *Legislative and Executive Efforts to Modernize NEPA and Create Efficiencies in Environmental Reviews*, 45 TEX. ENVTL. L.J. 317 (2015).

57. See Interview with Silva-Bañuelos, *supra* note 12.

58. Table 1 See appendix _ for the Trust's NEPA flow chart.

the public, and ensure that environmental information is readily available before, during, and after decisions are made.”⁵⁹ To achieve this, the Preserve explicitly embraced adaptive management as the means by which it would adjust its activities (referred to as “stewardship actions”) or strategic guidance based on knowledge gained from new information, experience, experimentation, and monitoring results.⁶⁰ Dinah Bear, former general counsel at the CEQ who guided the Preserve in its promulgation of NEPA regulations, explains:

The Board has set about their work determined to make learning about the land they administer the major touchstone of its management. Shortly after establishment, the Board committed to building an organizational culture and structure that would fully support adaptive management. The Trust has invested heavily in the kinds of inventory and monitoring work needed to provide baseline information for the comparative evaluation of future resource conditions. It has also designed a framework for long-term monitoring that is intended to result in periodic, viable assessments of the cumulative effects of preserve activity. In its effort to integrate a vigorous ongoing program of experimental field science with day-to-day management, the Valles Caldera Trust is unique.⁶¹

In his interviews, Gess found that board members and stakeholders viewed the NEPA procedures as a major success. One senior staff member stated:

[T]o me the biggest [success] was to develop a decision-making process that is fairly efficient, that really takes . . . that focuses back on the intent of [NEPA].... I think the NEPA

59. National Environmental Policy Act (NEPA) Procedures of the Valles Caldera Trust for the Valles Caldera National Preserve, 68 Fed. Reg. 42,460, 42,462 (July 17, 2003) [hereinafter NEPA Procedures].

60. Dinah Bear, *Some Modest Suggestions for Improving Implementation of the National Environmental Policy Act*, 42 NAT. RES. J. 931, 949 (2002).

61. *Id.* at 948.

process is becoming so convoluted in a lot of the other agencies because of a lot of different things. Some of the agencies have misinterpretations and in some cases case law . . . court decisions have forced things on the agencies that in my view don't really get back to the initial purpose of what NEPA is really all about.⁶²

In sum, the Preserve's staff, board, and stakeholders were able to set aside the common conceptions of NEPA, and, as a result, compliance became a benefit rather than a burden.

The Preserve's approach to NEPA is inextricably linked to its commitment to adaptive management. The Preserve included science-based adaptive management among its ten guiding principles for its management, based on its statutory charge.⁶³ The principle stated "[w]e will exercise restraint in the implementation of all programs, basing them on sound science and adjusting them consistent with the principles of adaptive management."⁶⁴ Collaborative process is evident in their approach to adaptive management: the regulations describe adaptive management as an accelerated learning process involving scientists, managers, and citizens.

Learning in the achievement of sustainable ecosystems requires an array of strategies and partnerships of managers and citizens working directly with scientists to provide a holistic view of desired conditions and positive, creative responses to change. Through adaptive management, the Trust will provide for multiple use and sustained yield of the renewable resources of the Preserve.⁶⁵

The Preserve defined an adaptive management approach as one in which:

62. Gess, *supra* note 18, at 158 (citation omitted).

63. See FRAMEWORK AND STRATEGIC GUIDANCE, *supra* note 9, at 13.

64. *Id.*

65. NEPA Procedures, 68 Fed. Reg. at 42464.

Stewardship actions or strategic guidance are adjusted based on knowledge gained from new information, experience, experimentation, and monitoring results. Adaptive management is the preferred method for managing complex natural systems. Science-based research, inventory, and monitoring includes not only the natural sciences but also social sciences such as economics, political science or sociology.⁶⁶

This definition is consistent with the National Resource Council's definition, which has been incorporated by many federal agencies, including the Park Service and other units within the Department of Interior.⁶⁷

While adaptive management seems straightforward, it has proven quite difficult to accomplish in practice. In their survey of the first generation of litigation related to adaptive management implementation by federal agencies, Professors Ruhl and Fischman found that what most agencies practice cannot be accurately called "adaptive management" but instead use what they term "a/m-lite," a watered-down version of the theory that resembles ad hoc contingency planning more than it does planned learning while doing.⁶⁸ The gap between theory and practice occurs in part due to the series of interlinking management actions that must take place in order for adaptive management to be successful. These actions are illustrated by the U.S. Department of Interior's technical guide for adaptive management implementation.⁶⁹ First, in "assessing a problem," there must be a clear statement of management objectives to guide decisions. This includes identifying explicit assumptions about expected outcomes to compare against actual outcomes, which in turn requires some type of conceptual model of how the

66. FRAMEWORK AND STRATEGIC GUIDANCE, *supra* note 9, at Glossary.

67. See generally BYRON K. WILLIAMS ET AL., DEP'T OF INTERIOR, ADAPTIVE MANAGEMENT: THE U.S. DEP'T. OF THE INTERIOR TECHNICAL GUIDE (2009).

68. J.B. Ruhl & Robert I. Fischman, *Adaptive Management in the Courts*, 95 MINN. L. REV. 424, 426 (2010) (detailing the first generation of federal case law resulting from efforts by federal agencies to engage in adaptive management).

69. See appendix _ for the Trust's NEPA flow chart.

management area functions.⁷⁰ Managers then design management actions that can test these assumptions and implement them in ways that allow for effective monitoring.⁷¹ Monitoring data is then evaluated and, based on that new knowledge, management actions are adjusted to reflect what is learned.⁷²

This embedded feedback loop of action, monitoring, evaluation, and adjustment, focuses specifically on learning about the impacts of management. Ideally, multiple iterations of this process occur, refining a manager's understanding of the issues and the system in which he or she operates.⁷³ At each step in this process, there are elements of the overall management paradigm that can make or break adaptive management's success. In the case of step one, for example, managers are often pressured to take management actions in the absence of baseline data needed for effecting monitoring.

The Preserve also streamlined its NEPA processes by investing heavily in the most advanced Geographic Information Science (GIS) technology and gathering baseline data that could then serve as a starting point for multiple NEPA analyses. For example, it mapped the existing vegetative composition of the Preserve to a three-meter pixel resolution, then, using aerial photography, delineated the natural vegetation into over 2000 "stands" to which over thirty characteristics that described composition and structure were attributed.⁷⁴ The structure and composition information was stratified for field sampling. The end product was a powerful spatial geodatabase that provided a basis upon which to evaluate future actions. It also dramatically streamlined the NEPA process from the outset. "[W]hile 'streamlining' has become a value-laden term in the context of NEPA, the acquisition of on-the-ground information could certainly reduce the need to engage in the type of costly, lengthy modeling exercises that some agencies feel obliged

70. See WILLIAMS ET AL., *supra* note 67, at 56.

71. *Id.*

72. *Id.*

73. See *id.* at 57.

74. Interview with Marie Rodriguez, Director Stewardship Division, Valles Caldera Trust (April 14, 2015).

to undertake because of lack of empirical information.”⁷⁵ The relative efficiency of the Preserve’s NEPA process was confirmed by Gess’ interviews: “[a] high-level Forest Service employee told me, ‘I drool over their NEPA process, their ability to move certain things a little bit faster than we do because our own regulations require certain things, and the [Preserve’s] NEPA process is much more streamlined.’”⁷⁶ They also worked to convert this research into an easy to understand format, working with stakeholders to propose goals and strategies.⁷⁷ Two other critical actions essential to the feedback loop—monitoring and mitigation—are now addressed separately.

III. MONITORING, MITIGATION, AND THE ROLE OF SCIENCE IN THE ADMINISTRATIVE HIERARCHY

Monitoring and mitigation are essential components for adaptive management, and the Preserve directly integrated both into their NEPA procedures. This is a marked departure from most federal agency approaches; NEPA’s general failure to require the monitoring and mitigation necessary for adaptive management is widely recognized.⁷⁸ In general, NEPA provides that “[a]gencies may provide for monitoring to assure that their decisions are carried out and should do so in important cases.”⁷⁹ It does not actually require monitoring and, as a practical matter, monitoring is often abandoned when budgets require agencies to cut back on operations. In a survey of adaptive management practitioners, the strongest response received concerned the need for adequate monitoring in order to properly implement adaptive management.⁸⁰ Approximately 70% of practitioners felt that monitoring efforts are

75. Bear, *supra* note 60, at 949.

76. Gess, *supra* note 18, at 158–59.

77. *See id.* at 6.

78. *See supra* note 48.

79. 40 C.F.R. § 1505.3 (2016).

80. Melinda H. Benson & Asako B. Stone, *Practitioner Perceptions of Adaptive Management Implementation in the U.S.*, 18 *ECOLOGY AND SOCIETY* (2013), <http://www.ecologyandsociety.org/vol18/iss3/art32/>.

generally not adequately funded.⁸¹ Comments from the survey also indicated frustration with the quality of monitoring efforts, noting that monitoring was often expensive and inefficient, while not being controlled enough to have viable results.⁸²

The Preserve's NEPA regulations integrated both monitoring and learning into its process, providing: "Monitoring and evaluation of stewardship actions, research, and detailed studies provide the public and the Trust with the basis for adapting ongoing and future stewardship actions to achieve the goals of the Trust and the requirements of NEPA."⁸³ The regulations further stated that:

If, based on monitoring conclusions or other new information available . . . the observed outcomes of stewardship actions described in one or more stewardship registers as amended differ significantly from those anticipated or if new information has a meaningful bearing on the anticipated consequences of one or more stewardship actions, the Responsible Official must consider such information and: (1) Consider the preparation or supplementation of an environmental document . . . (2) If appropriate, propose a stewardship action and/or continue, modify, or terminate one or more stewardship actions . . . and (3) Appropriately, amend the stewardship register to incorporate the new information and/or change to the stewardship action or description of consequences in the relevant environmental document.⁸⁴

The Preserve's process provided managers with three options at the end of the first iterative of the adaptive management loop:

81. *Id.*

82. *See id.* The survey found that practitioners do feel hampered by legal and institutional constraints: well over 70% not only believed that constraints exist and could specifically name one or more example of a legal constraint on their work implementing adaptive management. *Id.* At the same time, it found practitioners generally optimistic about potential for institutional reform. *Id.*

83. NEPA Procedures, 68 Fed. Reg. 42,460, 42,468 (July 17, 2003).

84. *See supra* note 59, at 42,472.

continue, modify, or terminate.⁸⁵ While not explicitly requiring mitigation per se, the fact that the Preserve was legally required to take one of these three actions, in combination with the management goals of the Preserve, reflected the intent to minimize impacts, rectify mistakes when necessary, and reduce or eliminate impacts over time. These elements formed the core definition of mitigation under NEPA.⁸⁶ Mitigation, like monitoring, is generally not required under NEPA.⁸⁷ In rare instances in which the NEPA process does commit mitigation, NEPA requires the agency to also require monitoring, and it allows the agency to condition its approval of permits, funding and other activities on the mitigation required by the decision.⁸⁸

The Preserve's science program established monitoring sites for ecological conditions from the outset.⁸⁹ The science program had three components: (1) inventorying natural resources, (2) monitoring environmental changes resulting from the Preserve's programs, and (3) conducting research that will help manage the Preserve's resources.⁹⁰ By investing in monitoring early and committing to its use in decision-making processes and NEPA analysis, the Preserve went beyond what most federal agencies have been able to accomplish. Gess' research early in the Preserve's experiment confirmed the commitment and enthusiasm for this process early on:

For many, it is the real chance to integrate adaptive management, complete with scientific monitoring and feedback, into the daily operations. ... There is of course the hope that

85. *Id.*

86. 40 C.F.R § 1508.20 (2016).

87. The exception for both is when an agency develops something called a "mitigated FONSI" or "finding of no significant impact." A mitigated FONSI is appropriate when the agency determines that, because it is committed to mitigating the impacts of its action, development an EIS is not required. *See* Haugrud, *supra* note 48.

88. *See* Haugrud, *supra* note 48.

89. *See* GAO 2009, *supra* note 43, at 11.

90. *See* Haugrud, *supra* note 48.

the scientific data can be used to make good, sound judgments, which avoid some of the deadlock and confrontation affecting other natural resources. For others, it is simply the chance to ‘get outside the box,’ to experiment with new and innovative ideas, to be creative.⁹¹

Scientific research also flourished due to its role in the administrative hierarchy. Within the Preserve’s institutional structure, the Scientific Services Division was an independent unit with the Director of Scientific Services reporting directly to the Executive Director.⁹² It also had a charismatic leader, Dr. Bob Parmenter, who directed the science program from the beginning.⁹³ He was the longest serving member of the Preserve’s staff.⁹⁴ Prior to taking the job, Dr. Parmenter ran the Sevilleta Long Term Ecological Research Station located about fifty miles south of Albuquerque, New Mexico at the Sevilleta National Wildlife Refuge.⁹⁵ Dr. Parmenter also served as research faculty in the Department of Biology at the University of New Mexico.⁹⁶ Under his leadership, the science program was established concurrently with (and independently from) the other operational programs of the Preserve.⁹⁷

Early on, the Preserve’s experiment with NEPA was also seen as an opportunity to inform how other agencies view NEPA. Dinah Bear observed:

If the Trust succeeds in its goals of integrating science, decision making, and the accountability to and involvement by the public, it could make a difference in how troubled land management agencies think about NEPA – in no small measure just by demonstrating that NEPA is not a barrier

91. Gess, *supra* note 18, at 176.

92. Interview with Bob Parmenter, Director Science Services Division of the Valles Caldera Trust (Apr. 14, 2005)

93. *See id.*

94. *See id.*

95. *See id.*

96. *See id.*

97. *See id.*

but rather a framework for implementing adaptive management.⁹⁸

Based on her years of experience, she argued that NEPA implementation and associated land practices will not change until NEPA has post-decisional value and receives the necessary institutional funding and commitment.⁹⁹ This case study has the potential to inform both research and practice regarding NEPA processes and procedures by other federal agencies. It also informs ongoing discussions regarding how to better integrate emerging knowledge into natural resource decision making. In the context of its grazing program, however, there is a relevant example of the Preserve's science-based adaptive management in action.

IV. ADAPTIVE MANAGEMENT IN ACTION

The Preserve took a comprehensive, adaptive approach to its grazing program. This reflected a belief that a science-based approach was key to reducing conflicts over management: “the traditional separation in most land management agencies of scientific activities from on-the-ground, management decision making has contributed to development of institutional cultures that do not easily embrace a close partnership between science and management.”¹⁰⁰ The overarching approach included monitoring

to assess the combined impacts of livestock and other wildlife (primarily elk) on the vegetation of the VCNP. Before each summer grazing period, a range assessment is undertaken to determine the maximum number of cattle that can be supported within each major pasture area. This assessment [was designed] conservatively [to] assume[] that only spring forage [would] be available for the entire season. . . . Once this assessment is conducted, the VCT adjusts the

98. Bear, *supra* note 60, at 949.

99. *See generally id.*

100. FRAMEWORK AND STRATEGIC GUIDANCE, *supra* note 9, at 61.

planned number of cattle to be introduced to the VCNP pastures to ensure that the available forage is not overutilized.¹⁰¹

The protocol provided that “[a]t the end of each season, the forage remaining is measured for the purpose of assessing total utilization by cattle and elk, and these values are then used to begin planning for the next season.”¹⁰² They experimented with “exclosures,” keeping out both livestock and wildlife “to determine the relative roles of these major herbivores on removing forage in the riparian zones of the VCNP.”¹⁰³ The Trust then combined these experiments with satellite imagery to provide a more detailed assessment of large herbivore impacts on the VCNP grasslands, thereby allowing a high degree of accuracy in planning future livestock stocking rates.¹⁰⁴

From 2002 to 2008, the Trust operated a variety of annual programs for domestic livestock grazing.¹⁰⁵ From 2002 through 2005, for example, the grazing program offered drought relief and grazing opportunities to ranchers with grazing allotments on the nearby Santa Fe National Forest.¹⁰⁶ Perhaps the most dramatic example of adaptive management came in 2006, when drought conditions were so severe that the Trust canceled the grazing program for the year.¹⁰⁷ As part of the science program that year, 200 yearlings were hosted on the preserve as part of an ongoing research and monitoring program linked to a prescribed burn.¹⁰⁸ The next year, the Trust hosted a program of 500 yearlings for four months through a contract awarded to a New Mexico rancher through a

101. *Id.* at 62.

102. *Id.*

103. *Id.*

104. *Id.*

105. STATE OF THE PRESERVE 2012, *supra* note 41, at 57.

106. *Id.* at 57–58.

107. *Id.* at 58.

108. *Id.*

competitive request for proposals.¹⁰⁹ “In 2008, a competitive contract was awarded to a different owner to graze up to 2,000 yearling steers as a single herd, moving throughout the Preserve.”¹¹⁰ This was the most profitable year for the Trust’s grazing program.¹¹¹ However, adverse impacts to the fishing program’s revenues, as well as damage to parts of the riparian zones, led the Trust away from its 2008 approach.¹¹²

By 2009, the grazing and science program transitioned from managing interim programs for domestic livestock grazing to a more comprehensive approach to range management.¹¹³ Its NEPA documentation stated that the Trust worked hard to meet both the legal requirements as well as the spirit of NEPA.¹¹⁴

The Trust developed a formula for determining a multiple-use, sustained yield of forage resources that addressed the needs of the

109. *Id.*

110. *Id.*

111. STATE OF THE PRESERVE 2012, *supra* note 41, at 61.

112. *Id.* at 58.

113. *Id.*

114. *See generally* VALLES CALDERA TRUST, ENVIRONMENTAL ASSESSMENT: MULTIPLE USE AND SUSTAINED YIELD OF FORAGE RESOURCES (Apr. 7, 2009) [hereinafter MUSY EA].

A document in itself does not meet either the spirit or the legal standard of NEPA. It is the process leading up to and in combination with, the document that must meet the standard. In the instance of the Stewardship Action, Multiple Use and Sustained Yield of Forage (MUSY-Forage), the word journey may reflect a more accurate connotation of what has occurred than process. The journey has included an exploration and quantification of a newly acquired jewel of public land, (the Preserve), as well as developing the organization and system to embark on this “experiment in public land management”. It has been an arduous journey at times, and many travelers have been along for all or part of the adventure! Like many other aspects of government, successful implementation of the NEPA is best achieved through participation by an engaged citizenry, objective experts, and an open government organization. The investment in this particular journey will allow future planning efforts related to the use and management of natural resources to be accomplished in much shorter trips!

Id. at 3.

grazing program, the recreation and hunting programs, as well as the overall ecology of the Preserve.¹¹⁵ Each year, the Preserve used extensive monitoring data from the previous years, projected climate forecasts, and other factors to estimate stocking rates.¹¹⁶ It estimated not only the impact of cattle but also the amount of available forage for the resident population of approximately 3,000 elk and included a goal of leaving 60% of forage vegetation for ecosystem services, including soil erosion prevention and carbon sequestration.¹¹⁷ That said, it acknowledged the need for an adaptive approach rather than hard percentages:

The proposed allocation of forage is a conservative approach to ensure that over use is not ubiquitous, repeated, or excessive. Adaptive management, guided by the proposed system of goals, objectives, and monitored outcomes is designed to inform managers at various scales to ensure the integrity of the system as a whole is maintained or improved over time. Actual allocation and capacity can be adjusted based on the assigned area and duration of use, the types or class of animals, available management tools (herding, fences, lures), and environmental conditions.¹¹⁸

The grazing program also shifted from Preserve-wide, rapid rotating grazing to an approach that restricted grazing to the Preserve's upland pastures, using stock ponds rather than natural streams to herd cattle.¹¹⁹ The Trust worked with New Mexico State University to operate the program.¹²⁰ The approach "included cow-calf pairs from local livestock owner/operators, replacement heifers, and a research project to address brisket disease in cattle (a

115. See *id.* at Appendix B. Monitored Outcomes 1–2.

116. See *id.*

117. See STATE OF THE PRESERVE 2012, *supra* note 41, at 61. Monitoring also included assessment of plant diversity. MUSY EA, *supra* note 114 at Appendix B. Monitored Outcomes.

118. MUSY EA, *supra* note 114, at 80–81.

119. See STATE OF THE PRESERVE 2012, *supra* note 41, at 58.

120. *Id.*

high-elevation sickness that can cause high mortality rates in livestock unaccustomed to grazing in mountain environments).¹²¹ The experimental program was beneficial both ecologically and financially by maximizing the number of ranchers in the program while also minimizing environmental issues, “and avoiding conflicts with the fishing” and recreational programs.¹²²

The program implemented in 2009 also included the removal of superfluous interior fences, the construction of new fences and relocation of corrals “as needed to operate ecological and economically sustainable programs for domestic livestock grazing.”¹²³ A decision was made in 2015 to allow grazing only in upland pastures on the Preserve in order to minimize environmental impacts.¹²⁴

The Trust’s grazing program provides an example of the learning-by-doing that is the hallmark of adaptive management. Information learned during each grazing season informed future management actions.¹²⁵ By integrating the grazing and science program together as equal partners, the Trust could build trust among the various stakeholders and defend its decisions over time. For example, the environmental group WildEarth Guardians, placed a bid one season, proposing to graze only a few animals while also offering to pay a hefty fee—effectively offering the Preserve money

121. *Id.*

122. *Id.*

123. *Id.* at 63.

124. *See* Interview with Bob Parmenter, *supra* note 92.

125. *See* NICHOLAS THOMPSON, LAND COVER CHANGE DURING A TRANSITION IN LAND MANAGEMENT AT VALLES CALDERA 1989-2013, 2 (July 25, 2016). A study of land cover change evaluating the effect of the change in ownership structure and management goals on land cover change at the Valles Caldera provided evidence that adaptive management strategies employed by the Trust were beneficial to the landscape. *Id.* at 54–55. The research evaluated rates of change in land cover for the final 10-year period of private ownership, from 1989-1999, and the first 10-year period of management under by the Trust from 2003-2013. *Id.* at 54. “[D]ata show variances in the rates of wetland and rangeland recovery between each management period.” *Id.* “The magnitude of wetland and rangeland recovery during the” Trust “managed change period was three times larger than the magnitude of wetland and rangeland recovery during the privately managed period, suggesting that” the Trust’s approach to grazing was more ecologically sound. *Id.* at 54–55.

to suspend its grazing program.¹²⁶ The Preserve went with lower bids that year (from neighboring Jemez Pueblo and New Mexico State University's livestock experimentation program) involving higher stocking rates and less money.¹²⁷ The WildEarth Guardians is known for its litigious nature, but it chose not to challenge the legality of the Preserve's decision. This is a testament to its overall support and respect for the program and the good will that can be earned when open communication and science are core elements of decision making. The Preserve's use of science as part of an iterative decision-making process through NEPA, in addition to its commitment to review past decisions to test the accuracy of prior NEPA analysis, provided a basis for learning and collaboration over time. By explicitly requiring monitoring under NEPA and also requiring subsequent action based on that information, the Preserve reconfigured NEPA's relationship to uncertainty.

Attempts to make grazing a substantial source of income, however, were unsuccessful.¹²⁸ During the last few years of management by the Trust, it granted two grazing permits, one permit was issued to Jemez Pueblo and the other to New Mexico State University.¹²⁹ Stocking rates were much lower than what was allowed historically.¹³⁰ In 2012, for example, permit holders were annually allowed 773 cattle for grazing—a far cry from the 5,000 allowed when

126. *Feds Refuse \$35,000 Offer to Keep Cows off Valles Caldera Preserve*, WILD EARTH GUARDIANS (Jan. 13, 2012), http://www.wildearthguardians.org/site/News2?page=NewsArticle&id=7421#_WH_rKRsrLIU.

127. *See Daniel Cusick, Valles Caldera Awards Grazing Contract to University-Led Consortium*, ENV'T & ENERGY NEWS (May 14, 2009), <http://www.eenews.net/landletter/stories/78023/search>.

128. *See Laura Paskus, Trouble on the Valles Caldera: Push to Keep Cows on Preserve Clashes with Mandate to Make Money*, HIGH COUNTRY NEWS (Nov. 28, 2005), <http://www.hcn.org/issues/311/15943>; *see generally* VALLES CALDERA TRUST, 2012 VCNP LIVESTOCK GRAZING REPORT 19 (2012) [hereinafter 2012 LIVESTOCK GRAZING REPORT].

129. *See* 2012 LIVESTOCK GRAZING REPORT, *supra* note 128 at 2. NMSU has a number of research and educational programs associated with this permit, including the "Top of the Valle" Bull Development Program, a Heifer Development and Artificial Insemination Program, and a Regional Cow/Calf Outreach and Grazing Program. *Id.* at 7.

130. *See* Paskus, *supra* note 129.

the land was privately owned.¹³¹ For these permits, the Trust received \$30,920 in grazing fee revenue.¹³² Expenditures estimated for administering the program, however, were \$26,196.¹³³ This resulted in a net income of only \$4,724.¹³⁴ As with its other programs, the Trust has not always made financial gain the top priority. In 2009, the Trust chose to renew the permits of the current holders despite the fact that WildEarth Guardians offered to pay \$50,000 for the right to graze fewer than a dozen cattle.¹³⁵ This decision reflects the larger goals of the program and provides an example of the Trust's relegation of financial self-sufficiency as one of many management goals.

V. CONCLUSION

The Trust's grazing program provides an inspiring case study in science-based adaptive management. It invested in NEPA procedures that included adaptive management, required mitigation and monitoring, and used both as part of its decision-making process. It also demonstrated NEPA's potential to provide a regulatory home for adaptive management.¹³⁶ Investment in baseline data, GIS mapping, ongoing monitoring, and public process all made the Preserve's decisions better informed and correspondingly more acceptable to the public. The decision to use science-based adaptive management provided the Preserve with a basis in decision making and demonstrated that even controversial decisions like stocking rates for grazing can be made in ways that reduce conflict and build trust. The 2014 legislation transferring its operation to the NPS states that grazing "shall" occur as appropriate for scientific

131. *Id.*; 2012 LIVESTOCK GRAZING REPORT, *supra* note 129 at 2.

132. *See* 2012 LIVESTOCK GRAZING REPORT, *supra* note 129 at 2.

133. *Id.* at 19.

134. *Id.*

135. *See* Cusick, *supra* note 127.

136. *See* Benson & Garmestani, *supra* note 48 at 1427 (arguing NEPA would be an appropriate regulatory home for formal adaptive management protocols).

and educational purposes.¹³⁷ Continued use of adaptive management for the Preserve's already modest grazing program would serve both purposes, and the current plan is to continue along these lines.¹³⁸ This will allow this form of range management to continue and provides a basis for learning across federal agencies.

137. Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015, Pub. L. No. 113-291, § 3043(b)(6), 128 Stat 3292, 3794 (2014) ("The Secretary shall allow the grazing of livestock within the Preserve to continue— (A) at levels and locations determined by the Secretary to be appropriate, consistent with this section; and (B) to the extent the use furthers scientific research or interpretation of the ranching history of the Preserve.").

138. Personal communication with Bob Parmenter, Director Science Services Division of the Valles Caldera Trust, Dec. 6, 2016.