

Craig Thomas

Sustainability

and the American Naturalist Tradition

Revisiting Henry David Thoreau, Aldo Leopold,
Rachel Carson, and Edward O. Wilson

[transcript] New Ecology

From:

Craig Thomas

Sustainability and the American Naturalist Tradition

Revisiting Henry David Thoreau, Aldo Leopold,
Rachel Carson, and Edward O. Wilson

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Humanity is failing at solving complex socio-ecological problems like global climate change, biodiversity loss and population growth. The existing 'sustainable development' paradigm and its reliance on trade-offs between the three pillars of environment, economics, and equity is not robust enough to maintain global carrying capacity. In this timely intervention, Thomas argues that the holistic and transdisciplinary thinking of four iconic American naturalists – Henry David Thoreau, Aldo Leopold, Rachel Carson, and Edward O. Wilson – can instead help to solve our biggest twenty-first century challenges by synthesizing values from four eras of cultural and environmental history.

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Sustainability and the American Naturalist Tradition

Revisiting Thoreau, Leopold, Carson and Wilson

INTRODUCTION: NATURALISTS AND HOLISM

Not till we are lost, in other words not till we have lost the world, do we begin to find ourselves, and realize where we are and the infinite extent of our relations.

HENRY DAVID THOREAU, WALDEN: OR LIFE IN THE WOODS (1854)

Our chaotic society and derelict environment mirror the great complexity and uncertainty of our times. Though it may seem implausible to us, our consumption patterns and rates may be outstripping the world's resources. Population ecologists like William Rees (1992; 2013) and Mathis Wackernagel (1996; 2013), ecological economists like Robert Costanza (1991) and Herman Daly (2004), and environmental scientists and systems modelers like Donella and Dennis Meadows (2004) argue that we have likely already surpassed *carrying capacity*—the maximum human population the Earth's ecological systems can support without deteriorating the ecosphere.

At its core, this book examines the effective means for preventing the collapse of the carrying capacity of the ecosphere and avoiding the end of civilization as we know it. Our best estimates predict that by 2050, the U.S. population will exceed 400 million, and the world's population will have surpassed nine billion, rising exponentially in some developing countries such as in already environmentally depleted regions in North Africa, the Middle East, and Southeast Asia. By the end of the century, we are expecting the Earth's carrying capacity to contain 11.5 billion human beings, doubling what many experts think is the Earth's human carrying capacity. The resulting increased demand for depreciating necessities such as food, water, timber and fuel will irreversibly convert already dwindling and non-replaceable natural resources into consum-

able energy and other economic resources (Schneider & Kay, 1994). The rising population and consumption rates on Earth collectively will have a multitude of negative outcomes for humankind and ecosystems alike—or what are called *socio-ecological systems* (SES).

But massive population and consumption growth manifests just one of many colossal problems for the ecosphere, or the global SES. The gradual but persistent warming of the Earth's atmosphere due to the increase of atmospheric greenhouse gases represents one such problem and exacerbates most existing SES challenges. More than 97 percent of publishing climate scientists confirm that since the beginnings of the Industrial Revolution (1760-1840), humans have increased the ecosphere's carbon dioxide (CO₂) to levels unprecedented over the past 400,000 years, which will increase the range of global temperatures worldwide (Cook, et al., 2006; IPCC, 2014; Pew, 2012). Recently researchers also found global climatic change is occurring at a rate at least ten times faster than any change in the past 65 million years (Stanford, 2013).

Yet another major SES challenge is biodiversity loss. Biodiversity loss in our forests, rivers, soils, and oceans is already estimated to be 100-10,000 times the background extinction rate. Plant and animal species loss has already permanently altered almost all—if not *all*—the ecosystems of the planet. For example, a recent report from the International Programme on the State of the Ocean (2015) states *all* ocean life is endangered, and if we continue along our same trajectory, coral reefs may well be extinct by the year 2050. Overfishing, run-off pesticides and herbicides, ocean warming, ocean acidification and other factors have coalesced to damage oceanic species richness and genetic diversity as well to disrupt the biological services the ocean naturally provides. These ecosystem services include: nutrient cycling, cleaning the air and the water of pollutants, providing oxygen and eliminating CO₂, and other services provided by balanced ecosystems that developed over hundreds of millions of years.

COLLAPSE

While these modern problems may seem new, a definite preponderance of evidence in recent sustainability scholarship demonstrates SES problems have been plaguing humankind since the dawn of human culture. Anthropologists like Jared Diamond (2006), Charles Redman (1999), and many others (Konfirst, 2012; Linden, 2006; Montgomery, 2012) have revealed how extreme events like soil loss, unfettered population growth, great changes in climate, and the homogenization of endemic natural systems have afflicted society for centuries. Ecologist, geologist, and anthropologist Jared Diamond (2006), for instance, cites pre-historical Montana as an example of a culture where climate

shifts forced massive migrations, local extirpations, and changes in agricultural regimes set the course of that society's declining future.

Past environmental and socio-economic issues combined to collapse civilizations even in the ancient world. Examples of collapse into a dark age include the Sumerian city-state of Uruk (c. 4000 B.C.) with population densities roughly equivalent to those experienced by modern Parisians—the highest in the Western world (Boone & Modarres, 2006). Environmental historian Eugene Linden (2007) attributes the demise of Uruk to a 200-year drought between circa 2200-2000 B.C. that led to a 93 percent decrease in population. Population ecologist Lester Brown (2011) instead attributes its ecological and social demise to salt concentrations in the soil and “an environmental flaw in the design of their otherwise extraordinary irrigation system” (p. 9)—a source of many failed states. But whatever the cause, ecological events extinguished the Sumerian economy, then its society, eventually obliterating even the language itself (Konfirst, 2012).

In another example, the Minoan civilization (2600-1400 B.C.) on the Greek island of Crete devalued and undervalued crops, leading first to their population exceeding carrying capacity, then famine, followed by the absorption of their culture into a larger and more powerful city-state. The Minoans' innovations in the sciences and technology of the era also created capacity for energy-deficit spending and repeated economic boom-and-bust cycles.

Later in Greece, while the rocky coasts helped form important trade routes created a progressive and “healthy” competition among the Greek states, this economic development simultaneously led to significant soil erosion from massively expansive agriculture projects and the subsequent “fragmentation” of competitive Greek city-states (Kotkin, 2006, p. 20). Despite having an advanced trade network, moreover, the Greek practice of agricultural terracing that constituted the foundation of their sustainability demanded significant amounts of physical labor in what environmental historian J. R. McNeill (2000) calls a “somatic energy regime” (p. 11). When invading forces removed this energy resource (i.e., slaves), Athens and other Greek city-states no longer had the ability to keep their farms from eroding into the Aegean (McNeill, 2000). It would not be until the nineteenth century that a student of social and environmental systems, George Perkins Marsh (1864), delivered, in *Man and Nature: Or, Physical Geography as Modified by Human Action*, one of the first strong polemics against deforestation based on the collapse of Mediterranean civilizations from desertification.

Seemingly, these societies failed to realize that society and environment function as one single, “coupled,” human-natural system (or SES), despite Xenophon having established irrigation and agricultural harvests as the ecological foundation of mercantilism in *Oeconomicus* (384 B.C.) (Glacken, 1975, p. 13). In a more recent example, the Khmer Empire (802-1431), centered in Cambo-

dia, had populations rivaling Roman populations at the height of its Empire. But their population and consumption growth caused massive deforestation, finally silting their irrigation system to such a degree that they could no longer be used. However ironic, it is often the same technology that leads to a culture's rise, leads to its demise.

IDEALIST VS. NATURALIST WORLDVIEWS

As environmental historian Ulrich Grober (2012) states, “sustainability is the antonym of collapse” (p. 16). Cultural preservation has been the ultimate goal of society since the first civilizations. This is why Native Americans, who drew thinking outside the streams of Western science and philosophy, developed the “seven generations” concept (Hauptman, 2008).¹ Historical proto-sustainability concepts are among the most fundamental cultural beliefs, including “sustenance” of the *Old Testament* (circa 1000-400 B.C.), or even the well-meaning, but idealistic and static “stability” of Plato’s *Republic* (circa 380 B.C.)—referring not only to food but also to all human necessities including shelter, nourishment, and fuel. History itself thus may hold many answers for restoring balance and achieving sustainability of the ecosphere.

One important thinker from Greek culture who profoundly affected Western culture was Plato (428-348 B.C.). Plato’s worldview, while technically holistic in that it attempted to fit all animate and inanimate things on Earth into one construct, is a classic example of the constraints endemic to an ideological and unbalanced approach. Plato’s “Idealism” (often referred to as Platonic thought) heavily influenced Christian holism during the Enlightenment and contained a worldview not unlike many religious fundamentalists observed around the world today.

Idealism is defined today as both a “philosophy,” and as “any of various systems of thought in which the objects of knowledge are held to be in some way dependent on the activity of mind. Often contrasted with *realism*” (Oxford, 2017). Although there is no one-to-one relationship between Plato’s Idealism and the understanding of idealism today, because of the latter part of this defi-

1 | Hauptman (2008), an Iroquois, argues that the Iroquois are the originators of seven generations concept, which has been useful in negotiation American-Indian relations since the 1800s, in *Seven of Generations Iroquois Leadership: The Six Nations since 1800: The Iroquois and Their Neighbors*. *OED Bible* translation: *sustenance*: necessities of life; food. *The Bible*, Psalm 22:30; 78:06; 102:18. Psalms contains many citations with direct reference to the coming of future generations depending on translation Hebrew dictum to build a city, “for the edification of future generations” (Exodus 17:14; Deuteronomy 31:19).

dition, one can begin to see how idealist perspectives might not mesh with the approaches needed to solve SES problems (also known in sustainability discourse as *wicked problems*, which I describe in full in Chapter 1). Idealistic views in many ways contradict sustainability thinking since the tradition associated with its discourse has evolved from real-life environmental problems (Minteer, 2011; Cole & Foster, 2001).

Plato denied facts and knowledge as emanating from a material and natural world. Instead, he posited concepts, values, and principles from an abstract system of belief steeped in eternal and idealistic “forms.” The urban ecologist Louis Mumford (1961) noted in his famous *The City in History* how Plato and his teacher Socrates originated idealistic thinking in Western thought, but they possessed virtually no understanding of the natural world to guide their philosophical worldview. Plato’s theory of perfect and eternal forms like “tree” or “mountain,” represented a higher plane of existence, of which the physical and material world was a mere shadow.

Plato’s was what we would call today *reductionist*, or, “A person who analyses and describes a complex phenomenon in terms of its simple or fundamental constituents,” (Oxford, 2017). While in ecology as well as other sciences, reductionism compliments holism and the scientific method, here it constitutes more of a pejorative term given its failure to capture the immense range of layered complexity that emerges from study of the natural world.

In contrast to Plato, Aristotle relied on direct observation of biological phenomena and conceived of “logos” as “reasoned discourse.” Aristotle (384-322 B.C.), the “first naturalist,” originated scientific, naturalistic, and holistic thinking in Western discourse. His thinking can still guide the understanding and solving of SES, wicked problems today. Aristotle is rightly placed at the origin of naturalist history because he “put natural history on par with the traditionally respectable sciences such as mathematics, medicine and astronomy” (Huxley, 2011, p. 24). The philosopher and mathematician Bertrand Russell (1872-1970) accredits Aristotle with raising human culture from its primitive status.

Aristotle, the founder of the physical sciences and “father” of the scientific method, was also aware of organizing value of logos and purposely created the term “oikos” to represent both “ecology” and “economy.” *Oikos* or “eco” represented a discourse on the relationship between human beings and the natural world. Aristotle’s thinking is the first evidence of the full scientific method in practice, which is the reason he is often accredited with its invention. It is a considerably improved way of approaching a given problem, and it utilizes a combination of *deductive* (logical and empirical) and *inductive* (creative and probability related) reasoning (Klein, 1990). But even more important, Aristotle studied the natural world, developing, according to Wilson (1998), an “empiricist” and “biological basis for morality” (p. 53).



Figure 1: The School of Athens. The late Renaissance painter Raphael contrasted two different worldviews—one spiritual and one material—that contributed to Western civilization to that point, and as characterized by Plato and Aristotle. (Raphael, 1509)

The conflict between Aristotle and Plato also represents two antagonistic philosophical views of Western thinking. This polarity is indelibly represented in later Enlightenment thought as complementary yet contradictory and already firmly established as seen in Raphael's (1483-1520) late Renaissance painting "The School of Athens" (c. 1509-11) (Most, 1996). In it (see Figure 1.), Plato is pointing upward to represent the world of ideas, the intangible, abstract perfection of mathematics. On the right, Aristotle motions toward the Earth representing the world of natural laws, botany, chemistry, physics, and the scientific method. Plato is also "pointing upwards beyond the limits of pagan philosophy toward an eventual Christian revelation that he alone can vaguely sense" (Most, 1996, p. 165).

Human co-operation with the natural world is important for SES problem solving. While Plato began with abstract ideas and proceeded to build a philosophy of nature around Ideal Forms—as thinkers do in primarily in religious frameworks—Aristotle, on the contrary, invented a new form of logic that began instead with specific observations from the material and natural sciences, proceeding through experimentation and trial and error to the formulation of ideas that were generalizations (Klein, 1990).

Aristotle's ethics instead derived along direct observation of physical laws and centered on the moral and ethical development of human beings as a result of contact with nature. Additionally, his ethics focused on innate biological functions of human beings within what we would today call an ecosystem—all concepts further developed by the naturalists examined in the present book. In direct opposition to his teacher, Plato, Aristotle reformed what a worldview could be, showing it could operate in congruence with—and as part of—the natural world (Klein, 1990). As a result, Aristotle's concepts, values, and prin-

ciples inform each other and seek agreement throughout his many books. *Poetics, Physics, Rhetoric, Drama, Dreams, Economics* (which meant both one's products and labor, but also one's "home" in an ecological system), *Memory, The Natural Sciences, Moral and Political Philosophy, The Method of Science and Philosophy, Generation and Corruption* and other books based on the precept that *all* the principles of nature reinforce one another.

Especially important are Aristotle's understanding of *emergence* (which is fundamental to contemporary ecology) and the solving of socio-ecological problems. *Emergence* and *emergent properties* have been defined as the arising of novel and coherent structures, patterns, and properties during the process of self-organization in complex systems (Anderies, Jansen & Ostrom, 2004). Emergent phenomena are conceptualized as occurring on the macro-level, in contrast to the micro-level components and processes out of which they arise (Goldstein, 1999). Finally, emergent properties are phenomena that cannot be predicted from the components of the level or unit in ecological levels of organization and have *non-reducible properties* (Odum & Barrett, 2005). Over two thousand years ago Aristotle thus effectively corrected Plato's Idealism.

In yet further example of how Aristotle's sophisticated understanding of the relationship stemming from the confluence of science, ethics, economics—and knowledge as a whole—are apropos for today's sustainability thinking, he was among the first thinkers to develop notions of diverse sustainability principles like *intergenerational equity* in his *Nicomachean Ethics* (350 B.C.). Additionally, he was the first to articulate sustainability's concept of *future generations* (Aristotle & McKeon, 1941; *OED*, 2014).

I suggest both Aristotle's worldview—and the naturalist worldview in general—are much more pragmatic for solving SES problems as they also encompass natural and human concepts, values, and principles. Plato's idealistic worldview (i.e., Idealism) is overtly ideological and antithetical to a holistic, ecological, and humanist worldview. It is also contradictory to sustainability thinking as it lacks components vital to sustainability thinking, such as observation, empiricism, and the scientific method.

The philosophy of Idealism, the core of Plato's thinking, is a worldview a naturalist often specifically rejects. Holism that is limited to the disciplines of either philosophy or science exclusively, or that conform to ideological and religious beliefs, is fatally flawed. Often throughout history, ideological and religious beliefs have run counter known scientific concepts, values and principles. Religious dogma, such as that which in the seventeenth century called Copernicus (1473-1543) and Galileo (1564-1642) heretics for reporting on natural laws we know today to be true, has historically prevented our scientific observations of the natural world from informing our entire worldview.

Naturalists have often aspired to describe all the fundamental laws of the universe in complimentary and holistic terms. In this book I will demonstrate

that naturalist concepts, values, and principles frequently run counter to a more predominant thinking of global expansion and domination of both nature and other human beings.

Here, I closely examine the worldview of four prominent American naturalists. During the course of my sustainability research, I have found that the life and work of what are traditionally referred to as *naturalists*, or *natural philosophers*—who are well versed in both environmental and cultural history—possess a sustainable worldview. Naturalists were among the first scientists and were ecologists before the creation of the discipline in academia. Since antiquity, certain naturalists can be considered exceptional thinkers as they were often trained in both the theory and practice of both science and philosophy.

SUSTAINABLE SYSTEMS

How can the long tradition of naturalist discourse help us achieve sustainability today? Similarly to Plato's thinking, narrow, idealistic, and non-scientific views have divided human knowledge from natural knowledge for over two thousand years. Such views still predominate in a sustainable development paradigm where the values development and conservation are pitted against one another, as well as within the discourse and practices at the university where the sciences and humanities are compartmentalized. I propose that while many sustainability scholars have extolled Aristotle's use of deductive reasoning (Klein, 1990), few have used his reasoning method to solve complex SES. In solving complex, emergent problems, while we can begin with deductive reasoning, we must also employ inductive reasoning. Since we must make decisions about the future with imperfect knowledge, we can use Aristotle's reasoning method, which "starts from what is already known, proceeds sometimes through induction and sometimes by syllogism" (Klein, 1990, p. 140).

In looking for a new sustainability paradigm, I find the writing of naturalists from the American environmental tradition provide a notably rich and fertile ground for sustainability thinking. While we often employ quasi-statistical reasoning projected indefinitely into the future to solve social and environmental problems here and around the world, sustainability is not about 5, 10, or 20 years, but it concerns the long-term. It is therefore apt to consider both our measurable past and our long history.

In researching some of the most influential shapers of naturalist thinking, I found members of overlapping fields of study like biologists, climatologists, ecologists, foresters, ornithologists, evolutionary biologists and environmental scientists also often integrated their thoughts on the environment with economics, sociology, psychology, ethics, religion, philosophy, and history. Traditional naturalists often simultaneously cross-examined concepts, values, and

principles from the natural sciences, social sciences, and humanities—also known as the *Three Branches*.

As we will see, naturalists have traditionally observed data and phenomena holistically because of the demands of the field first called “Natural History.” The “first naturalist” Aristotle, who unified principles through writings on fields as diverse as biology and ethics, physics and poetry, and evolution and society, famously stated in *Metaphysics*:

[T]he truth seems to be like the proverbial door, which no one can fail to hit, in this respect it must be easy, but the fact that we can have a whole truth and not the particular part we aim at shows the difficulty of the whole, *meaning the whole is more than the sum of its parts* (Aristotle, 371 B.C./2004, p. 36)

Aristotle’s third-century BC holistic view is similar to today’s definition of holism.² His sense of all knowledge being related represents a worldview that is no longer “mystical,” or “top-down” as in a Christian or divine plan, as scores of great thinkers have proposed. His views are instead founded on the idea that knowledge from the Three Branches are all related, and they can be integrated in a paradigm of interdependency—where each part contributes to the whole—and works *toward synthesis among* all knowledge (Klein, 1990; Wilson, 1998; 2015).

Because not every naturalist proved adept at integrating science and ethics, natural history and philosophy, ecology and society, and environmental and socio-economic problems within a holistic worldview, I call the naturalists examined in this book, given their deep and broad coupled-systems approach of their work, *ecohumanists*. Ecohumanists suggest changing the larger SES that created unsustainable practices in the first place. Their ethic of one coupled human and natural system, with economics subordinated to environmental limits, links important values from the natural sciences and the humanities for sustainability education. Throughout this book, I also sometimes refer to these naturalists as *ur-* or *proto-*ecologists and sustainability thinkers.

A range of writings first drew my interest to these authors and how they could enhance sustainability discourse. These included Henry David Thoreau’s (1854) lengthy essay on “Economics” in *Walden: or Life in the Woods* (1854); and Ben Minteer (2006) and Bryan Norton’s (2005) treatment of Aldo Leopold as a pluralist as well as a sustainability and transdisciplinary thinker. I was also motivated by the contrast between Rachel Carson’s early writings on the sea and her *Silent Spring* (1962), a clear departure from her placid depictions of coast-

2 | “The theory that parts of a whole are in intimate interconnection, such that they cannot exist independently of the whole, or cannot be understood without reference to the whole, which is thus regarded as greater than the sum of its parts” (Oxford, 2017).

al ecosystems and their multifarious interactions, to a more pointed critique on industry and the application of science. Finally, E. O. Wilson's (1986; 1992; 1998; 2012; 2016) writing on the coevolution of genetic (natural) and cultural processes, the theories of biophilia and consilience, as well as his commentary on the other ecohumanists, formed the foundation of this study.

In preparation for writing the book and in ultimately choosing four representative naturalists, I carefully considered many holistic thinkers. In particular, I examined those who exhibited holistic and coupled-system thinking that extended to the social and economic spheres. I reflected on an international body of literature of naturalists and interdisciplinary thinkers such as Thomas Jefferson, Johann Wolfgang von Goethe, Alexander Humboldt, George Perkins Marsh, Charles Darwin, John Muir, John Burroughs, P.D. Ouspensky, Albert Einstein, Edward Abbey, Paul Erhlich, Michel Foucault, Wallace Stegner, Barry Commoner, Donald Worster, Jane Jacobs, Stewart Brand, Bill McKibben, David Owen, Lester Brown, and Vandana Shiva—all of whom are referred to in this book. These thinkers are among those whose concepts, values, and principles capture and integrate a remarkably heterogeneous range and depth of historical, normative, economic, ecological, scientific, and social values pivotal to a viable discourse in sustainability.

THE AMERICAN ENVIRONMENTAL TRADITION

I settled upon four *American* naturalists for several reasons. First, most of my life experience and research in environmental management and sustainability, as well as all my education in sustainability, has been as an American citizen. Second, until just recently, Americans have had the largest per-capita carbon footprint, and corresponding *ecological footprint*—the amount of natural resources needed to support a human population—of any existing country.³

Third, Western ideologies of capitalism, expansionism, democracy, and exceptionalism beginning with the Industrial Revolution in America led to many of the global environmental and economic systems we live in today; the four selected naturalists critique all of these ideologies. Thoreau responded to the effects of early American industrialism that he observed. It was the American-led economic expansion and leadership in the fields of ecology, science, and technology beginning at outset of the twentieth century to World War II to which Leopold reacted. Likewise, the explosion of unfettered research and

3 | Recently China's carbon footprint surpassed the United States, although the average citizen has one-fifth the footprint of an average American, and many argue the products manufactured in China for us should contribute to our footprint, which might keep us in first place as the world's largest consumer of natural resources.

technological applications following World War II evoked a response by the early biologist and environmental activist Rachel Carson. Later, it is during the era of *sustainable development* that began in the 1970s, and exemplified by the *Brundtland Report* in the 1980s, to which E. O. Wilson responded at the turn of the twenty-first century.

Fourth, I examined naturalism in the United States because it is Americans—especially conservative and religious right—the have been responsible for blocking many international treaties such as the Kyoto Protocol and quite recently the Paris Accord Climate Agreement, which have limited Europe, China, as well as smaller developing countries from establishing international sustainability policies sooner. Those obstructing such environmental agreements have ideological, religious, and economic worldviews well removed from how the ecosphere works, upon which the four naturalists often remark.

Fifth, and finally, although the original, American environmental movement has now fragmented into many splinter groups, the influence of America and its media, economics, and military still reaches to almost every corner of the globe. Therefore, America's potential for leadership in the creation of a more sustainable economic, ethical, and education system appears nearly boundless.

In the end, I selected naturalists from four different eras: Henry David Thoreau (1817-1862), Aldo Leopold (1887-1948), Rachel Carson (1907-1964), and Edward O. Wilson (1934-). I investigated a considerable amount of each author's writing, making their work the main of unit of analysis. I focused on their most mature works: *Walden*, *A Sand County Almanac*, *Silent Spring*, and *Consilience*. I justify this in that each author devoted a concerted amount of time to search for connections between environmental and social systems, as well as accounting for the trajectory their views took as they reached a higher level of holistic and SES thought. Each book represents the thinker's most developed, tried-and-tested thinking on local-to-global sustainability.

Thoreau could induce scientific principles from philosophic principles—and vice versa—because of his unique late Enlightenment education in natural history. Thoreau, like Aristotle, employed a version of the scientific method across the natural sciences and humanities that equally valued both inductive and deductive reasoning, and he became an American pioneer in SES or coupled-systems thinking. Other than Thoreau's very well researched contributions to cultural and individual ethics before producing his manifesto *Walden* (1854), Thoreau had written many essays and journal entries on economics, as well as delivered many lectures at the Concord Lyceum,⁴ including one entitled "Economy."

4 | Thoreau devoted much of his life to the Concord "Lyceum," based on Aristotle's concept of a town hall-type lecture open to the public, and delivered by local professionals to share with the community (Mumford, 1961).

Leopold's second book *Game Management* (1933), a very practical manual about the management of biological diversity, was written after countless articles on forestry, wildlife management, and the examination of what today we would call socio-ecological relationships, across all the states of the continental United States. It was not until after Leopold had a lifetime of working in forestry, on town councils, publishing in local newspapers, and working in the university that he could fully record his mature thoughts about biological health and integrity in *A Sand County Almanac* (1949). Despite what has been often perceived as anthropocentric rhetoric, *A Sand County Almanac* presents not a picture of prosperous men simultaneously preserving and living off the fat of the land, but instead it paints a model of resilience in the preservation and restoration of old places and ways.

Likewise, I examined Carson's and Wilson's most mature thoughts on sustainability. Carson had published dozens of articles and received high praise and acclaim for three previous books of nature writing, one of which won the National Book Award. With *Silent Spring* (1962), she took a far more serious turn as an early environmental activist concerned with the destruction of many of her former research sites through the applications of pesticides (specifically, DDT). Finally, Wilson—twice winner of the Pulitzer Prize, and who could be counted as a historical naturalist for the importance of his work in the 1960s and 1970s alone—has made a number of bold attempts to unite natural, social, and human systems. This work blazed a trail for today's sustainability thinkers and academics; yet, it is not until *Consilience* (1998) and in the brief *Future of Life* (2002) that he fully links the sciences and humanities and engages with some of the world's most pressing and complex socio-ecological challenges that will face the twenty-first century.

Each naturalist and ecologist presented in this book has contributed substantially to natural history and/or the science of ecology. In their youth, each was an amateur naturalist and ornithologist, and later in life an activist. Each was an education reformer either in theory and practice, often stressing the importance of education that extended far outside the university. As an activist, each has demonstrated a fully matured perspective on how nature should and must be treated from an individual point-of-view and as a matter of self-actualization, promoting local-to-global conservation. These naturalists were also all educators who fostered environmental education regarding diverse subjects such as forest management; the relationship between our understanding of God, nature, and humankind; environmental stewardship; the moral obligations to the natural world; and humility toward natural things that we do not fully understand.

The book begins with Thoreau, and the era of rapid American industrialism, expansionism, and rapid scientific advancement in the middle of the nineteenth century—especially in the ecological sciences—and ends with E.

O. Wilson, the only now living naturalist of the four. During the 200-year period from Thoreau's birth to the present, the United States led helped raise the global Gross Domestic Product (GDP) to that of 50 times that of a person living then, and increase the average per capita GDP from 565 to well over five thousand dollars (Mosley, 2010). In this same time-period, we have also increased global population from one to seven billion, increased fish catches from one to 74 million tons, and increased coal output from 10 million to well over five billion metric tons, drastically and irreversibly altering the ecosphere. (Mosley, 2010)

IDEOLOGICAL AND POLARIZED WORLDVIEWS TODAY

Today, energy corporations (seemingly interested first and foremost in business-as-usual exploration and delivery such as Exxon) have dominated the interests of recent government leaders like American President Donald Trump, Secretary of State Rex Tillerson, and Republican Senator James Inhofe to block important greenhouse gas-reducing policies with mechanisms such as carbon taxes. The United States, contrary to all good, solid scientific information as well as ethical considerations, is operating under the premise that climate change is at best an "engineering problem," and at worst, a "hoax" (*New York Times*, 2017, Feb.). Quasi-scientific organizations like the Science & Environment Policy Project, the American Council on Science and Health, the National Center for Policy Analysis, the Independent Institute, the Frontiers of Freedom Institute, and the Advancement of Sound Science Coalition will also seemingly pay anyone with a PhD willing to deny that climate change is not happening, or certain toxins do not cause health problems, for instance, in order to generate confusion, stall important regulations indefinitely, and provide the basis for continued abuse of society and nature.

James Inhofe, the current chair of the U.S. Senate's Environment and Public Works Committee, epitomized ideological, Platonic, and idealistic thinking when he said, "The climate is changing, and climate has always changed. The hoax is that there are some people who are so arrogant to think that they are so powerful, they can change climate. Man can't change climate" (CSPAN, 2015, Jan.).

Deeply polarized and ideological divisions between the American Right, who cling to growth-first ideas centered on deregulating energy and financial institutions, and the American Left, who also constitute the majority of environmentalists, and would like to see more, rather than less, regulation. So deep are the divisions, in fact, that environmental issues such as the Keystone pipeline, fracking, the dissolving of the Environmental Protection Agency, and the freeing up of federal lands and a score of national monument sites for the

exploitation of resources, rarely receive any airtime in the news among all the contentious discourse that dominates even the most informed discussions.

In addition, United Nations planning has suffered further from the fact that most of its members are determined to have economic growth in developed and developing countries alike. Wilson (1998) writes (and many others have argued), “people generally don’t understand science” (p. 293). The educational training politicians generally receive is limited to social sciences, humanities, and/or the law, with minimal knowledge of natural sciences.

Speaking to the rise and fall of ancient civilizations, the biologist and naturalist, Edward O. Wilson (1998) writes:

Ecologists add another perspective, with this explanation: The populations reached the local carrying capacity, where further growth could be sustained with the technology available. At that point life was often good, especially for the ruling classes, but fragile. A change such as a drought or depletion of the aquifer or a ravaging war then lowered the carrying capacity. The death rate soared and the birth rate fell (from malnutrition and disease) until lower and more sustainable population levels were reached. (p. 314)

Unlike politicians, historical naturalists consistently frame the natural world in terms of both its—and humankind’s—health and wellbeing.

Our greatest SES challenges call for an informed sustainability discourse commensurate with their magnitude, complexity, and integration (Kates & Parris, 2003). Here, I assert that the intrinsic ability of these unique ecologists, writers, activists, and thinkers to view the Earth, its ecosystems, and its inhabitants (human and otherwise) as a single, integrated system preserves the Aristotelian tradition of integrating knowledge. Today’s sundry and myriad disciplines can be consolidated in effort to guide core principles for living our lives with integrity and purpose to a finite planet. The writings and examples of ecologists provide more robust sustainability principles than today’s widely accepted or “received” UN-related sustainability thinking. Naturalist principles can help solve our most wicked problems by synthesizing a broad range of knowledge in the natural sciences, social sciences, and the humanities to inform sustainability discourse.