Ecology without Us: Ecological Succession and History in *Earth Abides*

Abstract: George R. Stewart's *Earth Abides* (1949) is a classic American post-apocalypse novel, but it is also a thought experiment examining humanity's changing role on earth that closely reflects the shift from a deterministic paradigm of ecological succession to one emphasizing contingency and human impact. Enmeshed in a community of scientists involved on the debate, Stewart builds on it to create a theory of environmentally embedded history in which human agency is understood as a partnership with the natural environment. By attending to Stewart's network of scientific influences, this article seeks to transcend the "antagonistic wilderness" reading of post-apocalyptic ecologies.

> *The Angel of History must look just so. His face is turned towards the past. Where we see the appearance of a chain of events, he sees one single catastrophe, which unceasingly piles rubble on top of rubble and hurls it before his feet.*
>
> *—Walter Benjamin*

> *Plant associations are contemporary expressions of historical events and processes, involving changes in environment and biota over a large span of geologic time. A real science of plant ecology must rest not only on physiology and genetics, but on historical plant and physical geography.*
>
> *—Carl O. Sauer*

In 1955, a symposium of unprecedented scope and interdisciplinarity gathered in Princeton, New Jersey to address a topic whose importance was growing more obvious every year: "Man's Role in Changing the Face of the Earth." When the Berkeley geographer Carl Ortwin Sauer was asked to organize this symposium, the enormity of not just the question but the task it occasioned left him "aghast, excited, and somewhat scared": from a list of ninety of the leading thinkers in the humanities, sciences, and social sciences, Sauer was to pick only thirty, suggesting topics that

would organize their contributions into a coherent series of addresses (Williams et al. 154). The basis for this work was George Perkins Marsh's *Man and Nature; or, Physical Geography as Modified by Human Action* (1864), which inspired the conference's title and motivating question, so much so that the symposium became known as the "Marsh Festival." Among those questions: is humanity an external force acting on nature, or just one part of it? How did humanity arrive its present role and how should it be represented? And implicitly: how can humanity's impact on the planet be weighed against the planet's capacity for regeneration and resilience?[1] Answering these questions would require the historical rigor that characterized Sauer's work to be combined with the speculations into the future more characteristic of his co-organizer, Lewis Mumford, and the science-fiction writers like Kurt Vonnegut and Aldous Huxley—whom Sauer both met with skepticism and considered inviting (Williams et al. 155). They were also the questions that would be carried forward into the sixties, seventies, and beyond, marking the Marsh Festival as an important preamble to the modern environmental movement.[2]

Perhaps the most enduring expression of the intellectual moment this symposium represents, however—or at least the one with the widest circulation into the twenty-first century—is a science-fiction novel that in many ways anticipates the symposium, had close ties to its organizer Carl Sauer and the wider academic milieu whom the conference served, and took up the same set of questions in ways that have not been sufficiently recognized: *Earth Abides*. The 1949 novel by Sauer's friend and colleague George R. Stewart, a foundational text in the American post-apocalypse canon, can be read in environmental terms that are more complex than the simple vision of a "return-to-wilderness" that is usually ascribed to it. Rather, it is a thought experiment in human ecology that tries to evaluate the scale and nature of humanity's impact on the planet by suddenly removing it. Among the few survivors of planetwide plague is

the novel's protagonist Ish, a combination ecologist-geographer who seems almost eager to watch the results of the experiment come in: "What would happen to the world and its creatures without man? *That* he was left to see!" (25). *What* Ish sees, exactly, would be determined by Stewart's own ecological imaginary, but it was guided by input of a group no less interdisciplinary than that of Sauer's conference—indeed, I will read Stewart's classic post-apocalypse novel almost as a symposium in itself, one in which Sauer also played a central role. One contention of this article is that *Earth Abides* should be understood as the product of an interdisciplinary environment that Stewart cultivated and drew on liberally to write a truly ecological science-fiction, that is, one invested in the state of the contemporaneous ecological science. Stewart's research notes reveal a rich network of historians, botanists, zoologists, ecologists, epidemiologists, and more, among them Starker Leopold, Aldo Leopold's son and an influential zoologist and forester. Considering the novel in this context creates a window into the state of multidisciplinary human ecology at a moment of defining transition.

The rest of this article will argue that *Earth Abides* reflects a contemporaneous shift in theories of ecological succession—a concept foundational to ecological science, which describes the changing composition of plant and animal communities in an area over time as it progresses from bare ground to mature forest—imagining a post-human ecological succession as the basis for an ecologically embedded understanding of *historical* succession. *Earth Abides* insistently returns to distinctly successional images as nature either "reclaims" or simply emerges among the traces of the built environment humanity has left behind. The inconsistencies and tensions among these representations reflect a transitional moment in the dominant paradigm of succession, from a teleological and climatically determined model to one contingent on the local physical environment and unpredictable migrations of plant and animal species. Stewart's

depiction of historical *de-succession* similarly responds to a changing physical, technological, and social environment. Exploring the range of perspectives on the determinism-contingency axis that defines the succession debates, Stewart finally lands, as would ecological consensus, on the side that rejected a teleological and deterministic vision of succession; as he does so, he outlines the basis for a vision of human and natural histories that co-produce each other, and defines a hybrid successional paradigm that proceeds by progressively complex human-nature assemblages. This distinction matters in terms of how we understand the imaginative potential of post-apocalyptic natures as well as for what it shows about the place of the human in ecological thinking even to this day. The conclusion will thus gesture towards the relevance of Stewart's environmentally embedded future history to human-nature thinking in the Anthropocene. Reconsidering the environmental thinking of *Earth Abides* is a way to also rethink the ecological possibilities of post-apocalypse speculation more broadly considered, both in science-fictional terms and in terms of the broader environmentalist context where such speculation appears.

Earth Abides begins when Ish goes into the wilderness to get away from people. It works—arguably too well, as Ish discovers when he emerges after weeks alone, in which he was stranded while recovering from a rattlesnake bite, and finds almost nobody at all. A plague has so decimated the human population that "mankind seem[s] merely to have been removed rather neatly, with a minimum of disturbance" (16). The houses are empty, the stores unattended, as though everyone had vanished without a trace—except for the built environment, the infrastructure, and everything else humanity has done to transform its surroundings. The terms of the human-nature equation have been radically changed, and nature is left to do what it will with what has been left behind. Cracks open in streets and widen with erosion, becoming habitats for

weeds and bushes (54). Population booms of successively larger creatures sweep over the empty cities, from ants and rats to cattle and mountain lions (88-90, 112-13, 134, 136). As the natural reemerges from the rubble of history, Ish watches carefully to see what path the renaissance of the natural will take—what its endpoint, if it has one, will look like—while rediscovering a way to live within the new nature.

The basic plot follows an outline familiar to many stories in which a catastrophe creates the necessity, and opportunity, to rebuild society from the ground up.[3] When Ish has fully accepted the reality of the plague, he begins to wander, first from city to city and eventually across the entire country, everywhere encountering societal dissolution. His passage is marred by roads that are becoming impassable with fallen trees and eroded earth; he meets scattered survivors along the way, but mostly encounters vacated (and changing) terrain. In Manhattan's Upper West Side, his eventual destination, Ish encounters a formerly wealthy couple who do their best to maintain a sense of bourgeois normalcy, the biggest changes in their lives being the inability to ice cocktails and the impossibility of finding other couples for Bridge. Ish returns to his home on San Lupo Drive outside San Francisco and survives on scavenged food, for a time by himself.

The rest of the novel traces the fate of the tribe he gathers around him, beginning with Em, both his wife and a mother figure, followed by Ezra and his several wives—a beginning that neatly summarizes the novel's (and the decade's) sexual politics. They are followed by the working-class George and Mary, and finally by Evie, a woman whose disabilities earn her the disturbing label "half-witted" (143). They survive and adapt to successive changes in the built environment, as electricity, cars, plumbing, and the calendar fall into disrepair. Ish struggles, and ultimately fails, to pass on the basics of reading, writing, math, and history on to the growing

second generation, with the exception of Joey, his youngest son and the heir apparent of the intellectual tradition Ish self-consciously represents. When an outsider carrying Scarlet Fever arrives, another epidemic kills a handful of the tribe. Most consequentially for Ish, it kills Joey, and with it the dream of an intellectual upper-class that could quickly restore modernity. The novel moves quickly through the succeeding years, lingering on Ish's final days as a tribal elder and demigod. We see that the tribe has grown into a society of hunters, having grown out of scavenging. It is unrecognizable in relation to twentieth-century American society, and it has clearly reverted to what Stewart sees as a primitive zero-point.[4] But it is a zero-point that is different in important ways from the zero-point of the human species, and which in some ways seems to be better off than the modernity it succeeds.

Meanwhile, the earth, as promised, abides; but it is not the earth of 10,000 BC, and still less of the Pleistocene before it. Readings of this renascent nature have ignored the fundamentally ruderal, or post-disturbance, quality of these eruptions of extra-human life, claiming that they are part of a returning "wilderness" and all the attendant cultural values that tend to attach to it. Elizabeth Wells claims that the post-holocaust environment Ish observes is one of "projected, fantasmic wilderness…conceptualized as a kind of primal arena in which the lone Crusoe figure battles the forces of anarchy before persuading them to submit to the shackles of civilization" (479). Likewise, Gary K. Wolfe takes *Earth Abides* as the exponent of a regular structure characterizing post-apocalypse novels, one in which nature plays a significant role: he claims "the re-emergence of the wilderness as antagonist" to be one of the defining gestures of the form (13-4). Most recently, in *The Nation*, Christine Smallwood describes Stewart's "obsession" with the man-versus-nature motif, contrasting the modern environmentalist conception of nature—as benign but threatened—with Stewart's vision of the earth, which she

sees as "in some fundamental way already uninhabitable, and humans [as] exiles in it." She continues: "The social and the ecological can come into balance, but it's an uneasy truce. It's not just that man can't ever dominate nature. It's that one day, inevitably, a pitiless nature will bring him to his knees." The version of nature each of these readings project onto Stewart, as something to be struggled against and conquered but which can never be assimilated, is a kind of frontier-logic in reverse. As William Cronon has shown, such logic is part of the "trouble" with wilderness as a concept, a trouble implicitly imputed to *Earth Abides*. In suggesting that Stewart imagines a return to an antagonism between human and nature, they suggest that the world returns to a wilderness in which there is, by definition, no place for humanity.

Less attention is paid in these accounts to the specific process by which the forest "returns" and to what state it is assumed to return *to*, but both issues are essential in understanding a thought experiment that uses human absence to determine the impacts of human presence. In fact, Stewart was carefully mediating his naturalist vignettes and representations of renascent environments among a range of positions on the theory of ecological succession, positions that were coming to conflict as part of a larger paradigm shift in ecological science. In some moments Stewart seems to reproduce the till-then dominant theory that is consistent with wilderness thinking, a paradigm that favored a teleological and climatically induced climax community. But he is more often, and more definitively, casting his lot with the nascent movement to dethrone it. Attending to Stewart's visions of environment-making with more specificity, we can read him as asking just what ramifications of this shift in ecological thought would have on how we think the human-nature equation in the first place.

When one knows to look for it, depictions of ecological succession are hard to miss in *Earth Abides* and elsewhere in Stewart's work. Certain depictions of natural growth are

presented almost as case studies, and the unique position of its protagonist is a cue to read them as such: Ish is "an incipient scholar...necessarily oriented to observe, rather than to participate," and his doctoral dissertation "investigat[ing] the relationships, past and present, of men and plants and animals in th[e] region" gives him the necessary footing to observe with informed interest precisely what happens after the fall of humanity (5, 13).

Among the clearest representations of the succession that follows is a vignette detailing the transformation, when untended, of Manhattan's Central Park:

> An island within an island, the green oblong of the Park will remain. It has open soil where the rain penetrates. The sun shines upon it. In the first season the grass grows tall; the seeds fall from the trees and bushes, the birds bring in more seeds. Give it two seasons, three seasons, and the eager saplings are sprouting. Give it twenty years, and it is a jungle of second growth with each tree straining upward to gain light above its fellows, and the hardy natives, fast-growing ash and maple, crowding out the soft exotics which man once planted there. … Give it a hundred years, and you walk in full-grown forest, scarcely knowing that man was ever there except where the stone arch still spans the underpass, making a strange cave. (69-70)

Precisely targeting the process of succession, this vignette acts almost as a key to understand other representations of natural reclamation in the novel, a repeating set of images that will recur in various forms and environments from beginning to end. This is "second growth" or secondary succession, meaning there is already soil. As such, the process begins with midsuccessional plants: "the grass grows tall," developing from a manicured grass carpet or bare soil to a proper grassland community. The "eager saplings" thrive because there is nothing to shade them out on a grassland, but as more of them thrive, they begin to create the shade that will kill the grassland community that preceded them. Ash and maple trees take over, because they are "fast-growing," as Stewart says, but also because they are relatively shade tolerant and can thrive well enough to "crowd out" competitors while they compete for more sun. The result is a "full-grown forest" that is the perfect picture of a successional climax community.

But the route to this climax forest reveals two basic assumptions about how succession works and its relation to humanity. First, Stewart assumes that the "hardy natives, fast-growing ash and maple," will succeed *because* they are native, growing quickly in the conditions to which they are accustomed; "exotics" that need human aid will not find it, and thus they fail. Especially in the first half of the novel, this defines the trend: exotic plants and native plants are almost constantly struggling for dominance, and the native plants gradually win out. Wheat repeatedly falls under the advance of native grasses, lasting only for a generation or two. Anything that is not native to California dies out, and anything whose existence is otherwise tied to human care either does not survive or does not spread. That is to say, the second assumption is that anything associated with humanity will die off, even extra-human life. The reverse is also true: the stable, mature forest community, composed only of native plants, will by implication persist indefinitely, and it will do so precisely because no humans are there to disturb it—its very existence is tied up in its "scarcely knowing that man was ever there."

If this were the only passage on succession, Stewart's successional paradigm would indeed be consistent with a simple equation of post-human nature and a reversion to wilderness. It is the inverse of Cronon's *reduction ad absurdum* of the wilderness concept: "if wild nature is the only thing worth saving, and if our mere presence destroys it, then the sole solution to our own unnaturalness, the only way to protect sacred wilderness from profane humanity, would seem to be suicide" (83). Having committed species suicide, a wilderness-centric perspective would assume that the earth "abiding" means returning to a pre-human state, which in this case means reversion to pre-human plant communities.

But the Central Park vignette is not the only such moment and is even atypical. The other dominant set of images is one of primary succession in built environments, in which an

inhospitable environment like bare rock has to be eroded and covered by earth before midsuccessional plants can grow (Miller and Spoolman 115-8). Stewart accelerates this process, which normally takes hundreds or thousands of years, to make it narratively workable within the span of Ish's life, as erosion from overflowing or broken water infrastructure covers roads in soil and earthquakes disrupt pavement. The signification of soil covering an uninhabitable human environment is plain:

> …growth was everywhere pushing in upon the roads and buildings. Runners from vines and climbing roses already dangled across windows and hung swinging from eaves and porch roofs. The smaller houses looked as if they were shrinking back shyly and beginning to hide in the woods. Fences were also being obscured. There was no longer a sharp line between the road and the surrounding country. Grass and weeds were showing green at every little crack in the concrete; blackberry shoots were pushing in from the shoulders, breaking the clean white line. In one place the long runners of some vine reached clear to the white line in the middle of the pavement, and met others advancing from the other side. (54)

In support the return-of-wilderness reading, one might note that succession obscures the human environment. Houses begin "shrinking" into the woods, along with fences, which bring the symbolic weight of containment and control over the land and what lives on it—animal husbandry, domestication, and the idea of property itself. Concrete, the most enduring of materials and one on which so much of modernity depends, is symbolically destroyed, and its destruction is *necessary* for the return of life that appears "at every little crack." The wilderness ideal requires the destruction, or at least the obfuscation, of the built environment.

But as the breaking of borders or boundaries continues, it contradicts the return-of-wilderness mode by symbolically re-integrating humanity and nature. Two clear "lines" between the two are broken, first "between the road and the surrounding country" and second "the white line in the middle of the pavement." There are two conflicting ways to read this image. On one hand, it is the human mark *per se* that is obscured, as with the houses and the fence above. But on the other hand, it is merely the *line between the two* that is obscured. It is not that humanity is

being destroyed by a renascent nature; it is rather that the two are becoming one. It is the binary that breaks down rather than humanity and human environments themselves.

The two visions alternate throughout, but by novel's end, images of integration have become dominant over those of return to a pre-human zero-point. Where the early naturalist vignettes unambiguously favor native plants as the inheritors of the earth in every case, we eventually see that certain exotic plants—the major recurring symbol of human "natures"—are actually more suited to the California environment, or at least have a competitive advantage and will survive:

> As he walked along, he saw the houses on both sides of the street, fallen into ruin now, what with the earthquake and the mere passage of time. Vines climbed high upon them. Encroaching trees had thrown porches out of line.
>
> Everywhere he observed the struggle between the native plants which were moving back into the gardens, and the exotics which once had been planted there and carefully tended.
>
> …He saw no wisteria or camellia or coprosma though they had once been common. But the tall climbing rose vines were still vigorous. A large and handsome evergreen tree he recognized as a deodar, native to the Himalayas. It was still growing vigorously, but looking beneath it, he found no seedlings. Apparently it could live there, but would not reproduce. On the other hand beneath a eucalyptus tree, a species native to Australia, he found seedlings which had sprouted up through the litter of leaves in which nothing else would grow. (288-9)

There is a new natural. Absent continued human meddling, non-human life does not return to a pre-human state or to an easy domination of everything foreign by "natives." Now, a kind of compromise is reached that has more to do with the immediate physical environment than a deterministic concept of the natural. The characterization of plants has changed, as "exotics" now become individuated: wisteria, deodar, eucalyptus. With more specificity, what-grows-where becomes a relative matter, an interaction between climatic conditions, the hyper-local conditions of the physical environment, and the other plants that happen to be nearby, native or otherwise. Eucalyptus succeeds in part because the "litter of leaves" from neighboring plants

have created conditions in which it has a competitive advantage: nothing else can grow there. The built environment that remains is symbolic of this compromise. In some cases it is an impediment, as it takes an earthquake to disrupt these human environments enough for plant life to inhabit them. On the other hand, certain forms of life use the environment to their advantage, just like they would any other environment: the vines "climb[] high" upon the ruins of houses as they might normally do on the trunks of trees, and trees that are strong enough to push the porches out of line find a competitive advantage over those that cannot. Humanity's trace on the natural world is that of a mediator, with the sense of its being a "disturbance" subtly diminishing. The environments that will emerge have to be understood as a material dialogue between millennia of human presence (modernity in particular) and the natures they encountered.

In this post-human context, the difference matters. Stewart is asking what would happen if humanity disappeared; the answer will have serious implications in understanding humanity's place in the overlapping systems of the earth. If formerly human environments return easily to a pre-human state, then humans' reign on the planet has been a disturbance of something that would otherwise have had a clear natural path. If, as appears to be the dominant paradigm by novel's end, a new form of non-human nature emerges that responds to and assimilates to humanity's traces, the age of the human has just been one dominating environmental condition that had planet-wide effects, but which is less a "disturbance" (for there is no external point of comparison) than an influence. In this latter case, the earth might abide, but it will be a different earth; "pristine nature" is not so pristine—that is, not so non-human—but has to compromise with the built environment rather than simply reclaiming it. The question, in other words, goes right back to the one asked by George Perkins Marsh and again by the participants of the 1955 conference: is humanity separate from nature or a part of it?[5]

Neither position is clearly represented enough to definitively ascribe one or the other to Stewart; rather, the novel has to be understood as embodying the argument, specifically as it was expressed in the shifting paradigm of ecological succession. Stewart was writing at a moment of conflict in succession ecology, and the debate would have been made unavoidable by his association with Sauer as well as a wider network of scientists in fields to which the concept was relevant.

Sauer himself is a particularly interesting figure in this context, and there is a basis for assuming that his work had some influence on the composition of *Earth Abides.* Stewart was an English professor at U.C. Berkeley for most of his career, and became close to Sauer and his family, probably not long after they both came to Berkeley in 1923 (Starrs 30-5; cf. Scott), given that Stewart was among the faculty in other departments whom Sauer considered "adjuncts of the Geography faculty" (qtd. in Williams et al. 130). While Sauer's name does not appear directly in Stewart's research notes for the novel, he was almost certainly consulted, perhaps in a less formal setting. In the first place, it is clear that Sauer owned and read Stewart's work from the correspondence that does exist between the two men.[6] Sauer was clearly on Stewart's mind when he wrote *Earth Abides* to some extent, as Ish refers to him by name in the text, wondering aloud what his tribe might look like if it contained "one of those high-powered minds that he remembered from his university years—Professor Sauer, perhaps" (167). He was a geographer rather than ecologist *per se*, but then, so is Ish, a geography grad student writing a dissertation on ecology.

Sauer's work was closely involved with the succession debate: he was among those challenging the dominant, teleological theory of ecological succession. Though it was first

introduced by Henry David Cowles, the more influential paradigm was established by Frederic Clements in *Plant Succession: An Analysis of the Development of Vegetation* (1916). Clements conceived of succession as deterministic, proceeding through predictable stages to a stable endpoint which, once reached, would remain stable indefinitely unless actively disrupted. Local "physiographic" characteristics were relevant to the development of plant communities, but subordinated to other (less immediate) forces—most notably climate, which was influenced by "major physiographic features such as mountain barriers or ocean currents," which were in turn "the outcome of the astronomical relations between the sun and the earth" (Clements 5). An order is established by reference to larger and more remote forces that are ultimately geological and even astronomical in scale. The endpoint was the "climax community," a name reserved for the plant associations that most closely corresponded to the climate of a given region (Worster 211). Besides its climatic determinism, the defining feature of Clements's theory was the idea that a plant community was *in itself* a complex organism. *Plant Succession* begins with the idea that the "climax formation is an organic entity" and that the "organism…arises, grows, matures, and dies" (Clements 3). The growth of such a formation is deterministic in the way that the body of an individual member of a species would be deterministic: it has a growth and life cycle, and while things might interfere with or alter that cycle, it had an essentially set progression. *Earth Abides*'s Central Park vignette is representative of the Clementsian paradigm, which set the tone for the growing field of American ecology until the middle of the century (Kingsland 133). It is this version of the theory that, in its characterization of humanity as a disturbance to an otherwise pristine and stable plant community, closely mirrors the wilderness thinking usually attributed to Stewart.

But Clements had his critics. Henry Allen Gleason, an ecologist and a taxonomist at the New York Botanical Garden, agreed that succession occurs, but argued that the process of succession was highly individuated to the area where it occurred—not predictable with the broad brush of climatic determinism, not a "complex organism" with fixed traits when mature, and indeed almost random. He would ask, polemically: "Are we not justified in coming to the general conclusion, far removed from the prevailing opinion, that an association is not an organism, scarcely even a vegetational unit, but merely a coincidence?" (16). Gleason's revision of the succession theory polarized ecologists upon its release, and it would continue to over the coming decades as questions arose regarding ecology's role in guiding policy and matters of land use (Kingsland 160, Worster 239-40). Clementsian succession could be the foundation of a society organized and guided so as not to disturb nature's cycles, a society in which ecologists would play a major role; Gleasonian or "individualistic" succession, according to Donald Worster, implied a nature that was already chaotic and shifting, that "man need not worry overly much about disturbing" (Worster 239; cf. Kingsland 161-4).

Carl Sauer's position was broadly Gleasonian in that he rejected a deterministic model of succession. In 1950, the year after *Earth Abides* was published and two years after Stewart's novel *Fire*, Sauer published an article on the place of anthropogenic and natural fire as a determining factor in plant and animal communities. It begins with a wholesale dismissal of climatic climax communities, instead employing a more historical lens that takes natural and human factors into account in equal measure over a million-year period to describe a constantly changing environment and correspondingly tumultuous species associations (16-8). Most interesting to Stewart, however, would have been Sauer's understanding of how humanity causes environmental transformation. To Sauer, the human is the "second great agent of disturbance"

after climate, "an aggressive animal of perilous social habits, insufficiently appreciated as an ecologic force and as modifier of the course of evolution" (18). Citing archaeological evidence across the world, he suggests that the explanation for the widespread presence of grasslands is not climate, but a combination of anthropogenic and natural fires—and he pointedly includes North America, where he insists (rightly) that human presence and fire practices were factors far longer than was normally assumed at the time. Human and natural history come together in what he calls (in a phrase that fits easily into the modern ecocritical lexicon) "ecologic assemblages" that are "established and maintained" by anthropogenic fires. Recognizing this meant, in his view, that the overriding question regarding humanity's place in nature was not how to return to a pre-human state of nature, but how to compare modern use of fire and to that of his "aboriginal predecessors" in our attempts "to work out a durably modus vivendi for man in a non-static environment" (20-1).

The centrality of fire to Sauer's understanding of the human-nature equation would certainly have been of interest to Stewart's own thinking, given that Sauer would likely have been researching the role of fire in human and natural history at the same time that Stewart was composing his novel *Fire*. The book closely anticipates *Earth Abides* in many aspects, but two stand out as relevant here. First, both novels imagine natural regeneration after acts of what Clements termed "nudation" or "denudation," or in other words, clearing of plant associations that would precede ecological succession (Clements 4, 33). In *Fire* the act of denudation is natural and cataclysmic (from a human perspective): a forest fire; in *Earth Abides*, it is unnatural but (again from a human perspective) part of the normal working of things: the growth of modern civilization. But the two are ecologically indistinguishable, and in both novels knowledgeable observers describe changes in the species associations that follow.

The other major similarity of the two novels is that both embody the ecological debates that arise in thinking through acts of natural and artificial denudation. In *Fire*, the debate that occurs mirrors an older debate that might be framed as that between preservationism and conservationism—that is, between the John Muirs and Gifford Pinchots, or those whose idea of environment is preservation by limiting human impact and those for whom a forest should be managed to sustainably supply a stock of resources.[7] An aging forest ranger voices the former perspective, saying, "It's a mighty pretty stretch of trees. I've known it for twenty years. Why couldn't we just keep it for people to look at?" His younger upervisor with a degree in forestry responds, "That stuff down there is crying out to be built into houses. As it stands, it's fire-bait. Think of all the down-timber in there" (50). This method, staging debates between characters who represent different environmental positions, is one that is more famously a strategy of Kim Stanley Robinson's Mars Trilogy, where the topic of debate is the terraformation of Mars.[8] But in *Earth Abides*, it is an internal debate between Clements's climatic climax and a Gleason's or Sauer's contingency and constant change. Here, the debate is similarly one of environmental ethics and the proper role of humanity in relation to the physical environment; but the direct topic is (secondary) ecological succession.

If conflicting arguments are at the center of Stewart's novelization of ecology, his preferred method of research is almost certainly a cause. In October 1947, Stewart systematically conducted interviews with Berkeley faculty in a wide range of disciplines to directly ask them what would happen in the scenario he imagines, summarizing their responses in his notes.[9] Starker Leopold, Aldo Leopold's son and an important ecologist in his own right, appears to be the source for Stewart's representation of domesticated animals either going feral and surviving or remaining domestic and dying out, as well as the series of ant, rat, and cattle population

booms that sweep over the post-human landscape. Herbert L. Mason, a noted botanist, would have joined Sauer in questioning the appearance of a climatic climax in the novel; his opposition to it was pronounced, and his work in part considered the impact of human activity on the development of the region's plant communities.[10] In some cases, Stewart's correspondents appear to have even read the novel or selections of it. Stewart notes that zoologist Robert C. Stebbins voiced "serious objection to my opening as piling improbability on improbability," but continued to outline a successional process in which wild native plants would wipe out domesticated species, particularly wheat fields. If Sauer and Mason were probable sources for Stewart's depiction of contingency in the formation of ecological associations, then a more deterministic privileging of native plants likely comes from Stebbins and others whom Stewart interviewed ("Research Notes"). Ish's implicit internal debate regarding the nature of succession reflects a state of disturbance in the multitude of fields represented by Stewart's milieu.

What is most innovative about Stewart's natural descriptions in terms of science-fictional practice, then, is not that it makes an argument or enters into the debate around ecological succession, though he does seem to follow Sauer into the anti-climatic climax position to the extent that he does take a stance. Rather, it is the extent to which these newly natural environments reify the succession *debate*—presenting points and counterpoints, conflicting evidence—in the land itself. But it is in the interactions between these natural descriptions and the development of the tribe that Stewart makes his own contribution to the larger debate of which Marsh's work and the 1955 conference can be taken as emblems.

Stewart's contribution to this body of thinking might be thought of as the inverse of Sauer's: if Sauer's approach brought a historical view to natural histories of place, Stewart's brings a sense

of natural embeddedness and ecological succession to bear on his understanding of history. And similarly, if Stewart's engagement with ecological succession makes his "nature" more historical, unable to return to a natural zero-point, the reverse is also true: his sense of history is not thinkable without some reference to nature.

Alongside the concepts of ecological succession that mark his natural landscapes, Stewart's post-human thought experiment culminates in a view of human history as ultimately successional in nature. Like the post-climatic successional theories, it is not a successional history with an endpoint. Rather, it is one in which historical change is concurrent with the ever-changing environments in which it takes place. This does not mean that Stewart's historical paradigm is one of crude environmental determinism, and he shows very little patience for the climatic theories of civilization or race that earlier ecologists entertained.[11] In fact, Ish disavows climatic theories of history directly when he finds the last book he checked out of the library as a graduate student, a book by C. E. P. Brooks called *Climate through the Ages* only to immediately dismiss it: "Actually, this book was not of the slightest value to human progress. Climatic change was not a practical problem. In any case, this book had been superseded" (291-2). Climate is so irrelevant to the development of the new civilization, and civilizations in general, that it is not worth studying. What is worth studying, and is presumably more influential in determining the path of human development, is the more immediate environment and the plant and animal communities that compose it.

Considering history as a process of embedded succession recasts it in the context of extra-human natural history. Monarchical succession is directly invoked to explain a change in the dominant species of an ecosystem:

> The fables were wrong. Not the Lion, but Man, was King of the Beasts….As in the old days when some conqueror died, leaving no tall son, and the captains

> strove together for the scepter and none proved strong enough and the realm fell apart, so it shall be again, for neither the ant nor the rat nor the dog nor the ape is wise enough above his fellows. For a little while there will be jostlings, quick rises, and sudden falls; then, a quiet and a peace such as the earth has not known in twenty thousand years. (119)

A double slippage occurs here, in both directions across human and extra-human categories. In the first place, the "jostlings, quick rises, and sudden falls" describe the competition that drives successional change, and ecological succession is thus being represented in terms of human governance and a power struggle. And while human exceptionalism persists (no other species is "wise enough above his fellows") the human is also understood as a beast—"King of the Beasts" in the same way that the lion was, that is, as one of them. Humanity's place in the community of other animals is reset by the cataclysm; yet the result is not a constant violence of nature "red in tooth and claw," but retains some sense of the climax state in the "quiet and…peace such as the earth has not known in twenty thousand years." History easily slides into an ecological projection of what happens without a "keystone species," or a species with an outsized influence on the ecosystem of which it is a part.

Beyond this direct invocation of monarchial succession, Stewart's sense of historical change has a definitive successional structure of its own—not in terms of successional rule, but in changing configurations of society over time, almost a humanized version of ecological succession. In short, historical succession occurs in reverse as the tribe that Ish gathers around him moves backward through sequential historical stages. Media, most cars, and modern industrial factories fail first; then electricity; then plumbing infrastructure; then written language and mathematics, as the survivors fail to pass on education to their offspring; and when even the calendar and timekeeping fall by the wayside, they finally decide it "might as well be the Year One": the zero-point (125). This process is successional in a sense similar to Frederick Jackson Turner's frontier thesis, with the key difference that it lacks a *telos*. Turner claims that the history

of Europe can be read in the New World: “Line by line as we read this continental page from West to East we find the record of social evolution,” he tells us, a progression from so-called “savagery” to the factories of industrial society. In saying as much, he echoes the Italian economist Achille Loria, who sees in the United States the key to understanding “the course of universal history” (Turner 11).

Stewart takes the successional paradigm without the determinative universal theory of history—a historical analogue to the midcentury revolt against the climatic climax theory. He realizes that modernity cannot be easily jumpstarted through education, because even education relies heavily on the environment in which it occurs and the successional stages that preceded it. The basis of science and culture cannot be reinstated because everything that led to them has been wiped away: basic skills like intermediate math and reading are no longer relevant, and the only thing that sticks is the things relevant to their immediate environment, such as crude bow construction (215-9, 297-301).The environmental revolution has changed so much about the human cultures it contains that a revived modernity cannot take root (with the pun intended rather literally).

Moreover, succession in historical terms is, like ecological succession, understood as an almost random process defined by chance combinations of elements, and it is understood that one such association of people and practices gives way to and enables the one that follows. Trying to consider the tribe historically, Ish first has to adopt a scientific approach to the problem: he describes his object of study as “a society reduced in size until it had attained the simplicity of a laboratory experiment,” a process parallel to Stewart’s choice of Central Park’s “island within an island” to demonstrate ecological succession. But any attempt at generalization based on this experiment, or to find the equivalent of a deterministic climax community, gives

way to a highly individualistic account of the associations that will determine the course of history. Rather than "the philosopher's neat microcosm," which might allow generalization, he instead finds "a group of individuals" subject to random selection, a situation comparable to the individualistic model of succession and plant association that was then beginning to take hold in ecology.[12] As for the history that results from such an association: "Change the individuals, and the whole situation changed. Change even one individual!" Significantly, this moment of greatest proximity to the individualistic succession is precisely when Stewart refers to Sauer by name, wondering how the association and the resultant history would change were someone like Sauer included (167).

It is not that human history and the natural environment are independently successional within parallel but distinct structures, however. Rather, historical and ecological succession exist in complex interrelation. Ish quickly goes against his own conjecture that variations in human communities will solely determine the course of history to suggest that "the physical environment might be stronger, and might force aberrant individuals into its mold" (167). Elsewhere, Ish the grad student (or Stewart the professor) cannot help but theorize this interaction further:

> What made life anyway?...Here was he, Isherwood Williams, a strange mingling of realities and fantasies and pressures and reactions, and there all outside was the vast empty city with misty rain falling upon the long empty streets, and the twilight now beginning to deepen. Between the two, him and everything outside him, there lay some kind of strange bond; as one changed, so the other changed also.
>
> It was as if there were a vast equation with many terms on each side, and yet only two great unknowns. He was on one side; *x*, perhaps, you could call him; and on the other side was *y*—everything which was called the world. And the two sides of the equation always were trying to keep more or less in balance and never quite managed it. Perhaps the real balance only came with death. (97)

The self—standing in for the society and the individual at once—is conceived as a system, as is the environment. Each has its own composition and an internal nature determined by the relation

of elements in that system, but each also impacts the other in a mutually determinative relationship. Humanity (x) has an impact on the environment (y) in which it occurs, and environmental change is in part a product of human action. At the same time, human activity does not occur in a void, but only in relation to the system in which it occurs. The illusion of an unbounded human agency, a capacity to unilaterally determine, falls away. This situation is not implied to be new, only newly realized with the collapse of modernity—only *able* to be realized with the collapse of modernity.[13]

Historical moments impact and are enabled by their material environments, entangled with them in a sense consistent with more modern understandings of human and extra-human agency. Yet another vignette reminds us that every step of human history is defined by its relationship to non-human organisms. History is not an expression of human desires, but a complex product of environmental conditions:

> …this great civilization grew up, not by men's desires, but rather by Forces and Pressures. Step by step, as villages grew larger, men must give up the free wandering life of berry picking and seed gathering and tie themselves to the security (and drudgery) of agriculture. Step by step, as villages grew more numerous, men must renounce the excitement of the hunt for the security (and drudgery) of cattle keeping. … How then, once overthrown, shall this great civilization, except by renewed Forces and Pressures, ever come again? (293-4)

Civilization proceeds by "steps," which is itself a successional paradigm; at least the first few of these steps *are* determined in advance: gathering leads to agriculture, which leads to cattle raising, and, implicitly, beyond. But what ultimately drives this succession is a naturalized sense of imminent environmental conditions that will not be identical to those of the pre-human world. The "Forces and Pressures"[14] that cause changes in civilization are the same as those that motivate the growth of other plant and animal species: population growth yields successive structures of relation (or exploitation) with other forms of life—berries, seeds, plants, and cattle—and it is these relationships themselves that are here dubbed "civilization." There is no

civilization that is *just human*, only those defined by interaction with other species. But the new civilizations that develop after the fall will be historically and environmentally determined at once: determined by the post-human "natural" environments that emerge in response, to invoke Walter Benjamin, to the "single catastrophe, which unceasingly piles rubble on top of rubble and hurls it before [the] feet" of the Angel of History.

The ecological insight enabled by catastrophe, then, is at once that civilization itself is already a catastrophe from an ecological perspective and that the entirety of historical change is an act of co-production between human and extra-human life. We might, following Haraway, call it a succession of naturecultures.[15] We might follow Jason W. Moore in noting that historical change is not a matter of humanity acting on nature or the reverse, but rather that history "is better reckoned as a cascade of environment-making processes and relations, through which particular bundles of human and extra-human nature flow, upon which these bundles act and re-form as they act" (174). For Ish's part, he realizes how insufficient the human-versus-nature paradigm is in accounting for historical agency—whether in the form of a Clementsian vision of human action as only disturbing mature growth or the "wilderness" paradigm that imagines human and nature as fundamentally separate. The problem of both comes in failing to conceive of the human reliance on other life and their role in shaping the so-called "nature" that defines so much of the planet:

> He must also save other things. Seeds, for instance. He must see to it that the more important domestic plants did not vanish from the earth.
>
> Suddenly he felt that all civilization depended not only upon men but also upon these other things which had marched with him like kinsmen and friends and companions. If Saint Francis had hailed the sun as brother, might not we also say, "Oh, Brother Wheat! Oh, Sister Barley!" (122)

The only way to act historically is to act ecologically, or in other words, to act *through* and *with* other forms of life. Realizing as much breaks down the human-nature dyad to the point that

wheat and barley become *siblings* to humanity, not opponents or tools, even if Stewart seems uninterested in considering these relationships from beyond the human perspective. Here, as in the historical formulations of Haraway, Moore, and others, human and non-human life combine in constantly changing forms and assemblages that themselves produce environments—and are produced by environments. A historiography in this direction would study the changing form of these relationships as well as what they produce. *Earth Abides* has to be understood as a narrative attempt to do just that, one whose result is a synthesis of ecological and historical succession: a succession of human-nature assemblages, each giving way to the another as they move backwards and forwards in time.

The apocalyptic mode gets to have it both ways in contemporary thinking about the environment: it bolsters wilderness-centric thinking or subverts it, depending on what is imagined to happen "after the fall." But roughly two-thirds of a century after the publication of *Earth Abides,* the act of post-apocalyptic speculation remains a mainstay of contemporary environmental thought in much the same way that George Perkins Marsh's motivating questions have endured through the 1955 Princeton symposium and into the present. A line beginning with Marsh and drawn through the midcentury moment of Stewart's novel and Sauer's symposium would find its end in theories of the Anthropocene. The Anthropocene has been a paradigm-shifting concept, suggesting that human influence on the planet goes well beyond the surface, enough to rank as a geological force—or in other words, beyond what the earth can abide. It is, however, only a different answer to the same questions posed at the Marsh Festival, and perhaps not so different, at that: Marsh's own answers to it have resurfaced in the age of Anthropocene discourse, as he was

among the earliest to say explicitly that "human action must rank among geological influences" (464).

The act of mind that defines *Earth Abides* has almost as distinct a presence in contemporary Anthropocene discourse. Jan Zalasiewicz is a member of the Anthropocene Working Group who in 2016 formally recommended that the International Union of Geologic Sciences formally adopt the Anthropocene as a geological epoch, and has more generally been an advocate for adopting the epoch across numerous media and academic articles.[16] In 2008, he published *The Earth Without Us,* which makes the case for the Anthropocene by imagining the human race's extinction from an extraterrestrial perspective 100 million years in the future. As in the middle of the century, current thinking about humanity's impact requires—or is at least aided by—imagining extinction.

Zalasiewick's book is not alone. It is joined most notably by Alan Weisman's *The World Without Us* (2007), a thought experiment published the year before Zalasiewick's and even more similar to *Earth Abides.* Weisman's inciting incident bears a striking similarity to Stewart's: "picture a world from which we all suddenly vanished. Tomorrow. … Say a *Homo sapiens*-specific virus—natural or diabolically nano-engineered—picks us off but leaves everything else intact" (4). He goes on to dwell with particular care over the images of post-human ecological succession that begin with destruction of human traces, in which "pavement separates" in the streets of New York City and pioneers "blow in from Central Park and work their way down the new cracks, which widen further" (26).

References to Weisman's thought experiment frame Dipesh Chakrabarty's "The Climate of History," a foundational essay in Anthropocene studies in the humanities. Taking Weisman as a starting point, Chakrabarty points out that a new historical method and politics is needed

because “the wall between human and natural history has been breached” in much the same way that Stewart insistently breaches and re-breaches it in his dual successional processes. *Earth Abides* certainly falls short of the “negative universal history” that Chakrabarty calls for, in which global politics is separated from a homogenizing global identity, but it does bear the marks of a historical sensibility transformed by an epiphanic dissolution of human-nature dualism (221-2). The historical vision that can be seen in flashes throughout the novel takes much the same tack that ecocritical thought in the Anthropocene has, questioning the nature and limits of human agency and recognizing the entanglement of human activity with non-human life.

Finally, *Earth Abides*, like the Anthropocene, builds on its moment in the history of ecological science to expose, if not directly critique, the unspoken assumptions of ecological, conservationist, and preservationist thought. In this sense his sustained attention to the zero-points to which nature might or might not return absent human interference can be taken as a midcentury anticipation of William Cronon’s “The Trouble with Wilderness” or Emma Marris’s more recent *The Rambunctious Garden* (2013). Marris in particular points out how regularly our searches for natural zero-points fail to find the zeros they seek, and calls into question the environmentalist common sense built on the assumption of these “states of nature.”

At the very least, then, *Earth Abides* merits recognition for its ecological thinking in terms that go beyond the wilderness-as-antagonist model. But the case of Stewart’s classic novel speaks to a larger need for a more robust examination of the “natures” of post-apocalyptic speculation within and beyond the boundaries of science fiction. What it and the conversation around it demonstrate is that post-apocalypse thinking already has been a mainstay for interrogating humanity’s impact on its environments—but that such thinking can (and often

might) do more than merely reproduce existing structures of thought, perhaps even critically revising them.

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Notes

[1] Cf. Kingsland 170 and Williams et al. 154.

[2] The conference is understood as such in two defining histories of American ecology. Donald Worster, in *Nature's Economy: A History of Ecological Ideas* (2nd ed.), argues that the "new environmentalism" that would shortly emerge "owed much to a relatively obscure group of thinkers in the two or three decades that preceded" it, a group for whom the Princeton conference would act as a kind of cross-section (350-2). I follow the lead of Sharon E. Kingsland, in her more recent history of ecology, *The Evolution of American Ecology, 1890-2000*, in reading the conference as both foundational to modern environmentalism and representative of the shift in theories of ecological succession discussed below. Much of the ensuing argument will be implicitly framed by Worster's and Kingsland's histories.

[3] Cf. Wolfe, whose general schema for the post-apocalypse novel is helpful even if he simplifies post-apocalyptic natures to some extent.

[4] Here and throughout, I use "zero-point" to refer to the baseline at or immediately before the beginning of human civilization. This term implicitly connects post-apocalypse fiction and wilderness thinking. Wolfe suggests that the post-apocalypse genre has been so enduring because of its capacity for "remaking zero," and finds a regular structure in attempts to do so (4). For the zero-point as a motif in environmental thought, I am indebted to Emma Marris's *Rambunctious Garden*. Marris points out: "The notion of a stable, pristine wilderness as the ideal for every landscape is woven into the culture of ecology and conservation—especially in the United States. Take the *baseline*. Virtually every scientific study of environmental change uses or assumes a baseline. Baselines are reference states, typically a time in the past or a set of conditions, a zero point before all negative changes" (3). She goes on to show that such baselines usually interpret as natural what is more often anthropogenic in some form or another (e.g., 51).

[5] Cf. Kingsland 155-78.

[6] After receiving a copy of *The American Ways,* he makes clear that it is not the first book of Stewart's in their personal collection, referring to his "prized collection of Stewartiana" to which the new book would be added. In response to Stewart's later *The Good Lives,* a joint biography of six historical figures, Sauer suggests that Stewart extend his talents to a biography of the previous generation of geologists and geographers. Finally, in preparation for *Sheep Rock* (1951), Stewart took a trip to the novel's titular setting along with his son, Starker Leopold, and several other scientists, among them Carl Sauer (cf. *Sheep Rock* 283-4). I am grateful to Donald M. Scott for his biography of Stewart and for his personal correspondence regarding Sauer's presence in the Stewart Papers.

[7] Cf. Marris, Kingsland.

[8] Cf. Robinson "UCSD," 8:00.

[9] The full list of interviewees, followed by their departmental affiliation, follows (faculty of U.C. Berkeley unless otherwise noted): Edward O. Essig, entomologist; H. P. Collins, historian; Starker Leopold, ecologist; Herbert L. Mason, botanist; Samuel Paul Welles, paleontologist; Robert C. Stebbins, zoologist (specializing in herpetology); Clarence Melvin Haring, veterinary science; David G. Mandelbaum, anthropology; Michael Doudoroff, bacteriology and immunology; Robert Thomas Orr, zoologist and natural historian at the California Academy of Sciences ("Research Notes").

[10] Robert Ornduff and Lincoln Constance note that he "was particularly critical of the Clementsian school of plant ecology, which attributed quasi-organismal qualities to "associations'" (236). In his study "Pleistocene Flora of the Tomales Formation," he notes, "Today man is the principal modifier of the habitat through the clearing of land. Once this land is cleared it is not often permitted to revert to forest." But he does not frame this as a disturbance preventing the return of a pre-ordained climax organism; rather, in the case quoted, he projects that without human influence a balance between two distinct forest types based on local physiographic situations (130).

[11] E.g. Nathaniel Southgate Shaler, a Harvard professor and student of Louis Agassiz whose theories of climate were all but explicitly justifications for subjugation of nonwhite races (Kingsland 9-12).

[12] Cf. Gleason.

[13] This is another moment, early in the novel, when Ish tests out a the strict human-nature separation characteristic of wilderness thinking. But his conclusion, that balance only comes with death, is tentative and ultimately contradicted by other moments in the novel. If no "balance" is to be found between "man" and nature, it is not because of a fundamental opposition (this passage ultimately shows the opposite) but because the very concept of ecological "balance" was being put to the question.

[14] This is a somewhat dated concept for 1949, reminiscent of Herbert Spencer and American literary naturalism.

[15] Cf. Haraway 105-7
[16] E.g. Zalasiewicz, "Working Group," "Anthropocene," and "Making the Case."