

Pace Environmental Law Review

Volume 33

Issue 3 Spring 2016

*Climate, Energy, and Our Underlying Environmental
Ethic*

Article 1


April 2016

Learning to Live with the Trickster: Narrating Climate Change and the Value of Resilience Thinking

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Recommended Citation

Robin Kundis Craig, *Learning to Live with the Trickster: Narrating Climate Change and the Value of Resilience Thinking*, 33 Pace Envtl. L. Rev. 351 (2016)

Available at: <http://digitalcommons.pace.edu/pelr/vol33/iss3/1>

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ARTICLE

Learning to Live with the Trickster: Narrating Climate Change and the Value of Resilience Thinking

ROBIN KUNDIS CRAIG*

The world around us is changing. The Intergovernmental Panel on Climate Change (IPCC) extensively documented this fact in its 2013–2014 Fifth Assessment Report,¹ and numerous national and regional reports have done the same on more local scales.² Indeed, the IPCC pulled few punches regarding the fact

* William H. Leary Professor of Law, University of Utah S.J. Quinney College of Law. This article is adapted from the 2015 Lloyd K. Garrison Lecture on Environmental Law that I gave at the Pace University School of Law on April 1, 2015. My thanks to Professor Jason Czarnezki at Pace for inviting me to give the lecture and to Leslie Crincoli for all her work in coordinating my visit. This article is based in large part on work that Professor Melinda Harm Benson, University of New Mexico, and I have been doing for our forthcoming book *The End of Sustainability*, and so I would also like to thank Mindy for her generous and continuing efforts on that project. Nevertheless, this article is my adaptation of that work, and I remain solely responsible for its contents. I may be reached at robin.craig@law.utah.edu.

1. The IPCC's Fifth Assessment Report consists of four reports published in 2013 and 2014: Intergovernmental Panel on Climate Change, *Climate Change 2013: The Physical Science Basis* (2013), <http://www.ipcc.ch/report/ar5/wg1/> [<https://perma.cc/B5MJ-698F>] [hereinafter *2013 IPCC Physical Science Report*]; Intergovernmental Panel on Climate Change, *Climate Change 2014: Impacts, Adaptation, and Vulnerability* (2014), <http://www.ipcc.ch/report/ar5/wg2/> [<https://perma.cc/74VE-63VE>, <https://perma.cc/UDK9-FPMJ>] [hereinafter *2014 IPCC Adaptation Report*]; Intergovernmental Panel on Climate Change, *Climate Change 2014: Mitigation of Climate Change* (2014), <http://www.ipcc.ch/report/ar5/wg3/> [<https://perma.cc/4UDP-W7DJ>] [hereinafter *2014 IPCC Mitigation Report*]; Intergovernmental Panel on Climate Change, *Climate Change 2014: Synthesis Report* (2014), <http://www.ipcc.ch/report/ar5/syr/> [<https://perma.cc/8DNP-HZMP>] [hereinafter *2014 IPCC Synthesis Report*].

2. See, e.g., U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES (2014), http://s3.amazonaws.com/nca2014/low/NCA3_Climate_Change_Impacts_in_the_United%20States_LowRes.pdf?download

that change is our new reality, leading off its synthesis Summary for Policymakers by emphasizing that “[h]uman influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems.”³ These ongoing changes include alterations to air temperature and wind currents, ocean temperature and currents, and terrestrial and weather conditions around the world; to the ecosystems that depend upon those global systems and the ecosystem services that they can provide; and to the societies that depend upon those ecosystems, including their products, functions, and services.⁴

Importantly, how humans understand and frame this new world of continuous, unprecedented, multiple-sector, multiple-scale, and often unpredictable change matters considerably to how we experience that change and how well we continue to interact with ecological systems. Of course, some of our future interactions with ecological change will be mediated by the existing structures of our socio-ecological systems; as the U.S. Global Change Research Program reported in 2014, “[c]limate changes interact with other environmental and societal factors in ways that can either moderate or intensify these impacts.”⁵

However, what might be termed the cultural psychology of change—our cultural narratives of change—will also matter. Cultural narratives are deeply embedded social stories that frame and contextualize events within a particular culture to help give

ad=1 [https://perma.cc/EL3N-PA4H]. As this assessment notes, “[i]mpacts related to climate change are already evident in many regions and sectors and are expected to become increasingly disruptive across the nation throughout this century and beyond.” U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: HIGHLIGHTS 7 (2014), http://www.globalchange.gov/sites/globalchange/files/NCA3_Highlights_LowRes-small-FINAL_posting.pdf [https://perma.cc/2XWG-W5JX] [hereinafter 2014 USGCRP HIGHLIGHTS REPORT].

3. 2014 IPCC Synthesis Report, *supra* note 1, at 2.

4. Robin Kundis Craig, “Stationarity Is Dead”—*Long Live Transformation: Five Principles for Climate Change Adaptation Law*, 34 HARV. ENVTL. L. REV. 9, 23–26 (2010).

5. 2014 USGCRP HIGHLIGHTS REPORT, *supra* note 2, at 7.

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them meaning.⁶ “[N]arrative is a fundamental mode of [human] thought,”⁷ and anthropologists have long studied creation stories, myths, folklore, and personal narratives for insights into how particular cultures construct and inform personal and cultural identity, give meaning to events, and perpetuate and inculcate social norms.⁸ Such cultural narratives, moreover, are particularly important during times of change.⁹ This article examines how American culture narrates the myriad and often complex and unpredictable alterations that climate change is bringing to our global systems, particularly in terms of environmental and natural resources law and policy.

This article is based on the 2015 Pace Garrison Lecture that occurred on April 1, 2015. Fittingly for a talk given on April Fool’s Day, this article focuses on tricksters. It posits that framing climate change as one incarnation of a mythological trickster can give us a better cultural narrative framework for thinking about environmental, natural resources, and energy law and policy in a climate change era. The trickster narrative can helpfully displace the dominant engineering framework that informs most of American¹⁰ environmental, natural resources, and energy law and policy and open the way to a more productive policy context based on ecological resilience and resilience thinking.

6. Linda C. Garro & Cheryl Mattingly, *Narrative as Construct and Construction*, in *NARRATIVE AND THE CULTURAL CONSTRUCTION OF ILLNESS AND HEALING* 1, 1 (Cheryl Mattingly & Linda C. Garro, eds., 2000).

7. *Id.* at 2.

8. *Id.* at 3–5.

9. Paul Schiff Berman, *Law, Culture, and Community*, *PoLAR*, Nov. 2000, at 170, 170.

10. This article deliberately focuses solely on United States culture, law, and policy, and the interactions among them, recognizing that cross-cultural comparisons are difficult at best and potentially fraught with insurmountable discontinuities and acknowledging that, even within the United States, there are identifiably different cultural attitudes toward climate change. *See generally, e.g.*, ANTHONY LEISEROWITZ ET AL., *YALE PROJECT ON CLIMATE CHANGE COMM’N, GLOBAL WARMING’S SIX AMERICAS IN SEPTEMBER 2012* (2012), <http://environment.yale.edu/climate-communication/files/Six-Americas-September-2012.pdf> [<https://perma.cc/4FUQ-47TS>] (identifying six groups of Americans by their responses to climate change science). That said, however, it is worth noting that calls for new cultural narratives in the face of climate change are also emerging in other developed nations. *E.g.*, Dan Hamburg, *Needed: A New Cultural Narrative*, *CULTURE CHANGE* (Dec. 3, 2010), <http://www.culturechange.org/cms/content/view/688/65/> [<https://perma.cc/HDG2-WF9H>].

Part I of this article will examine the general importance of cultural narratives to society and law. Part II, in turn, examines the narrative that has dominated U.S. environmental and natural resources law and policy since the middle of the 20th century, a narrative that this article refers to as “Humans as Controlling Engineers.” In Part III, this article examines the cultural narratives that have emerged in the United States to date as responses to climate change, concluding that they all either continue the “Humans as Controlling Engineers” narrative into a climate change era or promote human helplessness (and hopelessness) in the face of climate change impacts. A much better cultural narrative, Part IV argues, is the narrative of the trickster—a narrative that has been unusually (compared to the rest of the world) but emphatically missing from European-derived American culture. Viewing climate change as the 21st-century trickster would not only help Americans to contextualize the many complexities of climate change but would also help to create a cultural context that can promote resilience thinking and the unavoidable necessity of transformation, both social and ecological.

I. THE ROLE OF CULTURAL NARRATIVES

A. Cultural Narratives and Change

How we think about the natural world and our relationship to it matters.¹¹ Moreover, these relationship stories are in fact a form of narrative—that is, a cultural story about how we exist with and within natural systems. This article posits that climate change creates the need in the United States for a new cultural narrative about our relationship to the natural world and ecological systems, a narrative that accepts continual change and adaptation as its foundation while still empowering humans to act.

11. As Melinda Harm Benson has observed, “How we think about environmental management challenges is important. It matters because our characterization of these challenges dictates both how we perceive them and then, correspondingly, how we integrate these perceptions into our legal and institutional frameworks.” Melinda Harm Benson, *Reconceptualizing Environmental Challenges—Is Resilience the New Narrative?*, 21 J. ENVTL. & SUSTAINABILITY L. 99, 100 (2015).

In general, cultural narratives help members of a particular culture to frame and contextualize their own and their communities' place in the world.¹² These narratives can also help to instill value systems into members of the community prior to, or instead of, individual experience—i.e., the cultural stories can both substitute for and precondition a person's direct experience with dilemmas and choices. Thus, for example, researchers have argued that cultural narratives can instill moral reasoning norms and principles even if individuals within that culture are unlikely to encounter the particular morality challenge at issue in the narrative, or before they encounter it personally.¹³

In the climate change context, this research suggests that all of us are preconditioned by our specific cultural narratives to react to climate change in particular ways. In addition, cultural narratives mediate how cultures both respond to change and change themselves.¹⁴ Robert Berman, for example, has emphasized that “[n]arratives are particularly relied upon in times of change, disorientation, trauma, and conflict. A society's social institutions must function as storytellers at such crisis moments. Religious narratives and their accompanying rituals are the clearest example of an institution constructing meaning out of death and other irrational and frightening events.”¹⁵ In a more classificatory approach, Robert Justin Lipkin distinguished between deliberative and dedicated cultures in terms of how they process change:

12. Garro & Mattingly, *supra* note 6, at 2–7.

13. Morteza Dehghani et al., *The Role of Cultural Narratives in Moral Decision Making*, 31 PROC. OF THE ANN. CONF. OF THE COGNITIVE SCI. SOC'Y (2009), http://www.qrg.northwestern.edu/papers/files/qrg_dist_files/qrg_2009/narratives-cogsci09-md-19.pdf [<https://perma.cc/BZ5Z-7KNQ>].

14. Thomas F. Thornton & Patricia M. Thornton, *The Mutable, the Mythical, and the Managerial: Raven Narratives and the Anthropocene*, 6 ENV'T & SOC'Y: ADVANCES IN RES. 66, 67 (2015) (“Narrative frames often organize our perceptions and interpretations of experience, transforming ‘what would otherwise be a meaningless aspect of the scene into something that is meaningful’ They are important guides for understanding phenomena such as social and environmental change, which develop as plots, with causal chains, perpetrators, victims, conflicts and resolutions.” (quoting ERVING GOFFMAN, *FRAME ANALYSIS: AN ESSAY ON THE ORGANIZATION OF EXPERIENCE* 21 (Northeastern Univ. Press ed., 1986)).

15. Berman, *supra* note 9, at 170.

A deliberative culture is committed to the deliberative attitude which is concerned with rational autonomy as the basic principle for deciding personal and cultural issues. This type of culture employs a deliberative process for settling social conflicts and for cultural change. *Deliberative ideals, both on an individual and a cultural level, continually seek to modify, revise, and refine cultural values.* By contrast, a dedicated culture embraces continuity and closure in the values it seeks. Dedicated cultures possess a cultural narrative providing a normative theme for grounding the culture. Typically this theme explains the origination of the culture and why the relevant cultures values are sanctioned. *Dedicated cultures approach conflict resolution and cultural change through sanctified tradition and custom.*¹⁶

Clearly, U.S. culture has elements both of dedicated and deliberative cultures. However, it is fair to say that, so far, the United States' collective political and legal response to climate change has reflected a dedicated culture far more than a deliberative culture—a collective unwillingness to give up the “American way of life.”¹⁷ Our existing cultural narratives are working against us effectively embracing and implementing climate change adaptation.

B. Cultural Narratives and Law

While cultural narratives often operate on an individual level, they are also important to the formation and implementation of law and governance, although both culture and the law and narrative and the law interact in complex relationships. On the culture side, as Christine Lorillard has observed, “[i]t has become an axiom . . . that law and culture intersect and influence each other. It has also become almost axiomatic that what the law attempts to dictate, culture may not

16. Robert Justin Lipkin, *In Defense of Outlaws: Liberalism and the Role of Reasonableness, Public Reason, and Tolerance in Multicultural Constitutionalism*, 45 DEPAUL L. REV. 263, 328 (1996) (emphasis added) (citations omitted).

17. See, e.g., Nick Desai, *Climate Change and the American Way*, HUFFINGTON POST AUSTRALIA. (July 29, 2014, 2:35 PM), http://www.huffingtonpost.com/nick-desai/climate-change-and-the-am_b_5631139.html?ir=Australia [<https://perma.cc/4AA6-NYLB>] (noting “the alarming number of Americans big oil has deluded into not only denying basic science, but also becoming actual defenders of fossil fuels as somehow protecting the American way of life.”).

allow to happen.”¹⁸ Adding to the complexity, legal narratives—such as those embodied in judicial decisions—collectively constitute a culture of their own, traditionally (in the United States and elsewhere) reflecting an empowered white male subculture.¹⁹ Given this complex relationship between law and culture, moreover, changes in the law can both promote (as in court racial desegregation orders) and reflect (as in increased consumer protections in contract and landlord-tenant law) changes in the surrounding social culture. As such, law becomes one means of narrating culture. As Paul Berman has acknowledged, narrative is an important component of law’s construction of cultural meaning, because “[l]aw is . . . a discourse for conceptualizing reality, or, as anthropologist Clifford Geertz put it, ‘law is . . . part of a distinctive manner of imagining the real.’ Thus, law is one mechanism through which we construct meaning from the world around us.”²⁰

On the narrative side, legal theorists often emphasize how important narrative is to law. For example, at a basic and pragmatic level, practitioners exhort the importance of narrative and storytelling in legal persuasion.²¹ At a deeper level, however, Randy Gordon has argued that “narratives often stand in the formative background of laws. This is true for statutory and common law alike.”²² Thus, cultural narratives can directly

18. Christine Metteer Lorillard, *Stories that Make the Law Free: Literature as a Bridge Between the Law and the Culture in Which It Must Exist*, 12 TEX. WESLEYAN L. REV. 251, 251 (2005) (citing Robert M. Cover, *Nomos and Narrative*, 97 HARV. L. REV. 4, 9–10 (1983)).

19. *Id.* at 255–56.

20. Berman, *supra* note 9, at 170.

21. *E.g.*, Jeffrey D. Jackson, *For Effective Persuasion, Don’t Neglect the Narrative*, J. KAN. BAR ASS’N, Apr. 2015, at 12, 12 (“Judges and jurors have one major thing in common: they are people. Because they are people, they more easily understand concepts if those concepts are presented as part of a story.”); Jonathan K. Van Patten, *Storytelling for Lawyers*, 57 S.D. L. REV. 239, 239 (2012) (“One of the principal techniques of persuasion comes through understanding the art of storytelling.”).

22. RANDY GORDON, REHUMANIZING LAW: A NARRATIVE THEORY OF LAW AND DEMOCRACY 2 (2008), <https://www.era.lib.ed.ac.uk/bitstream/handle/1842/2655/Rehumanizing%20Law.pdf?sequence=6&isAllowed=y> [<https://perma.cc/7VQY-YZPJ>]. See generally *id.* at 59–66 (discussing the various narratives at play in the United States in the 19th century that led to Congress’s adoption of food safety laws).

influence the exact scope and content that positive law takes in a specific place and/or with respect to a specific subject.²³

This permeation of law by cultural narrative also occurs in environmental law and in the emerging laws and policies to cope with climate change, as Part II will discuss in more detail. However, as is always true with all law and culture, the mutual influence of environmental law and cultural narrative is two-way and complex. Thus, for example, translating existing legal narratives into climate change disputes has already been recognized as one means for Americans to get a social and legal grip on climate change. For instance, Laura King has argued that the climate change common-law nuisance litigation created “a new legal narrative [that] soothed psychological chaos and initiated problem-solving by giving shape and in particular by assigning agency to an amorphous problem.”²⁴

In other words, employing a familiar legal narrative of public nuisance can provide society with a sense of empowerment and control in dealing with the apparent chaos of climate change. As scholars have discussed at length, however, for a variety of reasons ranging from institutional capacity to specific legal infirmities, public nuisance litigation is unlikely to provide the U.S. legal system with a comprehensive framework for either climate change mitigation or climate change adaptation.²⁵ At the same time, as the next Part explores, existing statutory law embodies the wrong cultural narrative for a climate change era,

23. See, e.g., Ryan Chabot, *Found Innocent: Revealing the Law's Narrative Child Witnesses*, 24 L. & LITERATURE 319, 322 (2012) (arguing that the Anglo-American cultural narrative of the child “pervades legal discourse”).

24. Laura King, *Narrative, Nuisance, and Climate Change*, 29 J. ENVTL. L. & LITIG. 331, 333 (2014).

25. See David A. Dana, *The Mismatch Between Public Nuisance Law and Global Warming*, 18 SUP. CT. ECON. REV. 9, 13–35 (2010) (emphasizing the inability of courts to deal with climate change nuisance cases); Stephen M. Johnson, *From Climate Change and Hurricanes to Ecological Nuisances: Common Law Remedies for Public Law Failures?*, 27 GA. ST. U. L. REV. 565, 566 (2011) (arguing that causation presents a nearly insurmountable problem for climate change nuisance cases); Matthew Edwin Miller, *The Right Issue, The Wrong Branch: Arguments Against Adjudicating Climate Change Nuisance Claims*, 109 MICH. L. REV. 257, 264–87 (2010) (arguing that climate change nuisance cases are neither justiciable nor redressable). Notably, to date, no climate change nuisance lawsuit has succeeded in forcing anyone—defendants or the courts—to deal with climate change. Moreover, nuisance has some more comprehensive limitations as a legal framework.

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similarly failing to provide a workable framework for dealing with the Anthropocene.²⁶

II. OUR CURRENT DOMINANT NARRATIVE IN ENVIRONMENTAL AND NATURAL RESOURCES LAW: HUMANS AS CONTROLLING ENGINEERS

The main argument of this Part is that the United States needs a different cultural narrative than that which environmental and natural resources law have historically relied upon to deal with climate change adaptation.²⁷ To begin, however, it is worth acknowledging that scholars have characterized and categorized the various narratives of environmental law in different ways. This Part begins by surveying those other classifications and characterizations before focusing on the narrative that this article considers most damaging, the narrative of “Humans as Controlling Engineers.”

26. The “Anthropocene” is a popular—and soon perhaps official—designation for the climate change era:

The imperative for science to classify timescales of environmental change in the earth’s development recently has resulted in the promulgation of a suggested new geologic epoch: the Anthropocene. The term combines the Greek root for humans, *Anthropos*, with the term for new, “cene,” and is usually glossed as “The Age of Humankind.” It was first used by the Nobel laureate scientist Paul Crutzen and his colleague Eugene Stoermer as a label “to emphasize the central role of mankind in geology and ecology . . . [and that] the impacts of current human activities will continue over long periods.” . . . Meanwhile, the International Commission on Stratigraphy (ICS), the scientific body charged with authenticating classifications of the planet’s developmental stages, will render its decision on whether or not to accept the new term and epoch in 2016, and the social sciences and humanities are weighing in on the Anthropocene’s claim of humankind’s new status as a full-fledged geologic force.

Thornton & Thornton, *supra* note 14, at 66–67 (citations omitted).

27. As Thornton & Thornton assert, “scientists interested in creating an informed public around the crisis of climate change must first overcome the challenge imposed by this new imagining of human agency on an unprecedented scale: ‘Our thinking about ourselves now stretches our capacity for interpretive understanding.’” *Id.* at 67 (quoting Dipesh Chakrabarty, *Postcolonial Studies and the Challenge of Climate Change*, 43 *NEW LITERARY HIST.* 1, 13 (2012)).

A. Narratives of Environmental Law and Environmental Management

As noted, scholars have characterized environmental law narratives in the United States in a variety of ways. However, two approaches to the intersection of environmental/natural resources law and narrative are particularly relevant here. The first approach might be referred to as identifying the narratives *in* environmental law—that is, the tropes and stories that recur throughout American environmental and natural resources law, particularly in the law’s application to particular circumstances.²⁸ It is with this sense of environmental law narrative, for example, that Michael Burger has persuasively argued that the development of environmental jurisprudence in the United States has been “something less rational” than what is normally argued—namely, an iterative response to recurrent and competing stories that seek to instantiate competing environmental narratives.²⁹ Arguing that “narrative is essential to environmental discourse,” Burger identifies four important ecological narratives recurring throughout U.S. environmental and natural resources law: the pastoral; wilderness and wildness; the “environmental apocalyptic;” and “toxic tales.”³⁰ Dating to classical times:

[t]he pastoral project is to craft an image and a myth for the natural world. It operates by situating people in what theorist Leo Marx termed the “middle landscape,” a pasture bordered on one side by the city and on the other by the wilderness, but spared the “deprivations and anxieties” of both.³¹

As an environmental law narrative, the pastoral takes three forms: “the elegy, which looks back to a lost history; the idyll, which celebrates an abundant present; and the utopia, which

28. For example, Fred Light has noted the importance of “the historical/cultural narratives of Love Canal, Bhopal, or Exxon Valdez as keys to statutory interpretation” in environmental law. Alfred R. Light, *Anthony G. Amsterdam and Jerome Bruner, Minding the Law (Harvard 2000)*, 13 ST. THOMAS L. REV. 415, 419–20 (2000) (book review).

29. Michael Burger, *Environmental Law/Environmental Literature*, 40 ECOLOGY L.Q. 1, 3–4 (2013).

30. *Id.* at 14, 16.

31. *Id.* at 17.

looks forward to an idealized future.”³² In contrast, “[t]hough it shares some of the pastoral’s anthropocentric and humanist values, the wilderness idea emphasizes the importance of non-human nature.”³³ The wilderness narrative is linked to “notions of authenticity, freedom and purity” but also to fear, distrust, and justification of eradication instincts.³⁴ Next, according to Burger, “[t]he environmental apocalyptic is rooted in the Christian prophetic tradition and remains ‘the single most powerful master metaphor that the contemporary environmental imagination has at its disposal.’”³⁵ The environmental apocalyptic invokes nostalgia for a world that is about to be lost while at the same time holding out hope that humans can avoid the apocalypse.³⁶ Finally, “toxic tales . . . can at their most generic scale be defined as ‘expressed anxiety arising from perceived threat of environmental hazard due to chemical modification by human agency.’”³⁷ In a toxic tale, “nature is important not in its invocation of a particular pastoral idea, nor in its manifestation as a wilderness refuge, but precisely because of its impacted nature, because it is already always a ‘second nature.’”³⁸

The second approach to narrative and environmental law is the project of identifying the narratives of environmental and natural resources law—that is, the story of these branches of law as a discipline. As one recent example of this approach, Melinda Harm Benson has recently identified three narratives to describe

32. *Id.*

33. *Id.*

34. *Id.* at 18–19; see also Shaun Fluker, *Ecological Integrity in Canada’s National Parks: The False Promise of Law*, 29 WINDSOR REV. LEGAL & SOC. ISSUES 89, 122 (Apr. 2010) (discussing the “wilderness paradox” and noting that “wilderness narratives construct nature as the ultimate good, using science, ethics, or both as justification”).

35. Burger, *supra* note 29, at 20 (quoting LAWRENCE BUELL, *THE ENVIRONMENTAL IMAGINATION: THOREAU, NATURE WRITING, AND THE FORMATION OF AMERICAN CULTURE* 285 (1996)).

36. *Id.*; see also Jimmie Killingsworth & Jacqueline S. Palmer, *Millennial Ecology: The Apocalyptic Narrative from Silent Spring to Global Warming*, in GREEN CULTURE: ENVIRONMENTAL RHETORIC IN CONTEMPORARY AMERICA 21, 21, 30 (Carl. G. Herndl & Stuart C. Brown eds., 1996) (tracing the history of the apocalyptic narrative in American environmental thought).

37. Burger, *supra* note 29, at 21 (quoting LAWRENCE BUELL, *WRITING FOR AN ENDANGERED WORLD: LITERATURE, CULTURE, AND ENVIRONMENT IN THE U.S. AND BEYOND* 31 (2009)).

38. *Id.* (quoting BUELL, *supra* note 35, at 45).

the historical arc of American environmental management: the tragedy narrative, the sustainability narrative, and the resilience narrative.³⁹ The tragedy narrative characterizes the beginning of the environmental movement, when post-World War II studies began revealing the negative impacts that humans were having on the environment.⁴⁰ As Benson notes, a “combination of concern and idealism . . . gave birth to the environmental movement. While there was a growing fear of our newfound capacities to alter our world, there was also faith in the ability of science and technology to make the world a better place.”⁴¹ The resulting environmental laws were prescriptive and generally took a “command and control” approach and “proved very effective addressing what might be considered the ‘low hanging fruit’ or ‘end of pipe’ environmental problems, *i.e.*, those that can be addressed by identifying causes and then placing restrictions or processes on specific sources.”⁴² The second sustainability narrative, in turn, “focuses less on problems and fears and more on finding a more balanced way to manage the impacts associated with resource consumption and other environmental woes. ‘Sustainability’ in this case refers to the long-term ability to continue to engage in a particular activity, process, or use of natural resources.”⁴³ This narrative emerged significantly at the 1992 United Nations Conference on Environment and Development and has been gaining steam internationally ever since,⁴⁴ although sustainability has yet to significantly alter U.S. environmental and natural resources laws and policies. Finally, and in contrast to the other two narratives, “resilience thinking is grounded in an acknowledgement of uncertainty and disequilibrium within [socio-ecological systems], with a ground-level acknowledgement that change is not only always possible but also to be expected.”⁴⁵ Specifically, “[i]n contrast to the sustainability narrative, the emphasis in resilience thinking is on understanding the dynamics and complexities of the [socio-

39. Benson, *supra* note 11, at 102–03.

40. *Id.* at 105.

41. *Id.*

42. *Id.* at 107.

43. *Id.* at 110.

44. *Id.* at 111.

45. Benson, *supra* note 11, at 115.

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ecological systems], not on determining and then maintaining a fixed system state. The emphasis is *building adaptive capacity* rather than *maintaining stationarity*.⁴⁶

Both narrative projects reveal important facets of American environmental and natural resources law and policy. Blending the two, what I would like to argue here is that most U.S. environmental and natural resources law and policy have never transitioned out of Benson's tragedy narrative, leaving us with a paradigm narrative that humans are still very much in control of ecological and socio-ecological reality—the "Humans as Controlling Engineers" narrative.

B. The "Humans as Controlling Engineers" Narrative

The "Humans as Controlling Engineers" narrative in U.S. environmental and natural resources law and policy emphasizes human control over nature. Within this narrative, for most of the history of environmental law in the United States, humans have claimed the considerable ability to control and modulate human impact on ecological systems. As Benson has noted, this view is in large part remnant of the technological exhilaration that the United States experienced in the wake of World War II, underscored in the 1960s by landing a man on the Moon.⁴⁷ Americans could, it seemed, do anything we wanted with respect to harnessing nature's resources—down to and including atoms—and with respect to conquering nature's challenges, like the vacuum, cold, and immense distances of outer space. Humans appeared to be the technological masters of the universe.⁴⁸

46. *Id.* at 116.

47. *Id.* at 103–04; see also TED NORDHAUS & MICHAEL SHELLENBERGER, *BREAK THROUGH: FROM THE DEATH OF ENVIRONMENTALISM TO THE POLITICS OF POSSIBILITY* 6 (2007).

48. See BARRY COMMONER, *THE CLOSING CIRCLE* 128–29 (1971) (indicating that because "technologies have rapidly transformed the nature of industrial and agricultural production" there were significant changes after World War II in the "pace of environmental deterioration"); Alyson C. Fluornoy, *Restoration Rx: An Evaluation and Prescription*, 42 ARIZ. L. REV. 187, 201 (2000) ("Human population and the power and speed of our technology for altering the environment have changed dramatically since the end of World War II, and the consequences of these changes have only begun to unfold over the past thirty years."); Daniel Solomon, *Eras*, 29 FORDHAM URB. L.J. 1439, 1441 (2002) ("The whole evolution of the American townscape can be divided into eras—one that begins with the earliest colonial settlements and ends at World War II, one that

Within this narrative framework, humans have the ability to manage and transform ecosystems to promote the values humans choose to prioritize.⁴⁹ On private land, for example, one such priority has been the promotion of farming—often increasingly on a massive scale and of monocrops—made possible through extensive soil fertilization, treatment of crops through pesticides, and (especially in the West) massive irrigation projects.⁵⁰ More recently, urbanization and especially suburbanization have been displacing farming as a top priority, leading Americans to replace millions of acres of wetlands, fields, and forests with pavement, asphalt, and lawn.⁵¹

The public lands, in turn, are engineered to serve a wide variety of American values, including national parks, timber production, cattle ranching, and energy production.⁵² Such

extends from then almost to the present, and now a new era with the work of a current generation reacting to what was built on such a vast scale with such hubris, blind optimism and historiophobia in the fifty years after the war.”).

49. “Optimizing for particular products has characterized the early development of natural resources management An optimization approach aims to get a system into some particular ‘optimal state’ and then hold it there. That state, it is believed, will deliver maximum sustained benefit.” BRIAN WALKER & DAVID SALT, *RESILIENCE THINKING: SUSTAINING ECOSYSTEMS AND PEOPLE IN A CHANGING WORLD* 6 (2006).

50. *Id.*

51. William E. Nelson & Norman R. Williams, *Suburbanization and Market Failure: An Analysis of Government Policies Promoting Suburban Growth and Ethnic Assimilation*, 27 *FORDHAM URB. L.J.* 197, 197 (1999) (“The social history of America in the twentieth century is one of suburbanization. At the turn of the century, most Americans lived in large, dense urban centers. Single tenements often housed multiple generations, even several different families. Today, the tenements remain, but where open pastures and forests once encircled America’s cities, single-family homes dot the landscape.”).

52. Jan Stevens & Richard Frank, *Current Policy and Legal Issues Affecting Recreational Use of Public Lands in the American West* 1 (Res. for the Future, Discussion Paper No. 09-23, 2009), https://www.law.berkeley.edu/files/RFF_Report_RFrank.pdf [<https://perma.cc/UE4W-9PQP>] (“Public lands can be used any number of ways: timber harvesting, water resource development, fisheries, recreation (both active and passive), wilderness preservation, wildlife habitat, and mineral development.”). These uses are often highly destructive as well as highly engineered. Michael C. Blumm, *Public Choice Theory and the Public Lands: Why “Multiple Use” Failed*, 18 *HARV. ENVTL. L. REV.* 405, 407 (1994) (describing multiple use management on the public lands and concluding that it has failed “because of pressure from stockmen’s associations, multiple use on the public rangelands has produced overgrazing; because of pressure from timber mills and timber-dependent communities, multiple use in the national forests has produced below-cost timber sales; because of pressure from

engineering efforts include fire suppression (and its long-term ecological consequences),⁵³ the destruction of old growth forests,⁵⁴ and the creation of roads,⁵⁵ recreational facilities,⁵⁶ mining operations (including newer drilling pads for hydraulic fracturing operations),⁵⁷ and a host of other permanent or semi-permanent infrastructure.

electric utilities and the aluminum industry, multiple use of Columbia Basin streamflows has made the Snake River salmon an endangered species.”)

53. Rebecca K. Smith, *War on Wildfire: The U.S. Forest Service’s Wildland Fire Suppression Policy and Its Legal, Scientific, and Political Context*, 15 U. BALT. J. ENVTL. L. 25, 28–29 (2007) (“In addition to inflicting human casualties, the war on wildfire inflicts ecological effects which may be more significant than the impact from allowing wildfires to burn. Tactics include using heavy machinery like bulldozers and fellerbunchers, fire line construction, ‘temporary’ road construction, and helicopter landing pad construction. These tactics can have long-term consequences such as erosion and soil compaction. Compacted fire lines may last for decades; erosion from fire lines may surpass the erosion which the fire would have caused; and vehicles and equipment may carry invasive species to the area.” (citations omitted)).

54. *Resources and Tools: Forest Facts—America’s Deforestation Crisis*, SAVE AM.’S FORESTS FUND, <http://www.saveamericasforests.org/pages/educationrtfacts.htm> [<https://perma.cc/ST86-VGD5>]. Pinning down an exact loss of “old growth” or numbers acres cut is difficult because of varying definitions. According to the Save America’s Forests Fund, however:

Less than 4% or under 40 million acres of America’s original forests remain in existence. According to the World Resources Institute, less than 1% of ‘Frontier Forests’—large, contiguous virgin forests with all the species intact—still exist in the lower 48 states. Of the original 1.04 billion acres of virgin forest in the U.S., over 96% has been cut down.

Id.

55. DAVID G. HAVLICK, NO PLACE DISTANT: ROADS AND MOTORIZED RECREATION ON AMERICA’S PUBLIC LANDS 73 (2002) (estimating that 550,000 miles of road had been built on public lands using various agencies’ best estimates).

56. See Stevens & Frank, *supra* note 52, at 9–10 (“The Bureau of Land Management reports that 80 percent of its contacts with the public relate to recreation, and that the number of recreational visitors to public lands has doubled over the last decade. Between 2000 and 2007, the number of individuals driving off-road increased around 19 percent in the number of participants, and the number of days 56 percent. Almost 146 million people viewed or photographed natural scenery in 2007, an increase of 14 percent in participants and 60.5 percent in days. Viewing or photographing wildlife, kayaking, big-game hunting, sightseeing, and visiting wilderness also rose between 2000 and 2007.” (citations omitted)).

57. Looking just at lands managed by the U.S. Bureau of Land Management, “[c]urrently on file with the Bureau of Land Management (BLM) are 4,272 mining plans and notices filed by 489 companies and 432 individuals, encompassing a total estimated area of 185,513 acres of BLM-managed public

America's waterways are perhaps the most engineered ecosystems of all. As Senator Bill Bradley of New Jersey once remarked, "man's attempt to control nature in the West meant damming, storing, and distributing the water of the great river basins; the Colorado, the Columbia, the Missouri and a few others."⁵⁸ However, engineered waterways are not just a western reality. As just one example, according to the U.S. Army Corps of Engineers, there are about 45,000 dams in the United States.⁵⁹ Some of these dams—1756 of them, to be precise—generate hydropower, accounting for about seven percent of the electricity produced in the United States in 2013.⁶⁰ Some of these dams control—or at least are supposed to control—floods, and flood control measures have engineered and changed the flows of almost all major rivers in the United States, from the Columbia River in the Pacific Northwest to the Missouri and Mississippi Rivers in the country's heart to the Chattahoochee River in Georgia and the Everglades in Florida to the Lower Hudson River in New York.⁶¹ Finally, some of the dams support irrigation projects. Although the use of water for irrigation is actually declining in the United States, according to the U.S. Geological Survey, in 2010 Americans still withdrew about 115 billion gallons per day of fresh water for irrigation, fifty-seven percent coming from surface water sources and the rest from

land in the United States." *Summary of Mining Plans of Operation on BLM Land*, ENVTL. WORKING GROUP, <http://www.ewg.org/mining/plans/index.php> [<https://perma.cc/PZ97-9HT5>].

58. Sen. Bill Bradley, *Water and the West*, 6 WYO. L. REV. 339, 342 (2006).

59. *Corps Map: National Inventory of Dams*, U.S. ARMY CORPS OF ENGINEERS, http://nid.usace.army.mil/cm_apex/f?p=838:1:0::NO::APP_ORGANIZATION_TYPE,P12_ORGANIZATION:1 [<https://perma.cc/A4YG-CWVJ>].

60. *Frequently Asked Questions*, NAT'L HYDROPOWER ASS'N, <http://www.hydro.org/tech-and-policy/faq/> [<https://perma.cc/Y25R-PGZG>].

61. *See generally, e.g.*, A. Dan Tarlock, *United States Flood Control Policy: The Incomplete Transition from the Illusion of Total Protection to Risk Management*, 23 DUKE ENVTL. L. & POL'Y FORUM 151 (2012). In addition, the U.S. Army Corps of Engineers' National Inventory of Dams database identifies more than 10,000 dams across the country for which flood control is listed as at least one of the dam's purposes. *CorpsMap: National Inventory of Dams*, U.S. ARMY CORPS OF ENGINEERS, http://nid.usace.army.mil/cm_apex/f?p=838:4:0::NO (follow "NID Interactive Report" hyperlink; then select "Flood Control" under the "Primary Purpose" column).

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groundwater.⁶² Irrigation withdrawals accounted for thirty-eight percent of total fresh water withdrawals in the United States, and the water irrigated about 62.4 million acres, an increase from 2005 of about 950,000 acres.⁶³

Of course, this willingness to engineer ecosystems in the United States came with environmental consequences—dustbowls and exhausted soils in farm lands;⁶⁴ the loss of salmon runs in the Pacific Northwest⁶⁵ and many parts of the Northeast;⁶⁶ polluted waters throughout the United States;⁶⁷ and increasing numbers of increasingly endangered species.⁶⁸

Notably, however, when the federal government and the states began to address these consequences in the 1960s and 1970s, their solutions still arose within the engineering narrative context. In essence, if humans broke it, humans could fix it. Or, from perhaps a more nuanced perspective, if human priorities for

62. MOLLY A. MAUPIN, JOAN F. KENNY, SUSAN S. HUTSON, JOHN K. LOVELACE, NANCY L. BARBER & KRISTIN S. LINSEY, *ESTIMATED USE OF WATER IN THE UNITED STATES IN 2010*, at 25 (2014).

63. *Id.*

64. *See Dust Bowl*, HISTORY CHANNEL, <http://www.history.com/topics/dust-bowl#> [<https://perma.cc/5UDQ-28DR>].

65. *See* John V. Byrne, *Salmon is King—Or is It?*, 16 ENVTL. L. 343, 346–54 (1986).

66. *See Atlantic Salmon (Salmo Salar)*, NOAA FISHERIES, <http://www.fisheries.noaa.gov/pr/species/fish/atlantic-salmon.html> [<https://perma.cc/RH6L-PNYA>] (“By the early 19th century, Atlantic salmon runs in New England, which historically occurred in almost every major river north of the Hudson River, were severely depleted. By the end of the 19th century, Atlantic salmon had been extirpated from three of the five rivers with the largest populations (Androscoggin, Merrimack, and Connecticut Rivers). In general, the abundance of Atlantic salmon continued to decline in all rivers through the first half of the 20th century.”).

67. *See National Summary of Impaired Waters and TMDL Information*, EPA (Mar. 21, 2016), http://iaspub.epa.gov/waters10/attains_nation_cy.control?p_report_type=T [<https://perma.cc/T4L4-GYSE>] (summarizing the thousands of waters in the United States that still do not meet their water quality standards).

68. Nicola Rowe, *Humans Are Directly to Blame for a Rise in the Number of Endangered Species, Claims Scientists*, DAILY MAIL (June 21, 2013, 11:11 AM), <http://www.dailymail.co.uk/sciencetech/article-2345874/Humans-ARE-directly-blame-rise-number-endangered-species-claims-scientists.html> [<https://perma.cc/BRW6-U3UB>] (noting research published in 2013 indicates that “[a]s the average nation grows the number of endangered species increases by 3% every ten years,” that “11% of animals worldwide will be endangered by 2050,” and that “humans are the leading cause of animal extinction.”).

particular ecosystems had changed, there was nothing to prevent humans from re-engineering the relevant natural systems to suit these new priorities.

As evidence of this assertion, consider the number of federal pollution control statutes grounded in human technological capability—the Clean Water Act’s effluent limitations,⁶⁹ the Clean Air Act’s emissions standards,⁷⁰ the Safe Drinking Water Act’s maximum contaminant levels.⁷¹ The pervasiveness of the “Humans as Controlling Engineers” narrative is also evident in the number of federal environmental and natural resources statutes that pursue preservation and restoration as prominent goals, implicitly and explicitly assuming the ability of human managers to return ecological systems to and then keep them in human-defined desirable states of being.⁷² For example, the Clean Water Act’s overall purpose incorporates both goals, seeking to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”⁷³ Both the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund)⁷⁴ and the Oil Pollution Act⁷⁵ allow governments and tribes to collect natural resources damages for ecosystems impaired by releases of hazardous substances and oil spills, respectively, and the basic measurement of those damages is the cost of restoring the area to pre-spill or pre-release conditions—a fairly explicit incorporation of the “if humans broke it, humans can fix it” mentality. Treatment, storage, and disposal facilities regulated under the

69. 33 U.S.C. § 1311 (2012).

70. 42 U.S.C. §§ 7411, 7479, 7501 (2012).

71. *Id.* § 300f.

72. “Indeed, one of the assumptions that pervades these laws is that anthropogenic change is unnatural and degrading, but also nontransformative and hence (generally) reversible. This assumption sets up the most basic paradigms of environmental and natural resource regulation and management: preservation and restoration.” Craig, *supra* note 4, at 32.

73. 33 U.S.C. § 1251(a).

74. 42 U.S.C. § 9607(f)(1) (noting that natural resources damages for CERCLA include “restor[ing], replac[ing], or acquir[ing] the equivalent of such natural resources”); 43 C.F.R. § 11.10 (2015).

75. 33 U.S.C. §§ 2702(b)(2)(A), 2706(b)(2)(A); 33 C.F.R. § 136.211(a) (2015) (noting that natural resources damages for the Oil Pollution Act include “the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of the damaged natural resources”).

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Resource Conservation and Recovery Act must undertake corrective actions if their activities contaminate land or groundwater, restoring those sites to pre-contamination status.⁷⁶ Similarly, the Surface Mining Control and Reclamation Act seeks to ensure that mining operations restore the disturbed landscape to something approaching its pre-mining condition.⁷⁷ The overall goals of the Endangered Species Act are to prevent the extinction of imperiled species and to restore them to populations that ensure that each species will thrive.⁷⁸ Multiple-use public lands management is more complex precisely because it anticipates and promotes continued human uses of public resources; nevertheless, the paradigm remains (legally, at least) to minimize human destruction of these resources.⁷⁹ Nevertheless, public lands managers have been moving toward an ecosystem management approach, with the goal of preserving ecosystem functions and services.⁸⁰

76. 42 U.S.C. § 6924(u), (v); *see also* 40 C.F.R. §§ 257.21–.28, 258.50–51 (2015).

77. 30 U.S.C. § 1265(b)(2) (2012) (requiring mining permittees to “restore the land affected to a condition capable of supporting the uses which it was capable of supporting prior to any mining”).

78. 16 U.S.C. §§ 1531(b), 1532(3) (2012); *see also* 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, 940, 968–75 (1997) (discussing the “uniformitarian” approach of the ESA).

79. *See, e.g.*, 43 U.S.C. § 1701(a)(8) (2012) (declaring a national policy that public land management “protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values,” “preserve and protect certain public lands in their natural condition,” “provide food and habitat for fish and wildlife and domestic animals,” and “provide for outdoor recreation and human occupancy and use”); 43 C.F.R. § 1601(a) (defining “areas of critical environmental concern” to be public lands “where special management attention is required . . . to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards”); *id.* § 1601(i) (defining “multiple use” in part to be the “harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment,” paying attention to “the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output”).

80. *See, e.g.*, Robert L. Fischman, *The Significance of National Wildlife Refuges in the Development of Conservation Policy*, 21 J. LAND USE & ENVTL. L. 1, 14–22 (2005) (describing the 1997 conversion of National Wildlife Refuge management to an ecosystem-based approach).

The recitation of these statutory provisions makes clear that the “Humans as Controlling Engineers” narrative pervades and underlies a good deal of environmental and natural resources law and policy: If we broke the environment, we can fix it—and we might even be able to make it “better.” We can further underscore this point by flipping the question: Are there any environmental and natural resources laws or policies that openly acknowledge that we might NOT be able to fix the environment? Indeed, it is extraordinarily difficult even to find legal provisions that absolutely forbid certain human activities on the grounds that we know that they will irreversibly damage ecosystems and the functioning of the natural environment. Species protections probably come closest, but even endangered species laws tend to include permit provisions that allow members of imperiled species to die and habitat to be destroyed.⁸¹

Power plants provide a particularly apt—and timely—example of our engineering approach to environmental protection. Almost all power plants are located near water because they need cooling water,⁸² and all power plants consume fuel to produce electricity, usually by burning fossil fuels. As a result, power plants have environmental impacts on at least two media—air and water—and generally present waste disposal issues, as well. On the air emissions side, the Clean Air Act has long required power plants to meet technology-based emissions standard for pollutants like sulfur dioxide and particulates,⁸³ and the EPA has just proposed new greenhouse gas regulations for power plants that depend heavily on technological innovation, such as carbon capture and storage.⁸⁴ On the water side, the

81. *E.g.*, 16 U.S.C. § 1539(2)(B)(i) (authorizing incidental take permits for endangered species).

82. NRDC, IB: 14-04-C, POWER PLANT COOLING AND ASSOCIATED IMPACTS 2 (2014), <http://www.nrdc.org/water/files/power-plant-cooling-ib.pdf> [<https://perma.cc/5YNE-VHND>].

83. *E.g.*, 40 C.F.R. §§ 60.40–60.46 (2015).

84. *Clean Power Plan: Regulatory Actions*, EPA, <http://www.epa.gov/cleanpowerplan/regulatory-actions#regulations> [<https://perma.cc/2T4A-CGFN>]. In response to litigation challenging the Clean Power Plan, on February 9, 2016, the U.S. Supreme Court stayed the regulations even before the U.S. Court of Appeals for the D.C. Circuit had addressed the merits. *See, e.g.*, Jonathan H. Adler, Opinion, *Supreme Court Puts the Brakes on the EPA’s Clean Power Plan* (Feb. 9, 2016), <https://www.washingtonpost.com/news/volokh-conspiracy/wp/>

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Clean Water Act has always regulated power plants' discharges of cooling water back into rivers and streams, especially to control the temperature of that water.⁸⁵ Newer regulations, however, are also addressing cooling water intake and the reality that these pumps and intake structures entrain, smash, and chop up fish and other aquatic organisms.⁸⁶

Nevertheless, despite its ubiquity, the "Humans as Controlling Engineers narrative" has problems. First, even without climate change, this narrative does not fit well with developing and increasingly sophisticated ecological studies. At base, attempts to perpetually optimize natural systems to suit human priorities "does not work as a best-practice model because this is not how the world works."⁸⁷ As I have argued elsewhere using different terminology, the "Humans as Controlling Engineers" narrative:

assume[s] that ecological change is predictable and that human impacts are generally reversible. Predictability is what makes human use of natural resources manageable and ecological preservation possible. If regulators can predict how a species, resource, or ecosystem will respond to changes in human impacts (more or less pollution, more or fewer people, more or fewer vehicles, more or less habitat destruction), they can manage that species, resource, or ecosystem to the human-determined functionality or productivity goal. Thus, we require drinking water contamination to be below maximum contaminant levels, manage fisheries for maximum sustainable yield, regulate air pollution to eliminate human health risks, and manage public lands to achieve sustained yield of several products and services. Reversibility, in contrast, presumes that undesirable ecological change can be undone. While some of the exceptions to this assumption are obvious—extinction of species, for example—the whole concept of environmental restoration depends upon it.⁸⁸

2016/02/09/supreme-court-puts-the-brakes-on-the-epas-clean-power-plan/
[<https://perma.cc/8W6Z-WPMH>].

85. 33 U.S.C. § 1326 (2012).

86. *Id.* § 1316(b); 40 C.F.R. §§ 125.80–125.89.

87. BRIAN WALKER & DAVID SALT, *RESILIENCE THINKING: SUSTAINING ECOSYSTEMS AND PEOPLE IN A CHANGING WORLD* 6 (2006).

88. Craig, *supra* note 4, at 35.

However, both scholars and the IPCC have made it clear that predictability and reversibility will become increasingly unlikely in our climate change century.⁸⁹ Even without climate change, natural systems continually change in complicated ways, generating complex feedback loops across scales and among systems that lead to unpredictable results. As Daniel Botkin argued persuasively in 1992 in *Discordant Harmonies*, there is no such thing—even before climate change—as the “Balance of Nature.”⁹⁰

Instead, nature is constantly changing, and humans should accept change *as* natural and allow it to occur.⁹¹ This reality of a complex, multi-scaled, and ever-changing reality is captured in the concept of “panarchy.” Lance Gunderson and C.S. “Buzz” Holling coined the term “panarchy” in 2002⁹² to describe the cross-scale and dynamic character of interactions between humans and ecological systems. In particular, Gunderson and Holling purposefully included the Greek god Pan in their naming of panarchy to capture the unpredictable chaos that can arise when humans tinker with natural systems at any scale—particularly in terms of unexpected consequences for linked systems operating at other scales.⁹³

Climate change is one of these unexpected consequences of multi-scalar linkages. Humans starting burning fossil fuels for energy at an industrial scale in the mid-1700s. These activities occurred (at least at first) on local and national scales and initially produced primarily local effects, like air pollution and “killer fogs.”⁹⁴ However, the carbon cycle is both planetary in

89. See *id.* at 35–36 and sources cited therein.

90. Daniel B. Botkin, *Adjusting Law to Nature's Discordant Harmonies*, 7 DUKE ENVTL. L & POL'Y F. 25, 27 (1992); see also Daniel Botkin, *Is There a Balance of Nature?*, DANIEL B. BOTKIN (May 23, 2013), <http://www.danielbbotkin.com/2013/05/23/is-there-a-balance-of-nature/> [<https://perma.cc/B4KG-MKAG>].

91. See *Is There a Balance of Nature?*, *supra* note 91 (“People give lip service to the idea that nature may not be constant, but when it comes to passing laws, setting down policies, giving advice, and deciding what to do, most of the time we act as if nature was balanced—constant.”).

92. PANARCHY: UNDERSTANDING TRANSFORMATIONS IN HUMAN AND NATURAL SYSTEMS 5 (Lance H. Gunderson & C.S. Holling eds., Island Press 2002).

93. *Id.*

94. *E.g.*, Christopher Klein, *The Killer Fog that Blanketed London, 60 Years Ago*, HISTORY (Dec. 6, 2012), <http://www.history.com/news/the-killer-fog-that-blanketed-london-60-years-ago> [<https://perma.cc/8YPR-WVM9>].

geographic scale and centuries long in temporal scale.⁹⁵ As a result, it took a couple of centuries for human-scale energy production to become visible as a planet-wide disturbance—i.e., climate change.

Climate change, of course, has become the second major reason why the “Humans as Controlling Engineers” narrative no longer works. We have fundamentally shifted the workings of the planet to serve human priorities. In so doing, moreover, we have set in motion any number of positive feedback mechanisms that are accelerating the changes that we and the ecosystems that we depend upon are experiencing.

As one basic example, warming air temperatures warm the ocean, and together warming air and warming ocean melt sea ice in the Arctic. Sea ice is white and reflects much incoming sunlight. In contrast, open ocean is dark and absorbs much solar radiation. As a result, the more sea ice melts, the faster the oceans warm and the faster sea ice melts.⁹⁶ Moreover, Arctic sea ice melting invokes panarchy principles, as well, because it appears that the extent to which Arctic sea ice melts in the summer influences the severity of winters in the northeastern United States and in Europe.⁹⁷ Thus, melting sea ice exerts feedbacks and influences at multiple scales, with complex and surprising results.

Climate change’s positive feedback mechanisms can be very complex, as shown in the connections between climate change, desertification, and biodiversity loss.⁹⁸ In general, the removal of water from landscapes both increases the amount of greenhouse

95. See *Climate Change & the Carbon Cycle*, MARINE CONSERVATION INST., <https://marine-conservation.org/what-we-do/program-areas/ocean-acidification/climate-carbon/> [https://perma.cc/8D9T-7ZZ6].

96. *Climate Change: Figure 9: Climate Feedback Loops*, NAT’L ACAD. OF SCI., ENGINEERING, MED., <https://nas-sites.org/americasclimatechoices/more-resources-on-climate-change/climate-change-lines-of-evidence-booklet/evidence-impacts-and-choices-figure-gallery/figure-9/> [https://perma.cc/3RFG-VS9U].

97. John Vidal, *Rapid Arctic Ice Loss Linked to Extreme Weather Changes in Europe and US*, GUARDIAN, (June 1, 2015, 8:51 AM), <http://www.theguardian.com/environment/2015/jun/01/rapid-arctic-ice-loss-linked-to-extreme-weather-changes-in-europe-and-us> [https://perma.cc/7VY5-TLM8].

98. *Desertification: 7. Is There a Link Between Desertification, Biodiversity Loss, and Global Climate Change?*, GREENFACTS, <http://www.greenfacts.org/en/desertification/1-2/7-climate-change-biodiversity-loss.htm#0> [https://perma.cc/N8WC-EKEA].

gases entering the atmosphere and increases the loss of species in a self-perpetuating downward spiral.

It is important to remember, however, that climate change underscores rather than creates the reality disjunction that the “Humans as Controlling Engineers” narrative creates. In essence, humans cannot assert complete control over ecosystems and expect desirable results indefinitely, because we just don’t know enough about those ecosystems and their ever-changing multi-scalar complexity. Climate change does, however, make the disjunction between our environmental law narrative framework far more visible while simultaneously demanding a change in that framework.

III. EMERGING CULTURAL NARRATIVES ABOUT CLIMATE CHANGE

Whatever we thought we understood about ecosystems’ responses to human technological interventions, climate change fundamentally challenges Americans’ ability to effectively narrate, and hence effectively influence, our evolving relationship to evolving natural systems. For example, in a recent book, *How Culture Shapes the Climate Change Debate*, Andrew J. Hoffman argues that, in the United States, “[c]limate change has been transformed into a rhetorical contest more akin to the spectacle of a sports match, pitting one side against the other with the goal of victory through the cynical use of politics, fear, distrust, and intolerance.”⁹⁹

To be sure, narratives *are* emerging in contemporary American culture about climate change. However, as social scientists have confirmed, “we interpret and validate conclusions from the scientific community by filtering their statements through our own worldviews.”¹⁰⁰ In other words, most of us evaluate the scientific conclusions regarding climate change in the context of a cultural narrative about reality.

It is in this sense that it has become critical that the dominant American culture lacks a cultural narrative about change that is both empowering and realistic: We need a

99. ANDREW J. HOFFMAN, *HOW CULTURE SHAPES THE CLIMATE CHANGE DEBATE* 2–3 (Stan. Univ. Press 2015).

100. *Id.* at 3–4.

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narrative that tells us how to cope with, to live with, the trickster that is climate change. Instead, the stories about climate change that have emerged either unhelpfully reincarnate the “Humans as Controlling Engineers” narrative or, perversely, create tales of human impotence. Four such narratives currently infuse American culture: (1) climate change doesn’t really exist; (2) climate change may exist, but humans didn’t cause it and so we can’t really do anything; (3) climate change exists, but we can engineer our way out of it and its effects; (4) climate change exists and our current way of life is doomed (with three variations).

A. Climate Change Doesn’t Really Exist

The first narrative asserts that climate change isn’t really happening. In some segments of the United States, for example, climate change—or global warming—is a plot of the liberal Left to scare people and to direct scientific research monies in certain directions.

While the full-on denier crowd is shrinking overall, it still exists. In 2012, the “Six Americas” climate change project found that eight percent of Americans are still “dismissive” of climate change, while another thirteen percent doubt that it is occurring and nine percent are disengaged from climate change issues,¹⁰¹ suggesting that about thirty percent of Americans effectively subscribe to some form of climate change denial. A 2013 survey by the Yale Project on Climate Change Communication concluded that thirty-seven percent of Americans do not believe that climate change is happening.¹⁰² Perhaps importantly, this number has varied over time, from twenty-eight percent in Fall 2008 to forty-eight percent in Spring 2010, following the “ClimateGate” e-mail scandal,¹⁰³ suggesting that changing events can change the force of the climate change denial narrative. Nevertheless, its continued persistence, even at varying strengths, does not bode well for the adoption of a more effective cultural narrative.

Obviously, if your story is that climate change isn’t happening, there’s no need for any kind of fundamental adjustment to American society—or U.S. environmental and

101. ANTHONY LEISEROWITZ ET AL., *supra* note 10, at 6.

102. *See* HOFFMAN, *supra* note 99, at 9.

103. *Id.*

natural resources law and policy. To perhaps overstate the obvious, the climate change denial narrative promotes continued inaction in the face of climate change.

B. It Isn't Us

In this second narrative, climate change is happening but humans didn't cause it. According to Gallup Poll surveys between 2010 and 2012, only about half of Americans believed that humans were causing climate change.¹⁰⁴ While that number increased to fifty-seven percent in 2013 and 2014, about forty percent of Americans still deny human involvement in causing climate change.¹⁰⁵

Most obviously, this second narrative vitiates any reason to engage in greenhouse gas regulation: If anthropogenic greenhouse gas emissions are not the cause of climate change, there is no reason for humans to completely change our way of life. Thus, by denying human agency in climate change, the "it isn't us" narrative effectively undermines any concerted effort to deal with climate change mitigation—that is, legal efforts to reduce greenhouse gas emissions and, eventually, greenhouse gas concentrations in the atmosphere.

Nevertheless, and unlike the climate change denial narrative, this second narrative can still inspire climate change adaptation efforts. If the climate is changing in ways that affect human lives, the cause is largely irrelevant to the issue of whether adaptation efforts are necessary. Indeed, Katrina Kuh has labeled such efforts "agnostic adaptation" and has identified cultural moments when such approaches may be more beneficial than efforts arising from humans being the cause of climate change.¹⁰⁶

However, this second narrative also effectively figures climate change as a natural disaster. Within this narrative,

104. Lydia Saad, *A Steady 57% in U.S. Blame Humans for Global Warming*, GALLUP (Mar. 18, 2014), <http://www.gallup.com/poll/167972/steady-blame-humans-global-warming.aspx> [https://perma.cc/MK8Z-M88L].

105. *Id.*

106. Katrina Kuh, *IPCC Response Essay #14: Agnostic Adaptation*, ENVTL. L. PROF BLOG (Nov. 21, 2014), http://lawprofessors.typepad.com/environmental_law/2014/11/ipcc-response-essay-14-agnostic-adaptation.html [https://perma.cc/ZBA7-NJEZ].

therefore, humans become the disempowered victims of the story. This narrative thus risks infusing all climate change adaptation efforts with the same sense of disempowerment: If climate change is just another natural disaster like floods and earthquakes and hurricanes, then there's a limit to what we can do to prepare.

C. Technology Will Save Us

The third narrative is that technology will save us from climate change. In a slightly different context, Thomas and Patricia Thornton have labeled this narrative the “Technofix Earth Engineers” narrative, arguing that its proponent “present the Age of Humanity less as a looming crisis than an engineering and enterprise opportunity, replete with calls for planetary management that put scientific and technical personnel at the helm in creating a ‘good Anthropocene.’”¹⁰⁷

More generally, the “Technology Will Save Us” narrative at least acknowledges that climate change exists, but it simply reinvigorates the “Humans as Controlling Engineers” narrative for a climate change era, creating problems for both the mitigation and adaptation sides of climate change law and policy. Thus, while this narrative is far more empowering than the previous two, it also continues all the fallacies that the “Humans as Controlling Engineers” narrative has embodied over the last eighty years even as it pervades both mitigation and adaptation discussions. Thus, for example, Erle Ellis argued in a *New York Times* editorial that “[w]e transform ecosystems to sustain ourselves. This is what we do and have always done.”¹⁰⁸

On the mitigation side, the extreme form of the “technology will save us” narrative leads to the promotion of geoengineering technologies to cool the planet—aerosol sprays into the atmosphere, orbiting mirrors to reflect solar radiation, iron fertilization of the oceans to “eat” carbon dioxide.¹⁰⁹ At the very

107. Thornton & Thornton, *supra* note 14, at 72.

108. Erle C. Ellis, *Overpopulation is Not the Problem*, N.Y. TIMES (Sept. 13, 2013), <http://www.nytimes.com/2013/09/14/opinion/overpopulation-is-not-the-problem.html?r=0&adxnnl=1&adxnnlx=1420506016bLUQq/TXkhA+PcuI4KyFSQ> [https://perma.cc/LTB4-2KJP].

109. *What Is Geoengineering?*, OXFORD GEOENGINEERING PROGRAMME, <http://www.geoengineering.ox.ac.uk/what-is-geoengineering/what-is-geoengineering/> [https://perma.cc/NVM2-4USL].

least, however, geoengineering raises a whole host of risk issues and a series of political and legal hot potatoes.¹¹⁰ We can start, for example, with the very basic issue of: Who's in charge? Who gets to adjust the orbiting mirrors? Who gets to inject more particles into the atmosphere? Alternatively, as has already occurred with iron fertilization of the oceans,¹¹¹ is the world at the mercy of every person or entity with enough money and technology to try to manipulate the planet?

However, it must also be remembered that geoengineering technologies are largely unproven technologies, especially at the planetary scale, making geoengineering a planet-wide and potentially costly experiment.¹¹² Among the risks that most geoengineering techniques create, moreover, are the panarchical risks of unexpected consequences in complex multi-scalar systems. Geoengineering projects thus repeat the human hubris that has attended many much smaller-scale attempts to manipulate nature. Notably, however, this time the fate of the entire planet hangs *intentionally* in the balance.¹¹³

More fundamentally, however, geoengineering does not address some of the critical ecological problems that are the direct result of increasing greenhouse gas concentrations in the atmosphere. The most important of these is ocean acidification—that is, the lowering of the ocean's pH as ocean waters absorb excess carbon dioxide from the atmosphere.¹¹⁴ According to scientists, even the geoengineering techniques currently being proposed to remove carbon dioxide from the atmosphere aren't

110. Andrew Snyder-Beattie, *Geoengineering is Fast and Cheap, but Not the Key to Stopping Climate Change*, GUARDIAN (May 15, 2015, 4:05 AM), <http://www.theguardian.com/sustainable-business/2015/may/15/geoengineering-climate-change-greenhouse-gases> [<https://perma.cc/E43W-JNSB>].

111. Jeff Tollefson, *Ocean-fertilization Project Off Canada Sparks Furore*, 490 NATURE 458, 458-59 (2012).

112. John Vidal, *Geoengineering Side Effects Could Be Potentially Disastrous, Research Shows*, GUARDIAN, (Feb. 26, 2004), <http://www.theguardian.com/environment/2014/feb/25/geoengineering-side-effects-potentially-disastrous-scientists> [<https://perma.cc/P4DT-68Y5>].

113. For example, “[o]ne category of geoengineering schemes, solar radiation management, has the potential to cool the atmosphere quickly and at relatively low direct cost, yet may be highly risky.” Sabine Mathesius et al, *Long-Term Response of Oceans to CO₂ Removal from the Atmosphere*, 5 NATURE CLIMATE CHANGE 1107, 1107 (2015).

114. Robin Kundis Craig, *Ocean Acidification and the Clean Water Act*, 93 WASH. U. L. REV. (forthcoming 2016).

enough to save the oceans.¹¹⁵ As such, the “technology will save us” narrative can deflect attention away from some of the very real reasons that we need to reduce the concentrations of carbon dioxide and other greenhouse gases in the atmosphere.¹¹⁶

A less extreme variation on the “technology will save us” narrative in the mitigation context insists that humans will, in the nick of time, develop technologies to effectively and quickly replace our fossil-fuel-based economy.¹¹⁷ While such technological developments would be welcome, however, planning environmental and natural resources law around that expectation is a gamble—a gamble that could well take us to a vastly degraded world by the time our new technologies are in place.

In the adaptation context, a third variation on the “technology will save us” narrative is that we can adapt our way through climate change—i.e., that climate change adaptation will be “enough,” allowing us to avoid fundamentally changing our lifestyles. To be sure, climate change adaptation is an intensely technological endeavor, and both international and U.S. agencies have been compiling guidebooks of these techniques.¹¹⁸ It is not the mere use of technology to adapt that makes this narrative harmful. Rather, it is the belief that technological adaptation can stave off significant ecological and socio-ecological change that makes this version of the “Technology Will Save Us” narrative unhelpful.

Specifically, this variation of the narrative fundamentally underestimates the potentially catastrophic impacts of climate change and denies the reality that most people will in fact have to cope with—to face the inevitability of—unavoidable changes. It manifests in the United States most obviously in coastal climate change adaptation and the prevailing preference for resistance—

115. Mathesius et al., *supra* note 113, at 1112.

116. Tim Radford, *Stop Burning Fossil Fuels Now: There is No CO2 Technofix*, *Scientists Warn*, *GUARDIAN* (Aug. 4, 2015, 11:22 AM), <http://www.theguardian.com/environment/2015/aug/03/stop-burning-fossil-fuels-now-no-co2-technofix-climate-change-oceans> [<https://perma.cc/8V4X-4UJR>].

117. *See, e.g.*, Eric Niller, *Can New Energy Technology Save the Planet?*, *DISCOVERY NEWS* (Dec. 1, 2015, 8:30 AM), <http://news.discovery.com/tech/alternative-power-sources/can-new-energy-technology-save-the-planet-151201.htm> [<https://perma.cc/4MDE-95BY>].

118. *E.g.*, MARK ELLIOTT ET AL., *TECHNOLOGIES FOR CLIMATE CHANGE ADAPTATION: THE WATER SECTOR* (Thanakvaro De Lopez ed., 2011).

coastal armoring and sea walls—over retreat.¹¹⁹ In this context, promoters of sea walls, coastal armoring, and flood gates effectively promise that life will continue to be normal because “technology will save us.” However, these discussions ignore the potential for sea-level rise to overwhelm even the most seemingly extravagant of coastal technologies while simultaneously privileging one climate change coastal problem—sea-level rise and coastal inundation¹²⁰—at the expense of other insidious but often more determinative climate change adaptation issues. For example, most coastal communities will lose their drinking water as saltwater intrudes into coastal aquifers long before actual inundation makes the community uninhabitable.¹²¹ Thus, by focusing adaptation efforts on human control and minimizing disruption and displacement, the “Technology Will Save Us” narrative can actually obscure significant risks to human health and human life.

D. It’s the End of the World as We Know It

The environmental apocalyptic narrative is alive and well in the Anthropocene. In mainstream pop culture, for example, this narrative is fully embodied in the movie *The Day After Tomorrow*,¹²² in which the United States and Europe fall victim to suddenly changing ocean currents and the creation of frozen continents. With this fourth narrative, moreover, climate change

119. MOLLY LOUGHNEY MELIUS & MARGARET R. CALDWELL, STANFORD LAW SCH., 2015 CALIFORNIA COASTAL ARMORING REPORT: MANAGING COASTAL ARMORING AND CLIMATE CHANGE ADAPTATION IN THE 21ST CENTURY 3 (2015) (detailing how much of the California coast has been armored and the detrimental impacts on beaches and coastal ecosystems); Evan Lehmann, *Sea Walls May Be Cheaper than Rising Waters*, SCI. AM., (Feb. 4, 2014), <http://www.scientificamerican.com/article/sea-walls-may-be-cheaper-than-rising-waters/> [<https://perma.cc/U9WS-FGSU>].

120. *E.g.*, Nick Stockton, *Map Shows Where Sea-Level Rise Will Drown American Cities*, WIRED (Oct. 12, 2015, 3:00 PM), <http://www.wired.com/2015/10/map-shows-sea-level-rise-will-drown-american-cities/> [<https://perma.cc/TN9F-UMQB>].

121. *Coastal Groundwater Systems*, USGS, <http://wh.er.usgs.gov/slr/coastalgroundwater.html> [<https://perma.cc/65HE-EQPG>] (last updated Nov. 24, 2014); *Water Resources: Climate Impacts on Water Resources*, EPA, <http://www3.epa.gov/climatechange/impacts/water.html> [<https://perma.cc/L7FU-6PL4>] (last updated Feb. 23, 2016).

122. *THE DAY AFTER TOMORROW* (Twentieth Century Fox 2004).

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narratives flip from denial to an over-determined acceptance of the worst-case scenario of climate change. Somewhat ironically, therefore, this fourth climate change acceptance narrative is as disempowering a response to climate change as the first two.

A particular danger of this fourth climate change narrative is that it dovetails exceedingly neatly with existing apocalyptic narratives in American culture, both environmental¹²³ and not. Some of these existing narratives, for example, are religious.¹²⁴ Indeed, it is worth noting that some churches have embraced climate change as the path toward the Second Coming, possibly impeding efforts to deal with climate change.¹²⁵

However, as Burger and others have already pointed out,¹²⁶ the United States also has a strong cultural tradition of secular apocalyptic narratives, including in connection with the environment. Probably importantly, the current generations of “senior decisionmakers” in the United States can still remember the Cold War and the always-present threat of nuclear annihilation and “mutually assured destruction,”¹²⁷ making it particularly easy for those of us who grew up in that cultural context to frame climate change as another potential apocalypse.

This fourth narrative also has a particularly unhelpful variation to it, what might be called the climate change *carpe diem* narrative. Examples of this narrative variation are not yet as extensive as they probably will become, but one of the most prominent came in response to scientific research published in mid-May 2014 that the collapse of the West Antarctic ice sheet

123. See Burger, *supra* note 29, at 20.

124. Emma Green, *Half of Americans Think Climate Change Is a Sign of the Apocalypse*, ATLANTIC, (Nov. 22, 2014), <http://www.theatlantic.com/politics/archive/2014/11/half-of-americans-think-climate-change-is-a-sign-of-the-apocalypse/383029/> [https://perma.cc/7QF6-F89K]; Ryan Koronowski, *Most White Evangelicals Attribute Intense National Disasters to the Apocalypse, Not Climate Change*, CLIMATE PROGRESS, (Nov. 22, 2014, 1:48 PM), <http://thinkprogress.org/climate/2014/11/22/3596041/poll-religion-climate-end-times-evangelicals/> [https://perma.cc/A4AS-BZCU].

125. James Gerken, *Climate Change Study: Religious Belief In Second Coming of Christ Could Slow Global Warming Action*, HUFFINGTON POST AUSTRALIA, (May. 4, 2013), http://www.huffingtonpost.com.au/2013/05/03/climate-change-study_n_3204054.html?ir=Australia [https://perma.cc/5SMN-Y249].

126. Burger, *supra* note 29, at 20–21 and sources cited therein.

127. *Mutual Assured Destruction*, NUCLEARFILES.ORG, <http://www.nuclearfiles.org/menu/key-issues/nuclear-weapons/history/cold-war/strategy/strategy-mutual-assured-destruction.htm> [https://perma.cc/CFH8-NN9W].

was inevitable.¹²⁸ Scientists originally hedged that full collapse could take several centuries,¹²⁹ although studies published since then have almost uniformly documented that Antarctic ice is melting and collapsing much faster than expected,¹³⁰ requiring upward adjustments in expected sea level rise both by 2100 and over the next couple of centuries.¹³¹ This is information that should prompt world-wide adjustment in coastal planning.

Nevertheless, *Forbes Magazine* chose instead to feature the conclusion of a group of economists: “If Antarctic Melting Has Passed the Point of No Return, We Should Do Less About Climate Change, Not More.”¹³² While there are many things that are objectionable about the economists’ conclusion, the aspect that is most dangerous for our current narrative context is the assumption that once *some* changes become inevitable, *all* change is inevitable, and inevitable to a specific unavoidable end.

The most positive formulation of the “It’s the End of the World As We Know It” narrative is what Thomas and Patricia Thornton have labeled the environmental Jeremiad of the Anthropocene, a moral admonition “that planetary limits are being irresponsibly transgressed by human activity, the footprint of which must be reduced in order to live sustainably within planetary boundaries.”¹³³ This “call to reform” version of the fourth narrative appears often in environmental news media. For example, two months after *Forbes’ carpe diem* response to the collapse of Antarctic ice sheets, *Forbes* contributor Eric Mack seized upon the potentially long timeframe of that collapse to

128. Ian Joughin et al, *Marine Ice Sheet Collapse Potentially Underway for the Thwaites Glacier Basin, West Antarctica*, 344 *SCI.* 735, 738 (2014).

129. *See id.*

130. Johannes Feldmann & Anders Levermann, *Collapse of the West Antarctic Ice Sheet After Local Destabilization of the Amundsen Basin*, 112 *PNAS* 14,191, 14,191 (2015), <http://www.pnas.org/content/112/46/14191.full.pdf> [<https://perma.cc/79S7-VMUC>].

131. *See id.*

132. Tim Worstall, *If Antarctic Melting Has Passed the Point of No Return, We Should Do Less About Climate Change, Not More*, *FORBES* (May 13, 2014), <http://www.forbes.com/sites/timworstall/2014/05/13/if-antarctic-melting-has-passed-the-point-of-no-return-we-should-do-less-about-climate-change-not-more/#2715e4857a0b3763abcb731f> [<https://perma.cc/6G6B-F833>].

133. Thornton & Thornton, *supra* note 14, at 72. This environmental Jeremiad may also lead to what these authors refer to as the “New Genesis” narrative and future. *Id.* at 73.

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argue that “[i]t’s time to finally take the need to reduce climate change emissions seriously while also developing realistic plans for adapting to a warmer, wetter planet. This week’s news could mark the end of the world as we know it today, but that should be seen as an opportunity to build a better one.”¹³⁴ However, the Jeremiad variation is still rooted in fear of destruction, not in human empowerment, limiting its usefulness as a cultural narrative for climate change. As multiple social scientists have emphasized:

“fear framing” or risk-focused appeals to motivate public support of climate change policies have proved largely ineffective at triggering behavioral shifts. As Moser and Dilling note, “[a]n excessive focus on negative impacts (i.e., a severe ‘diagnosis’) without effective emphasis on solutions (a feasible ‘treatment’) typically results in turning audiences off rather than engaging them more actively.”¹³⁵

IV. LEARNING TO LIVE WITH THE TRICKSTER

A. The Trickster Narrative

So, again, while climate change narratives certainly are emerging in the United States, none of them yet posits a human relationship with climate change that figures a means for humans to live, long-term and productively, with climate change. They are all about resistance or about giving up.

However, a different kind of cultural narrative exists that can far more productively frame climate change: the story of the trickster. In general, folklore stories like those of the trickster can become powerful cultural narratives for dealing with climate

134. Eric Mack, *Melting Antarctica Is the End of the World As We Know It, and That’s A Good Thing*, FORBES (May 14, 2014), <http://www.forbes.com/sites/ericmack/2014/05/14/melting-antarctica-is-the-end-of-the-world-as-we-know-it-and-thats-a-good-thing/#2715e4857a0b2a2e23c03f72> [https://perma.cc/S8YE-EZKV].

135. Thornton & Thorton, *supra* note 14, at 67–68 (quoting S. MOSER & R. DILLING, *THE OXFORD HANDBOOK OF CLIMATE CHANGE AND SOCIETY* 165 (J. Dryzek, R. Norgaard & D. Scholsberg eds., 2011)) (citing P. Bain et al., *Promoting Pro-Environmental Action in Climate Change Deniers*, 2 NATURE CLIMATE CHANGE 600 (2012); Alexa Spence & Nick Pidgeon, *Framing and Communicating Climate Change: The Effects of Distance and Outcome Frame Manipulations*, 20 GLOBAL ENVTL. CHANGE 656 (2010)).

change because they place humans in a different relationship to ecological change.¹³⁶ Specifically, as Thomas and Patricia Thornton have noted:

The tenor and rhetoric of the prevailing discussions of climate change and the Anthropocene are at odds with an alternative heuristics circulating in many indigenous communities that are instead shaped by the shared understanding that humans are but a small part of a relational universe that cannot be fully cognized, much less managed, by any one species.¹³⁷

Tricksters in particular are agents of chaos, forces that disrupt normal expectations and sometimes violate important cultural or sacred boundaries.¹³⁸ While trickster stories and trickster figures exist all over the world and in most cultures,¹³⁹ the trickster is notably, pervasively, indeed almost insistently absent from one prominent culture: the Euro-American culture of the United States.¹⁴⁰ In contrast, most Native American cultures celebrate trickster tales, whether the trickster takes the name of Coyote, Raven, Iktomi the Spider-Man, or several others.¹⁴¹

Among other things, trickster tales teach humans to expect the unexpected and that change—good or bad—is just part of life. For example, in one tale from the Tsimshian, Raven is hungry

136. *Id.* at 68 (“Folklore and traditional mytho-historical narratives offer an alternative approach to framing anthropogenic and other causes of environmental change, one that has existed since the dawn of humans’ capacity to historicize their lives and place in the cosmos. These narratives arguably have much to teach us about framing our understanding and contingent responses to environmental change over time and across spaces. They remind us of the futility of a managerialism that governs only for control and stability without proper consideration of relational feedbacks and the dynamic and anarchic forces in nature.”).

137. *Id.*

138. *Tricksters*, MYTHS ENCYCLOPEDIA, <http://www.mythencyclopedia.com/Tr-Wa/Tricksters.html> [<https://perma.cc/TZK2-HECN>].

139. *Id.*

140. In many ways, tricksters conflict with modern western cultures in general. See, e.g., William G. Doty & William J. Hynes, *Historical Overview of Theoretical Issues: The Problem of the Trickster*, in MYTHICAL TRICKSTER FIGURES: CONTOURS, CONTEXTS, AND CRITICISMS 13, 28–29 (William J. Hynes & William G. Doty eds., 1993) (noting that tricksters “graph ways of operating that go against the Western grain,” falling victim to the Western bias against trickery and humor). However, many European cultures still have trickster figures, such as Loki in Norse tales.

141. See *id.*

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and wants a whale that villagers have hunted and brought up on shore. As Raven, he causes a commotion on the beach, then turns himself into a human man to translate the Raven language, telling the villagers that a deadly disease is coming and they have to leave. The villagers do, and so Raven gets the entire whale—and the village—to himself.¹⁴²

In a Crow tale, perhaps a tad more resonant with climate change,¹⁴³ Old Man Coyote and Raven work together, along with Wolf, Bull Moose, Elk Stag, and Buck Antelope to steal summer from Old Woman, all because Old Man Coyote was continuously cold. Through an elaborate plot, Old Man Coyote steals the black bag with summer in it, then engages in an elaborate relay race with the other animals to keep Old Woman's children, who are in hot pursuit, from retrieving the bag. When they are safely returned to their own lands, Old Man Coyote opens the bag and releases summer, and the earth rejoices.

However, Old Woman's children eventually appear at Old Man Coyote's tipi, demanding that he return summer to them. In a plot twist made for lawyers, Old Man Coyote and the children negotiate a settlement, whereby each group gets summer for half the year. Thus, the humans in Old Man Coyote's lands now enjoy summer for half the year.

Collectively, what the trickster narratives teach us is that we are *not* in complete control, that life and nature involve a certain amount of chaos and unpredictability, and that we must, in a very deep sense, learn to roll with the punches—celebrate the benefits that can arise from such chaotic interventions as well as deal with the damage that results when change occurs.¹⁴⁴ However, because the trickster often gets tricked himself, trickster narratives also teach that we can act to affect our

142. See RICHARD ERDOES & ALFONSO ORTIZ, *AMERICAN INDIAN TRICKSTER TALES* 254–55 (1999).

143. *Id.* at 13–15 (1999).

144. See William J. Hynes & William G. Doty, *Introducing the Fascinating and Perplexing Trickster Figure*, in *MYTHICAL TRICKSTER FIGURES: CONTOURS, CONTEXTS, AND CRITICISMS*, *supra* note 140, at 1, 8 (noting that the antics of tricksters frequently “highlight[] the possibilities within a society for creative reflection and change of the society’s meanings”); Doty & Hynes, *supra* note 140, at 20 (noting that tricksters act by “temporarily breaking down and intermingling all categories so as to cause new combinations and anomalies”).

reality, and even when we don't get everything we want, we can still improve upon what our conditions would otherwise be.

Thomas and Patricia Thornton, for example, have argued that the Raven trickster tales from the Native American Tribes of the Pacific Northwest make particularly apt cultural narratives for a climate change era.¹⁴⁵ Characterized by "improvisation in the face of unpredictability,"¹⁴⁶ Raven is both:

a driver of, or respondent to, environmental shifts. Although Raven frequently appears as either the harbinger of or an active agent provoking extraordinary ecological events, they are nonetheless not cast in the rhetoric of crisis. Instead, Raven adapts, innovates, and transforms with Earth's changes, sometimes by relying upon his intimate knowledge of local species, sometimes by cunning and wiles, and sometimes by happenstance as a result of his ulterior manipulations, and, at times, buffoonery. In contrast to the overtly mechanistic cause and effect models that prevail in popular and scientific discourse today, the lessons Raven can and does teach offer a multivalent understanding of the place of human activity in the world. Taken collectively, Raven tales . . . emphasize a moral ecology of mutual dependence, intersubjectivity, survival, resilience, feedbacks, and adaptation in the face of ceaseless and open-ended ecological change.¹⁴⁷

Raven is thus "an anthropogenic reflection of humanity as one among many competing, strategizing species."¹⁴⁸ In addition, the Thorntons argue, because Raven operates "as a mutable transducer of conventional boundaries," he:

anticipates humanity in the Anthropocene, both as an agent (or "driver") of change through his appetites and aspirations to control things for his own purposes, and as a resilient respondent to change (through coping, mitigation, adaptation, etc.) when earth systems and their constituent elements prove too powerful,

145. Thornton & Thornton, *supra* note 14, at 68.

146. JAMES C. SCOTT, *SEEING LIKE A STATE: HOW CERTAIN SCHEMES TO IMPROVE THE HUMAN CONDITION HAVE FAILED* 6 (Yale Univ. Press 1998).

147. Thornton & Thornton, *supra* note 14, at 68.

148. *Id.* at 74.

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dynamic, and complex to be harnessed for the benefit of one being or species.¹⁴⁹

Climate change is the trickster of the 21st century. We can predict, in general, what increasing concentrations of greenhouse gases mean for the planet: Increasing air temperatures; increasing water temperatures; changes to both air and water currents; changes to dominant weather patterns; freak storms and seasonal anomalies; and so forth. However, pinning down the details of what exactly will happen in specific places and when gets a lot trickier. There is a reason, in other words, that an increasing number of scientists and academics and journalists refer to climate change as either “climate weirding” or “global weirding”: Things are just getting strange. And unpredictable. And complex. Humans, in turn, need to adopt a trickster mentality to increase our own resilience and survival within the Anthropocene.

B. Operationalizing the Trickster Narrative in Environmental and Natural Resources Law: Resilience Thinking

The Anthropocene is an era that will inevitably frustrate the engineers—those who want to continue to believe that humans are in control of ecological and socio-ecological systems, those who seek to avoid change and maintain the status quo. The trickster offers a new vision, one of flexible resilience in the face of continual ecological change. As the Thorntons note, for example, “Raven’s mutability, adaptability, and resilience, his ability to fly away, take a bird’s eye view, and revise his response to changing planetary conditions always leads to sustainment even in the face of environmental transformations.”¹⁵⁰

However, while the trickster narrative is a helpful cultural narrative for Americans to adopt in order to cope with climate change, it can only contextualize, rather than operationalize, a new approach to environmental and natural resource law and policy. On the operational end, resilience thinking offers the same sort of framework for coping with change while simultaneously

149. *Id.* at 69.

150. *Id.* at 75.

suggesting a much more productive legal and policy framework for this new era.

Resilience thinking is a school grounded in the concept of ecological resilience, defined as “the capacity of a system to absorb disturbance and still retain its basic function and structure.”¹⁵¹ What is slightly misleading about this definition, however, is that it implies that resilience is about a steady-state. In fact, as Benson acknowledges, “resilience thinking is grounded in an acknowledgement of uncertainty and disequilibrium within [socio-ecological systems], with a ground-level acknowledgement that change is not only always possible but also to be expected.”¹⁵² It reflects the fact that “[t]he last three or four decades have fostered a revolution in the way scientists think about the world: instead of orderly and well behaved, they now view it as complex and uncertain.”¹⁵³

Thus, for example, resilience thinking acknowledges from the beginning that ecological systems and socio-ecological systems progress constantly through adaptive cycles of change.¹⁵⁴ In these cycles, growth phases lead to conservation phases that lead to release phases, which in turn leads to reorganization of the system, perhaps as something slightly different, until a growth phase begins again.¹⁵⁵ An example would be a young forest that grows into an old forest which is then beset by a forest fire, allowing new species to take root and make use of the newly released nutrients that had been locked up in the old trees. As such, resilience thinking acknowledges that change and coping with change are a continual reality within natural systems.

However, ecological thresholds and regime shifts are also an important component of resilience thinking, meaning that

151. BRIAN WALKER & DAVID SALT, *RESILIENCE THINKING: SUSTAINING ECOSYSTEMS AND PEOPLE IN A CHANGING WORLD*, at xiii (Island Press 2006). See 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, 1375–78 (2011), for a more complete discussion of engineering and ecological resilience in the context of law and climate change.

152. Benson, *supra* note 11, at 115.

153. Ann P. Kinzig et al., *Resilience and Regime Shifts: Assessing Cascading Effects*, *ECOLOGY & SOC’Y*, June 2006.

154. *Adaptive Cycles*, RESILIENCE ALLIANCE, <http://www.resalliance.org/adaptive-cycle> [<https://perma.cc/G6YV-KC4W>].

155. *Id.*

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transformation of ecosystems and the social systems that depend upon them is always a possibility.¹⁵⁶ Perhaps disturbingly to human peace of mind, resilience thinking thus acknowledges, for example:

that the seemingly stable states we see around us in nature and in society, such as woody savannas, democracies, agro-pastoral systems, and nuclear families, can suddenly shift out from underneath us and become something new, with internal controls and aggregate characteristics that are profoundly different from those of the original.¹⁵⁷

Like the trickster cultural narrative, therefore, resilience thinking acknowledges—this time scientifically—a world of continuous ecological system change over which humans cannot exercise complete control. Indeed, research indicates that ecological regime shifts have cascading effects that can ripple through social and economic systems as well as ecological, all the while eluding human management strategies that attempt to control them.¹⁵⁸

Importantly, however, resilience thinking does not itself posit a normative goal for environmental management, law, or policy because resilience itself (ecological or engineering) is merely a property of a system that says nothing about whether that state is itself desirable or undesirable.¹⁵⁹ As many have pointed out, evil political regimes can be just as (or maybe even more) resilient than good ones, and legal systems can quite resiliently suppress basic human rights.¹⁶⁰ In the context of ecosystems, degraded

156. Kinzig et al., *supra* note 153.

157. *Id.*

158. *Id.* (“[C]rossing a single threshold between alternative regimes often leads to a ‘cascading effect’ in which multiple thresholds across scales of space, time, and social organization and across ecological, social, and economic domains may be breached. The regime that this cascading effect ultimately produces has a tendency to be highly resilient and resistant, for instance, to management strategies that might seek to restore the earlier regime.”).

159. *E.g.*, Craig Anthony (Tony) Arnold, *Resilient Cities and Adaptive Law*, 50 IDAHO L. REV. 245, 246 (2014); Robin Kundis Craig & Melinda Harm Benson, *Replacing Sustainability*, 46 AKRON L. REV. 841, 863 (2013); Ruhl, *supra* note 151, at 1381.

160. *See* Lance Gunderson & C.S. Holling, *Resilience and Adaptive Cycles*, in *PANARCHY: UNDERSTANDING TRANSFORMATIONS IN HUMAN AND NATURAL SYSTEMS* 25, 31–32 (Lance H. Gunderson & C.S. Holling eds., 2002); Craig

ecosystems offering few ecosystem goods and services can be incredibly resilient to perturbations, while highly productive ecosystems (from a human perspective, at least) may be incredibly vulnerable to system transformation.

As a result, managing for resilience is not and cannot be the full goal of environmental and natural resources law and policy; instead, we must ask: managing for the resilience of what to what? As a starting point, therefore, environmental and natural resources law and policy might adopt resilience thinking with the following normative goal: *Preserving and where possible increasing the ecological resilience of ecosystems to climate change and other human-induced stressors in order to promote biodiversity and desirable ecosystem services, then assisting the productive and biodiversity-enhancing transformation of ecosystems when transformation becomes inevitable.*

There is a lot packed into that goal, even as general as it is, and it is not the purpose of this article to fully parse it. The point, instead, is that we can productively reframe the normative goals of environmental and natural resources law and policy to incorporate both resilience thinking and an acceptance of continual and sometimes surprising change. It is in this sense that Director of the Millennium Ecosystem Assessment Walter Reid's statement makes sense: "In a world characterized by dynamic change in ecological and social systems, it is at least as important to manage systems to enhance their resilience as it is to manage the supply of specific products."¹⁶¹ Resilience thinking counsels us to approach ecosystem management, and environmental and natural resources law and policy, with humility and respect for the potential fragility and transformability of ecosystems, particularly as climate change impacts become increasingly worse.

Of course, the devil is in the details. Resilience thinking will require many different specific rules and standards to accommodate the wide variety of subjects that make up environmental and natural resources law. For example, pollution is almost always an anthropogenic stressor to ecological and

Anthony (Tony) Arnold, *Environmental Law, Episode IV: A New Hope? Can Environmental Law Adapt for Resilient Communities and Ecosystems?*, 21 *J. ENVTL. & SUSTAINABILITY L.* 1, 13 (2015); Benson, *supra* note 11, at 117.

161. Walter V. Reid, *Foreword* to WALKER & SALT, *supra* note 151, at xi.

social systems. Moreover, beyond immediate impacts, many forms of pollution can bioaccumulate, move across media (e.g., air to water and vice-versa), and/or accumulate downstream or down-current. As Benson acknowledges, the United States' existing laws for reducing existing stressors like pollution have done a good job of addressing the relatively easy problems.¹⁶² Nevertheless, much remains to be done. Resilience thinking counsels that we reduce significantly or eliminate as many of these non-climate change stressors as we can in order to reduce the number of anthropogenic perturbations to ecosystems and socio-ecological systems that remain in desirable states. More provocatively, true resilience thinking may also require that American environmental law re-structure environmental cost-benefit analyses and regulatory permitting/market entry thresholds to better account for the long-term impacts, synergistic impacts, and the known and unknown unknowns of chemical interactions, such as the increasingly pervasive environmental interactions of pharmaceuticals and hormone mimickers in unstudied combinations.

In natural resources management, in turn, resilience thinking counsels for the across-the-board *serious* implementation of ecosystem-based management based on a *strong* precautionary principle—a precautionary principle now informed by the new reality that all bets are off for ecosystems in a climate change era. For example, ocean fisheries management has long been criticized for allowing overfishing of key commercial species on a global scale. Although some countries like the United States and Canada have gotten better at preventing and redressing overfishing over time, no country is yet fully grappling with the widespread changes climate change is bringing to the oceans. These changes include:

- Shifting ocean currents, which have implications for both wild-caught fisheries and marine aquaculture;¹⁶³
- The shift of marine species poleward as ocean temperatures warm, meaning at the very least that species are shifting regulatory jurisdiction and at the

162. Benson, *supra* note 11, at 106.

163. Robin Kundis Craig, *Re-Tooling Marine Food Supply Resilience in a Climate Change Era: Some Needed Reforms*, 38 SEATTLE U. L. REV. 1189, 1212–14 (Summer 2015).

worst that entire marine ecosystems are shuffling species and disrupting predator-prey relationships, to unpredictable results;¹⁶⁴

- Ocean acidification, the process by which carbon dioxide dissolving into the oceans is lowering the oceans' pH. Ocean acidification interferes with the ability of species with shells to grow those shells. It is already disrupting shellfish aquaculture in the Pacific Northwest and Maine and poses a threat to important fisheries off of Oregon, Washington, and Alaska. More insidiously, however, ocean acidification threatens the viability of the shelled plankton species that both make up the base of the marine food web and supply fifty percent of atmospheric oxygen;¹⁶⁵ and
- The combination of increased temperatures and ocean acidification is decimating coral reef ecosystems worldwide, and it is an open question whether any significant coral reefs will survive the next century.¹⁶⁶

In light of these kinds of global (and arguably existential) threats to marine (and human) life, a precautionary approach to fisheries management must mean something profoundly deeper than simply cutting back on catch quotas. We must fundamentally re-think how to promote marine resilience, even if the resulting ecosystems are different from those we have now. An important first step, for example, would be to drastically reduce (or even outlaw) large-scale commercial fishing worldwide. A second step would be to protect all remaining relatively intact habitat areas in marine protected areas to prevent further destruction. We also need to invest much more money into scientific research that will allow us to detect changes in marine environments as they are occurring and to invest significant diplomatic effort into joint management of shifting species.

164. *Id.* at 1208–12.

165. *Id.* at 1214–17.

166. See WALKER & SALT, *supra* note 151, at 3 (“In the last few decades approximately 20 percent of the world’s coral reefs were lost, an additional 20 percent were degraded. In the Caribbean, 80 percent of coral has been lost in recent decades.”).

Resilience thinking also counsels that biodiversity protection more generally receive far more attention in United States law and policy than it has to date. Embarrassingly, the United States remains one of the four recognized nations (along with Andorra, South Sudan, and the Vatican) not to have ratified the United Nations Convention on Biodiversity, perhaps the most emblematic example of our willingness to subordinate biodiversity as an environmental and natural resources law priority. Nevertheless, widespread extinction of species is consistently predicted as a climate change impact. Moreover, loss of biodiversity also impairs ecosystem and socio-ecological resilience. While we can have quite a spirited debate on the “proper” role of humans in actively assisting species’ survival, such as through assisted migration, our knowledge of which such interventions will work is still fairly limited, especially in light of the fact that many species, terrestrial and marine, are now shifting their ranges to accommodate climate change impacts. We can increase species’ ability to adapt for themselves if we do two things: (1) protect as many currently useful habitats and ecosystems as we can, and (2) create and protect as many corridors as possible to connect those habitats and ecosystems so that species can move to new ranges as they need to.

Finally, resilience thinking counsels that formerly taboo subjects need to be incorporated into U.S. law and policy in order to adequately comprehend all drivers of change in natural systems. Specifically, population and consumption have to be part of the discussions we have regarding environmental, natural resources, and energy law and policy.

The world’s human population has been going up dramatically in the last few centuries compared to the previous history of humanity, and a growing human population means more consumption of resources as well as less space for other species. Research published in *Science* in September 2014 projected that, instead of leveling off around 2100, as the United Nations had projected, the population of humans will continue to grow into the 22nd century.¹⁶⁷ This paper also predicts that

167. Sarah C.P. Williams, *Experts Be Damned: World Population Will Continue to Rise*, SCI. (Sept. 18, 2014, 2:00 PM), <http://www.sciencemag.org/news/2014/09/experts-be-damned-world-population-will-continue-rise> [<https://perma.cc/CJA6-8979>].

there will be 9.6 billion humans on the planet by 2050 and almost 11 billion humans on the planet by 2100, although that number could go as high as 12.3 billion.¹⁶⁸

Every additional human being on the planet represents a net increase in greenhouse gas emissions. Paul Murtaugh and Michael Schlx detailed the fact that childbearing is decidedly *not* a carbon-neutral activity, although the exact impact varies considerably depending on emissions and reproduction assumptions and on the mother's country of residence.¹⁶⁹ Nevertheless, under a constant emissions scenario, a woman in the United States who has two children would be responsible for adding close to 19,000 tons of carbon dioxide to the Earth's atmosphere over time.¹⁷⁰ In addition, every child born is a consumer of resources, with most of the planet striving vigorously to achieve an American lifestyle.

Of course, both population control and consumption control are touchy political subjects that rightfully invoke human rights concerns, religious freedom, national security concerns, and issues of fundamental fairness. However, all signs are that we are quickly out-consuming our planet, a tragedy of the global commons that is severely undermining our future resilience. Population and consumption must be part of the climate change era conversation, or the changes that we are likely to encounter will be far more severe than those we are probably willing to put up with.

Moreover, there are politically acceptable "first approaches" to population and consumption that can helpfully improve resilience, as well. On the consumption side, conservation, recycling, and increased efficiency are positive first steps and relatively non-controversial steps. On the population side, ensuring that women and girls are educated and that women have access to small business loans are effective first steps in

168. Patrick Gerland et al, *World Population Stabilization Unlikely This Century*, 346 *SCI.* 234, 234 (2014), <http://www.demographic-challenge.com/files/downloads/452fbf0a4300800ec6cc4af4315e11ca/science-1257469-full.pdf> [<https://perma.cc/USE2-HJW3>].

169. Paul A. Murtaugh & Michael G. Schlx, *Reproduction and the Carbon Legacies of Individuals*, 19 *GLOBAL ENVTL. CHANGE* 14, 16–18 (2009).

170. *Id.* at 18.

reducing population growth,¹⁷¹ and they also entail human rights improvements rather than infringements.

V. CONCLUSION

One of the most important aspects of resilience thinking and its acceptance of continual change is that it acknowledges that shocks to particular systems, particularly during the release phase of the adaptive cycle, add unpredictability to the system. A system *might* exhibit the classic sense of resilience in response to the shock, recovering as essentially the same system as it was before. Conversely, the system might collapse in response to the shock, becoming a completely different system—perhaps one that is less productive and complex than what existed before. As noted, a third possibility also exists: that a shock will push a system across a threshold and into a transformed but also resilient new state or status.

Again, ecosystem transformations are, in and of themselves, neither “bad” nor “good.” While it is likely that humans accustomed to one kind of system are likely to view any such transformation as something to be avoided, it is also possible that the transformed state will be preferable, or at least beneficial to certain groups of people.

The more important point once again is that resilience thinking offers a framework that incorporates change as a given—a framework within which humans can contemplate both the fact that different kinds of change can result from disturbances and the fact that we might be able to influence, even if we cannot completely control, the type of change that might actually occur in a given system. More broadly, a resilience thinking framework for environmental and natural resources law and policy in the context of a trickster cultural narrative about climate change would give us all an empowering cultural milieu

171. EarthTalk, *Does Population Growth Impact Climate Change?*, SCI. AM., (July 29, 2009), <http://www.scientificamerican.com/article/population-growth-climate-change/> [https://perma.cc/WDE8-37SK]; see also Anushay Hossain, *Seven Billion People and Women’s Rights: What’s the Connection?*, FORBES (Oct. 29, 2011, 1:04 AM), <http://www.forbes.com/sites/worldviews/2011/10/29/seven-billion-people-womens-rights-what-is-the-connection/#3b24206342cf> [https://perma.cc/8A65-H48F] (arguing that “the whole world will reap the rewards” if women get control of their own fertility).

in which to deal with the continual alterations to our “normal” lives that climate change is bringing.

Resilience thinking and the trickster narrative warn us that undesirable transformations of our socio-ecological systems are possible—and maybe even in some circumstances, inevitable. However, resilience thinking and the trickster narrative also teach us that we can avoid at least some of the socio-ecological transformations that we really don’t want: the trickster can be tricked. In a climate change era, however, both avoidance and guided transformations require hard work, belt-tightening, and many changes to our environmental and natural resources law and policies.

Nevertheless, acknowledging the reality of continuous change and the importance of complex system dynamics by adopting a resilience thinking framework provides us with a first step on a path toward coping with, rather than fighting or retreating from, the new reality that is the Anthropocene. It is in this sense, therefore, that resilience thinking offers us a framework for learning to live with the trickster of climate change.¹⁷²

172. While this article has focused on climate change adaptation, it is also worth noting that resilience thinking also counsels us about climate change mitigation—namely, if we don’t get serious about mitigation soon, the climate change trickster will make our lives increasingly uncomfortable increasingly frequently!