HISTORY OF LANDSCAPE

Wilderness in History and Ecology

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Wilderness. Few environmental terms are so freighted with controversy and misunderstanding. To many it evokes awe-inspiring landscapes, nature unfettered by people and modernity, and the best strategy to protect forests, biodiversity, and a climate run amok. To others, it evokes erasing of indigenous peoples, a relic of colonialization, a misunderstanding of forest stewardship, and a recipe for ecological degradation.[1] In this article, I will attempt to reconcile these opposing views. Although this topic is global in its relevance and application, this article will focus on eastern North America, the region with which I am most familiar.

A boardwalk provides access to a stand of swamp tupelo (*Nyssa biflora*) in South Carolina's Congaree Wilderness. *Photograph courtesy of the author*

Origins and concepts of wilderness

The concept of wilderness—land uncultivated and uninhabited by people that is free to self-organize [2] —is as old as civilization itself, and perhaps far older. As human cultures formed semi-sedentary and permanent cultures, a duality emerged between land that was settled and land that was not; a perception of danger often permeated the latter.[3]

In the earliest work of literature, the Mesopotamian Epic of Gilgamesh (c. 4000 years ago), the leaders of Uruk say to their hero who plans to travel to the Cedar Forest to slay its formidable guardian: "Gilgamesh … the forest stretches for ten thousand leagues in every direction; who would willingly go down to explore its depths?"[4]

Three millennia later in the Anglo-Saxon poem *Beowulf* (c. 700–1000 CE), the hero braves "an unvisited land among wolf-haunted hills, wind-swept crags, and perilous fen tracks" to slay the monster Grendel.[5]

This duality of the settled vs. the foreboding wild was not limited to European and Near Eastern civilization, but also appeared in sub-Saharan Africa and advanced cultures of Mesoamerica. [6] Of the classical Mayan civilizations of Mexico (250–900 CE), the Mesoamerican scholar Karl Taube wrote: "… the forest is a dangerous, uncontrollable place of demons and fierce, biting beasts. Although the Classic Maya may well have closely cared for and managed forests of valued woods, fruit trees, medicines, and other products, the fearsome way spirits suggest a more distant, wilder realm…."[7] The Aztecs too feared the forest beyond civilization, even as they used parts of the forest as a source of wood. The pioneering ethnographer Bernardino de Sahagun transcribed Aztec views of the forest in his sixteenth century Florentine Codex: "It is a disturbing place, fearful … home of the wild beast …. There is no one …. It is desolate …. There is nothing edible. Misery abounds … there is constant fright. One is devoured. One is slain by stealth …"[8] Needless to say, there are striking parallels between the ancient Maya and Aztecs and ancient European and Near Eastern myths and sentiments about wild nature. The universality and convergence of human nature transcends culture and geography.

But fear was not the only emotion connected to unsettled land. In the ancient cultures of the Far East (beginning in the 5th century BCE), many Chinese artists and poets revered wild nature as a place to commune with God (even as others focused on its dangers and hostility). Painted scenes of wild nature were viewed as an antidote to the stifling confines of everyday life in civilization.[9] Fear and reverence, it turns out, are two sides of the same coin.

There were other human benefits assigned to experiencing wilderness, namely character building. Dating from pre-European North America, the semi-sedentary Nez Percé of the Pacific Northwest have a word that means "peopleless land" (*titoqanót wétes*). The peopleless land was generally in the

1 These diverse views on wilderness protection can be found in Denevan, W. M. (1992). The pristine myth: the landscape of the Americas in 1492. *Annals of the Association of American Geographers*, 82(3), 369–385; Cronon, W. (1996). The trouble with wilderness: or, getting back to the wrong nature. *Environmental History*, 1(1), 7–28; Fletcher, M. S., Hamilton, R., Dressler, W., & Palmer, L. (2021). Indigenous knowledge and the shackles of wilderness. *Proceedings of the National Academy of Sciences*, 118(40), e2022218118; Watson, J. E., Shanahan, D. F., Di Marco, M., Allan, J., Laurance, W. F., Sanderson, E. W., … & Venter, O. (2016). Catastrophic declines in wilderness areas undermine global environment targets. *Current Biology*, 26(21), 2929–2934; Nash, R. F. (2001). *Wilderness and the American Mind*. Yale University Press; Berlyn, G. P. et al. (2020). The Forest School GC3 Response Letter. Yale School of the Environment, The Forest School. New Haven, CT. https://forestpolicypub.com/wp-content/uploads/2023/03/Final_The-Forest-School-GC3-Response-1.pdf.

2 https://www.merriam-webster.com/dictionary/wilderness. Since the 1964 Wilderness Act, wilderness as a conservation policy has come to mean the formal designation—through legal or administrative process—of land protected from timber harvesting to remain in an untrammeled condition, rather than unsettled or unused land per se. This distinguishes wilderness from land currently unused but susceptible to management at a later date. See Foster, D. et al. (2023). *Wildlands in New England. Past, Present, and Future.* Harvard Forest Paper 34. Harvard University.

3 Nash, R. F. (2001). *Wilderness and the American Mind*. Yale University Press; Taube, K. A. (2003). *Ancient and Contemporary Maya Conceptions About Field and Forest* (pp. 461–492). Food Products Press.

4 https://open.maricopa.edu/worldmythologyvolume2heroicmythology/chapter/the-epic-of-gilgamesh/

5 Quotes from Nash, R. F. (2001).

6 Anderson, M. G., et al. (1989) *Wild Spirits, Strong Medicine : African Art and the Wilderness*. Edited by Enid Schildkrout, Center for African Art. University of Washington Press.

7 Taube, K. A. (2003). Taube also noted that land outside of settled areas were potentially dangerous as buffer areas between two hostile or competing tribes.

high elevations of the Bitterroot Mountains, which became largely inaccessible for three seasons of the year. It was into these mountains that the tribe sent their adolescent children alone as part of a week-long rite of passage ritual (*wéyekin*). An absence of people and any sign of their daily activities were integral to the *wéyekin*.[10]

The previous example complicates the prevailing notion that the concept of wilderness is the product of civilization and the colonization of the Americas and was absent from hunter-gatherer societies who lived inseparably from the land.[11] It is true that the Nez Percé did not view the Bitterroot Mountains as "wild," dangerous, and apart from their existence in the same sense that English Americans might have,[12] but they nonetheless distinguished the mountains as an unsettled counterpart to the lands that they regularly inhabited as part of their seasonal movements.[13]

The Nez Percé were not unique among Native American tribes in terms of recognizing unsettled land. In the eastern woodland cultures, the Delaware have words for "uninhabited tract" (*tauwatawk*) and "in the uninhabited land" (*tauwatawique*). Similarly, the Passamaquoddy-Maliseet languages from northern Maine include words meaning "wilderness" (*kataskomiq*) and "out in wilderness" (*elomahkiwik*).[14] The dichotomy between settled and uninhabited land is fundamental to the concept of wilderness and appears to be common to humanity, regardless

Early Postclassic Mayan portrayal of the forest, featuring wild nature juxtaposed with a person near his dwelling. Detail of a mural from the Upper Temple of the Jaguars, Chichén Itzá. *From Taube (2003)*

8 de Sahagun, Bernardino. *Florentine Codex: General History of the Things of New Spain. Book 11 — Earthly Things* (1963). Translated by Charles E. Dibble and Arthur J. O. Anderson. University of Utah Press, Salt Lake City.

9 Nash, R.F. (2001); Tin, T., & Yang, R. (2016). Tracing the contours of wilderness in the Chinese mind. *International Journal of Wilderness,* 22(2), 35–40.

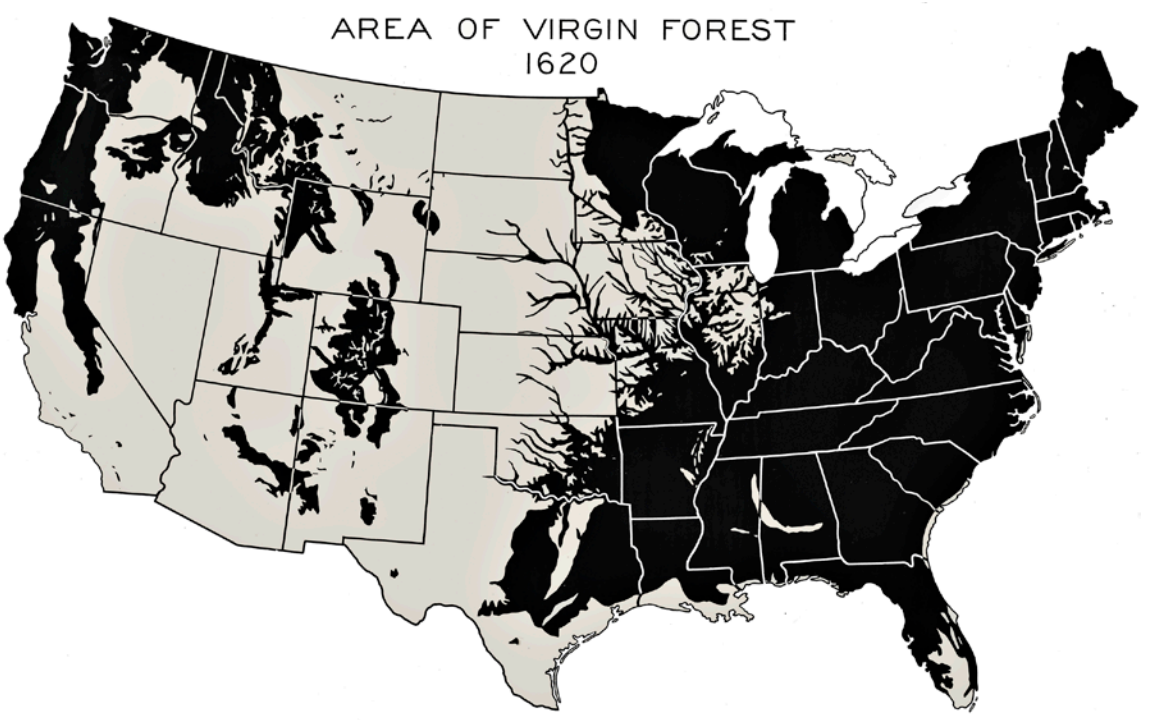
10 Sabol Spezio, T. (2020) Titoqanót Wétes—Nez Percé in Hall, Marcus and Wilko Graf von Hardenberg, eds. "New Wilderness Babel: What does Wilderness Mean in Your Language?" Environment & Society Portal, Virtual Exhibitions. Version 2. Rachel Carson Center for Environment and Society. https://www.environmentandsociety.org/exhibitions/wilderness-babel/titoqanot-wetes-nez-perce

11 Nash, R. F. (2001) states: "... civilization created wilderness. For nomadic hunters and gatherers who represented our species for most of its existence, "wilderness" had no meaning. Everything natural was simply habitat, and people understood themselves to be part of a seamless living community."

12 Nash, R. F. (2001) quotes Chief Standing Bear of the Oglala Sioux (Born 1829) who said "only to the white man was nature a 'wilderness' and...the land infested with wild animals and savage people." [For Native Americans] "there was no wilderness since nature was not dangerous but hospitable." The critical distinction here seems to be that Standing Bear considered danger and hostility to be inherent in the definition of wilderness, which was undoubtedly an accurate assessment of English American (and the Aztecs and Mayan) views on the subject. However, wilderness at its core simply means 'uninhabited and unwilled land.' It is this latter meaning, stripped of its emotional connotations, where we find overlap between the Nez Percé and our modern American understanding of wilderness.

13 Sabol Spezio, T. (2020)

14 These Delaware (Lenape) words come from David Zeisberger's Indian dictionary, Zeisberger, D., & Horsford, E. N. (1887). *Zeisberger's Indian Dictionary.* New York: AMS Press. Zeisberger, a Moravian missionary and minister, lived with the Delaware (Lenape) tribe in the 1750s; Passamaquoddy-Maliseet Language Portal https://pmportal.org/



Greeley's Virgin Forest map. *From Greeley, W. B. (1925)*

of whether the culture is in a densely populated and permanent civilization or a semi-nomadic hunter-gatherer culture.[15]

European perceptions of wilderness in eastern North America

One of the earliest European descriptions of the eastern North American landscape was by the Italian explorer Giovanni Verrazzano in 1524. Verrazzano's descriptions of the forests are notable because they are relatively neutral and even positive in tone. For instance, while observing the Carolina coast, Verrazzano did not see a terrifying wilderness but rather "an outstretched country … covered with immense forests of trees, more or less dense, too various in colors, and too delightful and charming in appearance to be described."[16] Italian words for wilderness focus on the deserted, uninhabited character of the land and are generally not laden with negative emotions and danger,[17] which might help explain the tone of Verrazzano's language.[18]

In contrast, the English settlers who arrived at Plymouth, MA in 1620 viewed the landscape with much more foreboding. William Bradford described a "hideous and desolate wilderness."[19] The hostile wilderness viewpoint largely prevailed for the next century and a half in eastern North America, with John Adams noting in his diary in 1756 that "the whole continent was one continued dismal wilderness."[20]

Beginning in the late eighteenth and early nineteenth centuries, naturalists, writers, and landscape painters—who were witnessing the increasing destruction of forests and wildlife by their fellow European-Americans—began to extol the beauty and benefits of wild nature. In wilderness, the Romantics—like the ancient Far Eastern cultures over a millennia before them—found the highest expression of nature, the place closest to God, and the source for finding the pinnacle of human character.[21]

The Romantics are often portrayed as "inventing the American Wilderness" based in large part on their ignorance of the previous Native American influence on the land.[22] Yet, the naturalist William Bartram, perhaps the earliest champion of wilderness in America, was far from unaware of the land use activities of Native peoples. Traveling in Georgia in 1773, he came upon "the most magnificent forest I had ever seen … sublime … many of the black oaks measured eight, nine, ten, eleven feet diameter …"

Yet, nearby he also observed "many very magnificent monuments of … the ancient inhabitants of these lands are visible … I observed a stupendous conical pyramid … vast tetragon terraces … and certain traces of a larger Indian town … the work of a powerful nation whose period of grandeur perhaps long preceded the [European] discovery of this continent."[23] Given its proximity, Bartram's magnificent forest was almost certainly once used, even tended, by the former civilization. The black oak trees, which can live over 250 years old,[24] likely supplied generations of people from the former culture with acorns, as well as meat from animals that foraged on the acorns (deer, bear, turkey). Burning, fuelwood removal, and tending by the former inhabitants may have even helped promote these oaks by reducing competition from other trees.

Bartram evidently saw little contradiction between a "sublime" forest and one that was previously inhabited and used. This addresses an important and often misunderstood point about wilderness—that it needn't be (and often isn't) pristine in the sense of never having been significantly manipulated by humans in the past; it just needs to be largely shaped by natural processes today and remain so into the future. Indeed, the 1975 Eastern Wilderness Act made this point clear when it established wilderness areas in US National Forests across 13 eastern states in lands that had been previously (and relatively recently) managed by European Americans. The key provision outlined in the original 1964 Wilderness Act is that land is maintained in an "untrammeled" (i.e. undirected and unrestrained) condition going forward.[25] The 2.7 million-acre Adirondack Forest Preserve in New York is the most prominent example of a state-owned wilderness that is not pristine. Designated as "forever wild" by an act of the state legislature in 1894, most of the preserve was logged by Europeans prior to being protected. It has nonetheless become the most iconic wilderness landscape in the eastern United States.[26]

While Bartram was the champion of eastern American wilderness in the eighteenth century, Henry Thoreau held that mantle in the nineteenth. Thoreau, for his part, was also knowledgeable of the impacts of Native Americans, albeit with fewer direct observations than Bartram. After reading William Woods' c. 1633 account of the eastern Massachusetts landscape, Thoreau wrote in his diary that "[the Native Americans] regularly cleared extensive tracts for cultivation …" and "one would judge from accounts that the woods were clearer than the

15 Rothenberg, J. (1980). Indians & wilderness. *Dialectical Anthropology*, 57–62; Anderson, M. G., et al. (1989).

16 *The Voyage of John de Verrazzano, along the Coast of North America, from Carolina to Newfoundland, A.D. 1524*.

17 Piccioni, L. (2020). A Language Without Wilderness—Italian, in Hall, Marcus and Wilko Graf von Hardenberg, eds. "New Wilderness Babel: What does Wilderness Mean in Your Language?" Environment & Society Portal, Virtual Exhibitions. Version 2. Rachel Carson Center for Environment and Society https://www.environmentandsociety.org/exhibitions/wilderness-babel/language-without-wilderness-italian; Adams, W. (2020). Wilderness—England's English, in in Hall, Marcus and Wilko Graf von Hardenberg, eds. "New Wilderness Babel: What does Wilderness Mean in Your Language?" Environment & Society Portal, Virtual Exhibitions. Version 2. Rachel Carson Center for Environment and Society. https://www.environmentandsociety.org/exhibitions/wilderness-babel/wilderness-englands-english

18 Verrazzano was also sailing for and reporting to the King of France, so he was more apt to speak in positive terms of the lands he was observing.

19 Nash, R. F. (2001).

20 Pearce, F. (2022). *A Trillion Trees: Restoring Our Forests by Trusting in Nature*. Greystone Books Ltd.

21 Nash, R. F. (2001).

22 Denevan, W. M. (1992).

23 Bartram, W. A. (1976). *Travels and Other Writings*. Princeton: Princeton University Press.

24 Eastern Oldlist (2024). https://www.ldeo.columbia.edu/~adk/oldlisteast/.

25 The confusion about wilderness needing to be pristine originates, in part, from a clause in the 1964 Wilderness Act definition that wilderness is "…land retaining its primeval character and influence…which generally appears to have been affected primarily by the forces of nature…" However, the passage of the 1975 Wilderness Act made it clear that previous logging and other human management did not disqualify lands from being designated and managed as wilderness into the future. Two US Senators who worked on the wilderness bills in 1964 and 1975 roundly dismissed the notion that wilderness needed to be historically pristine. Henry Jackson called this a "serious and fundamental misinterpretation of the Wilderness Act," (https://en.wikipedia.org/wiki/Eastern_Wilderness_Areas_Act), and Frank Church said that "Nothing could be more contrary to the meaning and intent of the Wilderness Act." Quoted in Foreman, D. (2014). The myth of the humanized pre-Columbian landscape. *Keeping the Wild: Against the Domestication of Earth,* 114–125.

26 Davis, J. (2015). Letting it be on a continental scale: some thoughts on rewilding. *Protecting the Wild: Parks and Wilderness, the Foundation for Conservation,* 109–119.

primitive wood that is left, on account of Indian fires …" But Thoreau also recognized previous Native American land use as occurring on a completely different scale and intensity—because it still left much of the landscape and its life forms intact—than what he was experiencing in mid-nineteenth century Concord, Massachusetts: "But when I consider that the nobler animals have been exterminated here—the cougar, panther, lynx, wolverine, wolf, bear, moose, deer, the beaver, the turkey, etc., etc.— I cannot but feel as if I lived in a tamed, and, as it were, emasculated country …"[27] And indeed it was. Thus, when Thoreau suggested that we "should preserve a certain sample of wild nature" so that it "may still exist and not be civilized off the face of the earth,"[28] he was including in wild nature the forest and all its animal inhabitants that had once co-existed with native peoples prior to European settlement.

Thoreau's pleas notwithstanding, the pace of environmental destruction only increased in the second half of the nineteenth century across the Eastern US and Great Plains. Logging and timber production peaked at the turn of the twentieth century, while most of the large mammals—grey wolves, bison, elk, cougars, and wolverines—were exterminated from the eastern United States.[29] At least four bird species were driven extinct from habitat loss and/or overhunting, most notably the Passenger Pigeon and the Ivory-Billed Woodpecker.[30]

It was on the heels of this destruction that the US Forest Service Chief WB Greeley published a paper and series of maps in 1925 showing the extent and loss of "virgin forests" in the United States since 1620.[31] In the 1620 map we see virtually the entire eastern United States covered by a sea of virgin forest except for those areas that were naturally grassy vegetation—the Prairie Peninsula in central and northern Illinois, the Everglades in Florida, the crescent-shaped Blackbelt Prairie in Mississippi and Alabama, and the Blackland Prairie of eastern Texas. There are no Native American settlements and agricultural fields, no open lands along the coast and river valleys, and no thinned and open forests from centuries of burning and fuelwood gathering. This errant perspective of the virgin forest prevailed among many authors, environmentalists, and scientists.[32]

The pristine myth and reality

In 1992, the geographer William Deneven published *The Pristine Myth: the Landscape of the Americas in 1492* as a rebuttal to the notion that America was a pristine and largely empty wilderness prior to European settlement. Deneven's paper built on earlier works by Gordon Day (1953), William Cronon (1983), Michael Williams (1989) and others that described the important influence that Native Americans once had on the forested landscapes of the Eastern US. [33] The Pristine Myth was reiterated by Cronon in his influential 1996 essay *The Trouble with Wilderness* and popularized widely in Charles Mann's 2005 book *1491*.[34]

Deneven, Mann, and others argued that the Americas, including the seemingly most remote wilderness areas on Earth such as the Amazon rainforest were not pristine, virgin forests, but actually once populated and intensively used by native peoples. Perhaps 60 million people lived in the Americas in total, with about 4 million people north of Mexico.[35] According to these authors, it wasn't until over 90%

27 Foster, D. R. (1999). *Thoreau's Country: Journey Through a Transformed Landscape*. Harvard University Press.

28 Nash, R. F. (2001).

29 Williams, M. (1989). *Americans and their Forests: a Historical Geography.* Cambridge University Press. Alverson, W.S., Waller, D. and Kuhlmann, W. (2013). *Wild Forests: Conservation Biology and Public Policy.* Island Press. Whitney, G.G. (1996).

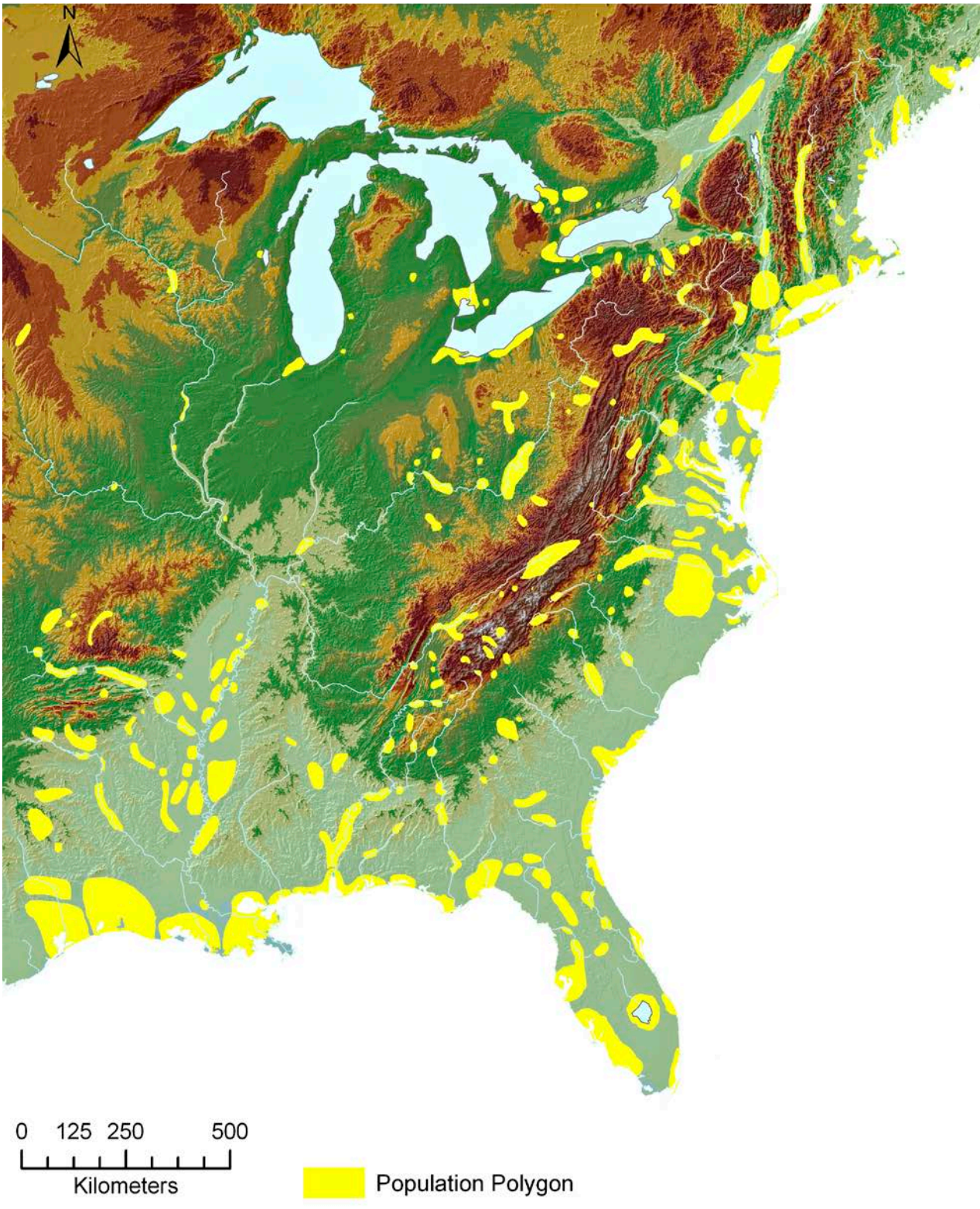
30 Askins, R.A. (2014). *Saving the World's Deciduous Forests: Ecological Perspectives from East Asia, North America, and Europe.* Yale University Press.

31 Greeley, W. B. (1925). "The Relation of Geography to Timber Supply." *Economic Geography* 1: 1–11; Peterken (1996) defined virgin forest as forest "never having been significantly influenced by people and implies an unbroken history of natural development"; however, it can often mean not influenced by technologically advanced societies. In either case, Greeley's map completely ignores the important impact of human cultures on eastern American forests prior to 1620. Peterken, G.F. (1996). *Natural Woodland: Ecology and Conservation in Northern Temperate Regions*. Cambridge University Press.

32 Denevan, W. M. (1992); See for example Miller, P. (2009). *Errand into the Wilderness* (Vol. 81). Harvard University Press and Waller, D. and Kuhlmann, W. (2013). *Wild Forests: Conservation Biology and Public Policy.* Island Press.

33 Day, G. M. (1953). "The Indian as an Ecological Factor in the Northeastern Forest. *Ecology*, 34(2), 329-346; Cronon, W. (1983). *Changes in the Land: Indians, Colonists, and the Ecology of New England*. Hill and Wang; Williams, M. (1989).

34 Denevan, W. M. (1992); Mann, C.C. (2005). *1491: New Revelations of the Americas before Columbus*. Knopf; Cronon, W. (1996). "The Trouble with Wilderness: or, Getting Back to the Wrong Nature." *Environmental History*, 1(1), 7–28.



Population settlement locations of Native Americans at 1500 CE in the eastern United States. *Data from Milner and Chaplin (2010)*

of American Indian populations succumbed to European diseases, resulting in the abandonment of settlements and agricultural fields and the subsequent regrowth of forests, did the perception of the virgin American wilderness come into being in the eighteenth and nineteenth centuries.

There is certainly some truth to these arguments. There were over a million Native peoples in in the Eastern United States in 1500 CE,[36] and when we look to the accounts of the first European explorers prior to the devastating disease epidemics, we clearly see examples of Native American impacts on the landscape. Not only were there extensive clearings and settlements in many areas, but the forest itself was often notably open and thinly treed. For example:

> Samuel Champlain in Boston Harbor, MA (1605): "All along the shore there is a great deal of land cleared and planted with Indian corn."
>
> John Smith, Jamestown. Virginia (1607): "the [Native American] houses are in the midst of their fields or gardens, which are small plots of ground. Some 20 acres, some 40, some 100, some 200, some more, some less. In some places some 20 to 50 of those houses together … Near their habitations is little small wood or old trees on the ground by reason of them burning of them by fire. So that a man may gallop a horse amongst the woods any way."
>
> Garcilaso, Georgia (1539): "The land of Ocute … has the most open forest and very excellent fields along the rivers."
>
> Garcilaso, Northwestern Florida (1539): "The first two leagues beyond the river the land consisted of open plains and the next four of cultivated fields … Ugachile had 200 houses."[37]

Corroborating these historical accounts, fossil pollen and charcoal evidence obtained from sediment cores reveal significant non-forest vegetation and fire in many locations along the East Coast prior to European settlement. Some examples include the outwash plain of Martha's Vineyard, Massachusetts, extensive cultivation and open vegetation in southern Ontario and along the Little Tennessee River Valley in eastern Tennessee, and cultivated vegetation and burning in the nearby highlands of North Carolina.[38]

But how much land did the Native Americans inhabit and use in 1500 CE? And how do we reconcile the above accounts with others that suggest a very different landscape character? For instance:

> Jacques Cartier, exploring the region around the mouth of the Saint Lawrence River, New Brunswick (1535–1536): "… the land is not tilled nor full of people; and it is all full of woods …"
>
> Samuel Champlain, exploring the inlets of Passamaquoddy Bay along New Brunswick and Maine Coast (1604): "[aside from an area in which] there are 15 to 20 acres of cleared land … all the rest of the country is covered with very thick forests."
>
> John Smith, Virginia (c. 1607–1609): "By the rivers are many plaine marishes, containing some 20 some 100. some 200 Acres, some more, some lesse. Other plaines there are few, but onely where the Salvages inhabit: but all overgrowne with trees & weeds, being a plaine wildernesse as God first made it."
>
> Hernando De Soto between Florida and Georgia (c.1540): "[we passed through] a lean land, and most of it covered with rough pine groves, low and very swampy, and in places having lofty dense forests, where … the horses [could not] enter …"[39]

The human population density provides some critical perspective. At 1500 CE, the population of eastern North America is estimated to have been ~1.6 million people,[40] which is slightly higher than the population of the state of New Hampshire today. Distributed across 1.2 million square miles of what is now the eastern United States, an area 133 times larger than New Hampshire, this population size results in an average of 1.3 people per square mile. To put that number into perspective, the US Census Bureau in 1890 defined as "unsettled" land with less than 2 people per square mile.[41] Locally much higher population densities and settlement patterns were clustered along the resource-rich coast and river valleys, which left many inland areas far below the average. Additionally, substantial areas of resource-rich land remained unsettled, resulting in scattered population centers.[42]

What emerges from this density estimate and a comprehensive map of settlement locations (Fig. 3) is the extent to which Native American land use impacted large areas of the eastern United States AND the extent to which there were vast and far more extensive unoccupied areas across this region at 1500 CE.[43] Along much of the Gulf Coast and eastern seaboard (with the exception of the Carolinas) and many major rivers, the notion of a pristine wilderness is inconsistent with previous American Indian occupation.[44] Forest composition, structure, and age in these areas, particularly within dense population clusters, were notably shaped by Native American agricultural and silvicultural activities. For example,

in the abandoned fields and settlements of the Iroquois in southern Ontario, white pine forests grew back in what was previously beech-maple deciduous forest. But beyond kilometers to tens of kilometers around settlements and travel corridors, the land was generally uninhabited and only lightly used if at all. In these wilderness areas, human impacts were "indistinguishable from other drivers of environmental heterogeneity."[45]

Examples of these uninhabited areas in the southeastern US are confirmed by Hernando De Soto's expedition (1539–1543)—the first European expedition into the southeastern U.S. prior to the devastating disease epidemics, presumably wrought by De Soto himself and other Europeans. His army traveled through 60 leagues (~150 miles) of "desert," (the Spanish term for unpopulated lands) from modern day Tallahassee, Florida to central Georgia. Then De Soto marched 9-10 days through 80 leagues (~200 miles) of another uninhabited stretch between Ocute in northeastern Georgia and Cofitachequi in South Carolina.[46]

But 1500 CE is still just a snapshot in time in the pre-European past. It is important to consider that large agricultural population centers developed between 900 and 1300 CE—most spectacularly at Cahokia in the central Mississippi valley—and that many of these settlements shrank, relocated, or disappeared by 1500 CE.[47] For instance, the Great Lakes region of Michigan, the Ohio River Valley, and large parts of the Midwestern US that were uninhab-ited in 1500 CE were settled in earlier centuries. Other areas remained, to the best of archaeological knowledge, uninhabited during these centuries.[48] Thus, an important distinction can be made between wilder-ness that was not pristine in the sense of having been settled and/or managed in the past (e.g., Bartram's magnificent black oak forest described above) and

35 Deneven, W. M. (1992); Milner, G. R., & Chaplin, G. (2010). "Eastern North American Population at ca. AD 1500." *American Antiquity,* 75(4), 707–726.

36 Milner, G. R., & Chaplin, G. (2010).

37 These quotes represent just a few of the many examples. Quotes obtained from Williams, M. (1989). Americans and their forests: a historical geography. Cambridge University Press. Alverson; Swanton, J. R. (1985). Final report of the United States De Soto Expedition, Smithsonian Institution Press; The voyages and explorations of Samuel de Champlain 1604–1616. https://libsysdigi.library.uiuc.edu/oca/Books2008-05/voyagesexplorati/voyagesexplorati-01cham/voyagesexplorati01cham.pdf?ref=quillette.com.

38 Cridlebaugh, P. A. (1984). *American Indian and Euro-American impact upon Holocene vegetation in the lower little Tennessee River Valley, East Tennessee.* The University of Tennessee; Stevens, A. (1996). *The Paleoecology of Coastal Sandplain Grasslands on Martha's Vineyard, Massachusetts*. University of Massachusetts Amherst; Munoz, S. E., Mladenoff, D. J., Schroeder, S., & Williams, J. W. (2014). "Defining the Spatial Patterns of Historical Land Use Associated with the Indigenous Societies of Eastern North America." *Journal of Biogeography,* 41(12), 2195–2210. Delcourt, H. R., & Delcourt, P. A. (1997). "Pre-Columbian Native American Use of Fire on Southern Appalachian Landscapes." *Conservation Biology,* 11(4), 1010–1014.

39 Swanton, J. R. (1985).

40 Native American population estimate from Milner, G. R., & Chaplin, G. (2010), which is about a half million people higher than that estimated by *National Geographic* in 2007 (*National Geographic: Colonial America 1491 vs. 1650 – A World Transformed*).

41 US Census Bureau (2012). Following the frontier line, 1790 to 1890. https://www.census.gov/dataviz/visualizations/001/.

42 See Munoz et al. (2014) and Milner and Chaplin (2010).

43 Milner and Chaplin (2010).

44 However, as noted before, a pristine or virgin quality is not a necessary requirement of wilderness designation. It does, however, address the question of whether the land had a lengthy history of human land use.

45 Quote from Munoz, S. E., Mladenoff, D. J., Schroeder, S., & Williams, J. W. (2014). "Defining the Spatial Patterns of Historical Land Use Associated with the Indigenous Societies of Eastern North America." *Journal of Biogeography*, 41(12), 2195–2210. Munoz et al. (2014) also provided the example of the pine forests regrowing on abandoned Iroquois settlements. See also Tulowiecki, S. J., Ranney, E. R., Keenan, E. M., Neubert, G. M., & Hogan, M. L. (2022). "Localized Native American Impacts on Past Forest Composition Across a Regional Extent in Northeastern United States." *Journal of Biogeography*, 49(6), 1099–1109. These authors concluded that "Native American land use had no detectable effect on forest composition across a regional extent, but increased the abundance of fire-tolerant, shade-intolerant and nut-producing trees locally."

46 Swanton, J. R. (1985). *Final Report of the United States De Soto Expedition*, Smithsonian Institution Press.

47 See Figure 6 in Munoz et al. (2014).

48 Milner, G. R., Anderson, D. G., & Smith, M. T. (2001). The Distribution of Eastern Woodlands Peoples at the Prehistoric and Historic Interface. *Societies in Eclipse: Archaeology of the Eastern Woodlands Indians, A.D. 1400–1700*, 9–18. Munoz et al. (2014).

49 An example of the former can be found in the De Soto expedition. In northcentral Florida, De Soto "passed an

Forests, it turns out, are not dependent on human beings to produce thriving, complex, and diverse structures.

wilderness that was very likely pristine in the sense of having been only very lightly used but never settled.[49]

A skeptic may point to the incomplete archaeological record as not reflecting the full extent of Native American settlements and impacts on the landscape. Although small sites (fire pits and temporary camps) have undoubtedly been missed by archaeologists, it is unlikely, according to the archaeologist George Milner, that significant population centers have been overlooked during the past century of archaeological investigation.[50]

Eastern North America was a thriving and peopled landscape in 1500 CE, and to an even greater extent for many centuries beforehand. It was also a wilderness landscape in which most of the land area remained unsettled and very lightly affected by people. Both of these ideas are true simultaneously.[51]

The condition of wilderness forests

Although the concept of wilderness is a cultural construct, wilderness nonetheless reflects a physical reality in which certain landscapes are primarily or completely outside the realm of human intervention or direction. If large areas of eastern North American forests grew under Native American management at some time between 1000 and 500 years ago, and perhaps even larger areas appear to have grown and self-organized largely independent of human beings, what are the implications for the health of forests growing today in protected wilderness areas that are unaided by management? Do forests require human management to prevent degradation as some have suggested?[52]

In 2002, forest ecologist Jerry Franklin and colleagues published an influential paper on the development of "natural forests" (those unmanaged by people).[53] The authors showed how such forests develop a complex arrangement of structures as they age—i.e., dead standing and downed trees, and large old trees—regardless of, and in large part because of, what nature throws at them in terms of natural disturbances. The authors argued that contemporary forest management could do a better job of protecting biodiversity and ecological processes and functions by emulating the structural development in older, natural forests. Forests, it turns out, are not dependent on human beings to produce thriving, complex, and diverse structures. Rather, undirected forests exposed to the whims of nature result in forest conditions that forest managers would do well to learn from and apply to their management practices.

This is hardly surprising. North America's eastern deciduous forests evolved and developed over 60 million years in the absence of people before humans crossed the Bering Land Bridge and arrived on the scene about 15,000 years ago.[54] This is not to say that land use activities of Native Americans didn't create diverse vegetation structures and benefit certain

species—they certainly did[55]—but that forests are by no means dependent on such activities by people for complexity, diversity, function, and habitat.

Subsequent research in the eastern United States has not only borne out the idea of the self-sustaining natural forest, but that wilderness and wilderness-like forests are generally in better condition than those that are not protected from human activities. Two papers authored by National Park Service ecologists in 2016 and 2018 compared dozens of National Park forests in the eastern United States to nearby unprotected forests exposed to management. The authors led by Kate Miller reported greater structural complexity—in terms of large live and dead trees and large dead wood on the forest floor—and greater tree species diversity in the park forests.[56]

A more recent paper that I published with colleagues in 2023 reported similar results in wildland (aka wilderness) forests of the Northeastern US: structural complexity (diversity of tree diameter size classes, density of large live and large dead trees, and maximum tree height) were all greater in wildland forests than in forests exposed to management.[57] Notably, we observed the greatest discrepancies in forest condition in wilderness areas that had been protected for the longest time—i.e., in the Adirondack and Catskill Forest Preserves that were designated as "forever wild" over a century ago. In short wilderness designation does not result in forest degradation, as some have proposed. Just the reverse happens.

Increased structural complexity and tree species richness generally provide greater resources and habitat niches and thus are predictors of overall biodiversity.[58] In a 2014 paper, researchers from the University of Minnesota found that bird species richness, density, and abundance of individual species were all higher in wilderness forests compared to adjacent managed forests in Superior National Forest.[59] Notably, the number of "early successional" bird species—those species that prefer young, scrubby habitats

uninhabited region ten or twelve leagues in extent…in which there are large forests of walnut, pines, and other trees…They all appeared to have been set out by hand there being so much space from one to another than horses could even run between them…" It seems plausible that the expedition was passing through a wilderness that had been, at least in part, altered by human management in centuries past.

50 Milner and Chaplin (2010).

51 Vale, T. R. (2000). Pre-Columbian North America: Pristine or Humanized-or Both? *Ecological Restoration*, 18(1), 2–3.

52 Fletcher, M. S. et al. (2021); Berlyn, G. P. et al. (2020).

53 "Natural forests" are largely synonymous with wilderness forests. Franklin, J. F., Spies, T. A., Van Pelt, R., Carey, A. B., Thornburgh, D. A., Berg, D. R., … & Chen, J. (2002). "Disturbances and Structural Development of Natural Forest Ecosystems with Silvicultural Implications, Using Douglas-fir forests as an Example." *Forest Ecology and Management*, 155(1–3), 399–423.

54 Askins, R.A. (2014).

55 See Whitney (1996) and Munoz et al. (2014).

56 Miller, K. M., Dieffenbach, F. W., Campbell, J. P., Cass, W. B., Comiskey, J. A., Matthews, E. R., … & Weed, A. S. (2016). "National Parks in the Eastern United States Harbor Important Older Forest Structure Compared with Matrix Forests." *Ecosphere*, 7(7), e01404; Miller, K. M., McGill, B. J., Mitchell, B. R., Comiskey, J., Dieffenbach, F. W., Matthews, E. R., … & Weed, A. S. (2018). "Eastern National Parks Protect Greater Tree Species Diversity Than Unprotected Matrix Forests." *Forest Ecology and Management*, 414, 74–84. See Miller, K. M., McGill, B. J., Weed, A. S., Seirup, C. E., Comiskey, J. A., Matthews, E. R., … & Paul Schmit, J. (2021). Wilderness forests, particularly those in proximity to human development, are not immune to the spread of invasive plants, as many of these National Park forests have seen increases in invasive plants over time. See Miller, K. M., McGill, B. J., Weed, A. S., Seirup, C. E., Comiskey, J. A., Matthews, E. R., … & Paul Schmit, J. (2021). "Long-Term Trends Indicate that Invasive Plants are Pervasive and Increasing in Eastern National Parks." *Ecological Applications*, 31(2), e02239. However, tree cutting almost invariably promotes greater invasive plant abundance in managed forests than in forests that are left uncut. See Wilms et al. 2017. "The Effects of Thinning and Burning on Understory Vegetation in North America: a Meta-Analysis." *Forest Ecology and Management*.

57 Faison, E. K., Laflower, D., Morreale, L. L., Foster, D. R., Hall, B., Johnson, E., & Thompson, J. R. (2023). "Adaptation and Mitigation Capacity of Wildland Forests in the Northeastern United States." *Forest Ecology and Management*, 544, 121145.

58 McElhinny, C., Gibbons, P., Brack, C., & Bauhus, J. (2005). "Forest and Woodland Stand Structural Complexity: its Definition and Measurement." F*orest Ecology and Management*, 218(1–3), 1–24.

59 McElhinny, C., Gibbons, P., Brack, C., & Bauhus, J. "Forest and Woodland Stand Structural Complexity," 1–24.

60 See for example the recent review paper by Akresh, M. E., King, D. I., McInvale, S. L., Larkin, J. L., & D'Amato, A. W. (2023). "Effects of Forest Management on the Conservation of Bird Communities in Eastern North America: A Meta-Analysis." *Ecosphere*, 14(1), e4315.) The authors reported that recently managed (<16 years since cutting) forests had higher bird conservation value than unmanaged forests, in large part because of their habitat benefits for early successional bird species. However, their analysis "excluded studies examining the effects of fire or other natural disturbances." from the unmanaged forest category. Given that natural disturbances are the key

Complexity and species diversity also go hand in hand with the resilience of the forest.

rather than mature forests—did not differ between the two management categories. Early successional species can benefit from human management that creates young, shrubby vegetation;[60] but importantly these species don't require such management to survive. Indeed, the Minnesota researchers found that natural openings from treefalls, beaver ponds/meadows, floodplains, and other disturbances provided those habitats naturally, as they undoubtedly did for millions of years before humans arrived in North America.[61]

Greater structural complexity and species diversity also go hand in hand with the resilience of the forest (i.e., the capacity of forests to recover from disturbance), a particularly relevant quality in our current age of climate change and increased forest disturbances. In a recent global analysis of forest resilience in the journal *Nature,* the authors concluded the following: "Intact [i.e., unmanaged] forests have considerably … higher forest resilience

drivers of structural complexity and biodiversity in natural forests, one cannot conclude from Akresh et al. (2023) that wilderness forests do not provide adequate habitat for early successional forest species. In contrast, Zlonis and Niemi (2014) cited above and in the text did include the full range of forest conditions and natural disturbances in their study.

61 Additionally, the frequency and intensity of weather related disturbances such as windthrow and insect outbreaks have increased in recent decades and are expected to continue to increase with climate change, providing greater amounts of young, shrubby vegetation that will benefit early successional species. See Parmesan, C., Morecroft, M. D., Trisurat, Y., Adrian, R., Anshari, G. Z., Arneth, A., Gao, Q., Gonzalez, P., Harris, R., Price, J., Stevens, N., & Talukdarr, G. H. (2022). "Terrestrial and Freshwater Ecosystems and Their Services. In H.-O. Pörtner, D. C. Roberts, M. Tignor, E. S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, & B. Rama (Eds.), *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 197–377). Cambridge University Press. https://doi.org/10.1017/9781009325844.004.

62 Forzieri, G., Dakos, V., McDowell, N. G., Ramdane, A., & Cescatti, A. (2022). "Emerging Signals of Declining Forest Resilience Under Climate Change." *Nature*, 608(7923), 534–539.

63 Faison, E. K. et al. (2023).

64 Nunery, J. S., & Keeton, W. S. (2010). "Forest Carbon Storage in the Northeastern United States: Net Effects of Harvesting Frequency, Post-Harvest Retention, and Wood Products." *Forest Ecology and Management,* 259(8), 1363–1375.

65 However, it is important to note that not all indigenous stewardship and management is enlightened and beneficial, and that regardless of ethnicity, high human population densities, human migration into previously unpeopled lands, and access to technology have historically played a large role in human impacts on forests and wildlife, including local and global extinctions of species. See Wilson, E. O. (1999). *The Diversity of Life*. W. W. Norton & Company; Diamond, J. (2011). *Collapse: How Societies Choose to Fail or Succeed* (revised edition). Penguin. Estrada, A., Garber, P. A., Gouveia, S., Fernández-Llamazares, Á., Ascensão, F., Fuentes, A., … & Volampeno, S. (2022). "Global Importance of Indigenous Peoples, Their Lands, and Knowledge Systems for Saving the World's Primates from Extinction." *Science Advances*, 8(31), eabn2927.

66 Waller, D. M., & Reo, N. J. (2018). "First Stewards: Ecological Outcomes of Forest and Wildlife Stewardship by Indigenous Peoples of Wisconsin, USA." *Ecology and Society.*

67 Sze, J. S., Childs, D. Z., Carrasco, L. R., & Edwards, D. P. (2022). "Indigenous Lands in Protected Areas Have High Forest Integrity Across the Tropics." *Current Biology*, 32(22), 4949–4956; Schuster, R., Germain, R. R., Bennett, J. R., Reo, N. J., & Arcese, P. (2019). "Vertebrate Biodiversity on Indigenous-Managed Lands in Australia, Brazil, and Canada Equals That in Protected Areas." *Environmental Science & Policy*, 101, 1–6; Monitoring of the Andean Amazon Project (2023) MAAP #183: Protected Areas & Indigenous Territories Effective Against Deforestation Across Amazon | MAAP (maaproject.org).

68 Sze et al. (2022).

69 Pearce, F. (2022).

70 Faison, E. K. (2021). "Backyard Climate Solutions." *Arnoldia,* 78(3), 28–37.

71 Cronon, W. (1996).

than managed forests … This finding reinforces the expectation that intact forests have a higher capacity to withstand external perturbations."[62]

In addition to resilience, the capacity of forests to accumulate and store carbon (aka their "climate mitigation capacity") is a critical ecosystem service with ever increasing carbon dioxide levels in the atmosphere. Our 2023 paper mentioned above found that wildland forests stored 20% more aboveground carbon (carbon in both live and dead trees) than in unprotected forests overall.[63] Researchers from the University of Vermont examined the relationship between carbon and forest management more thoroughly. They calculated the carbon accumulated in forests exposed to a wide range of forest management approaches, ranging from the most intensively managed clearcuts to the least intensively managed 'structural retention harvests.' Interestingly the retention harvests significantly outperformed the clearcuts in terms of carbon accumulation; however, the unmanaged forests outperformed all of the managed forest scenarios, even when the stored carbon that remained in harvested wood products was included in the managed forest totals.[64]

Indigenous stewardship and wilderness

Not all forms of forest management are equivalent in terms of their impacts and ability to retain structures and species. Contemporary Native American forest and wildlife management are, in some cases, more progressive and less impactful than those of modern European-American systems.[65] For example, in Wisconsin, the Menominee and Ojibwe tribes value old trees and forests, and consequently manage their tribal forests for longer rotations and larger trees. Menominee County, in which the tribal lands are located, is also the least populated county in Wisconsin; thus, low population densities undoubtedly contribute to the relatively light touch on the tribal forests. These forests, in turn, store more carbon than national forests managed by the USDA Forest Service located just outside the reservation. The Menominee and Ojibwe also value and protect large carnivores such as wolves, resulting in reduced deer browsing pressures and increased tree seedling densities on their tribal lands.[66]

At a global scale, indigenous territories often rival "protected areas"—which include wilderness area but also less strictly protected lands that allow some management—in terms of greater connectivity, greater vertebrate diversity, reduced forest loss, and greater forest integrity than surrounding unprotected and non-indigenous lands.[67] One recent study showed that indigenous lands that overlapped with protected areas in South America achieved the highest forest integrity scores in the world; however, these areas also had the highest proportion of wilderness forests.[68] Thus, it's unclear what exactly is driving the enhanced conservation performance of these areas. Is it indigenous stewardship—most notably better protection against illegal logging/mining/hunting than protected areas that are under government control[69]—or is it the existing high percentage of wilderness? The choices are to some extent interdependent, and like many such questions, the answer is probably both/and rather than either/or.

Concluding thoughts

Just as it is clear that over a million Native Americans lived in and altered parts of the landscape of the eastern United States prior to Columbus, it is also clear that uninhabited, wilderness-like conditions existed across vast areas of this region at 1500 CE. Many of these uninhabited areas were once inhabited by Native American cultures centuries earlier; many others were apparently never inhabited.

Forest ecosystems generally thrive in a wilderness condition, achieving high levels of complexity, diversity, and carbon storage relative to managed areas; but of course, wilderness conditions do not provide everything that people need (i.e., wood, fuel, crops, shelter) and thus cannot and do not exist everywhere. And, as William Cronon argued, we can find considerable joy and satisfaction in the wildness and naturalness in our own backyards—something that I too have written about[70]—if, that is, we are open to seeing it.[71]

Yet, the nature near our dwellings will always feel different to us than the nature of unsettled areas outside of human influence. That was true for the classical Maya in Mexico, and it was true for the Nez Percé in the Pacific Northwest. Unsettled wilderness has always been a recognized part of the American landscape, and thus protected wilderness areas today are, in many respects, a natural outgrowth of a concept and condition that was common long before Europeans arrived in America.

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