Developing a Human-Environment Timeline: A Chronology of Ideas and Events for the Anthropocene

by

Thomas Barclay Larsen

B.A., University of Missouri-Columbia, 2013
M.A., Kansas State University, 2016

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Geography
College of Arts and Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2018

Abstract

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This dissertation initiates conversation about developing an official human-environment timeline. Oriented from the perspective of a geographer, this exploratory research involved the qualitative analysis of human-environment events and ideas from a series of four geographic encyclopedias. A human-environment timeline emerged from this research, as well as a hierarchical typology of time periods: durations, duration revolutions, scenes, scene transitions, and intervals. The timeline was then interpreted according to four "ways of knowing": normal science, cultural ecology, political ecology, and humanistic geography. This research supports inquiry into how time periods can be employed to better understand and communicate the human-environment relationship through time.

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Table of Contents

List of Figures

List of Tables

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Dedication

To my family

Roberta, Robert, Paige, and Matthew Larsen

Aut Agere Aut Mori

Chapter 1 - Introduction

"Probably no other single element in the environment is as important or as interesting to us as ourselves," Zelinsky (1978, 491). The human relationship with the environment is and has been an ongoing natural experiment ever since "Lucy walked upright by that African lake three million years ago;" and that experiment is at risk of failure (Englehardt 2018).

All non-human organisms modify their surrounding environment. Beavers build dams, termites eat through wood and build mounds, and mosquitos transmit diseases. Examining human modifications, however, means more now than ever before. Zelinksy notes, "Although we human beings have only recently formed a conspicuous component of the habitat in purely physical terms, we have indeed come to play a most decisive role in the way that habitat now operates" (1978, 491). Early *Homo sapiens* were just as engaged in their relationship with the environment as we are today. Food and shelter were among the earliest concerns for *Homo sapiens* as they worked within and transformed the environment into livable place. Today, concerns have only multiplied, and we have entered what Orr (2016) calls the "Long Emergency." As one of humanity's oldest topics, the human-environment relationship has aspects that are pre-disciplinary, pre-historical, pre-historiographical, and pre-linguistic.

Humans have a timeline for life (Betts *et al*. 2018), a timeline for the geologic record (Cohen *et al*. 2013), but no timeline for the human-environment relationship. This exploratory study uses geographic encyclopedias to lay a foundation for the creation and interpretation of a human-environment timeline. The debates over officiating the Anthropocene—a proposed geologic epoch dating the human impress on the planet—demonstrate that one new period on the geologic timescale is not a sufficient representation of the human-environment relationship. The lack of consensus is met with a burgeoning amount of interest, which spans from critical

scholarship to the constructive. A goal of this dissertation is to start a conversation concerning how time periods are employed to understand the evolving human-environment relationship.

This dissertation has three objectives, which will be expanded upon in the ensuing chapters:

1. **Design an abductive, qualitative method** to explore a select group of geographic encyclopedias as a foundational data source to examine which events and ideas emerge as major entries for a human-environment timeline.
2. **Build** a hierarchical periodization (*i.e.*, a timeline) of the human-environment relationship.
3. **Interpret** the idea of a human-environment timeline based on several modes of human-environment thinking and scholarly perspectives: normal science, cultural ecology, political ecology, and humanistic geography.

From these objectives, this dissertation seeks to contribute toward the development of an official human-environment timeline. The timeline will feature time periods that are tailored specifically to the human-environment context, not from the standpoint of the geologic or biotic record. Beginning this scholarly conversation is a critical response to the problems that humanity faces as evidenced by the proposed geologic epoch of the Anthropocene. The effort also contributes a method for synthesizing time periods, a process that is based upon abduction and concepts from qualitative meta-analysis and grounded theory.

Possibilities and Limits of the Anthropocene

The Academy has been *possessed* by an idea: the Anthropocene. According to Bornstein (2007), possession by an idea requires four conditions: (1) the unquestioned desire for people to devote more than a decade toward the idea, (2) clear "how-to" strategies for disseminating the

idea, (3) the idea's ability to stand out on its own without any assistance, and (4) the trustworthiness of the group advancing the idea. Almost two decades have passed since the Anthropocene's first conception (Crutzen and Stoermer 2000; Crutzen 2002). The Anthropocene is a time period, first proposed in the early 2000s (Crutzen 2002; Crutzen and Stoermer 2000), which has resulted in an explosion of research and commentary. The intention of this new epoch is to provide a period either in conjunction with or following the Holocene in which humans have transformed the landscape to the point where the human impress can be identified in the layers of rock and sediment (Crutzen 2002; Crutzen and Stoermer 2000).

A case for inclusion in the official geologic timeline has been progressively built (Waters *et al*. 2016). On its own, the proposed geologic epoch has been both championed and criticized by scholars of different disciplines (Castree 2015a; Castree 2015b; Castree 2017; Toivanen *et al*. 2017). The Anthropocene Working Group consists of prominent, trustworthy academics in the realm of human-environment relations; its members have sought to increase the Anthropocene's transparency and inclusiveness (Zalasiewicz *et al.* 2015; Ellis *et al*. 2016; Ellis 2017). Overall, the conditions are ideal for the continued success of a conceptual Anthropocene.

Humans are living in a new official geologic age, but it is not the Anthropocene. In July 2017, the International Commission on Stratigraphy (ICS) added the Meghalayan age to the Holocene epoch (Voosen 2018). The Holocene now consists of three ages: Greenlandian (11,700-8,200 BP), Northgrippian (8,200-4,200 BP), and Meghalayan (4,200 BP to present) (see Cohen *et al.* 2013; ICS 2018). The most recent age is the product of a global drought that can be distinguished in the geologic record. Despite being officiated, the Meghalayan continues to be criticized for inconsistencies by geologists, archaeologists, and paleoclimatologists (Voosen 2018). Geologic evidence does not align with the archaeological evidence because

archaeologists find little indication of a sudden universal collapse in civilization caused by global drought (Middleton 2018). By the end of this dissertation, it should become clear that time periods, whether relevant to geologists or social scientists, are not exempt from criticism or reinterpretation.

The official geologic timeline is an ongoing collaborative that scientists regard as one of humankind's great intellectual achievements (Bjornerud 2018). Geologic strata are used to conceptualize and periodize how the environment has changed since Earth's beginning (Walker *et al*. 2013). Debates about the creation of an Anthropocene epoch have led to attempts to insert the imprint of the human factor into the geologic timeline. All the while, no official timeline exists to do the same for the relationship between humans and the environment they have changed. In other words, there is a well-established geochronology, or Earth time (McPhee 1982; Bjornerud 2018), but there is a need for an anthrochronology, or human time (Harrington 2018).

Research on the Anthropocene

The Anthropocene has been met with varying reactions by natural scientists, social scientists, and humanities scholars (Steffen *et al.* 2011a). Working groups and calls for collaboration have worked to contextualize the Anthropocene by formalizing its boundaries (Ellis 2015; Ellis *et al.* 2013; Biermann *et al.* 2016; Brondizio *et al.* 2016; Zalasiewicz *et al.* 2015). As of the writing of this chapter, the Anthropocene continues to be an informally recognized epoch on the geologic timeline, despite claims that it functions separately from the Holocene and can be examined in geological stratigraphy (Waters *et al.* 2016). The Anthropocene has resulted in an explosion of transdisciplinary dialogue and commentary (Toivanen *et al.* 2017). Consequently, more and more scholars are devoting energy, directly and

indirectly, to thinking about time periods and how they inform understandings about the human-environment relationship.

The Anthropocene's widespread audience opens the proposed epoch to important criticisms about using a single time period to define the place of humans in environmental transformations. The Anthropocene has three limitations. For one, it represents a specific aspect of the human-environment relationship, one which may be discerned through the scientific study of the human traces in the stratigraphy (Zalasiewicz, Waters, and Head 2017). As much as social scientists are called to become involved, the *geologic* aspect of the Anthropocene has been the dominant view (Waters *et al.* 2016). Regardless, the social, structural, biological, perceptual, or experiential characteristics have also gained priority in the Anthropocene's development (for example, see Brondizio *et al.* 2016; Ellis *et al.* 2016).

Second, despite its geologic theme, the structure and makeup of the proposed Anthropocene epoch are difficult to define and, thus, place boundaries. Written more than a half-century ago, White's (1967, 1203) "The historical roots of our ecologic crisis" provides a relevant insight to this matter:

> People, then, have often been a dynamic element in their own environment, but in the present state of historical scholarship we usually do not know exactly when, where, or with what effects man-induced changes came.

White (1967) articulates a sense of uncertainty that remains present in the most recent Anthropocene development. Some academics claim that the Anthropocene reaches back to the human discovery of fire, while others claim that the epoch begins with the introduction of nuclear technology and weaponry after 1945 (Lewis and Maslin 2015). Regardless of where to draw the boundary, there is more than one 'right' answer. For example, Smith and Zeder (2013) draw from an assortment of scientific literature to document alternative periodizations of the

Anthropocene (Table 1.1). The authors' central argument is that the Holocene and Anthropocene should be considered one-in-the-same, coupled together rather than separated. The geologic boundary of an Anthropocene epoch is a case study for the varied and perceptual aspects of periodizing the human-environment relationship.

Table 1.1: Alternative starting dates for the Holocene-Anthropocene boundary (Smith and Zeder 2013).

Year	Event
AD 1950s	Development of artificial radionuclides and atomic bombs
AD 1750-1800	Industrial Revolution and global atmospheric change
2,000 BP	Human civilizations begin altering the earth's surface
5,000-4,000 BP	Intensification of agriculture and global atmospheric change (due to methane from rice agriculture and raising cattle)
8,000-5,000 BP	Introduction of agriculture and global atmospheric change (due to methane from rice agriculture and carbon dioxide from deforestation)
11,000-9,000 BP	Initial domestication of plants and animals; construction of human niches
11,700 BP	Boundary between Pleistocene and Holocene
~13,800 BP	Change in megafaunal predation and vegetation

Third, a transdisciplinary audience results in the Anthropocene taking on a pluralized nature, or 'Anthropocenes' (Toivanen *et al.* 2017). Multiple representations of the Anthropocene exist (see Figure 1.1). Much like a zone of transition from one region to an adjacent one, the 'boundary' can be expressed in a number of ways. The Anthropocene can be viewed as a gradient of increasing human transformation of the environment, as in Ellis *et al.* (2016). This idea correlates with Scott's (2017) take that a "thin" Anthropocene began with the discovery of fire and became more intense as innovations took place in agriculture, technology, and the

development of nation-states. It can be represented simply as a "golden spike," such as after 1945 when above-ground nuclear bomb testing altered the Earth's radiative composition (Steffen *et al*. 2015). There can also be a spectrum indicating the change from traditional agricultural and societal transformations of the Earth to industrial and post-industrial transformations (Smith and Zeder 2015). Finally, there can be a series of overlapping variables to represent the Anthropocene, such as the increase in methane and carbon dioxide, the increase in deforestation and soil erosion, and the mass extinction of species (Ruddiman *et al.* 2015).

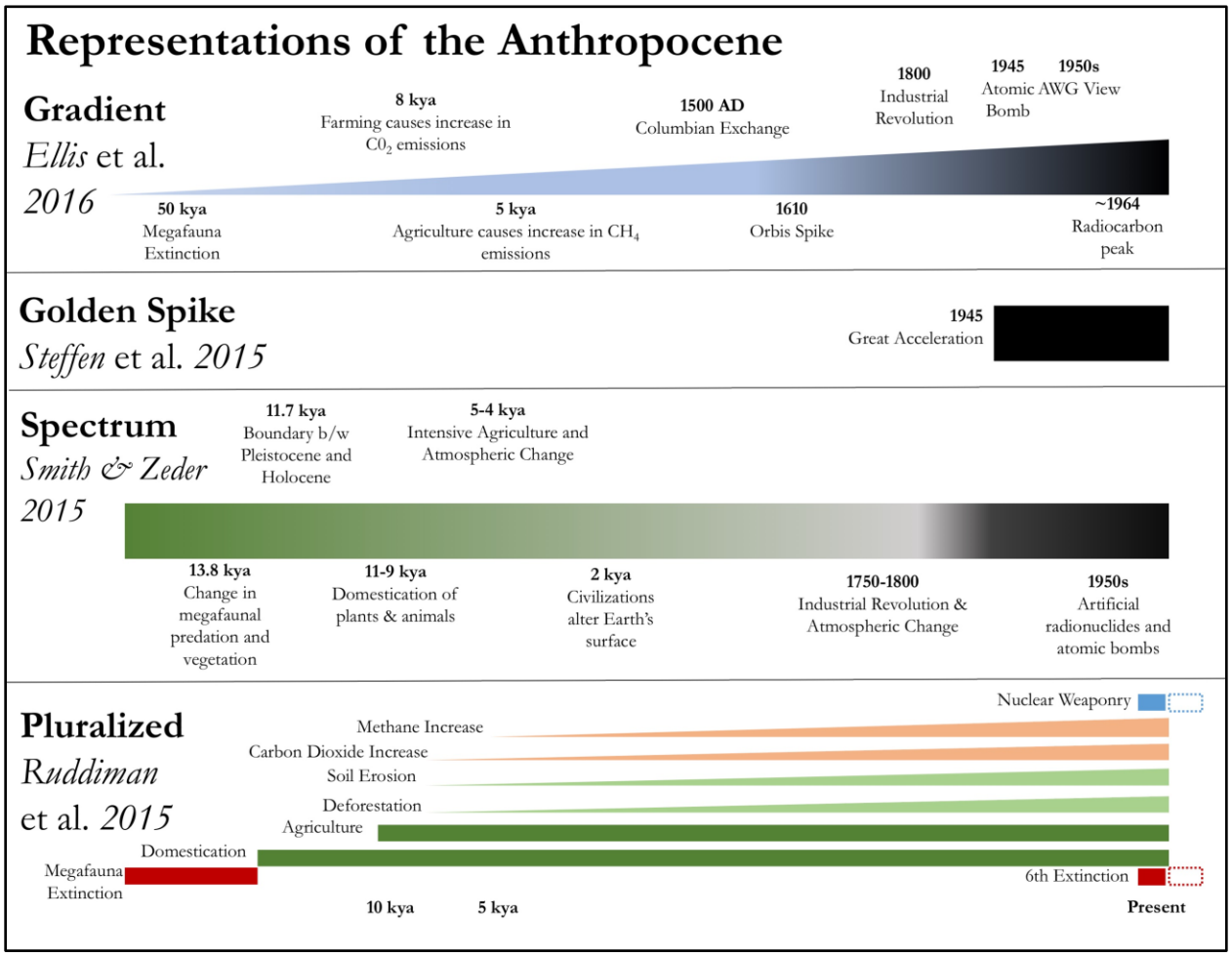


Figure 1.1: Representations of the Anthropocene, derived from Ellis *et al.* (2016), Steffen *et al.* (2015), Smith and Zeder (2015), and Ruddiman *et al.* (2015) (Source: Author).

Pluralization of the Anthropocene concept leads to a suspicion that the proposed geologic epoch cannot represent these multiple aspects of the human-environment relationship at once. Pluralization does not necessarily aid in the geologists' ultimate goal of identifying a formal geologic epoch; rather, this debate can be criticized as a misappropriation of various social scientific and humanistic perspectives onto a trending idea in the Earth sciences. The Anthropocene is an idea that can no longer be confined to the geologic record. New perspectives are needed.

Social Scientific Attitudes on the Anthropocene

The call by Ellis *et al.* (2016) to involve more social scientists in the Anthropocene coincides with a number of critiques by social scientists. Castree (2015a, 302), a nature-society geographer, argues that the current initiatives in defining the geologic Anthropocene are "far too science led", noting that this research "is dominated by those who regard planetary change, and human responses to it, as amenable to analysis and influence absent any deep engagement with other forms of knowing and acting." In other words, the current representations of the Anthropocene reflect only one dimension of a so-called 'Age of Humans.' In a later commentary in *Science*, Castree (2017) makes his view more explicit by arguing that perspectives in critical social theory clash with logical positivist approaches to the Anthropocene. He writes:

> What counts as epochal change is a matter of perspective and emerges from judgements about when quantitative change morphs into qualitative transformation. The interpretive and critical parts of social science can help us to appreciate that formalizing the Anthropocene is a misguided attempt to 'scientize' a particular set of value judgements. No such formalization is needed to underpin arguments for humans to live in ways that are less environmentally destructive (289).

Three points emerge from Castree's insights. First, the idea of an Anthropocene has a natural science origin, and this effectively excludes the varieties of perspectives that the social

sciences and humanities may contribute. As such, any social scientific contribution appears to either be a hinderance to the geologic effort to determine an Anthropocene epoch or simply an opportunity to make one's research relevant to existing trends. Second, the idea of an Anthropocene, in and of itself, is a social creation trying to use value judgements to represent a major human transformation. Which aspect of the human-environment modification becomes selected to represent the transformation? The process is similar to giving a blank map to a classroom of geography students and asking them to draw lines to indicate where the Great Plains region is located (see Rossum and Lavin 2000). Third, Castree (2017) questions why a formalized geologic time period is necessary in building an argument for more sustainable lifestyles. Perhaps there are more effective and holistic ways of describing and communicating the existential crisis that humans have created on Earth (*e.g.*, as a "Long Emergency" (Orr 2016)).

The Significance of Timelines

No consensus exists on what the "Age of Humans" means, when it begins, or how might it end. Despite its unclear foundation as a time period, the Anthropocene continues to garner scholarly interest. It has become a focal subject for journals like *Anthropocene* and the *Anthropocene Review*. According to Bjornerud (2018, 131), "In many ways, the exact start of the Anthropocene matters less than the concept behind it." The "Age of Humans" has more significance than simply an epoch on a geologic timeline. The interdisciplinary interest in the Anthropocene suggests that it is time to consider prospects for an anthrochronology, one that integrates multiple perspectives, events, and time periods on the human timescale. Before considering prospects for a human-environment timeline, a brief discussion follows giving four reasons for why a scientific timeline has intellectual merit.

First, a scientific timeline provides a common frame of reference for describing patterns of change through time. Among large scholarly collaboratives, an official timeline's dating schemes and typology of time periods allows for consistent scholarship. Geologists have used this process to establish official versions of the geologic timeline (Cohen *et al*. 2013; Walker *et al.* 2013). First officiated by Arthur Holmes in 1913, a geologic timeline "is the ordered compilation of numerical ages and relative age determinations based on stratigraphic and other principles" (Walker *et al*. 2013, 259). A geologic timeline is intended to provide (1) a common chronostratigraphic vocabulary from which to discuss phenomena, and (2) a consistent understanding of relative and numerical ages of events (Walker *et al*. 2013). The strive toward standardization proves crucial for major synthesis works like the multivolume, *The geology of North America*, which involved creating the first Geological Society of America Geologic Time Scale to encourage uniformity in citations (Palmer 1983). The timeline's eons, eras, periods, epochs, and ages provide a consistent frame of reference to classify geologic phenomena during different points of Earth's history (Cohen *et al*. 2013). The timeline's role as a reference work has broader implications than citation consistency. The geologic timeline has been the subject of international collaboration for around for over a century and is celebrated as one of science's greatest achievements. A key contribution of the geologic timeline has been its motivation to determine the age of the Earth (Bjornerud 2018). As a result, it affirms fundamental scientific facts about the formation of the Earth's lithosphere.

Second, a timeline serves as a form of synthesis. As more research on a phenomenon arises, that knowledge needs to be synthesized with existing knowledge. Additionally, multiple methods of inquiry can be triangulated to reach new conclusions. The geologic timeline is synthesized and updated from emerging research in chronostratigraphy, geochronology,

astrochronology, chemostratigraphy, and geomagnetic polarity (Walker *et al*. 2013). Similarly, biologists recognize the significance of synthesizing and reappraising the increasing evidence of genetic data and new insights from the fossil record (Betts *et al*. 2018). The creation of a timeline involves more than a survey of different time periods; it entails real-time decision-making founded upon the triangulation and appraisal of available data.

Third, the timeline is a temporal map for scholars to consider different scales of analysis—to move from a larger timescale to examine the subtleties of smaller time periods. A timeline can give context to time periods within it, similar to the distinct contexts that places and regions offer when analyzing geographic aspects of the Earth. Walker *et al.* (2013, 259) describe the geologic timeline as "an invaluable tool for geoscientists investigating virtually any aspect of Earth's development, anywhere on the planet, and at almost any time in Earth's history." A timeline thus can orient understandings of how different time periods connect to one another and how a period may relate to the broader timeline.

Fourth, an official timeline may form the basis for constructing alternative representations, as a way to evaluate how different data and perspectives may yield different periodizations. The geologic timeline has multiple variations (Orndorff 2018), including those provided by Gradstein and colleagues (2012); Ogg, Ogg, and Gradstein (2016), the ICS (Cohen *et al*. 2013); and the Geological Society of America (Walker *et al*. 2013). A human-environment timeline may be of value in helping scholars make sense of the relative placement of events and the duration of various time periods.

The geologic and the biologic timelines integrate a massive amount of research in the natural sciences. The synthesis employed for these timelines has limits: the parameters of the geologic and biologic timelines do not account for the *social* sciences. The incorporation of a

social scientific perspective could add an entirely different suite of perspectives on the creation and formalization of a timeline. Ellis and colleagues (2015) advocate for including social scientists in formalizing the Anthropocene. A timeline that combines the physical and social sciences could further understandings of how to synthesize and represent phenomena through time. Ongoing debates on the proposed geologic epoch only testify to the need to explore additional options for how to use periodization to improve communication about the human-environment relationship.

Proposing a Human-Environment Timeline

An official human-environment timeline could harness the energy and interest cultivated from the transdisciplinary discussion of an Anthropocene. Its creation can spark inquiry into how the myriad aspects of the human-environment relationship can be represented through a hierarchy of time periods. The timeline can embody a variety of human-environment periods by melding together the history and the historiography of the human-environment relationship. That blend represents something that the geologic Anthropocene, whether formalized for forever informal, is incapable of performing.

This dissertation proposes a prototypical timeline that is constructed through abduction, a mixture of deductive and inductive processes (see Holt-Jensen 2009), with the idea that the human-environment relationship requires multiple ways of knowing and interpretation. Some scholars may feel obliged to build upon this timeline, while others may feel compelled to tear down, reconstruct, or do away with it. Multiple perspectives will help advance our knowledge of how the human-environment relationship has changed and will continue to change over time. This dissertation also considers how the theoretical aspects of periodization might play into the ways in which the human-environment relationship is conceptualized through time. While the

proposed Anthropocene is both a valuable big idea and possible label for a time period, an original and dynamic timeline gives *carte blanche* for scholars to consider other big ideas/ages that may stimulate human-environment thinking.

Representing the Human-Environment Timeline

For this dissertation research, a human-environment timeline emerges from qualitative meta-analysis involving the collection of ideas and events discovered in a series of four encyclopedias: *Encyclopedia of environment and society* (Robbins 2007a), *Encyclopedia of geography* (Warf 2010a), *Encyclopedia of environmental change* (Matthews 2014a), and *Encyclopedia of global change* (Goudie 2002a). The raw, ordinal data for building the human-environment timeline include two categories: 'ideas' and 'events.' An idea is loosely defined. It comes in a variety of representations, including a plan, scheme, method, ideology, opinion, conviction, principle, notion, fancy, conception, thought, supposition, entity, or meaning, among numerous other synonyms and descriptors (Merriam Webster 2018b; Cambridge 2018b). A human-environment idea is defined here as an open-ended way to refer to any concept or publication that has influenced how people think about the human-environment relationship.

An event is similarly open-ended. In historical terms, an event can refer to a significant outcome or happening in a place during a moment or over a period of time (Merriam Webster 2018a; Cambridge 2018a). In Earth systems science, an event can mean an "intermittent, relatively short-lived process, commonly of high magnitude or energy, with characteristics that vary markedly from normal background conditions" (Owen 2012, 382). An event represents a disturbance to a system which changes its environmental characteristics. On the geological timeline, the duration of such happenings is relative to the scale of time and can range from hours to millennia. For this research, an event denotes any significant occurrence that has

affected the human-environment relationship. Events vary in length. For the most part, their length can represent one day and be generalized up to a year. Some events represent the median year of a time period (*i.e.*, 1950 for the middle of the 20th century). From the collection of ideas and events, the human-environment timeline is created through the synthesis of these data into clusters of time periods.

The concept of a human-environment timeline is not new. A number of examples exist for what could be considered human-environment timelines. For example, the Rachel Carson Center for Environment and Society (2018) has developed the open-access Environment and Society Timeline Tool. This online tool provides a timeline that is thematic, comprehensive, and searchable. The timeline is organized according to the year in which each event falls. Each event is linked to a description and summary of the occurrence. The timeline features the ability to filter the events according to one of eleven themes: biodiversity, climate, disasters, environmental knowledge, environmental movements, environmental politics, infrastructure, landscape transformation, pollution, population, and resources. This timeline is an intensive exploration of environment and society through time. Regardless of its completeness, the timeline falls short because there is no clear periodization or way of synthesizing the various clusters of human-environment events that exist in the dataset.

A second example of a timeline is William Kovarik's "Environmental history timeline." This timeline began as part of the appendix of the book, *Mass media and environmental conflict* (Neuzil and Kovarik 1996). The timeline has since been converted to online format and has expanded. The initial 1996 publication forms the foundation of the timeline. Kovarik (2018) has curated a wealth of additional events, based upon suggestions by environmental historians and others. The resulting timeline is an organic, participatory compilation of human-environment

events. Similar to the Rachel Carson Center's timeline, the "Environmental history timeline" is hindered by its application of time periods. The time periods used in the timeline are centered on Western and American divisions, even though they may represent other happenings around the world. For example, the twentieth and twenty-first centuries are periodized according to decade-long or calendar-based intervals rather than a contextual basis. Farther back in history, common historical periods are used, such as the Enlightenment, Progressive, and Renaissance Eras. A global human-environment timeline is limited when periods do not specifically relate to data detailing the human-environment relationship.

The third example is perhaps the most one-dimensional. In the *Encyclopedia of environment and society*, Golson (2007) provides a 112-item chronology of nature-society relations, based upon information from the entries. This appendix section, though helpful as a reference, offers no rationale for why each event was selected. The results of this dissertation research find that the Golson (2007) chronology omitted hundreds of potential events. Chapter 5 of this dissertation documents the sheer number of human-environment events and ideas that were not included in the Golson appendix.

The fourth example of a human-environment timeline takes a "big picture" approach. McNeill (2014) addresses seven major turning points in the human-environment relationship from one hundred thousand years ago to the present. Those turning points include: (1) the discovery and use of fire, (2) the development of verbal communication, (3), the migration out of Africa, (4) plant and animal domestication, (5) the creation of cities, (6) the Columbian Exchange, and (7) the dependence on fossil fuels. McNeill's timeline differs from the previous four timelines because it focuses on points of time in which a critical transition occurs in how humans interact with the environment. For these selected turning points, ideas matter more than

precise dates and large quantities of data. McNeill's account gains in its ability to synthesize the human timescale while sacrificing the synthesis associated with the quantitative itemization of human-environment events and ideas through time. Like the other timelines, it lacks a dynamic human-environment periodization, although it offers seven useful "golden spikes" in environmental history.

None of the above illustrations explicate the intention to produce an official human-environment timeline. The Rachel Carson Center (2018), Kovarik (2018), Golson (2007), and McNeill (2014) represent four variations of the human-environment relationship through time. Combined, the examples contain useful features. They archive large amounts of information, offer striking visualizations, and provide thematic descriptions and classifications. Separated, they lack essential qualities that an official human-environment timeline should have, such as a coherent periodization and a hierarchical nature. Lessons can be derived from these individual timelines in pursuit of creating an official human-environment timeline.

The present timeline effort distinguishes itself from these illustrations in three ways. First, it applies ideas and events to develop a hierarchical series of periods that specifically relate to the human-environment relationship. Based upon their single-level character, none of the above timelines appear capable of being manipulated to produce an official, multi-level periodization without causing distortion. Second, the proposed human-environment timeline involved designing a qualitative meta-analysis of geographic encyclopedias to synthesize periods from human-environment ideas and events. None of the mentioned timelines employed a rigorous, systematic exploration of selected reference works to this degree. Third, this dissertation's human-environment timeline goes beyond the presentation of a timeline by

critiquing and interpreting the completed product according to four ways of knowing: normal science, cultural ecology, political ecology, and humanistic geography.

Overview of the Dissertation

In addition to the present introductory chapter, this dissertation contains five additional chapters. The second chapter, "Periodization and the Human-Environment Relationship," provides a theoretical foundation for periodization and the human-environment relationship. Time periods have represented dynamic aspects of the human-environment relationship long before the proposed Anthropocene epoch. Geography makes a suitable disciplinary base for a human-environment timeline because of its human-environment tradition, capability for synthesis, and interest in the Anthropocene. When applied to the geographic perspective, time periods share similarities with thinking about places and regions. This chapter argues that human-environment geographers should not take periodization for granted. Time periods, like regions, have three valuable purposes: (1) they serve as ways to synthesize human-environment phenomena; (2) they have multiple parts to their "anatomy" that morph and change as scholars add new knowledge and interpretations; and (3) they are significant ways to classify the human-environment relationship through time.

The third chapter, "Methods," builds the theoretical and methodological foundation for the timeline's research design. No single method exists to develop a human environment timeline. The development of the timeline drew from qualitative meta-analysis and grounded theory to synthesize a hierarchy of thematic time periods. The chapter begins by discussing the selection of an operational definition and conceptual framework provided by Zimmerer (2017) for the human-environment relationship. It moves on to justify the importance of encyclopedias as cognitive authorities in geographic thought and suitable target databases for the human-

environment timeline. The chapter then addresses the role of induction, deduction, and abduction in scientific research. The timeline's research design most closely resembles abduction because it involves a complementary mixture of induction and deduction. From here, the chapter expands on the topic of meta-research and provides rationale for drawing from qualitative meta-analysis and grounded theory. Development of the human-environment timeline consists of six stages: (1) selection of encyclopedias, (2) data collection, (3) development of data categories and a typology of time periods, (4) periodizing the timeline, (5) using descriptive statistics to assess the characteristics of the timeline, and (6) interpreting the timeline.

The fourth chapter, "Assembling the Human-Environment Timeline," presents three items: (1) statistics that describe the timeline dataset, (2) a hierarchical typology of time periods developed by the researcher, and (3) a prototype for a human-environment timeline. The statistics are meant to provide an overview of the dataset. The typology was developed during the process of collecting and interpreting ideas and events that comprise the human-environment timeline. The typology contains five parts: Durations, duration revolutions, scenes, scene transitions, and intervals.

The fifth chapter, "Interpreting the Human-Environment Timeline," details how events and periods along a human-environment timeline can be interpreted through the lenses of four ways of knowing: normal science, cultural ecology, political ecology, and humanistic geography. This discussion-based chapter provides an overview of each way of knowing. From there, it assesses which elements of the human-environment timeline might be emphasized or criticized by each way of knowing. Finally, it presents a series of five axioms for interpreting a human-

environment timeline. The point of this chapter is to document how different perspectives might interpret an official human-environment timeline.

The final chapter, "Moving Forward with a Human-Environment Timeline," concludes with an overview of the study's contributions, limitations, and possibilities for future inquiry. It makes the case for the establishment of a human-environment timeline working group.

Chapter 2 - Periodization in the Human-Environment Relationship

Geographers play an important role in compiling and presenting the growing understanding of the human-environment relationship (Turner 2002). Given that responsibility, geographers ought to be concerned about how scholars employ time periods to understand the changing aspects of the human-environment relationship. Periodization, a scholarly process often used in history, is becoming increasingly important to geographers as time periods like the Anthropocene become integrated into geographic thought (see Ellis 2017). According to Wishart (2004), the concept of a time period has been taken for granted in geographic research. This chapter reviews the relevance of timelines and periods in human-environment geography. Periodization contributes to geographic thought through its intersection with a number of topics, such as regionalization and the changing nature of the human-environment relationship.

The case must be made for why a trained geographer is suited to build an initial human-environment timeline. Geographers have an expertise in three components that contribute toward the development of a human-environment timeline: human-environment relations, synthesis thinking, and evaluation of time periods like the Anthropocene. The disciplinary boundaries between history and geography might inhibit progress toward the synthesis of the human-environment relationship. Human-environment geographers should be sensitive to the connections between geography and history, region and period, and place and event. This chapter establishes connections between time periods and regions to discuss three characteristics of periodization: (1) time periods as forms of synthesis, (2) the morphology of time periods, and (3) time periods as objects of classification.

Timelines and Geographic Thought

The areas of geology and biology have yielded two distinct timelines that synthesize and periodize patterns of change in their respective disciplines (ICS 2018; Betts *et al*. 2018). Arguably, geographic research on the human-environment relationship has reached a critical mass to develop its own timeline (see Lowenthal 1990; Turner 2002). Compared to traditional dissertations in geography, a human-environment timeline is an unusual product. In a 2015 study, Kaplan and Mapes examined topics and themes for U.S. geography dissertations spanning 120 years. The authors, both geographers, applied periodization to group the dissertations into eight eras. Among dissertation titles, some of the most common words and phrases were 'spatial', 'analysis', 'modeling', 'landscape', 'change', 'development', and 'region'. By contrast, 'period', 'history', 'timeline', 'Anthropocene', and other relevant terms were not represented in the top twenty words and phrases for any of the eight eras. Though a human-environment timeline may not be perceived as a conventional geography dissertation, it operates within the margins of geographic thought and contributes toward emerging trends in the discipline. Three reasons exist why geography provides ae suitable origin for the human-environment timeline: (1) the human-environment relationship represents an essential component of geography's identity, (2) geographers synthesize and explore phenomena spanning across and beyond the physical and natural sciences, (3) geographers use multiple forms of classification and generalization that relate to the creation of time periods.

Geography as the Human-Environment Discipline

Geography is adept at creating a human-environment timeline because it is regarded as the 'human–environment' discipline (Turner 2002; Yarnal and Neff 2004). The human-environment relationship represents a core tradition in geographic thought (Pattison 1964;

Glacken 1967; Murphy 2014); it occupies a space in most variations of geography's conceptual terrain (see Table 2.1 for an overview of conceptual frameworks in geography). Generally defined, human–environment geography encompasses geographic ways of understanding, approaching, and synthesizing ideas and questions about the complex relationship between people and the places they inhabit (see Zimmerer 2017). It addresses a broader task that extends beyond geography, the process of "seeking lessons about society and nature taken from the study of the relationships between the two" (Turner 2002, 60). For geographers, nature-society connections have been a topic of concern ranging from the historic, historiographic, epistemic, spatial, to the place-based (Kates 1987; Turner 2002; Zimmerer 2010; Zimmerer 2017).

Table 2.1: Frameworks in geography, with human-environment themes indicated in bold under the framework domains (compiled by author).

Geography Framework	Framework Domains
William Pattison (1964) ***Four Traditions***	• Spatial tradition • Area studies tradition • **Man-land tradition** • Earth science tradition
Edward J. Taaffe (1973) ***Three Views of Geography***	• Spatial organization • Area study • **Man-land relations**
NAS (1997) ***Geography's Perspectives***	Domains of synthesis • Environmental dynamics • **Environmental/ societal dynamics** • Human/societal dynamics Geography's ways of looking at the world • Integration in place • Interdependencies between places • Interdependencies among scales Spatial representation • Visual • Verbal • Mathematical • Digital Cognitive
Billie Lee Turner II (2002) ***Geography's Identities***	• Spatial-chorological • **Human-environment**
Susan Hanson (2004a, 720) ***Geographic Advantage***	• **Relationships between people and the environment** • Importance of spatial variability (the place-dependence of processes) • Processes operating at multiple and interlocking geographic scales • Integration of spatial and temporal analysis
Alexander B. Murphy (2014) ***Crosscutting Themes***	Four Traditions • Spatial • Area studies • **Human-environment** • Earth sciences Crosscutting Themes • Spatial relationships • Place characterization • Geographical context

Geography has reached a critical mass that has warranted the synthesis of research within and beyond its disciplinary boundaries. Reviews, encyclopedia entries, geography dictionaries, and reference books have attempted to create an inventory of human–environment geography's numerous subdisciplines, theoretical backgrounds, and etymologies (for example, see Turner 1997; Turner 2002; Zimmerer 2010; Harden 2012; Zimmerer 2017). The geography community has fostered a tradition of participating in and coordinating large-scale stock-takings of the human-environment relationship. Geographers build upon significant early contributions, such as George Perkins Marsh's ([1864] 2003) *Man and nature: Or, physical geography as modified by human action*, to help lead symposiums and coordinate publications that have influenced thinking about the human-environment relationship. Two examples of symposiums include *Man's role in changing the face of the Earth* (Thomas 1956), and *The Earth as transformed by human action: Global change and regional changes in the biosphere over the past 300 years* (Turner *et al.* 1989). The subject matter of these major symposiums indicates that geographers are not simply interested in places and regions, but also patterns of change during crucial periods of time in the human-environment relationship. Aligned with scholarly interest in periodizing the Anthropocene, the human-environment timeline would be a logical continuation of the human-environment tradition in geography.

Geography and Synthesis

Existing scientific timelines require the synthesis of an expansive array of research to create time periods (for example, see Palmer 1983). A trained geographer is suited to create a human-environment timeline because of his or her capability to perform synthesis thinking. Synthesis is a powerful disciplinary skill in geography; the ability to unify multiple types of

knowledge has improved the observation and evaluation of interconnections between humans and the environment (Gober 2000).

Synthesis sits at the very core of fundamental geographic concepts, such as study of places and regions (Hart 1982), even though there has been debate on what synthesis may represent among research topics (see Sauer 1956). Synthesis can be traced to the origins of modern geography and is exhibited through the foundational work of geographers like Alexander von Humboldt, Paul Vidal de la Blache, Élisée Reclus, and Peter Kropotkin (Unwin 1992). A human-environment timeline fits well within geography's historiographical roots in synthesis.

More specifically, the timeline relates to geography's domains of synthesis defined by a panel of the National Academy of Sciences (NAS). The 1997 NAS report, *Rediscovering geography: New relevance for science and society*, defines three domains of synthesis for the discipline:

1. The first domain, environmental dynamics, concerns generating new knowledge from examining how physical systems and processes (*i.e.*, biogeography, climatology, and geomorphology) are interrelated.
2. The second domain pertains to human-societal dynamics. This realm of research synthesizes societal processes within a place as well as determining how complex societal structures interact at varying scales.
3. Between the above two domains of synthesis is the final domain, environmental-societal dynamics. Of the three domains of synthesis, this area of research most directly corresponds with the human-environment relationship.

Based on these domains, a trained geographer is expected to be literate in synthesizing either human/societal or environmental processes, as well as how complex phenomena cross

over between the two. These multiple levels of synthesis make geography an appropriate discipline to execute the synthesis required for a human-environment timeline.

Geography, the Anthropocene, and Periodization

A time period, like a region, can be viewed as an instrument for historical generalization, representation, and classification (Sauer 1921; Grigg 1965; Oliver 1991; Wishart 1997; Wishart 2004). Geographers employ time periods frequently in research, but they tend not to look at time periods as an object of study in the way that historians do (Baker 2003). As a result, periodization, unlike regionalization, has been largely taken-for-granted in geography. Geographer David Wishart (1997; 2004) makes the case that the regions and time periods have more in common than not. Wishart's argument is expanded later in this chapter.

Time periods are taking on a more pivotal role in geographic thought. Prospects for periodizing the recent human-environment ideas and events are making their way into discussions on the progress of geography. "Whether or not the Anthropocene is ultimately formalized within the Geologic Time Scale, its widespread popularity embodies a paradigm shift now well underway," argues Erle Ellis (2017, 525) in *Progress in Physical Geography*. Ellis discusses bridging the Anthropocene, a big idea in global change and the human-environment identity (see Castree 2015a), with geographic thought. Specifically, Ellis (2017) calls for physical geographers to consider becoming involved in developing the discrete boundary for this proposed geologic epoch. These commentaries suggest that geographers have a legitimate voice in the development of official time periods.

In sum, a human-environment timeline contributes toward geographic thought because it intertwines the discipline's expertise in the human-environment relationship, ability to synthesize complex phenomena, and emerging interest in periodization. While this dissertation does not

reflect the norms of previous geography dissertations, it relies upon geographic theory and skills to produce a timeline for the human-environment relationship.

Historical Thought and Geographic Thought – Bridging Gaps

A great deception between historical and geographic thought is the disciplinary ownership of concepts like regions, places, and time periods. Neither geography nor history has territorial claims to basic concepts such as region or period. Both areas of the academy can learn (and indeed *have* learned) from each other. The division appears to be more influenced by the culture of academia (*i.e.*, disciplinary silos) than concrete epistemological reasons. While mutual disciplinary respect is important, the creation of barriers between ideas is unproductive. To proceed in the development of a human-environment timeline, some background on this issue must be addressed.

Geography is concerned in part with the dynamics of places at varying scales and how human and non-human elements interact to create these places. Human-environment geography involves the use of geographic skills and perspectives to understand how humans relate to the environment, or the places to which they belong and influence (Turner 2002; Zimmerer 2017). In this context, geography contributes toward understanding the human-environment relationship through expertise in concepts like place, region, spatiality, geographic information systems (GIS), and synthesis.

Historians address the human-environment relationship from the standpoint of historical representation. The sub-discipline of environmental history most closely aligns to this topic. Three characteristics distinguish environmental history: (1) the mission of the sub-discipline, (2) its contributions to historiography, and (3) its focus on key figures in influencing the human-environment relationship. First, environmental history's mission is concerned with "all the

interactions that societies in the past have had with the nonhuman world, the world we have not in any primary sense created" (Worster 1990, 1089). The main components of environmental history act like a three-legged stool: investigating and recreating past environments, determining how humans transform those environments, and examining the ways in which ideas, attitudes, and perceptions affect that interaction (Worster 1990; Worster 1993). Environmental historians have developed a dynamic discipline involving the human-environment relationship through time. *Turning points in environmental history* represents one such example of the desire among environmental historians to contribute a comprehensive chronology of the human environment relationship (Uekoetter 2010). Because of its mission and direction, environmental history has acquired a distinct disciplinary connection with historical and environmental-historical geography (Wynn *et al*. 2014).

Second, among their contributions, environmental historians have been adept at examining the historiography of big ideas in the human-environment relationship. Rakestraw (1972), for example, argues how conservation has been over-simplified and decontextualized by academics and non-academics. Rakestraw points out that utilitarian and preservationist perceptions of conservation mischaracterize the historical relationship between organizations like the U.S. Forest Service (USFS) and the National Park Service (NPS). The views of Gifford Pinchot, the first director of the USFS, often become conflated with the organization he represented. Both the USFS and Pinchot have been labeled anti-preservationist in past scholarship, a perception that contradicts the Forest Service's history of cooperating and collaborating with the "preservationist" National Park Service (see also White 1985). Environmental historians proceed to question the legitimacy of conservation as a term to describe the belief systems of different cultures, such as indigenous peoples. To illustrate,

Harkin (2007) and Langdon (2007) find that the belief systems of the Pacific Northwest Coast, such as the Kwakwaka'wakw peoples or the Southern Tlingits, were not set up to be assessed and evaluated under Western ethics of conservationism and environmentalism. Environmental historians have made significant contributions toward the historiography of human-environment ideas, whether those ideas represent the dominant group or alternative factions (see also Merchant 1980; Worster 1994).

Third, environmental historians tend to focus on key figures who influence the human-environment relationship. Thus, there is more of a biographical component to environmental history. Historians emphasize getting to know the people involved in the human-environment relationship, whereas geographers tend to be more concerned with how humans affect the overall makeup of a place or region (Meinig 1968). The lives of figures and groups, in other words, represent key sources of information, not just the factors that give rise to places and regions. Environmental historians study various aspects of the human-environment relationship, including its big ideas and the people who help shape those ideas.

The epistemological border between geography and history tends to be illusory (Wishart 1997). What ultimately seems to distinguish the two disciplines is the level of exaggeration placed on geographical and historical concepts, such as time periods and/or places/regions. Alan R.H. Baker (2003, 4) observes:

> Historical geographers tell us stories about how *places* have been created in the past by people in their own image, while historians tell us different stories about how *periods* have been created in the past by people in their own image.

From this statement, it appears that geographers tell stories about places and historians tell stories about people. Geographers and historians apparently use different tools, region or period, to address these topics. Two examples illustrate why this is problematic.

The first example involves how historians use the geographic concept of place to represent the history of the human-environment relationship. Environmental historians like James E. Sherow and Dan Flores have employed place as a conceptual lens to direct research on the environmental history of the American West. Sherow (1998) makes the point that an environment is a place, and that place has a distinctive environmental history. The historian declares:

> As ecologists point out, an environment can be contained in the belly of a moose, or it can encompass the entire planet. When historians study the interactions of all living species occupying a given area as they create a place in a state of constant fluidity through time, environmental history comes into view (1998, 17).

Place, therefore, is not confined to geography; it represents a dynamic and creative concept to be employed by other disciplines, such as historical research. Flores (1998) adds to this idea by arguing that the spirit of a place is created through the complex interactions of human and non-human processes. He writes, "In its combination of words, the phrase 'spirit of place' thus refers to a more modern–one might even say more holistic–technique for examining the interaction between humans and slices of nature" (33). The outcome, Flores notes, is the emergence of new voices and understandings of the history of the American West. An interest in geographic concepts like place gain fresh contexts in historical writing.

The second example involves the concept of the time period. Time periods have never been off-limits to non-historians who try to understand the human-environment relationship. No single discipline can justifiably stake their claim of the Industrial Revolution, the Great Acceleration, the Great Transformation, the Holocene, or the Conservation Age. Scholars addressing the proposed geologic epoch of the Anthropocene have verified how blurry the scholarly boundaries can be (McNeill and Engelke 2014).

The idea of an Anthropocene time period was first coined in 2000 by an atmospheric chemist at a science conference in Mexico (Crutzen 2002). The Anthropocene concept has become an informal time period to describe the "Age of Humans," a period in which humans have left their impress on geologic time (Crutzen and Stoermer 2000; Crutzen 2002). J.R. McNeill and Peter Engelke state that the Anthropocene is "a new period (whether epoch, period, or era in geologists' parlance) in which human actions overshadow the quiet persistence of microbes and the endless wobbles and eccentricities in the Earth's orbit, affecting the governing systems of the Earth, and therefore define the age" (2014, 2). Geologists, geographers, environmental historians, ecologists, anthropologists, and other scholars are involved in charting when the Anthropocene began and how it has proceeded (Steffen *et al.* 2011a). It is simply untrue and counterintuitive to claim periodization as the sole responsibility of one discipline.

Yet the opposite perspective continues to ring true in disciplinary dialogues. For the most part, environmental history has evolved independently from the ideas developed by its geographically-affiliated compatriots (Baker 2003). The relationship between environmental history and historical geography is accounted for in a 2014 roundtable entitled "Reflections on the American environment" in the *Journal of Historical Geography*. This symposium brought together essays and commentaries from three historical geographers (Graeme Wynn, Craig Colten, and Robert M. Wilson), two environmental historians (Martin V. Melosi and Mark Fiege), and one political ecologist (Diana K. Davis) (Wynn *et al.* 2014). While these commentaries may not be representative of the geography or history communities, they do offer some insights into the relationship between both subjects.

One takeaway from Wynn *et al.* (2014) regards how some environmental historians may perceive the way geography fits within their own work. Environmental historians appear to

selectively borrow from the geographic perspective, including spatial thinking, the totality of place, and geographic information systems. According to Martin V. Melosi, an environmental historian and contributor to the roundtable, the connection between geography and history appears to "matter more to geographers than it does to historians," writing that "our infatuation with historical geography may be more like puppy love than all-consuming ardor" (Melosi 2014, 164). Melosi concludes by downplaying the need to forge a relationship between geography and history. Rather than focus on interdisciplinary collaboration between the two subjects, he seems to advocate for a broader perspective—the search "beyond the familiar, that that which we think we know, to something that offers rich possibilities" (Melosi 2014, 165). Melosi's viewpoint is just one of a diversity of perspectives in the rapidly developing field of environmental history. On the other hand, the commentary does suggest a fundamental importance of searching for innovative ways to explore the human-environment relationship.

Geographers have more connections establish with their confreres over in the history department. Donald Worster, an environmental historian, advocates for scientists and historians to discover more "pathways across the levees of specialization that divide us, to become aware of our shared life in nature" (1993, 29). The same can be said for historical thought and geographic thought. One way to do this is to expand upon David Wishart's work on the relationship between time periods and regions. The next sections address the common characteristics of region and period, while also connecting that understanding to the human-environment relationship.

Region and Time Period

Time periods are one way that humans make sense of their relationship with the environment over time. Just as regions are a gathering of similar places, periods are a gathering

of connected events (Wishart 2004). As stated earlier, region and period often disperse between geography and history—region (and place) to geography and period (and event) to history. Geographer John Fraser Hart (1982, 21) said, "Geographers must be wary of reifying regions, just as historians must be wary of reifying eras." Though Hart's words have merit, perhaps he should have discussed scholars in general using these concepts to inform their thinking.

Conversely, geographer David Wishart (2004) contends that geographers should be concerned about both region and time period. Just as regions make the "best link between academic geography and general society" (Wade 2006, 188), so too must time periods serve as communication devices. Periodization refers to the process of creating, modifying, critiquing, and employing time periods; it serves as one tool to understand the temporal dimensions of the human-environment relationship at the local, regional, and global contexts. Periodization has been an ongoing issue in geography; human geographers have been criticized for their focus on geographic phenomena occurring after 1500 and giving less priority to premodern and early modern histories (Jones 2004). In addition, geographers have been challenged for their emphasis on change as an object of study while tending to "neglect the continuity among epochs, to overlook that the new necessarily builds on and incorporates what has gone before" (Brown 1999, 1). Geographers, like historians, should value and build upon how eras are perceived and why certain ones are accepted over others.

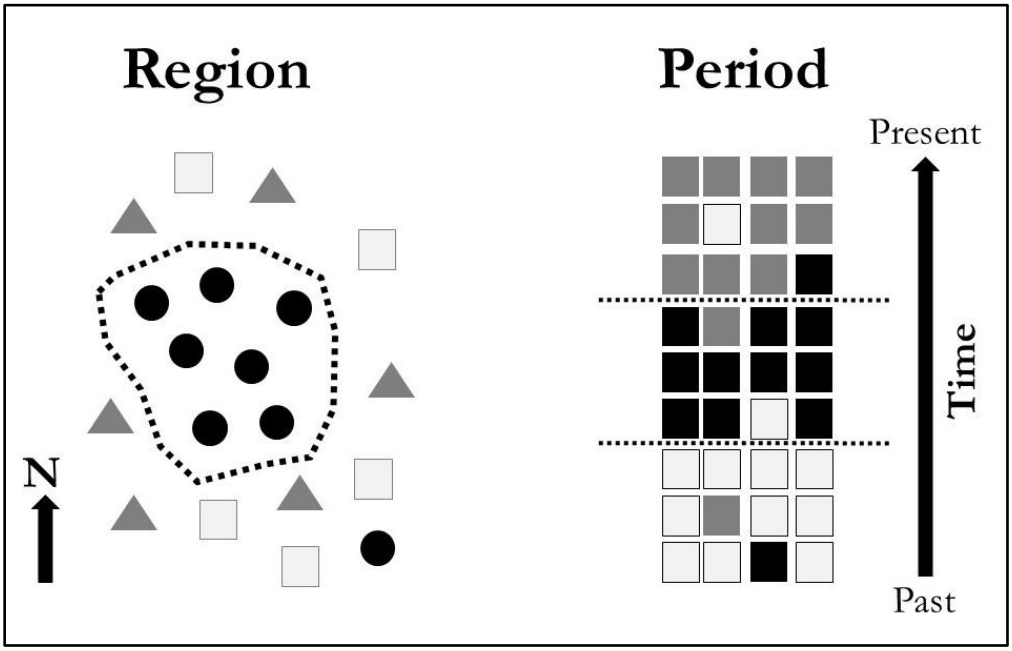
Periodization poses numerous possibilities for geographic thought. Few studies exist about periodization and how it shapes geographic knowledges. Region and time period are not just complementary concepts. When understood together, as Wishart (2004) shows, they create a vital synergy to improve how geographers, historians, and other scholars synthesize and classify aspects of the human-environment relationship. Period and region possess three likenesses: (1)

they serve as forms of synthesis, (2) they serve as 'living' narratives that morph and change through time, and (3) they are forms of classification.

Regions and Time Periods as Forms of Synthesis

When somewhat similar places are grouped together, regions are formed. Similarly, a collection of events can be synthesized in time to create periods. Synthesis is the "radical putting together of ideas" (Gober 2000, 8) and is crucial to how geographic thought contributes toward human dimensions of global change (Harrington and Harrington 2012). Synthesis is important for periodizing the past and regionalizing places (see Figure 2.1).

Figure 2.1: Regions as a synthesis of similar places and periods as a synthesis of similar events (Source: Author).



The purpose of "*regional geography is to find the essential characteristics of a particular region—its 'regional character' based upon the localized associations of variables in place—by examining a wide range of variables over a limited number of places*" (Berry 1964, 9, original emphasis). Regional synthesis entails gathering characteristics about locales, followed by translating this understanding to inform geographic knowledge. Missouri, for example, can

undergo a regional synthesis by examining a number of variables, such as soil type, topography, land-use, socio-economic activities, economics, agriculture, the urban-rural spectrum, among others (Collier 1955). Schroeder (1981) mapped Missouri's presettlement prairies by synthesizing spatial information from historic atlases, soils and topographic maps, as well as the U.S. General Land Office Survey's field notes and township plat maps from 1816 to the 1850s. This original research has expanded to reconstruct the waterways, population centers, and land use of the state's landscape before European settlement (Harlan 2010). For example, the *Atlas of Lewis and Clark in Missouri* builds upon Schroeder (1981) by mapping the presettlement Missouri River waterscape using the journals of Meriwether Lewis and William Clark (Harlan and Denny 2003). These forms of synthesis allow tracing what Harlan (2010, 3) calls the "ghostly footprints" of the landscape, "the existing remnants still on the land—all there to show the way if we just see it." Sub-regions of Missouri, like the Ozark Highlands in the southern portion bordering Arkansas, can be further synthesized according to their physiographic and cultural composition (see Sauer 1920). Regional synthesis occurs when a variety of phenomena are grouped together, examined for their underlying connections and dissimilarities, and applied to create a spatial understanding of complex relationships.

While regions synthesize characteristics about a collection of similar places, periodization involves the putting together of related events. The process of selecting or identifying periods in time requires multiple levels of discernment. Historian Jerry H. Bentley writes that the

> identification of coherent periods of history involves much more than the simple discovery of self-evident turning points in the past: it depends on prior decisions about the issues and processes that are most important for the shaping of human societies, and it requires the establishment of criteria or principles that enable historians to

> sort through masses of information and recognize patterns of continuity and change (1996, 749).

Following Bentley, establishing a period hinges on parameters and criteria made by the individual. Historians and other scholars make decisions with regard to the selection, interpretation, distillation, grouping, and communication of historical facts.

Synthesis and periodization become interdependent when relevant events (and accounts of those events) are connected and interpreted according to a historical context. Sherow describes scholars of the American West as "temperamental chefs, each with his or her own special mix of ingredients" (1998, 5). In this manner, a period is very much like a creating a dish with historians adding their spices to a basic recipe. Thus, the historian combines different ingredients to produce new knowledge or provide a different take on what is already known.

In human-environment scholarship, synthesis is a common way of deploying periods, especially in more collaborative contexts. For example, the *Earth as transformed by human action* (also known as the ET Volume) presents a historical synthesis of human-environment issues during the Great Transformation, a 300-year period beginning around the dawn of the Industrial Revolution and proceeding into the end of the twentieth century (Turner *et al.* 1990). The ET Volume focuses on synthesizing the ways in which technology and human activities have transformed the environment, including the neutral effects, the negative impacts, and the possibilities for improvement and reform (Adams 1990). The book, which has oft been described in terms of proportions (seven pounds, 720 pages), stems from a symposium at Clark University that attempted to advance knowledge on how humans have transformed the Earth's surface over the past three centuries (Turner, Kates, and Meyer 1994).

The ET Volume's Great Transformation is somewhat similar to the proposed Anthropocene in the sense that it represents a time period of tremendous impress by human

actions (as opposed to non-human forces) on the environment (Kates, Turner, and Clark 1990). The hefty survey is divided into four parts, which comprise four themes for synthesizing the Great Transformation period: people and society, environmental change, regional contexts, and perspectives. The first theme deals with how population and society, which considers how environmental change is influenced by the growth and expansion of people, technology, institutions and culture, industrial production and consumption, and urban areas. The second theme considers the Great Transformation in terms of different variables of environmental change, such as land (*e.g.*, forests, soils), water (*e.g.*, coastal zones, terrestrial water systems, water quality), oceans and atmosphere (*e.g.*, climate, marine environments, composition of the atmosphere), biota (*e.g.*, land and marine animals, plants), and chemicals and radiation (*e.g.*, carbon, sulfur, nitrogen and phosphorus, pollutants, ionizing radiations). The third section describes twelve regional contexts within which human-induced environmental transformations have occurred, such as Amazonia, the East African Highlands, the United States Great Plains, and so on. Finally, the fourth section examines the perspectives, meanings, and ideas that have contributed toward understanding the human-environment relationship during the Great Transformation (Turner *et al.* 1990). As a case study on themes used for periodization, the symposium puts together ideas and events from demography, ecology, regional geography, and historiography to develop the Great Transformation.

One of the limitations of synthesis is reductionism (Gober 2000). Synthesis can be a misleading word in the sense that approaches toward analyzing the whole may not always succeed and may over-simplify the phenomenon in question (Berry 1964; Seamon 2018). Reductionism can occur during both the processes of regionalization and periodization. Regions reflect the ways in which people perceive the organization and order of space and place (see

Olstad 2012). As a result, regions possess the problem of having both inclusive and exclusionary features (Entrikin 1997). For example, the synthesis of one, two, or fifty-four factors cannot definitively express the totality of a region (McDonald 1966).

Periodization, as in McNeill and Engelke, is an "anarchic business with no set criteria" (2014, 207). While a period may synthesize a collection of events, it can also be discriminatory and argumentative. Cross-cultural interaction affects the periodization of historical phenomena (Bentley 1996). Individuals from different nations may synthesize periods from different perspectives (for example, see Fuchs 2012). In the academic realm, Wishart's words ring true:

> Historical representation is also selective and subjective because facts are selected from the evidence with questions already in mind and many other valid facts which another historian, in another time or place, might have used are left untouched (1997, 116).

Following Wishart, history is not a static representation; it is diverse and constantly evolving as new varieties and generations of minds reinterpret old facts and uncover new ones. If a researcher compiles and analyzes a different assemblage of events than the historian next door, then that individual might present a different representation of period. An environmental historian, for example, may select different accounts and events of the Age of Environmentalism when compared to a historian interested in population demographics—two different mindsets for synthesis approaching the same time period.

The timeframe from 1945 to the present has been labeled in different ways, two of which include the Great Acceleration and the Great Onslaught. The Great Acceleration embodies the rapidly quickening pace of technology and societal change which has transformed the global environment (McNeill and Engelke 2014). Michael Williams (2003) coins the Great Onslaught to synthesize the vast clearing and degradation of the Earth's forests. Both periods are similar in three ways: their general starting time, their academic and non-academic significance, and their

reflection of how human impacts on the environment have changed since World War II. Yet, the two periodizations gather, order, and synthesize events differently. The Great Acceleration addresses the broader influence of human impacts on the environment. The Great Onslaught, on the other hand, focuses on deforestation as a specific form of human-environment interaction. The formation of the 'Greats' involves the voluntary selection of certain events and contexts. In addition, the selected start date suggests a strong correlation among war, technological development, and global environmental change.

The ET Volume's Great Transformation is subject to certain limitations of reductionism based on decision-making by symposium leaders. Changing the time scale and variables away from the three-century Great Transformation would yield a different historical representation. Opting for a five-century period would have resulted in a different synthesis, one that begins with the Columbian discovery of the New World and the exchange of people, plants, animals, and pathogens associated with the colonial era (Adams 1990; Butzer 1992; Crosby [1972] 2003). A ten-century Great Transformation would confront issues of collapse as culture groups expanded beyond their available resource base (Diamond 2005). Still, the 300-year timeframe risks being, as Adams (1990, ix) notes, is "clearly too coarse meshed" to account for the subtleties which may occur in shorter, more in-depth epochs. This idea connects to the modifiable areal unit problem, which has informed debates in regional geography and geographic thought more generally. The modifiable areal unit problem holds that regions are arbitrarily selected for the purposes of making sense of one or more geographic phenomena occurring in a territory. This selectivity may provide a reduced sense of reality if it is used to inform ideas about contexts at larger or smaller scales. The study of periodization could gain from thinking about scaling issues associated with regions, which are created to make sense of a

complex world; but "the more closely one examines any part, the greater is the falsification of the reality" (Hartshorne 1961, 276).

Like the ET Volume's rendition of the Great Transformation, the proposed Anthropocene 'proper' involves a selective form of synthesis. The Anthropocene is being put forth as a *geologic* epoch, first and foremost (Steffen *et al.* 2016a). The informal epoch has been criticized by its failure to include perspectives in the critical social sciences and the environmental humanities (Castree 2015a; Castree 2015b). In a *Nature* correspondence, Zalasiewicz *et al.* (2017, 289) write that the "geological Anthropocene is not defined by holistic analysis of all human impacts on Earth, but by whether those impacts have produced suitable signals in the stratal record" at the global level. This geoscience bias is done for a specific reason: having the Executive Committee of the International Union of Geological Sciences ratify the Anthropocene as a part of the geologic timescale. Despite having implications for social scientists and geographers (see Brondizio *et al.* 2016; Ellis *et al.* 2016; Ellis 2017), the proposed Anthropocene has taken on a great variety of meanings beyond its original geologic label, from the scientific to the moral (for example, see Steffen *et al.* 2011b), for the natural and social sciences (see Castree 2017).

In sum, a period can either take on holistic or selective characteristics, even though consensus over an epoch can include contradiction and competing ideas of the truth (see Gaddis 2002). That outcome depends on the perspectives of the decision-makers, the 'ingredients' used in historical research, and the objectives for developing the period in question. In the words of Rosenberg (2012, 6): "No periodization or organizational scheme can capture the past in its entirety. History is representational, not replicative, and the necessity of selectivity means that every framework inescapably illuminates some elements and relegates others to the shadows."

As a process of representation, periodization allows for the possibility to change and account for different progressions through time.

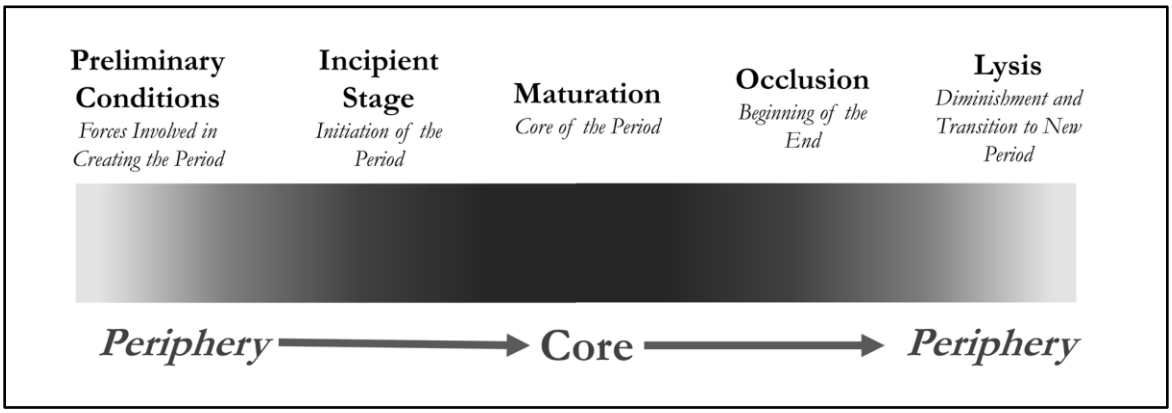
Morphology of Periods and Regions

The concepts of period and region have a morphological, "living" character to them. Time periods consist of progressions; changes occur both within and across different time periods. The character of a selected time periods can evolve as new knowledge is gained about historical phenomena. Similarly, the landscapes that make up regions are subject to continuity, change, and transformation, as human-environmental processes transpire through time (Sauer 1925). Like regions, time periods can be used to conceptualize how landscapes change over time, such as the sequence of architectural styles in urban areas (Whitehand *et al.* 2014). Historical periods are used as a method for mapping the processes of continuity and change, with time as their principle terrain (Green 1992). In this manner, time periods are the temporal regions from which events take shape in the historic and geographical imagination. Questions arise about how people form time periods as historical representations, a morphology which can go beyond the simple story plot or identifying a beginning and end.

The morphology of a time period can be compared to with the life cycle of a typical mid-latitude cyclone. A mid-latitude cyclone is a meteorological phenomenon that occurs in the atmosphere between 30°N/S and 55°N/S. It represents a wave of low pressure moving across the landscape that interacts with different air masses. The cyclone's life cycle happens in five stages (Figure 2.2). Since there is no exact time when a mid-latitude cyclone begins or ends, an operational definition is needed to provide a start and end point. There is, however, a consensus regarding identifiable points along the cyclone's progression: preliminary conditions, incipient stage, maturation, occlusion, and lysis. Like a mid-latitude cyclone, time periods can have their

own morphologies over time (Figure 2.2). Periods are often discussed in relation to the events, conditions, or forces that preceded them. The 'Preliminary Conditions' phase offers context to why a period developed in the first place. The 'Incipient Stage' occurs in the historian's mind when the beginning boundaries, however fuzzy or subjective they may be, form in the historical record. The core characteristics of the period are best defined in the 'Maturation Stage.' If the period does not extend into the present, then an 'Occlusion Stage' delineates the boundary where the time period starts to diminish. However, the characteristics of a particular time period may produce the conditions that help create a next temporal event. The 'Lysis Stage' accounts for a time period's diminishment and the need to transition to a subsequent one.

Figure 2.2: Stages of a prototypical historical period (Source: Author).



Regions are usually characterized by conditions that occur in the core or hearth. As one travels in space away from the core, the conditions change and a question for geographers/cartographers has been: where do I draw the line? Hart (1982) argues that good regional geography should be concerned more with the character of the core, rather than the specific location of a boundary within a transitional zone.

Revolutions in nature-society relations can be thought of as having a morphology similar to the Occlusion (beginning of the end) and Lysis Stage (diminishment and transition to a new period) in the mid-latitude cyclone analogy. Revolutions have traditionally been regarded

critical time periods for characterizing the human-environment relationship through time. Revolutions bear a distinct relation to Malcom Gladwell's (2002) 'tipping points' in the spread of ideas or trends. In nature-society research, a revolution relates to Martin Scheffer's theory of critical transitions, or "sharp shifts in systems driven by runaway change toward a contrasting alternative state once a threshold is exceeded" (2009, 105). Critical transitions, like the end of a mid-latitude cyclone, depend on a certain coalescence of socio-environmental precursors that result in a regime change (Scheffer 2009). According to Merchant (1997, 19),

> ecological revolutions are major transformations in human relations with nonhuman nature. They arise from changes, tensions, and contradictions that develop between a society's mode of production and its ecology, and between its modes of production and reproduction. These dynamics in turn support the acceptance of new forms of consciousness, ideas, images, and world views.

Revolutions, whether Neolithic, agricultural, industrial, or otherwise, are not meant to be static pictures of past critical transitions in human-environment relationships. Rather, as Merchant (1997) has described, revolutions are meant to be dynamic animations of periods of rapid change in the past. A revolution provides the momentum for a turning point in the transformation of the human relationship with the environment (Fitzgerald 2010). Revolutions are also perceptual; consideration of what represents a revolution can vary by place and culture (see Wishart 2004).

The morphology of periods arises in historical studies relating to the Industrial Revolution. The work of Merchant and Worster exemplify the major ideas that inform this critical transition period in the human-environment relationship. Merchant's (1980) *Death of nature: Women, ecology, and the scientific revolution* and Worster's (1994) *Nature's economy: A history of ecological ideas* use the Industrial Revolution as a significant border between one form of human-environment relationship and another. In *Death of nature*, Merchant (1980) sets the stage by discussing how the changing conditions from 1500 to 1700 combine to inform how

the Industrial Revolution is conceived. The Baconian trend toward scientism and rationalism, the ideological alienation of humans from the non-human environment, and the development of modern technologies for environmental transformation all factor into the instigation of the Industrial Revolution. Merchant's narrative can be viewed as documenting the preliminary conditions and incipient stage of what is to become the Industrial Revolution.

Picking up at the mid-eighteenth century, Worster's *Nature's economy* explores how different perspectives influenced human-environmental thought from the beginnings of the Industrial Revolution to the end of the twentieth century (1994). *Nature's economy* illuminates the contested and constantly-changing relationship between the Arcadian perspective, an alternative narrative which conceived Romanticism and ecocentric, 'land ethic' ideals, and the imperialist mindset, which prompted the idea that technological modernization and human domination of the environment is a God-given right and duty for society. In Worster's narrative, a general sense of the Industrial Revolution's core characteristics is provided, along with an understanding of how the time period has transitioned and occluded with the transition into the twentieth century.

Commonly agreed-upon time periods like the Industrial Revolution are not the only examples of historical morphologies. The narrative progression of time periods has aided in creating models for mitigating environmental hazards and land-use systems. For example, Kates and colleagues outline four overlapping time periods for the reconstruction of New Orleans, Louisiana after Hurricane Katrina (2006). The 'emergency' phase occurs between zero and fifteen weeks following the disaster. After this initial phase, three periods of restoration follow. The first period of restoration, occurring during three to fifty weeks after the event, sees the first groups of people returning to the city and repairing the built landscape. The second

reconstruction period, between four to 500 weeks after the disaster, happens as infrastructure is rebuilt and replaced, with the signs of a return to pre-disaster living conditions. In the final reconstruction phase, between 300 to 1000 weeks following the disaster, people work to commemorate the disaster and improve the city.

Other conceptual models of time-period transitions exist to explain certain aspects of the human-environment relationship. Huston (2005) outlines three phases of land-use change. The first and longest phase is the agrarian stage, which includes a level of subsistence based on primary productivity. As humans become more independent from environmental constraints, they enter into the second phase of industrialization. Finally, the land changes in the third phase because of transitions to electronic communication and efficient forms of transportation. Another variation is Ellis *et al.*'s (2013) threefold model of land-use systems. The first phase is intensification, in which new technologies allow for more productivity and population increase. Involution, the second phase, refers to the point when resources are exhausted to the point when more labor and costs are required to maintain increased production. The third phase is the production "crisis" in which land has ceased to be productive to accommodate for increasing populations. The three examples—Kates *et al.*'s (2006) reconstruction after Hurricane Katrina, Huston's (2005) three phases of land-use change, and Ellis *et al.*'s (2013) land-use systems model—demonstrate that periodization has value for modeling human-environment systems.

One problem with the morphological character of time periods or regions involves providing an exact boundary or an all-encompassing model to encapsulate the time period or region in question. In regional geography, a cartographic analysis of perceptions of the Great Plains region shows that the identified regional boundaries are varied (Rossum and Lavin 2000; see also Wishart 2004). The theories of relationism and the New Regionalism question the

practicality of territorial approaches to the creation of regions, instead advocating for examining the coalescence of social, financial, and political relationships (Jonas 2012). Similar positions can be applied toward understanding periodization (Wishart 2004).

Multiples of ten or one hundred are commonly used in periodization. Round numbers and discrete beginnings and ends are useful in understanding and communicating history. Heavy reliance on our base-10 number system and Gregorian calendar cannot, however, accurately account for the complexity of human-environment phenomena through time. Periods are amorphous representations, with boundaries which are elusive to pin down (Casey 2006). Casey uses the following example to illustrate this point: "[W]e do not have a sense of when 'post-modernism' as an architectural or philosophical movement was born–*i.e.* sometime in the 1960s–but do we know where it will *end*?" (Casey 2006, 450). The boundaries of geologic epochs and eras are generally just as, if not more, ambiguous and subject to variance as the places and regions in which the evidence for a transition can be found.

As historian David Blackbourn has noted, formalized periods like the Renaissance are 'living' in the sense that they are constantly changing as new perspectives and information become available (2012). Old conceptualizations of time periods, however one-dimensional or hegemonic, help to inform newer periodizations, with "old markers...bent and reshaped, contracted and expanded, refined and adapted to serve new needs" (Blackbourn 2012, 302). In other words, time periods are never quite discarded. Instead, they take on new meanings and lessons when different ways of knowing are applied.

The proposed Anthropocene has expanded into multiple versions following Crutzen and Stoermer's (2000) initial coining. Debate continues over the question of the Anthropocene's suitability as a possible formal epoch within the geologic timescale. A dominant perspective

sees the Anthropocene as geologically distinct from the Holocene epoch, with the most explicit formation of the Anthropocene happening at the beginning of the Great Acceleration (McNeill 2017; Waters *et al.* 2016). Still, other perspectives offer alternative 'morphologies,' one being that the Anthropocene co-evolved with the Holocene epoch (Smith and Zeder 2013) with ice-core evidence of changes in trajectories for carbon dioxide and methane concentrations related to human activities (Ruddiman *et al*. 2015).

A significant portion of the ongoing debate is where in time to place the boundary of the epoch's incipient stage. Lewis and Maslin (2015) review numerous possibilities for defining the beginning of the Anthropocene, which include: the megafauna extinction (50,000 to 10,000 yr BP), agricultural revolution (around 11,000 yr BP), the widespread diffusion of agricultural practices (around 8,500 yr BP to present), the production of rice (6,500 yr BP to present), the Columbian Exchange (1492 to 1800), the Industrial Revolution (1760 to present), the first nuclear bomb detonation (1945 to present), and the widespread use and dumping of industrial chemicals (around 1950 to present), among others.

These boundaries have two things in common. First, they suggest a critical transition in which human interactions transform the environment in some new way, whether that be turning a significant portion of land into agricultural fields; increasing the amount of methane in the atmosphere by cultivating rice; exchanging plants, animals, people, and pathogens between the Old and New Worlds; or altering the radiative composition of Earth's soils by developing nuclear weaponry. Second, these markers represent a general time in which certain human practices have intensified to the point when a critical transition is reached (see Ruddiman *et al.* 2015). These 'golden spikes' are not necessarily precise moments, especially the farther one

goes back in time. Rather, they signify a steepening slope associated with a major transition in the human-environment relationship.

Time periods can have distinct morphologies or progressions that provide human-environment time periods with more than just a beginning and end. The Great Acceleration, the reconstruction of Hurricane Katrina, and the Industrial Revolution all have temporal morphological qualities. Time periods take on distinctive characteristics based on how people frame and interpret their core and transitional periphery, the dominant and alternative narratives, and the storyline. Time periods can be used to represent the changing morphology of the human-environment relationship through time. The structure of these periods themselves can also evolve as new knowledge and perspectives are gained.

Classification—Typology of Periods and Regions

The previous two sections characterize time periods as a form of synthesis and that they have a morphology or progression in their narrative and structure. Periods can be dynamic or static at times, based on the information available, the researcher's perspective, and the human-environment phenomenon in question. They can also have qualities that can be both holistic and reductive, as illustrated by the work on the 300-year Great Transformation (Adams 1990). Periods, like regions, can entail forms of classification. Classification refers to the process of sorting properties based on shared characteristics or common relationships (Birks and Matthews 2014). The classification process is similar to synthesis because it helps make sense of complex phenomena by adopting a typology or series of categories. Classification of time periods allows for identifying connections among different representations of time, just as one regional context might give a clue toward understanding geographic phenomena in a different location or at a different scale. A summer dry or Mediterranean climate class was defined in a European context

but takes on the more distinctive characteristics of the class definition in the southwestern United States.

The logical classification of either time or place can add structure to a complex idea, act as intellectual shorthand, and provide a practical foundation for the development of new ideas (Oliver 1991). Regionalization, in particular, has an extensive history of use for classification purposes as a way to provide a sense of order to the geographic phenomenon being studied (Grigg 1965; Sauer 1921). According to William Bunge, a key problem in geography and other disciplines "lies in trying to find more and more economical ways of ordering our perception of facts" (1966, 7). The region has been a place-based tool for organizing, interpreting, and communicating facts across space and time (Hart 1982; Wade 2006). Regionalization is a characteristically geographic form of scientific classification in that the objects being selected for inclusion in the region must be next to each other in space.

In geographic thought, regions have been a source of debate over whether or not geography should be a discipline known for its scientific laws (the nomothetic approach) or by its ability to address how particular areas are distinct from one another (the idiographic approach) (Schaefer 1953). Phenomena in disciplines like geography can contain elements of both idiographic and nomothetic perspectives, as Windelband (1980) points out (cited in Unwin 1992). Such a case can be made with connecting regions and classification.

Addressing the relation between regionalization and classification, geographer David Grigg (1965, 471) argues that "a prime aim of classification is to enable inductive generalizations to be made about the objects studied, not simply to arrange objects in classes." For regional geography, those objects tend to be adjacent places with similar characteristics. Regional classification can have hierarchical (spatial scale) and typological (thematic or

chorological) qualities. In terms of typology, regions can be classified in terms of dominant type, such as voluntary regions (spontaneous settlements of migrants with like-minded ideals), vernacular or folk regions, functional or nodal regions, or formal regions (see Zelinsky 1980; Zelinsky 1992).

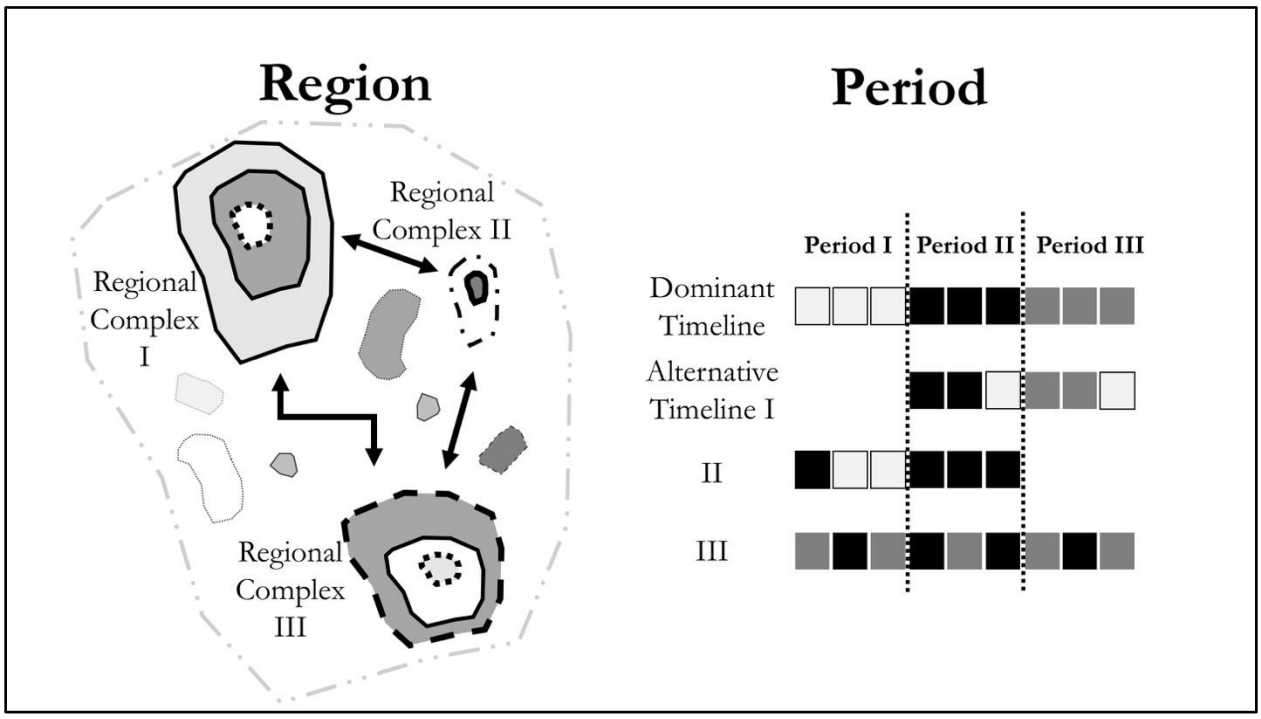
In addition, regions have been classified according to place-based themes or a series of criteria, such as the division of the United States into cultural or physiographic regions. On the cultural side, the Great Plains, Middle West, and Middle America comprise three qualitative and contrasting regional images in North America (Shortridge 1989). From a historiographical standpoint, these regions influence one another's development and are deployed in different ways to convey diverse public perceptions (Rozum 2017). On the physiographic end, the Köppen-Geiger climate classification system and forms of regional climate classification have helped scholars gain a sense of regional synoptic patterns occurring in the Earth's atmosphere (Harman and Winkler 1991). The Köppen-Geiger climate classification continues to be updated and gains renewed significance as global climate changes (see Peel, Finlayson, and McMahon 2007).

The interpretive judgements that historians and geographers make to classify and categorize time periods have gone largely unexamined (Wishart 2004). Wishart challenges geographers to reassess how periodization is used in building historical narratives, with the intention of opening the door to alternative narratives. Periodization, like regionalization, has both typological and hierarchical qualities. The geologic time scale, the sought-after temporal theater for the proposed Anthropocene, is broken down into a hierarchical typology of eras, epochs and ages. Time is divided according to specific geological and Earth system characteristics (Cohen *et al*. 2013; Walker *et al*. 2013).

Revolutions associated with nature-society relationships, Merchant (1997) shows, comprise another more qualitative typology to classify major turning points in the human-environment endeavors. The qualitative classification of time periods helps to draw connections between different ranges of time, such as the First Industrial Revolution and the Second Industrial Revolution (see Topik and Wells 2012). The enumeration of the "Industrial Revolutions" implies a progression through time as different human-environmental contexts emerge.

Periodization can thus help forge scene-by-scene connections with activities at different points of time and across different time scales. Alternative representations of that timeline (*i.e.*, different boundary markers, events, interpretations) can create different contexts and frameworks for examining the human-environment relationship through time. The dominant timeline progression may or may not coincide neatly with alternative timelines for a topic like industrialization. Similarly, regions consist of places that can connect to one another in complex scales and contexts (see Figure 2.3).

Figure 2.3: Interconnections of periods and regions (Source: Author).



Take for example the Casas Grandes civilization, a Mesoamerican culture which flourished from A.D. 1200 to 1450. This archeological example can be used to demonstrate how time periods and regions are classified according to the analysis of pottery artifacts. Something as material as picking up a pottery sherd and identifying its attributes, size, the type of material mixed with clay to form the ceramic, the design, the part of the bowl from which the sherd broke off, the surface texture, the process involved to create the ceramic, can help associate that object with the characteristics of a culture region during a particular period of time. These temporal and locational attributes can aid the archaeologist in understanding the characteristics of a culture group living in a particular region and at a specific period of time (see VanPool and VanPool 2007).

The classification of pottery sherds has contributed toward the determination of the major periods and the regional extent of the Casas Grandes civilization. Temporal and spatial analysis of sherds using an extensive classification system, provides a way to periodize the time scale of

the Casas Grandes peoples (Di Peso 1974; Di Peso, Rinaldo, and Fenner 1974). The dates for these periods have since been revised and updated (VanPool and VanPool 2007). Based on ceramics, scholars have periodized this region in three major parts: the Viejo (A.D. 600-1200; with its Convento, Pilon, and Perros Bravos phases), the Medio (A.D. 1200-1450; with its Buena Fe, Paquimé, and Diablo phases), and the Tardio (1450-1660; with its Robles and Spanish contact phases) (VanPool and VanPool 2007). The work by VanPool and VanPool illustrates a desire by scholars to create a hierarchy among time periods with a major category and subsets within.

Spatially, ceramics and other artifacts have pointed to the Casas Grandes peoples inhabiting a region encompassing northern Mexico and a portion of the American Southwest. The Casas Grandes civilization has been regionalized on two ends of a spectrum: as a smaller-scale culture region, similar to a voluntary or nodal region, as well as one a larger more formal region encompassing one the most spatially expansive social systems in Southwestern prehistory (VanPool, VanPool, and Leonard 2005). The Casas Grandes civilization provides a case study in periodization and regionalization because it shows how classification can take different trajectories in helping to discover the human-environment relationship.

Putting labels on a place or event risks limiting the ability for that classification to represent other dimensions of history or geography. When the arrangement of places into categories becomes an end in itself, then a static conceptualization of the regional system is produced (Grigg 1965; McDonald 1966). For example, there exists the problem of representing the fluidity and complexity of the Ozark cultural region if the region has been historically classified according to physical features rather than folkloric, dialectical, or socio-economic factors (Rader and Kirby 2017). Various social theoretical critiques, such as those from radical

and post-structural geographers, highlight the capacity of a regional designation to emphasize the ideals of the dominant group in power; this limitation has resulted in the proposal for alternative regionalisms (Jonas 2013).

Periodization as classification can be a source of constraint on historical understanding. As pedagogical devices, one period may not adequately represent the entirety of a historical phenomenon being studied (see Graff 2015). Classification of dominant periods and events has been criticized by postcolonial, feminist, and postmodern thinkers (Wishart 2004). Revisionist histories have been produced in response to dominant periodic classifications (Maynes and Waltner 2012). To illustrate, the classification of major revolutions in human prehistory (*i.e.*, the Neolithic Revolution) results in a constrained sense of what all went on during those periods. The Neolithic Revolution tends to be associated with the quality and type of tools that trace to that time range. That dominant idea leaves little room for examining other aspects of human-being-in-the-world, such as the psychological and embodied experiences of place and changing social meanings (Gamble 2007; Maynes and Waltner 2012). The classification of the Neolithic Revolution provides a singular dimension to how the prehistoric human-environment relationship developed.

The possible classification of the Anthropocene as a geologic epoch constrains the ability of the concept to account for all aspects of the human-environment relationship. Alternative representations of the Anthropocene have been proposed in the social sciences and humanities, especially in the realms of literary history and indigenous knowledges. The edited collection, *Anthropocene reading: Literary history in geologic times*, provides an assortment of examples for the ways in which the Anthropocene can be reimagined through different epistemic, literary, and perceptual lenses (Menely and Taylor 2017). Cohen's (2017) "Anarky" proposes throwing

out periodization as an approach to the past. Contrasting the Anthropocene's linear structure, Cohen envisions human-ecological history as a vast, non-linear and turbulent ocean, while the historical record—its selection, classification, and ordering of facts—is but an ark, or 'arkive', wading through its waters. To Cohen, "Water does not periodize like stone or landlocked texts. Its archive eddies, whirls, conveys dangerously, transforms the submerged into the rich and strange" (34). Mentz's (2017) "Enter Anthropocene: Circa 1610" takes a more empathetic approach to periodization, viewing periods as possibilities to create valuable interpretations. Specifically, Mentz proposes a qualitative typology based on his reading of William Shakespeare's *The Tempest*, which was written during the culmination of environmental changes during the Columbian Exchange ([1610] 2011). Mentz's typology of the Anthropocene shows a progression in humanity's response to their impacts on the environment, based on the selection of punctuation marks: *It's all my fault. It's all my fault! It's all my fault?* Punctuation, the period, exclamation point, and the question mark, helps to classify the tonalities of the Anthropocene (Mentz 2017). In "Reading vulnerability: Indigeneity and the scale of harm", Hooley (2017) examines the Inupiaq-Inuit poetry of d. g. nanouk okpik as an illustration of alternative representations of the Anthropocene. These three contributions offer alternate representations of the Anthropocene beyond the geological classification. On one hand, there is the possibility of doing away with periodization altogether, as Cohen suggests. On the other hand, the Anthropocene can be appreciated for its plurality of meanings (Mentz 2017). Still, alternative narratives, such as indigenous knowledges, can add more marginalized voices to understanding the relevant time period (Hooley 2017).

In sum, the classification of time periods can have critical and analytical applications, depending on the perspective of the researcher. Classification helps give order to complex

histories; at the same time, it can constrain historical knowledges. The Anthropocene debate has opened the possibility for examining new ways that period classification can inform the human-environment relationship.

Conclusion

> [A]s important as better technology is to a more resilient future, real solutions will also require improvements in our behavior and institutions: the rediscovery of big ideas, traditions, techniques, design strategies, and, even those quaint and mostly forgotten qualities of wisdom and humility in an age much enamored of self-promotion, surface appearances, and busy with trivialities (Orr 2016, 33-34).

David Orr claims that humans are living in a time period he calls the "Long Emergency," an existential state of environment crisis which beckons for a major transformation of society. In the quote above, Orr identifies the need to take a step back and examine past wisdoms. Dynamic periodization can create an entryway into the rediscovery of past, in order to understand the human relationship with the environment. Though periodization and regionalism have their limitations, classification provides the potential to make connections, evolve as new knowledge is gained, and create a sense of order out of complexity. Periodization and the human-environment relationship are unavoidable. Building from Wishart (2004), it is vital for historians, geographers and others to collaborate in the creation, critique, and expansion of time periods as a way of understanding the human-environment relationship. The study of periodization ought to be incorporated into how geographers think about and investigate human-environment questions and problems.

Chapter 3 - Methods

The previous chapter discussed periodization as a flexible method of synthesis and classification in informing the collective understanding of the human-environment relationship. It made the case that time periods, like regions, should be of concern to human-environment geographers and other scholars. A challenge arises when considering the process of developing a comprehensive human-environment timeline: what approach to knowledge development is appropriate?

This research draws from qualitative meta-analysis and grounded theory to abductively develop a human-environment timeline (Bryant and Charmaz 2007; Reichertz 2007). Abductive reasoning involves a combination of inductive and deductive interpretation. The inductive approach, in particular, allows for adjustments and modifications as new information and understandings emerge. Deduction helps to triangulate and reinforce findings from the inductive approach (Holt-Jensen 2009).

Before outlining the overall research design, this chapter identifies the operational definition and conceptual framework used to approach the human-environment relationship. It then builds the case for encyclopedias as trustworthy texts for qualitative analysis (Charmaz 2006). From there, the relationship among induction, deduction, and abduction is discussed in relation to qualitative methods. Abductive reasoning is suggested to increase trustworthiness of the timeline's grounded theory meta-analysis.

The research design of the human-environment timeline consisted of six overlapping phases. During the first phase, "Selection of Encyclopedias," the researcher selected a series of encyclopedias based on a list of criteria. The second phase, "Data Collection," was the most substantial portion of the methodological process. The researcher first populated the dataset by

collecting ordinal (time-series) data from the targeted encyclopedias. These data were openly coded and reconciled for any discrepancies. Phase III, "Data Categories," involved the formation of 'common sense' categories—ideas and events—of the human-environment timeline (Kelle 2007). During Phase IV, "Timeline Periodization," a hierarchical typology of time periods served as the structural skeleton of the human-environment timeline, with codes assigned to the levels in the hierarchy (Charmaz 2006; Birks and Mills 2011). Afterward, the human-environment timeline was subdivided by identifying boundaries within significant threshold moments and between clusters of related events and ideas. The process of building a timeline was subjective and founded upon the investigator's abductive exploration of the human-environment literature and familiarity with the data (Timmermans and Tavory 2012). In Phase V, descriptive statistics helped to summarize the data and give a sense of the extent to which each additional encyclopedia added to or reinforced knowledge found in other encyclopedias. These statistics had no influence on the timeline periodization. The sixth and final phase, "Interpreting the Timeline," involved a critique of the resulting human-environment timeline according to four "ways of knowing": 'normal' science, cultural ecology, political ecology, and humanistic geography.

Defining the Human-Environment Relationship

The human-environment relationship is a wide-ranging topic with multiple representations. This qualitative meta-analysis relies upon the definition and framework of the human-environment relationship provided by Karl S. Zimmerer (2017). He defined the human-environment relationship as "comprised of forms of knowledge that integrate the in-depth analysis of both human-social conditions and the dynamics of the biogeophysical world" (1). It encompasses ways of understanding, framing, approaching, and synthesizing ideas and questions

about the complex relationship between people and the places they inhabit. In geography, the human-environment relationship can be represented in two ways: its definition and conceptual framework. The two proceeding sections discuss the nuances among the choice of words, definitions, and areas of study for the human-environment relationship. Following this discussion is a brief summation of how this dissertation defines and employs the human-environment relationship.

Definitions of the Human-Environment Relationship

In geography, the definition of the human-environment relationship depends on which words are used, what those words represent, and how they connect to each other. This core concept of geography goes by numerous aliases, such as the man-land tradition (Pattison 1964), human-environment relationship (Turner 1997), human-environment identity (Turner 2002), environmentalism (Castree 2000), the ecological perspective on human affairs (Sprout and Sprout 1965), human ecology (Barrows 1923), human-environment interactions (Harden 2012), and nature-society geography (Zimmerer 2010) (see Figure 3.1 for more examples). Other selections and assemblages can also be present, such as people-place relationships (Hay 2002), ecology (Worster 1994), culture and environment (Altman and Chemers 1980), and environmental thought (de Steiguer 2006), among other titles implicit and explicit. Geographers and non-geographers have come up with numerous variations of the 'human-environment'. The selection of whether or not to use humans over society, nature over environment, or scrapping the dualism altogether is often left to the discretion of the geographer.

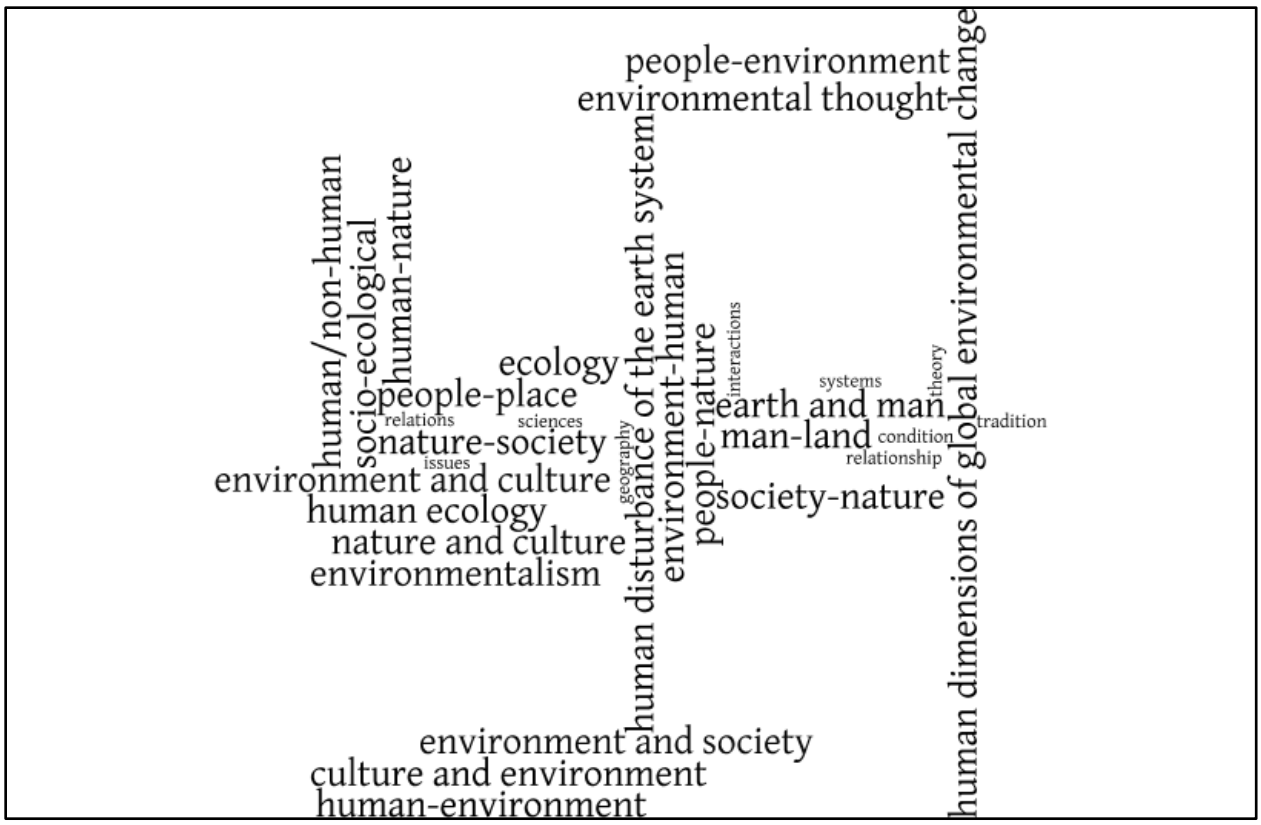


Figure 3.1: Word cloud of representations of human-environment geography (wordle.net)

For the most part, there exists a certain degree of liberty with the selection of words to call the phenomenon. Phrases such as nature-society relations, human-environment interactions, and environment and society are often accepted as synonyms for the entire tradition. Correspondingly, these synonymous phrases can also reference to a specific subset of human-environment geography. Nature-society relations, for example, can stand for both the tradition as well as the niche of human-environment research in political ecology and human geography (Zimmerer 2017). Similarly, the use of human-environment interactions has strong ties to physical and economic geography, with clear associations with the study of environmental hazards, risk, vulnerability, and resilience, along with land use, land systems, and land change (Zimmerer 2017). In such cases, the issue of how these terms are employed may affect how that research is contextualized.

Still, other words have transitioned out of common usage. For the most part, invocations of the word 'man' has fallen into disuse in favor of more inclusive words like people, humans, or society. The man-land tradition and its key traditional texts—for example, *Man's role in changing the face of the Earth* (Thomas 1956)—have been accused as a projection of "overt sexism" because of their gendered specificity (see Whatmore 2014, 152). Susan Hanson ([1991] 2004b, 155) remarks in a column she wrote as President of the American Association of Geographers (AAG), "Expanding the catchy 'man-land' phrase to 'nature-society' did more than admit women as active agents in shaping (solid) environments: the label change invited a rethinking of the focus and scope of environmental geography." Thus, there are moments when precision is deemed important—as in the gendered 'man-land' conception—and times when a lack of precision is not necessarily enforced.

This research uses the 'human-environment' terminology because it represents an appropriate, wide-ranging representation of the phenomenon. What is meant when someone employs the term 'human-environment geography'? There are subtleties among popular definitions. Of the many variations of defining human-environment geography, four overlapping interpretations are commonly used: the classical, synthesis, disciplinary, and sub-disciplinary interpretations (see Table 3.1).

Table 3.1: Definitions of human-environment geography.

Human-Environment Definition	Interpretation
"The man-land or ecological view will be considered as emphasizing the relations between man and his natural or biophysical environment" (Taaffe 1974, 2).	*Classical*: Traditional conception of human-environment geography
"The human-environment condition constitutes a synthesis subject, which, unlike its spatial-chorological counterpart, requires no special justification within the framing of the systematic sciences. This condition is an aggregate phenomenon derived from a composite of natural and human phenomena and processes, logically no different from the ecosystem or landscape of ecology, the group of sociology, and the institutions and organizations of political science" (Turner 2002, 62).	*Synthesis*: Human-environment geography as synthesis subject and object of geographic analysis
"Human-environment geography, comprised of forms of knowledge that integrate the in-depth analysis of both human-social conditions and the dynamics of the biogeophysical world, is also referred to as environmental, nature-society, and environment and society" (Zimmerer 2017, 1).	*Synthesis*: Human-environment geography as forms of knowledge
"Between physical and human geography, lies the vibrant arena of human-environment geography. The investigation of nature-society relationships lies at the heart of geography and has been one of the pillars of the discipline since the modern academic structure crystallized in 19th-century Germany. This realm of inquiry also has been an important bridge between geography and other fields" (Moseley *et al.* 2014, 9).	*Disciplinary*: Human-environment geography as the disciplinary space between physical and human geography
The human-environment tradition is "an interactive view…that emphasizes the essential role of human behavior and adaptation in transformations of the earth" (Kates 1987, 530).	*Sub-Disciplinary*: Emphasis on one niche of human-environment geography
In terms of nature-society relations, "Nature is socially constructed in the sense that it is transformed through the labour process, and fashioned by the technologies and values of human production" (Whatmore 2014, 156).	*Sub-Disciplinary*: Emphasis on one niche of human-environment geography

The first definition involves the classical emphasis of "the relationship between man[/humans] and his[/their] natural or biophysical environment" (Taaffe 1974, 2). This classical interpretation is present to different degrees in many human-environment definitions. The second definition is mentioned by Turner (2002), which holds that human-environment

condition serves as the synthesis subject toward which geographic knowledge has contributed much thought. The human-environment condition, to Turner, represents the fundamental object of geographic research, just as cultures are the foundation of anthropology and the ecosystem is the basis for ecology. Zimmerer expands upon that synthesis definition to include that various ways of knowing can promote geographic understanding of "both human-social conditions and the dynamics of the biogeophysical world" (2017, 1).

The third definition maps human-environment geography onto the space overlapping the disciplinary divide between human and physical geography. In the textbook, *An introduction to human-environment geography*, William G. Moseley and colleagues view the "investigation of nature-society relations" as a core part of geography, in part because of where it is situated within geography's disciplinary terrain (2014, 9). The final interpretation touches upon the lack of precision in terms of word-selection. Some definitions define human-environment geography more from a sub-disciplinary level. The occurrence of such a definition tends to relate to the geographer's sub-disciplinary expertise, whether it be in cultural ecology, political ecology, social constructivism, and so on (consult Table 3.1 to view Kates 1987, 530 for a cultural ecological definition and Whatmore 2014, 156 for a social constructivism definition; see also Robbins, Hintz, and Moore 2013 for an emphasis on political ecology and reconciliation ecology). There are multiple meanings for this phenomenon. Zimmerer (2017) offers a broad definition that incorporates not only the systems of human-environment interaction, but also knowledge and ideas about that relationship.

Human-Environment Frameworks

Conceptual frameworks for humans and the environment have been a point of geographic concern for some time (Macinko 1978). Human-environment geography is similar to the broader

discipline of geography because multiple human-environment *traditions* exist. There is a tremendous amount of diversity in what can be considered 'human-environment geography'. Reviews of the subject tend to be selective regarding which aspects are identified has having programmatic value. A recent review in *Environmental Studies* identifies future trajectories for human-environment research, which include the roles of consumption, decision-making, resource-use, climatic change, industrial ecology, biodiversity and ecosystem services, social institutions in human-environment interactions (Moran and Lopez 2016). The search for conceptual frameworks has become a vital subgenre to identifying and justifying desiderata for human-environment research. This section will survey a number of these frameworks, as well as identify distinctions and commonalities among them. Reviews of the ecological perspective (Sprout and Sprout 1965), framework of culture-environment relations (Altman and Chemers 1980), human-environment perspectives and research cores (Turner 1997), human-environment interactions (Harden 2012), nature-society geography/human-environment geography (Zimmerer 2010; Zimmerer 2017), and global change and the human-environment relationship (Harrington and Harrington 2012) represent the desire of geographers to identify key topics, questions, frameworks, and approaches within human-environment geography (Table 3.2).

The lesser-known 'ecological perspective on human affairs' (Sprout and Sprout 1965) defines a variety of ecological hermeneutics for the human-environment identity, including environmental determinism, free-will environmentalism, possibilism, probabilistic models of behavior, as well as the cognitive, explanatory, and predictive aspects of man-milieu relationships. Operating out of Princeton University at the time, Harold Sprout and Margaret Sprout directed much of their thinking toward the ecological perspective on international relations. Regardless, their backgrounds in geography and grasp of the human-environment

epistemologies warrant their in-depth understanding of important lenses for examining human-environment geography.

Table 3.2: Human-environment geography frameworks

Human-Environment Geography Framework	Framework Domains
Harold Sprout and Margaret Sprout (1965) ***Ecological Perspectives***	1. Environmental determinism 2. Free-will environmentalism 3. Possibilism 4. Probabilistic models of behavior 5. Man-milieu relationships: cognition, explanation, & prediction
Irwin Altman and Martin M. Chemers (1980) ***A Framework of Culture/ Environment Relations***	• Natural environment (topography, climate, flora, fauna) • Environmental orientations and world views (cosmology, religion, values, norms) • Environmental behaviors and processes (privacy, personal space, territoriality, crowding) • Environmental cognitions (perception, coding, memory, judgements) • Environmental outcomes (built environment, homes, farms, cities)
Billie Lee Turner II (1997) ***Ways of Knowing and Research Cores***	3 Ways of Knowing 1. Postpositivism 2. Critical theory 3. Constructivism 6 Research Cores 1. New cultural geography 2. Political ecology 3. Resource geography 4. Cultural ecology 5. Human ecology 6. Cultural landscape
Karl S. Zimmerer (2010) ***Human-Environment Knowledge Domains***	1. Environmental governance and political ecology 2. Environmental hazards, risk, and vulnerability science 3. Land use and land cover change science 4. Human-environment interactions 5. Environmental landscape history and ideas 6. Scientific concepts and environmental management
Carol P. Harden (2012) ***Human-Environment Frameworks***	• Environmental determinism • Human/cultural/ political ecology • Natural hazards • Human impact • Sustainability
John A. Harrington, Jr. and Lisa M.B. Harrington (2012) ***Ideas about Global Change***	• Complexity • Importance of the local • Synthesis • Sustainability science • Vulnerability science • Land change science • Geographic information science
Karl S. Zimmerer (2017) ***Topical and Thematic Area of Human-Environment Geography***	1. Environmental hazards, risk, vulnerability, and resilience 2. Land use and land cover change science 3. Social-ecological and coupled human-environment systems 4. Political ecology and environmental governance 5. Livelihoods and agricultural landscapes 6. Resource political economy, management, and politics 7. Food, health, and bodies in relation to the environment 8. Environmental landscape history and ideas 9. Knowledge concepts in environmental management and policy

In 1980, Irwin Altman and Martin M. Chemers provide a humanistic variation on the human-environment framework. Altman, particularly, has contributed insight and discussion into geographic issues such as place attachment (see Altman and Low 1992). Altman and Chemers, psychologists by trade, produce a framework of culture/environment relations. It consists of an interconnected network of the natural environment (topography, climate, flora, fauna), environmental orientations and world views (cosmology, religion, values, norms), environmental behaviors and processes (privacy, personal space, territoriality, crowding), environmental cognitions (perception, coding, memory, judgements), and environmental outcomes (built environment, homes, farms, cities). The influence of Yi Fu Tuan's foundational elements of humanistic geography is present throughout this framework, especially regarding environmental behaviors and processes (see Tuan 1976). The framework's focus on social systems, connection to environment and behavior research, and its more humanistic leanings distinguish it from later representations of the human-environment produced by geographers.

Almost two decades later, Turner (1997) provides a separate account of the human-environment identity. He outlines three ways of knowing (postpositivism, critical theory, and constructivism) and six human-environment research cores, which include the new cultural geography, political ecology, resource geography, cultural ecology, human ecology, and cultural landscape. He envisions these perspectives and research cores to connect and synergize in a conceptual spiral of human-environment understanding. Turner depicts a hybrid framework of the human-environment identity that is both hermeneutic—though much more limited than that of Sprout and Sprout (1965)—and represents a selection of the popular human-environment research cores that do not necessarily include the psychological perspective advocated by Altman and Chemers (1980).

After the one hundredth year anniversary of the AAG, a series of papers came out which audited different realms of geography found within the *Annals*. One of those papers, written by Karl S. Zimmerer (2010), addresses nature-society geography. Zimmerer performs a content analysis and historiography of nature-society geography within the first one hundred years of the AAG. In his retrospective account, Zimmerer outlines six knowledge domains that have occurred from 1911 to 2010: environmental governance and political ecology, environmental hazards, risk, and vulnerability science, land use and cover change science, human-environment interactions, environmental landscape history and ideas, and scientific concepts and environmental management. Those ideas were expanded upon in Zimmerer's (2017) encyclopedic entry entitled "Geography and the study of human-environment relations." In this encyclopedia article, Zimmerer progresses in connecting human-environment knowledge domains—increased to nine—to key traditions in geography, as well as outside of geography. Those connections within and outside geography were less obvious in the 2010 paper. It becomes clear from reading Zimmerer's work that human-environment geography is a *living* framework, in the sense that continues to change in dynamic ways.

Carol P. Harden's (2012) AAG Presidential Address bears similarities to Zimmerer (2017) in that it provides an updated overview of the human-environment identity. Harden considers problems of the human-environment dichotomy within the dominant ways of knowing for human-environment research, while advocating for a more balanced relationship between human and environment. She describes the degree to which the human-environment duality is balanced or offset within the following ways of knowing: environmental determinism, human/cultural/political ecology, natural hazards, human impact, and sustainability. Harden ultimately posits that sustainability provides the greatest epistemological balance between human

and environment. Thus, sustainability becomes elevated as the ultimate deliverable by this geographic tradition.

John A. Harrington, Jr. and Lisa M.B. Harrington (2012) perform another audit of the human-environment identity but situate their discussion at the intersection of global change and geographic thought. Harrington and Harrington (2012) identify seven research perspectives relating to global changes and the human-environment relationship. Those ideas include complexity, the importance of the local, synthesis, sustainability science, vulnerability science, land change science, and geographic information science (GIScience). Overall, these ideas reflect research pathways which have influenced the ways geographers have thought about the human-environment relationship in the context of global change. Harrington and Harrington diverge from previous frameworks by highlighting the importance of complexity, synthesis, scale (especially the global and local levels), and geospatial technologies on the human-environment milieu.

These six reviews are useful in providing a thematic summary of human-environment identity. To illustrate, Harrington and Harrington (2012) focus on the human-environment identity within the context of global change research and geographic thought. Sprout and Sprout (1965) and Altman and Chemers (1980) take a more behavioral approach by addressing various types of cognition and perception. In two attempts, Zimmerer (2010; 2017) tries to summarize nature-society geography's research cores embedded within and beyond the *Annals of the American Association of Geographers*. These reviews, with perhaps the exception of Zimmerer (2017), do not necessarily venture past the identification and summarization of the basic knowledge domains.

The human-environment relationship has been a subject addressed and framed by a number of geographers and non-geographers. Some frameworks emphasize the theoretical aspects, while others take on the disciplinary cores and research niches. The definition and conceptual framework provided by Zimmerman (2017) is valued for its comprehensiveness and clarity. Zimmerman's overview forms the basis for the study's methodology.

Encyclopedias as Authorities in Geographic Thought

With Zimmerer's (2017) human-environment definition and framework in mind, consideration was given toward the selection of resources to mine and synthesize for the timeline. Geographic encyclopedias represent exemplary target databases to include in the research design. The present period has been described as the Information Age, a time when knowledge production has become computerized. The Information Age provides the setting from which scholars are discovering, sharing, and debating knowledge of the human-environment relationship. In his introduction to *Encyclopedia of environment and society*, Robbins (2007b) states,

> If it is a new world of problems and situations, it is also one of new and integrative ideas. As the 'environment' becomes a concern for economists, political scientists and anthropologists, 'social' forces are increasingly a concern of conservation biologists and geneticists" (viii).

Being on the "same page" has been crucial for maintaining interdisciplinarity in human-environment research. With the increase of available information, however, human-environment knowledges run the risk of becoming highly disconnected, variable, and inaccessible. Reference works represent one response to the "data deluge" now impacting the world of academic scholarship (Bell, Hey, and Szalay 2009).

The problematic situation now facing the citizens of Earth, who seem to be fouling their own nest, justifies the coordination and publication of encyclopedias related to global change and the role of humans in that transformation, such as the *Encyclopedia of global change* (Goudie 2002) and *Encyclopedia of global environmental change* (Munn 2002). According to Munn (2002, xiv), attempts toward synthesis have been "scattered across a broad spectrum of journals and books, and information on global environmental change is not readily available in an inter-related way." Still, other solutions are sought. Writing from the standpoint of a literary historian, Woods (2017) makes the case that humankind's ecological footprint can be uncovered and archived through the act of reading. This form of literary excavation can help to keep up with the vast and varying fields of information on the human-environment relationship.

The Value of Encyclopedias

Documents, encyclopedias, academic articles, and books act as artifacts which can influence the cultural narrative of a topic (see Coffey 2013). Encyclopedias enable human-environment geographers and other scholars to take a step back, explore what has been written, figure out what has been learned, and address that understanding. Academic encyclopedias and dictionaries provide one way to communicate the knowledge discovered from an archival database. In geography, encyclopedias and dictionaries have received only passing attention (see Setten 2008; Demeritt 2008), but they have more use to researchers than simply collecting dust on library bookshelves. Academic encyclopedias and dictionaries act as cognitive authorities on a subject, thereby instilling a certain intellectual legacy for a discipline (Rasoamampianina 2014; Spree 2014).

The continued production of encyclopedias, dictionaries reference books, and sourcebooks can be just as problematic as not having any distillations at all. The extensive

International encyclopedia of geography: People, the Earth, environment and technology (Richardson *et al.* 2016), with its fifteen volumes and over 1,000 articles, follows a number of similar encyclopedias and dictionaries, a substantial group of which were written within the first decade of the second millennium. Examples of works edited by geographers include, but are not limited to: Barney Warf's *Encyclopedia of human geography* (2006) and *Encyclopedia of geography* (2010a); Paul Robbins's *Encyclopedia of environment and society* (2007a); the *International encyclopedia of human geography* edited by Rob Kitchin and Nigel Thrift (2009); Derek Gregory and colleagues' fifth edition of *The dictionary of human geography* (2009b); David S.G. Thomas's fourth edition of *The dictionary of physical geography* (2016); and John A. Matthews's *Encyclopedia of environmental change* (2014a). The cycle of new dictionaries and encyclopedias continues to repeat itself with little or no stocktaking. How does this next one add value to what has already been compiled? There should be a reason to undertake a new compilation that goes beyond selling volumes to fill the shelves in libraries.

Regardless, encyclopedias, dictionaries, and other tomes of geographic knowledge offer a trove of research possibilities, especially when it comes to synthesizing and communicating major topics or interrogating the salient knowledges that dominate a discipline. For this dissertation, a selection of geographic reference works serves as the foundation for understanding the different forms of human-environment thinking. Geographic encyclopedias and dictionaries are a mine for inducing human-environment knowledges. More and more of these resources are being produced to occupy physical space on library bookshelves and digital space on archived online databases. With many encyclopedias being produced at increasing intervals and volumetric proportions, what is there to gain?

Encyclopedias as Cognitive Authorities

Encyclopedias and dictionaries acquire a sense of 'cognitive authority', which implies that a person, group of people, or institution becomes recognized as an epistemic authority on a subject (Rasoamampianina 2014). Encyclopedias play the role of communicating knowledges, acting as a guide, influencing the thinking of others, and expressing informed opinions (Rasoamampianina 2014). Encyclopedias possess a scope of authority, which "is defined from the range of topics and from the depth of treatment, which allows the communication of greater knowledge to the readers" (553). The authority of encyclopedias is typically determined by the authors, editors, publishers, publishing history, recommendations from other people and institutions, and connection to a particular genre (Rasoamampianina 2014). Systematic investigation of encyclopedias provides insights into the forces involved in producing and consuming such reference works (Spree 2014). With the expanding accessibility of online and open-source resources, the traditional format of the encyclopedia is being called into question (Rasoamampianina 2014; Spree 2014).

Dictionaries have undergone similar scrutiny. Wallace (2006) gives a lengthy review of the political nuances behind Garner's *A dictionary of modern American usage* (now titled *A dictionary of modern English usage*, 2016). Wallace (2006, 75) insightfully challenges readers to question the authoritative decisions made by prominent reference collections,

> We regular citizens tend to go to The Dictionary for authoritative guidance. Rarely, however, do we ask ourselves who exactly decides what gets in The Dictionary or what words or spellings or pronunciations get deemed substandard or incorrect. Whence the authority of dictionary-makers to decide what's OK and what isn't?

Wallace warns against the snootiness that comes with policing the written language. His essay gained so much notability that the 2016 publication of Garner's authoritative text, in its fourth

edition, includes an entry for "snoot." Additionally, in two introductory essays, Garner (2016) addresses the greater context of the ongoing debates about who gets to decide the ways in which language gets used. The same question, why should reference-makers be the authority over what to include or exclude, could and ought to be posed for authoritative sources in the production of ideas about the human-environment identity. Encyclopedias, though intended to be comprehensive, often represent the ideals and perspectives of the editors and section contributors who control the types of topics and the aspects of the topic which get written about.

Geographic knowledge has been present in encyclopedias and dictionaries throughout history. According to Glacken (1967), early encyclopedias of the Middle Ages were important resources for transmitting geographic knowledge, especially about the characteristics of places and properties of things found in the environment. Much of this knowledge echoes the worldviews of the Middle Ages and involves place-names, provinces, quotations, environmental theories, and descriptions of geography. Twelfth and thirteenth century encyclopedists like Bartholomew of England would describe places, both sacred and otherwise, and expand the discussion to consider environmental influences and the characteristics of landscapes and the people who inhabit them (Glacken 1967). In recent years, encyclopedias have transitioned from a select group of individuals to a small army of contributors, often in the tens and hundreds.

The influence of contemporary encyclopedias and dictionaries on geographic thought has received passing attention. Two articles in *Geoforum* comment on the acceleration of encyclopedia resources as the twentieth century transitions into the twenty-first (Demeritt 2008; Setten 2008). Geographic encyclopedias, dictionaries, readers, companions, and handbooks have increased in number and through shorter intervals for new editions. These resources are

perceived as handy distillations of the broad discipline of geography, but they have their problems.

Setten (2008) takes a critical approach by cautioning the tendency for encyclopedias and dictionaries to exclude certain geographic knowledges while championing others. The geographer argues that the production of encyclopedias and other references empowers a select group of scholars to map out the discipline's "cognitive territory" (2008, 1102-1103). Setten briefly traces the evolution of the *Dictionary of human geography* from edition to edition. Two sets of findings result. First, in reviewing the succession of the dictionary editions, the researcher finds that the endeavor has tended to be Anglophone-dominant, to include only writers from the English linguistic community. Second, in terms of geographic knowledges, Setten finds that earlier editions of the dictionary have a suspicious omission of ideas like 'landscape'. The second article in *Geoforum* takes a more empathetic stance on geographic references. Coming from an anecdotal perspective, Demeritt (2008) recognizes the capacity for geographic encyclopedias and dictionaries to promote the unity and diversity of the discipline.

Two takeaways and one research possibility ascend from Setten (2008) and Demeritt (2008). First, from a critical position, geographic resources can favor some geographic knowledges while excluding others. The editors of *The dictionary of human geography* willingly concede to the criticisms of the resource's tendency to focus on language, concepts, and scholarship of the English language (Gregory *et al.* 2009b). The capacity of encyclopedic resources to influence geographic thought has yet to be robustly and systematically evaluated. Second, from an empathetic perspective, geographic resources can encapsulate a distilled yet effective representation of geography for the general public and scholars alike. Overall, more systematic efforts are needed to evaluate geographic reference works for the knowledges that

they contain and omit. Comparative assessment of entries used in the development of a human-environment timeline represents one such systematic effort.

Theoretical Foundation for Meta-research

The creation of a human-environment timeline involves the compilation, synthesis, and periodization of knowledge from secondary sources. A search through the literature revealed no clear set of social scientific methods for developing a timeline. In normal science, the timeline construction has entailed the formation of committees to review and synthesize the latest research. For example, the 27-volume *The geology of North America* enabled the creation of the first Geological Society of America Geologic Time Scale (Palmer 1983). The 1982 Time Scale Advisory Committee was tasked with creating the timescale. The committee published its findings in the journal *Geology* in two pages, the first with a brief overview and list of references, and the second with the actual timeline.

The development of the first human-environment timeline, on the other hand, necessitates further justification. There is no pre-defined method for periodization in the social sciences. As a result, this research design draws from existing methods in qualitative meta-research. Qualitative meta-research acts as an umbrella term to include phenomenological approaches, meta-analysis, meta-synthesis, and grounded theory (Levitt 2018). The creation of a human-environment timeline entailed an abductive, textual analysis of the encyclopedias to synthesize time periods. Grounded theory was especially pertinent in the design.

To expand on this approach, the following sections address three topics: (1) the relationship among induction, deduction, and abduction in science, (2) the increasing significance of meta-research in science, and (3) how meta-analysis and grounded theory allow

room for designing a method that maintains the timeline's methodological integrity, rigor, and trustworthiness.

Inductive, Deductive, and Abductive Approaches to Scientific Paradigms

Induction, deduction, and abduction represent three meta-processes for scientific analysis. Induction and deduction occupy opposite sides of the research spectrum, with abduction near the middle (Holt-Jensen 2009; Figure 3.2). This section describes how induction and deduction relate, how they manifest in scientific paradigms, and why abduction reconciles the differences between the two.

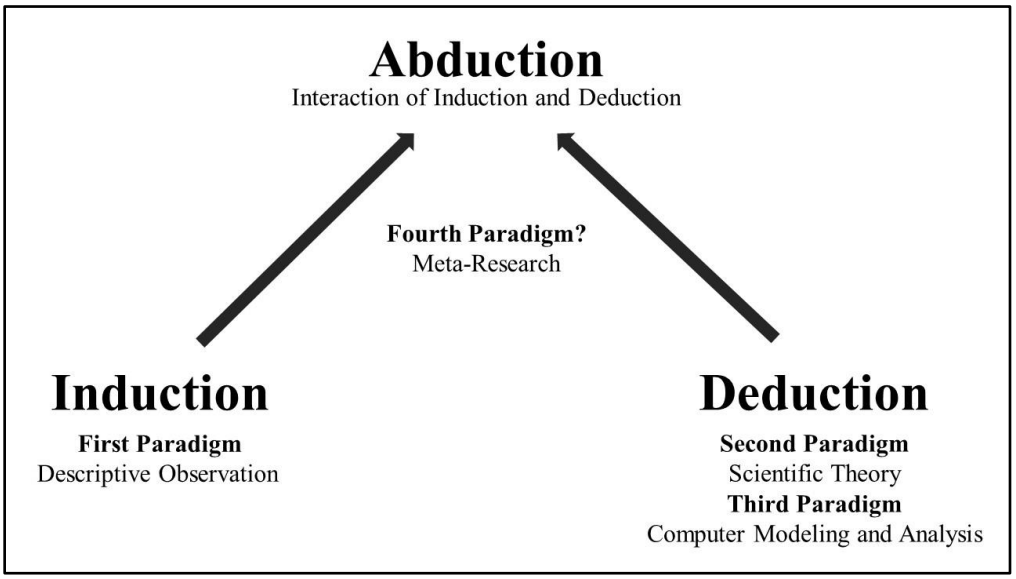


Figure 3.2: Induction, deduction, and abduction with associated scientific paradigms (Source: Kuhn 1962; Holt-Jensen 2009; Bell, Hey, and Szalay 2009)

Induction refers to the process of coming to a general truth based upon the examination of a series of related observations (Matthews and Thorn 2014). In induction, no pre-determined ontology or truth is required in the building of these generalizations. The inductive approach can be summed up as an inference to a good explanation, a response to the "excessive focus on justification" which often leads to "neglect of the apparently more mundane project of principled

description" (Lipton 2002, 207). The inductive creation of time periods, for example, emerges from the exploration of the temporal spacing of events and ideas found in a dataset. In the history of geography, figures like Alexander von Humboldt used inductive exploration to come to new conclusions about science and the observed natural world (Unwin 1992).

An alternative to induction is deduction, in which a predefined truth orients how particular situations are examined; as such, the predefined truth acts to reinforce the conclusion (Thorn 2014). Those who select a deductive approach and/or a modeling approach to better understand a system generally do not have to justify their selection; deduction already operates on a set of rules that justify the approach (Thorn 2014). Deductive, epistemological methods of synthesis are being developed to communicate how to approach problems in human-environment interactions. For example, the PISA (Power, Incentives, System, and Adaptation) acronym helps to incorporate four interrelated approaches that are deployed in human-environment research (Bousquet *et al.* 2015). PISA was developed by the Socio-Ecological Theories and Empirical Research (SETER) project. The PISA acronym reflects four schools of thought that are reordered in practice according to how the four aspects of a human-environment issue are addressed. Deductive thinking allows for the interpretation and critique of uncertainties brought about by inductive research.

In normal science, deduction and induction have been prioritized in different ways over time, even though both processes are interrelated to some degree. This tension can be examined through the progression of normal science's three research paradigms. By definition, a paradigm refers to a set of widely-accepted theories for addressing scientific problems (Kuhn 1962). The Western scientific record begins around the seventeenth century and has served as a foundation for scientific understanding, communication, and exploration (Lynch 2009). The first paradigm

involves the inductive description of natural phenomena. In the second paradigm, science transforms by adopting a theory-heavy, deductive approach. The expansion of scientific understanding allows for the creation of conceptual models and schemas that generalize natural phenomena. These conceptual models allow hypotheses to be put forward and tested with subsequent data collection and analysis. In the third and more recent paradigm, scientists use software and computers to simulate complex systems. The paradigm has emphasized deductive thinking. Computer simulations have aided scientists as they explore, apply, and amend scientific understandings on topics like climatic change, the origins of the universe, and testing the safety of automobiles (Bell, Hey, and Szalay 2009). An advantage of computer simulation of complex systems is that the researcher is not required to test the hypothesis in the real world. These deductive, computer-based simulations contribute toward the theoretical foundations of scientific thought.

A proposed fourth paradigm was popularized by a computer scientist, the late Jim Gray, during a talk delivered on 11 January 2007. This paradigm represents the dominance of eScience and data-intensive research, in which software is used to collect and synthesize information from bits and bytes stored in databases (Hey, Tansley, and Tolle 2009). The fourth paradigm is significant because, in the words of Lynch (2009, 181)

> the scientific record and the supporting system of communication and publication have reached a Janus moment where we are looking both backward and forward. It has become clear that data and software must be integral parts of the record—a set of first-class objects that require systematic management and curation in their own right.

The expansion and digitization of the scientific record has changed how scientists consume, produce, manage, and curate information. The scientific record, according to Lynch (2009), has become its own object of research.

One phenomenon becomes clear when examining the four paradigms together: the significance of inductive and deductive methods in generating knowledge. The fourth paradigm and the first paradigm are similar in the sense that they prioritize exploratory, inductive analysis. The first and fourth paradigms differ in terms of their *terrae incognitae*, or unexplored research terrain (Wright 1947). The first paradigm involves descriptive observation of real-world phenomena, whereas the fourth paradigm views the digital realm of sensors and existing datasets as the new "frontier." Inductive research, however, benefits from deductive critiques and interpretations, especially when negotiating the problems of uncertainty (Matthews and Thorn 2014). A dialectic between the two approaches could help separate the wheat from the chaff in building a human-environment timeline.

Abduction is a complementary middle way between induction and deduction. It employs induction to create a base understanding of a phenomenon and then improves upon that knowledge through deductive techniques (Holt-Jensen 2009). In context of the human-environment timeline, abductive techniques permit the systematic investigation of encyclopedias followed by the triangulation of those results with research. That mixture works to establish the validity and trustworthiness of the research. As a general method, abduction has been argued as a way of combatting some of the problems in meta-research (Timmermans and Tavory 2012).

Significance of Meta-Research

Meta-research, or "research on research," is an opportunity for scientists to examine the field's advances and drawbacks to inform a more rigorous and efficient scientific research (Enserink 2018, 1179). Meta-research includes both qualitative and quantitative methods of exploration. Investigators of science, technology, and innovation (STI) realize the need to assess the nature of their field to produce advances in knowledge (Börner 2018). The identification and

synthesis of science's "crowded frontier" can decrease the redundancy of ideas and encourage the generation of imaginative and transformative discovery (Evans 2018, 1195). Computer scientists and others have made the role of induction especially clear in the proposal of a new paradigm of scientific research dedicated toward eScience (Bell, Hey, and Szalay 2009).

Knowledge discovery from databases (KDD) represents one form of fourth-paradigm research. Introduced in 1989, KDD includes the development of theories and methods to understand the storage of data, the use of algorithms to automate data mining, the interpretation and visualization of data, and how to model the interaction between human and machine in knowledge discovery (Fayyad, Piatetsky-Shapiro, and Smyth 1996a). KDD uses automated techniques to respond to the slow and highly-subjective problem of manually analyzing and interpreting data. As Fayyad *et al.* note: "When the scale of data manipulation, exploration, and inference grows beyond human capacities, people look to computer technology to automate the bookkeeping" (1996a, 28). Within geography, KDD has been an important topic of discussion within the geographic information science (GIScience) community (Yuan 1999).

KDD and eScience present benefits for advancing geographic thought about the human-environment relationship. In GIScience, scholars have voiced the need to develop and improve upon information systems, such as Keyhole Markup Language (KML), that account for the dynamism of nature-society relations (Craglia *et al*. 2008). Craglia *et al.* (2008, 147) envision a comprehensive "Digital Earth" to harness the increased availability of information to inform "our collective awareness of the need to understand interdependencies of environmental and social phenomena on a global scale." In this sense, eScience creates new methods of synthesizing and mapping information about the human-environment relationship.

In human-environment geography, efforts have been underway to synthesize the vast amount of knowledge produced about the human-environment relationship, especially in the context of global environmental change. Systematic reviews of regional and local case studies help to create generalized knowledge claims (GKCs). Through meta-analysis, GKCs are now being created to inform understandings of socio-environmental systems, such as biodiversity initiatives and large-scale land acquisitions (Magliocca *et al.* 2018).

Geography is both an art and a science (Hart 1982). The discipline's humanities-side and science-side are often at odds with each other (Meinig 1983). That tension remains with the introduction of data-intensive science and large-scale meta-analyses. For instance, a challenge of KDD is the problem of total dependence on automation and a more synchronized integration of human and machine interaction (Fayyad, Piatetsky-Shapiro, and Smyth 1996a). The automated sifting through data displaces the requirements of expertise from the scholar (of observation and understanding) to the machine programmer. The value of human discernment is taken for granted through the automated production of knowledges. The rationalistic act of data modeling and mining risks drawing geography further away from an art and closer toward objective science. This discussion now transitions to more qualitative, holistic options for developing a human-environment timeline.

Periodization, Qualitative Meta-Analysis, and Grounded Theory

Qualitative meta-analysis allows for the research design to be adapted to meet the goals of the research question (Levitt *et al.* 2017; Levitt 2018). The timeline's research design draws from methodological research on abductive reasoning, qualitative meta-analysis, and grounded theory. Recommendations from this scholarship establish criteria for rigor, validity, and trustworthiness. Qualitative approaches like grounded theory work to justify the process of

comparing, interpreting, and synthesizing data without having to formulate a hypothesis beforehand (Bryant and Charmaz 2007). The overall goal for the timeline's research design is to establish a method for collecting, periodizing, and interpreting the data emerging from analysis of geographic encyclopedias.

Qualitative meta-analysis involves the aggregation and synthesis of findings from qualitative research (Levitt 2018). A qualitative meta-analysis was selected over a quantitative content analysis to reflect the primary goal of this research – to interpret and understand underlying connections among big ideas and periods. The frequency of entries matters less than the interpretive significance of the entry (Levitt 2018). In the words of Hart (1982, 23), "A statistical association between two variables, no matter how close, does not show causality, and indeed it may result from the operation of other variables that have not even been investigated." Though Hart was speaking about regional geography, his criticism of statistics can be applied to the context of this meta-analysis. The objective of qualitative research, according to Charmaz (2004), is to interpret meanings beyond their frequencies. Statistics, though helpful in describing and summarizing a dataset, are not to be substituted for the mastery over content.

Grounded theory represents one form of qualitative meta-analysis (Yanow and Schwartz-Shea 2006). Classical grounded theory is largely an inductive process; categories and theories are intended to arise from the documents being analyzed (Kelle 2007). Grounded theorists analyze a variety of resources, including interviews, ethnographic data, and texts (Charmaz 2006). The method is appropriate in the case of this study because a textual analysis of encyclopedias contains an inherent process that can be guided by grounded theory (Birks and Mills 2011).

Approaches from grounded theory were applied to establish a thematic classification of time periods for the human-environment timeline (Glaser and Strauss 1967; Timulak 2013). This periodization occurred through the analysis of encyclopedias as 'extant texts,' data sources which the researcher did not influence (Charmaz 2006). Grounded theory requires that the researcher maintain an open-minded exploration of whichever resources she or he is examining. Since its conception in the 1960s, grounded theory has also been combined with a specific scholarly perspective, such as radical critiques, post-positivism, or social constructionism.

Abductive reasoning, or the interactive combination of inductive and deductive thinking, has become more commonly used in qualitative meta-analysis and grounded theory (Bryant and Charmaz 2007; Reichertz 2007; Lipscomb 2012; Granheim, Lindgren, and Lundman 2017). Though grounded theory began as an inductive method, it has now evolved to include an interaction between inductive and deductive reasoning (Bryant and Charmaz 2007). Similarly, Levitt (2018) has advocated a hybrid of qualitative methods to strengthen the validity and trustworthiness of the research design and findings. Timmermans and Tavory (2012) argue for the benefits of reevaluating the data according to a theoretical, deductive framework. As Reichertz (2007, 221) notes, "data are to be taken seriously, and the validity of previously developed knowledge is to be queried. It is a state of preparedness for being taken unprepared." Deductive reasoning can serve as a form of triangulating the inductive findings with other sources and perspectives (Timonen, Foley, and Conlon 2018).

Research Design

The timeline's qualitative meta-analysis involved six overlapping phases: (1) selection of encyclopedias, (2) data collection, (3) data categories and a typology of time periods, (4) periodizing the timeline, (5) using descriptive statistics to assess the characteristics of the

timeline, and (6) interpreting the timeline. Table 3.3 outlines the abductive reasoning implemented throughout the research process.

Table 3.3: Outline of overlapping research phases and the associated elements of induction and deduction used in abductive reasoning.

Research Phase	Inductive Reasoning	Deductive Reasoning
I. Selection of Encyclopedias		Purposeful sampling of encyclopedias (Morse 2007; Levitt 2018)
II. Data Collection	Exploration of text for timeline entries; initial examination of temporal and thematic patterns among the entries (Charmaz 2006)	Criteria for being included on the human-environment timeline based on Zimmerer (2017) and reconciling data discrepancies (Morse 2007; Levitt 2018)
III. Data categories and typology of time periods	Selection of data categories and time period typology (Charmaz 2006; Kelle 2007)	Triangulation with empirical scholarship outside of the encyclopedias (Kelle 2007)
IV. Timeline periodization	Examining and interpreting thematic, temporal patterns in the dataset (Lempert 2007)	Labeling each time period based upon outside scholarship (Reichertz 2007)
V. Descriptive statistics	Summarizing the general features of the completed timeline and its periodization	
VI. Interpreting the timeline		Evaluation of a human-environment timeline based on different ways of knowing (Yanow and Schwartz-Shea 2006)

Phase I: Selection of Encyclopedias

Phase I involved selecting a series of encyclopedias for textual analysis. Four geographic encyclopedias represented the target sources for gathering time-sensitive, or ordinal, data to build the human-environment timeline. This textual analysis included the purposeful sampling of articles from four encyclopedias: *Encyclopedia of global change* (Goudie 2002a), *Encyclopedia of environment and society* (Robbins 2007a), *Encyclopedia of geography* (Warf 2010a), *Encyclopedia of environmental change* (Matthews 2014a). Concepts in grounded theory are

relevant because they have been used to perform meta-analyses of documents, literature, secondary data sources, and other non-traditional sources of data (Birks and Mills 2011).

Two key principles in sampling for qualitative methods are (1) that the participants need to be trustworthy informants of the phenomenon being studied and (2) that the sampling techniques need to be focused and effective (Morse 2007). As mentioned earlier, encyclopedias are distillations of a vast body of knowledge for a subject. Because encyclopedias contain articles written by experts in the field, they serve as authorities on a subject and also work to further the intellectual legacy of certain ideas over others (Demeritt 2008; Setten 2008; Rasoamampianina 2014; Spree 2014). Encyclopedias, thus, represent targeted and efficient databases for building an initial human-environment timeline. The backgrounds of individual authors satisfy the requirement of having credible informants for discussing the human-environment relationship (Charmaz 2006; Morse 2007). The process of selecting encyclopedias occurred between November 2017 and May 2018.

To be included in the study, the encyclopedias needed to meet three criteria. First, the encyclopedia must be compiled and published since at least 2000 CE. The timeliness of the encyclopedia ensures that its content is relatively up-to-date for use in timeline development. Second, the encyclopedia must be edited by a geographer and explicitly relate to geographic thought. The human-environment relationship embodies one of geography's most significant traditions; geographers have contributed much toward facilitating research on the human-environment relationship (Kates 1987; Turner 2002; Zimmerer 2017). Therefore, geographic encyclopedias provide a powerful disciplinary scope for synthesizing ideas and events along the human-environment timeline. Third, the encyclopedia must explicitly address aspects of the human-environment relationship. As such, there should be no question about whether or not an

encyclopedia's purpose and subject matter contributes to the creation of the human-environment timeline.

Numerous encyclopedias were reviewed for possible inclusion in this study. Table 3.4 lists the encyclopedias which were considered but ultimately did not get used. These encyclopedias were not selected for multiple reasons. Some encyclopedias, like the *International encyclopedia of geography* were difficult to access, despite multiple attempts at acquiring inter-library loans and directly contacting the publisher. The majority of encyclopedias did not meet the requirement of having a geographer as the chief-editor.

Table 3.4: Encyclopedias that were reviewed but not selected.

Encyclopedia Name	Publication Year	Editors	Overview
The international encyclopedia of geography: people, the earth, environment, and technology	2017 (Regularly Updated Online)	Richardson *et al.*	15 volumes, 4,000,000 words, 8,000 printed pages, 1,000 illustrations
Encyclopedia of environmental issues, 2nd Edition	2011	C.W. Allen	772 articles ranging from 300 to 3000 words; 4 volumes
Encyclopedia of environmental ethics and philosophy	2009	J. Baird Callicott and R. Frodeman	2 volumes
Encyclopedia of global environmental change	2002	T. Munn	5 volumes, 500 articles, 100 biographies, 150 definitions, 100 acronyms
Berkshire encyclopedia of sustainability	2010	Anderson	10 volumes, 887 articles, more than 900 contributors
Encyclopedia of world environmental history	2004	S. Krech, J.R. McNeill, and C. Merchant	3 volumes, 520 articles
The Cambridge encyclopedia of hunters and gatherers	1999	R.B. Lee and R. Daly	1 volume
Encyclopedia of human evolution and prehistory	2000	E. Delson, I. Tattersall, and J.A. van Couvering	Over 800 topic headings or entries—50 to 9,000 words in length, one volume

Four encyclopedias were chosen as the target databases for this research. They include:

- *Encyclopedia of environment and society*, edited by Paul Robbins (2007a)
- *Encyclopedia of geography*, edited by Barney Warf (2010a)
- *Encyclopedia of environmental change*, edited by John A. Matthews (2014a)

- *Encyclopedia of global change*, edited by Andrew S. Goudie (2002a)

The four encyclopedias satisfy the first two requirements. Aside from being published in the last two decades, each encyclopedia is compiled by a geographer specializing in a different subset of the discipline: a political ecologist (Robbins), a human geographer (Warf), a physical geographer specializing in environmental change (Matthews), and a physical geographer specializing in human impacts on the environment (Goudie). The array of outlooks brought by these scholars helps to limit the chance of overemphasizing certain aspects of the human-environment relationship over others.

Paul Robbins' (2007) *Encyclopedia of environment and society* most directly addresses topics of the human-environment relationship. Robbins is a political ecologist who has built a career examining the relationships among socio-political institutions, people, and the environment (see Robbins 2011). The five-volume *Encyclopedia of environment and society* features around 1,200 entries, five associate editors, and 303 contributors. The purpose of this encyclopedia is to communicate emerging ways of thinking about the relationship between nature and society. The resource gathers the subject's "multiplying issues, concepts, theories, examples, problems, and policies together in one place" (Robbins 2007b; vii). The encyclopedia illustrates the diverse range of the human-environment relationship by incorporating "different types of entries, including key individuals, policies, problems, processes, and theoretical concepts that sit astride what has traditionally been known as 'society' and 'environment'" (Robbins 2007b, vii). Robbins (2007b) views this encyclopedia as one way to prepare the public to tackle the socio-environmental problems of the next one hundred years. During data collection, the choice to assess Robbins (2007a) first afforded a foundation for determining which components of the text might represent the human-environment relationship through time.

The scope expands beyond environment and society with the inclusion of Barney Warf's (2010a) *Encyclopedia of geography*. Warf is a human geographer who specializes in economic geography, telecommunications, and production. Warf has also made contributions to quantitative methods, as well as political economy and social theory in geography and has served as an editor for *The Professional Geographer*. This encyclopedia describes human-environment events and ideas within the larger disciplinary context of geography. The six-volume encyclopedia is similar to Robbins (2007a) in length, but with more breadth. After editing over 1.78 million words, Warf (2010a) presents an encyclopedia that features 1,224 entries, a five-person advisory board, and 942 authors. The editor explains the purpose of the resource:

> This encyclopedia sets for itself an ambitious task: to offer a reasonably comprehensive and useful summary of the state of the discipline in the early 21st century. As geographical knowledge has exploded in quantity, diversity, and sophistication, many people, including students and the informed lay public find it difficult to know where to turn. This project attempts to fill that gap (2007b, liv).

The goal, for Warf, is to make the whole of geography accessible and palatable to the public. Each alphabetical entry is subsumed under one of the following categories: physical geography; human geography; methods, models, and geographic information systems (GIS); the history of geography; nature and society; and people, organizations, and movements. With assistance from geographer Barry Solomon, Warf dedicates a series of sub-themes under the 'nature and society' category: agriculture, environment and people, hazards and disasters, resources and conservation, and water.

The analysis of encyclopedias transitions from the human to the more physical side of the human-environment relationship, with John A. Matthews's (2014a) *Encyclopedia of environmental change*. Matthews is a physical geographer who contributes research in Holocene environmental change, scientific dating methods, glaciology, as well as geographic history and

philosophy. The three-volume encyclopedia is shorter than the previous two resources, but it contains a higher quantity of shorter individual entries (over 4,000 terms). Matthews is the chair-editor of an eleven-person editorial board and 140 total contributing authors. The *Encyclopedia of environmental change* explores topics in environmental change in the broadest sense, spanning across the humanities and the physical, applied, and social sciences. The encyclopedia examines environmental change across a variety of timescales: "Pre-Quaternary, Quaternary (the past 2.58 million years), Holocene (the past 11.7 thousand years), Anthropocene (the past ca 250 years), prehistoric, historical, current and potential environmental changes" (Matthews 2014b, xlv). The encyclopedia responds to the "need to define, clarify and interpret the terminology employed by researchers in this field for a wider audience, increasingly aware of the existence of natural and human-induced (anthropogenic) environmental change. There are topical issues with important social consequences" (xlv).

Andrew S. Goudie's (2002a) *Encyclopedia of global change* complements the previous three encyclopedias by addressing human dimensions of global change. Goudie, like Matthews, has expertise in physical geography within the context of human impacts and transformations of the environment. The two-volume encyclopedia features twenty members of its advisory and editorial board, contributing in-depth essays on around 300 topics relating to global change and Earth systems. The purpose of the *Encyclopedia of global change* is to present

> our current knowledge of natural and anthropogenic changes in the Earth's physical, chemical, and biological systems and resources, and it examines the effects of those changes on human society. Its focus is primarily on the changes that affect the human rather than the geologic time scale, although the Earth's natural rhythms and processes are discussed in sufficient detail that present-day or projected trends may be considered against the appropriate background of natural change (Goudie 2002b, xii).

This resource resembles the Matthews text because it orients itself from an environmental systems standpoint. Goudie's (2002a) encyclopedia diverges from Matthews (2014a) by focusing primarily on processes occurring on the human timescale. Matthews, on the other hand, considers environmental change on the deeper, geologic timescale.

Goudie (2002a) also recognizes that distinctive forms of thinking are required to examine the intersection between humans and the environment. He declares: "Frequently, it is frustratingly difficult to separate out the effects of human and natural factors in environmental change. Natural and human factors often combine to create a particular effect" (2007c, ix). This encyclopedia acts as a bookend for data collection as the timeline entries began to reach saturation, as more and more of the same codes arose.

The four encyclopedias elaborate on aspects of human-environment relationship on overlapping and at interlocking temporal and spatial scales. The editors would likely agree with Robbins's point that the

> new world of problems and situations…is also one of new and integrative ideas. As the 'environment' becomes a concern for economists, political scientists, and anthropologists, 'social' forces are increasingly a concern of conservation biologists and geneticists (2007b, viii).

The chief editors also acknowledge the need to distill the ever-quickening, diversifying pace of human-environment research.

Phase II: Data Collection

In sampling data, the qualitative researcher does not need to treat all data equally; she or he can prioritize some descriptions and illustrations over others (Morse 2007). This selectivity was especially important when mining encyclopedias for entries on the human-environment

timeline. Drawing from Zimmerer (2017), those happenings can represent any one of the following criteria:

- Environmental hazards, risk, vulnerability, and resilience
- Land use and land cover change science
- Social-ecological and coupled human-environment systems
- Political ecology and environmental governance
- Livelihoods and agricultural landscapes
- Resource political economy, management, and politics
- Food, health, and bodies in relation to the environment
- Environmental landscape history and ideas
- Knowledge concepts in environmental management and policy

The goal of Phase II was to perform an open coding to compile a diverse array of data from encyclopedias to construct a human-environment timeline (see Charmaz 2006; Levitt 2018). The researcher's training as a human-environment geographer influenced his theoretical sensitivity to exploration of geographic encyclopedias (Birks and Mills 2011). Between January and August 2018, the investigator systematically read through each encyclopedia entry to identify ideas and events for the human-environment timeline. When the researcher located an event or idea (*i.e.*, a data point), he catalogued and coded it in a Microsoft Excel database. For each event and idea, five attributes were entered into the database: date, description, category, time frame, and encyclopedic references.

- **Date –** This attribute gives the general year for when the human-environment event or idea occurred. Dates are reconciled to use secular dating: years before present, or before 1950 (BP) and common era (CE) or before common era (BCE).

A separate column indicates whether the date is before common era (BCE) or CE. BP is employed as an additional reference for all dates occurring before present.

- **Description** – This attribute serves as a brief memo that details the character of the event or idea that occurred. For some of entries, elaboration is provided for how it is significant toward understanding the human-environment relationship.
- **Category –** The "Category" attribute determines if a data point on the timeline is characterized as an idea or event. The two categories represent 'common sense codes' that will be described in Phase III (Kelle 2007).
- **Time Frame –** The "Time Frame" attribute signals if the date for an entry represents the core, or middle of a time range. It provides the general time range in BP or BCE.

The fourth category of attributes pertains to the encyclopedic references that specifically cite each idea and event. Each data point contains a list of entries in the encyclopedia(s) where it is cited. This method facilitates the ability to examine the connections and cross-referencing among the four encyclopedias. The references are separated according to encyclopedia.

- **References for Robbins (2007a) –** This attribute provides the list of entries that reference the event or idea in question for the *Encyclopedia of environment and society*.
- **References for Warf (2010a) –** This attribute provides the list of entries that reference the event or idea in question for the *Encyclopedia of geography*.
- **References for Matthews (2014a) –** This attribute provides the list of entries that reference the event or idea in question for the *Encyclopedia of environmental change*.

- **References for Goudie (2002a) –** This attribute provides the list of entries that reference the event or idea in question for the *Encyclopedia of global change*.

In qualitative analysis, there is a need to reach a point in which there is an interchangeability of indicators, a situation in which "no new properties or dimensions are emerging from continued coding and comparison" (Holton 2007, 265). The listing of references allowed the ability to capture and compare the reemergence of timeline entries that are coded. By the time the final text was reviewed (Goudie 2002a), the major threshold moments for the human-environment timeline were already accounted for and reinforced through multiple entries both within and among encyclopedias. While addition of another encyclopedia may have yielded quantitatively more entries, it would most likely have little qualitative impact on the emerging themes for the timeline's periodization.

Reconciling Data Discrepancies

In August and September 2018, the researcher reviewed the raw data generated from populating the dataset and reconciled inconsistencies in dating, cross-referencing, and descriptions. Dating inconsistencies existed among encyclopedias and among entries within encyclopedias. For example, some entries used years before Christ (BC), years before common era (BCE), years before present (BP), and the number of years ago. These discrepancies posed a problem for standardizing the ordinal data. Each date was calibrated to represent the conventions of scientific dating: years before 1950 (before present, or BP) and common era (CE). In addition to calibrating the dates, the researcher checked the references, categories, and descriptions for formatting inconsistencies. Condensed and unabridged versions of the data are made available in Appendixes A and B.

The data selection process also includes some periods and general time frames, such as the "1970s" and the middle of the fifteenth century. Any period that span over multiple years was catalogued according to the middle, or core, of that timeframe. The rationale for this is to have an event in which the core characteristics of the period are represented. For example, England rural land-use changes from open fields to enclosures from 1760 to 1830 CE. In this case, the two years are subtracted from one another. That number is divided by two; the product of that division is added to the earlier of the two dates. The result is the median date, or core, of the period: 1795 CE. This method forgoes the search for a precise beginning and end; it opts for general idea of when the characteristics of the period are certain to be apparent. In this case, it was important to get a sense of the period of when the land-use transition was in full effect. Other decisions included providing dates for entries with conflicting dates, multi-volume publications spanning more than one year, and time ranges that occur over the span of two years. Table 3.5 identifies these discrepancies and describes the rationale for the decisions that the researcher made.

Table 3.5: Discrepancies in time frames for the human-environment timeline.

Discrepancy	Solution	Rationale	Example
Two general time ranges are given as boundaries.	Use the beginning of the first time range and the end of the second time range (ex. 1820 to 1930 CE), then find the year located at the center of that period.	A complete representation of the period, with the middle of the time range used to represent the core of that generalization.	1820s to 1920s = 1820 to 1920 *Core Date = 1860*
General descriptors such as early, middle, and late.	Use the date that represents the median boundary for that descriptor.	Less discrepancies and more consistency with dating.	Early-1400s = 1425 Middle-1400s = 1450 Late-1400s = 1475 Early-1990s = 1993 Middle-1990s = 1995 Late-1990s = 1998 *(round up to nearest year)*
An entry accounting for an occurrence lasting two years	Use the earlier of the two dates	Signal the commencement of the event.	1997 to 1998 = 1997
A multi-volume publication spanning multiple years	Use the earliest of the dates	Focus on the initial introduction of the idea	Henri Lefebvre's three-volume *Critique of everyday life* = 1947, 1961, and 1981 CE = 1947
Time range that represents the accumulation of a human-environment phenomenon	Use the latest date	Focus on the endpoint of the accumulation	From 1865 to 1884, around 60 million bison are hunted in the United States. = 1884
Revolutions with multiple time frames and dates	Use the series that is most comprehensive and specific	Allow for more specific contexts of the revolutions	Agricultural Revolutions • First: 14,000 BP • Second: 800 CE • Third: Late-1600s to mid-1800s CE • Fourth: Late-1920s CE (1928 CE) • Fifth: ~1950 CE

Timeline entries with multiple dates are reconciled through selecting the earliest option. This issue is prevalent the further the timeline goes back beyond the common era. In addition, events and ideas that are thousands of years before the present difficulties for retrieving a specific date. These events are given general dates to the nearest one hundred. Some dates are updated to reflect the most current knowledge. For example, the first *Homo sapiens* are believed to have emerged around 300,000 BP (Galway-Witham and Stringer 2018). Behavioral complexity arose even earlier, around 320,000 BP (Gibbons 2018). The use of fire also comes up earlier in the timeframe of human evolution; instead of the original 400,000 BP date, scientists now believe that fire-use began around 1,000,000 BP (Berna *et al*. 2012). The timeline, therefore, requires continuous updates as new knowledge is acquired. As a result, the abductive process in qualitative methods became crucial in this portion of the timeline's meta-analysis.

Phase III: Data categories

During data collection, ideas and events emerged as two categories of timeline entries. They closely align with 'common sense codes' which help to explore patterns among general topic-related categories (Kelle 2007). The 'event' category refers to a significant moment in human history which affected the human-environment relationship in some way. The major oil spill in January and February of 1969 in the Santa Barbara Channel is an example of an event. An 'idea' refers to the emergence of the publication of a concept that influenced the way people think about the human-environment relationship. The term "Spaceship Earth," which was popularized in the 1960s, is an example of an idea (Boulding 1966). They represent two categorical dimensions of the timeline. Ideas and events are loosely-defined terms; their meaning often depends on the individual's perspective and objectives. This section provides

general descriptions of each, as well as an explanation for why they were included in data collection.

An idea is a timeline category because of the ability of new ideas to influence human-environment thinking through time. Glacken (1967) orients the historical development of human-environmental ideas according to these key themes. In his concluding remarks, Glacken reflects on the "striking fact that virtually every great thinker who lived within this 2300-year period had something to say about one of the ideas, and many had something to say about all of them" (713). When human-environment scholars consider these ideas in their research, they are, to paraphrase Glacken (706), effectively throwing their own pebbles (ideas) into the water, causing a ripple effect which may or may not interfere with the ripples caused by other pebbles. As more pebbles are tossed into the pond, the ripples become overwhelming and obscure the ideas from which they originated. Thus, the history and synthesis of ideas to isolate the signal from the chaotic interference remains integral to the study of the human-environment identity.

An idea comes in a variety of representations. An idea can be a plan, scheme, method, ideology, opinion, conviction, principle, notion, fancy, conception, thought, supposition, entity, or meaning, among numerous other synonyms and descriptors (Merriam Webster 2018b; Cambridge 2018b). Ideas are concepts that change, add to, or reinforce the way people think about the world. They can be examined, taken apart, and assessed in relation to other ideas.

Ideas also have the power to transform collective knowledge and behavior. According to Malcom Gladwell (2002), a social tipping point happens when an idea catches on and spreads like wildfire through human society. Gladwell outlines three circumstances that lead to a tipping point. First, tipping points occur when a small group of dedicated individuals work to promote an idea (the "Law of the Few"). Second, ideas need to have a "Stickiness Factor", which means

that they must resonate with human culture. Third, ideas require the right context, or assemblage of socio-environmental factors, in order to reach a tipping point. Transformative ideas are strong motivators of societal change.

The "idea" category provides a historiographical dimension to the human-environment timeline. Merchant (1981), Worster (1994), Hay (2002), and de Steiguer (2006) are four scholars who have illustrated the complexity of human-environmental thought as it evolves and diversifies through time. Those ideas can be as singular as a niche publication, such as White Jr.'s (1967) "The historical roots of our ecological crisis," or as momentous as a revolution in human-environment thinking, such as the Age of Ecology (Worster 1994) or the Anthropocene (Crutzen 2002). In the context of this qualitative meta-analysis, *a human-environment idea is defined as any concept, discovery, or publication that has influenced how people perceive and reason about the human-environment relationship*. Examples of ideas include Carl Sauer's morphology of landscape (1925), the "pristine myth" of nature (Denevan 1992), as well as knowledge concepts in environmental management and policy (Zimmerer 2017). In addition, important pieces of legislation, such as the Clean Air Act, are ideas that produce an event—the passage of legislation. Those ideas are catalogued when they become a reality.

The second category, the event, serves to document actual experiences of the human-environment relationship on the timeline. Like an idea, an event is open-ended. In historical terms, an event can refer to a significant outcome or happening in a place during a moment or period of time (Merriam Webster 2018a; Cambridge 2018a). In Earth systems science, an event can mean an "intermittent, relatively short-lived process, commonly of high magnitude or energy, with characteristics that vary markedly from normal background conditions" (Owen 2012, 382). In systems science, an event is a disturbance to a system which changes its

characteristics. On the geological timeline, the duration of such happenings is relative to the scale of time and can range from hours to millennia (Owen 2012).

When placed side-by-side in the dataset, events and ideas appear to influence one another through time. A sliver of time becomes filled with inventions, innovations, laws, treaties, discoveries, environmental disasters, resource crises, creative expressions, and social movements. All of these occurrences inform the human-environment relationship through time. The 1970s, for instance, contains a wealth of ideas and events that related to one another (Figure 3.3). Events include the establishment of the U.N. Man and the Biosphere Program in 1971, the oil crisis triggered by the Organization of the Petroleum Exporting Countries (OPEC) in 1973, the Chinese Tangshan earthquake in 1976, and the declaration of New York's Love Canal as a public health hazard in 1978. Within the same decade, fresh ideas emerge from leaders in politics, academics, and society. Such ideas include Meadows and colleagues' (1972) *Limits to growth*, Schumacher's (1973) *Small is beautiful*, Germany's "Blue Angel" environmental certification strategy, and the U.S. Supreme Court's ruling in *Philadelphia vs. New Jersey*, in which the U.S. Commerce Clause is used to prohibit the importing of garbage into New Jersey from Philadelphia. The combination of ideas and events onto one timeline creates a dynamic and multidimensional representation of the human-environment relationship.

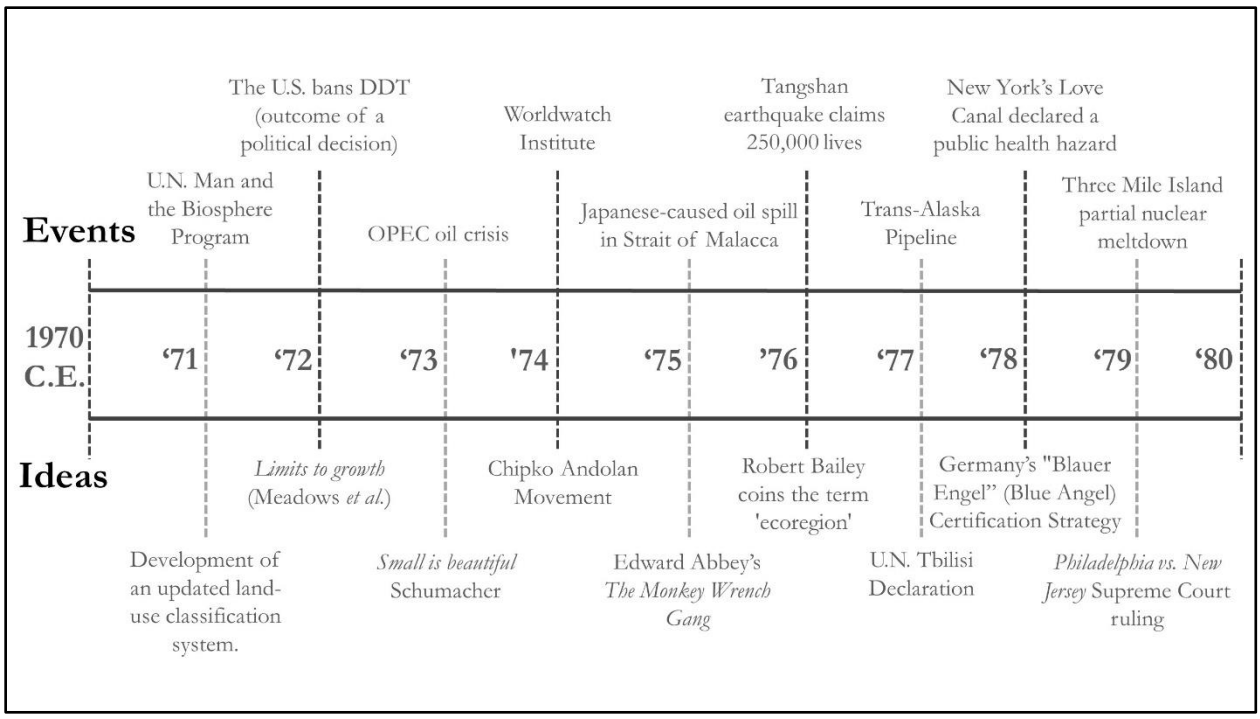


Figure 3.3: Human-environment ideas and events during the 1970s (Source: Author).

For the purposes of this qualitative meta-analysis, *a human-environment event is defined as a significant occurrence in time that affects the human relationship with the environment*. An event focuses on the human timescale, rather than the geological. For the most part, events on the human timescale transpire for less than one year. Longer durations open the possibilities for generalization in the form of a time period. An event gains inclusion if it specifically relates to the intersection of humans and the environment. Events, therefore can include anything from Hurricane Katrina, to the domestication of animals, to the Rio Earth Summit of 1992, to the global oil crisis of the 1970s.

During the coding process, the distinction between ideas and events became more nuanced. Numerous entries can encompass both an "idea" and "event." In those instances, decisions were made to consistently categorize entries as ideas or events. In certain entries of the timeline, an idea may take priority of an event if both are present in the description. Those

decisions were made during the coding process. Table 3.6 provides some of the most prevalent instances when an entry would be labeled an idea.

Table 3.6: Examples of ideas for the human-environment timeline.

Idea	Rationale	Example
Significant publication or idea addressing the topic of the human-environment relationship	The timeline consists of a variety of publications that provide different dimensions of human-environment understanding. Publications of books, journal articles, and periodicals help to advance various human-environment knowledges. These publications form the basis of human-environment thinking.	• Ehrlich and Holdren's IPAT (1970 CE) • Rachel Carson's *Silent spring* (1962 CE) • Donella Meadows and colleagues' *Limits to growth* (1972 CE) • Gaia hypothesis by James Lovelock and Lynn Margulis (1972 CE)
Convention, summit, or conference	A convention, summit, or conference on the human-environment relationship often serves as the umbrella for a series of plans, strategies, agreements, and other ideas. As such, the conference itself is considered the embodiment of an idea or suite of ideas.	• 1946 CE International Convention on the Regulation of Whaling • 1979 CE Bonn Convention on the Conservation of Migratory Species • 1992 CE Earth Summit
Discovery, development, and refinement of a new concept; scientific, ecological, or social theory; or idea through exploration or research	The physical act of exploration or research is not considered an idea, but that process has a mental component. The conceptual knowledge gained from exploration can lead to ideas. These ideas are typically represented through a publication of the explorers' voyages and scholars' texts.	• Conception of evolution during Charles Darwin's voyage of the Beagle • Alexander von Humboldt's idea of nature during his travels through South America
Attribution of symbolic value toward the environment	Aspects of the environment can have symbolic meaning for humans. These values affect how humans think about their relationship with the environment.	• Around 4,800 BP, Sheng-Nung's identification of five sacred plants: *(cont'd)*

Idea	Rationale	Example
		soybean, barley, millet, rice, and wheat
System of ordering the human-environment relationship	Systems of order exist for how humans interact with and make sense of the environment. These systems are conceptual and become enacted through the passing of laws and regulations.	• Development of early cadastral systems of land organization • Latitude and longitude • Map projection • Land-use classification systems • Climate classification systems
Development of a new study or school of thought	Schools of thought are important influences on human-environment thinking. They can literally represent schools, but the ideas put forth by these schools of thought are prioritized.	• Ecofeminism in 1974 CE • Berkeley School of Geography in 1923 CE • Annales School of Historical Thought in 1923 CE
Passage of a law, treaty, initiative, program, series of standards, court decision, political maneuver, or legislation that invokes thinking about the human-environment relationship	A law, treaty, and piece of legislation encompass ideas and values which are introduced and enforced when enacted. These ideas can provide the foundation or represent the outcome of conferences, the establishment of organizations, and the creation of parks and reserves. The legislation itself is regarded as an idea promoting human-environment thinking. The law or treaty takes priority as an idea when an entry description also contains a conference, meeting, organization foundation, or park/reserve creation.	• Code of Hammurabi around 3,650 BP • Stockholm Treaty on Persistent Organic Pollutants in 2001 CE • India's Laws of Manu around 2,150 BP • U.S. General Mining Law in 1872 CE • The U.S. Supreme Court ruling on *Tennessee Valley Authority vs. Hiram G. Hill* in 1978 CE
Understandings of how environmental phenomena (*i.e.*, disease and illness, disasters) connect to the human-environment relationship	The understandings that arise from the discovery of environmental phenomena and diseases cue into how humans make sense of how their relation to the environment impacts health and other aspects of human life. As such, they can	• John Snow's discovery that cholera and London was a result of a contaminated water system *(cont'd)*

Idea	Rationale	Example
	be ideas that facilitate human-environment thinking.	• Discovery that mosquitos carry malaria in 1881 CE • Discovery of the greenhouse effect in 1827 CE
Literature and Film	Fictional and non-fictional literature and film are regarded as ideas when they convey certain aspects of the human-environment relationship.	• F.F. Coppola's *Apocalypse now* in 1979 CE • John Steinbeck's *The grapes of wrath* in 1939 CE • Walt Disney's *Bambi* in 1942 CE
Social Movements	Environmental movements are regarded as manifestations of ideas that have taken shape and diffused in society.	• Chipko Andolan Movement in 1974 CE • Environmental Justice Movement in the 1960s CE • Green Belt Movement in 1977 CE
Establishment of a religion	A religion orders the way its followers view the world, as well as how people from the outside perceive those worldviews. Therefore, a religion is an idea because it facilitates thinking and reasoning about the human-environment relationship.	• Establishment of Buddhism, Islam, and Christianity

Table 3.6 conveys the point that a human-environment timeline can consist of a variety of ideas. A human-environment idea can manifest in a social movement, conference, publication, a religion, film, book of fiction, law, court ruling, among others. The selection of ideas is subjectively based upon the researcher's rationale. Events contain similar gray areas. Table 3.7 describes the instances in which an entry on the timeline represents an event.

Table 3.7: Examples of events for the human-environment timeline.

Event	Rationale	Example
Invention of a new tool or instrument	An invention involves the creation of a material item which can stem from an idea. On the timeline, an invention is an event because it acts as a tool for human-environment interaction. The use of an invention does not have to facilitate thinking and reasoning about the human-environment relationship.	• Invention of the spinning jenny in 1765 CE • James Watt's steam engine in 1775 CE • Edmund Cartwright's power loom in 1787 CE • Michael Faraday's electric generator in 1831 CE
Construction of monuments	Monuments represent objects made by humans from resources in the environment, such as stone, wood, or metal. A monument can convey some idea about the human-environment relationship. If this idea is not made apparent in the entry description, then the construction of a monument is considered an event.	• Construction of megalithic structures in Northern Europe around 6,450 BP • Construction of the pyramids in Egypt
Exploration of a territory	An individual or group's exploration of a territory connects to the human movement to parts of the world that were previously unknown to them. These expeditions are events because they represent the physical act of exploring new lands, which is a form of human-environment interaction. Discoveries from these explorations can be considered ideas if they relate specifically to the human-environment thinking.	• Polynesian exploration of the Pacific in 4,450 BP • Captain James Cook's voyage across the Pacific Ocean from 1786 to 1779 CE • Viking exploration of North America in 1,050 BP • Charles Darwin's voyage to South America from 1831 to 1836 CE
Creation of writing systems, art, and maps	Writing systems, art (*i.e.* cave paintings), and maps are valuable mediums of communication about the human-environment relationship. Similar to monuments, they are described as events because they can facilitate, but not necessarily invoke, thinking about the human-environment relationship.	• Prehistoric cave art • Landscape painting techniques • Geographic information systems (GIS) • Digital maps; virtual globes *(cont'd)*

Event	Rationale	Example
Recording, observing, and measuring environmental phenomena	The development of records about environmental phenomena, such as climate, can cue into a human-environment idea. The act of measuring a process like climate does not become an idea until it is used to make a conceptual connection to some type of human-environment relationship.	• Records of Nile River heights in 5,000 BP • Records of climatic patterns in Ancient China • Records of animal vivisections in Greek manuscripts • Charles Keeling's 1958 beginning to measure atmospheric carbon dioxide in Mauna Loa
Establishment of an organization or think tank	This organization can be governmental or non-governmental. Organizations stem from ideas which can be introduced through legislation. For the purposes of this research, organization establishments are considered events on the human-environment timeline.	• National Audubon Society in 1905 CE • Civilian Conservation Corps in 1933 CE • Wilderness Society in 1935 CE • The Club of Rome in 1968 CE • International Fund for Animal Welfare in 1969 CE
Discovery of an environmental resource	Resources are constantly uncovered and created in the environment. Resource discovery is considered an event in the timeline of human-environment interaction.	• Discovery of uranium in 1789 CE • Plutonium in 1941 CE • Francesco de Larderel's discovery of a way to tap into Italy's geothermal energy resources in 1827 CE
Establishment of parks and nature reserves	The establishment of parks and nature reserves are often produced from the ideas espoused by legislation. The establishment of the parks themselves is viewed as the outcome of an idea and is considered an event in most cases. *Exception*: when the park or reserve is associated with a significant piece of legislation in the entry description.	• Italy's first national park, Gran Paradiso, in 1922 CE • Establishment of the Dominican Republic's first nature preserve in 1927 CE • Waterton-Glacier International Peace Park in 1932 CE
Establishment of funding programs and	Funds and campaigns provide monetary resources to produce research	• International Monetary Fund *(cont'd)*

Event	Rationale	Example
campaigns for human-environmental issues	on ideas relating to the human-environment relationship. The funds themselves are regarded as events.	• World Wildlife Fund in 1961 CE • International Fund for Compensation for Oil Pollution Damage in 1971 CE • Multilateral Fund of the Montreal Protocol in 1990 CE
An outcome of a political decision	An outcome of a political decision refers to the consequences that occur as a result of a political idea.	• In 1992 CE, around 70,000 farmers are evicted from Los Haitises National Park in the Dominican Republic. These evictions are a result of the green militarization techniques imposed by the government of the Dominican Republic.

Table 3.7 details the reasons for categorizing an entry as an event. A human-environment event can consist of funds and campaigns, resource discoveries, expeditions, inventions, and the construction of monuments. The rationales in Tables 3.6 and 3.7 identify cases in which a need exists to prioritize an idea over an event, or vice versa. During the initial coding process, these aspects of the raw data were accommodated.

Phase IV: Timeline Periodization

Phase IV involved the periodization of the human-environment timeline. This step entailed using more focused and theoretical coding to divide the collection of ordinal data into a hierarchy of thematic time periods (see Charmaz 2006; Figure 3.4). The process depended on the researcher's interpretation of and familiarity with the dataset. Dey (2007, 168) notes, "Categories emerge initially from a close engagement with data, but can achieve a higher level of

abstraction through a process of 'constant comparison' which allows their theoretical elaboration and integration." Through constant comparison, relevant categories emerged through the interpretation of timeline entries.

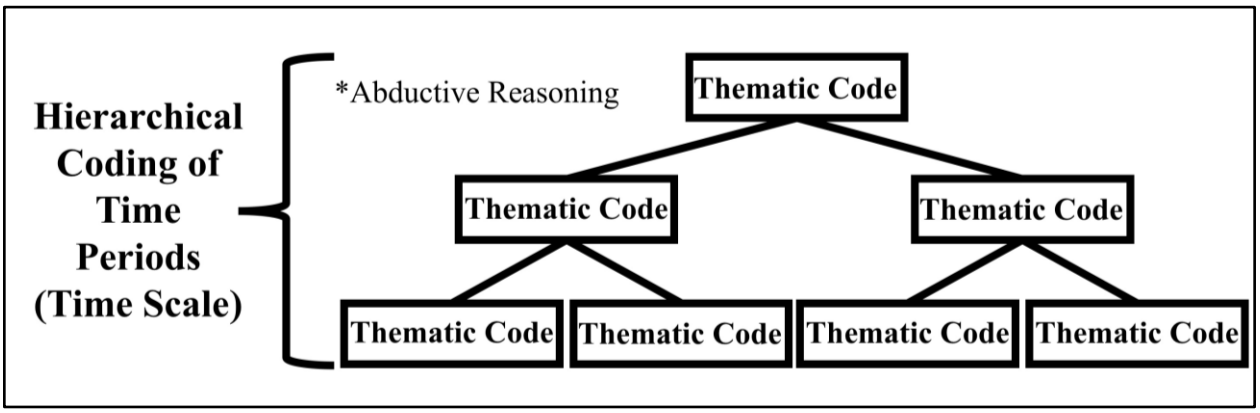


Figure 3.4: Conceptual diagram showing the interrelation between the timeline's hierarchical and thematic coding (after Kelle 2007). Each time period was assigned a hierarchical code based on the time scale it represented, as well as a unique thematic code that served as its overall title. Abductive reasoning was employed in both coding instances.

Focused and axial coding were developed in conjunction with the thematic coding. Focused coding refers to the process of using more specific codes to synthesize larger sets of data; axial coding expands to consider sub-categories (Charmaz 2006). The combination of focused and axial coding helped to provide periods at different time scales with a synthesis that best communicated the thematic context of the timeline entries. Through these codes, a storyline was built following the arc of grounded theory analysis (Birks and Mills 2011). To document this process, an overarching narrative was built through examining how themes in time transitioned to new themes (see Lempert 2007). A summary of that narrative is presented in the fourth chapter.

In order to support abductive reasoning, the researcher triangulated the themes emerging time periods with outside scholarly books and articles of relevance relating to the human-environment relationship. This inclusion had two purposes: 1) cross-reference the theme for

each time period to demonstrate its empirical significance and 2) provide additional resources which might reinforce the grounded theory development (see Kelle 2007). These references were reviewed, and their respective citations were added to the time period in question.

As temporal and thematic patterns emerged from the dataset, the researcher generated a set of theoretical codes—codes which connect to one another in some way—to establish a hierarchical typology of time periods (see Charmaz 2006). That typology serves as the underlying structure and organization for the timeline. The generation of this main structure was triangulated with literature on the nature of time periods, ideation, and critical transitions in nature-society relations (*e.g.*, Gladwell 2002; Scheffer 2009). Chapter 4 discusses the typology in detail.

By its definition, this abductive process includes both inductive and deductive approaches, which opens it up to constructive criticism from multiple perspectives. Over time, scholarly advancement of a human-environment timeline will benefit from the thoughts and suggestions for improvement from others familiar with the subject matter. Following the initial synthesis of the events and ideas into a timeline, a subsequent phase involved interpretation and critique of the timeline from different ways of knowing.

Phase V: Descriptive Statistics

After the coding and periodization occurred, statistics were used to describe some features of the data collected, coded, and periodized for the human-environment timeline. Specific statistics indicate the number of entries from each encyclopedia, whether they are events or ideas, numbers of entries during various time windows, etc. These statistics are necessary to understand four aspects of the timeline: the quantity of data along the human-environment timeline, time ranges where clusters of data occur, the categorical proportion of events to ideas,

as well as the extent to which knowledge is added or reinforced through the addition of each encyclopedia. The goal of these descriptive statistics is to obtain a general understanding of the character of the dataset and the relative importance of idea and events from different time periods. The numbers give a sense of the quantity of knowledge that the four encyclopedias contribute toward the human-environment timeline. In keeping with the objectives of qualitative meta-analysis, the statistics happened after the fact and had no influence on the generation of the timeline (Levitt 2018).

Phase VI: Interpreting the Timeline

Phase VI was a deductive endeavor that involved interpreting the human-environment timeline from the perspective of normal science, cultural ecology, political ecology, and humanistic geography. The method of interpretation is related to the study of hermeneutics, which focuses on the comparative understanding of different ways of knowing (Yanow and Schwartz-Shea 2006). More specifically, hermeneutics deals with the systematic, empathetic inquiry of "the cultural artifacts people created and vested with their values, beliefs, and/or sentiments—that is, the material manifestations or objectifications of mind…rather than consciousness itself" (Yanow and Schwartz-Shea 2006, 15). For instance, Glacken's (1967) *Traces on the Rhodian Shore* could be interpreted as an artifact for how people have made sense of the human-environment relationship over time.

This study used an abductive exploration of encyclopedia entries to create a human-environment timeline. That approach opens the timeline to scrutiny from different points of view. Phase VI intended to do just that: the interpretation of the human-environment timeline from different modes of knowing. The concept stems from a Bousquet *et al.* (2015) paper in *Global Environmental Change*, entitled "The PISA grammar decodes diverse human-

environment approaches." In this paper, the authors document how four different schools of human-environment scholarship—political ecology, vulnerability, resilience, and commons-complexity science—approach issues of environmental management. The authors find that the four schools have a shared vocabulary of power, incentives, systems, and adaptation (PISA) to approach topics of human-environmental change. What makes the schools different is the degree to which each element of PISA is prioritized over the others. While the authors observe considerable overlap among the schools of thought, Bousquet *et al.* (2015) also acknowledge value in their distinctiveness. This distinctiveness is what adds value when different human-environment epistemologies interpret the timeline.

This final interpretive phase sought to point out some of the issues with the proposed timeline and suggest how the timeline might look when viewed, for example, from the perspective of a political ecologist. This section briefly summarizes the four ways of knowing and explains the reasons behind selecting each one. These four ways of knowing can be divided into two groups, science and social theory (Figure 3.5). Overlaps exist between these dyads, and perspectives can change according to the research. Chapter 5 elaborates on each way of knowing more deeply and identifies general themes that orient each way of knowing. It is important to note that these schools of thought contain multiple definitions and conceptual intersections.

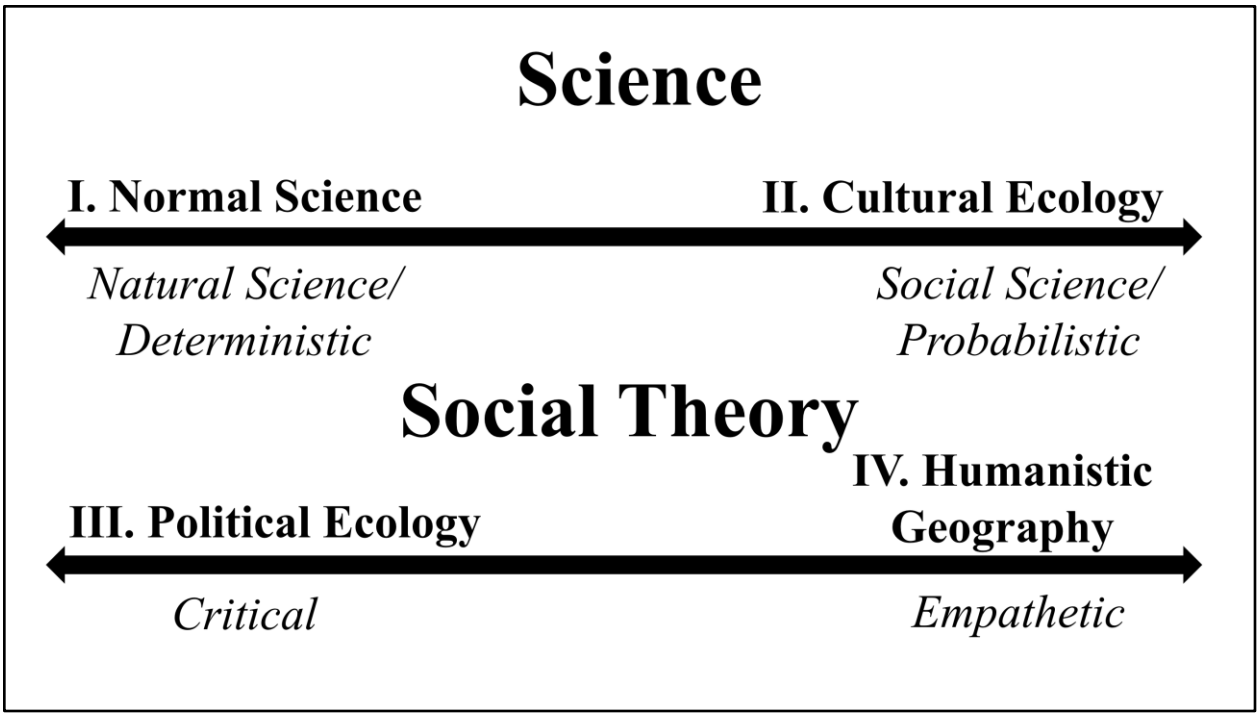


Figure 3.5: Four ways of knowing in relation to one another (Source: Author).

Normal Science

Within the natural and social sciences, there is a spectrum between the natural and social sciences. The natural sciences tend to focus on the physical processes that determine a certain outcome of human-environment interaction. Normal science, in its traditional sense, best fits this part of the spectrum (Kuhn 1962). Its counterpart in this interpretive study, cultural ecology, takes on a more social scientific perspective. While both normal science and cultural ecology have commonalities, their traditional meanings emphasize different aspects of the human-environment relationship.

Normal science is a term used by Thomas S. Kuhn (1962) in *The structure of scientific revolutions*. It refers to a state of scientific thought in which there is a relatively stable paradigm of generally-accepted or taken-for-granted scientific theories, laws, tools, applications and ideas. That paradigm functions as a foundation from which to explore new frontiers of research.

Without that paradigm, researchers face the tedious problem of continually justifying their research practices in order to explore new scientific phenomena. For example, Kuhn uses the illustration of a scientists studying the nature of physical optics before the discoveries of Isaac Newton:

> Being able to take no common body of belief for granted, each writer on physical optics felt forced to build his field anew from its foundations. In doing so, his choice of supporting observation and experiment was relatively free, for there was no standard set of methods or of phenomena that every optical writer felt forced to employ or explain (1962, 13).

Normal science deduces its discoveries based upon what it has already uncritically assumed to be true. Criticism and disproval of those ideas, Kuhn argues, leads to a crisis in scientific thought. A skeptical view of established ideas has characterized normal science and subsequent scholars have tested ideas and added new insights over time using the methods of induction, deduction, modeling, and most recently eScience methods. Development of ideas and conceptual models of lithospheric plates and plate movement in geology provides one example. If the process results in a new way of thinking (*i.e.*, a new paradigm), then a scientific revolution has occurred. There is ongoing speculation as to whether or not normal science incorporates social sciences. For the most part, the Kuhnian normal science perspective has tended to favor the natural sciences (*i.e.*, chemistry and biology), even though the idea has been appropriated to parts of the psychological and behavioral sciences (Peterson 1981). Normal science provides a baseline perspective in this study because it has been used in the development of much about what humans know about their physical relationship with the natural world.

Cultural Ecology

At the other end of the spectrum is the more probabilistic social sciences, in which humans have the capacity to influence their environment (Sprout and Sprout 1965). Cultural

ecology, or human ecology, is the study of the variation of human responses and adaptations to the environment. Cultural ecology has its origins in the early-modern history of geography (*i.e.*, Alexander von Humboldt and Karl Ratzel) but is solidified as a field of geographic study in the 20th Century through the proliferation of ideas from geographers, such as Harlan Barrows' (1923) "Geography as human ecology" and the Berkeley School led by Carl O. Sauer. It started as a disciplinary link between geography and anthropology but has expanded in its interdisciplinarity to areas of biology, political science, and others (Grossman 1977; Turner 1989; Zimmerer 2007). Cultural ecologists and others continue to reinterpret and challenge ideas as new human-environmental contexts emerge (Zimmerer 2006; Head 2010).

This study elected cultural ecology because the school has served both as a research specialty in geography and as an interdisciplinary form of synthesis for the human-environment relationship (Turner 1989). While the perspective has not necessarily dominated, it at least has helped inform two landmark stock-takings for the human-environment relationship: *Man's role in changing the face of the Earth* (Thomas *et al.* 1956) and *The Earth as transformed by human action* (Turner *et al.* 1989). Cultural ecology is unique among the four ways of knowing because this approach to study examines the human timescale at a broad conceptual level. It has been a leader in the examination of how people have co-evolved with the environment through time through the development of new technologies and forms of living in the environment—from leveraging fire and making stone tools to building civilizations and advancing modern industry (Knapp 2017). As such, cultural ecology's combination of science and culture has allowed it to have one foot in the realm of the natural sciences, where normal science has typically resided, and another in the realm of socio-cultural theories (Zimmerer 2006; Zimmerer 2007).

Political Ecology

On the social theoretical side, there is a spectrum between critical and empathetic ways of knowing. During the last part of the twentieth century, geography saw the development of new ways of knowing based upon various social theories (Unwin 1992). Two such perspectives include political ecology and humanistic geography. Political ecology is a critical perspective which problematizes issues of power in nature-society relations (Vaccaro, Beltran, and Paquet 2013), while humanistic geography takes on a more empathetic outlook that seeks to identify unifying ways of being in the world (Seamon and Lundberg 2017).

With foundations in Marxist and critical social theory, political ecology is the study of how political and social institutions use power to control the use of natural resources. According to Robbins (2011), political ecology is a critical response to so-called *apolitical* ecologies. The apolitical explanation relies on quantitative, scientific methods to understanding the dynamics of human and natural systems (*e.g.*, normal science and aspects of cultural ecology) (Turner and Robbins 2008). Political ecologists denounce ideas like the IPAT equation (human impact on the environment is a function of population, affluence, and technology; Ehrlich and Holdren 1971), the tragedy of the commons (Hardin 1968), limits to growth (Meadows *et al.* 1972), and the environmental Kuznets curve (Grossman and Krueger 1991). From the political-ecological perspective, these ideas are flawed because they do not factor the social and political influences of private institutions, states, and non-governmental organizations. According to Vaccaro, Beltran, and Paquet (2013, 256), political ecology "defines the environment as an arena where different social actors with asymmetrical political power are competing for access and control of natural resources."

Political ecology as a way of knowing is used in this study because it provides an important alternative to the determinism of physical science, possibilism of cultural ecology, and the empathetic nature of humanistic geography. Political ecology also has a distinctive perspective on the human-environment relationship through time because it focuses on the period after states and industrial civilizations have developed, especially after capitalism and modernization transform the global political economy. This scholarly perspective is also one of the youngest and quickly-growing ways of knowing in human-environment geography (Zimmerer 2006; Zimmerer 2007; Zimmerer 2017).

Humanistic Geography

Humanistic geography attempts to understand the lived meanings of the human condition in relation to the environment (Tuan 1976). This area of study, which developed significantly in the 1970s and has advanced since that decade, provides a scholarly alternative to the quantitative revolution and draws from phenomenology and existentialism. Humanistic geography serves an intellectual medium to make sense of the unique experiences that humans have in their everyday interactions with places (Tuan 1976). With books like Yi Fu Tuan's *Topophilia: A study of environmental perception, attitudes, and values* (1974), humanistic geography helped build the capacity for studying human perception of the environment (Mikesell 1978).

Humanistic geography represents one of the less-appreciated perspectives of the human-environment relationship. After the 1970s, humanistic geography was largely overshadowed by radical and critical trends in geographic research. Largely pushed out of its home discipline, humanistic geography saw much of its developments after the 1980s coming from philosophy, architecture, environmental history, psychology, and urban planning (Seamon 2015). Its usefulness as a way of knowing in this array of theoretical and applied approaches provides a

worthwhile perspective for interpreting the human-environment timeline. Humanistic geography also offers an empathetic distinctiveness when compared to the critical viewpoint of political ecology and the objective outlooks of normal science and cultural ecology.

Phase VI of this research makes the point that there is more than one way to create, interpret, and critique the human-environment timeline. Normal science, cultural ecology, political ecology, and humanistic geography represent four significant perspectives, each with their distinct ways of thinking about the human-environment relationship through time. This development, combined with the abducted grounded theory analysis, allowed for the development of axioms for interpreting human-environment time periods.

Conclusion

In summary, the development of the human-environment timeline used grounded theory methods to build 'theory' in the form of time periods. This initial research expands further through the process of deductive interpretation and the creation of axioms for the interpretation of time periods. In future grounded theory research, theoretical sampling can be employed to test the results by examining how they hold up in a different situation or set of data (Birks and Mills 2011). The final chapter provides a summary of the work, addresses some of its limitations, and makes suggests for further inquiry. The chapter also considers how the process can be moved forward through a Human-Environment Timeline Working Group.

Chapter 4 - Assembling the Human-Environment Timeline

The previous chapters make three points in developing the human-environment timeline: (1) the informal geologic epoch of the Anthropocene can be expanded to create an anthrochronology of the human-environment relationship; (2) periodization can be employed in dynamic ways to represent the human-environment relationship; and (3) the abductive exploration of geographic encyclopedias can provide an initial conversation-starter for developing a timeline that better represents human-environment relationships.

Results from the inductive collection of human-environment ideas and events from four geographic encyclopedias are provided: Goudie's (2002a) *Encyclopedia of global change*, Robbins's (2007a) *Encyclopedia of environment and society*, Warf's (2010a) *Encyclopedia of environmental change*, and Matthews's (2014a) *Encyclopedia of environmental change*. From this grounded theory meta-analysis, a human-environment timeline and a hierarchical typology of time periods were composed to organize that data. This chapter presents the human-environment timeline and its hierarchical typology of time periods, describes the rationale for the inclusion and naming of each time period, and provides a statistical overview of the dataset for the human-environment timeline.

A Hierarchical Typology of Human-Environment Time Periods

A hierarchical typology of time periods emerged during the qualitative meta-analysis of geographic encyclopedias and reviews of the literature. A goal of this typology is to help organize the entries for the human-environment timeline into longer durations of time along with shorter sub-intervals. This objective derives from the orderly hierarchical typology of the geologic timeline, which consists of eons, eras, periods, epochs, and ages (Cohen *et al*. 2013). The geologic timeline's typology, however, is inappropriate for the much shorter human-

environment timescale. Important aspects of the human-environment relationship need to be conceptually connected to the proposed typology. Unlike the geologic timeline, a goal in developing the typology was to have the language consist of approachable terms that a wide audience can decipher.

The proposed timeline typology does not adhere to common conventions of dividing time. None of the time periods are simplified by multiples of ten, one hundred, or one thousand. The human-environment relationship does not accommodate for neat boundaries between, for example, 1800 CE to 1900 CE. Characteristics of a time period are more important than the timeframe they encapsulate. A geologic timescale, for example, may name time periods after influential regions of geologic study, such as the Greenlandian Age, Pennsylvanian Epoch, or Mississippian Epoch (Cohen *et al*. 2013). For the human-environment timeline, the proposed name for each time period relates to a significant idea or event in the evolving human-environment relationship. This dissertation proposes a timeline typology consisting of five levels: durations, duration revolutions, scenes, scene transitions, and intervals. These time periods interact similar to a lifeline, complete with pulses that rise as the human-environment relationship changes through time (Figure 4.1). Each proposed term is discussed individually and then as a group.

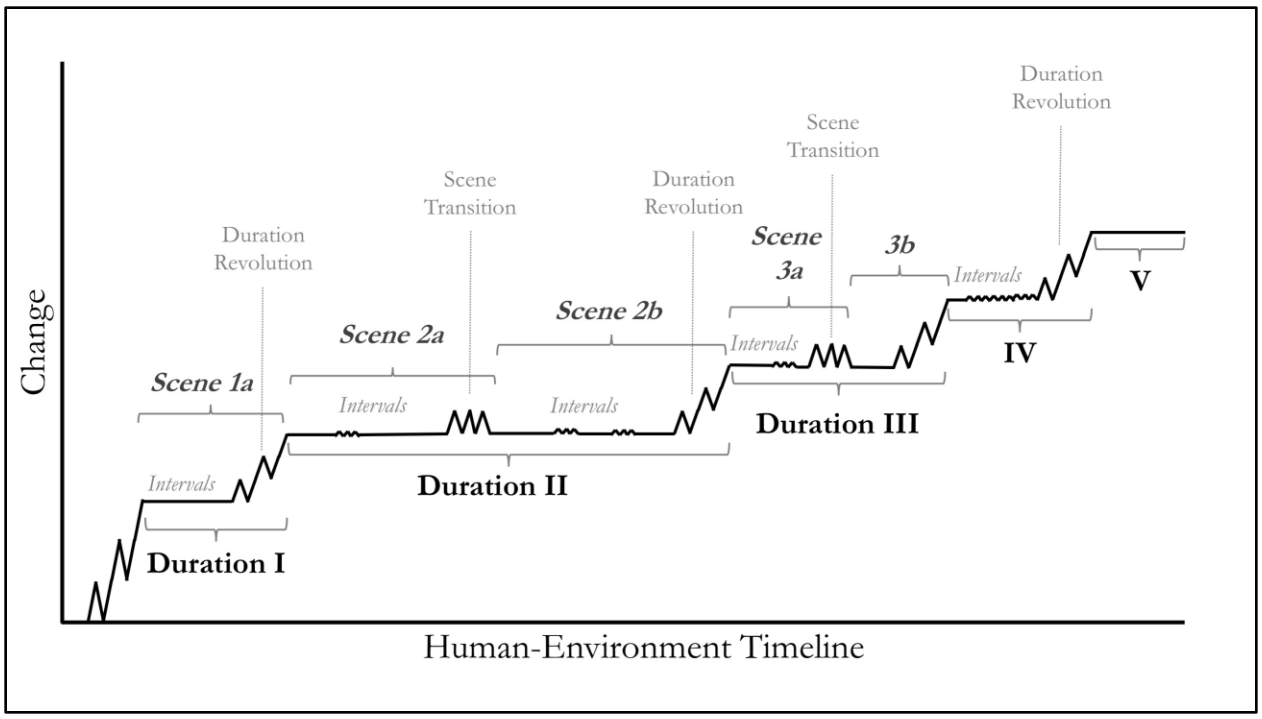


Figure 4.1: Conceptual diagram of the hierarchical typology for the human-environment timeline (Source: Author).

The duration level occupies the longest scale of time in the typology. The duration stems from the *Annales* School's idea of the *longue durée*. The *Annales* School was heavily influenced by French geographers Paul Vidal de la Blache and Élisée Reclus (Ferretti 2015). The *longue durée* holds that all significant changes in human history occur over extended periods of time. The concept has been applied in a number of research areas including world-systems theory (see Wallerstein 2004). Taking from the idea of the *longue durée*, the "duration" remains quasi-stable regardless of the innumerable events occurring in places around the world, as well as the major changes that create critical transitions at smaller scales of time.

The next duration occurs after a "duration revolution," when the entire human-environment relationship is transformed completely and irreversibly. Duration revolutions embody a perennial aspect of the relationship between humans and the environment; change, in other words, is long-term and repetitive (Gutkind 1956). Gutkind describes the relationship as an

ongoing struggle, “at times violent and sporadic, at others gentle and consistent, but forever demanding a new response to a new challenge” (1). This idea corresponds with Glacken’s (1967) point about how revolutions, like the Industrial Revolution, are additive and supplementary to the conditions that the period preceded; in other words, revolutions build upon past events, not break away from them. With that said, duration revolutions are set within the context of this timeline typology and may not reflect traditional conceptions of an Agricultural or Industrial Revolution.

A scene bears resemblance to a duration, only at a smaller time scale. Scenes are important sub-periods in the larger narrative of the duration. A change in scene occurs when some aspect of the human-environment relationship undergoes a tipping point or transformation. The “scene” idea originates from Castree’s (2015a) critique of the Anthropocene. The term Anthropocene is primarily temporal and disregards the geographic nature of the human-environment relationship. Castree recommends that the Anthropo*cene* be changed to the Anthropos*cene*. Some geographers tend to interchange “scene” and “landscape” in their studies. The use of the “scene” conjures images of spaces, places, and regions affected by a regime of human-environment interaction.

A “scene transition” is a regime shift to a new scene. The term comes from Scheffer’s *Critical transitions in nature and society*. Scheffer (2009, 105) describes critical transitions as “sharp shifts in systems driven by runaway change toward a contrasting alternative state once a threshold is exceeded.” The scene transition is meant to describe the conditions that lead to a shift in some aspect of the human-environment relationship.

Intervals are shorter time periods that occur within a scene without creating a critical transition to a new scene or duration. These time periods combine to help to form the thematic

characteristics, or the core, of a scene and duration. Multiple intervals can occur within the same scene.

This proposed typology helps begin the conversation for developing a human-environment timeline. A collection of significant events and ideas combines to create waves of small-scale characteristics in the human-environment relationship, called intervals. Larger waves may induce a change that leads to a transition to a new scene or a revolution between durations. The duration represents the overall meta-narrative for the human-environment timeline.

One of the problems with developing a temporal typology is determining how to account for lengthy pauses in the record. The scene and the duration act, more or less, as long-term thematic time periods in which an overall "stability" exists for the human-environment relationship. The characteristics of a time period will differ from duration to duration and from scene to scene.

The Human-Environment Timeline

The human-environment timeline requires visualization that complements the hierarchical typology described above. History can be mapped and visualized in different ways. As such, there is an assortment of options for how the human-environment timeline can be presented. At least three options are present: (1) distance or the yardstick, (2) a familiar time interval, such as a the 24-hour clock, and (3) a table or chart. The "yardstick" signifies a line that is divided by tick-marks that indicate transitions among time periods. This simple visual is what a typical timeline might represent. The yardstick, however, does not effectively account for multiple hierarchical levels associated with the time periods. The 24-hour clock has been an effective teaching tool to communicate the scale of deep geologic time by translating it to the

length of a day; humankind has been present for the "last fraction of a second" (Bjornerud 2018, 16). Diamond (1987, 66) demonstrates the effectiveness of the 24-hour clock as a communication tool for human history:

> Suppose that an archaeologist who had visited from outer space were trying to explain human history to his fellow spacelings. He might illustrate the results of his digs by a 24-hour clock on which one hour represents 100,000 years of real past time. If the history of the human race began at midnight, then we would now be almost at the end of our first day. We lived as hunter-gatherers for nearly the whole of that day, from midnight through dawn, noon, and sunset. Finally, at 11:54 p.m. we adopted agriculture.

Humans only occupy a fraction of geologic time (Bjornerud 2018). The 24-hour clock is an approachable option for representing the geologic time and scale in introductory geology lab exercises (Thompson 2018). The human-environment timeline could be illustrated in a similar concise, visually-appealing manner. On the other hand, the clock is more difficult to organize and understand as more time periods and entries are added to the timeline. "Busier" wedges of time, such as the period from 1950 CE to the present, would require being extracted and visualized separately. For the time being, the chart or table proved to be a good option because it can organize multiple hierarchies of time periods and accommodate for more information as the timeline changes and evolves as new information and perspectives are included.

The process of building the timeline began with the duration and ended with the interval. The resulting human-environment timeline can be found in Table 4.1. That timeline includes four durations: (1) Survival Duration, (2) Adaptation Duration, (3) Keystone Duration, and (4) Acceleration Duration. These timeframes vary in length and contain differing numbers of scenes, intervals, revolutions, and transitions. Each time period reflects in some way the characteristics of periodization illustrated in Chapter 2. First, time periods are tools for synthesis; they help to identify groupings or patterns in a diversity of events happening in

different places at varying geographic and temporal scales. Developing the human-environment timeline required the ability to inductively distinguish clusters within the dataset. Second, time periods are not static boundaries in history; they contain core and peripheral sets of characteristics that evolve and change as new perspectives and additional information emerges. The revolutions among durations and transitions among scenes in the timeline are examples of how periodization can take on dynamic qualities. Multiple stories, characteristics, and representations can be attributed to each time period; alternative periods might easily substitute for existing ones. Third, establishing time periods is a form of classification; the hierarchical typology is an example of how time periods can be developed to systematically organize and arrange large quantities of information. This section provides a general overview of the rationale behind the selection of each component of the timeline.

Table 4.1: The human-environment timeline.

Duration	Scene	Revolution/Transition	Interval
Acceleration Duration 1945 CE to Present	**Long Emergency Scene** 2014 CE to Present		
	Sustainable Development Scene 1992 to 2014 CE	**Planetary Boundaries Transition** 2009 to 2014 CE	
			Green Capitalist Interval 2002 to 2009 CE
			Ecosystem Services Interval 1995 to 2002 CE
			Agenda 21 Interval 1992 to 1995 CE
	Overshoot Scene 1975 to 1992 CE	**Sustainability Transition** 1987 to 1992 CE	
			Sagebrush Interval 1979 to 1987 CE
			Petrophilia Interval 1975 to 1979 CE
	Green Governance Scene 1970 to 1975 CE	**OPEC Transition** 1973 to 1975 CE	
			Earth Day Interval 1970 to 1973 CE
	Spaceship Earth Scene 1945 to 1970 CE	**Silent Spring Transition** 1962 to 1970 CE	
			Hiroshima-Nagasaki Interval 1945 to 1962 CE

(cont'd)

Duration	Scene	Revolution/Transition	Interval
Keystone Duration 6,000 BP to 1945 CE	**Wealth of Nations Scene** 100 to 5 BP	**Nuclear Revolution** 1939 to 1945 CE	
			Agro-Industrial Interval 24 to 11 BP
			Model T Interval 42 to 24 BP
			Conservation Interval 86 to 42 BP
			Railroad Spike Interval 100 to 86 BP
	Global Map Scene 340 to 100 BP	**Industrial Transition** 187 to 100 BP	
			Private Property and Commons Interval 340 to 187 BP
	Civilization Scene 6,000 to 340 BP	**Colonial Transition** 444 to 340 BP	
			Wayfaring Interval 1,600 to 444 BP
			Growth and Collapse Interval 4,950 to 1,600 BP
			Agricultural Impress Interval 6,000 to 4,950 BP
Adaptation Duration 320,000 to 6,000 BP	**Domestication Scene** 15,000 to 6,000 BP	**Agricultural Revolution** 15,000 to 6,000 BP	
	Ecumene Scene 320,000 to 15,000 BP		**Turtle Island Interval** 30,000 to 15,000 BP
			Animal Husbandry Interval 40,000 to 30,000 BP
			Out-of-Africa Interval 320,000 to 40,000 BP
Survival Duration 2,600,000 to 320,000 BP	**Pyro Scene** 1,000,000 to 320,000 BP	**Pyro Revolution** 1,000,000 BP to 320,000 BP	
	Forage Scene 2,600,000 to 1,000,000 BP		**Speciation Interval** 1,900,000 to 1,000,000 BP
			Evolutionary Interval 2,600,000 to 1,900,000 BP

Survival Duration

The Survival Duration lasts from 2,600,000 to 320,000 BP. It occupies the longest portion of timeline and has the least number of entries, around 0.18 percent (Table 4.2). During the qualitative meta-analysis, this duration and its sub-periods have a place because of their

qualitative significance to the human-environment relationship. This duration of the human-environment relationship is characterized by the gradual evolution of humans as they break away from their last common ancestors (LCA) to become the modern *Homo sapiens sapiens* (see Galway-Witham and Stringer 2018). Part of that evolution also entails finding food and shelter (*e.g.*, surviving) as a species, among other species, within the environment. This duration emphasizes the importance of evolution and survival in the initial unraveling of the human relationship with the environment.

Table 4.2: The Survival Duration of the human-environment timeline

<table>
<tr><th>Duration</th><th>Scene</th><th>Revolution/Transition</th><th>Interval</th></tr>
<tr><td rowspan="3">Survival Duration
2,600,000 to 320,000 BP
Entries: 4
0.18 %</td><td>Pyro Scene
1,000,000 to 320,000 BP
Entries: 1</td><td>Pyro Revolution
1,000,000 BP to 320,000 BP
Entries: 1</td><td></td></tr>
<tr><td rowspan="2">Forage Scene
2,600,000 to 1,000,000 BP
Entries: 3</td><td rowspan="2"></td><td>Speciation Interval
1,900,000 to 1,000,000 BP
Entries: 1</td></tr>
<tr><td>Evolutionary Interval
2,600,000 to 1,900,000 BP
Entries: 2</td></tr>
</table>

Two scenes are present. The Forage Scene depicts the time period when hunting and gathering become widespread, crude tools are being used, and the number of hominin species reach a peak in diversity (Shultz and Maslin 2013). That progression/transition is indicated by about 1,900,000 BP between the Evolutionary Interval and the Speciation Interval. *Homo sapiens sapiens* emerge and develop complex behaviors during the Pyro Scene (see Gibbons 2018), when fire begins to be used to transform the environment (see Berna *et al*. 2012). Stemming from the ideas of Pyne (2016), the Pyro Scene corresponds with the Pyro Revolution because the introduction of fire creates enough change (*i.e.*, a *critical mass* phenomenon) which

marks both the creation of new scene and also a major transition to a new duration. The adoption of fire as a form of human-environment transformation is a key threshold moment highlighted by the meta-analysis of the encyclopedias.

Adaptation Duration

Manipulation by the use of fire and the continued advancement of *Homo sapiens sapiens* result in the critical transition to the Adaptation Duration (320,000 to 6,000 BP). The number of entries increases to 3.1 percent (Table 4.3). Similar to the Survival Duration, this time period and its sub-periods are deemed qualitatively significant to the human-environment relationship, regardless of the number of entries that they contain. By 320,000 BP, anatomically modern humans (AMH) are materializing *en masse* from the various hominin species and are adapting to the environment. In the meta-analysis, this time seems to signal an end to the survival and a beginning to the adaptive practices of modern humans. The Adaptation Duration is one in which humans add to their foraging abilities, make innovations in toolmaking, and become more mobile (*e.g.*, venturing to new areas). With a larger population, humans also become increasingly dependent on the domestication of plants and animals. These practices provide the thematic core of the Adaptation Duration.

Table 4.3: The Adaptation Duration of the human-environment timeline

Duration	Scene	Revolution/Transition	Interval
Adaptation Duration 320,000 to 6,000 BP ***Entries: 68*** ***3.1 %***	**Domestication Scene** 15,000 to 6,000 BP ***Entries: 55***	**Agricultural Revolution** 15,000 to 6,000 BP ***Entries: 55***	
	Ecumene Scene 320,000 to 15,000 BP ***Entries: 13***		**Turtle Island Interval** 30,000 to 15,000 BP ***Entries: 3***
			Animal Husbandry Interval 40,000 to 30,000 BP ***Entries: 2***
			Out-of-Africa Interval 320,000 to 40,000 BP ***Entries: 8***

Two scenes exist for the Adaptation Duration. The Ecumene Scene refers to the period of time in which humans begin to expand their presence out of Africa and into Eurasia and the American continents (see Smith 2017). The term "ecumene" means the inhabited or known world. This theme is exemplified by two of the Ecumene Scene's three intervals: Out-of-Africa Interval (320,000 to 40,000 BP) and Turtle Island Interval (30,000 to 15,000 BP). "Turtle Island" is a traditional indigenous reference to the North American continent (see Black *et al*. 2014). Based upon the meta-analysis of encyclopedias, entries embodying the theme of movement overlap with entries describing the domestication of plants and animals. As humans spread across the scene, they begin to practice early forms of animal domestication during the Animal Husbandry Interval (40,000 to 30,000 BP). The Domestication Scene (15,000 to 6,000 BP) refers to the period when agriculture and animal domestication become widespread forms of human-environment interaction (McNeill 2014). Like the Pyro Scene, the Domestication Scene also corresponds with the Agricultural Revolution, which marks a large-scale change to the

Keystone Duration. With that said, it is important to note that the Agricultural Revolution aligns specifically to the meta-analysis and hierarchical typology developed in this research; the time period should not be confused with existing conceptual variations of an Agricultural Revolution.

Keystone Duration

The Keystone Duration (6,000 BP to 1945 CE) arises from the Agricultural Revolution and embodies the period in time when humans become a global keystone species (Ellis *et al.* 2013; Smith 2017). This duration of nearly six thousand years contains 39.34 percent of the entries on the timeline (Table 4.4). The Keystone Duration conveys the point when *Homo sapiens sapiens* begin to have a greater amount of influence on environmental conditions. The entries on the timeline take on a wider array of themes ranging from the growth and collapse of complex grain-based civilizations to the introduction of important laws for environmental conservation to the development of nuclear technology. The Keystone Duration starts after the extensive adoption of agriculture leads to the greater transformation of the global environment in forms that include deforestation and increased soil erosion (Williams 2003; Ellis *et al*. 2013).

Table 4.4: The Keystone Duration of the human-environment timeline

Duration	Scene	Revolution/Transition	Interval
Keystone Duration 6,000 BP to 1945 CE ***Entries: 862*** ***39.34 %***	**Wealth of Nations Scene** 100 to 5 BP ***Entries: 463***	**Nuclear Revolution** 1939 to 1945 CE ***Entries: 34***	
			Agro-Industrial Interval 24 to 11 BP ***Entries: 95***
			Model T Interval 24 to 11 BP ***Entries: 101***
			Conservation Interval 86 to 42 BP ***Entries: 181***
			Railroad Spike Interval 100 to 86 BP ***Entries: 52***
	Global Map Scene 340 to 100 BP ***Entries: 171***	**Industrial Transition** 187 to 100 BP ***Entries: 121***	
			Private Property and Commons Interval 340 to 187 BP ***Entries: 50***
	Civilization Scene 6,000 to 340 BP ***Entries: 228***	**Colonial Transition** 444 to 340 BP ***Entries: 38***	
			Wayfaring Interval 1,600 to 444 BP ***Entries: 62***
			Growth and Collapse Interval 4,950 to 1,600 BP ***Entries: 105***
			Agricultural Impress Interval 6,000 to 4,950 BP ***Entries: 23***

The Keystone Duration consists of three scenes which make up its narrative progression: the Civilization Scene, the Global Map Scene, and the Wealth of Nations Scene. The Civilization Scene (6,000 to 340 BP) traces the beginnings of agriculture's impact on soil erosion, human impacts on the patterns of flora and fauna on the landscape, and changes in the composition of the atmosphere (Ruddiman *et al*. 2015; Ellis *et al.* 2013). The core characteristics of this period are best expressed during the Agricultural Impress Interval (6,000 to 4,950 BP). Moving out of the Agricultural Impress Interval, complex nation-states co-develop alongside the new agricultural practices and begin intervals of development and environmental collapse, most notably during the Growth and Collapse Interval between 4,950 and 1,600 BP (see Diamond 2005 for examples). While there are multiple societies that flourished and collapsed before and after this time range, the Growth and Collapse Interval embodies key examples of the phenomenon (*i.e.*, the Akkadian and Mesopotamian civilizations) arising from the abductive meta-analysis.

The Wayfaring Interval (350 CE to 1506 CE) occurs as the act of exploration becomes a dominant form of human-environment interaction (see Boorstin 1983). Maritime travel is a means of exploring and then settling parts of North and South America. Around 350 CE, the Polynesians have already island-hopped their way to the west coast of the New World. By 900 CE, the Norse explore the northeastern portions of North America. Around 1340 CE, Ibn Battuta travels across North Africa (three times farther than Marco Polo's travels). By 1492, Christopher Columbus and others reach the New World. The Colonial Transition initiates in 1506 CE as sugar cane plantations spring up in the Caribbean. In 1507 CE, Martin Waldseemüller's map draws from the data collected by Amerigo Vespucci to depict the "Americas" and Asia as separate bodies of land (Wilford 1981). The use of Vespucci's first name as a toponym is an

example of European colonial transformations of Old and New World environments. From interpreting the encyclopedia entries, it appears as though the advances in mapping and increased colonial interactions results in a shift in the human-environment relationship.

During the Colonial Transition, the exchange of people, goods, flora and fauna, and diseases changes the nature of the global environment and the human relationship to it. The year 1610 CE marks a distinct downturn in global carbon dioxide levels, presumably due to the regrowth of forests in the Americas after mass numbers of indigenous people die from disease (Lewis and Maslin 2015). Between this "Orbis Spike" and 1850 CE, the global map becomes more refined and detailed as humans document and survey the Americas and other realms. The Global Map Scene features the Private Property and Commons Interval (1610 to 1763 CE), a period in which the ideas about the intellectual boundary between privately-owned areas and commonly-held property become more distinct in Western Society. During this time, scientific attitudes toward the environment gain prominence with the influence of thinkers like John Locke, Isaac Newton, Francis Bacon, and others. Outcomes for this interval influence the ways humans think about their relationship with the environment. The relationships between privatization, the commons, and environmental impacts aid Thomas Robert Malthus (1798 CE) to conceive *An essay on the principle of population*, which discusses the problems of environmental degradation as a result of increased population growth and agricultural production. The second part of the Global Map Scene includes the Industrial Transition, which occurs around the invention of the spinning jenny (1763 CE) and the steam engine (1775 CE). This "scene transition" documents the preliminary socio-environmental forces that instigate the industrialization of the human-environment relationship (Headrick 1990).

Capitalism's tenets of production and consumption become topics of embrace and criticism during this time (Chisholm 1990; Merchant 1990). Adam Smith, in particular, helps to advance capitalist ideas about human exploitation of nature for profit (Worster 1993; Worster 1994). Smith's *Wealth of nations*, written in 1776 CE, helps set the cadence for the shift to a new scene in 1850 CE, titled the Wealth of Nations Scene. The Wealth of Nations Scene represents a world that is transformed by capitalist, deterministic, and rationalistic perceptions of and interactions with the environment (Merchant 1980; Relph 1981). This time period includes four intervals which serve as its core themes from the meta-analysis. The Railroad Spike Interval (1850 to 1864 CE) occurs during the time when railroads become a primary mode of transporting humans and goods. The construction of railroads not only transports environmental resources, but the process also requires environmental resources (*i.e.*, timber, iron, and coal) to exist and function (Fiege 2012). As a contrast to the Wealth of Nations Scene's more capitalistic endeavors, key themes emerge in environmental ethics and decision-making. The Conservation Interval gains prominence around 1864 CE with the publication of George Perkins Marsh's *Man and nature*, which influences conceptions of how humans modify the Earth's surface. This interval embodies a shift in Western environmental thought and practice toward conservation (see de Steiguer 2006; Dant 2017). Following the Conservation Interval, the Model T Interval (1908 to 1926 CE) represents the Fordist influence of assembly lines and industrial manufacturing on human-environment interaction. That perception is translated to cultivation during the Agro-Industrial Interval (1926 to 1939 CE), which sees an increase in mechanized and chemical agriculture (see Headrick 1990). The Wealth of Nations Scene culminates with the Nuclear Revolution (1939 to 1945 CE), which occurs with the formation of research projects

relating to World War II and nuclear warfare (Fiege 2012). In the meta-analysis, the end of World War II denotes a sharp revolution to a new duration, the Acceleration Duration.

Acceleration Duration

The Acceleration Duration (1945 CE to present) follows the Keystone Duration. This duration contains more than 57 percent of all entries (Table 4.5). It relates to the Great Acceleration, a time period that coincides with recent research on the Anthropocene (see McNeill and Engelke 2014; Bjornerud 2018). Like the Great Acceleration, the Acceleration Duration starts after World War II when humans change from being simply a keystone species to accelerating the rate of their environmental impact (Thomas 1956; McNeill and Engelke 2014). The duration also represents an acceleration in technological innovations and the generation of information. For example, the above-ground detonation of nuclear weapons after the Nuclear Revolution transforms the radiative signature of Earth's geology. Bunge (1988, 1) writes, "The Big Bang is geomorphological in scale, not architectural; radiation is stellar in size, not radiographical; the doom is global by definition, not national." The second "Big Bang" signals the runaway change in the rate and extent of human-induced change of the Earth's surface. Among a number of runaway changes (see Steffen *et al.* 2015), population growth explodes and primary energy use increases, phenomena which coincide with upsurges in atmospheric carbon dioxide, ocean acidification, and global climate change. The socio-environmental forces of the Acceleration Duration trigger the development of new and reinterpreted ways of addressing problems about how humans are transforming the human-environment relationship (Lowenthal 1990). In the meta-analysis, the duration's sub-periods contain more connections to big ideas that appear in the encyclopedias and scholarly literature.

Table 4.5: The Acceleration Duration of the human-environment timeline.

Duration	Scene	Revolution/Transition	Interval
Acceleration Duration 1945 CE to Present ***Entries: 1257*** ***57.37 %***	**Long Emergency Scene** 2014 CE to Present ***Entries: 2***		
	Sustainable Development Scene 1992 to 2014 CE ***Entries: 375***	**Planetary Boundaries Transition** 2009 to 2014 CE ***Entries: 12***	
			Green Capitalist Interval 2002 to 2009 CE ***Entries: 86***
			Ecosystem Services Interval 1995 to 2002 CE ***Entries: 182***
			Agenda 21 Interval 1992 to 1995 CE ***Entries: 95***
	Overshoot Scene 1975 to 1992 CE ***Entries: 440***	**Sustainability Transition** 1987 to 1992 CE ***Entries: 147***	
			Sagebrush Interval 1979 to 1987 CE ***Entries: 173***
			Petrophilia Interval 1975 to 1979 CE ***Entries: 120***
	Green Governance Scene 1970 to 1975 CE ***Entries: 154***	**OPEC Transition** 1973 to 1975 CE ***Entries: 53***	
			Earth Day Interval 1970 to 1973 CE ***Entries: 101***
	Spaceship Earth Scene 1945 to 1970 CE ***Entries: 286***	**Silent Spring Transition** 1962 to 1970 CE ***Entries: 118***	
			Hiroshima-Nagasaki Interval 1945 to 1962 CE ***Entries: 168***

The Acceleration Duration covers five scenes: the Spaceship Earth Scene, the Green Governance Scene, the Overshoot Scene, the Sustainable Development Scene, and the Long Emergency Scene. The Spaceship Earth Scene (1945 to 1975 CE) incorporates the idea of "Spaceship Earth" proposed by Kenneth Boulding and Barbara Ward (Boulding 1966); it represents a time when modern society gains a clear sense of its impact on the Earth as its home (Worster 1994). Spaceship Earth also necessitates the need for humans to steer their current practices away from a global environmental collapse. During the Spaceship Earth Scene, the Hiroshima-Nagasaki Interval (1945 to 1962 CE) signifies the initial aftermath once U.S. President Harry S. Truman approves detonating the Little Boy atomic bomb in Hiroshima on 6 August 1945 and Fat Man in Nagasaki on 9 August 1945. The Silent Spring Transition ensues in 1962 CE when Rachel Carson exposes the environmental and health hazards caused by the human usage of DDT as a chemical insecticide (McNeill 2000; de Steiguer 2006). The publication on declines associated with birds becomes a catalyst for the environmental movement.

The Silent Spring Transition shifts to the Green Governance Scene (1970 to 1975 CE). This period is paradoxical. On one hand, the Earth Day Interval indicates the move toward the widespread institutionalization of environmentalism (Turner 2015). During this period, the United States passes a number of significant pieces of environmental legislation, such as the Clean Air Act (1970 CE), Clean Water Act (1972 CE), and Endangered Species Act (1973 CE). On the other hand, the Acceleration continues with the global trade of fossil fuel resources and other commodities from the environment. While new legislation is being passed and governmental organizations are formed, the Green Governance Scene is disrupted by the oil and energy crisis caused by trade embargos from the Organization of the Petroleum Exporting

Countries (OPEC). The OPEC Transition (1973 to 1975 CE) serves as a reminder of the human dependence on fossil fuel resources (Fiege 2012).

As such, the OPEC Transition conveniently leads to the Petrophilia Interval (1975 to 1979 CE) of the Overshoot Scene (1975 to 1992 CE). "Petrophilia" comes from the work of literary scholar Derek Gladwin (2018); it literally means "love of petrol." OPEC reveals the raw nerve of fossil fuel dependence (McNeill 2000). During the Overshoot Scene, the demand for environmental resources first exceeds the amount of resources that the Earth produces in a single year. The first Earth Overshoot Day is 31 December 1986. The Overshoot Scene combines the surpassing of the ecological footprint, a dire recognition of society's self-destructive dependence on oil, and an increase in the deregulation of the economy. After the Petrophilia Interval, the Sagebrush Interval (1979 to 1987 CE), named after the Sagebrush Rebellions of this era (Graf 1990; Dant 2017), encapsulates the fierce anti-government sentiments in the United States toward the regulation and management of the environment. Those ideas reflect greater trends in economic and environmental deregulation perpetuated by the Ronald Reagan and Margaret Thatcher administrations (McNeill 2000). The Overshoot Scene concludes with a turn toward the idea of sustainable development, especially following the 1987 Brundtland Report, *Our common future*. This publication is featured prominently in all of the encyclopedias and thus marks the beginning of the Sustainability Transition (1987 to 1992 CE), a period in which sustainability becomes a priority for discussion associated with proposed global development projects and human-environment thinking (Botkin 1990; Worster 1993).

The Sustainability Transition is bookended by the Earth Summit of 1992 CE, a prominent conference that is frequently mentioned in all of the encyclopedias. The United Nations Conference on Environment and Development, also called the Earth Summit, transpires during 3

to 14 June 1992 in Rio de Janeiro, Brazil. The Earth Summit instigates a socio-political tipping point in which sustainability is adopted as an international priority in diplomacy. That leads to the Agenda 21 Interval (1992 to 1995 CE) of the Sustainable Development Scene. Agenda 21 is one of the numerous agreements advanced by the Earth Summit. The Sustainable Development Scene (1992 to 2014 CE) occurs as the ideas of sustainable development transform conversations and documents addressing global environmental governance.

Complementary to the Agenda 21 Interval, the Ecosystem Services Interval (1995 to 2002 CE) identifies the commodification of environmental pollution and incentivization of sustainable environmental practices. The interval commences in the mid-1990s with publications by Robert Costanza and colleagues (see Costanza *et al*. 2017). Influenced by the ideas of Ronald Coase, the ecosystem services idea involves putting an economic price on the amenities that the environment affords for sustaining human survival and well-being. Examples include water resources, nutrient cycling, pollination, refugia, and food production. The Ecosystem Services Interval progresses to the Green Capitalism Interval (2002 to 2009 CE), a period when businesses and governments become aware of the economic benefits that addressing environmental risk can bring. The Stern Review (2006), a compendium on the costs of climate change, provides a relevant example.

As the timeline reaches closer toward the present, the abductive meta-analysis shifts to favor more deductive reasoning than inductive. Similar to the very beginning of the timeline, the frequency of events and ideas becomes less and less after around 2010. Because of this factor, the researcher draws heavily from high-impact scholarship on the human-environment relationship. The Green Capitalism Interval progresses to the next scene through the Planetary Boundaries Transition. The term, planetary boundaries, is coined by Rockström *et al.* (2009) to

embody the idea that there are natural planetary limits that can be associated with the Earth system. Aspects, such as climatic change, the nitrogen cycle, ozone depletion, ocean acidification, global freshwater use, and land use change have limits to which humans can interact with the environment without instigating unstable conditions.

The Planetary Boundaries Transition feeds into the current Long Emergency Scene. Orr (2016) designates the "Long Emergency" as the present environmental crisis that humans are encountering. The scene's beginning, 2014 CE, coincides with the fifth report of the Intergovernmental Panel on Climate Change (IPCC) and the publication of Elizabeth Kolbert's (2014) *The Sixth Extinction: An unnatural history*. The Long Emergency Scene sets a precedent for understanding the global environmental problems affecting the world during the Acceleration Duration.

Statistical Overview of the Dataset

Descriptive statistics give a general sense of the dataset. They were calculated after the qualitative meta-analysis was performed and had no impact on the periodization of the timeline. The statistics convey three aspects about the human-environment timeline. First, the human-environment relationship encompasses a significantly long period of time. Second, the encyclopedias tend to focus on more recent events and ideas. There is a significant reduction in the number of events and ideas available before the twentieth century. Third, multiple encyclopedias provide the needed data that effectively add and reinforce ideas and events along the human-environment timeline.

The first point provides just one answer to the question of where to begin the human-environment timeline. There is no agreed-upon date or boundary for when the human-environment relationship begins. Discussion about the Anthropocene in Chapter 1 indicates that

there are multiple scholarly suggestions regarding when that time period starts. Upon examination of the encyclopedias, it can be argued that the human-environment timeline begins at one of the earliest points of human evolution, around 2,600,000 BP. Humans are thought to have begun evolving from their Last Common Ancestors a little over 2.5 million years ago.

Examination of the four encyclopedias produced a total of 2191 entries, with 974 being ideas and 1,217 data elements representing events. Events tend to outnumber ideas throughout the human-environment timeline at varying degrees (see Figure 4.2a; Figure 4.3a; Figure 4.4a). The time range for total entries extends from 2.6 million years ago to 2014 CE. Within this dataset, ideas emerge around 4,803 BP and continue to the end of the data record at 2014 CE. Events arise around 2,600,000 BP and populate the existing data set up to 2012 CE. Within this range of anthro-centric time, multiple scales of time exist that account for certain periods of the human-environment relationship. Those scales become more apparent in the development of the hierarchical typology of time periods, which is addressed in the next section.

Second, the proportion of entries is lopsided by favoring the more recent past over the deeper past. Of the total entries, 187 occur before the Common Era (BCE) and 2004 occur during the Common Era (CE). Common Era events and ideas are therefore ten times more likely to be represented in the dataset. The results remain the same no matter how the entries are divided up into time ranges. The last 1000 years have more catalogued events and ideas than the rest of the years put together (Figure 4.2).

A)

Time Range	Events	Ideas	Total
Before 15,000 B.P.	18	0	18
15,000 to 14,000 B.P.	4	0	4
14,000 to 13,000 B.P.	1	0	1
13,000 to 12,000 B.P.	1	0	1
12,000 to 11,000 B.P.	5	0	5
11,000 to 10,000 B.P.	12	0	12
10,000 to 9,000 B.P.	7	0	7
9,000 to 8,000 B.P.	11	0	11
8,000 to 7,000 B.P.	10	0	10
7,000 to 6,000 B.P.	4	0	4
6,000 to 5,000 B.P.	22	0	22
5,000 to 4,000 B.P.	23	4	27
4,000 to 3,000 B.P.	21	3	24
3,000 to 2,000 B.P.	28	10	38
2,000 to 1,000 B.P.	25	6	31
1,000 B.P. to Present	1025	951	1956
Total	1217	974	2171

B)

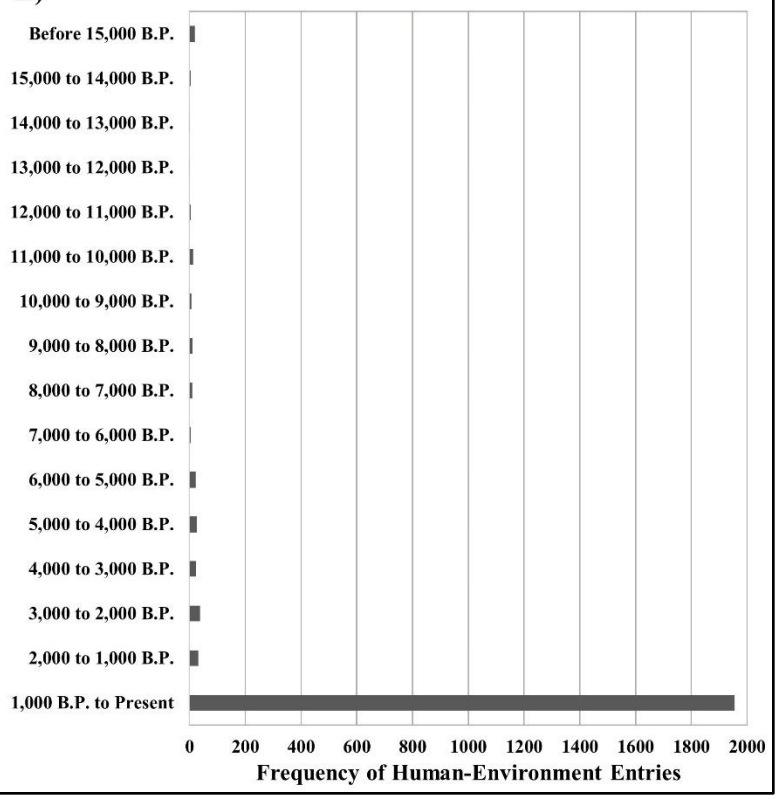


Figure 4.2: A) Tabular data on the frequency of events and ideas from 2,600,000 BP to 2014 CE and B) Bar graph of total human environment entries (Source: Author).

Moving beyond frequency, the proportion of ideas and events is disproportionately inclined toward the present age. Figure 4.3b displays the proportion of ideas and events in 500-year intervals from before 4,000 BP to 2014 CE. These graduated circles show a fair proportion of events and ideas emerging before 4,000 BP. The numbers do not increase through 500-year intervals until about 500 BP to 2014 CE—by that time, the proportion of entries engulfs all of the other timeframes before it. This illustration provides a sense of how large the gap is between the deeper past and the most recent past in terms of the number of human-environment entries.

A)

Time Range	Event	Idea	Sum
Before 4,000 B.P.	118	4	122
4,000 to 3,500 B.P.	13	3	16
3,500 to 3,000 B.P.	8	0	8
3,000 to 2,500 B.P.	8	3	11
2,500 to 2,000 B.P.	20	7	27
2,000 to 1,500 B.P.	14	4	18
1,500 to 1,000 B.P.	11	2	13
1,000 to 500 B.P.	29	10	39
500 B.P. to Present	996	941	1937
Total	1217	974	2191

B)

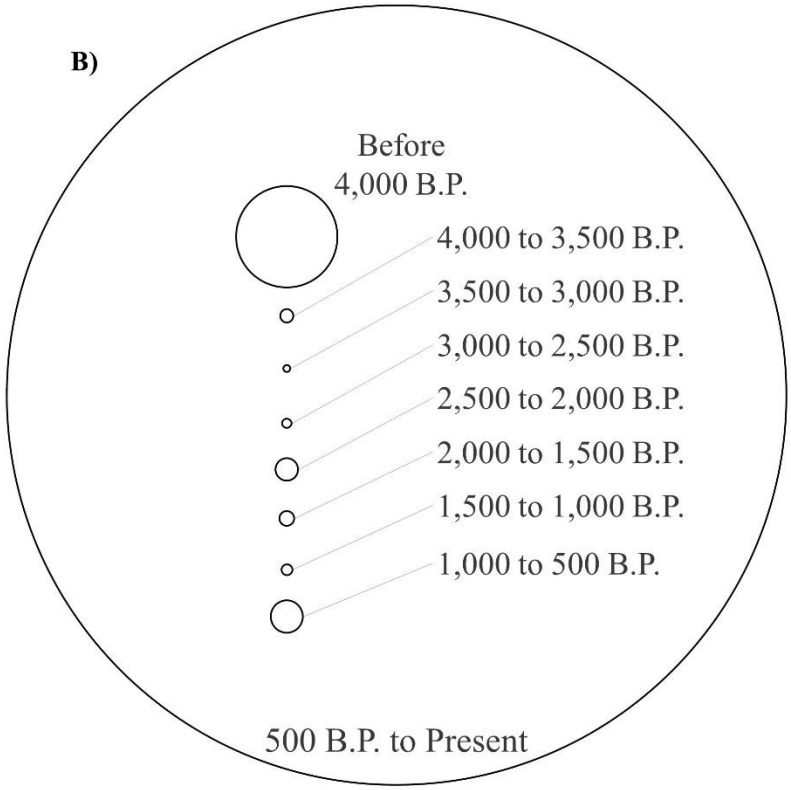


Figure 4.3: A) Tabular data on the frequency of events and ideas (from 2,600,000 BP to 2014 CE) in intervals of 500 and B) The proportion of total events and ideas along the human-environment timeline, in intervals of 500 years (Source: Author).

The gap continues to be pronounced when the scale shrinks to the period between 1000 BP and 0 BP (1950 CE) (Figure 4.4). In 100-year intervals, there is a gradual increase in the proportion of events and ideas from 1,000 BP to 100 BP. The time interval between 100 BP and 0 BP (1850 CE to 1950 CE) features more than 66 percent of all events and ideas combined for that 1000-year time series.

A)

Time Range	Event	Idea	Sum
1,000 to 900 B.P.	9	1	10
900 to 800 B.P.	6	2	8
800 to 700 B.P.	4	4	8
700 to 600 B.P.	7	1	8
600 to 500 B.P.	3	2	5
500 to 400 B.P.	23	4	27
400 to 300 B.P.	24	15	39
300 to 200 B.P.	14	12	26
200 to 100 B.P.	91	44	135
100 to 0 B.P.	328	191	519
Total	509	276	785

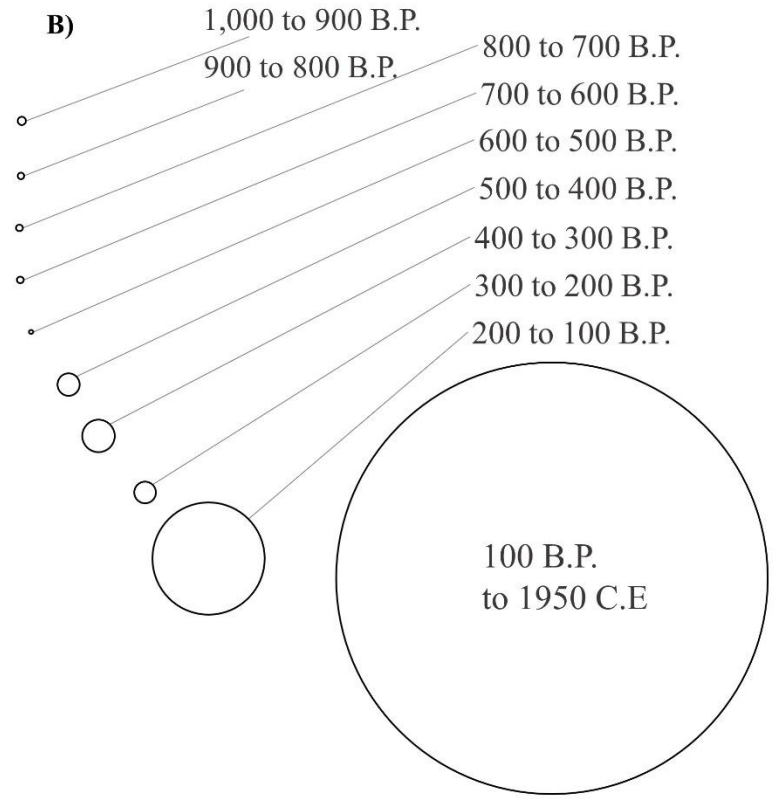


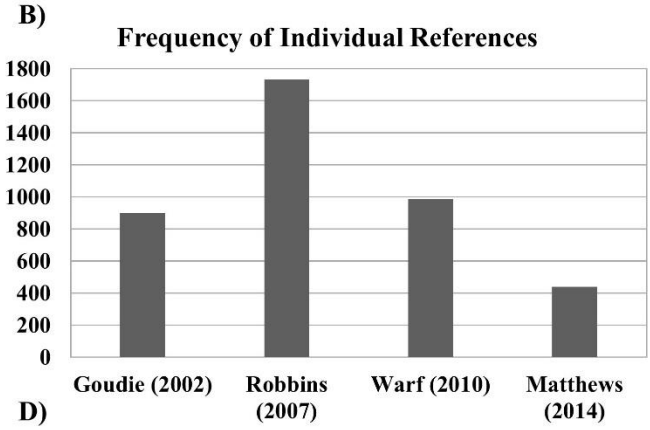
Figure 4.4: A) Tabular data on the frequency of events and ideas (1000 BP and 1950 CE) in intervals of 100 and B) The proportion of total events and ideas from 1000 to 0 BP (Source: Author).

Third, assessment of multiple encyclopedias works to add original entries to the timeline, as well as provide cross-references for certain events and ideas (Figure 4.5). References are defined as the individual essays, entries, and articles that comprise each encyclopedia. Some encyclopedias contribute more entries than others. The *Encyclopedia of environment and society* (Robbins 2007a) provides the majority of entries (44 percent) for the human-environment timeline, while the *Encyclopedia of environmental change* (Matthews 2014a) text contributes the least, around 12 percent. These figures are not intended to assess the value of each encyclopedia based on the number of entries it offers. As explained in Chapter 3, each resource has a specific purpose for this research. Rather, these statistics are meant to provide a general idea of where the timeline entries originate.

A)

Encyclopedia	# Individual References
Goudie (2002)	899
Robbins (2007)	1732
Warf (2010)	985
Matthews (2014)	439
Total	**4055**

B)



C)

Encyclopedia	# Timeline Entries Contributed
Goudie (2002)	611
Robbins (2007)	1240
Warf (2010)	618
Matthews (2014)	333
Total	**2191**

D)

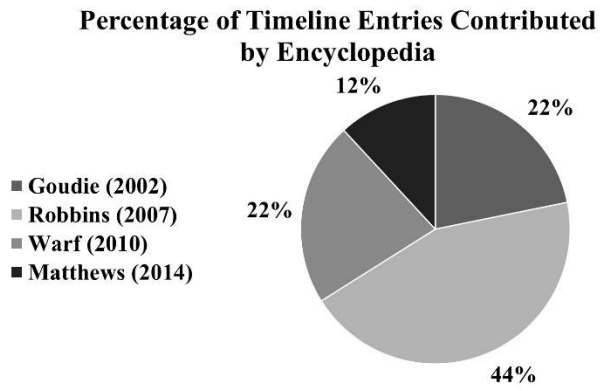


Figure 4.5: A & B) Tabular data on the frequency of individual references that each encyclopedia contributes; C) Frequency of timeline entries contributed by each encyclopedia; and D) Percentage of timeline entries contributed by each encyclopedia (Source: Author).

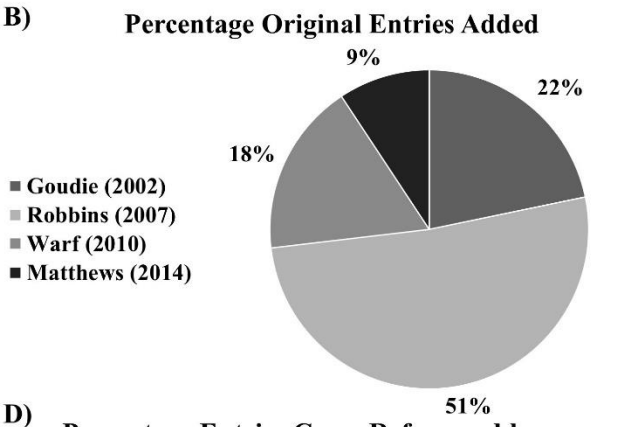
Each encyclopedia does add and reinforce entries on the human-environment timeline. A timeline entry can have more than one encyclopedia reference. Around 72 percent of the events and ideas have just one encyclopedic entry. Robbins (2007a) offers the most original, single-reference entries for the timeline (51 percent), with Goudie's (2002a) *Encyclopedia of global change* providing half as many (22 percent) (Figure 4.6a; Figure 4.6b). The encyclopedias reinforce the 609 timeline entries that contain multiple references, either from the same encyclopedia or multiple encyclopedias (Figure 4.6c; Figure 4.6d). Of the 609 multiple timeline entries, Robbins (2007a) reinforces 70 percent, Warf's (2010a) *Encyclopedia of geography*

contributes 56 percent, Goudie (2002a) adds to 44 percent, and Matthews (2014a) accounts for 31 percent.

A)

Encyclopedia	# Original Entries Added
Goudie (2002)	344
Robbins (2007)	813
Warf (2010)	278
Matthews (2014)	147
Total	**1582**

B)



C)

Encyclopedia	# Entries Reinforced (Out of 609)
Goudie (2002)	267
Robbins (2007)	427
Warf (2010)	340
Matthews (2014)	186

D)

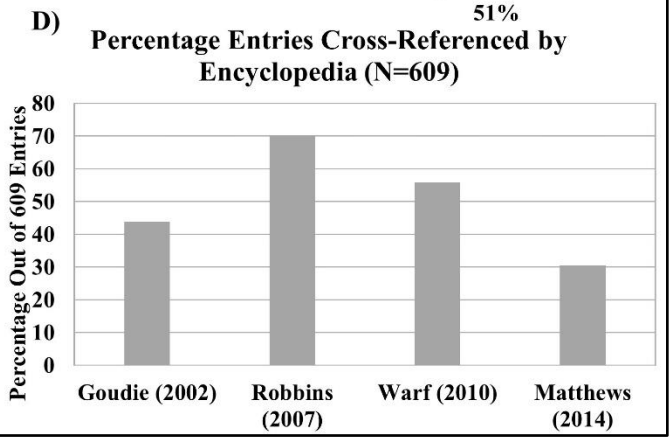


Figure 4.6: A) Tabular data on the frequency of single-reference entries added by each encyclopedia that no other reference includes; B) Percentage of original entries; C) Tabular data on the frequency of multiple-reference entries that each encyclopedia cross-references; and D) Percentage of timeline entries reinforced by each encyclopedia out of the 609 multiple-reference entries (Source: Author).

Some entries on the timeline were discussed more than others (Table 4.6). Table 4.6 provides a list of the ideas or dates that were alluded to the most in the encyclopedias. The list includes important conferences and agreements, such as the Montreal Protocol (1987 CE, 29 entries) and the Kyoto Protocol (1997 CE, 27 entries). Others represent publications that transformed the way people think and make decisions about the human-environment relationship, such as Rachel Carson's *Silent spring* (1962 CE, 23 entries) and Thomas Robert

Malthus's *An essay on the principle of population* (1798 CE, 21 entries). Environmental disasters also factor into this list, such as Chernobyl (1986 CE, 23 entries) and Hurricane Katrina (2005 CE, 21 entries). Of all the entries on the timeline, encyclopedia authors referenced the Earth Summit in 1992 CE the most, with over 55 cross-references.

Table 4.6: Timeline entries with the most encyclopedia references.

Rank	Date	Entry	# References
1	1992 CE	Earth Summit's development of Agenda 21, the Forest Principles, and the Rio Declaration on Environment and Development.	55
2	1987 CE	*Our common future*, or the Brundtland Report	30
3	1987 CE	Montreal Protocol	29
4	1997 CE	Kyoto Protocol	27
5	1775 CE	Industrial Revolution beginning	25
6	1962 CE	Rachel Carson's *Silent spring*	23
7	1986 CE	Chernobyl disaster	23
8	1994 CE	Framework Convention on Climate Change standards and objectives put into effect	22
9	1798 CE	Thomas Robert Malthus's *An essay on the principle of population*	21
10	1949 CE	Aldo Leopold's *A Sand County almanac*	21
11	2005 CE	Hurricane Katrina and New Orleans, LA	21
12	1972 CE	U.N. Conference on the Human Environment	19
13	14,000 BP	First Agricultural Revolution	18
14	1864 CE	George Perkins Marsh's *Man and nature*	18
15	1973 CE	Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	17
16	1992 CE	U.N. Convention on Biological Diversity	17
17	1859 CE	Charles Darwin's *On the origin of species*	16
18	1968 CE	Garrett Hardin's "The tragedy of the commons"	16
19	1985 CE	Vienna Convention for the Protection of the Ozone Layer	16
20	2004 CE	Tsunami on the Indian Ocean affecting Indonesia, Thailand, Myanmar, India, and Sri Lanka	16
21	1970 CE	U.S. National Environmental Policy Act (NEPA)	15
22	1973 CE	Organization of the Petroleum Exporting Countries (OPEC) oil and energy crisis	15
23	1988 CE	Formation of the Intergovernmental Panel on Climate Change (IPCC)	15

Rank	Date	Entry	# References
24	1872 CE	Yellowstone National Park Act	14
25	1934 CE	U.S. Dust Bowl	14
26	1969 CE	Gaia hypothesis by James Lovelock and Lynn Margulis	13
27	1972 CE	U.S. Clean Water Act	13
28	1989 CE	*Exxon Valdez* oil spill off the coast of Alaska	13

In sum, these descriptive statistics help visualize and quantify the nature of the compiled data from the encyclopedias. The addition of multiple encyclopedias is found to contribute more original entries and cross-references than one encyclopedia alone. As the cross-referencing became more frequent after reviewing the second encyclopedia, the researcher's confidence in reaching theoretical saturation increased (see Birks and Mills 2011). Ultimately, the four encyclopedias provided enough data for synthesizing the human-environment relationship into time periods.

Conclusion

This chapter introduces the features of a human-environment timeline. Choices for the timeline's visualization and periodization are explained. This research is a product of abductive thinking through the exploration of geographic encyclopedias and human-environment literature. In this process, decisions were made for how the time periods are synthesized and classified. Each time period varies in the frequency of entries. The sheer quantity of entries in a time frame does not warrant the creation of a new time period; each time period is constructed based on the relative significance of the events and how events relate to one another. This chapter also clarifies the connection of these time periods to sources outside of encyclopedias through cross-referencing. In presenting the human-environment timeline, the researcher willingly opens the

product up to different interpretations and criticisms. The next chapter discusses how different ways of knowing might react to the timeline.

Chapter 5 - Interpreting the Human-Environment Timeline

In *The Earth as transformed by human action,* Demeny (1990) suggests that:

> Nature, the ancients held, makes no jumps. The proposition, with little qualification, also applies to human history…Sharp demarcations of epochs and stages within the story of population change as it unfolds over time are thus necessarily arbitrary. They can be defended only, first, by invoking the need to make such demarcations for orderly discussion of any subject and, second, by choosing break points on the time scale that recommend themselves both as practical and as least vulnerable to counterarguments (41).

In this passage, Demeny first identifies the need for a demographic timeline for the Great Transformation from 1700 to present and he advocates for the selection of "break points" that stand up to scrutiny.

The present research builds from the value of Demeny's two goals—invoking the need for a conversation and applying that knowledge to discuss arbitrary (but practical) break points through time for the human-environment relationship. Up to this point, the case has been made for the creation of a human-environment timeline, while using abductive exploration of geographic encyclopedias. The emerging time periods promote a need for conversation over how a timeline could be interpreted from different ways of knowing. This dissertation welcomes challenges and reinterpretations of a human-environment timeline.

The natural and the social sciences typically orient their research on specific ontologies, epistemologies, and ideologies. The confluence of these act as a "North Star" for navigating research problems. Different "ways of knowing" have led to disciplinary divisions within the academy (*e.g.,* Snow 1959). When applied as tools of interpretation and problem solving, the reductionist approach to knowledge can be put to effective use. Wilson (1998) has argued that consilience is needed to move beyond this thinking that dominated progress in scholarly thought in the twentieth century. Consilience refers to a "united system of knowledge," a "map of what

is known" among the physical sciences, social sciences, and the arts (Wilson 1998, 326). With this holistic mindset, humanity can begin to identify unexplored realms of its relation to the planet and the universe.

Geologists have adopted the rock record for their data and the methods of stratigraphy in creating a timeline for Earth history. Now, a series of theoretical lenses are being applied (perhaps misapplied) to the geologic timeline, which may serve to distort or clarify the processes involved in the creations of those eons, eras, and epochs, as well as the environmental conditions involved in establishing those periods. The multidisciplinary debates surrounding the proposed Anthropocene epoch suggest that different perspectives lead to multiple Anthropocenes (Toivanen *et al*. 2017). The proposed human-environment timeline has the flexibility to represent dominant trends through human history because it would not be constrained by the layers of geological strata.

The discussion should go beyond the human-environment timeline proposed in this dissertation. More broadly, this chapter addresses the general idea of a human-environment timeline—of what it would consist, how it could be represented, and what perspectives might contribute to its generation. In the general sense, a human-environment timeline has the qualities of a "polycene," or the manifestation of many time periods. A duration, scene, revolution, transition, or interval may be characterized or periodized differently according to one's perspective. As a result, the development of the timeline is necessarily subjective. Insights emerge when more viewpoints are added. This chapter contemplates four possible interpretations of a human-environment timeline: normal science, cultural ecology, political ecology, and humanistic geography. These initial insights are considerations for further dialogue and may not necessarily represent the range of perspectives within a way of knowing. The

chapter ends with the proposal of a series of axioms for the interpretation of time periods and the human-environment relationship.

Interpretations on Behalf of Time Periods

For this chapter, the task of the researcher is to act as a mediator among different interpretations of a human-environment timeline. Diverse perspectives lead to fresh ways of conceptualizing and responding to the human-environment relationship. Interpretation is a decisive element of thinking about and experiencing the human-environment relationship. This section describes how interpretation factors into the perceptual and epistemological aspects of the human-environment relationship. It transitions to discussion about how interpretation plays a role in periodization.

Cultures can respond differently to the same environmental conditions, based upon their values and perceptions of the environment (see Buttimer 1974). A classic example of this is Vogt and Roberts's (1956) comparative study of five cultures living near Gallup, New Mexico. The authors write, "People see the world through cultural lenses compounded of particular combinations of values; they respond in different ways in accordance with their differing values" (25). To demonstrate this phenomenon, the authors detail a study of five cultures in a region south of Gallup, New Mexico—Zuni and Navajo American Indians, Mormons, Catholic Spanish-Americans, and Texan Protestant-American homesteaders. The Spanish-Americans have a "come what may" take on nature, recognizing that there will be good seasons and bad seasons, and that one should stay in the present and refrain from overworking. The Texan homesteaders, however, tend to practice a mastery over nature (especially economically) with thoughts directed to the future. The Mormons share similar practices with the Texans but emphasize their mastery over nature as "eternal progress of the universe in which man himself

progresses toward godhood" (30). The Zuni peoples have adopted a view of cooperation with nature—planted in the present yet embedded in the past. The Navajos have comparable values as the Spanish-Americans and the Zunis but diverge because of their view that the universe is a powerful and threatening force.

During droughts, the five cultures respond very differently to the environment (Vogt and Roberts 1956). The Zunis increase their ceremonial rainmaking activity. The Navajos also increase their ceremonies, but not to the extent as the Zunis – to show humility to the threatening universe. The Spanish-Americans do little more than meet to talk about the drought in the plaza. By contrast, the Mormons and Texans take more pragmatic measures in addition to prayer, such as artificial rainmaking projects, reducing crop acreage and livestock herds, and petitioning for government assistance. Vogt and Roberts (1956) demonstrate that there are multiple human-environment relationships. Attitudes and values form the basis how humans make sense of these relationships.

Culture can embody the shared practices, values, and beliefs that humans have in relation to the world. Epistemologies, on the other hand, are lenses for how scholars make sense of culture and other aspects of the known world and the *terrae incognitae* yet to be discovered (Wright 1947). Scholarly thought about person-environment relationships is a "cultural heterotopia," meaning that it contains a multitude of perspectives; hermeneutics assist the researcher in navigating this noisy "bazaar of exchange" (Mugerauer 1994, 3). Hermeneutics embody the search for a common intersection in the "cross-traffic among philosophy, literary theory, history, geography, anthropology, and the professional practices of psychiatry, architecture, planning, urban design, and law" (3). The development of hermeneutics has acted as "a middle way" between the epistemological polarities of logical positivism and extreme

relativism (*i.e.*, postmodernism). According to Mugerauer (4-5), "Hermeneutics not only distinguishes, it also helps join things that belong together." In *Interpretations on behalf of place*, Mugerauer (1994) interprets architecture from the standpoint of philosophers like Michel Foucault, Jacques Derrida, Mircea Eliade, and Martin Heidegger.

Epistemology has implications for addressing key problems in human-environment interactions. Bousquet *et al.* (2015) find that human-environment researchers from four schools of thought—political ecology, vulnerability, resilience, and commons and complexity—all factor in themes of power, incentives, systems, and adaptation (PISA) into their approach to the devastation of greenhouse tomato crops by the *Bemisia tabaci* whitefly. These whiteflies carried the Tomato Yellow Leaf Curl virus (TYLC) and other pathogens to areas of southern France. The four schools of thought share the common PISA grammar, but the assemblage of these human-environment elements results in different thematic approaches to the same phenomenon. The "commons and complexity" school emphasizes the tomato farmers' capacities to adapt when invasive species enter into the agricultural system. The "political ecology" school, on the other hand, argues that the neoliberalization of agriculture (*i.e.*, deregulation of agricultural markets, power of large corporations, dependence on cash crops) increased the risk and uncertainty for individual farmers when confronted by the TYLC. The "vulnerability" school searches for the root of the problem by examining which parts of the agricultural system are most sensitive to disease outbreaks. The "resilience" school, meanwhile, makes strides in determining a plan for minimizing future outbreaks caused by *Bemisia tabaci*; part of that plan involves offering incentives to develop appropriate technology for minimizing these risks. In sum, each school of thought approaches the TYLC outbreak in France from thematic points of view, based upon how

they prioritize the PISA grammar code. Epistemologies and schools of thought matter when considering how to approach issues of the human-environment relationship.

Schools of thought and epistemologies also matter when examining how time periods are created and interpreted. Wishart (2004) makes it clear that one's "way of knowing" influences how events and ideas are grouped together to form time periods. For example, the history of a Great Plains indigenous group can be periodized using a variety of conventional approaches, including the demographic transition model, economic cycles, and Anglo-American colonial perspectives. Those time periods are very likely to differ from the key events and periods that stick out in the oral histories of the Pawnee or the Lakota. Wishart's point is that time periods are epistemological. Interpretation plays a crucial role in the representation of history (see also Wishart 1997).

Four Lenses of a Human-Environment Timeline

Normal science, cultural ecology, political ecology, and humanistic geography all address the human-environment relationship. In some cases, these four perspectives share a good deal in terms of observations/data and even in the methods used to create some understanding. As the third chapter notes, the four ways of knowing differ in terms of important themes or values. While normal science favors the more deterministic natural sciences, cultural ecology tends toward the more probabilistic social sciences. Political ecology asks questions of how power becomes a problem in nature-society relations, whereas humanistic geography attempts to examine the qualities that unite humans and their place within existence. This section summarizes the major emphases for each of these "way of knowing" and includes suggestions for how each would interpret the general idea of a human-environment timeline.

Normal 'Physical' Science

Normal science refers to the commonly-held paradigms that science embodies during a period of time (Kuhn 1962; Unwin 1992). Normal science, according to Abler, Adams, and Gould (1971), is a *megaconstruct* comprised of a hierarchy of concepts and ideas. Science emphasizes using objective, empirical methods to observe, measure, and understand the universe (Lee 1999). That process has entailed separating the observer from the environment and distinguishing the spectrum between internal (emotions, thoughts, desires, sensations) and external (outside our bodies) events (Abler, Adams, and Gould 1971). Thus, to be aware of an event is to observe the phenomenon and find ways of measuring it. Normal science affords humans the ability to systematically order experience in the natural world and test hypotheses (Figure 5.1).

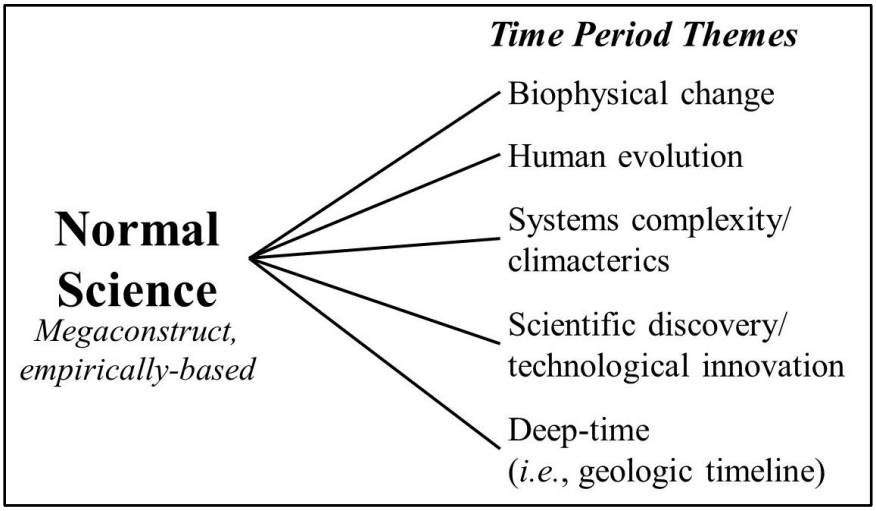


Figure 5.1: Overview of normal science's themes for how it might periodize a human-environment timeline (Source: Compiled by Author).

Normal science includes basic science and the applied sciences. Basic science, or pure science, refers to the study of a phenomenon for its own sake. Applied science occurs when a problem needs to be solved, which can lead to technological innovations (Lee 1999). The

historiography of science has been influenced by perspectives from around the world, including the advances made in the Middle East and Asia (White 1967). White claims, "Our science is the heir to all the sciences of the past" (1967, 1204). According to White, science had been occurring long before the Scientific Revolution of the eighteenth century through the invention of new technologies and methods of managing and transforming the environment.

The current scientific paradigm stresses the roles of deduction and systems thinking in observing and modeling phenomena. Systems, "an interconnected set of elements that is coherently organized in a way that achieves something," have become a central tenet for normal science (Meadows 2008, 11). Systems have evolved from an idealized natural order (analogous to a machine) to the search for a signal through the noise of a chaotic environment (O'Neill 2001). Nature, ecologists now agree, is not a divinely-built machine; the goal of systems thinking is to see the harmonies in the chaotic, disordered, individualistic environment (Botkin 1990). This work has helped to turn phenomena like biodiversity into areas of scholarly study (see Hunter 1996). Science's inclination toward systems thinking results in a favoring of creating periods marked by a climacteric, or an environmental crisis (Burton and Kates 1986; Bjornerud 2018).

Science has made important contributions to uncovering the deep history of the Earth, especially in terms of geologic time (Bjornerud 2018). Burgess Shale deposits, for example, have provided an "extensive well-documented window upon…the first flowering of the Cambrian explosion," when complex life began to exist and take shape (Gould 1989, 24). Science has also advanced the theory of evolution by natural selection, a key scientific paradigm for how humans make sense of their relationship to the natural world (Dawkins 2016).

Of the four "ways of knowing," the normal science perspective would be the most likely to interpret a human-environment timeline according to physical systems, evolutionary, and technological thinking. This perspective is exemplified by Ehrlich and Ehrlich's (2008) *The dominant animal: Human evolution and the environment*. Darwinian evolution plays a key role in this book's framing of the human-environment relationship. The authors trace humanity's cultural evolution and genetic coevolution with the biophysical world starting with the emergence of *Homo sapiens*. They proceed toward the present, suggesting that humans have now become the keystone species, identifying new scientific discoveries and technological innovations as they emerge.

Additionally, a normal scientist would perhaps be critical of coupling both internal and external events, such as combining biophysical phenomena, the generation of ideas, the introduction of social theories, the showcase of a film or piece of literature, and the occurrence of major political conferences. The abductive inclusion of both empirical and theoretical entries on a timeline without a hypothesis does not necessarily fit in the normal science perspective. Though Ehrlich and Ehrlich (2008) weave multiple perspectives into their narrative, they maintain evolution as the key theme of the narrative. The human-environment timeline in this dissertation combines and classifies a diversity of events and ideas that do not relate solely to one theme, like evolution.

Figure 5.2 includes some examples of ideas and events, taken from the encyclopedias, that a normal scientist would possibly consider for the timeline. Events could relate to major shifts in the Earth's system that affected or where influenced by humans, such as the mass extinction of megafauna around 10,000 BP and the geologic effects of nuclear bomb testing.

Ideas could include innovations and discoveries in science and technology, as well as concepts that further understanding about the Earth's environmental system.

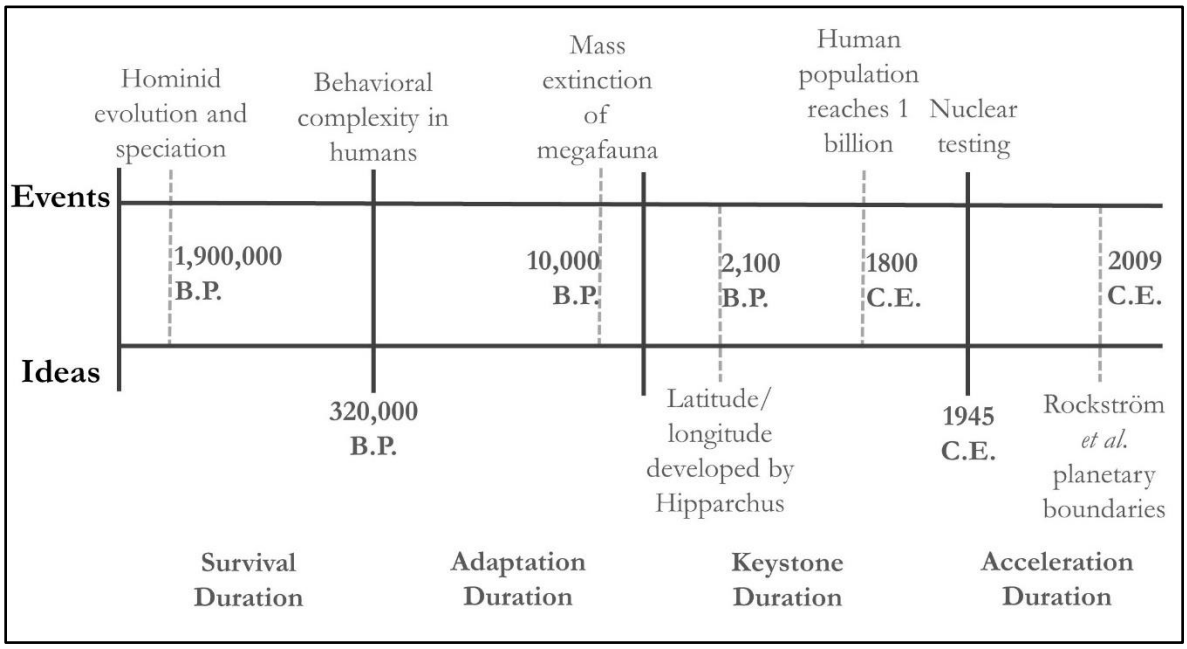


Figure 5.2: Examples of ideas and events for a "normal science" human-environment timeline (Source: Author).

Cultural Ecology

A goal of cultural ecology is to gain a sense of the human-environment relationship from the perspectives of adaptation, human transformations of the environment, and the diffusion of cultural traits and practices (Wallach 2005; Prudham 2009; Figure 5.3). As a social science, cultural ecology is the "study of the relationships and interactions between humans, their biology, their cultures, and their physical environments" (Sutton and Anderson 2004, 2). It has roots in the work of Carl O. Sauer, the Berkeley School, Harlan Barrows, the Chicago School, Roy Rappaport, among others (Steiner 2002; Prudham 2009). The field has also influenced the creation of specialties like land-change science and risk-hazards research (Turner and Robbins 2008). Cultural, or human, ecology has one foot in normal science and the other in the social sciences, particularly archaeology and anthropology (Turner 1989; Butzer 1990; Wallach 2005).

A prominent distinction afforded the social sciences is an emphasis on probabilistic rather than deterministic thought. This characteristic gives cultural ecology an important and unique perspective for addressing a human-environment timeline.

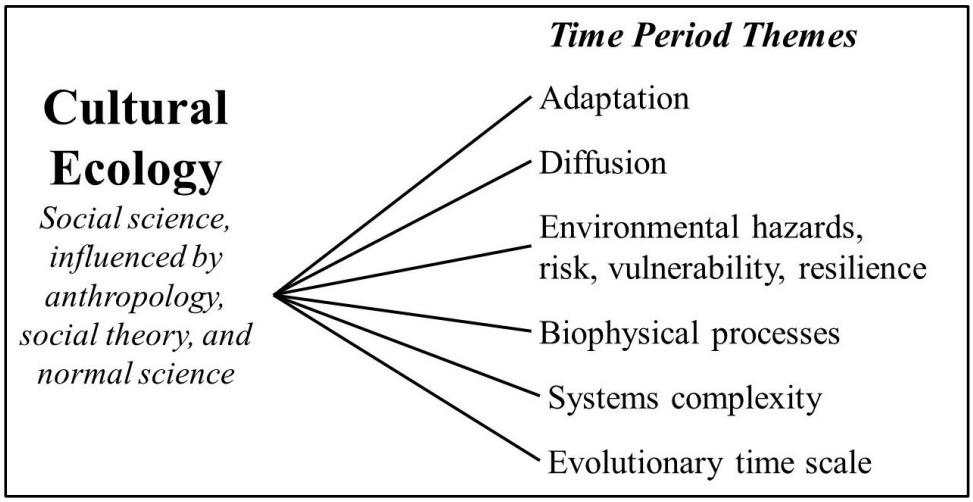


Figure 5.3: Overview of cultural ecology's themes for how it might periodize a human-environment timeline (Source: Compiled by Author).

In its traditional sense, cultural ecology incorporates systems thinking; the integration of language, technology, and culture; the function, structure, and morphology of cultural landscapes; the behavior and interactions of people in settlements and institutions; forces of human migration, mitigation, and adaptation to environmental change; and the complexity of human-environment systems (Butzer 1990; Steiner 2002; Wallach 2005). Cultural ecology takes a more social scientific approach to a human-environment timeline than normal 'physical' science; it incorporates social theories and ideas that may not necessarily align with the scientific perspective (for example, see Zimmerer 2006; Zimmerer 2007). The 9/11 terrorist attacks, for example, revealed the weaknesses of being overly dependent on normal science's objectivity and rationality. Its structured methods and models could not adequately capture risks and unintended consequences of environmental and human-caused disasters. The vulnerabilities of science led to *vulnerability science*, an offshoot of cultural ecology, which "helps understand those

circumstances that put people and places at risk and those conditions that reduce the ability of people and places to respond to environmental threats" (Cutter 2003,6). Vulnerability science branches from cultural ecology's tradition of addressing problems in environmental hazards and risk.

Currently, cultural ecologists are expanding from their traditional biophysical expertise to consider how their area of study fits into trending social theories (*i.e.*, more-than-human geographies) and contemporary societal issues. Concepts like human adaptation are being updated to represent: trends in studying adaptation to climate change; how adaptation manifests in everyday practices; the changing contexts of adaptation geographically and temporally; and how adaptation relates to trending social theories in cultural ecology (Head 2010). In other words, the key tenets for cultural ecology are changing; frames of interpretation, such as adaptation, cultural diffusion, and vulnerability to environmental hazards, take on new shades for understanding the timeline.

Like normal science, a cultural ecological interpretation of a human-environment timeline could extend to the earliest periods of human evolution. A cultural ecologist would be inclined to evaluate time periods that emphasize human adaptation and transformation of the environment, such as the mastery of fire around 1,000,000 BP. Cultural ecology also serves to challenge the durations of the timeline that are the longest-lasting, but least represented: the Survival Duration and the Adaptation Duration. Emerging research is currently challenging conventional wisdoms held by cultural ecologists. For example, evidence is now suggesting that complex nation-states were developing thousands of years before the Agricultural Revolution; the problem is finding the traces of these forgotten societies (Scott 2017). As cultural ecology progresses in these discoveries, its scholars will criticize the present human-environment

timeline for upholding conventional wisdoms. The human-environment relationship becomes more elusive as research considers entries and time periods farther back in time; cultural ecologists and normal scientists are the most established of the four ways of knowing in considering questions of long-term, evolutionary time.

Contrasting with normal science, a cultural ecological interpretation of a human-environment timeline would allow for a more social scientific perspective (see Figure 5.4 for examples taken from the human-environment timeline). Cultural ecologists would likely be interested in human vulnerability and resilience to environmental hazards like the aftermath of Hurricane Katrina (*e.g.*, Kates *et al.* 2006). Cultural ecologists would also be interested in how the exchange of ideas, value systems, and goods affects the human-environment relationship (*i.e.*, the Columbian Exchange of the sixteenth century; Butzer 1992; Crosby [1972] 2003).

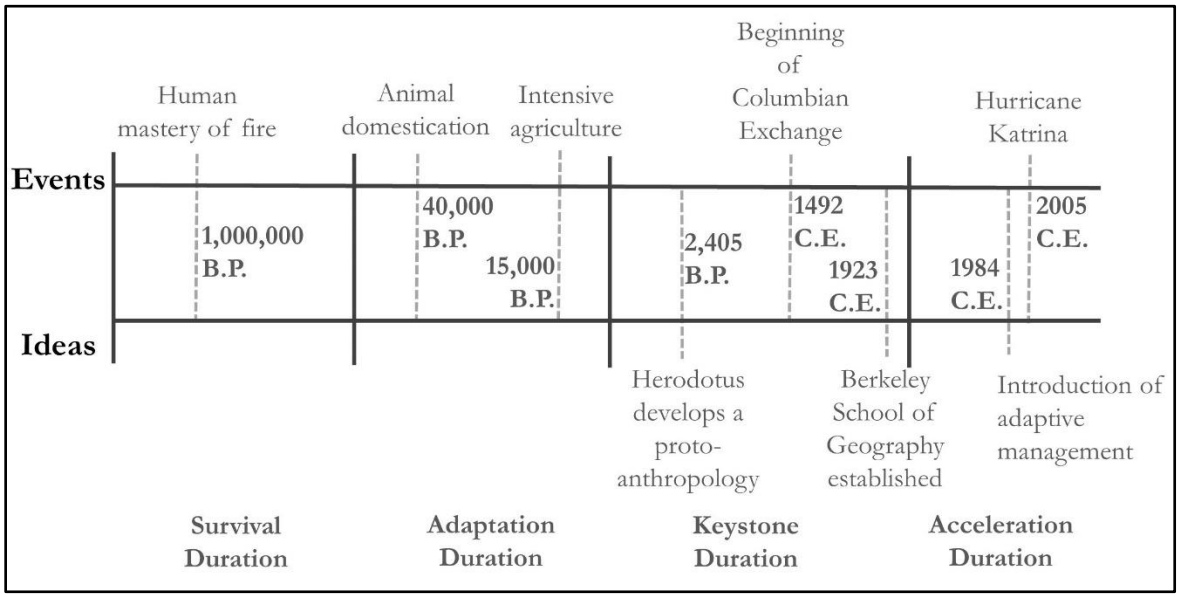


Figure 5.4: Examples of ideas and events for a "cultural ecology" human-environment timeline (Source: Author).

Political Ecology

According to Zimmerer (2006; 2007), political ecology arises out of geography and cultural ecology. Political ecology, according to Vaccaro, Beltran, and Paquet (2013, 256), "defines the environment as an arena where different social actors with asymmetrical political power are competing for access and control of natural resources." In some respects, this perspective is a critical reaction to traditional cultural ecology and the human-environment tradition of geography. Given the emphasis on the environment for natural resources, political ecology overlaps with recent developments in political economics that emphasize choices in distributional conflicts related to wealth.

Political ecologists distinguish themselves from *apolitical* ecologists. The apolitical explanation is dominated by normal science approaches (Robbins 2011). Apolitical ecology relies on objective methods to measure the dynamics of human and natural systems, and the implications of changes on biodiversity and sustainability (Turner and Robbins 2008). Conversely, political ecology tries to comprehend how complex knowledges of biodiversity shape and are shaped by power from networks of actors and shareholders involved in myriad discourses (Robbins 2011). The political and apolitical perspectives vary in multiple ways. Their differences have remained discordant research strands which have typically seen few intersections (some scholars have walked across the aisle and tried to articulate and reconcile these differences, such as Turner and Robbins 2008). Political ecology's radical roots and opposing relation to apolitical ecologies distinguishes it as a mode of reference for interpreting the timeline (Figure 5.5).

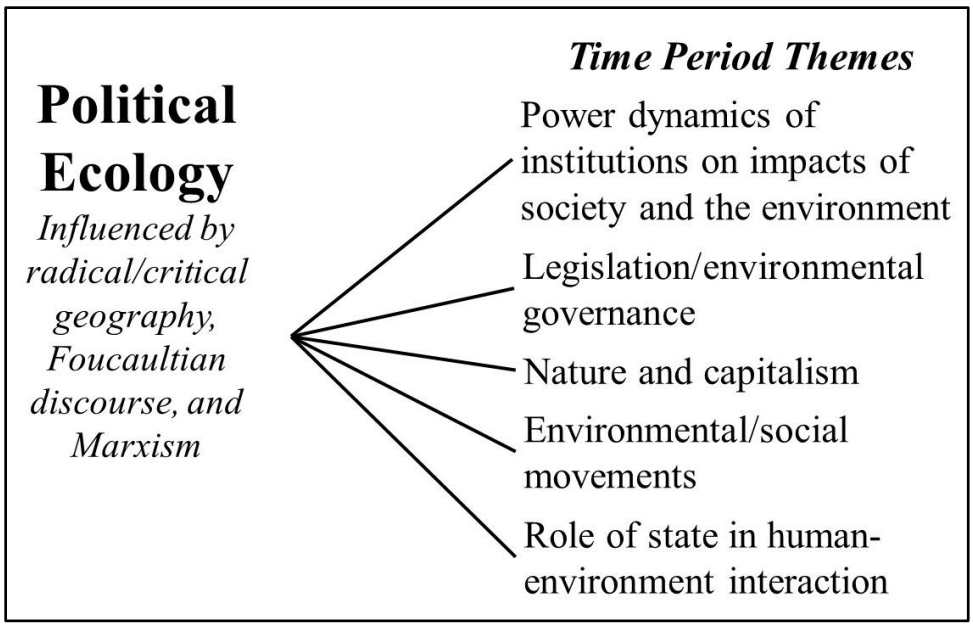


Figure 5.5: Overview of political ecology's themes for how it might periodize a human-environment timeline (Source: Compiled by Author).

Drawing from Marxist and critical geography, political ecologists typically focus on the institutional and economic forces of power in human-environment interactions (Peet and Watts 2004). As a result, they are also concerned with how power affects marginalized groups and unevenly distributes capital. In McAfee's (1999) "Selling nature to save it," the seemingly positive idea of green developmentalism, or the process of providing aid to developing countries through environmentally-conscious practices, has negative implications in real life. According to McAffee (134), "[G]reen developmentalism reflects the initiatives by 'far-sighted capitalist actors' in the Global North to use biodiversity and the Convention on Biological Diversity (CBD) to their benefit." Political ecologists critically engage issues of capitalism, environmental governance, conservation, environmental certification, green militarization, and development (Peluso 1993; Büscher *et al.* 2012; Vaccaro, Beltran, and Paquet 2013; Lunstrum 2014; Duffy 2016). Thus, they are the most likely to show interest in examining parts of the timeline that either facilitate, contradict, or counteract these human-environmental phenomena.

Political ecology's critical stance on apolitical ecologies provides a clue for how a political ecologist might interpret a human-environment timeline. A political ecologist may be interested in the timeline's representation of consequences surrounding important legislation or economic decisions. She or he may wish to consider how the characteristics of dominant time periods serve to marginalize or rule out certain populations or perspectives. The political ecologist may be more inclined to include diverse entries on the timeline, such as social movements, environmental legislation, key publications, and the founding of institutions (for example, see Escobar 1998).

One example of historical representation from a political ecologist is West's (2006) *Conservation is our government* now*: The politics of ecology in Papua New Guinea*. Set within the largest island in Melanesia, this book addresses the political and anthropological dimensions of conservation in the context of the country's highly coveted "birds of paradise", Gimi culture, the local Maimafu peoples, and the Crater Mountain Wildlife Management Area (CMWMA). West's premise is that conservation development has taken on the domineering role of controlling the livelihoods of local populations. Non-governmental organizations, researchers, locals, and other groups invoke conservation to advance their own agendas. As a result, traditional representation of conservation development does not reflect what has actually been happening in the country. This book unveils both dominant and alternative histories for the conservation-development period through the interacting accounts of locals, institutions, and other actors operating at local, global, and regional scales. To illustrate, actors like researchers and conservation-oriented agencies alter the history "with every proposal, depending on what aspect of the Crater Mountain project and its history the NGO wishes to highlight" (145). For

political ecologists, time periods represent important discourses for the dominant political forces driving the human-environment relationship.

The timeline in Figure 5.6 contains entries which emerged from the encyclopedias that a political ecologist may find relevant. This timeline differs from Figures 5.2 and 5.4 because it consists of only two durations. It is unclear how political ecologists might interpret a timeline dating before the Industrial Revolution, the rise of neoliberalism, or the dawn of capitalism. Early records of environmental governance, such as the Code of Hammurabi, may provide a start. Political ecology becomes more relevant as humanity progresses through the Wealth of Nations Scene (1850 to 1945 CE) to the current Long Emergency Scene (2014 CE to Present).

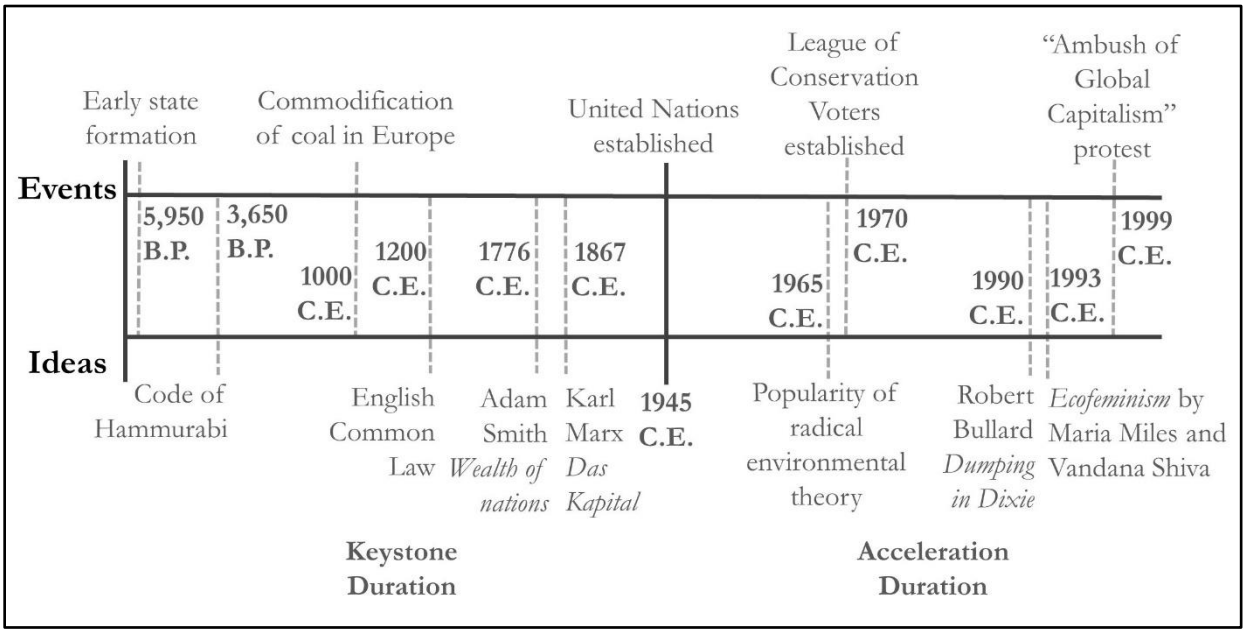


Figure 5.6: Examples of events and ideas for a "political ecology" perspective on a human-environment timeline (Source: Author).

Humanistic Geography

Humanistic geography is a subfield of the discipline that has been largely misunderstood since Tuan (1976) helped articulate its formalization. Perceived as dormant in contemporary geography, humanistic geography has made important gains outside of the discipline, in

philosophy, architecture, history, and the arts (Seamon 2015). According to Seamon and Lundberg (2017, 1), humanistic geography is a "conceptual perspective claiming that a comprehensive understanding of human-environment relationships must consider individual and group experiences and meanings of space, place, landscape, region, mobility, and related geographic phenomena" (Figure 5.7). The goal of humanistic geography is to understand the human condition in relation to the world (Tuan 1976), or the process of shedding "light on the complexities of man's relationship to the [E]arth" (Buttimer 1976, 277). This way of knowing emphasizes four things: (1) varieties of human experience; (2) the application of qualitative methods; (3) a sense of reflexivity between researcher and subject; and (4) the examination of place experience and interpretations of social worlds (Seamon and Lundberg 2017). Humanistic geography is theoretically founded upon phenomenology, the study of everyday things and experiences as they are, and existentialism (Seamon 1979; Seamon and Sowers 2009). Place and its counterpart (placelessness) represent basic components of humanistic geography (Relph 1976). Sense of place involves the affective and experiential bonds that humans have to localities (Tuan 1974). In relation to the idea of a timeline developed and presented in this dissertation, humanistic geography's concern for place, everyday experience, and human emotions and values all factor into a timeline interpretation that is more focused on lived experience than normal science and more empathetic than political ecology.

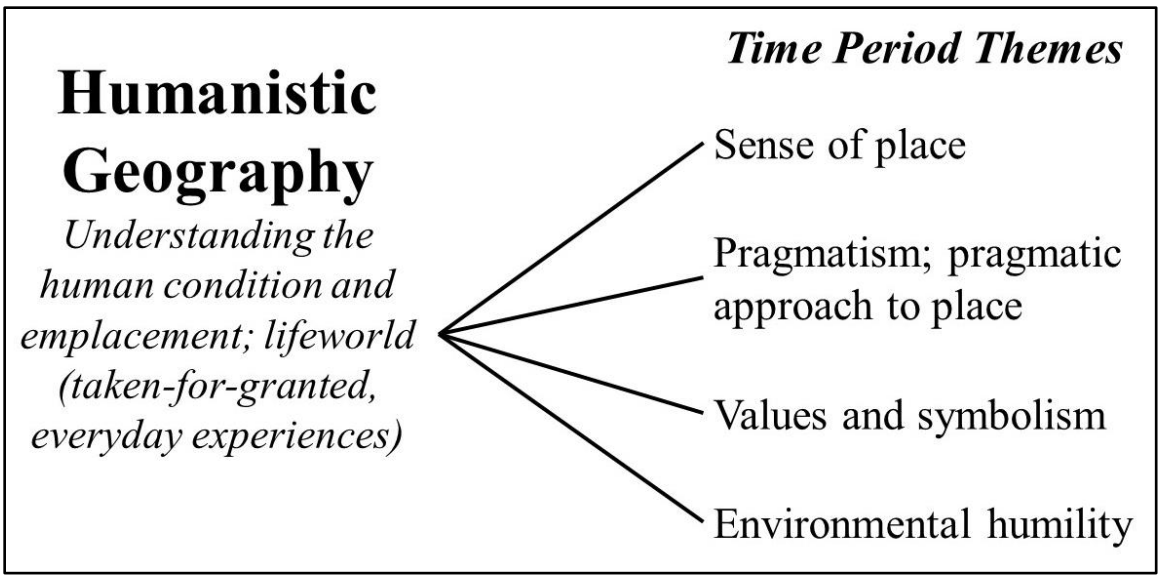


Figure 5.7: Overview of humanistic geography's themes for how it might periodize a human-environment timeline (Source: Compiled by Author).

Humanistic perspectives of the human-environment relationship have existed long before the study became formalized in geography, at least implicitly (Relph 1981). In *Man's role in changing the face of the Earth*, Gutkind (1956) signifies an important voice during a time when ideas about the human-environment relationship were changing. Though humans did not see the Earth from outer space until the 1960s, society saw numerous advances in flight technology. These advances led to the ability for people to look and understand the world from a synoptic, "God's-eye view" (1). Gutkind interprets this new shift in the orientation of consciousness (from the ground to the aerial view) as an opportunity to consider the human condition in relation to their place on Earth. In Gutkind's words, "The landscape which spreads before our eyes and mind is like a seismograph recording the finest oscillations of man's role in changing the face of the [E]arth" (3-4). Gutkind transitions to a more humanistic way of thinking by describing three chains of transformation: 1) I-Thou to I-It, 2) humankind's stages of reaction to the environment, and 3) widening scale and changing experience of place. These three chains of transformation

offer a lens for examining a human-environment timeline from the standpoint of a humanistic geographer.

The first chain connects to Relph's (1981) idea of environmental humility, a term in humanistic geography which refers to a compassionate way of experiencing and interpreting places. "I-It" represents the perception that humans are separate from the environment and are therefore able to exploit it however they please. "I-Thou" affords a strong connection with and reverence for the environment (Gutkind 1956). Similarly, environmental humility encourages a tolerant, unpretentious, and non-anthropocentric method of being in the world (Relph 1981).

In Gutkind's (1956) second chain, there are four stages of humans' attitudes toward the environment—fear and longing for security, growing self-confidence and increasing observation, exploitation and conquest of the environment, followed by an age of responsibility and unification. This stepwise process relates to how the human condition transforms as new environmental and sociological contexts arise (see also Tuan 1974; Altman and Chemers 1980). The third chain of transformation—the widening scale and changing experience of place—has connections to the pragmatism in humanistic geography (see Smith 1984). A pragmatic sense of place, for instance, accounts for the distinctiveness of places in the midst of global change; it empowers local populations to take active responsibility for the places to which they belong (Relph 2008a; Relph 2008b; Relph 2009).

A humanistic interpretation of a human-environment timeline will consider a variety of topics, but key events and ideas would include the introduction of new techniques of environmental and architectural design (see Figure 5.8 for timeline examples from the encyclopedias). The construction of Central Park, for example, was a catalyst for the creation of future urban park areas. The ideas of urban planning developed by Jane Jacobs (1961) also

allows for pragmatic and humble approaches toward improving human-environment relationships. Humanistic geographers would also be interested in ideas relating to the standardization of society through the spread of McDonald's restaurants (see Relph 1976; Ritzer 1993; Seamon 2018). This homogenization of the landscape is referred to as "placelessness."

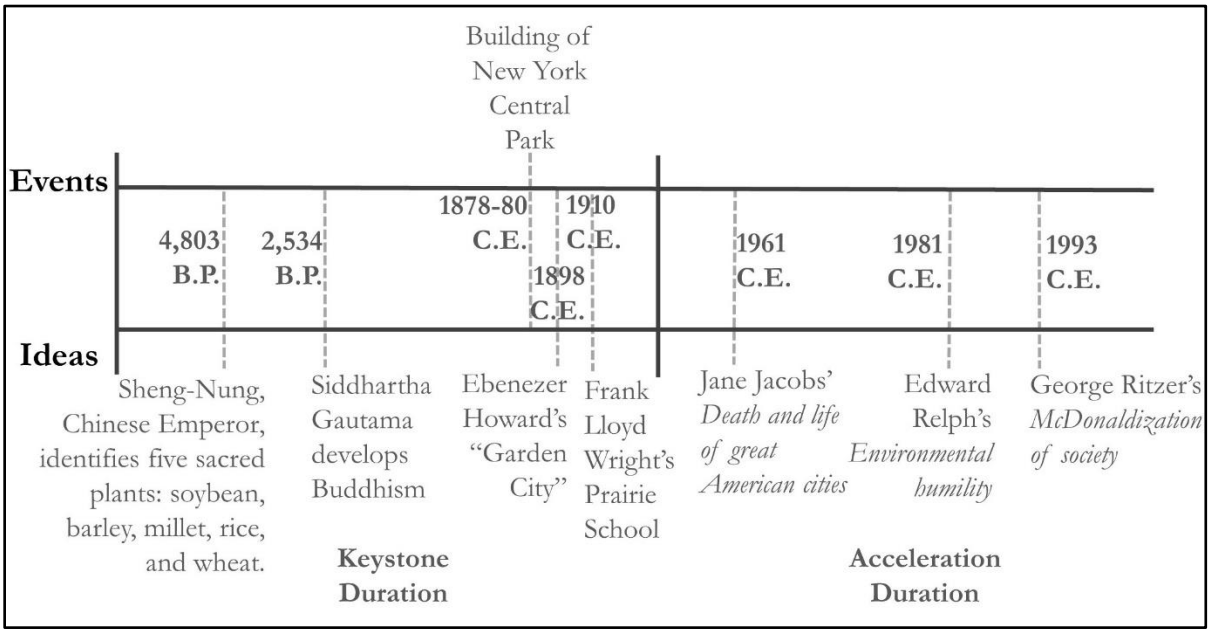


Figure 5.8: Examples of events and ideas for a "humanistic geography" perspective on a human-environment timeline (Source: Author).

Axioms for Interpreting Time Periods

This discussion leads to the prospect of creating a series of axioms for interpreting a human-environment timeline. There exist axioms for interpreting the cultural landscape (Lewis 1979), which have been updated and reinterpreted (see Mitchell 2008). What general statements can be made about the interpretation of time periods for a human-environment timeline? Combined with the abductive grounded theory meta-analysis, the deductive judgements of the timeline helped to produce the five axioms for interpreting a human-environment time period. These axioms can provide a source of discussion for how different ways of knowing may critique or interpret the human-environment timeline. The five axioms are:

1. *There are seen and unseen elements of a human-environment time period*.
2. *Different perspectives provide important pieces to the narrative for a time period*.
3. *A human-environment time period has limits and is never exempt from scrutiny*.
4. *A human-environment time period conveys one or more big ideas about the human-environment relationship during a given range of history*.
5. *A human-environment time period should cultivate a sense of timefulness.*

Each axiom can contribute toward understanding the overall narrative of the human-environment timeline, from the beginning of the Survival Duration over 2.6 million years ago to the present. The four ways of knowing have their own insights to contribute toward each axiom and time period. Each axiom is elaborated in conjunction with the four perspectives and the human-environment timeline (refer to Table 4.1).

Axiom I: Seen and Unseen Elements

There are seen and unseen elements of a human-environment time period. Just as there are seen and unseen aspects in a landscape (Upton 1997), so too are there elements to a time period that are explicit and implicit. The human-environment timeline contains a variety of entries, many of which do not necessarily relate to the theme of the time period. To name and place boundaries for a timeline reduces it to one particular idea or set of ideas, but it works well to cut through the "noise" of seemingly random and unconnected events. There are seen and unseen elements both within and among time periods. Deeper exploration will involve discovering accounts that are inexplicit in the dominant metanarrative that the time period maintains and how these accounts connect to other time periods.

In the human-environment timeline, the Survival Duration (2,600,000 BP to 320,000 BP) contains seen and unseen elements of the human-environment relationship. In this case, the

'seen' represents those aspects which can be empirically verified through evidence. Through scientific dating techniques, normal scientists and cultural ecologists can help to recreate aspects of early hominins during the Evolution (2,600,000 to 1,900,000 BP) and Speciation (1,900,000 to 1,000,000 BP) Intervals (Galway-Witham and Stringer 2018). Evidence of fire use and toolmaking can also cue into the "seen" elements of the Pyro Scene/Revolution (1,000,000 to 320,000 BP). Through these methods, time periods can be empirically reconstructed or 'seen,' to a point.

Much of the Survival Duration is 'unseen' or inferred. For the humanistic geographer, less knowledge exists regarding the lived experience of early hominins and even less about their daily attitudes and values (*e.g.*, Gamble 2007). Additionally, the critical social theories of the political ecologist may appear anachronistic during this duration and its sub-periods. 'Unseen' inferences about the social and political structure of early societies, such as those communities during the Forage Scene (2,600,000 to 1,000,000 BP), can be made from artifacts left behind (Shultz and Maslin 2013).

On the other hand, the timeline's overall hierarchy of periods contain thematic connections to one another. The unseen implications of the Survival Duration and its sub-periods may be revealed through connections to later time periods. For example, the Pyro Scene and Pyro Revolution (1,000,000 to 320,000 BP) have implications for the lived experience and the political ecology of the Great Acceleration Duration (1945 CE to present), when the post-World War II use of fossil fuels increases immensely (McNeill and Engelke 2014; Gladwin 2018). Useful thematic connections can be made, for example, by considering the pre-historic Pyro Scene in the context of the more recent OPEC Transition (1973 to 1975 CE) and the Petrophilia Interval (1975 to 1979 CE) (see also Pyne 2016; Gladwin 2018). The question can

be postulated regarding the historical repetition of human dependence on fire and fuel. In other words, unseen elements may be seen in other parts of the human-environment timeline.

Axiom II: Different Perspectives

Different perspectives provide important pieces to the narrative for a time period. A political ecologist may be critical of how normal scientists and humanistic geographers may idealize a time period, perhaps even suggesting that creating a timeline is a hegemonic practice by groups and individuals who hold power. Cultural ecologists might question the selection and arrangement of events related to human adaptation to the environment. A timeline benefits from this multiplicity of approaches in the progression to a more comprehensive timeline.

The application of different perspectives can be helpful in interpreting the Adaptation Duration (320,000 to 6,000 BP) and its associated sub-periods. A collaboration consisting of a normal scientist, cultural ecologist, political ecologist, and humanistic geographer could lead to the more holistic interpretation of the duration's physical, socio-political, and lived aspects of the human-environment relationship. A normal science mindset could focus on how environmental conditions made it easier or more difficult for human movement during the Out of Africa Interval (320,000 to 40,000 BP). A cultural ecology perspective could help elaborate on the relationship between movement and domesticating in environmental adaptation during the Ecumene Scene (320,00 to 15,000 BP). A humanistic geography lens could contribute insights on the early conceptions of sense of place and place attachment as humans inhabit North and South America during the Adaptation Duration's Turtle Island Interval (30,000 to 15,000 BP). A political ecologist view could contribute an understanding of how early political systems evolved during the Domestication Scene and the Agricultural Revolution (15,000 to 6,000 BP).

Accordingly, the four perspectives provide the opportunity to use a time period as a vehicle to consider various aspects of the human-environment relationship.

Focusing on one perspective at a time is useful, but a time period's overall narrative benefits from attempting the combination of these multiple lenses. Interpretive questions may be asked, such as how human adaptation to the environment (cultural ecology) during the Domestication Scene correlates with the development of early state powers (political ecology), human values and perceptions of the environment (humanistic geography), and the limits provided by the environment (normal science). Through this exercise, human-environment time periods become interpretive tools for synthesis.

Axiom III: Limits to Periodization

A human-environment time period is never exempt from scrutiny. Different interpretations will expose weaknesses in the currently established human-environment timeline. Such dialogue makes room for progression in concept development. The human-environment timeline's emergent categories of time periods may be able to account for dominant themes from the dataset; those themes can be triangulated through the scholarly literature. Regardless, these time periods will not accurately represent the nuances of the human-environment relationship. Time periods are limited in terms of the initial data, their boundaries and thematic categories.

The confinement of time periods to boundaries hinders the narrative progression (morphology) of the time period. The Keystone Duration (6,000 BP to 1945 CE) and its sub-periods are comprised of temporal boundaries which work well from a wide lens but lose their precision as the smaller time scales are magnified. This criticism would likely be identified by normal scientists, cultural ecologists, political ecologists, and humanistic geographers, alike. More work, for example, needs to be done to better track the morphology of time periods like the

Agricultural Impress Interval (6,000 to 4,950 BP), the Private Property and Commons Interval (1610 to 1763 CE), and the Conservation Interval (1864 to 1908 CE). A normal scientist may address this limitation by employing empirical quantitative methods as opposed to the qualitative and mixed methods relied upon by a political ecologist or a humanistic geographer.

The core characteristics of the time period may not represent all human-environment relationships during that time frame (see Wishart 2004). The human-environment timeline represents dominant themes emerging from the abductive exploration of encyclopedias and scholarly literature. Not all themes are likely to be represented. Time periods during the Keystone Duration tend to relate more toward themes in the natural sciences and technological innovation. For example, the duration's Wealth of Nations Scene (1850 to 1945 CE) contains intervals relating to Western technologies like the railroad, automobile, and agricultural industry. These themes, though significant at a global scale, risk excluding other themes. Similarly, a cultural ecologist may criticize the Growth and Collapse Interval (4,950 to 1,600 BP) because it does not necessarily account for the potential of thriving informal communities which may have lived through the periods of growth and collapse of complex civilizations (*e.g.*, Scott 2017). A political ecologist or humanistic geographer might disapprove of the overall lack of indigenous and other localized perspectives within the Keystone Duration.

Overall, successful interpretation is dependent on understanding the morphological (*i.e.*, boundaries) and thematic limitations of human-environment time periods. New methods and data sources should be considered. One possibility for addressing this limitation is to develop the field of *ethno-periodization*, which would study how different ethnic groups periodize the human-environment relationship. These alternative periodizations could be evaluated against the present human-environment timeline.

Axiom IV: Big Ideas

A human-environment time period conveys one or more big ideas about the human-environment relationship during a given range of history. A time period serves as a "big idea," or a thematic container for exploring the lessons and complexities of the human-environment relationship. The Anthropocene, for example, represents a big idea which has continued to have scholarly significance despite its limitations (Castree 2015a; Bjornerud 2018). As human-environment time periods shift with the introduction of new information, they may continue to carry the same fundamental concept, perhaps within a different temporal context.

There is an ideational component tied to the titles of periods on the human-environment timeline. The sub-periods of the Acceleration Duration (1945 CE to present) contain a number of big ideas for the human-environment relationship. These big ideas connect to a variety of perspectives. A normal scientist, for example, may be interested in exploring the Overshoot Scene (1975 to 1992 CE) to interpret the connection between human consumption of fossil fuels and the first Earth Overshoot Day. A cultural ecologist may interpret the Sustainability Transition (1987 to 1992 CE) and the Sustainable Development Scene (1992 to 2014 CE) as an example of how the cultural diffusion of sustainability has led to global adaptive strategies based on a 'land ethic' (Leopold 1949). A political ecologist may select how an idea like ecosystem services would lead to its own interval (1995 to 2002 CE) and be employed for monetary gain, especially during the Green Capitalist Interval (2002 to 2009 CE). A humanistic geographer might be interested in how space travel and environmental values caused a drastic shift during the Spaceship Earth Scene (1945 to 1970 CE) regarding how humans made sense of their relationship to the environment (Boulding 1966). Each of the time periods on the human-

environment timeline has a specific connection to one or more ideas about the human-environment relationship.

The ideas behind a human-environment time period can stimulate discussion among academics and non-academics. The timeline affords the chance to embed these big ideas in time to form an anthrochronology. Time periods can thus serve not only as objects of research, but also as educational devices for students learning about the human-environment relationship. Additional ideas may arise as more individuals participate in critiquing and interpreting the timeline.

Axiom V: Timefulness

A human-environment time period should cultivate a sense of timefulness. Originating in geology, timefulness is a clear and deep understanding of the past, what is known, and what is unknown (Bjornerud 2018). For the human-environment timeline, timefulness represents a process of revisiting, questioning, engaging with, and identifying with the past to achieve a clearer understanding of the changing human-environment relationship through time. Timefulness will be what leverages a human-environment timeline to facilitate future decision-making and sense-making.

Timefulness is a reminder that history lives through people's curiosity about the past (Bjornerud 2018). The process initiates an exploration into humanity's past relationship with the environment to better understand how the present fits into the greater timescale. The human-environment timeline currently puts humankind in the Long Emergency Scene (2014 CE to present) of the Acceleration Duration (Orr 2016). The characteristics, temporal boundaries, and duration of that scene may turn out be different than the time period's original intent. This idea

is echoed in Lovejoy's (2017, 160) call for a societal transformation in order to redefine the Anthropocene:

> [This vision] will entail abandoning the hubris and environmental destruction (however unaware) that led to this era being named the Anthropocene, and exchanging them for a sense of wonder at and respect for the extraordinary living world of which we are a part.

Lovejoy's point connects to environmental systems operating under normal science, the concepts of adaptation and cultural diffusion in cultural ecology, the political realm as understood by political ecology, as well as the lived experiences, attitudes, perceptions, and values of humanistic geography. A period like the Long Emergency Scene suggests a history of possibilities that have yet to become the past. Timefulness may assist in charting the trajectory of the Long Emergency Scene and future anthrochronologies.

Chapter 6 - Moving Forward with a Human-Environment Timeline

This dissertation has created a human-environment timeline through the qualitative textual analysis of data from encyclopedias. Those data were synthesized and subdivided according to a hierarchical typology of time periods into longer durations; somewhat shorter scenes, revolutions, and transitions; and even shorter intervals. Four major time periods or durations, labeled as Survival, Adaptation, Keystone, and Acceleration, transcend the period from 2.6 million years ago to the present. Names for these durations indicate the long-term changing thematic character of the human-environment relationship. Scenes within the durations account for shorter-term critical transitions in some aspect of the human-environment relationship. Intervals are smaller-scale waves of change within scenes.

A revolution is the transition from duration to duration, such as the transition between the Keystone Duration (6,000 BP to 340 BP) and the Acceleration Duration (1945 CE to Present). A scene transition indicates a change to a new scene within a duration. For example, the Sustainability Transition (1987 to 1992 CE) marks the transitional boundary between the Overshoot Scene (1975 to 1992 CE) and the Sustainable Development Scene (1992 to 2014 CE). From the use of fire, through the development of agriculture, human expansion and colonization, industrialization, and nuclear technology, these periods of rapid change helped usher in new time periods of greater impact associated with the human-environment relationship. Recent transitions, labeled as Silent Spring, OPEC, Sustainability, and Planetary Boundaries, occur at a more rapid pace and help make the case for the Great Acceleration (McNeill and Engelke 2014) in recent decades.

Time periods become shorter and more frequent toward the present. This property is also characteristic of the geologic timeline (Cohen *et al*. 2013) and the timeline for life (Betts *et al*.

2018). Throughout the timeline, there are definitive pauses and gaps within the timeline where existing time periods can be adjusted, and new time periods can be shaped.

After the development of the prototypical timeline, the timeline was then interpreted according to four ways of knowing: normal science, cultural ecology, political ecology, and humanistic geography. The interpretation process documented how varying approaches to scholarly thought could view the process and resulting timeline differently. A result derived from thinking about a human-environment timeline from multiple perspectives was the establishment of five axioms for interpreting the human-environment landscape: (1) there are seen and unseen elements of a human-environment time period; (2) different perspectives provide important pieces to the narrative for a time period; (3) a human-environment time period has limits and is never exempt from scrutiny; (4) a human-environment time period conveys one or more big ideas about the human-environment relationship during a given range of history; and (5) a human-environment time period should cultivate a sense of timefulness. Transdisciplinary collaboration is needed to expand upon these interpretations more fully.

In summary, this research presents four takeaways:

1. Time periods are integral toward understanding the human-environment relationship through time. A conversation should begin over the creation of an official human-environment timeline.
2. An abductive and qualitative approach involving collecting and synthesizing data serves as a valuable approach toward building an initial human-environment timeline.
3. Encyclopedias are useful databases for the qualitative meta-analysis of human-environment periods, events, and ideas.

4. Scholars can approach the human-environment relationship using multiple ways of knowing; attention to those ways of knowing can help inform the possibilities and limitations of a human-environment timeline.

Evaluation of the Timeline

The introductory chapter identified four characteristics of an official timeline: (1) a common frame of reference, (2) a form of synthesis, (3) a temporal map to consider different scales of analysis, and (4) a basis for constructing alternative representations. The human-environment timeline contains each of these qualities and thus sets a standard from which future developments may be evaluated.

First, the timeline provides a common reference frame through its hierarchical typology of time periods. This hierarchy of durations, duration revolutions, scenes, scene transitions, and intervals gives the timeline an ordered, coherent structure for human-environment scholars to reference. A timeline's common reference frame has formed the foundation for scholarly collaborations in geology (Palmer 1983; Cohen *et al*. 2013; Walker *et al*. 2013). Existing human-environment chronologies to not feature this hierarchical structure (see Golson 2007; McNeill 2014; Kovarik 2018; Rachel Carson Center 2018). In addition to its structure, the human-environment timeline offers a set of classifications and themes that relate directly to the phenomenon. Rather than reference centuries and general time periods like the Golden Age, academics and non-academics can talk about the human-environment relationship in terms of the Pyro Scene, the Private Property and Commons Interval, and the Green Governance Scene. As a result, establishing an official human-environment timeline can provide a helpful reference for specific themes to address in future symposiums and collaborations.

Second, the timeline's development involved an abductive synthesis of ideas and events through a qualitative textual analysis. The geologic and biologic timelines each required collaborations of researchers exploring the latest research to synthesize time periods (Palmer 1983; Betts *et al*. 2018). Thus far, there has been no explicit example of applying concepts in meta-analysis and grounded theory to compose a timeline for the human-environment relationship. The methodological process for developing social scientific timeline should not be taken for granted. Further consideration should be directed toward how to use qualitative methods to systematically mine data and compose time periods. This human-environment timeline provides a starting point for this area of inquiry.

Third, through its large-scale temporal overview, the human-environment timeline orients inquiry into phenomena occurring at varying time scales. Similarly, scholars have carved out careers in helping to define one or more periods of the geologic timeline, such as the Holocene Epoch or the Megalayan Age (Voosen 2018). A graduate student in evolutionary anthropology may be concerned with further developing and amending the Survival and Adaptation Durations. An environmental historian may wish to track how the most recent Long Emergency Scene develops as humans proceed further into the twenty-first century. A political ecologist may be intrigued by examining how political discourses may have led to the transition between the Green Governance Scene to the Overshoot Scene.

Finally, the human-environment timeline's existence can be an opportunity to draw contrasts with different periodizations. Chapter 5, "Interpreting the Human-Environment Timeline," illustrates possibilities for different perspectives to contribute to this area of study. As a standard, the human-environment timeline can offer opportunities to explore alternative periodizations of the relationship between humans and nature. The next section discusses the

limitations of the present human-environment timeline and offers suggestions for expanding and improving upon this initial research.

Limitations

McNeill (2014, 13) cautions against accounting for the human-environment relationship in his chapter on the environmental history of humankind's first 100,000 years:

> I rush in where prudent angels fear to tread, to the realm of long-term global-scale history. As a rule, historians leave this treacherous terrain to others, to historical sociologists in particular. Historians have their reasons for this caution, preferring the surer ground of smaller-scale history that can be supported by written documentation. One way to reduce the impracticalities of long-term global-scale history is to privilege one variety of human experience.

McNeill underscores the point that large-scale environmental history is a complex, contradictory, and a shaky undertaking for any scholar. Although it appears prudent to consider history on a shorter timescale, it is still important to inquire about the ideas that arise from thinking about broader ideas associated with the human-environment relationship. With that said, the human-environment timeline has a number of limitations in its current form. For qualitative methods like grounded theory, it is important for the researcher to be reflexive and acknowledge how assumptions and limits may impact the research outcomes (Birks and Mills 2011). Three limitations exist:

1. A human-environment timeline is never complete.
2. A human-environment timeline is exclusionary.
3. Alternative and antipodal periodizations can be developed.

A human-environment timeline is never complete. The examination of four geographic encyclopedias does not account for every event and idea in the human-environment relationship. Analysis of additional encyclopedias may provide data that fills in some of the blanks but will

likely never offer an absolutely comprehensive representation of the human-environment relationship. Human creativity in scholarship suggests that others might find different sources of data (other than encyclopedias) to mine for nuggets of relevant information.

Aspects of the human-environment relationship are left undocumented during long periods of the human-environment coevolution. For example, the longest time period, the Survival Duration, has the least number of timeline entries out of the four major durations. Future work by archeologists and cultural anthropologists might help add relevant ideas or events. Additionally, the Long Emergency Scene is currently unraveling and confronting nascent conditions of global change. New insights and discoveries will likely (and ought to) add to this collection of time periods.

The characterization and classification of the timeline is also unfinished. The timeline's binary of ideas and events is problematic because there is an interplay between the two, with an event also comes an idea. Human conception of an idea can also be considered an event. The binary served as a useful initial way to describe the dataset of the human-environment timeline. What will become important is to venture outside the simple and elusive categorization of ideas and events to consider more deeply the role and impact of the identified moments along the human-environment timeline. One aspect will be to elaborate more on the events and ideas that lead up to and proceed after something like the 1994 Framework Convention on Climate Change or the 1992 Rio Earth Summit. How do these events/ideas develop and change over time? What is the "life cycle" or "morphology" of a human-environment event or idea?

In part because this timeline is designed to invoke further conversation and thus, could be considered incomplete, *the human-environment timeline unintentionally excludes a wide range of perspectives*. The emphasis on English-language resources risks limiting the timeline's

perspective to the context of Western society. Though the timeline does include events and ideas from around the world, the content in encyclopedias does appear to favor dominant European and North American perspectives on the human-environment relationship (see Setten 2008). Euro-centric perspectives tend to dominate history, and this emphasis can exclude invaluable traditional ecological knowledges (Davis 2009; Wildcat 2009). Wildcat (2009, 113), in particular, argues that the wisdom and validity of indigenous perspectives are overlooked by the "Western, forward-looking gaze of progress."

Postmodern and poststructural scholars will likely find this to be the case, as Wishart (2004) has articulated. For example, the timeline is constructed based on the affirmation that long-term human evolution is a scientific fact. That decision effectively minimizes religious, indigenous, and folkloric milieus which may provide alternative explanations. Furthermore, some cultures, especially marginalized ethnic and racial groups, may offer a completely different periodization than the synthesis proposed for human-environment timeline developed in this dissertation. These limitations open considerations for alternative anthrochronologies of the human-environment relationship. Instead of homeland security, Wildcat (2009, 139) advocates for "homeland maturity," a situation which acknowledges how "life-enhancing knowledge," like traditional ecological knowledge, emerge "from experience in the rich contours of the nature-culture nexus." Ethnic studies of periodization, or *ethno-periodization,* may prove to be a productive realm of inquiry.

Third, the human-environment timeline was created through the subjective process of abduction. Given the subjective nature of abductive synthesis, *the proposed periodizations can easily be called into question, and new periodizations can emerge*. Drawing up boundaries for a time period can pose problems and controversies similar to drawing a line on a map (see

Monmonier 1995). For better or for worse, the timeline satisfies the ultimate goal of creating an initial basis for developing an official human-environment timeline.

A Note on Data Exploration and Methods of Periodization

Through qualitative analysis, this exploration deviates from previous methods to create scientific timelines. The research design relates to trends in "fourth-paradigm" or eScience (see Bell, Hey, and Szalay 2009), as well as qualitative meta-analysis (see Levitt 2018). The research objectives of this dissertation required that methods be adapted to suit the nature of the data being synthesized (see Chapter 3).

The "Fourth Paradigm" and the Timeline

The fourth paradigm involves large-scale, automated, inductive research to compile and synthesize knowledge about a subject (Bell, Hey, and Szalay 2009). The methods for the present research do not reflect the fourth paradigm because of two differences. First, the target 'database' is a selection of hard-copy encyclopedias, rather than a digital archive. For the most part, encyclopedias are present in online or hard-copy formats, or both. The investigator opted for hard copies because they were easier to access and read than online formats. Inter-library loans tended to be a faster outlet to access encyclopedias when compared to obtaining an online subscription from the publisher. Second, the researcher *manually* collected, analyzed, and interpreted information from these encyclopedias. Automated computation using artificial intelligence, a tool in 'fourth paradigm' methods, is not present in this development of this human-environment timeline. The parameters of computer software (*i.e.*, programming to perform keyword searches) risk being too rigid to assess the subtleties of benchmarks for the human-environment relationship. This research, however, opens possibilities for fourth

paradigm research of the human-environment timeline, including comparing the manual versus computer-automated methods. According to Hansen and colleagues (2009, 155-156),

> Data exploration is an inherently creative process that requires the researcher to locate relevant data, visualize the data and discover relationships, collaborate with peers while exploring solutions, and disseminate results. Given the volume of data and complexity of analyses that are common in scientific exploration, new tools are needed and existing tools should be extended to better support creativity.

Ultimately, the "creative process" of data exploration is where qualitative methods came into play for the development of the human-environment timeline.

Qualitative Meta-Analysis and the Timeline

This research draws heavily from work in qualitative meta-analysis and grounded theory. The interpretive and adaptive qualities of these methods proved effective in synthesizing a human-environment timeline (see Levitt 2018). Qualitative analysis entails the production of categories and descriptive, meaningful themes (Granheim, Lindgren, and Lundman 2017). The generation of thematic time periods involved deriving meanings from the data, not using frequencies to divide the data into clusters (see Charmaz 2004). Meaning-making was essential in the creation of time periods that embodied the overall patterns of ideas and events within the timeline. Furthermore, the abductive principles used in grounded theory helped promote the trustworthiness and validity of the research through triangulating the inductive exploration of encyclopedias with outside scholarly research (Timmermans and Tavory 2012; Levitt 2018; Timonen, Foley, and Conlon 2018). This research does, however, deviate from existing research in meta-analysis and grounded theory because of its examination of encyclopedia entries as opposed to primary case studies.

Regardless, the abductive principles in qualitative research effectively apply to each phase of the research design. This research includes the process of defining the selection of which encyclopedias to select for systematic review, how to identify and make sense of the relevant data, how to divide up the data into categories and thematic time periods, and how to interpret the timeline from the standpoints of a normal scientist, cultural ecologist, political ecologist, and humanistic geographer. Remaining sections of this chapter discuss the broader impacts from developing a human-environment timeline. Final paragraphs conclude with the proposal for a human-environment timeline working group to engage the topic more fully.

Broader Impacts

Through composing a human-environment timeline, this work tries to promote timefulness, dispel the "end of history" illusion, and reinitiate the findings from Wishart's (2004) inquiry into how geographers understand and apply time periods to geographic research areas. Dominant themes exist for concepts like region, such as a sense of becomingness, the interrelation between cultural and environmental characteristics, and the relationships between region size, scale, and detail at different scales (Hart 1982). Less is known for what characteristics make up a period and how this affects the ways geographers appreciate and understand time. The Anthropocene has prioritized periodization as an important endeavor for global change scientists (Biermann *et al.* 2016) and geographers (Ellis 2017), alike. Nevertheless, there exists a need for a deeper examination of periodization and the human-environment relationship. This research also opens possibilities for a critical analysis of authoritative texts, such as encyclopedias and other reference collections of ideas (see Setten 2008; Willig 2013). Systematic exploration of encyclopedias can provide cues to which big

ideas and events of the human-environment timeline are included and advanced in geography and the human-environment identity.

Timefulness and the Human-Environment Relationship

There is value in a human-environment timeline that distills a long, multifaceted story in visual and contextual form. Development and officiation of a timeline can help to communicate the human-environment relationship to future generations. Timelines help scholars make sense of the relative placement of events and the duration of the identified time periods (Walker *et al*. 2013). Creation of time periods to synthesize and interpret the past is vital toward projecting future decision-making and research. A poem by Gary Snyder (2015, 67) concisely articulates the crucial connection between past and present. With white text set in front of a black background, it reads:

> This present moment
> that lives on
>
> to become
>
> long ago

As these words are read, the human-environment relationship continues to change, and the present leaves a trail of history behind it. The poem conveys Bjornerud's sense of timefulness. Timefulness, according to Bjornerud (2018, 5), is "an acute consciousness of how the world is made by—indeed, made of—time." Speaking from the perspective of a geologist, Bjornerud argues:

> an attitude of timefulness could transform our relationships with nature, our fellow humans, and ourselves. Recognizing that our personal and cultural stories have always been embedded in larger, longer—and still elapsing—Earth stories might save us from environmental hubris (178).

Bjornerud directs her discussion of timefulness toward geologic thinking; but this perspective can also be applied to *human-environment* thinking. Humans are "time illiterate" and time-denying in the sense that they are prone to proceed on the ever-quickening "march of progress" without taking a beat to consider how they arrived at that point and what problems might be in store for them (7). Bjornerud envisions a time-literate society, a "chornotopia" that appreciates the lessons of the past and uses that heritage to make society a better place (173).

Timelines, Human Capability, and a Sustainable Future

The human-environment timeline addresses the broad question of how the human-environment relationship has changed over time. One issue is the extent to which the timeline aids decision-making for a more sustainable future. The goal of this timeline is to be policy-relevant, not policy prescriptive, to paraphrase a statement on principles and procedures by the Intergovernmental Panel on Climate Change (IPCC 2010). The 'policy-relevant' model represents the general consensus of other official timelines. For example, the geologic and biologic timelines are founded upon objective research in the physical sciences (Walker *et al.* 2013; Betts *et al.* 2018); therefore, the development of these timelines do not account for ethics and decision-making outside the boundaries of normal science. A geologic timeline can contribute toward a more time-full perspective on the environment, as Bjornerud (2018) claims; but such an outlook does not necessarily correlate to prescribing a certain form of decision-making. By contrast, the human-environment timeline does contain ethical dimensions to it; but these aspects are founded upon qualitative meta-analysis. To direct the timeline toward a specific set of socio-political outcomes would be reductionist and hinder the goal of a holistic representation of the human-environment relationship.

Regardless, the timeline does have relevance to fostering a more sustainable future. While this dissertation presents a timeline that is heavily influenced by the normal science perspective, the initial research makes room for considering how time periods can be employed as communication devices to improve environmental ethics and decision making. One possible avenue lies at the intersection of sustainable development and human capability. The concept of sustainable development was popularized in the 1980s. The idea gained serious international popularity with the 1987 United Nations Brundtland Report, *Our common future*. The report defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (43). Since then, the idea has gained a multitude of definitions; but there is no question of its significance in environmental ethics and decision making (Mugerauer and Manzo 2008). Just as there are problems in defining the human-environment relationship (see Chapter 3), so too are there issues with defining sustainable development. The timeline can be assessed in terms of its relevance to sustainability under the capabilities approach.

Like sustainable development, the capabilities approach was introduced through the facilitation of the United Nations during the early 1990s (Sen 1993). Robeyns (2005, 94) defines the approach as "a broad normative framework for the evaluation and assessment of individual well-being and social arrangements, the design of policies, and proposals about social change in society." The capabilities approach to development, in other words, attempts to understand how development can foster the collective agency, responsibility, and freedom of individuals living in countries. The capabilities approach has gained relevance in geographic thought through two initiatives: Geo-capabilities and Powerful Geography (Solem, Lambert, and Tani 2013; Lambert, Solem, and Tani 2015 Boehm, Solem, and Zadrozny 2018). The two initiatives lay out an ethical

argument that students are being deprived of geographic skills because of top-down attempts at educational reform. Geo-capabilities and Powerful Geography emphasize grassroots educational reform that connects individual aspirations with the skills necessary for employment and well-being. The capabilities approach has broader implications for geography education: a need to include the human-environment relationship. Specifically, there is a need to further develop the concept of sustainability under the capabilities approach (Pelenc, Lompo, Ballet, and Dubois 2013).

Sustainable development and human capability are complementary and make up or each other's limitations (Lessmann and Rauschmayer 2013; Peeters, Dirix, and Sterckx 2013). Together, they more adequately address the integrity of both the environment and the individual. The bottom-up nature of the capabilities approach also challenges the top-down, far-sighted tendencies of global sustainable development (McAfee 1999; Peeters, Dirix, and Sterckx 2013). The first official human-environment timeline could help speak to the ethical aspects of the human relationship with the environment. A human-environment timeline can provide an approachable form of communication to enhance human reasoning, capability, and well-being in the context of sustainability (see Sen 2013). In this sense, it can work as a pedagogical device, research reference, and also as a resource for future environmental decision making.

One possible risk to sustainable development and human capability is the 'end of history illusion.' This idea is a psychological concept advanced by Quoidbach *et al.* (2013) to describe the misconception that humans have done all of the changing possible in their lifetime, so that there is no room to change in the future. This illusion suggests that humans are challenged to think rationally about how contemporary forcing will produce new outcomes. In a way, a less-than-satisfactory understanding of human-environment history could perpetuate the idea that the

present and future are not impacted by the past nor subject to change. If done effectively, periodization could help combat the capabilities deprivation that 'end of history illusion' causes among public perceptions of the human-environment relationship.

The human-environment timeline provides a relevant tool for charting "Our Common Future" by reflecting upon "Our Common Past." The Anthropocene represents not just a geologic epoch; its conception has moral and pragmatic relevance. A human-environment timeline could help to further liberate the Anthropocene from its origins in the physical sciences to promote consilience (see Wilson 1998). These time periods would not just represent breaks in time but would work to represent and influence perceptions of the human-environment relationship. A human-environment timeline provides an approachable distillation of valuable lessons and ideas of how humans arrived at the current global environmental crisis. This synthesized understanding of the past would only serve to promote better decision-making, where citizens and scholars may be able to ask questions like, "Is history repeating itself or entering a new age?"

The Great Unread

The so-called "Great Unread" was also a motivation for the development of a human-environment timeline. The Great Unread refers to the deluge of unread scholarly content that is present and multiplying in libraries, blogs, research databases, and social media. In science, technology has augmented the volumes of data by the hundreds and thousands (Bell, Hey, and Szalay 2009). The rapid pace of information production makes knowledge extraction more difficult (Fayyad, Piatetsky-Shapiro, and Smyth 1996b). Scholars are developing new methods to optimize knowledge creation and to keep up with the flood of new information.

Academics and non-academics alike are infowhelmed, a state in which individuals are bombarded by information faster than they can make sense of it all (Houser 2014; Woods 2017). Sunstein's (2006) *Infotopia: How many minds produce knowledge* characterizes today's 'information society', a technoscape in which more knowledge is produced, consumed, and shared than any other point in human history (2006; also cited in Houser 2014). Information overload can lead to problems when groups of people try to come to consensus over some issue. Sunstein (2006) identifies four such problems which arise among groups in Infotopia: 1) biases that amplify errors in producing knowledge and making decisions; 2) the common knowledge effect, in which dominant knowledges in a group have more influence over those held by just a few group members; 3) information that is shared according to a cascading order (*e.g.*, according to reputation); and 4) the tendency for groups to polarize in their positions on some form of knowledge. No academic group is exempt. Academics produce and are affected by the sheer amount of information out on the Web and elsewhere.

A Human-Environment Timeline Working Group

This dissertation ends with a call for a transdisciplinary human-environment timeline working group, similar to the already established Anthropocene Working Group. This could be organized by a disciplinary scholarly society that reaches out to like-minded others, a national academy of scholars, or an international collection of scholars, such as the Future Earth grouping. The goal of this working group will be to gather and synthesize big ideas and events to formally create an official human-environment timeline. The members will serve in part as a theoretical sample to help test the validity of the time periods generated for the human-environment timeline (see Birks and Mills 2011).

The human-environment timeline requires a working group that encourages social entrepreneurship and the generation of new ideas. Following Bornstein (2007), the group should institutionalize listening, pay attention to exceptional or unexpected information, present ideas and products that the public can understand and use, and promote soft skills that ensure a healthy and productive collaboration. This group would build off of the work done in previous symposiums throughout the history of scholarly and geographic thought. Important tomes have been arranged at semi-regular intervals, from Marsh's ([1864] 2003) *Man and nature*, to Thomas's (1956) *Man's role*, to Glacken's (1967) *Traces on the Rhodian Shore*, to Turner *et al.'s* (1990) *The Earth as transformed by human action*. This sequencing of scholarly gatherings and collections begs the question: from modifying, to changing, to transforming, which big ideas and historical periods will inform future symposiums and treatises on the human-environment identity? What topics will the next international symposiums and conferences address?

A human-environment timeline is not a trivial conception. It has implications in both academic and public realms. Sprout and Sprout (1965, 9-10) write that "environmental concepts and relationships are inherent in, and central to, any serious discussion of human affairs; and one's conceptions of such relationships and modes of analyzing them are certain to affect his images of the past and his expectations regarding the future." In alignment with this statement, there exists an inherent need for scholars to gather and assess the state of knowledge about certain aspects of the human-environment relationship. To a large degree, that interest was sparked by the geographic thinking of George Perkins Marsh. In 1864, Marsh published *Man and nature: or, physical geography as modified by human action*. Inspired by Marsh's work, over 70 scholars gathered in June 1955 for a symposium in Princeton, New Jersey, led by William L. Thomas, Jr. (the originator of the idea) and the self-described "peasant and cranky

old backwoodsman" Carl O. Sauer (Williams 1987, 231). This symposium and the three years of planning resulted in the publication, *Man's role in changing the face of the Earth* (Thomas 1956).

Marsh ([1864] 2003), Thomas (1956), Glacken (1967), and Turner *et al*. (1990) represent significant reflections on the human-environment identity within the context of a world that is continually changing through human intervention. They engage the questions of "what has happened," "what do we know about it," and "where are we going" that drive inquiry into the human-environment identity. They echo Carl Sauer's proposed three-part outline of the Man's role publication: retrospect (past), process (present), and prospect (future) (Thomas 1956; Williams 1987). Motivated by these works, this dissertation advocates for further inquiry to the retrospect, process, and prospect of building a human-environment timeline.

Bibliography

Abler, R., J.S. Adams, and P. Gould. 1971. *Spatial organization: The geographer's view of the world*. Englewood Cliffs, NJ: Prentice-Hall.

Adams, R.M. 1990. The relativity of time and transformation. In *The Earth as transformed by human action*, ed. B.L. Turner, II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, vii-x. Cambridge: Cambridge University Press, with Clark University.

Allen, C.W., ed. 2011. *Encyclopedia of environmental issues*, 2nd ed. Hackensack, NJ: Salem Press.

Altman, I., and M. Chemers. 1980. *Culture and environment*. Monterey, CA: Brooks/Cole Publishing.

Altman, I., and S.M. Low. 1980. *Place attachment*. Boston, MA: Springer.

Anderson, R., ed. 2010. *Berkshire encyclopedia of sustainability*. Great Barrington, MA: Berkshire Publishing.

Baker, A.R.H. 2003. *Geography and history: Bridging the divide*. New York: Cambridge University Press.

Barrows, H.H. 1923. Geography as human ecology. *Annals of the American Association of Geographers* 13(1): 1-14.

Bell, G., T. Hey, and A. Szalay. 2009. Beyond the data deluge. *Science* 323: 1297-1298.

Bentley, J.H. 1996. Cross-cultural interaction and periodization in world history. *American Historical Review* 101(3): 749-770.

Berna, F., P. Goldberg, L.K. Horwitz, J. Brink, S. Holt, M. Bamford, and M. Chazan. 2012. Microstratigraphic evidence of in situ fire in the Acheulean strata of Wonderwerk Cave, Northern Cape province, South Africa. *PNAS* 109(20): 1215-1220.

Berry, B.J.L. 1964. Approaches to regional analysis: A synthesis. *Annals of the American Association of Geographers* 54(1): 2-11.

Betts, H.C., M.N. Puttick, J.W. Clark, T.A. Williams, P.C.J. Donoghue, and D. Pisani. 2018. Integrated genomic and fossil evidence illuminates life's early evolution and eukaryote origin. *Nature Ecology & Evolution* doi.org/10.1038/s41559-018-0644-x.

Birks, H.J.B., and J.A. Matthews. 2014. Classification. In *Encyclopedia of Environmental Change*, ed. J.A. Matthews, 163. Thousand Oaks, CA: SAGE.

Birks, M., and J. Mills. 2011. *Grounded theory: A practical guide*. Los Angeles, CA: SAGE.

Bjornerud, M. 2018. *Timefulness: How thinking like a geologist can help save the world*. Princeton, NJ: Princeton University Press.

Black, T., T. Weis, S. D'Arcy, and J.K. Russel, eds. 2014. *A line in the tar sands: Struggles for environmental justice*. Oakland: PM Press.

Blackbourn, D. 2012. "The horologe of time": Periodization in history. *PMLA* 127(2): 301-307.

Boehm, R.G., M. Solem, and J. Zadrozny. 2018. The rise of Powerful Geography. *The Social Studies* 109(2): 125-135.

Boorstin, D.J. 1983. *The discoverers: A history of man's search to know his world and himself*. New York: Random House.

Börner, K. 2018. Modeling and mapping. *Science* 361(6408): 1196-1197.

Bornstein, D. 2007. *How to change the world: Social entrepreneurs and the power of new ideas*. Oxford: Oxford University Press.

Botkin, D.B. 1990. *Discordant harmonies: A new ecology for the twenty-first century*. New York, NY: Oxford University Press.

Boulding, K.E. 1966. The economics of the coming Spaceship Earth. In *Environmental quality in a growing economy*, ed. H. Jarrett, 3-14. Baltimore: Johns Hopkins University Press.

Bousquet, F., P. Robbins, C. Peloquin, and O. Bonato. 2015. The PISA grammar decodes diverse human-environment approaches. *Global Environmental Change* 34: 159-171.

Brondizio, E. S., K. O'Brien, X. Bai, F. Biermann, W. Steffen, F. Berkhout, C. Cudennec, M.C. Lemos, A. Wolfe, J. Palma-Oliveira, and C. A. Chen. 2016. Re-conceptualizing the Anthropocene. A call for collaboration. *Global Environmental Change* 39:318.

Brown, L.A. 1999. Change, continuity, and the pursuit of geographic understanding. *Annals of the American Association of Geographers* 89(1): 1-25.

Bryant, A., and K. Charmaz. 2007. Grounded theory in historical perspective: An epistemological account. In *The SAGE handbook of grounded theory*, ed. A. Bryant and K. Charmaz, 31-57. Thousand Oaks, CA: SAGE.

Büscher, B., S. Sullivan, K. Neves, J. Igoe, and D. Brockington. 2012. Towards a synthesized critique of neoliberal diversity conservation. *Capitalism Nature Socialism* 23(2): 4-30.

Bunge, W. 1966. *Theoretical geography*, 2nd ed. Lund: Lund Studies in Geography.

Bunge, W. 1988. *Nuclear war atlas*. Oxford: Basil Blackwell.

Burton, I., and R.W. Kates. The Great Climacteric, 1798-2048: The transition to a just and sustainable human environment. In *Geography, resources, and environment*, ed. R.W. Kates and I. Burton, 339-360.

Buttimer, A. 1976. Grasping the dynamism of the lifeworld. *Annals of the American Association of Geographers* 66(2): 277-292.

Butzer, K.W. 1990. The realm of cultural-human ecology: Adaptation and change in historical perspective. In *The Earth as transformed by human action*, ed. B.L. Turner, II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, 685-701. Cambridge: Cambridge University Press, with Clark University.

Butzer, K.W. 1992. The Americas before and after 1492: An introduction to current geographical research. *Annals of the American Association of Geographers* 82(3): 345-368.

Callicott, J.B., and R. Frodeman, eds. 2009. *Encyclopedia of environmental ethics and philosophy*. Farmington Hills, MI: MacMillan.

Cambridge. 2018a. Event. *Cambridge dictionary*. dictionary-cambridge.org, last accessed 20 August.

Cambridge. 2018b. Idea. *Cambridge dictionary*. dictionary-cambridge.org, last accessed 24 May.

Carson, R. 1962. *Silent spring*. Boston: Houghton Mifflin.

Casey, E. 2006. David Carr on history, time, and place. *Human Studies* 29: 445-462.

Castree, N. 2000. Environmentalism. In *The Dictionary of Human Geography*, ed. R.J. Johnston, D. Gregory, G. Pratt, and M. Watts, 223-225. Malden, MA: Blackwell.

Castree, N. 2015a. Changing the Anthropo(s)cene. *Dialogues in Human Geography* 5:301-316.

Castree, N. 2015b. Coproducing global change research and geography. *Dialogues in Human Geography* 5:343-348.

Castree, N. 2017. Anthropocene: social science misconstrued. *Science* 541(7637): 289.

Charmaz, K. 2004. Premises, principles, and practices in qualitative research: Revisiting the foundations. *Qualitative Health Research* 14(7): 976-993.

Charmaz, K. 2006. *Constructing grounded theory: A practical guide through qualitative analysis*. Thousand Oaks, CA: SAGE.

Chisholm, M. 1990. The increasing separation of production and consumption. In *The Earth as transformed by human action*, ed. B.L. Turner, II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, 87-101. Cambridge: Cambridge University Press, with Clark University.

Coffey, A. 2013. Analysing documents. In *The SAGE handbook of qualitative data analysis*, ed. U. Flick, 367-379. London, UK: SAGE.

Cohen, J.J. 2017. Anarky. In *Anthropocene reading: Literary history in geologic times*, ed. T. Menely and J.O. Taylor, 25-42. University Park, PA: Pennsylvania State University Press.

Cohen, K.M., S.C. Finney, P.L. Gibbard, and J.-X. Fan. 2013, updated. The ICS International Chronostratigraphic Chart. *Episodes* 36: 199-204.

Collier, J.E. 1955. Geographic regions of Missouri. *Annals of the American Association of Geographers* 45(4): 368-388.

Costanza, R., R. de Groot, L. Braat, I. Kubiszewski, L. Fioramonti, P. Sutton, S. Farber, and M. Grasso. 2017. Twenty years of ecosystem services: How far have we come and how far do we still need to go?. *Ecosystem services* 28: 1-16.

Craglia, M., M.F. Goodchild, A. Annoni, G. Camara, M. Gould, W. Kuhn, D. Mark, I. Masser, D. Maguire, S. Liang, and E. Parsons. 2008. Next-generation Digital Earth. *International Journal of Spatial Data Infrastructures Research* 3: 146-167.

Crosby, A.W. [1972] 2003. *The Columbian Exchange: Biological and cultural consequences of 1492, 30th anniversary edition*. Westport, CT: Praeger.

Crutzen, P.J. 2002. Geology of mankind. *Nature* 415:23.

Crutzen, P.J., and E.F. Stoermer. 2000. The Anthropocene. *Global Change Newsletter* 41:17-18.

Cutter, S.L. 2003. The vulnerability of science and the science of vulnerability. *Annals of the American Association of Geographers* 93(1): 1-12.

Dant, S. 2017. *Losing Eden: An environmental history of the American West*. West Sussex: Wiley.

Davis, W. 2009. *The wayfinders: Why ancient wisdom matters in the modern world*. Toronto, ON: House of Anansi Press.

Dawkins, R. 2016. *The selfish gene: 40th anniversary edition*. New York: Oxford University Press.

de Steiguer, J.E. 2006. *The origins of modern environmental thought*. Tucson: University of Arizona Press.

Delson, E., I. Tattersall, J.A. Van Couvering, and A.S. Brooks, eds. 2000. *Encyclopedia of human evolution and prehistory*, 2nd ed. New York: Garland Publishing, Inc.

Demeny, P. 1990. Population. In *The Earth as transformed by human action*, ed. B.L. Turner, II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, 41-54. Cambridge: Cambridge University Press, with Clark University.

Demeritt, D. 2008. Dictionaries, disciplines and the future of geography. *Geo Forum* 39(6): 1811-1813.

Denevan, W.M. 1992. The Pristine Myth: The landscape of the Americas in 1492. *Annals of the American Association of Geographers* 82(3): 369-385.

Dey, I. 2007. Grounding Categories. In *The SAGE handboujujok of grounded theory*, ed. K. Charmaz and A. Bryant, 167-190. Thousand Oaks, CA: SAGE.

Diamond, J. 1987. The worst mistake in the history of the human race. *Discover Magazine* 8(5): 64-66.

Diamond, J. 2005. *Collapse: How societies choose to fail or succeed*. New York: Penguin.

Di Peso, C.C. 1974. *Casas Grandes: A fallen trading center of the Gran Chichimeca*, Vols. 1-3. Flagstaff, AZ: Northland Press

Di Peso, C.C., J.B. Rinaldo, and G.J. Fenner, eds. *Casas Grandes: A fallen trading center of the Gran Chichimeca*, Vols. 4-7. Flagstaff, AZ: Northland Press.

Duffy, R. 2016. War, by conservation. *Geoforum* 69: 238-248.

Ehrlich, P.R. 1968. *The population bomb*. Rivercity, MA: Rivercity Press.

Ehrlich, P.R., and A.H. Ehrlich. 2008. *The dominant animal: Human evolution and the environment*. Washington, D.C.: Shearwater.

Ehrlich, P.R., and J.P. Holdren. 1971. Impact of population growth. *Science* 171:1212-1217.

Ellis, E.C. 2017. Physical geography in the Anthropocene. *Progress in Physical Geography* 41:525-532.

Ellis, E.C., J.O. Kaplan, D.Q. Fuller, S. Vavrus, K.K. Goldewijk, and P.H. Verburg. 2013. Used planet: A global history. *PNAS* 110(20): 7978-7985.

Ellis, E.C., M. Saslin, N. Bolvin, and A. Bauer. 2016. Involve social scientists in defining the Anthropocene. *Nature* 540: 192-193.

Englehardt, T. 2018. Three failing experiments? Mine, America's, and humanity's. *Common Dreams* https://www.commondreams.org/views/2018/07/27/three-failing-experiments-mine-americas-and-humanitys, last accessed 26 August 2018.

Enserink, M. 2018. Research on research. *Science* 361(6408): 1178-1179.

Entrikin, J.N. 1997. Place and region 3. *Progress in Human Geography* 21(2): 263-268.

Evans, J.A. 2018. A crowded frontier. *Science* 361(6408): 1195-1196.

Fayyad, U., G. Piatetsky-Shapiro, and P. Smyth. 1996a. From data mining to knowledge discovery in databases. *AI Magazine* 17(3): 37-54.

Fayyad, U., G. Piatetsky-Shapiro, and P. Smyth. 1996b. The KDD process for extracting useful knowledge from volumes of data. *Communications of the ACM* 39(11): 27-34.

Fiege, M. 2012. *The Republic of Nature: An environmental history of the United States*. Seattle: University of Washington Press.

Ferretti, F. 2015. Anarchism, geohistory, and the *Annales*: Rethinking Élisée Reclus's influence on Lucien Febvre. *Environment and Planning D: Society and Space* 33: 347-365.

Fitzgerald, D. 2010. Agriculture. In *Turning points of environmental history*, ed. F. Uekoetter, 29-43. Pittsburgh: University of Pittsburgh Press.

Flores, D. 1998. Spirit of place and the value of nature in the American West. In *A sense of the American West*, ed. J.E. Sherow, 31-38. Albuquerque, NM: University of New Mexico Press.

Fuchs, B. 2012. Golden ages and golden hinds; or, periodizing Spain and England. *PMLA* 127(2): 321-327.

Gaddis, J.L. 2002. *The landscape of history: How historians map the past*. New York: Oxford University Press.

Galway-Witham, J., and C. Stringer. 2018. How did *Homo sapiens* evolve?. *Science* 360(6395): 1296-1298.

Gamble, C. 2007. *Origins and revolutions: Human identity in earliest prehistory*. New York: Cambridge University Press.

Garner, B.A. 2016. *A dictionary of modern American usage*, fourth ed. Oxford: Oxford University Press.

Gibbons, A. 2018. Complex behavior arose at dawn of humans. *Science* 359(6381): 1200-1201.

Glacken, C. 1967. *Traces on the Rhodian Shore*. Berkeley: University of California Press.

Gladwell, M. 2002. *The tipping point: How little things can make a big difference*. New York: Back Bay Books.

Gladwin, D. 2018. *Ecological exile: Spatial injustice and environmental humanities*. New York: Routledge.

Glaser, B.G., and A.L. Strauss. 1967. *The discovery of grounded theory: Strategies for qualitative research*. New Brunswick, NJ: Transaction Publishers.

Gober, P. 2000. In search of synthesis. *Annals of the American Association of Geographers* 90(1): 1-11.

Golson, K.G. 2007. Chronology. In *Encyclopedia of environment and society*, ed. P. Robbins, 2021-2028. Thousand Oaks, CA: SAGE.

Goudie, A.S., ed. 2002a. *Encyclopedia of global change: Environmental change and human society*. New York, NY: Oxford University Press.

Goudie, A.S. 2002b. Introduction. In *Encyclopedia of global change: Environmental change and human society*, xi-xiv. Oxford: Oxford University Press.

Goudie, A.S. 2002c. Preface. In *Encyclopedia of global change: Environmental change and human society*, ix-x. Oxford: Oxford University Press.

Gould, S.J. 1989. *Wonderful life: The Burgess shale and the nature of history*. New York: Norton and Company.

Gradstein, F.M., J.G. Ogg, M.D. Schmitz, and G.M. Ogg, eds. 2012. *The geologic time scale*. Amsterdam: Elsevier.

Graf, W. L. 1990. *Wilderness preservation and the Sagebrush Rebellions*. Savage, MD: Rowman and Littlefield.

Graff, G. 2015. How periods erase history. *Common Knowledge* 21(2): 177-183.

Granheim, U.H., B.M. Lindgren, and B. Lundman. 2017. Methodological challenges in qualitative content analysis: A discussion paper. *Nurse Education Today* 56: 29-34.

Green, W.A. 1992. Periodization in European and world history. *Journal of World History* 3(1): 13-53.

Gregory, D., R. Johnston, G. Pratt, M.J. Watts, and S. Whatmore. 2009a. Preface to the fifth edition. In *The dictionary of human geography*, fifth edition, ed. D. Gregory, R. Johnston, G. Pratt, M.J. Watts, and S. Whatmore, vi-ix. Oxford: Blackwell.

Gregory, D., R. Johnston, G. Pratt, M.J. Watts, and S. Whatmore, eds. 2009b. *The dictionary of human geography*, fifth edition. Oxford: Blackwell.

Grigg, D. 1965. The logic of regional systems. *Annals of the American Association of Geographers* 55(3): 465-491.

Grossman, L. 1977. Man-environment relationships in anthropology and geography. *Annals of the American Association of Geographers* 67(1): 126-144.

Grossman, G. M., and A. B. Krueger. 1991. *Environmental impacts of a North American Free Trade Agreement*. Cambridge, MA: NBER.

Gutkind, E.A. 1956. Our world from the air: Conflict and adaptation. In *Man's role in changing the face of the earth*, ed. W.L. Thomas, Jr., 1-44. Chicago: University of Chicago Press.

Hanson, S. 2004a. Who Are "We"? An Important Question for Geography's Future. *Annals of the Association of American Geographers* 94(4): 715-722.

Hanson, S. 2004b. On geographers and the environment. In *Presidential musings from the Meridian: reflections on the nature of geography by presidents of the Association of American Geographers*, ed. M. D. Nellis, J. J. Monk and S. L. Cutter, 154-156. Morgantown, WV: West Virginia University Press.

Harden, C. P. 2012. Framing and Reframing Questions of Human-Environment Interactions. *Annals of the Association of American Geographers* 102:737-747.

Hardin, G. 1968. The tragedy of the Commons. *Science* 162:1243-1248.

Harkin, M.E. 2007. Swallowing wealth: Northwest coast beliefs and ecological practices. In *Native Americans and the environment: Perspectives on the ecological Indian*, ed. M.E. Harkin and D.R. Lewis, 211-232. Lincoln: University of Nebraska Press.

Harlan, J.D. 2010. Tracing the "ghostly footprints" of the landscape. *Missouri Natural Areas Newsletter* 10(12010): 2-3.

Harlan, J.D., and J.M. Denny. 2003. *Atlas of Lewis and Clark in Missouri*. Columbia, MO: University of Missouri Press.

Harman, J.R., and J.A. Winkler. 1991. Synoptic climatology: Themes, applications, and prospects. *Physical Geography* 12(3): 220-230.

Harrington Jr., J. 2018 Personal Communication, September 25, 2018.

Harrington, J.A., Jr., and L.M.B. Harrington. 2012. Global change and geographic thought. In *21st century geography: A reference handbook*, ed. J.P. Stoltman, 50-66. Thousand Oaks, CA: SAGE.

Hart, J.F. 1982. The highest form of the geographer's art. *Annals of the American Association of Geographers* 72:1-29.

Hartshorne, R. 1961. *The nature of geography*. Lancaster, PA: The Science Press Printing Company.

Hay, P. 2002. *Main currents in western environmental thought*. Bloomington, IN: Indiana University Press.

Head, L. 2010. Cultural ecology: Adaptation – retrofitting a concept?. *Progress in Human Geography* 34(2): 234-242.

Headrick, D.R. 1990. Technological change. In *The Earth as transformed by human action*, ed. B.L. Turner, II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, 55-67. Cambridge: Cambridge University Press, with Clark University.

Hey, T., S. Tansley, and K. Tolle, eds. 2009. *The fourth paradigm: Data-intensive scientific discovery*. Redmond, WA: Microsoft Research.

Holmes, A. 1913. *The age of the Earth*, 3rd ed. London: Nelson.

Holt-Jensen, A. 2009. *Geography: Its history and concepts*, 4th ed. Thousand Oaks, CA: SAGE.

Holton, J.A. 2007. The coding process and its challenges. In *The SAGE handbook of grounded theory*, ed. A. Bryant and K. Charmaz, 265-289. Thousand Oaks, CA: SAGE.

Hooley, M. 2017. Reading vulnerability: Indigeneity and the scale of harm. In *Anthropocene reading: Literary history in geologic times*, edited by T. Menely and J.O. Taylor, 184-201. University Park, PA.: Pennsylvania State University Press.

Hunter, M.L., Jr. 1996. *Fundamentals of conservation biology*. Cambridge, MA: Blackwell.

Huston, M.A. 2005. The three phases of land-use change: Implications for biodiversity. *Ecological Applications* 15(6): 1864-1878.

Intergovernmental Panel on Climate Change (IPCC). 2010. Statement on IPCC principles and procedures. IPCC. https://www.ipcc.ch/pdf/press/ipcc-statement-principles-procedures-02-2010.pdf. Last accessed 10 November 2018.

International Commission on Stratigraphy (ICS). 2018. International chronostratigraphic chart. ICS. http://www.stratigraphy.org/ICSchart/ChronostratChart2018-07.jpg, last accessed 17 July 2018.

Jacobs, J. 1961. *The death and life of great American cities*. New York: Random House.

Jones, R. 2004. What time human geography? *Progress in Human Geography* 28(3): 287-304.

Jonas, A.E.G. 2012. Region and place: Regionalism in question. *Progress in Human Geography* 36(2): 263-272.

Jonas, A.E.G. 2013. Place and region III: Alternative regionalisms. *Progress in Human Geography* 37(6): 822-828.

Kaplan, D.H., and J.E. Mapes. 2015. Panoptic geographies: An examination of all U.S. geographic dissertations. *Geographical Review* 105(1): 20-40.

Kates, R.W. 1987. The human environment: The road not taken, the road still beckoning. *Annals of the American Association of Geographers* 77(4): 525-534.

Kates, R.W., C.E. Colten, S. Laska, and S.P. Leatherman. 2006. Reconstruction of New Orleans after Hurricane Katrina: A research perspective. *PNAS* 103(40): 14653-14660.

Kates, R.W., B.L. Turner, II, and W.C. Clark. 1990. The Great Transformation. In *The Earth as transformed by human action*, ed. B.L. Turner, II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, 1-17. Cambridge: Cambridge University Press, with Clark University.

Kelle, U. 2007. The development of categories: Different approaches in grounded theory. In *The SAGE handbook of grounded theory*, ed. A Bryant and K. Charmaz, 191-213. Thousand Oaks, CA: SAGE.

Kitchin, R., and N. Thrift, eds. 2009. *International encyclopedia of human geography*. Amsterdam: Elsevier.

Knapp, G. 2017. Human ecology. In *International encyclopedia of geography: People, the earth, environment, and technology*, ed. D. Richardson, N. Castree, M. F. Goodchild, A. Kobayashi, W. Liu, and R. A. Marston. doi: 10.1002/9781118786352.wbieg0477. West Sussex, UK: Wiley.

Kolbert, E. 2014. *The Sixth Extinction: An unnatural history*. New York: Henry Holt and Company.

Kovarik, W. 2018. Environmental history timeline. *Environmental History Timeline* http://environmentalhistory.org/about/, last accessed 27 August 2018.

Krech, S., II, J.R. McNeill, and C. Merchant. 2004. *Encyclopedia of world environmental history*. New York: Routledge.

Kuhn, T.S. 1962. *The structure of scientific revolutions*. Chicago, IL: University of Chicago Press.

Lambert, D., M. Solem, and S. Tani. 2015. Achieving human potential through geography education: A capabilities approach to curriculum making in schools. *Annals of the American Association of Geographers* 105(4): 723-735.

Langdon, S.J. 2007. Sustaining a relationship: Inquiry into the emergence of a logic of engagement with salmon among the Southern Tlingits. In *Native Americans and the*

Environment: Perspectives on the Ecological Indian, ed. M.E. Harkin and D.R. Lewis, 233-273. Lincoln: University of Nebraska Press.

Lee, J.A. 1999. *The scientific endeavor: A primer on scientific principles and practice*. San Francisco: Benjamin Cummings.

Lee, R.B., and R. Daly, eds. 1999. T*he Cambridge encyclopedia of hunters and gatherers*. Cambridge: Cambridge University Press.

Lempert, L.B. 2007. Asking questions of the data: Memo writing in the grounded theory tradition. In *The SAGE handbook of grounded theory*, ed. A. Bryant and K. Charmaz, 245-264. Thousand Oaks, CA: SAGE.

Leopold, A. 1949. *A Sand County almanac and sketches here and there*. New York: Oxford University Press.

Lessmann, O., and F. Rauschmayer. 2013. Re-conceptualizing sustainable development on the basis of the capability approach: A model and its difficulties. *Journal of Human Development and Capabilities* 14(1): 95-114.

Levitt, H.M. 2018. How to conduct a qualitative meta-analysis: Tailoring methods to enhance methodological integrity. *Psychotherapy Research* 28(3): 367-378.

Levitt, H.M., S.L. Motulsky, F.J. Wertz, S.L. Morrow, and J.G. Ponterotto. 2017. Recommendations for designing and reviewing qualitative research in psychology: Promoting methodological integrity. *Qualitative Psychology* 4(1): 2-22.

Lewis P. 1979. Axioms for reading the landscape: Some guides to the American scene. In *The interpretation of ordinary landscapes: Geographical essays*, ed. D.W. Meinig, 11-32. New York: Oxford University Press, New York.

Lewis, S.L., and M.A. Maslin. 2015. Defining the Anthropocene. *Nature* 519: 171-180.

Lipscomb, M. 2012. Abductive reasoning and qualitative research. *Nursing Philosophy* 13: 244-256.

Lipton, P. 2002. *Inference to the best explanation*, 2nd ed. London: Routledge.

Lovejoy, T.E. 2017. Can we redefine the Anthropocene? In *Living in the Anthropocene: Earth in the Age of Humans*, ed. W.J. Kress and J.K. Stine, 157-160. Washington, DC: Smithsonian Books.

Lovelock, J.E. 1972. Gaia as seen through the atmosphere. *Atmospheric Environment* 6: 579-580.

Lowenthal, D. 1990. Awareness of human impacts: Changing attitudes and emphases. In *The Earth as transformed by human action*, ed. B.L. Turner, II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, 121-135. Cambridge: Cambridge University Press, with Clark University.

Lunstrum, E. 2014. Green militarization: Anti-poaching efforts and the spatial contours of Kruger National Park. *Annals of the American Association of Geographers* 104(4): 816-832.

Lynch, C. 2009. Jim Gray's fourth paradigm and the construction of the scientific record. In *Fourth paradigm: Data-intensive scientific discovery*, ed. T. Hey, S. Tansley, and K. Tolle, 177-184. Redmond, WA: Microsoft Research.

Macinko, G. 1978. Conceptual frameworks for the study of humans and their environment. In *Sourcebook on the environment: A guide to the literature*, edited by K.A. Hammond, G. Macinko, and W.B. Fairchild, 5-19. Chicago: University of Chicago Press.

Magliocca, N.R., E.C. Ellis, G.R.H. Allington, A. de Bremond, J. Dell'Angelo, O. Mertz, P. Messerli, P. Meyfroidt, R. Seppelt, and P.H. Verburg. 2018. Closing global knowledge

gaps: Producing generalized knowledge from case studies of social-ecological systems. *Global Environmental Change* 50: 1-14.

Malthus, T.R. 1798. *An essay on the principle of population*. London: J. Johnson.

Marsh, G.P. [1864] 2003. *Man and nature: Or, physical geography as modified by human action*. Seattle, WA: University of Washington Press.

Matthews, J.A, ed. 2014a. *Encyclopedia of Environmental Change*. Thousand Oaks, CA: SAGE.

Matthews, J.A. 2014b. Preface. In *Encyclopedia of environmental change*, xlv-xlvii. Thousand Oaks, CA: SAGE.

Matthews, J.A., and C.E. Thorn. 2014. Induction. In *Encyclopedia of Environmental Change*, ed. J.A. Matthews, 571. Thousand Oaks, CA: SAGE.

Maynes, M.J., and A. Waltner. 2012. Temporalities and periodization in deep history: Technology, gender, and benchmarks of 'human development'. *Social Science History* 36(1): 59-83.

McAfee, K. 1999. Selling nature to save it? Biodiversity and green developmentalism. Environment and Planning D: *Society and Space* 17: 133-154.

McDonald, J.R. 1966. The region: Its conception, design, and limitations. *Annals of the American Association of Geographers* 56(3): 516-528.

McPhee, J. 1982. *Basin and range*. New York: Farrar, Straus, and Giroux.

McNeill, J.R. 2000. *Something new under the sun: An environmental history of the twentieth-century world*. New York: W.W. Norton and Company.

McNeill, J.R. 2014. The first hundred thousand years. In *The turning points of environmental history*, ed. F. Uekoetter, 13-28. Pittsburgh: University of Pittsburgh Press.

McNeill, J.R. 2017. The advent of the Anthropocene. In *Living in the Anthropocene: Earth in the Age of Humans*, edited by W.J. Kress and J.K. Stine, 10-17. Washington, D.C.: Smithsonian.

McNeill, J.R., and J.P. Engelke. 2014. *The Great Acceleration: An environmental history of the Anthropocene since 1945*. Cambridge, MA: Belknap Press.

Meadows, D. 2008. *Thinking in systems: A primer*. White River Junction, VT: Chelsea Green Publishing.

Meadows, D.H., D.L. Meadows, J. Randers, and W.W.I. Behrens. 1972. *The limits to growth*. New York: Potomac Associates-Universe Books.

Meinig, D.W. 1968. *The Great Columbia Plain: A historical geography, 1805-1910*. Seattle: University of Washington Press.

Meinig, D.W. 1983. Geography as an art. *Transactions of the British Institute of Geographers* 8: 314-328.

Melosi, M.V. 2014. Environmental history and historical geography: an (often) excellent relationship? *Journal of Historical Geography* 43(1): 163-165.

Menely, T., and J.O. Taylor, eds. 2017. *Anthropocene reading: Literary history in geologic times*. University Park, PA: Pennsylvania State University Press.

Mentz, S. 2017. Enter Anthropocene, circa 1610. In *Anthropocene reading: literary history in geologic times*, ed. T. Menely and J.O. Taylor, 43-58. University Park, PA: Pennsylvania State University Press.

Merchant, C. 1980. *The death of nature: Women, ecology, and the scientific revolution*. San Francisco: Harper & Row.

Merchant, C. 1990. The realm of social relations: Production, reproduction, and gender in environmental transformations. In *The Earth as transformed by human action*, ed. B.L. Turner, II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, 673-684. Cambridge: Cambridge University Press, with Clark University.

Merchant, C. 1997. The theoretical structure of ecological revolutions. In *Out of the woods: Essays in environmental history*, ed. C. Millar and H. Rothman, 18-27. Pittsburgh: University of Pittsburgh Press.

Merriam Webster. 2018a. Event. *Merriam Webster dictionary*. merriam-webster.com, last accessed 20 August.

Merriam Webster. 2018b. Idea. *Merriam Webster dictionary*. merriam-webster.com, last accessed 25 May.

Middleton, G.D. 2018. Bang or whimper? The evidence for collapse of human civilizations at the start of the recently defined Meghalayan Age is equivocal. *Science* 361(6408): 1204-1205.

Mitchell, D. 2008. New axioms for reading the landscape: Paying attention to political economy and social justice. In *Political economies of landscape change*, ed. J.L. Wescoat, Jr. and D.M. Johnston, 29-50. Dordrecht, The Netherlands: Springer.

Moran, E.F., and M.C. Lopez. 2016. Future directions in human-environment research. *Environmental Research* 144: 1-7.

Morse J. 2007. Sampling in grounded theory. In *The SAGE handbook of grounded theory*, ed. K. Charmaz and A. Bryant, 229–244. London: SAGE.

Moseley, W. G., E. Perramond, H. M. Hapke, and P. Laris. 2014. *An introduction to human-environment geography: Local dynamics and global processes*. West Sussex, UK: Wiley.

Mugerauer, R. 1994. *Interpretations on behalf of place: Environmental displacements and alternative responses*. Albany, NY: SUNY Press.

Mugerauer, R., and L. Manzo. 2008. *Environmental dilemmas: Ethical decision making*. Lanham, MD: Lexington Books.

Munn, T., ed. 2002. *Encyclopedia of global environmental change*. Chichester, UK: Wiley.

Murphy, A.B. 2014. Geography's crosscutting themes: Golden anniversary reflections on "The four traditions of geography". *Journal of Geography* 113(5): 181-188.

National Academy of Sciences (NAS). 1997. *Rediscovering geography: New relevance for science and society*. Washington, D.C.: National Academies Press.

Neuzil, M., and W. Kovarik. 1996. *Mass media and environmental conflict*. Thousand Oaks, CA: SAGE.

Ogg, J.G., G.M. Ogg, and F.M. Gradstein. 2016. *A concise geologic time scale—2016*. Amsterdam: Elsevier.

Oliver, J.E. 1991. The history, status and future of climatic classification. *Physical Geography* 12:231-251.

Olstad, T.A. 2012. Understanding the science and art of ecoregionalization. *The Professional Geographer* 64(2): 303-308.

O'Neill. 2001. Is it time to bury the ecosystem concept? (With full military honors, of course!). *Ecology* 82(12): 3275-3284.

Orndorff, R.C. 2018. Divisions of geologic time—Major chronostratigraphic and geochronologic units. U.S. Geological Survey. https://pubs.usgs.gov/fs/2018/3054/fs20183054.pdf, last accessed 16 September 2018.

Orr, D. 2016. *Dangerous years: Climate change, the Long Emergency, and the way forward*. New Haven, CT: Yale University Press.

Owen, G. 2012. Event. In *Encyclopedia of environmental change*, ed. J.A. Matthews, 382-383. Thousand Oaks, CA: SAGE.

Palmer, A.R. 1983. The Decade of North American Geology: 1983 Geologic Time Scale. *Geology* 11: 503-504.

Pattison, W. D. 1964. The four traditions of geography. *Journal of Geography* 63(5): 211-216.

Peel, M.C., B.L. Finlayson, and T.A. McMahon. 2007. Updated world map of the Köppen-Geiger climate classification. *Hydrology and Earth System Sciences* 11: 1633-1644.

Peet, R., and M. Watts. 2004. *Liberation ecologies: Environment, development, social movements*, 2nd ed. New York: Routledge.

Peeters, W., D. Dirix, and S. Sterckx. 2013. Putting sustainability into sustainable human development. *Journal of Human Development and Capabilities* 14(1): 58-76.

Pelenc, J., M.K. Lompo, J. Ballet, and J. Dubois. 2013. Sustainable human development and the capability approach: Integrating environment, responsibility and collective agency. *Journal of Human Development and Capabilities* 14(1): 77-94.

Peterson, G.L. 1981. Historical self-understanding in the social sciences: The use of Thomas Kuhn in psychology. *Journal for the Theory of Social Behavior* 11(1): 1-30.

Prudham, S. 2009. Cultural ecology. In *The dictionary of human geography*, fifth edition, ed. D. Gregory, R. Johnston, G. Pratt, M.J. Watts, and S. Whatmore, 127-128. Oxford: Blackwell.

Pyne, S.J. 2016. Welcome to the Pyrocene. *Slate*. http://www.slate.com/articles/technology/future_tense/2016/05/the_fort_mcmurray_fire_

climate_change_and_our_fossil_fuel_powered_society.html, last accessed 18 September 2018.

Quoidbach, J., D.T. Gilbert, and T.D. Wilson. The end of history illusion. *Science* 339(6115): 96-98.

Rachel Carson Center for Environment and Society. 2018. Environment and society portal timeline tool. *Environment and Society Portal* http://www.environmentandsociety.org/tools/timeline, last accessed 27 August 2018.

Rader, B.G., and R.D. Kirby. 2017. Mapping the Ozarks as a cultural region by county boundaries. *Middle West Review* 4(1): 1-22.

Rakestraw, L. 1972. Conservation historiography: An assessment. *Pacific Historical Review* 41(3): 271-288.

Rakita, G.F.M., C.S. VanPool, T.L. VanPool, and S. Sterling. 2011. An introduction to the 76 Draw Site, Luna County, New Mexico. In *Patterns in Transition: Papers from the 16th Biennial Jornada Mogollon Conference*, edited by M.R. Landreth, 29-64. El Paso: El Paso Museum of Archaeology.

Rasoamampianina, V.A. 2014. Reviewing encyclopaedia authority. *Culture Unbound* 6: 547-568.

Reichertz, J. 2007. Abduction: The logic of discovery of grounded theory. In *The SAGE handbook of grounded theory*, ed. A. Bryant and K. Charmaz, 214-228. Thousand Oaks, CA: SAGE.

Relph, E. 1976. *Place and placelessness*. London: Pion.

Relph, E. 1981. *Rational landscapes and humanistic geography*. London, NY: Croom Helm.

Relph, E. 2008a. A pragmatic sense of place. In *Making sense of place: Exploring concepts and expressions of place through different senses and lenses*, ed. F. Vanclay, M. Higgins, and A. Blackshaw, 311-324. Canbarra ACT: National Museum of Australia Press.

Relph, E. 2008b. Senses of place and emerging social and environmental challenges. In *Sense of place, health, and quality of life*, ed. J. Eyles and A. Williams, 31-44. Burlington, VT: Ashgate.

Relph, E. 2009. A pragmatic sense of place. *Environmental and Architectural Phenomenology* 20: 24-3.

Richardson, D., N. Castree, M.F. Goodchild, A. Kobayashi, W. Liu, and R.A. Marston. 2017. *International encyclopedia of geography: People, the Earth, environment and technology*. West Sussex: Wiley.

Ritzer, G. 1993. *The McDonaldization of society: An investigation into the changing character of contemporary social life*. Newbury Park, CA: Pine Forge Press.

Robbins, P., ed. 2007a. *Encyclopedia of environment and society*. Thousand Oaks, CA: SAGE.

Robbins, P. 2007b. Introduction. In *Encyclopedia of environment and society*, vii-ix. Thousand Oaks, CA: SAGE.

Robbins, P. 2011. *Political ecology: A critical introduction*. New York: Wiley.

Robbins, P., J. Hintz, and S.A. Moore. 2013. *Environment and Society: A Critical Introduction*, 2nd ed. West Sussex, UK: Wiley.

Robeyns, I. 2005. The capability approach: A theoretical survey. *Journal of Human Development* 6(1): 93-114.

Rockström, J., W. Steffen, K. Noone, Å. Persson, F.S. Chapin, III, E.F. Lambin, T.M. Lenton, M. Scheffer, C. Folke, H. Schellnhuber, B. Nykvist, C.A. de Wit, T. Hughes, S. van der

Leeuw, H. Rodhe, S. Sörlin, P.K. Snyder, R. Costanza, U. Svedin, M. Falkenmark, L. Karlberg, R.W. Corell, V.J. Fabry, J. Hansen, B. Walker, D. Liverman, K. Richardson, P. Crutzen, and J. Foley. 2009. A safe operating space for humanity. *Nature* 461: 472-475.

Rosenberg, E.S. 2012. Introduction. In *A world connecting: 1870-1945*, edited by E.S. Rosenberg, 3-25. Cambridge, MA: Belknap Press of Harvard University Press.

Rossum, S., and S. Lavin. 2000. Where are the Great Plains? A cartographic analysis. *The Professional Geographer* 52(3): 543-552.

Rozum, M.P. 2017. The Great Plains and Middle West in 'Middle America': Historiographic reflections. *Middle West Review* 4(1): 71-84.

Ruddiman, W.F., E.C. Ellis, J.O. Kaplan, and D.Q. Fuller. 2015. Defining the epoch we live in: Is a formally designated "Anthropocene" a good idea?. *Science* 348(6230): 38-39.

Sauer, C.O. 1920. *The geography of the Ozark Highland of Missouri*. Chicago: University of Chicago.

Sauer, C.O. 1921. The problem of land classification. *Annals of the American Association of Geographers* 11(1): 3-16.

Sauer, C.O. 1925. The morphology of landscape. *University of California Publications in Geography* 2(2): 19-53.

Sauer, C.O. 1956. The education of a geographer. *Annals of the American Association of Geographers* 46(3): 287-299.

Schaefer, F.K. 1953. Exceptionalism in geography: A methodological examination. *Annals of the American Association of Geographers* 43(3): 226-249.

Scheffer, M. 2009. *Critical transitions in nature and society*. Princeton: Princeton University Press.

Schroeder, W.A. 1981. *Presettlement prairie of Missouri*. Jefferson City, MO: Missouri Department of Conservation.

Schumacher, E.F. 1973. *Small is beautiful: Economics as if people mattered*. London: Blond and Briggs.

Scott, J.C. 2017. *Against the grain: A deep history of the earliest states*. New Haven, CT: Yale University Press.

Seamon, D. 2015. Lived emplacement and the locality of being: A return to humanistic geography? In *Approaches to human geography: Philosophies, theories, people and practices*, 2nd ed., ed. S. Aitken and G. Valentine, 35-48. Thousand Oaks, CA: Sage.

Seamon, D., and A. Lundberg. 2017. Humanistic geography. In *International encyclopedia of geography: People, the earth, environment, and technology*, ed. D. Richardson, N. Castree, M. F. Goodchild, A. Kobayashi, W. Liu, and R. A. Marston. doi: 10.1002/9781118786352.wbieg0412. West Sussex, UK: Wiley.

Seamon, D. 2018. *Life takes place: Phenomenology, lifeworlds, and place making*. New York: Routledge.

Sen, A. 1993. Capability and well-being. In *The quality of life*, ed. M. Nussbaum and A. Sen, 30-53. Oxford, UK: Clarendon Press.

Sen, A. 2013. The ends and means of sustainability. *Journal of Human Development and Capabilities* 14(1): 6-20.

Setten, G. 2008. Encyclopaedic vision: Speculating on *The dictionary of human geography*. *Geo Forum* 39(6): 1097-1104.

Shakespeare, W. [1610] 2011. *The Tempest*, edited by V.M. Vaughan and A.T. Vaughan. London: Bloomsbury.

Sherow, J.E. 1998. Introduction: an evening on Konza Prairie. In *A sense of the American West*, ed. J.E. Sherow, 3-29. Albuquerque, NM: University of New Mexico Press.

Shortridge, J.R. 1989. *The Middle West: Its meaning in American culture*. Lawrence, KS: University Press of Kansas.

Shultz, S., and M. Maslin. 2013. Early human speciation, bran expansion and dispersal influenced by African climate pulses. *PLOS One* 8(10): 1-7.

Smith, A. [1776] 2009. *The wealth of nations*. Blacksburg, VA: Thrifty Books.

Smith, B.D., and M.A. Zeder. 2013. The onset of the Anthropocene. *Anthropocene* 4: 8-13.

Smith, J.S. 2017. Historical settlement. In *International encyclopedia of geography: People, the earth, environment, and technology*, ed. D. Richardson, N. Castree, M. F. Goodchild, A. Kobayashi, W. Liu, and R. A. Marston. doi: 10.1002/9781118786352.wbieg0500. West Sussex, UK: Wiley.

Smith, S.J. 1984. Practicing humanistic geography. *Annals of the American Association of Geographers* 74(3): 353-374.

Snow, C.P. 1959. *The two cultures*. Cambridge: Cambridge University Press.

Snyder, G. 2015. *This present moment*. Berkeley, CA: Counterpoint.

Solem, M., D. Lambert, and S. Tani. 2013. Geocapabilities: Toward an international framework for researching the purposes and values of geography education. *Review of International Geographical Education Online* 3(3): 214-229.

Spree, U. 2014. How readers shape the content of an encyclopedia: A case study comparing the German *Meyers Konversationslexikon* (1885-1890) with *Wikipedia* (2002-2013). *Culture Unbound*, 6: 569-591.

Sprout, H., and M. Sprout. 1965. *The ecological perspective on human affairs*. Princeton, N.J: Princeton University Press.

Steffen, W., W. Broadgate, L. Deutsch, O. Gaffney, and C. Ludwig. 2015. The trajectory of the Anthropocene: The Great Acceleration. *The Anthropocene Review* 2(1): 81-98.

Steffen, W., J. Grinevald, P. Crutzen, and J.R. McNeill. 2011a. The Anthropocene: Conceptual and historical perspectives. *Philosophical Transactions: Mathematical, Physical and Engineering Sciences* 369:842-867.

Steffen, W., R. Leinfelder, J. Zalasiewicz, C.N. Waters, M. Williams, C. Summerhayes, A.D. Barnosky, A. Cearreta, P. Crutzen, M. Edgeworth, E.C. Ellis, I.J. Fairchild, A. Galuszka, J. Grinevald, A. Haywood, J. Ivar do Sul, C. Jeandel, J.R. McNeill, E. Odada, N. Oreskes, A. Revkin, D.D. Richter, J. Syvitski, D. Vidas, M. Wagreich, S.L. Wing, A.P. Wolfe, and H.J. Schellnhuber. 2016. Stratigraphic and Earth system approaches to defining the Anthropocene. *Earth's Future* 4(8): 324-345.

Steffen, W., A. Persson, L. Deutsch, J. Zalasiewicz, M. Williams, K. Richardson, C. Crumley, P. Crutzen, C. Folk, L. Gordon, M. Molina, V. Ramanathan, J. Rockström, M. Scheffer, H.J. Schellnhuber, and U. Svedin. 2011b. The Anthropocene: From global change to planetary stewardship. *Ambio* 40(7): 739-761.

Steiner, F. 2002. *Human ecology: Following nature's lead*. Washington, D.C.: Island Press.

Stern, N. 2006. *The economics of climate change: The stern review*. Cambridge: Cambridge University Press.

Sunstein, C.R. 2006. *Infotopia: How many minds produce knowledge*. Oxford: Oxford University Press.

Sutton, M.O., and E.N. Anderson. 2004. *Introduction to cultural ecology*. Walnut Creek, CA: AltaMira Press.

Taaffe, E.J. 1974. The spatial view in context. *Annals of the Association of American Geographers* 64(1): 1-16.

Thomas, D.S.G., ed. 2016. *The dictionary of physical geography*. West Sussex, UK: Wiley.

Thomas, W. L., Jr., ed. 1956. *Man's role in changing the face of the earth*. Chicago, IL: University of Chicago Press.

Thompson, C. 2018. Metaphor for the geologic time scale. *Rates, dates and geologic time: Teaching about the temporal aspects of geoscience*. https://serc.carleton.edu/NAGTWorkshops/time/activities/60901.html, last accessed 18 September 2018.

Thorn, C.E. 2014. Deduction. In *Encyclopedia of environmental change*, ed. J.A. Matthews, 254. Thousand Oaks, CA: SAGE.

Timmermans, S., and I. Tavory. 2012. Theory construction in qualitative research: From grounded theory to abductive analysis. *Sociological Theory* 30(3): 167-186).

Timonen, V., G. Foley, and C. Conlon. 2018. Challenges when using grounded theory: A pragmatic introduction to doing GT research. *International Journal of Qualitative Methods* 17: 1-10.

Timulak, L. 2013. Qualitative meta-analysis. In *The SAGE handbook of qualitative data analysis*, ed. U. Flick, 481-495. London, UK: SAGE.

Toivanen, T., K. Lummaa, A. Majava, P. Järvensivu, V. Lähde, T Vaden, and J.T. Eronen. 2017. The many Anthropocenes: A transdisciplinary challenge for the Anthropocene research. *The Anthropocene Review* 4(3): 183-198.

Topik, S.C., and A. Wells. 2012. Commodity chains in a global economy. In *A world connecting: 1870-1945*, edited by E.S. Rosenberg, 593-812. Cambridge, MA: Belknap Press of Harvard University Press.

Tuan, Y. 1974. *Topophilia: A study of environmental perception, attitudes, and values*. Englewood Cliffs, NJ: Prentice-Hall.

Tuan, Y. 1976. Humanistic geography. *Annals of the American Association of Geographers* 66(2): 266-276.

Turner, B.L., II. 1989. The specialist-synthesis approach to the revival of geography: The case of cultural ecology. *Annals of the American Association of Geographers* 79(1): 88-100.

Turner, B. L., II. 1997. Spirals, Bridges and Tunnels: Engaging Human-Environment Perspectives in Geography. *Ecumene* 4:196-217.

Turner, B. L., II. 2002. Contested Identities: Human-Environment Geography and Disciplinary Implications in a Restructuring Academy. *Annals of the American Association of Geographers* 92:52-74.

Turner, B. L., II, W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer, eds. 1990. *The Earth as transformed by human action: Global change and regional changes in the biosphere over the past 300 years*. Cambridge: Cambridge University Press, with Clark University.

Turner, B.L., II, R.W. Kates, and W.B. Meyer. 1994. The Earth as transformed by human action in retrospect. *Annals of the American Association of Geographers* 84(4): 711-715.

Turner, B.L., II, & P. Robbins. 2008. Land-change science and political ecology: Similarities, differences, and implications for sustainability science. *Annual Review of Environment and Resources* 33: 295-316.

Turner, T. 2015. *David Brower: The making of the environmental movement*. Oakland: University of California Press.

Uekoetter, F., ed. 2010. *Turning points of environmental history*. Pittsburgh: University of Pittsburgh Press.

United Nations (UN). 1987. *Report of the World Commission on Environment and Development: Our common future*. New York: United Nations.

Unwin, T. 1992. *The place of geography*. Harlow: Longman Scientific and Technical.

Upton, D. 1997. Seen, unseen, and scene. In *Understanding ordinary landscapes*, ed. P. Groth and T.W. Bressi, 174-179. New Haven, CT: Yale University Press.

Vaccaro, I., O. Beltran, and P.A. Paquet. 2013. Political ecology and conservation policies: Some theoretical genealogies. *Journal of Political Ecology* 20: 255-272.

VanPool, C.S., and T.L. VanPool. 2007. *Signs of the Casas Grandes shamans*. Salt Lake City: University of Utah Press.

VanPool, T.L., C.S. VanPool, and R.D. Leonard. 2005. The Casas Grandes core and periphery. In *Mogollon Archaeology: Proceedings of the 13th Jornada Mogollon Conference*, edited by M. Thompson, J. Jurgena, and L. Jackson, 25-36. El Paso: El Paso Museum of Archaeology.

Vogt, E.Z., and J.M. Roberts. 1956. A study of values. *Scientific American* 195(1): 25-31.

Voosen, P. 2018. New geological age comes under fire: Timing and extent of ancient drought used to define the Meghalayan are uncertain. *Science* 361(6402): 537-538.

Wade, C. 2006. Editorial: A historical case for the role of regional geography in geographic education. *Journal of Geography in Higher Education* 30(2): 181-189.

Walker, J.D., J.W. Geissman, S.A. Bowring, and L.E. Babcock. 2013, updated. The Geological Society of America Geologic Time Scale. *GSA Bulletin* 125(3/4): 259–272.

Wallace, D.F. 2006. *Consider the lobster and other essays.* New York, NY: Back Bay Books.

Wallach, B. 2005. *Understanding the cultural landscape*. New York: Guilford Press.

Wallerstein, I., ed. 2004. *The modern world system in the longue durée*. London: Routledge.

Warf, B., ed. 2006. *Encyclopedia of human geography*. Thousand Oaks, CA: SAGE.

Warf, B., ed. 2010a. *Encyclopedia of geography*. Thousand Oaks, CA: SAGE.

Warf, B. 2010b. Introduction. In *Encyclopedia of geography*, xlix-lv. Thousand Oaks, CA: SAGE

Waters, C.N., J. Zalasiewicz, C. Summerhayes, A.D. Barnosky, C. Poirier, A. Galuszka, A. Cearreta, M. Edgeworth, E.C. Ellis, M. Ellis, C. Jeandel, R. Leinfelder, J.R. McNeill, D.B. Richter, W. Steffen, J. Syvitski, D. Vidas, M. Wagreich, M. Williams, A. Zhisheng, J. Grinevald, E. Odada, N. Oreskes, A.P. Wolfe. 2016. The Anthropocene is Functionally and Stratigraphically Distinct from the Holocene. *Science* 351(6269):137.

West, P. 2006. *Conservation is our government now: The politics of ecology in Papua New Guinea*. Durham, NC: Duke University Press.

Whatmore, S. 2014. Nature and human geography. In *Introducing human geographies*, 3rd ed., ed. P. Cloke, P. Crang, and M. Goodwin, 152-162.

White, L., Jr. 1967. The historical roots of our ecologic crisis. *Science* 155(3767): 1203-1207.

White, R. 1985. American environmental history: the development of a new historical field. *Pacific Historical Review* 54(3): 297-335. New York: Routledge.

Whitehand, J.W.R., K. Gu, M.P. Conzen, and S.M. Whitehand. 2014. The typological process and the morphological period: A cross-cultural assessment. *Environment and Planning B: Planning and Design* 41: 512-533.

Wilbanks, T.J. 1994. “Sustainable development” in geographic perspective. *Annals of the American Association of Geographers* 84(4): 541-556.

Wildcat, D.R. 2009. *Red alert! Saving the planet with indigenous knowledge*. Golden, CO: Fulcrum.

Wilford, J.N. 1981. *The mapmakers*. New York: Alfred A. Knopf.

Williams, M. 1987. Sauer and "Man's role in changing the face of the Earth". *Geographical Review* 77:218-231.

Williams, M. 2003. *Deforesting the Earth*. Chicago: University of Chicago Press.

Willig, C. 2013. Interpretation and analysis. In *The SAGE handbook of qualitative data analysis*, ed. U. Flick, 136-150. London, UK: SAGE.

Wilson, E.O. 1998. *Consilience: The unity of knowledge*. New York: Vintage.

Windelband, W. 1980. History and natural science. *History and Theory* 19: 169-185.

Wishart, D. 1997. The selectivity of historical representation. *Journal of Historical Geography* 23(2): 111-118.

Wishart, D. 2004. Period and region. *Progress in Human Geography*. 28: 305-319.

Woods, D. 2017. Accelerated reading: Fossil fuels, infowhelm, and archival life. In *Anthropocene reading: literary history in geologic times*, ed. T. Menely and J.O. Taylor, 202-219. University Park, PA: Pennsylvania State University Press.

Worster, D. 1990. Transformations of the Earth: Toward an agroecological perspective in history. *The Journal of American History* 76(4): 1087-1106.

Worster, D. 1993. *The wealth of nature: Environmental history and the ecological imagination*. New York: Oxford University Press.

Worster, D. 1994. *Nature's economy: A history of ecological ideas*, 2nd ed. New York: Cambridge University Press.

Wright, J.K. 1947. *Terrae incognitae*: The place of imagination in geography. *Annals of the American Association of Geographers* 37: 1-15.

Wynn, G., C. Colten, R.M Wilson, M.V. Melosi, M. Fiege, and D.K. Davis. 2014. Reflections on the American environment. *Journal of Historical Geography* 43(1): 152-168.

Yanow, D., and P. Schwartz-Shea. 2006. Thinking interpretively: Philosophical presuppositions and the human sciences. In *Interpretation and method: Empirical research methods and the interpretive turn*, ed. D. Yanow and P. Schwartz-Shea, 5-26. Armonk, NY: M.E. Sharp.

Yarnal, B., and R. Neff. 2004. Whither parity? The need for a comprehensive curriculum in human-environment geography. *The Professional Geographer* 56(1): 28-36.

Yuan, M. 1999. Representing Spatiotemporal Processes to Support Knowledge Discovery in GIS databases. In T.K. Poiker and N. Chrisman: *Proceedings: 8th International Symposium on Spatial Data Handling*, Pp. 431-440.

Zalasiewicz, J., C.N. Waters, M. Williams, A.D. Barnosky, A. Cearreta P. Crutzen, E. Ellis M.A. Ellis, I.J. Fairchild, J. Grinevald, P.K. Haff, I. Hajdas, R. Leinfelder, J. McNeill, E.O. Odada, C. Poirier, D. Richter, W. Steffen, C. Summerhayes, J.P.M. Syvitski, D. Vidas, M. Wagreich, S.L. Wing, A.P. Wolfe, A. Zhisheng, and N. Oreskes. 2015. When did the Anthropocene begin? A mid-twentieth century boundary level is stratigraphically optimal. *Quaternary International* 383: 196-203.

Zalasiewicz, J., C.N. Waters, and M.J. Head. 2017. Anthropocene: Its stratigraphic basis. *Nature* 541: 289.

Zelinsky, W. 1978. Human population and the environment. In *Sourcebook on the environment: A guide to the literature*, 491-508. Chicago: University of Chicago Press.

Zelinsky, W. 1980. North America's vernacular regions. *Annals of the American Association of Geographers* 70(1): 1-16.

Zelinsky, W. 1992. *The cultural geography of the United States*. Englewood Cliffs, NJ: Prentice Hall.

Zimmerer, K.S. 2006. Cultural ecology: At the interface with political ecology – the new geographies of environmental conservation and globalization. *Progress in Human Geography* 30(1): 63-78.

Zimmerer, K.S. 2007. Cultural ecology (and political ecology) in the 'environmental borderlands': Exploring the expanded connectivities within geography. *Progress in Human Geography* 31(2): 227-244.

Zimmerer, K. S. 2010. Retrospective on Nature-Society Geography: Tracing Trajectories (1911-2010) and Reflecting on Translations. *Annals of the American Association of Geographers* 100:1076-1094.

Zimmerer, K.S. 2017. Geography and the study of human-environment relations. In *International encyclopedia of geography: People, the earth, environment, and technology*, ed. D. Richardson, N. Castree, M. F. Goodchild, A. Kobayashi, W. Liu, and R. A. Marston, 1-23. doi:10.1002/9781118786352.wbieg1028. West Sussex, UK: Wiley.

Appendix A - Human-Environment Timeline (Abridged)

Duration	Scene	Revolution/Transition	Interval
Acceleration Duration 1945 CE to Present	**Long Emergency Scene** 2014 CE to Present		
	Sustainable Development Scene 1992 to 2014 CE	**Planetary Boundaries Transition** 2009 to 2014 CE	
			Green Capitalist Interval 2002 to 2009 CE
			Ecosystem Services Interval 1995 to 2002 CE
			Agenda 21 Interval 1992 to 1995 CE
	Overshoot Scene 1975 to 1992 CE	**Sustainability Transition** 1987 to 1992 CE	
			Sagebrush Interval 1979 to 1987 CE
			Petrophilia Interval 1975 to 1979 CE
	Green Governance Scene 1970 to 1975 CE	**OPEC Transition** 1973 to 1975 CE	
			Earth Day Interval 1970 to 1973 CE
	Spaceship Earth Scene 1945 to 1970 CE	**Silent Spring Transition** 1962 to 1970 CE	
			Hiroshima-Nagasaki Interval 1945 to 1962 CE

(cont'd)

Human-Environment Timeline (Cont'd)

Duration	Scene	Revolution/Transition	Interval
Keystone Duration 6,000 BP to 1945 CE	**Wealth of Nations Scene** 100 to 5 BP	**Nuclear Revolution** 1939 to 1945 CE	
			Agro-Industrial Interval 24 to 11 BP
			Model T Interval 42 to 24 BP
			Conservation Interval 86 to 42 BP
			Railroad Spike Interval 100 to 86 BP
	Global Map Scene 340 to 100 BP	**Industrial Transition** 187 to 100 BP	
			Private Property and Commons Interval 340 to 187 BP
	Civilization Scene 6,000 to 340 BP	**Colonial Transition** 444 to 340 BP	
			Wayfaring Interval 1,600 to 444 BP
			Growth and Collapse Interval 4,950 to 1,600 BP
			Agricultural Impress Interval 6,000 to 4,950 BP
Adaptation Duration 320,000 to 6,000 BP	**Domestication Scene** 15,000 to 6,000 BP	**Agricultural Revolution** 15,000 to 6,000 BP	
	Ecumene Scene 320,000 to 15,000 BP		**Turtle Island Interval** 30,000 to 15,000 BP
			Animal Husbandry Interval 40,000 to 30,000 BP
			Out-of-Africa Interval 320,000 to 40,000 BP
Survival Duration 2,600,000 to 320,000 BP	**Pyro Scene** 1,000,000 to 320,000 BP	**Pyro Revolution** 1,000,000 BP to 320,000 BP	
	Forage Scene 2,600,000 to 1,000,000 BP		**Speciation Interval** 1,900,000 to 1,000,000 BP
			Evolutionary Interval 2,600,000 to 1,900,000 BP

Appendix B - Human-Environment Timeline (Unabridged)

Survival Duration 2,600,000 to 3,200,000 B.P.

Forage Scene: 2,600,000 to 1,000,000 B.P.

Evolutionary Interval: 2,600,000 to 1,900,000 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2,598,050	B.C.E.	2,600,000	Human evolution begins in the Pleistocene. It continues with the creation of civilizations in the Holocene. This human revolution follows the inception of life, the oxygenation of the atmosphere, and biological complexity. This time range represents the earliest conception of the human-environment relationship.	Event	
2,498,050	B.C.E.	2,600,000	As humans evolve, their dietary practices transition from depending on plants to incorporating more meat. Archaeological evidence points to this transition based upon the adoption of tools for butchering meat.	Event	The most up-to-date timeframe is around 2.6 million years ago, provided by M. Domínguez-Rodrigo, T.R. Pickering, S. Semaw, and M.J. Rogers's 2005 "Cutmarked bones from Pliocene archaeological sites at Gona, Afar, Ethiopia: implications for the function of the world's oldest stone stools in *Journal of Human Evolution*. There is now evidence of 3.3 million-year-old stone tools, according to S. Harmand and colleagues' 2015 "3.3-million-year-old stone tools from Lomekwi 3, West Turkana, Kenya" in *Nature*.

Speciation Interval: 1,900,000 to 1,000,000 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1,898,050	B.C.E.	1,900,000	Human speciation reaches a high level of diversity as brains expand and hominins migrate between Africa and Eurasia. The human-environment relationship comprises of different species of hominins interacting with one another and the environment.	Event	This time frame is updated by S. Shultz and M. Maslin's 2013 "Early human speciation, bran expansion and dispersal influenced by African climate pulses" in *PLOS One*.

Pyro Scene: 1,000,000 to 320,000 B.P.

Pyro Revolution: 1,000,000 to 320,000 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
998,050	B.C.E.	1,000,000	Human ancestors begin to use fire. Fire represents an essential form of human interaction with and transformation of the environment.	Event	There are multiple dates for when fire is first used. The most common idea is 400,000 B.P. Evidence now suggests that fire dates to around 1,000,000 B.P. See Berna and colleagues (2012) "Microstratigraphic evidence of in situ fire in the Acheulean strata of Wonderwerk Cave, Northern Cape province, South Africa" in PNAS.

Adaptation Duration: 320,000 to 6,000 B.P.

Ecumene Scene: 320,000 to 15,000 B.P.

Out-of-Africa Interval: 320,000 to 40,000 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
318,050	B.C.E.	320,000	Behavioral complexity arises in human evolution during the Middle Stone Age (MSA). This period occurs when tools become smaller and more specialized.	Event	This date is updated to represent the most current time, proposed by Gibbons (2018) in *Science*.
298,050	B.C.E.	300,000	The first *Homo sapiens* emerge and begin migrating in and out of Africa.	Event	The origins of modern *Homo sapiens* are subjects of debate. This date comes from Galway-Witham and Stringer (2018) "How did *Homo sapiens* evolve?" in *Science*.
253,025	B.C.E.	254,975	From 500,000 B.P. to 8,000 B.C.E., hunting and gathering continues the develop and dominate human-environment interaction as the Old Stone Age transitions to the New Stone Age.	Event	This date represents the core of a time range dating from 500,000 B.P. to 8,000 B.C.E.
196,550	B.C.E.	198,500	The first anatomically modern humans (AMH) emerge and disperse out of Africa.	Event	This date represents the core time frame from 177,000 (paleoanthropological research) to 220,000 B.P. (genetic research) from I. Hershkovitz and colleagues' 2018 "The earliest modern humans outside Africa" in Science.
83,050	B.C.E.	85,000	By this time, humans have been migrating out of Africa and have reached the Arabian Peninsula and beyond.	Event	This date aligns with research conducted by Groucutt and colleagues (2018) *"Homo sapiens* in Arabia by 85,000 years ago" in *Nature Ecology & Evolution*.
68,050	B.C.E.	70,000	The Polynesians colonize Indonesia, New Guinea, and Australia.	Event	This date represents the core of a time range that spans between 100,000 and 40,000 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
43,050	B.C.E.	45,000	Humans reach Europe and eastern Asia.	Event	
41,050	B.C.E.	43,000	Humans create one of the first known mines in present-day Swaziland.	Event	

Animal Husbandry Interval: 40,000 to 30,000 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
38,050	B.C.E.	40,000	Australian Aboriginal peoples use prescribed burning to transform the environment.	Event	
38,050	B.C.E.	40,000	Dogs are believed to be first domesticated.	Event	The period when dogs are domesticated continues to be debated. This date provides the most current time period. See Botigué and colleagues (2017) "Ancient European dog genomes reveal continuity since the Early Neolithic" in *Nature Communications*.

Turtle Island Interval: 30,000 to 15,000 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
28,050	B.C.E.	30,000	Humans begin to make the trek from Siberia over the Bering Strait into North America. They reach North America by at least 15,000 B.P.	Event	This date is updated to represent the most current time, proposed by Hoffecker and colleagues (2014) "Out of Beringia?"
26,000	B.C.E.	27,950	Upper Paleolithic peoples make tools, beads, and religious icons out of mammoth and mastodon tusks. Hunting, fishing, and gathering are common human-environment activities.	Event	This date represents the core of a time range dating from 40,000 to 12,000 B.C.E.
20,000	B.C.E.	21,950	People begin to populate present-day	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Mexico and surrounding areas.		

Domestication Scene: 15,000 to 6,000 B.P.

Agricultural Revolution: 15,000 to 6,000 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
13,050	B.C.E.	15,000	Rice is cultivated in present-day South Korea. Growing rice is one form of agricultural adaptation to the environment.	Event	
12,050	B.C.E.	14,000	The 'First Agricultural Revolution,' as it is commonly known, begins as an important threshold moment in the human-environment relationship because its diffusion led to the domestication of plants and animals, which results in intense transformations of the landscape and the development of complex societies. In the Fertile Crescent, crops are domesticated like einkorn, emmer, barley, pea, and lentil.	Event	
12,050	B.C.E.	14,000	The Jōmon peoples of Japan produce some of the earliest records of pottery.	Event	
12,050	B.C.E.	14,000	Archaeological remains show domestication of dogs in Germany. The domestication of dogs represents a shift in human-environment relationship, in which dogs become an integral part of human adaptation to the environment.	Event	
12,050	B.C.E.	14,000	Yams are cultivated in southeast Asia and South Asia.	Event	
11,050	B.C.E.	13,000	Humans domesticate forms of place rye.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
10,050	B.C.E.	12,000	Archaeological remains show domestication of dogs in Israel.	Event	
9,550	B.C.E.	11,500	Humans begin to inhabit the Amazon River Basin. The first human occupation of the Amazon is a topic of debate. This general time period provides a case in which human interaction with the Amazon can be documented through pottery sherds and other archaeological evidence.	Event	
9,450	B.C.E.	11,400	Figs begin to be cultivated in the Jordan River Valley. The cultivation of figs is one form of agricultural adaptation to the environment during the Agricultural Revolution.	Event	
9,050	B.C.E.	11,000	Humans begin to use metals more frequently.	Event	
9,050	B.C.E.	11,000	Humans in the Neolithic Age begin to widely domesticate plants and animals, as well as use fertilizers.	Event	There appears to be little agreement on when the Neolithic Age begins. This date is a general conception of when it starts.
9,050	B.C.E.	11,000	The Pleistocene extinctions occur in North America, causing around 20-40 bird species and 40 large megafauna to go extinct. Pleistocene overkill theory attributes the extinctions to human hunting.	Event	This date represents the core of a time range dating from 12,000 to 10,000 B.P.
9,000	B.C.E.	10,950	Sheep are domesticated in the Near East.	Event	
8,550	B.C.E.	10,500	Einkorn wheat is domesticated by humans.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
8,550	B.C.E.	10,500	During the Holocene Hypsithermal warming, the second wave of domestication arises. Sheep and goats are thought to have been domesticated in northern Iraq and western Iran, while pigs are believed to have been domesticated in eastern Turkey and Syria. Cattle are found to be domesticated in Africa, while chickens are believed to have been domesticated in South Asia.	Event	This date represents the core of a time range dating between 11,000 and 10,000 B.P. (also ca 8,000-10,000 radiocarbon years BP).
8,550	B.C.E.	10,500	Wheat is domesticated for agriculture.	Event	This date represents the core of a time range dating between 11,000 and 10,000 cal B.P.
8,050	B.C.E.	10,000	Humans in the New World begin to domesticate maize, potatoes, tomatoes, avocados, sunflowers, and capsicums.	Event	
8,050	B.C.E.	10,000	The human population increases to 4 million.	Event	
8,050	B.C.E.	10,000	Deforestation begins in parts of Chile and the Mediterranean.	Event	
8,050	B.C.E.	10,000	Firestick farming occurs in the South African heathlands (fynbos).	Event	
8,050	B.C.E.	10,000	Mammoths become extinct.	Event	
8,050	B.C.E.	10,000	Humans in present-day Ecuador begin to cultivate squash.	Event	
8,050	B.C.E.	10,000	The African Humid Period occurs, which makes the Sahara more covered in vegetation and supportive of human settlement.	Event	This date represents the core of a time range dating from 14,500 to 5,500 B.P.
8,050	B.C.E.	10,000	Hunting and gathering continues to occur in	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the semiarid Sahel region of Africa.		
8,000	B.C.E.	9,950	The American lion becomes extinct. The American lion is believed to be part of a mass extinction of megafauna in North America. One theory proposes that these lions may have been hunted to extinction.	Event	
7,550	B.C.E.	9,500	Cats are found to be domesticated in Cyprus.	Event	
7,550	B.C.E.	9,500	Water fowl and pigs are domesticated in China, causing the spread of infectious diseases from animal to human and vice versa.	Event	
7,500	B.C.E.	9,450	Pottery is used in present-day Brazil.	Event	
7,500	B.C.E.	9,450	People in present-day Sudan engage in pottery-making.	Event	
7,300	B.C.E.	9,250	Humans domesticate lentils, peas, and vetch.	Event	This date represents the core of a time range dating from ca 10,000 to 8,500 B.P.
7,050	B.C.E.	9,000	The boreal chronozone features human-environment interactions in the taiga forests. Human activities include hunting and gathering, fishing, and pastoralism situated in the taiga forests.	Event	This date represents the core of a time range dating between 10000 and 8000 B.P.
7,000	B.C.E.	8,950	In present-day Papua New Guinea, humans cultivate gardens.	Event	
7,000	B.C.E.	8,950	Farming becomes widespread in India.	Event	
6,550	B.C.E.	8,500	Humans begin to domesticate aurochs. Aurochs are an extinct relative of present-day cattle. The species is an early example of livestock domestication, a	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			fundamental practice of human-environment interaction.		
6,550	B.C.E.	8,500	The domestication of cattle becomes widespread in North Africa and elsewhere.	Event	
6,500	B.C.E.	8,450	People in the Mediterranean adopt practices of farming and pottery-making.	Event	
6,500	B.C.E.	8,450	In Meso-America and South America, beans and squash become significant crops.	Event	
6,250	B.C.E.	8,200	Humans in the Near East begin to make tools and other items out of copper.	Event	This date represents the core of a time range dating from 6500 to 6000 B.C.E.
6,050	B.C.E.	8,000	Humans produce wine in Mesopotamia and Caucasia.	Event	
6,050	B.C.E.	8,000	The Aqualithic civilizations are non-Neolithic communities in Africa. During this period, they associate with the environments of lakes, rivers, and other water bodies.	Event	
6,050	B.C.E.	8,000	Agricultural intensification results in the increased release of carbon dioxide into the atmosphere.	Event	
6,050	B.C.E.	8,000	Humans intensify the cultivation of maize in Meso-America.	Event	
6,000	B.C.E.	7,950	People in present-day China begin to widely cultivate rice and millet.	Event	
5,650	B.C.E.	7,600	The Black Sea experiences a massive increase of water from the Mediterranean Sea. The flooding is believed to have inspired the biblical story of Noah's flood.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
5,550	B.C.E.	7,500	Agriculture becomes a primary land use in North Africa and Central Europe, as well as the Near East, and East Asia. The adoption of agriculture results in expansive deforestation.	Event	This date represents the core of a time range dating from 8,000 to 7,000 B.P.
5,500	B.C.E.	7,450	Humans in South America cultivate manioc.	Event	
5,500	B.C.E.	7,450	Humans in the Near East begin to utilize irrigation.	Event	
5,250	B.C.E.	7,200	People in Northern Europe adopt farming and pottery practices.	Event	This date represents the core of a time range dating from 5500 to 5000 B.C.E.
5,050	B.C.E.	7,000	Humans domesticate goats.	Event	
5,050	B.C.E.	7,000	In Southeast Asia and West Africa, people start to cultivate rice.	Event	
5,050	B.C.E.	7,000	In West Africa, humans start to cultivate sorghum and millet.	Event	This date represents the core of a time range dating from 8,000 to 6,000 ca B.P.
5,050	B.C.E.	7,000	Rice becomes a widely cultivated crop.	Event	
4,750	B.C.E.	6,700	Humans in the Balkans begin to make tools and other items out of copper.	Event	This date represents the core of a time range dating from 5000 to 4500 B.C.E.
4,500	B.C.E.	6,450	Humans in Northern Europe begin to construct megalithic structures.	Event	
4,350	B.C.E.	6,300	Humans around the Bulgarian Black Sea's port of Varna start to make items out of gold.	Event	

Keystone Duration: 6,000 B.P. to 1945 C.E.

Civilization Scene: 6,000 to 340 B.P.

Agricultural Impress Interval: 6,000 to 4,950 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
4,050	B.C.E.	6,000	Humans become key determinants of vegetation types in parts of present-day southern France.	Event	
4,000	B.C.E.	5,950	Major civilizations begin to form in Mexico, such as the Olmec and Teotihuacan peoples.	Event	
4,000	B.C.E.	5,950	Early civilizations emerge in present-day Iraq.	Event	
4,000	B.C.E.	5,950	Civilizations develop in present-day Egypt and Mesopotamia.	Event	
4,000	B.C.E.	5,950	Chinese populations begin to modify and manage coastlines.	Event	
4,000	B.C.E.	5,950	The Copper Age occurs as humans transition from the Neolithic to the Bronze Age, in which copper is a primary source for tools, jewelry, and other items.	Event	This date represents the core of a time range dating from 5000 to 3000 B.C.E.
3,800	B.C.E.	5,750	A wave of domestication emerges with the alpaca, llama, and guinea pig (present-day Peru); horse (present-day Ukraine, south Russia, and west Kazakhstan); the ass (northeast Africa); Bactrian camel (northwest China, Turkmenia, and east Iran); silkworm (China); and bovines (India, south Iraq, southeast Asia, Tibet).	Event	This date represents the core of a time range dating from 7,000 to 4,500 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
3,750	B.C.E.	5,700	Wheeled vehicles are introduced in the Near East.	Event	This date represents the core of a time range dating from 4000 to 3500 B.C.E.
3,600	B.C.E.	5,550	Strains of cotton are being used in Chile and Mexico. The early adoption of cotton as a textile is a representation of human adaptation to the environment in the prehistory of the Americas.	Event	
3,550	B.C.E.	5,500	The number of elm trees declines in northwest Europe, possibly in part due to human impacts.	Event	
3,500	B.C.E.	5,450	Maize, cotton, and llama are domesticated in South America.	Event	
3,500	B.C.E.	5,450	Cave art appears in Aounrhet, depicting cattle herding and hippopotamus.	Event	
3,500	B.C.E.	5,450	Terracing and irrigation become common components of the Mediterranean landscape.	Event	
3,500	B.C.E.	5,450	Sewage systems emerge in the Indus Valley, Mesopotamia, present-day Scotland, and Crete.	Event	This date represents the core of a time range dating from 4000 to 3000 B.C.E.
3,250	B.C.E.	5,200	Cities begin to develop in the Near East.	Event	
3,200	B.C.E.	5,150	Hieroglyphs emerge in Egyptian writing.	Event	
3,050	B.C.E.	5,000	The impress of the Agricultural Revolution transforms the global landscape. The agricultural transformation of the landscape increases the amount of greenhouse gas emissions during the Middle Holocene.	Event	
3,050	B.C.E.	5,000	Soybeans are cultivated in present-day China.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
3,050	B.C.E.	5,000	Humans learn how to make things out of iron.	Event	
3,050	B.C.E.	5,000	Methane increases in the atmosphere due to the spread of agriculture.	Event	
3,050	B.C.E.	5,000	Early height records of the Nile River are recorded.	Event	
3,050	B.C.E.	5,000	The human population increases to 14 million.	Event	
3,050	B.C.E.	5,000	Animal husbandry practices become widespread.	Event	

Growth and Collapse Interval: 4,950 to 1,600 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
3,000	B.C.E.	4,950	The Bronze Age begins in Eurasia leading to the rise of civilizations, written records, and manufacturing a variety of tools.	Event	
3,000	B.C.E.	4,950	Writing is developed in the Near East.	Event	
3,000	B.C.E.	4,950	Egyptian mummies indicate early cases of malaria in humans.	Event	
3,000	B.C.E.	4,950	Egyptian civilization constructs a series of dams and levees along the Nile River. These early dams and levees are representative of human adaptation to the environment.	Event	
3,000	B.C.E.	4,950	The Nile Valley begins to be transformed through the use of basin irrigation.	Event	
3,000	B.C.E.	4,950	Bronze represents one of the first substances that humans synthesize on a broad scale.	Event	
2,853	B.C.E.	4,803	Sheng-Nung, the Chinese Emperor, identifies five sacred plants: soybean, barley, millet, rice, and wheat.	Idea	
2,750	B.C.E.	4,700	Temple-mounds are constructed in South America.	Event	
2,750	B.C.E.	4,700	Walled villages are developed in China.	Event	
2,550	B.C.E.	4,500	The Hittites begin to make knives with iron blades.	Event	
2,550	B.C.E.	4,500	Pine becomes scarce in the previously pine-dominant British Isles.	Event	
2,550	B.C.E.	4,500	Copper mining and smelting become widely used in Europe.	Event	This date represents the core of a time range dating from 5,000 B.P. to 4,000 B.P.
2,550	B.C.E.	4,500	Farming occurs in the semi-arid Sahel region of Africa.	Event	This date represents the core of a time range dating from 5,000 B.P. to 4,000 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2,500	B.C.E.	4,450	Polynesians begin to explore the Pacific.	Event	
2,500	B.C.E.	4,450	Pyramids are constructed in Egypt.	Event	
2,500	B.C.E.	4,450	Early maps are created on clay tablets as ways to record land ownership, planning the construction of canals, and building infrastructure. They serve as systems for ordering human-environment interaction.	Idea	
2,500	B.C.E.	4,450	Egyptians reach the Land of Punt (Pwenet) as they explore the Horn of Africa for resources.	Event	
2,300	B.C.E.	4,250	This is one of the earliest records of humans raising fish, shellfish, and marine plants in captivity for entertainment and intellectual inquiry. The development of aquariums is an example of humans creating environments for fish primarily for human purposes. It involves the transplant of a non-human being into a captive environment.	Event	
2,300	B.C.E.	4,250	The Egyptians and Mesopotamians begin to use forms of the cadastral system of registering land.	Idea	
2,250	B.C.E.	4,200	Early forms of aquaculture are first adopted in China.	Event	This date represents the core of a time range dating from 2000 to 2500 B.C.E.
2,250	B.C.E.	4,200	The Akkadian civilization collapses in the Near East.	Event	
2,200	B.C.E.	4,150	Ancient representations of irrigation canals spring up along the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Tigris and Euphrates rivers.		
2,200	B.C.E.	4,150	The Mesopotamian civilization collapses largely due to drought, desertification, and famine.	Event	
2,050	B.C.E.	4,000	The Jewish religion is believed to have begun through the existence of Abraham, the father of Israel.	Idea	This date represents the core of a time range dating from 2100 to 2000 B.C.E.
2,050	B.C.E.	4,000	As a part of shifting cultivation practices, temporary inroads are built into the forested areas of western European heathlands.	Event	
2,050	B.C.E.	4,000	Elephants are domesticated. The domestication of elephants is one example of human adaptation to the environment.	Event	
2,050	B.C.E.	4,000	Cities begin to develop on multiple continents.	Event	This date represents the core of a time range dating from 5000 to 3000 B.P.
2,025	B.C.E.	3,975	Smelting leads to innovation in the human use of metals.	Event	This date represents the core of a time range dating from 5,500 to 3,000 B.P.
2,000	B.C.E.	3,950	Stonehenge is constructed in Europe.	Event	
2,000	B.C.E.	3,950	Strains of Old-World cotton (*G. herbaceum* and *G. arboreum*) are developed in the Indus Valley. The Old World-use of cotton as a textile is an example of human adaptation to the environment.	Event	
2,000	B.C.E.	3,950	Early uses of coal are documented during the Bronze Age. Coal is a distinctive energy resource for humans. The early use of coal in the Bronze Age shows coal's impact, albeit comparably smaller in scale than the common	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			'Industrial Revolution,' on the environment.		
2,000	B.C.E.	3,950	Dolphins come to symbolize music and joy by the Minoans. This dolphin symbolism is an example of humans ascribing meaning and significance to a non-human species.	Idea	
2,000	B.C.E.	3,950	Groundwater begins to be extracted and used by the Egyptians, Chinese, and Persians. The extraction and use of groundwater are examples of human adaptation to the environment.	Event	
2,000	B.C.E.	3,950	The Chinese find uses for mercury for cultural practices involving cosmetics, medicine, and technology.	Event	
1,750	B.C.E.	3,700	Iron is used in the Near East.	Event	
1,700	B.C.E.	3,650	The Code of Hammurabi provides an early form of water law, which holds if someone's irrigation canal negatively affects the livelihood of another person, then they are responsible to make amends.	Idea	
1,700	B.C.E.	3,650	The Indus Valley civilization collapses during a time when civilizations are expanding.	Event	
1,600	B.C.E.	3,550	An eruption buries the civilization living on the Greek island of Thera.	Event	
1,600	B.C.E.	3,550	Evidence of smallpox exists in Egypt through the archaeological investigation of mummies.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1,600	B.C.E.	3,550	The Minoan civilization is seriously impacted by the Thera/Santorini volcanic eruption.	Event	
1,600	B.C.E.	3,550	The Romans adopt a cadastral system of land partitioning.	Idea	
1,550	B.C.E.	3,500	Heathland in western Europe begin to be used for grazing.	Event	
1,550	B.C.E.	3,500	Oats and rye are domesticated.	Event	This date represents the core of a time range dating from ca 4,000 to 3000 B.P.
1,350	B.C.E.	3,300	The ancient Tongling copper mine is an early example of open-pit mining.	Event	
1,300	B.C.E.	3,250	Humans begin to live in Patagonia. This period occurs when humans begin directly impacting the Patagonian environment of present-day Argentina and Chile.	Event	
1,250	B.C.E.	3,200	Lapita is cultivated in Polynesia.	Event	
1,250	B.C.E.	3,200	Maize is cultivated in the American Southwest.	Event	
1,250	B.C.E.	3,200	Iron is used in the Mediterranean and India.	Event	
1,200	B.C.E.	3,150	The Phoenicians conduct maritime trade through adopting complex seafaring practices.	Event	
1,200	B.C.E.	3,150	The Iron Age begins as tools and weapons are created through the extraction and manipulation of iron, occurring later in areas outside of Eurasia.	Event	
1,050	B.C.E.	3,000	Bantu-speaking peoples migrate to West Central Africa. With their agricultural and iron-smelting	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			practices, these peoples transform the forested area into a lighter form of forest with pioneer trees, an event known as the African rain forest crisis.		
1,000	B.C.E.	2,950	The Chinese begin to record climatic patterns through the use of oracle bones.	Event	
800	B.C.E.	2,750	The Greeks and Phoenicians migrate around the Mediterranean basin	Event	This date represents the core of a time range dating between 1050 and 550 B.C.E.
750	B.C.E.	2,700	Cast iron is used in China.	Event	
700	B.C.E.	2,650	One of the earliest known maps is a painting of a village on a cave wall in Catal Huyuk in modern-day Turkey.	Event	
700	B.C.E.	2,650	The Great Wall of China is constructed.	Event	This date represents the core of the time range from 800 B.C.E. to 600 B.C.E.
600	B.C.E.	2,550	King Nebuchadnezzar builds the Hanging Gardens of Babylon, which is an attempt to create a lush gardenscape in the arid region. An earthquake destroys the Hanging Gardens in the first century.	Event	
600	B.C.E.	2,550	One of the earliest known cosmological maps is traced to Mesopotamia.	Event	
584	B.C.E.	2,534	Siddhartha Gautama begins to develop the philosophy, religion, and practice of Buddhism.	Idea	This date represents the core of a time range dating from 624 to 544 B.C.E.
579	B.C.E.	2,529	During his life, Anaximander creates the first map of the world, invents a version of the sundial, and proposes that the Earth is spherical.	Idea	This date represents the core of a time range dating from 610 to 547 B.C., rounded up to the nearest year.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			These contributions affect the way humans perceive and order their relation to the environment.		
564	B.C.E.	2,514	Zoroastrianism develops as a religion in present-day Iran.	Idea	This date represents the core of a time range dating from 589 to 539 B.C.E.
550	B.C.E.	2,500	Qanats are horizontal tunnels to extract and direct ground water.	Event	
500	B.C.E.	2,450	Greek manuscripts show early examples of humans performing vivisections on nonhuman animals.	Event	
500	B.C.E.	2,450	Natural gas is first used by the Chinese to boil water.	Event	
455	B.C.E.	2,405	Herodotus establishes a proto-anthropology. Through the creation of cultural descriptions, Herodotus is one of the earliest thinkers to practice anthropological thinking before the discipline was formally developed and recognized. Much of this cultural description has connections to the ways that humans relate to the environment. Through his studies, he provides a historical geography of the Nile River.	Idea	This date represents the core of a time range dating from 485 to 425 B.C.E.
450	B.C.E.	2,400	Hunting preserves are established by Persians in Asia Minor.	Event	This date represents the core of a time range dating from 550 to 350 B.C.E.
428	B.C.E.	2,378	A smallpox pandemic devastates Athens, Greece.	Event	This date represents the core of a time range dating from 430 to 426 B.C.E.
400	B.C.E.	2,350	First accounts of the mumps emerge.	Event	
400	B.C.E.	2,350	Hippocrates shows the relation between geography, environment, and human health in the	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			book *On airs, waters, and places*.		
400	B.C.E.	2,350	Greek sailors practice desalination by boiling sea water and distillation.	Event	
353	B.C.E.	2,303	Aristotle contributes ideas toward geography and cosmography, including ideas of climatic determinism and a geocentric system of astronomy. Aristotle's s*cala naturae* also refers to the 'ladder of life' and reflects the philosopher's understanding of nature. He creates an idealized hierarchy of natural beings from simple to advanced. Humans comprise part of the *scala naturae* but have a rational element to them. This approach becomes a significant aspect of Western ecological thought until the 1600s. It has been upheld as both an ethical perspective toward animals just as it has been criticized by others for being anthropocentric. Darwin took a similar idea in 1859 to create an evolutionary tree of life, as well as other scholars (*i.e.*, Jean-Baptist Lamarck in 1809 and Augustin Augier in 1801)	Idea	This date represents the core of a time range dating from 384 to 322 B.C.E.
350	B.C.E.	2,300	Greek geographer Pytheas reaches present-day Britain and Norway.	Event	
331	B.C.E.	2,281	Elephants are used by the Persians against the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			army of Alexander the Great in the Battle of Gaugamela. The weaponization of elephants in war is one of the numerous examples of humans domesticating non-human life to further a political conquest.		
326	B.C.E.	2,276	Elephants are used by the Indian army of Porus at the battle of Hydaspes. The weaponization of elephants in war is one of the numerous examples of humans domesticating non-human life to further a political conquest.	Event	
250	B.C.E.	2,200	Towns emerge in Africa.	Event	
250	B.C.E.	2,200	Rome installs a complex sewage system.	Event	This date represents the core of a time range dating from 800 B.C.E. to 300 C.E.
235	B.C.E.	2,185	Eratosthenes coins the word 'geography' and estimates the Earth's circumference.	Idea	This date represents the core of a time range dating from 276 B.C.E. to 194 B.C.E.
228	B.C.E.	2,178	Chinese water law incorporates public trust doctrines.	Idea	This date represents the core of a time range dating from 249 to 207 B.C.E.
224	B.C.E.	2,174	China experiences one of the first recorded plagues.	Event	
219	B.C.E.	2,169	Hannibal brings 34 elephants from Spain after invading Italy. The weaponization of elephants in war is one of the numerous examples of humans domesticating non-human life to further a political conquest.	Event	
217	B.C.E.	2,167	Elephants are used by the Macedonians in the Diadochi Wars, including the battle of Raphia.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
202	B.C.E.	2,152	Elephants are used by Hannibal in the Battle of Zama. The weaponization of elephants in war is one of the numerous examples of humans domesticating non-human life to further a political conquest.	Event	
200	B.C.E.	2,150	The first recorded accounts of leprosy emerge.	Event	
200	B.C.E.	2,150	Galen, a Roman physician, begins some of the first Western experiments on nonhuman animals (e.g., pigs, monkeys, and dogs) to study anatomy and to test hypotheses.	Event	
200	B.C.E.	2,150	India adopts the Laws of Manu, some of the earliest environmental laws.	Idea	
150	B.C.E.	2,100	The act of placing latitude/longitude grids on the globe for navigation is performed by Hipparchus, whose ideas are improved upon by Claudius Ptolemy.	Idea	This date represents the core of a time range dating from 200 to 100 B.C.E.
50	B.C.E.	2,000	The tributaries along the Yangtze River begin to be dammed.	Event	
50	B.C.E.	2,000	Mercury is mined in the Idrija, Slovenia.	Event	
50	B.C.E.	2,000	Early landscape portraits depict environments.	Event	
49	B.C.E.	1,999	The term 'crossing the Rubicon', or reaching the point of no return, is first introduced by the event of Julius Caesar's crossing the river to invade Rome.	Idea	
27	B.C.E.	1,977	The rise of the Roman Empire coincides with	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			an increase in demand for products like ivory. Resources and commodities become especially important along with the Roman Empire. Demand for products affects how humans interact with the environments that contain the necessary resources.		
6	B.C.E.	1,956	The birth of Jesus Christ ushers in the religion of Christianity.	Idea	
1	C.E.	1949	Via Arabian trade routes, banana production diffuses from South Asia to Africa and the Mediterranean. The spread of bananas to different regions makes this fruit, high in carbohydrates and nutrients, one way of transforming human-environment interactions in newly inhabited regions of the world.	Event	
1	C.E.	1949	Romans practice desalination by filtering sea water through clay soil.	Event	
10	C.E.	1940	Coastal dykes begin to be constructed in the Netherlands.	Event	
50	C.E.	1900	The Pont du Gard Aqueduct is built. The Pont du Gard Aqueduct is a significant example of early European attempts to divert water, around 44 million gallons per day, to be used for societal purposes.	Event	This date represents the middle of the first century C.E.
64	C.E.	1886	On 19 July, the Great Fire of Rome destroys around two-thirds of the city.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
77	C.E.	1873	Pliny the Elder notes the negative impacts that deforestation has on erosion.	Idea	
79	C.E.	1871	On 24 August, Mount Vesuvius erupts and decimates the city of Pompeii.	Event	
119	C.E.	1831	During his life, Ptolemy defines geography as the description of the earth. Ptolemy writes the eight-volume *Geographia*, which gives a geography of the Roman civilization and improves upon Hipparchus's latitude/longitude system.	Idea	This date represents the core of the time range from 87 to 150 C.E., rounded up to the nearest year.
172	C.E.	1778	A smallpox pandemic (Antonine Plague) occurs in the Roman Empire.	Event	This date represents the core of the time range from 164 to 180 C.E.
186	C.E.	1764	Taupo, New Zealand experiences the largest volcanic eruption of the past two millennia.	Event	
200	C.E.	1750	Early signs of whale hunting are found off the coast of Japan.	Event	
227	C.E.	1723	The Roman Period sees major landscape transformations through the establishment of civilizations and road networks, as well as deforestation for cultivation (along with woodland and grassland management).	Event	This date represents the core of the time range from 43 to 410 C.E., rounded up to the nearest year.
300	C.E.	1650	China drills some of the first early oil wells.	Event	

Wayfaring Interval: 1,600 to 444 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
350	C.E.	1600	The first Polynesians settle on Easter Island. Easter Island represents an isolated landscape which used to be inhabited by a large prehistoric civilization but declines due to overexploitation of natural resources and forest clearing.	Event	This date represents the core of the time range from 300 to 400 C.E.
365	C.E.	1585	On 21 July, parts of western Crete are uplifted by six meters by the coseismic uplift caused by an earthquake.	Event	
500	C.E.	1450	Complex states develop in present-day Japan.	Event	
542	C.E.	1408	The first occurrence of the bubonic plague (Plague of Justinian) emerges.	Event	This date represents the core of the time range from 541 to 543 C.E.
601	C.E.	1349	Mohammed's life from 570 to 632 C.E. gives rise to the religion of Islam.	Idea	This date represents the core of the time range from 570 to 632 C.E.
700	C.E.	1250	The pre-Columbian Amerindian civilizations create anthrosols called *terra preta* (Amazonian Dark Earths), soils with added organic and charred wastes as well as ceramic sherds to form a distinct layer of the stratigraphy.	Event	This date represents the core of a time range dating from 2000 to 500 B.P.
725	C.E.	1225	The term 'wild' enters into the English language.	Idea	
750	C.E.	1200	Snow is used as a way to cool air in the home of the Caliph in Baghdad. The adoption of snow to cool the Caliph's home in Baghdad, Iraq is one of the early forms of air conditioning.	Event	This date represents the core of the 700s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Humans utilize air conditioning to make their dwellings more habitable in various climates and environments.		
750	C.E.	1200	The Japanese improve the effectiveness of the fan by adding pleats to it. The Japanese-invention of fan pleats is an example of developing and improving ways to cool the body when environments become warm.	Event	This date represents the early eighth century C.E.
800	C.E.	1150	A Medieval 'agricultural revolution' occurs as new field systems and farming tools come into use, and forests are cleared in Central Europe for cultivation.	Event	This date represents the core of the time range from 500 to 1100 C.E.
897	C.E.	1053	Carp fish are found to be bred in flooded Chinese rice fields. Aquaculture is the process of farming fish through various practices. It represents one important response of humans toward the environment.	Event	This date represents the core of the time range from 889 to 904 C.E., rounded up to the nearest year.
900	C.E.	1050	The Norse begin to explore and settle northern parts of North America, including Greenland by 985. This expedition, along with others, belongs to the commonly-known 'European Age of Exploration,' a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
900	C.E.	1050	The Mayan civilization begins to collapse in Central America.	Event	This date represents the core of the time range from 800 to 1000 C.E.
908	C.E.	1042	The Vikings explore, invade, and colonize much of Europe, Iceland, Greenland, and even the eastern coast of North America.	Event	This date represents the core of the time range from 800 to 1015 C.E., rounded up to the nearest year.
950	C.E.	1000	Between 600 and 1300 C.E., the Polynesians settle in Hawaii, only to be discovered by Europeans in 1778	Event	This date represents the core of the time range from 600 to 1300 C.E.
1000	C.E.	950	Coal becomes a commodity in Britain. The early commodification of coal during this time helps to paint a picture into how events leading up to the common 'Industrial Revolution' contribute toward how humans have transformed the environment through using non-renewable energy resources.	Event	
1000	C.E.	950	Medieval states begin to form.	Event	
1000	C.E.	950	Humans settle in New Zealand.	Event	
1000	C.E.	950	The world population reaches between 250 and 500 million people.	Event	
1000	C.E.	950	The French create the crossbow, a modified bow for archery.	Event	This date provides an approximation of when the French adopt the crossbow.
1000	C.E.	950	Horse collars become widely used. This technology aids in the plowing of fields for agriculture, among other tasks.	Event	This date provides an approximation of when horse collars become widely-used.
1000	C.E.	950	After the collapse of the Mayan civilization, large areas of Meso-America become reforested.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1002	C.E.	948	In his life from 965 to 1039 C.E., Alhazen develops the principles of optics and the use of lenses for vision.	Idea	This date represents the core of the time range from 965 to 1039 C.E.
1050	C.E.	900	Chaco Canyon becomes a complex civilization in North America.	Event	This date represents the core of the time range from 850 to 1250 C.E.
1050	C.E.	900	The French and Spanish begin commercial whaling.	Event	This date represents the middle of the second century C.E.
1079	C.E.	871	The New Forest is created by William the Conqueror. The New Forest in England results in the displacement of 36 villages to accommodate for a royal forest dedicated to deer hunting. It is an early example of governance for a specific type of human-environment interaction. Proposed to be a UNESCO World Heritage Site, the New Forest turns into a national park in 2005.	Event	
1086	C.E.	864	The Domesday Book for England gives an account of land organization and human populations living in England.	Idea	
1090	C.E.	860	The first water-driven mechanical clock is created.	Event	
1100	C.E.	850	Nuisance law is an early form of land-use regulation which has been used in English courts. Nuisance law is based on the idea that humans have the right to use and enjoy their land.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1100	C.E.	850	Woodland conservation practices occur in Europe.	Event	
1100	C.E.	850	Large statues (*moai*) begin to be built on Easter Island.	Event	
1100	C.E.	850	From 950 to 1250 C.E., the Medieval Warm Period transpires which causes disease outbreaks among humans.	Event	This date represents the core of the time range from 950 to 1250 C.E. Boundary dates vary for the Medieval Warm Period.
1150	C.E.	800	Cahokia becomes a complex civilization in North America. These peoples construct large dwellings in the form of earthen mounds and perform expansive trading practices.	Event	This date represents the core of the time range from 1100 to 1200 C.E.
1154	C.E.	796	al Idrisi finishes a complete geographic description of the known world, referred to as the *Book of Roger*.	Idea	
1164	C.E.	786	The Julian flood occurs in Germany.	Event	
1190	C.E.	760	The magnetic compass is mentioned in European writing.	Event	
1200	C.E.	750	English Common Law is developed by traveling judges. Common Law is practiced after the Norman Conquest as a beginning to creating a blanket set of laws to govern a society. Common Law has been involved in environmental issues, such as preventing nuisances and trespassing, as well as riparian rights. As the environmental movement came about in the 1960s, Common Law is challenged and viewed as inadequate	Idea	This date represents the core of the time range from 1100 to 1300 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			as the state becomes more of an environmental regulator.		
1200	C.E.	750	The term 'game' enters into the common language as a descriptor birds or animals being hunted and killed.	Idea	
1215	C.E.	735	The Magna Carta is produced which outlines fundamental rights to individuals and limits the extent of the king's power. It addresses such issues as the use of water bodies, natural resources, and publicly-held lands.	Idea	
1219	C.E.	731	The Marcellus flood occurs in Germany.	Event	
1240	C.E.	710	Arabic numerals are advanced by Leonardo Fibonacci.	Event	
1271	C.E.	679	Marco Polo begins his travels to Persia and present-day China.	Event	
1273	C.E.	677	King Edward of England bans coal fires in the country. This act was one of the first forms of environmental protection in Western history. It is considered a human-environment idea because of its significance.	Event	
1287	C.E.	663	The Lucia flood occurs in Germany.	Event	
1294	C.E.	656	The earliest record of Iceland's "Geysir" is written, which coins the name of geysers around the world. Geysers are important sources of geothermal energy.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1340	C.E.	610	Ibn Battuta ventures across the Muslim territories of North Africa and the Middle East, traveling three times farther than Marco Polo.	Event	This date represents the core of the time range from 1325 to 1355 C.E.
1346	C.E.	604	An early form of biological warfare occurs in present-day Ukraine when rats and fleas are introduced into the area to spread illness and disease.	Event	
1347	C.E.	603	The Bubonic Plague creates one of the worst famines in human history. This era of environmental hazard results in over 40 million deaths in Europe.	Event	This date represents the approximate core of the time range from 1345 to 1348 C.E., rounded up to the nearest year.
1349	C.E.	601	Europe is overtaken by the Black Death disease. The Black Death is an epidemic when humans are deeply affected by a disease transmitted by rats. More than one-third of Europeans die from the disease.	Event	This date represents the approximate core of the time range from 1347 to 1350 C.E., rounded up to the nearest year.
1377	C.E.	573	Ibn Khaldūn of Egypt writes *Muqaddimah* in Qal'at Ibn Salama, which directly discusses the topic of human-environment interactions and is one of the earliest explicit accounts of the topic.	Idea	This date represents the approximate core of the time range from 1375 to 1378 C.E., rounded up to the nearest year.
1381	C.E.	569	The Peasants' Revolt is staged in London. The Peasants' Revolt represents an event in which peasants, reduced in number because of the Black Death, march in London to demand higher wages and better living conditions. The	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			protesters kill the Archbishop of Canterbury and the Lord Treasurer. This is an example of the environment, politics, and rebellion intersect.		
1419	C.E.	531	Cheng Ho conducts a series of seven expeditions sponsored by Cheng Tzu, the Chinese emperor at the time. This Chinese expansion is an example of realms other than Europe expanding across the landscape and changing human-environment interactions in those places.	Event	This date represents the core of the time range from 1405 to 1433 C.E.
1436	C.E.	514	The first All Saints Day flood occurs in Germany.	Event	
1440	C.E.	510	The term 'wildness' enters into the English language.	Idea	
1453	C.E.	497	Movable type-printing is invented by Johann Gutenberg.	Event	
1488	C.E.	462	Bartolomeu Dias of Portugal reaches the Cape of Good Hope in Africa.	Event	
1492	C.E.	458	Christopher Columbus reaches the New World. Columbus's European discovery of the New World results in the Columbian Exchange of goods, plants and animals, and diseases, thereby changing the characteristics of the world’s landscapes.	Event	
1497	C.E.	453	Vasco da Gama reaches the Indian Ocean.	Event	
1497	C.E.	453	John Cabot of Italy explores	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Newfoundland and the Northwest Passage.		
1498	C.E.	452	Bartolomeu Dias reaches the Cape of Good Hope. Dias's expedition is aided by the windshed of the subequatorial Atlantic.	Event	
1500	C.E.	450	Pedro Alvares Cabral begins to explore and colonize present-day Brazil. This expedition, along with others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.	Event	
1504	C.E.	446	Guru Nanak founds Sikhism, a cross between Islam and Hinduism.	Idea	This date represents the core of the time range from 1469 to 1539 C.E.

Colonial Transition: 444 to 340 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1506	C.E.	444	European colonists begin to grow sugar cane in the Caribbean.	Event	
1507	C.E.	446	In his famous map of the world, Martin Waldseemüller draws from the data acquired by Amerigo Vespucci. The cartographer represents the Americas and Asia as separate bodies of land. The term "America" becomes a symbol of various ideals, including the proliferation of colonialism. This occurrence influences the perception of humans toward the environment.	Idea	
1510	C.E.	440	Leonardo da Vinci designs the water-driven turbine.	Event	
1510	C.E.	440	Henry Cornelius Agrippa supports the philosophy and application of geomancy. Geomancy involves the process of using aspects of the Earth's surface in a prophetic and astrological way. It represents an early attempt for people to make sense of their place in relation to the surrounding environment through divination.	Idea	This date represents the core of the time range of Henry Cornelius Agrippa's life, from 1486 to 1535 C.E., rounded up to the nearest year.
1512	C.E.	438	Francisco Serrao arrives in Moluccas. Serrao's discovery of Moluccas sparks a monopoly on spices by Portugal.	Event	
1516	C.E.	434	Spanish friars bring plants, including bananas, from the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Canary Islands to Hispaniola. This event is an example of how the Columbian Exchange influences the human-environment relationship during colonial times. The Natives in the Americas found bananas to be especially desirable as a food.		
1521	C.E.	429	The Ferdinand Magellan expedition circumnavigates the globe. This expedition, along with others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.	Event	
1521	C.E.	429	Hernando Cortez returns to Tenochtitlan to learn that the Aztecs endure a major smallpox epidemic, with a second epidemic spreading in 1531.	Event	
1527	C.E.	423	From 1518 to 1536 C.E., Hernán Cortés establishes the Spanish rule by conquering the Aztec Empire and exploring much of present-day Mexico. Hernán Cortés's expedition results in a shift in human-environment interaction from an Aztecan to a Spanish-dominated perspective.	Event	This date represents the core of the time range from 1518 to 1536 C.E.
1529	C.E.	421	Francisco Pizarro explores the Northern	Event	This date represents the approximate core of the time

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Andes. This expedition, along with others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.		range from 1524 to 1533 C.E., rounded up to the nearest year.
1532	C.E.	418	The second All Saints Day flood occurs in Germany.	Event	
1532	C.E.	418	Álvar Núñez Cabeza de Vaca explores southern portions of the North American continent. This expedition, along with others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.	Event	This date represents the core of the time range from 1528 to 1536 C.E.
1541	C.E.	409	Pedro de Valdivia arrives in present-day Chile. This expedition, along with others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.	Event	
1543	C.E.	407	Diego de Rojas explores Chaco and Tucumán in present-day Argentina. This expedition, along with	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.		
1543	C.E.	407	A heliocentric theory is proposed by Nicolas Copernicus.	Idea	
1544	C.E.	406	Francisco de Orellana explores the Amazon. This expedition, along with others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.	Event	This date represents the approximate core of the time range from 1541 to 1546 C.E., rounded up to the nearest year.
1546	C.E.	404	The Columbian Exchange results in major changes in New/Old World ecologies, human eating habits, and types of labor. The Columbian Exchange involves the trade and transfer of commodities, including plants, animals, and pathogens, between the Old and New Worlds. This time period begins when the Europeans discover and take over the Americas (around 1492) and tapers off toward the end of the 1500s. Termed by Alfred W. Crosby in 1972, this period symbolizes an intense anthropogenic	Event	This date represents the core of the time range from 1492 C.E. to the turn of the 1600s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			transformation of the global environment. It also encompasses a time when plantations begin to take form in the New World.		
1550	C.E.	400	Europeans begin colonizing the Amazon River Basin. European colonization represents a time when human-environmental transformations and interactions begin to change. Europeans were especially apt to capitalize on the area's exotic commodities, including brazil nuts, animal hides, and dyes.	Event	This date represents the core of the 1500s C.E.
1550	C.E.	400	Yellow fever is transmitted from Africa to the Americas by way of the African slave trade.	Event	This date represents the core of the 1500s C.E.
1554	C.E.	396	This event is the earliest time when the tomato, a plant from the New World, appears in European written records.	Event	
1568	C.E.	382	Gerardus Mercator publishes a map of the world that uses his Mercator projection (*Nova et aucta orbia terrae descriptio ad usum navigatium emendate*), which becomes significant for navigation.	Idea	
1570	C.E.	380	Cadastral maps, or estate maps, begin to replace written registers of plots of land. Cadastral maps, between 1570 and 1900, become effective tools for addressing which parts of the environment that individuals own. This type of mapping allows	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			for effective taxation, land allocation, and transfers of property ownership. The delineation of boundaries exemplifies territorial thinking in the human-environment relationship.		
1570	C.E.	380	Abraham Ortelius produces *Theatrum orbis terrarum*, the first atlas to include European explorations.	Idea	
1570	C.E.	380	The third All Saints Day flood occurs in Germany.	Event	
1579	C.E.	371	Sir Francis Drake performs the English circumnavigation of the Earth. This expedition, along with others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.	Event	This date represents the approximate core of the time range from 1577 to 1580 C.E., rounded up to the nearest year.
1593	C.E.	357	Galileo Galilei invents the air-and-water thermoscope. Galileo's air-and-water thermoscope is one of the important scientific contributions to modern-day air conditioning.	Event	
1595	C.E.	355	Paris, France experiences a timber shortage.	Event	
1595	C.E.	355	Tomatoes begin to be planted in Europe.	Event	This date represents the core of the 1590s C.E.
1600	C.E.	350	The European threshold between ancient woodland (woodland that has	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			been present for hundreds to thousands of years) and recent woodland is identified.		
1600	C.E.	350	William Gilbert contributes research theories toward scientific understanding of the Earth's magnetism.	Idea	
1600	C.E.	350	The commonly-known Age of Exploration reaches the core of its human-environment influence. This period focuses on the European-dominated exploration of the world and provides the momentum for a global environmental transformation in the 1600s.	Event	This date represents the core of the time range from 1400 to 1800 C.E.
1600	C.E.	350	The Coal Age begins as coal satisfies the demands for energy.	Event	
1604	C.E.	346	Acts of Parliament in England begin to enclose commonly-held lands for private interests. Enclosure, or the privatization of public lands, is one intentional way that humans organize territory for ownership and use.	Idea	
1605	C.E.	345	Francis Bacon advances scientific views of knowledge and nature in *The advancement of learning*, among other works.	Idea	
1606	C.E.	344	Luis de Tores arrives in the strait that divides Australia and New Guinea, which is better understood during Abel Tasman's expedition from 1642 to 1644. This expedition, along	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			with others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.		
1608	C.E.	342	Galileo makes improvements on the telescope and develops ideas on motion and gravity.	Idea	
1609	C.E.	341	Hugo Grotius publishes *Mare liberum*, which describes the ocean as an inexhaustible resource unhindered by human activity and advocates for the depoliticization of coastal areas.	Idea	
1609	C.E.	341	Johann Kepler studies the processes behind planetary motions.	Idea	

Global Map Scene: 340 to 100 B.P.

Private Property and Commons Interval: 340 to 187 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1610	C.E.	340	The Columbian Exchange leads to an Orbis Spike in the Earth System in which features a dip in global carbon dioxide. This dip is caused by the return of forested areas after the mass dying off of people in the New World due to disease, war, and mass genocide with European colonists.	Event	
1610	C.E.	340	The English and Dutch commence commercial whale hunting. The English and Dutch become the dominant whalers of the 1600s (despite Germans beginning to whale hunt in 1694).	Event	
1625	C.E.	325	The human-environmental interactions in areas of Europe and the United States begin to intensify and gravitate toward a mechanized agriculture and industry.	Event	This date represents the core of the time range from 1500 to 1750 C.E.
1625	C.E.	325	The Scientific Revolution transforms thinking and reasoning about the human-environment relationship. Prominent thinkers include Nicolas Copernicus, Galileo Galilei, Francis Bacon, Isaac Newton, and René Descartes, among numerous others.	Idea	This date represents the time range from the middle of the 1500s (1550 C.E.) to the end of the 1600s (1700 C.E).
1627	C.E.	323	Slovakia becomes the first country to	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			experience mining with the use of gunpowder.		
1627	C.E.	323	In *The new Atlantis*, Francis Bacon envisions a human utopia-empire in which the explorable world is made for humans to dominate.	Idea	
1632	C.E.	318	J. Rey describes the first liquid thermometer.	Event	
1632	C.E.	318	The second Marcellus flood occurs in Germany.	Event	
1633	C.E.	317	The Thirty Years' War endures a typhus epidemic among cities in France and Germany, which is a result of overpopulation and crowding.	Event	This date represents the core of the time range from 1618 to 1648 C.E.
1637	C.E.	313	René Descartes expands upon mechanistic views of nature in *Discourse on method*.	Idea	
1638	C.E.	312	A large furnace is built in Coalbrookdale, which helps to make this English town one of the birthplaces of industrial production, especially in the realm of metalworks.	Event	
1640	C.E.	310	Cinchona bark, which contains quinine, is imported from South America to Europe to cure malaria and becomes widely purchased by 1677 through the British Pharmacopoeia.	Event	
1640	C.E.	310	Coke is derived from coal for the first time.	Event	
1643	C.E.	307	Evangelista Torricelli invents the barometer.	Event	
1643	C.E.	307	Evangelista Torricelli measures atmospheric pressure.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1650	C.E.	300	Bernhard Varens, or Varenius, publishes a significant geography textbook, *Geographia generalis*, which details the distinctions between specific geographies of places and general geography which explores universal laws of geographic explanation.	Idea	
1650	C.E.	300	Forces such as intensified land use, the Columbian Exchange, energy scarcity, and changing perceptions of nature aid in the quickening of environmental changes.	Event	This date represents the core of the time range from 1500 to 1800 C.E.
1650	C.E.	300	Viruses begin to be detected by the Dutch in plant life.	Idea	This date represents the core of the 1600s C.E.
1650	C.E.	300	Sir Isaac Newton and Gottfried Leibniz distinguish between absolute and relative space as ways to orient humans within the world.	Idea	This date represents the core of the 1600s C.E.
1650	C.E.	300	Th Easter Island civilization begins to collapse.	Event	
1654	C.E.	296	The theory of probability is proposed by Blaise Pascal and Pierre de Fermat.	Idea	
1655	C.E.	295	The Great Plague of London occurs.	Event	
1659	C.E.	291	The Central England Temperature Record begins and is the longest continuous account of weather, which is important part of climate reconstruction.	Event	
1663	C.E.	287	This year is the last sighting of the Dodo bird. The Dodo is a large flightless bird	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			which is discovered on Mauritius. The species is hunted to extinction and becomes a symbol of the conflicted relationship between humans and the environment.		
1666	C.E.	284	During 2-5 September, the Great Fire decimates much of London, resulting in a major rebuilding of the city.	Event	
1670	C.E.	280	Anton van Leeuwenhoek advances scientific thought in bacterial and microscopic organisms.	Idea	
1671	C.E.	279	The ensuing slave trade causes Africans to be forcibly moved to the Americas.	Event	This date represents the core of the time range from 1492 C.E. to approximately the middle of the 1800s C.E.
1673	C.E.	277	Isaac Newton develops ideas in differential calculus, gravity, and motion.	Idea	This date represents the core of the time range from 1665 to 1680 C.E., rounded up to the nearest year.
1689	C.E.	261	John Locke's *Lockean proviso* claims that humans have the right to use up the Earth's resources in an appropriate manner. However, that right is tempered by problems of equal access to resources and the ethic of not wasting the God-given environment.	Idea	
1690	C.E.	260	William Penn requires one acre of forest to be spared for every acre that is cleared. Penn's mandate as Colonial Governor of Pennsylvania is one of the first known acts of forest conservation in American history.	Idea	
1690	C.E.	260	Christian Huygens develops the wave theory of light.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1694	C.E.	256	Farms in Scotland's Culbin Sands are affected by advancing ice from the Little Ice Age.	Event	
1700	C.E.	250	Britain clears around 99 percent of its continuous wildwood forest to make way for agriculture.	Event	
1700	C.E.	250	The Age of European Expansion reaches its core period of influence. The four-hundred-year period between 1500 and 1900 C.E. marks the time when Europe colonized much of the world. Colonialism has numerous implications for not just the colonizers and the colonized, but also the environments exposed to the new human-environment interactions of colonialism. The time range accounts for new systems of economics, resource-use, and societal systems. It is important to note that the traditional sense of colonialism continues very much into the 1980s.	Event	This date represents the core of the time range from 1500 to 1900 C.E.
1700	C.E.	250	From around 1550 to 1850 C.E., the Little Ice Age occurs as a cold interval and affects primarily the European and North Atlantic realms.	Event	This date represents the core of the time range from 1550 to 1850 C.E. Periodizations of the Little Ice Age vary from this time range.
1712	C.E.	238	The term sustainability is first introduced by Hans Carl von Carlowitz in *Sylvicultura oeconomica*.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1714	C.E.	236	Gabriel Fahrenheit invents the mercury thermometer.	Event	
1723	C.E.	227	Merino sheep, known for their wool, begin to be legally exported outside of Spain, first to Sweden.	Event	
1725	C.E.	225	The Era of Abundance reaches its core for wildlife conservation. The time range's name refers to the idea that nature's bounty is intended for humans to enjoy and dominate.	Event	This date represents the core of the time range from 1600 to 1849 C.E.
1728	C.E.	222	The Copenhagen fire destroys much of the city. The Copenhagen fire affects almost one-third of the city and renders around one-fifth of the population homeless. Fire represents an environmental hazard for humans, especially as cities undergo increased urbanization.	Event	
1735	C.E.	215	The French prove the phenomenon of the Earth's polar flattening.	Idea	
1736	C.E.	214	Carl Linnaeus begins to develop a system of classification for plants and animals in the books *Systema naturae* and *Fundamenta botanica*.	Idea	
1738	C.E.	212	Carl Linnaeus publishes *Classes plantarum*, an expansion of his ideas on species classification.	Idea	
1743	C.E.	207	Tungøen farm is obliterated by ice advance caused by the Little Ice Age.	Event	
1748	C.E.	202	Julien La Mettrie compares the human	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			body to a machine in *L'Homme machine*.		
1750	C.E.	200	The Enlightenment is an intellectual movement which infuses the view of reason and experience with understanding the human-environment relationship.	Idea	This date represents the core of the time range from 1685 to 1815 C.E.
1755	C.E.	195	An earthquake occurs in Lisbon with seiches that affect Loch Lomond in Scotland.	Event	
1758	C.E.	192	Carl Linnaeus begins to classify different types of humans, including the 'Wild Man', American, Asiatic, and African, which propagates misconceptions about the connection between race and nature.	Idea	
1761	C.E.	189	John Harrison creates a chronometer that can find longitude.	Event	
1761	C.E.	189	From 1754 to 1767 C.E., the United States infects American Indians with smallpox by handing out contaminated blankets.	Event	This date represents the core of the time range from 1754 to 1767 C.E., rounded up to the nearest year.

Industrial Transition: 187 to 100 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1763	C.E.	187	An 'Agricultural Revolution' (as a common reference) occurs from the late-1600s to the mid-1800s C.E. This second Agricultural Revolution happens primarily in Great Britain. The production of crops undergoes a massive increase, largely due to the mechanization of agriculture and the processes of crop rotation and cultivating alternative types of crops. This revolution allows Great Britain's to feed its burgeoning urban population.	Event	This date represents the core of the time range from the late-1600s (1675 C.E.) to the mid-1800s (1850 C.E.). It is rounded up to the nearest year.
1765	C.E.	185	The spinning jenny is invented. The spinning jenny helps to weave thread to make textiles more quickly. It aids in the development of textiles from environmental resources, such as cotton, through a more mechanized process.	Event	
1768	C.E.	182	Forges at Coalbrookdale, England—a significant birthplace of the Industrial Revolution—begin to make iron rails for railroads.	Event	
1768	C.E.	182	From 1766 to 1769 C.E., Louis Antoine de Bougainville performs the first French circumnavigation of the Earth. This expedition, along with others, belongs to the European Age of Exploration, a	Event	This date represents the core of the time range from 1766 to 1769 C.E., rounded up to the nearest year.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.		
1770	C.E.	180	Eucalyptus seeds are taken from Australia during Captain Cook's expedition to Australia. Eucalyptus plants are transferred from Australia to be planted and cultivated throughout areas with comparable environmental conditions, like California.	Event	
1770	C.E.	180	Joseph Priestly develops the concepts of electricity and gases.	Idea	
1771	C.E.	179	Joseph Banks establishes Kew Gardens, a repository of valuable plants from around the world.	Event	
1774	C.E.	176	From 1768 to 1779 C.E., Captain James Cook conducts three voyages to explore the Pacific Ocean. Cook's voyage embodies the belief systems during the Age of Exploration. This expedition, along with others, belongs to the European Age of Exploration, a significant point in human-environmental history which marks the beginnings of a more globalized transformation and understanding of the environment.	Event	This date represents the core of the time range from 1768 to 1779 C.E.
1775	C.E.	175	The U.S. Continental Congress organizes the first representation of the U.S. Army Corps	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			of Engineers. The U.S. Army Corps of Engineers is instrumental for exploring and surveying the American West, as well as constructing various buildings and infrastructure. The Corps later becomes instrumental in managing and controlling riverways and harbors.		
1775	C.E.	175	James Watt invents the steam engine, an improvement of Thomas Newcomen's design from the early 1700s, which aids in the industrialization of society.	Event	
1775	C.E.	175	The Age of Modernity takes place from the 1600s to the present.	Event	This date represents the core of the time range from 1600 to 1950 C.E.
1775	C.E.	175	Sir Percivall Pott discovers the relationship between scrotum cancer and the level of exposure to soot by chimney sweepers. Pott's discovery is one of the first documented examples of how exposure to carcinogenic substances can lead to cancer. Cancer is a health-related hazard in the human-environment relationship.	Idea	This date represents the late-1700s C.E.
1775	C.E.	175	The common period of the Industrial Revolution begins. The Industrial Revolution is a time range discussed frequently in terms of the mechanization of nature and the human	Event	This date represents the late-1700s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			transformation of the environment. During this period, vast quantities of fuel are being burned for the means of producing commodities, infrastructure, and modes of transformation. Packaging and distribution also become internationalized. The revolution also causes an abrupt change in climate that continues into the present.		
1775	C.E.	175	Large quantities of carbon dioxide begin to be released into the atmosphere by humans during the dawn of the Industrial Revolution.	Event	This date represents the late-1700s C.E.
1776	C.E.	174	Adam Smith publishes *The wealth of nations*. Smith's *The wealth of nations* advocates for laissez faire attitudes toward economic regulation. Such acts of deregulation arguably encourage deregulated human domination over the environment through industry, capitalism, and mechanization.	Idea	
1777	C.E.	173	In *Histoire naturelle*, Count Buffon details human influence in transforming the global environment. This collection of writings develops from 1749 to 1804 C.E.	Idea	This date represents the core of the time range from 1749 to 1804 C.E., rounded up to the nearest year.
1778	C.E.	172	From 1644 to 1911 C.E., geomancy and Feng Shui are popularized during the Qing dynasty of China.	Idea	This date represents the core of the time range from 1644 to 1911 C.E., rounded up to the nearest year.
1781	C.E.	169	Immanuel Kant publishes *Critique of*	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			pure reason which conveys the importance of time and space in organizing and understanding of phenomena in the world.		
1783	C.E.	167	The Laki volcano creates reductions in insolation and climatic cooling due to the planetary dust veil it produces.	Event	
1783	C.E.	167	Benjamin Franklin makes the connection between a volcanic eruption in Iceland and the haze occurring while he served in Paris as the U.S. Ambassador.	Idea	
1785	C.E.	165	The Land Ordinance of 1785 provides a foundation for American surveys, organizations, and partitioning of land. It creates the Public Lands Survey System (PLSS).	Idea	
1785	C.E.	165	A steam engine is built in a cotton factory by Watt and Boulton.	Event	
1787	C.E.	163	Edmund Cartwright invents the power loom. Edmund Cartwright produces the power loom, which Worster (1994, 12) argues "completed the transformation of the textile industry to machine production."	Event	
1787	C.E.	163	Thomas Jefferson writes *Notes on the State of Virginia* which gives the climate-human relationship of Virginia.	Idea	
1787	C.E.	163	The Northwest Ordinance creates a rectangular system of	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			survey to sell off or grant federal territories held by the U.S.		
1788	C.E.	162	The African Association for Promoting the Discovery of the Interior Parts of Africa is established (now the Royal Geographic Society).	Event	
1789	C.E.	161	Uranium is discovered by Martin Heinrich Klaproth. Klaproth is a German chemist whose discovery of uranium influenced the twentieth-century development of nuclear technology, an significant component of the human relationship with and transformation of the environment.	Event	
1789	C.E.	161	Jeremy Benham poses this inquiry, "The question is not, can [animals] reason, nor, can they talk, but, can they suffer?" This famous quote is an ethical response to the predicament of human relationships to non-human life, particularly animals.	Idea	
1789	C.E.	161	Gilbert White becomes the first modern nature writer when he publishes *The natural history and antiquities of Selborne*.	Idea	
1789	C.E.	161	Jean Jacques Rousseau publishes *The social contract, or principles of political right*, which has been a resource for democratic decision-making on the environment.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1791	C.E.	159	William Bartram writes *Travels* which influences nature writing during the Romantic era.	Idea	
1791	C.E.	159	The metric system is developed.	Event	
1793	C.E.	157	The cotton gin is introduced with interchangeable parts. Eli Whitney intensifies textile production by making cotton easier to transform into material for clothing and other fabrics. More specifically, the gin allows for the systematic separation of the cotton from the seed.	Event	
1795	C.E.	155	From 1760 to 1830 C.E., England's rural areas change from open-fields to enclosed, depopulated, compact fields because of increasing urbanization.	Event	This date represents the core of the time range from 1760 to 1830 C.E.
1796	C.E.	154	The smallpox vaccination is created by Edward Jenner.	Event	
1798	C.E.	152	Thomas Robert Malthus publishes *An essay on the principle of population*. Thomas Robert Malthus has an important influence on the Age of Environmentalism, as well as Darwinian thought. In 1798, Malthus writes about the problem of environmental degradation due to increases in agricultural production and population growth. This economist's ideas have been attributed as one of the catalysts for modern environmental	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			debate. Malthus's 1798 essay is a hugely influential text for understanding the human-environment relationship. It holds that overpopulation and limited resources will lead to environmental problems such as a food shortage.		
1799	C.E.	151	Edward Charles Howard manipulates mercury for the creation of military explosives.	Event	
1800	C.E.	150	Bison no longer inhabit the southeastern portion of the United States.	Event	
1800	C.E.	150	The global life expectancy for humans is 30 years.	Event	
1800	C.E.	150	The human population increases to 1 billion.	Event	
1800	C.E.	150	Alexander Von Humboldt notices that the Valencia Basin in Venezuela dropped from 426 to 422 meters above sea level, which he attributes to deforestation practices.	Idea	
1800	C.E.	150	A revolution in agricultural technology occurs in Britain.	Event	This date represents the core of the time range from 1750 to 1850 C.E.
1800	C.E.	150	From the 1770s to the 1820s, a wave of industry ensues through the textile industry and steam power	Event	This date represents the core of the time range from 1770 C.E. to the end of the 1820s (1830 C.E.).
1801	C.E.	149	The percentage of humans living in urban areas increases to 26 percent.	Event	
1801	C.E.	149	Part I of Johann Goethe's *Faust* warns against the archetypal human's self-destructive lust for power	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1802	C.E.	148	The U.S. Army Corps of Engineers gains official recognition by U.S. Congress post-Revolutionary War. The U.S. Army Corps of Engineers is instrumental for exploring and surveying the American West, as well as constructing various buildings and infrastructure. The Corps later becomes instrumental in managing and controlling riverways and harbors.	Event	
1802	C.E.	148	Éleuthère Irénée du Pont de Nemours constructs a gunpowder plant outside of Wilmington, Delaware, an early example of chemical industrialization.	Event	
1802	C.E.	148	Atomic theory and the study of scientific meteorology are developed by John Dalton.	Idea	
1802	C.E.	148	From 1799 to 1804 C.E., Alexander von Humboldt explores Latin America, a time range which aids in his understanding of nature as a complex web.	Event	This date represents the core of the time range from 1799 to 1804 C.E., rounded up to the nearest year.
1803	C.E.	147	Luke Howard proposes a classification system for cloud identification.	Idea	
1804	C.E.	146	The Lewis and Clark expedition begins. Exploration is one expression of the human-environment relationship, especially with regard to the interest of humans in discovering new realms.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1804	C.E.	146	Thomas Jefferson signs the Louisiana Purchase, an agreement which doubles the size of the U.S.	Event	
1804	C.E.	146	The first railroad is built, the Penydarren Tramroad in Wales.	Event	
1805	C.E.	145	Carl Mollweide creates the equal-area map projection.	Idea	
1807	C.E.	143	Robert Fulton successfully navigates a steam vessel along the Hudson River.	Event	
1809	C.E.	141	Jean Baptiste de Lamarck publishes *Philosophie zoologique*. Lamarckian theory is an early proposal of evolution. Lamarck makes the argument that life adapts to its environmental conditions and transfers these traits to future generations.	Idea	
1812	C.E.	138	The New Madrid earthquakes of southeast Missouri cause destruction in much of the central and eastern United States.	Event	
1814	C.E.	136	George Stephenson produces the first steam locomotive in Britain.	Event	
1815	C.E.	135	The eruption of the Tambora volcano causes a 'year without summer' in 1816. The Indonesian volcano Tambora erupts, injecting volcanic dust and gases to cool the planet during a brief period of time.	Event	
1816	C.E.	134	Heinrich Brandes, a German physicist, draws the first weather map.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1820	C.E.	130	The German Royal Forest Academy is established. The German Royal Forest Academy represents the first public group that addresses forestry from a scientific standpoint. It belongs to a legacy of scientific forest management, which is one distinctive form of human-environment interaction.	Event	
1820	C.E.	130	Quinine is isolated from chinchona bark and eventually synthesized chemically in 1944.	Event	
1820	C.E.	130	Coastline reclamation begins in Singapore.	Event	
1821	C.E.	129	William Hart builds the first well to extract natural gas in Fredonia, New York.	Event	
1821	C.E.	129	The *Arnold vs. Mundy* Supreme Court decision is the first U.S. example of public trust doctrine in the sense that the state cannot infringe upon people's rights to use environmental resources.	Idea	
1821	C.E.	129	The Bay of Bengal is the origin of the first major cholera pandemic.	Event	This date represents the core of the time range from 1817 to 1824 C.E., rounded up to the nearest year.
1822	C.E.	128	John Loudon produces the *Encyclopedia of gardening*, a treatise on the history of gardens and the humanized landscape.	Idea	
1824	C.E.	126	*Gibbons vs. Ogden* reaches a U.S. Supreme Court decision. *Gibbons vs. Ogden* pertains to the operation of steamboat	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			monopolies and commerce among more than one state. The lawsuit has influenced such legislation as the Clean Water Act.		
1824	C.E.	126	The U.K. Society for the Prevention of Cruelty to Animals is established.	Event	
1825	C.E.	125	Robert Owen establishes New Harmony in Indiana. New Harmony is one of the failed communes to pop up in the nineteenth century. The idea behind these intentional communities is to adopt ways of living that are in communion with other humans and with the environment.	Event	
1825	C.E.	125	French cartographers develop lines to indicate elevation in topographic maps.	Event	This date represents the early-1800s C.E.
1826	C.E.	124	Joseph Nicéphore Niépce captures the first permanent photograph.	Event	
1826	C.E.	124	*Ebenezer Tyler vs. Abraham Wilkinson*, also called the Sargent's Trench Trial, rules that no individual has the ability to deny public domain water rights to another person.	Idea	
1826	C.E.	124	Boston becomes the first ever railroad hub with three radial rail lines.	Event	
1826	C.E.	124	Mary Shelley's *The last man* depicts a derelict landscape and inspires visions of future global environmental changes.	Idea	
1827	C.E.	123	Sulfur-tipped matches are developed by John	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Walker, an English chemist. Sulfur-tipped matches embody a technique for creating fire, an important element of human-environment interaction.		
1827	C.E.	123	The greenhouse effect is discovered by Jean-Baptists-Joseph Fourier. Fourier finds that the atmosphere acts similar to a glass in the way that it traps certain amounts of heat energy. In the 1850s, James Tyner finds that almost 99 percent of all gases in the atmosphere do not act as greenhouse gases, and that only a small percentage actually traps heat energy.	Idea	
1827	C.E.	123	Francesco de Larderel discovers a method for using geothermal energy that can create heat through evaporation as an alternative to consuming wood and other fuel sources.	Event	
1828	C.E.	122	Friedrich Wöhler performs the earliest synthesis of organic chemicals. Wöhler synthesizes urea from ammonium cyanate and ammonium chloride.	Event	
1830	C.E.	120	The Indian Removal Act triggers the mass displacement of Native Americans and the 'Trail of Tears', resulting in the deaths of around 4,000 Cherokees.	Event	
1830	C.E.	120	The Royal Geographical Society is founded.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1830	C.E.	120	The age of the Earth is determined in Sir Charles Lyell's *Principles of geology*.	Idea	
1831	C.E.	119	Michael Farada invents electricity in London.	Event	
1831	C.E.	119	The electric generator is invented by Michael Faraday.	Event	
1834	C.E.	116	The reaping machine is developed by Cyrus H. McCormick.	Event	
1834	C.E.	116	From 1831 to 1836 C.E., Charles Darwin embarks on the Beagle expedition. The Beagle voyage includes Darwin's travels to Argentina, Uruguay, Brazil, and Chile. The expedition influences Darwin's conception and theorization of evolution as a way of explaining how life has changed over time.	Event	This date represents the core of the time range from 1831 to 1836 C.E., rounded up to the nearest year.
1836	C.E.	114	Ralph Waldo Emerson publishes *Nature* which promotes a transcendental relationship between human existence and the environment.	Idea	
1837	C.E.	113	John Deere invents the steel plow.	Event	
1838	C.E.	112	From 1817 to 1859, Carl Ritter publishes volumes of *Erdkunde*, a comparative regional geography which emphasizes the importance of synthesizing the human and non-human elements that make up a region.	Idea	This date represents the core of the time range from 1817 to 1859 C.E.
1839	C.E.	111	Charles Darwin publishes *Voyage of the Beagle (Journal and Remarks). The Voyage of the Beagle* accounts for Darwin's	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			travels during the Beagle expedition. The journal provides a window into the development of evolutionary theory.		
1839	C.E.	111	Two new methods for photography are developed by Louis Jacques Mande Daguerre (silver-coated copper plate) and William Henry Fox Talbot (paper-based negative-positive process).	Event	
1839	C.E.	111	The first fuel cell is invented which can convert chemical energy of hydrogen without combustion.	Event	
1839	C.E.	111	The vulcanization of rubber is made possible by Charles Goodyear.	Event	
1839	C.E.	111	Ether is introduced as a surgical anesthetic by Crawford W. Long.	Event	
1840	C.E.	110	Building upon the work of Halford Mackinder, Alfred Thayer Mahan, an American naval strategist, advocates the importance of the sea for political power and influence in *The influence of sea power upon history*.	Idea	
1840	C.E.	110	The poliomyelitis epidemic emerges.	Event	
1840	C.E.	110	On 6 May, 317 deaths result from a tornado outbreak in Natchez, Minnesota.	Event	
1841	C.E.	109	The Croton River Aqueduct is opened in New York State. The Croton River Aqueduct is one example of human modification of water sources. Supervised by John B.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Jarvis, the aqueduct represents one of America's oldest dams. It helps to meet increasing demands for water in New York.		
1841	C.E.	109	Andrew Jackson Downing produces *A treatise on the theory and practice of landscape gardening, adapted to North America*. Downing's book becomes an important early book on landscape gardening and architecture. It embodies the more humanistic aspects of people-place relationships, especially with regard to the built and planned natural landscapes.	Idea	
1841	C.E.	109	Thomas Cook's tourism business allows Western travelers to tour Egypt and the rest of the Near East.	Event	
1841	C.E.	109	From 1839 to 1842 C.E., the Opium War transpires due to England going against China's policy of trading opium in the Asian country.	Event	This date represents the core of the time range from 1839 to 1842 C.E., rounded up to the nearest year.
1842	C.E.	108	The U.S. Supreme Court presides over *Martin vs. Waddell*, which establishes a ruling over environmental ownership. Later, it has been challenged by such environmentalist groups as the Wise Use Movement.	Idea	
1842	C.E.	108	London's Victoria Park is the first public urban park of its kind.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1843	C.E.	107	J. Bette Jukes begins the first scientific study of the Great Barrier Reef. This 1843 scientific survey starts the process of learning about the complex ecosystems that the Great Barrier Reef contains. The study is followed by numerous future studies of the reef system, especially after the Great Barrier Reef Committee is established in 1922.	Event	
1843	C.E.	107	The Great Bengal Famine is an example of boom famines, which occur even when an area experiences an increase in production.	Event	
1843	C.E.	107	The first iron-hulled screw-propeller ship is designed by I.K. Brunel to cross the Atlantic Ocean.	Event	
1844	C.E.	106	William Cullen Bryant advocates for a public park in New York City. Bryant's call sparks one of the first inquiries into establishing a public park for the increasingly congested borough of Manhattan. This proposal reflects a shift in thinking about urban land-use, societal well-being, and human-environment interaction.	Idea	
1844	C.E.	106	In *Dialectics of nature*, Friedrich Engels criticizes the immorality of buying and selling land as though humans were separate from the environment.	Idea	
1844	C.E.	106	On 24 May, Samuel F.B. Morse successfully transmits a	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			message over his telegraph, an invention which ushers in the Information Age.		
1845	C.E.	96	On 4 July, Henry David Thoreau begins his hermit experiment at Walden Pond. He eventually publishes *Walden*, which is an important example of nature writing.	Event	
1845	C.E.	105	Scottish David Livingstone begins his exploration of various parts of Africa, which include crossing the Kalahari, reaching Ngami Lake, and discovering Victoria (Mosi-oa-Tunya) Falls.	Event	
1845	C.E.	105	The Russian Geographical Society is established.	Event	
1845	C.E.	105	From 1830 to 1859 C.E., Alexander von Humboldt publishes the five-volume *Cosmos*, which details nature's holism and unified characteristics.	Idea	This date represents the core of the time range from 1830 to 1859 C.E., rounded up to the nearest year.
1845	C.E.	105	During the 1840s, the Transcendentalists form two well-known communes: Brook Farm (1841) and Fruitlands (1842). Brook Farm and Fruitlands, like other communes in the nineteenth century, represent an intentionality to adopt an alternative way of life and human-environment interaction. This idealized lifestyle is short-lived.	Event	This date represents the core of the 1840s.
1848	C.E.	102	The *Communist manifesto* is published. The *Communist*	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			manifesto influences much Marxist thought about the human-environment relationship and envisions an ultimate state of sharing and collective practices.		
1848	C.E.	102	William Lynch successfully explores, maps, and acquires the sea level depth of the Dead Sea.	Event	
1848	C.E.	102	The Three-Age System of human development is developed in Denmark (early 1800s) and before it is released in English. The Three Age System is a periodization of human development over time that includes the Stone Age, Bronze Age, and Iron Age.	Idea	
1848	C.E.	102	From 1845 to 1850 C.E., the Irish potato famine occurs due to the water mold *Phytophthora infestans*. The potato famine is an example of how a lack of genetic diversity and an over-dependence on one agricultural crop can lead to dangerous environmental consequences for humans, such as starvation and forced migration.	Event	This date represents the core of the time range from 1845 to 1850 C.E., rounded up to the nearest year.
1849	C.E.	101	The U.S. Department of Interior is established. The founding of the U.S. Department of Interior marks a time when the country becomes concerned with the conservation and preservation of land as	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			it continues to acquire new territories.		
1849	C.E.	101	Influenced by the work of Carl Ritter, Arnold Guyot delivers a series of lectures in Boston that detail a comparative study of human-environment interactions from the standpoint of an early-modern physical geographer. These lectures were compiled to create *The Earth and man: Lectures on comparative physical geography in Its relation to the history of mankind*.	Idea	
1849	C.E.	101	U.S. Congress begins to pass the Swamp Land Acts (one in 1849 and another in 1850 C.E.) to reclaim swampland along the Mississippi River through reclamation projects.	Idea	

Wealth of Nations Scene: 100 to 5 B.P.

Railroad Spike Interval: 100 to 86 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1850	C.E.	100	Septic systems are first adopted in France. This septic system is instituted underground and comprises one form of human management of waste in the environment.	Event	
1850	C.E.	100	The U.S. Army Corps of Engineers is tasked with managing the Mississippi River and its tributaries. The Corps' management of the Mississippi River has transformed this network of waterways into a system of dams, dikes, and other forms of river management.	Event	
1850	C.E.	100	The Tasmanian emu becomes extinct due to overhunting.	Event	
1850	C.E.	100	The amount of global biomass burning intensifies.	Event	
1850	C.E.	100	The Age of Imperialism occurs as Europe gains a stronger foothold as a global superpower	Event	
1850	C.E.	100	The transformation of Earth's terrestrial biosphere by human interaction creates the idea of the anthrome, which are areas either completely or mostly impacted by human activity.	Idea	This date represents the core of the time range from 1700 to 2000 C.E.
1850	C.E.	100	The 19th century experiences an increase in collective agricultural communities. Collective agriculture becomes a centerpiece for various secular and	Event	This date represents the core of the 1800s.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			religious groups, such as the Shakers, Mormons, and Hutterites.		
1850	C.E.	100	Plantations become widespread in Asia, Africa, and Oceania.	Event	This date represents the core of the 1800s.
1850	C.E.	100	The Petroleum Age occurs.	Event	
1850	C.E.	100	The Beneficial Use Doctrine defines water management principles as the U.S. expands farther into the American West. During the eighteenth century C.E., the Beneficial Use Doctrine is implemented during the California Gold Rush and other causes to move westward. It conflates water rights accompany land rights when a piece of property is purchased, as long as that water is managed wisely.	Idea	This date represents the core of the eighteenth century C.E.
1850	C.E.	100	London begins to construct an urban sewage system designed by Sir Joseph Bazalgette.	Event	This date represents the middle of the nineteenth century C.E.
1851	C.E.	99	Dr. John Gorrie patents the refrigerating machine. Gorrie is an American physician who invents a refrigerating machine that is able to decrease air's humidity and temperature. He seeks to condition the air in a way that would enhance the health of people living in the southeastern United States.	Event	
1851	C.E.	99	The 'Mother of the Forest' tree is cut down, instigating	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			concern for conserving wilderness territories.		
1851	C.E.	99	Herman Melville writes *Moby Dick*, a novel which describes whale hunting practices during the time.	Idea	
1851	C.E.	99	The American Geographical Society (AGS) is founded, which has fostered research, policy, and exploration relating to issues of the human-environment relationship.	Event	
1851	C.E.	99	The Francis turbine is developed to create electricity.	Event	
1851	C.E.	99	The percentage of humans living in urban areas raises to 45 percent.	Event	
1851	C.E.	99	Russia opens its first Moscow-to-St. Petersburg railroad line.	Event	
1851	C.E.	99	The idea that the Earth rotates on an axis is developed by Jean Bernard Leon Foucault.	Idea	
1852	C.E.	98	The first accounts of acid rain occur in Manchester, London, and Pittsburgh.	Event	
1852	C.E.	98	Harriet Beecher Stowe's *Uncle Tom's cabin* influences movements advocating empathy for all human (*i.e.*, slaves) and non-human life.	Idea	
1853	C.E.	97	Alexander Wood and Charles Pravaz invent the hypodermic syringe, which helps to administer vaccinations. This tool is an important human response to the problems of the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environment, most notably polio and rabies at this time.		
1853	C.E.	97	Part of the Fontainebleau forest outside Paris is set aside as a nature reserve.	Event	
1853	C.E.	97	From 1848 to 1858 C.E., the California Gold Rush period occurs. The California Gold Rush is a famous example of the frenzy caused by the search for precious metals. California, during this time, gains the image of a giant mine for gold and precious metals. The rush leads to the abrupt increase in population from Asia, Europe, and the United States eastern coast.	Event	This date represents the core of the time range from 1848 to 1858 C.E.
1854	C.E.	96	The Suez Canal is authorized to create the shortest maritime path between Europe and the Indian Ocean. Since then, the canal has been a contested human-made water body. It also creates problems of invasive fish species taking over native Mediterranean habitats.	Event	
1854	C.E.	96	Henry David Thoreau publishes *Walden*, an account of his hermit experiment at Walden Pond.	Idea	
1855	C.E.	95	John Snow locates the source of a cholera epidemic which plagues the city of London.	Idea	
1855	C.E.	95	Between the 1820s and the 1880s, a wave of industrialization occurs, which features	Event	This date represents the core of the time range from the beginning of the 1820s (1820

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			a globalized industrial scene and Great Britain's "Pax Britannica" economic dominance.		C.E.) to the end of the 1880s (1890 C.E.)
1855	C.E.	95	The North American Manufacturing Belt emerges as a prominent industrial region.	Event	This date represents the core of the time range from 1830 to 1880 C.E.
1855	C.E.	95	During the 1850s, cocaine is first isolated and extracted. Cocaine, a derivative of the coca plant, is created for human use. Eventually this natural resource is applied to medicines, beverages, and recreational drug-use. It is an example of human modification of the environment to create a product. Attitudes toward cocaine as a drug have changed over time, a phenomenon which reflects shifts in value-based perceptions of the environment.	Event	This date represents the core of the 1850s.
1855	C.E.	95	During the 1850s, Shellac is taken from South Asia and used as a plastic in the United States.	Event	This date represents the core of the 1850s.
1855	C.E.	95	Railroads begin to become popular in Western societies.	Event	This date represents the middle of the 1850s C.E.
1856	C.E.	94	The blast furnace is invented by Sir Henry Bessemer to produce steel.	Event	
1857	C.E.	93	Through telegraph communication, the *Washington Evening Star* begins to provide weather information.	Event	
1858	C.E.	92	New York City's Central Park is established. Central Park acts as a greenspace in the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			middle of an increasingly congested city of human activity. It is completed in 1878 after around 500,000 cubic feet of soil is helped to transform the landscape into a piece of environmental architecture. The park's design conceived by Frederick Law Olmsted and Calvert Vaux.		
1858	C.E.	92	Frederick Law Olmsted introduces the term 'landscape architecture', which is a form of planning, designing, and building which incorporates human and non-human aspects of a place to create a more ecological and natural built environment.	Idea	
1858	C.E.	92	Felix Tournachon creates the first aerial photograph from a hot air balloon, under the name Nadar.	Event	
1858	C.E.	92	The Second Opium War, also the Anglo-French War, occurs.	Event	This date represents the core of the time range from 1856 to 1860 C.E.
1858	C.E.	92	"On the tendency of species to form varieties; and on the perpetuation of varieties and species by natural means of selection" is published. This two-part paper series by Charles Darwin and Lord Alfred Russel Wallace influences early evolutionary thought, especially the ideas of natural selection, a concept which both scholars independently conceived.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1859	C.E.	91	Charles Darwin publishes *On the origin of the species by means of natural selection*. *The origin of the species* is a watershed moment for the development of evolutionary thought by natural selection.	Idea	
1859	C.E.	91	The United States begins to extract natural gas for commercial use. The extraction of natural gas in Titusville, Pennsylvania marks a major transition in how fossil fuels are used for societal and economic purposes.	Event	
1859	C.E.	91	Karl Marx outlines the ideas of historical materialism, one way to examine the human-environment relationship, in *Contribution to the critique of political economy*. Part of the historical materialist perspective includes the examination of modes of production. Marx describes 'modes of production' as the labor and resources needed for humans to transform parts of their environment into useful items. Historical materialism is connected with the concept of natural capital, which concerns the relationship between production and environment. Three modes of production are most common: kin-ordered, tributary, and capitalist production. Other	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			modes exist, such as Asiatic, slave, socialist, and communist.		
1859	C.E.	91	The United States features the first commercial oil well.	Event	
1860	C.E.	90	Swansea, Wales becomes the world leader in copper smelting, accounting for over 90 percent of the production from copper extracted in Cornwall and Anglesea. In the present day, most of the copper comes from Chile, Indonesia, the United States, Australia, and Canada.	Event	
1860	C.E.	90	From 1857 to 1863 C.E., Gregor Mendel develops a theory of inheritance by studying how peas reproduce. Mendel's work deals much with the concept of genetic inheritance. This monk's work is an immense contribution to the role that genetic inheritance plays in the environment, which includes humans.	Idea	This date represents the core of the time range from 1857 to 1863 C.E.
1861	C.E.	89	Admiral Robert Fitzroy, the Chief Meteorologist to the British Board of Trade, begins a public weather forecast and warning system.	Event	
1862	C.E.	88	Pasteurization is discovered by Louis Pasteur. Pasteur realizes that the process of heating food kills bacteria and viruses that may be malevolent to the human body.	Idea	
1862	C.E.	88	The Homestead Act of 1862 provides a	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			foundation for American surveys, organizations, and partitioning of land, as well as the environmental transformation the region west of the Mississippi River.		
1863	C.E.	87	Modern weather maps are pioneered by Sir Francis Galton.	Event	
1863	C.E.	87	John Tyndall discovers the nature of the greenhouse effect.	Idea	
1863	C.E.	87	Tin is mined to produce packaging to be used during the U.S. Civil War.	Event	This date represents the approximate core of the time range from 1861 to 1865 C.E.
1863	C.E.	87	Jules Verne produces a series of apocalyptic and environmental pop-cultural novels, including *Paris in the twentieth century* (1863), *Propeller Island* (1895), *The ice sphinx* (1897), *The village in the treetops* (1901), *The will of an eccentric* (1899), *The purchase of the North Pole* (1889), and *From the Earth to the moon* (1865).	Idea	This date marks the beginning of a series of publications.

Conservation Interval: 86 to 42 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1864	C.E.	86	George Perkins Marsh publishes *Man and nature*. Marsh's *Man and nature* helps to spearhead the early conservation movement and brings to light human transformations of the environment. It highlights the ability for humans to instigate change in their surroundings.	Idea	
1864	C.E.	86	In *The principles of biology*, Herbert Spencer attributes the 'survival of the fittest' to Darwinian thought. The idea brings about the concept of social Darwinism.	Idea	
1865	C.E.	85	The Royal Commission on River Pollution uses biological oxygen demand (BOD) to measure water pollution. Biological Oxygen Demand (BOD) is a way to assess how much organic matter is present in a body of water. The Royal Commission on River Pollution uses BOD for the first time to assess the state of pollution in England's waterways.	Event	
1865	C.E.	85	William Stanley Jevons releases *The coal question*. In this book, he presents the Jevons Paradox.	Idea	
1865	C.E.	85	Antiseptic surgery techniques are developed by Joseph Lister through the application of carbonic acid.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1865	C.E.	85	The theories of electricity, magnetism, and light are unified by James Clerk Maxwell.	Idea	
1865	C.E.	85	During the 1860s, the Meji Revolution introduces top-down industrial manufacturing practices to Japan.	Event	This date represents the core of the 1860s.
1866	C.E.	84	Ernst Haeckel first employs the term 'ecology'. Ecological thought has influenced human-environment thinking since before 'ecology' was considered a term. It studies the processes that affect the livelihoods and patterns of organisms in relation to the environment.	Idea	
1866	C.E.	84	The American Society for the Prevention of Cruelty to Animals is established.	Event	
1866	C.E.	84	Dynamite is invented by Alfred Nobel.	Event	
1867	C.E.	83	Karl Marx writes *Das kapital* which informs much of contemporary human-environmental thought regarding the role of markets and capitalism. In this publication, Marx brings up the idea of commodity fetishism, which refers to the concealment of the complex socio-environmental relations that are involved in the production of a commodity. Fetishism is the idea that the biography of a commodity is not made apparent to the consumer.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1867	C.E.	83	J. Wilson, Commissioner of the General Land Office, declares the survey of United States' mineral resources to be a top priority, which aids in the eventual creation of the U.S. Geological Survey. This leads to the surveys of John Wesley Powell, Clarence King, and others.	Idea	
1868	C.E.	82	Louisa May Alcott publishes *Little women*, which details her childhood experience on the Transcendentalist farm, called Fruitlands.	Idea	
1869	C.E.	81	Aden, Yemen installs the first desalination plant, constructed by the British.	Event	
1869	C.E.	81	In England, a patent is developed for the first steam-based desalination method.	Event	
1869	C.E.	81	The periodic table of the elements is developed by Dmitri Ivanovich Mendeleev.	Idea	
1869	C.E.	81	On 10 May in the United States, the connection of the Union Pacific and Central Pacific results in a major transcontinental railroad in North America.	Event	
1869	C.E.	81	On 24 May, John Wesley Powell embarks on an expedition along the Colorado River, conducting research on the physical geography and ethnology of the area.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1870	C.E.	80	Bananas reach the New York food market. Bananas are tropical fruit that become highly sought after once the ability to transport them to urban markets increased. Banana production is an example of how technology and markets influence the commodification of spatially-disparate, high-demand goods.	Event	
1871	C.E.	79	Edward Burnett Tylor publishes *Primitive culture*. Tylor's *Primitive culture* uses the comparative study of religions to describe the stages of societal development, with an accommodation for the level of happiness and moral values. More specifically, Tylor identifies a progression from animism to polytheism and finally to monotheism. These stages of development are viewed by Tylor as hierarchical rather than valuable in their own right. Aside from this point, Tylor also provides American anthropology with its foundational element: culture.	Idea	
1871	C.E.	79	The National Marine Fisheries Service (now the National Oceanic and Atmospheric Administration, or NOAA) is established as the oldest U.S. conservation agency.	Event	
1871	C.E.	79	Élisée Reclus publishes *The Earth: A descriptive history*, an early representation of	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			political ecological thinking which criticizes colonization and advocates revolutionary political intervention.		
1872	C.E.	78	The Yellowstone National Park Act is passed. As a result, Yellowstone becomes the world's first national park. Yellowstone is an example of human intentions for preserving a particular landscape at a national policy level. The Washburn-Doane Expedition of 1870 helps to spark intrigue about the protection of this park.	Idea	
1872	C.E.	78	The U.S. General Mining Law is passed as a way for people to discover and extract minerals. The U.S. General Mining Law represents a national political decision which influenced human dominance and transformation, especially of the American West region. It allows for the exploration and extraction of minerals on federal lands.	Idea	
1872	C.E.	78	Arbor Day becomes a formalized event. J. Sterling Morton, a journalist in Nebraska, creates Arbor Day, which is widely adopted by various countries. Arbor Day highlights the importance of trees on ecology and encourages the planting of trees.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1872	C.E.	78	The Japanese receive their first railroad system that connects Tokyo and Yokohama.	Event	
1872	C.E.	78	The term ‘acid rain’ is introduced by R.A. Smith.	Idea	
1874	C.E.	76	DDT is first created by Othamai Zielder. Ziedler produces DDT, which is not used as an insecticide until Paul Herman Muller discovers its effectiveness to kill pests in 1939.	Event	
1874	C.E.	76	The first waste incinerator is introduced in the United Kingdom.	Event	
1875	C.E.	75	Eduard Suess introduces the term 'biosphere', which is elaborated upon in 1926 by Vladimir Ivanovich Vernadsky. The 'biosphere' becomes a domain to examine aspects of the human-environment relationship in the Earth's system.	Idea	
1875	C.E.	75	The Era of Overprotection reaches its core in wildlife conservation. This time range refers to the time when concerns over environment results in a political overcompensation of environmental preservation.	Event	This date represents the core of the time range from 1850 to 1899 C.E.
1875	C.E.	75	The Askja volcano in Iceland erupts, causing displacement and economic problems.	Event	
1875	C.E.	75	The telephone is invented by Alexander Graham Bell.	Event	
1875	C.E.	75	Sugar plantations develop into large-	Event	This date represents the core of the 1880s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			scale enterprises in the Dominican Republic during the 1870s C.E. Sugar plantations lead to significant human transformations of the environment, including the proliferation of monoculture, deforestation, and new infrastructure (i.e., railroads).		
1875	C.E.	75	Pests and plant diseases seriously impact U.S. wine production during the 1870s C.E.	Event	This date represents the core of the 1880s C.E.
1875	C.E.	75	During the 1870s, steamboats with purse seins are introduced in United States fishing, making it easier to catch mackerel and menhaden on the east coast.	Event	This date represents the core of the 1880s C.E.
1875	C.E.	75	The capture and transportation of exotic fish increases around the world. The increase of merchant ships transporting exotic fish is a product of the demand by the world aquarium industry. Home aquariums and public exhibitions become a regular occurrence. This is an example of humans modifying the environment of exotic fish through displacement.	Event	This date represents the late-1800s C.E.
1876	C.E.	74	Henry Wickham smuggles around 70,000 rubber tree seeds from Brazil and brings them into Asia. Wickham's rubber tree smuggling is recognized as an example of biopiracy, one form of human-	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environment interaction in which a species or form of knowledge is extracted without permission and introduced into another area. Asia quickly outproduces Brazil in delivering rubber to the market.		
1876	C.E.	74	The Philadelphia Centennial Exposition introduces kudzu as a form of decoration and shade used in Asian gardening.	Event	
1876	C.E.	74	Canada passes the Indian Act which authorizes the creation of Indian reserves for First Nation peoples.	Idea	
1876	C.E.	74	The four-stroke internal combustion engine is invented by Nikolaus August Otto.	Event	
1876	C.E.	74	Élisée Reclus publishes *Géographie universelle*, which details his thoughts on social environmental justice and the human-environment relationship.	Idea	This date marks the beginning of the multi-volume publication.
1877	C.E.	73	Britain passes the Destructive Insects Act to mitigate agricultural impacts of the Colorado potato beetle. The Destructive Insects Act is an early example of a government-based response to decrease the level of pests in a country. The legislation indicates the use of laws to change the environment (*i.e.*, eradicating pests) to make it more habitable.	Idea	
1877	C.E.	73	Lewis Henry Morgan publishes *Ancient society*. Morgan's	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			book involves a comparative study of human cultures from an evolutionary point of view. One of the main ideas from the book reflects an early view in anthropological thought that some groups have developed far better than other groups, such as the progression from savagery to barbarism to civilized society. The evolutionary perspective brings to light how ideas from biological evolution have been used to ascribe a development value toward different cultures.		
1877	C.E.	73	*Black beauty* by Anna Sewell is an example of an influential piece of literature that promotes affection toward animals.	Idea	
1878	C.E.	72	India passes the 1878 Forest Act despite the calls of Dietrich Brandis for community-based forestry. The act advocates state monopolies over the management of forests.	Idea	
1879	C.E.	71	Thomas Edison invents the electric light bulb along with J.W. Swan.	Event	
1879	C.E.	71	The common water hyacinth, one of the world's most invasive weeds, is introduced to Africa.	Event	
1879	C.E.	71	Adolf Erik Nordenskiöld attempts to navigate the Northwest Passage.	Event	
1879	C.E.	71	The term 'national park' is first explicitly used	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			in the creation of the Royal National Park outside Sydney, Australia.		
1879	C.E.	71	From 1878 to 1880 C.E., Frederick Law Olmsted and Calvert Vaux construct the Emerald Necklace in Boston, Massachusetts as a part of the Urban Parks Movement.	Event	This date represents the core of the time range from 1878 to 1880 C.E.
1879	C.E.	71	The U.S. Geological Survey is established on 3 March. The U.S. Geological Survey is one example of a government structure that helps to map and understand the environmental terrain and processes occurring within a country.	Event	
1880	C.E.	70	The Australian 75-miles Dam, located in Warwick, is the first concrete-arch dam which influences the creation of numerous dams of the same variety throughout the world.	Event	
1880	C.E.	70	Conservation easements are first employed in Boston, Massachusetts for the purpose of building a park. Conservation easements are an agreement between a landowner and an organization, whether that be the Nature Conservancy or the federal government. An easement is a way for land to be preserved for conservation activities while maintaining some form of original ownership for a period of time.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1880	C.E.	70	The Swedish Adolf Erik Nordenskiöld conceives of setting aside federal land as national parks for the purposes of environmental preservation.	Idea	
1880	C.E.	70	Gold is discovered in Juneau, Alaska in 1880.	Event	
1880	C.E.	70	Portions of the Florida Everglades are drained and converted to agricultural fields due to the work of Hamilton Disston.	Event	
1880	C.E.	70	The demand for rubber increases in North Atlantic markets. This rubber demand causes a rise in extraction of latex from rubber trees located in the Amazon River Basin. It is an example of how an environmental resource becomes commodified and exploited by the Global North.	Event	This date represents the core of the time range from 1850 to 1910 C.E.
1880	C.E.	70	Hydroelectricity is made possible in December through the combination of the turbine and the rotor in Rothbury, U.K.	Event	
1881	C.E.	69	Carlos Juan Finlay proposes that mosquitoes are transmitters for illnesses such as malaria, which is later discovered in 1889.	Idea	
1881	C.E.	69	Goldaming, U.K. receives the first public electricity unit.	Event	
1882	C.E.	68	New York City receives its first power plant. The beginning of power plants in cities is significant in the development of	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			urban areas and the transformation of the surrounding ecosystems. Power plants become especially useful for human adaptations like air conditioning.		
1882	C.E.	68	Crocker and Curtis Electric Motor Company creates the first commercial electric fan. The proliferation of electric fans is another example of the widespread adoption of air conditioning technologies in the late-1800s.	Event	
1882	C.E.	68	Friedrich Ratzel introduces the study of Anthropogeography, which focuses on the ways in which environments influence and affect human activities. Ratzel's ideas are later expanded upon in the environmental determinist work of Ellen Semple.	Idea	
1882	C.E.	68	Appleton, Wisconsin receives the first U.S. hydroelectric generator.	Event	
1882	C.E.	68	The first hydroelectric plant is designed by Thomas Edison.	Event	
1883	C.E.	67	The American Ornithologist's Union is created. The American Ornithological Union represents the wish of a human organization to preserve exotic species of birds in danger of overhunting.	Event	
1883	C.E.	67	Sir Francis Galton publishes *Inheritance*	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			of human faculties. Galton's book brings up the idea of eugenics, which uses political and social processes to attempt to select for optimal human genetic traits. The idea of eugenics has fueled racial discrimination and the violation of human rights based on the genetic traits.		
1883	C.E.	67	Kudzu, now considered an invasive species, becomes popular for gardening and livestock fodder after the New Orleans Exposition.	Event	
1883	C.E.	67	The Krakatau volcano causes major reductions in insolation and climatic cooling due to the planetary dust veil it produces.	Event	
1883	C.E.	67	William Thomson, also Lord Kelvin, writes *On the size of atoms*.	Idea	
1884	C.E.	66	The discipline of anthropology becomes a formal academic area of study when Sir Edward Burnett Tylor becomes a University Reader in anthropology at Oxford. Anthropology is an integral field of research for the human-environment relationship because it has shaped understandings about how humans have progressed through time and how cultures form in places around the world. Sir Edward Burnett Tylor's Oxford position formalizes this discipline.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1884	C.E.	66	Fieidrich Engels publishes *Origin of the family, private property, and the state*. Engels's book compares nonindustrial societies to support the historical materialist mindset.	Idea	
1884	C.E.	66	Shiramiro Kitasato and Alexnder Yersin discover the organism that causes Black Death, *Pasteurella pestis*. Kitasato and Yersin provide a much-needed answer to the primary cause of Black Death, which helps to not only understand the past occurrences, but also how to address present-day manifestations of the sickness.	Event	
1884	C.E.	66	Louis Pasteur develops the rabies vaccine.	Event	
1884	C.E.	66	The common water hyacinth, one of the world's most invasive species, is introduced into the United States.	Event	
1884	C.E.	66	The German Karl Benz invents the first self-driven vehicle powered by gasoline.	Event	
1884	C.E.	66	Nikola A. Tesla creates the electric motor with George Westinghouse.	Event	
1884	C.E.	66	From 1865 to 1884, around 60 million bison are hunted in the United States.	Event	
1884	C.E.	66	In October, Greenwich becomes the Prime Meridian, thus contributing toward the system of how humans orient, map, and navigate the Earth.	Idea	
1885	C.E.	65	Explorer Henry Morgan Stanley	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			navigates the Congo River from start to finish. Stanley's exploration of the Congo River is a catalyst followed by colonial activities of trade and European extraction of resources.		
1885	C.E.	65	The Bunsen burner is invented. The Bunsen burner is a way to use natural gas, a fossil fuel, as a technique for cooking and heating, a significant change in the nature of fossil fuels and human-environment interaction.	Event	
1885	C.E.	65	Peter Kropotkin writes "What geography ought to be" which details his ideas about mutual aid, a moral approach to societal interactions and nature-society relationships.	Idea	
1885	C.E.	65	Gottlieb Wilhelm Daimler and Wilhelm Maybach patent an internal-combustion engine and build engines on a bicycle (1885), a carriage (1886), and a boat (1887).	Event	
1885	C.E.	65	The core of the conservation movement transpires from 1850 to 1920. The conservation movement is dedicated toward the conservation and preservation of areas, a fundamental assessment and appreciation of the relationship between nature and society in the midst of ongoing	Idea	This date represents the core of the time range from 1850 to 1920 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			industrialization of the world.		
1885	C.E.	65	During the 1880s, the need for fishery conservation and management is voiced in the North Sea, Mediterranean, and Newfoundland.	Idea	This date represents the core of the 1880s C.E.
1885	C.E.	65	Sewing machines are introduced which help expand the textile industry during the 1880s C.E.	Event	This date represents the core of the 1880s C.E.
1886	C.E.	64	*Forest and Stream* and similar publications help to establish the conservation ideology and create clubs dedicated to the matter. Conservation clubs become formed through the help of George Bird Grinnell's magazine *Forest and Stream*.	Idea	
1886	C.E.	64	In Orne Jewett's "The white heron", a girl forgoes a cash reward to spare a bird.	Idea	
1886	C.E.	64	New York Audubon Society is founded.	Event	
1886	C.E.	64	The Great Die-Up period occurs after a severe winter results in the deaths of hundreds of thousands of livestock.	Event	The earlier date, 1886 C.E., is used over the later date, 1887 C.E.
1887	C.E.	63	Jane Addams establishes the Hull House. Jane Addams has been an important voice for urban reform and environmental justice. At this time, the Hull House in Chicago, Illinois provides a place for people from different backgrounds to gather and increase their social capital in the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			industrialized city. Addams and her collaborators at Hull House become responsible for identifying many of the sanitation and health-related problems occurring within the city.		
1887	C.E.	63	The Boone and Crockett Club forms. Theodore Roosevelt and others establish the Boone and Crockett Club, which is an early environmental organization in the United States.	Event	
1887	C.E.	63	The Yellow River experiences an enormous flood.	Event	
1888	C.E.	62	The National Geographic Society forms.	Event	
1888	C.E.	62	The common water hyacinth, one of the world's most invasive weeds, is introduced into Australia.	Event	
1888	C.E.	62	John Dunlop invents the pneumatic tire, which is air filled an increase the automobility of humans.	Event	
1889	C.E.	61	The head of the U.S. Department of Agriculture gets an official spot in the presidential cabinet. This law is passed by Grover Cleveland which brings the agricultural aspect of the human-environment relationship further into the U.S. political realm.	Event	
1889	C.E.	61	Washington, D.C.'s National Zoological	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Park becomes the first U.S. zoo to adopt conservationist values.		
1889	C.E.	61	Juiz de Fora, Minas Gerais in Brazil installs an electricity source to power a mill.	Event	
1889	C.E.	61	Texas enacts a law to regulate the selling and consumption of petroleum products.	Idea	
1890	C.E.	60	Early attempts at restoration ecology, the act of repairing environments, begin to take form.	Event	
1890	C.E.	60	California receives its first national park: Sequoia National Park.	Event	
1890	C.E.	60	Yosemite, previously a state park since 1864, becomes a national park.	Event	
1890	C.E.	60	John Scott Keltie suggests that applied geographic science can act as a bridge between the natural and the social sciences.	Idea	
1890	C.E.	60	Elephants are virtually extirpated in South Africa.	Event	
1890	C.E.	60	The Texas Railroad Commission is established to regulate the state's petroleum industry.	Event	
1891	C.E.	59	The Forest Reserve Act is passed. The Forest Reserve Act allows the U.S. President to reserve forested lands in the public domain.	Idea	
1891	C.E.	59	India endures a significant cholera pandemic.	Event	
1891	C.E.	59	Ignatius Donnelly writes the dystopian novel *Caesar's column: A story of the twentieth century*, depicting the	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			destruction of New York in 1988		
1892	C.E.	58	The Sierra Club is established. The Sierra Club, founded by John Muir, is an organization that has advanced the preservationist and environmentalist view toward public lands.	Event	
1892	C.E.	58	Henry S. Salt writes *Animals' rights considered in relation to social progress*. Henry S. Salt (referred to as John Salt in Nursey-Bray and Palmer 2007) first introduces the term animal rights to contextualize his arguments about ethics relating to animal treatment by humans.	Idea	
1892	C.E.	58	The Boll Weevil appears in the American South and threatens the agricultural production of cotton. The Boll Weevil is an invasive species which threatens the American South's production of cotton, and example of environmental hazards on natural resources.	Event	
1892	C.E.	58	A patent is produced for the diesel engine.	Event	
1893	C.E.	57	Frederick Jackson Turner's 'Frontier Thesis' is published. Turner's 'Frontier Thesis' has declared the American West as essential toward the proliferation of democratic ideals. This publication comes at a time when western expansion has spread to virtually every	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			corner of the American landscape. The frontier effectively becomes closed shortly thereafter.		
1895	C.E.	55	The American Scenic and Historic Preservation Society is founded.	Event	
1895	C.E.	55	X-rays are discovered by Wilhelm Roentgen.	Event	
1895	C.E.	55	Portage railways are installed along the Congo River in the 1890s. Portage railways allow for easier trade and extraction of resources in and out of the Congo River Basin. Specifically, the railways make the river more navigable and easier to transport iron, rubber, and precious metals. This infrastructure is an example of human adaptation to the environment, as well as the commodification and mechanization of the environment.	Event	This date represents the core of the 1890s C.E.
1895	C.E.	55	The steam trawler and otter trawl are used for industrial fishing in the North Sea during the 1890s.	Event	This date represents the core of the 1890s C.E.
1896	C.E.	54	In *Greer vs. Connecticut*, the U.S. Supreme Court decides that it is the job of the states, not private entities, to enforce rules relating to animal rights. This decision is a result of a dispute between Connecticut and Edward M. Greer over selling animals in a different state that forbids the practice. The ruling represents a	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			political decision navigating the differences in state-level management of animals. The ruling is overturned in 1979 by the case *Hughes vs. Oklahoma*.		
1896	C.E.	54	The Massachusetts Audubon Society is formed. Harriet Hemenway and Minna B. Hall create the Massachusetts Audubon Society as a way to convenience Boston women of fashion from wearing products created by exotic birds.	Event	
1896	C.E.	54	Radiation is discovered by A.H. Becquerel.	Event	
1896	C.E.	54	Svante Arrhenius discovers that the addition of carbon into the atmosphere can influence the climate. Svante Arrhenius's findings influence the development of the idea of anthropogenic effects on climatic change that have become apparent one century after the Swedish chemist's discovery. Arrhenius's findings gain notoriety after a publication in 1908.	Idea	
1896	C.E.	54	St. Louis, Missouri experiences 255 deaths due to a tornado outbreak on 27 May.	Event	
1897	C.E.	53	The Forest Organic Act is passed in the U.S. to allow for federally-managed timber harvesting. This form of forest management represents an significant political decision for human	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			interactions with the environment.		
1897	C.E.	53	Casein plastics begin to be made from milk.	Event	
1897	C.E.	53	The electron is identified by J.J. Thompson.	Idea	
1898	C.E.	52	Biological Oxygen Demand (BOD) tests are developed to measure pollution in riverways. BOD tests become a regular form of assessing human impact on the hydrological system after the English Royal Commission on River Pollution began measuring BOD in 1865.	Event	
1898	C.E.	52	Ebenezer Howard proposes the idea of the garden city. Howard's 'garden city' represents a series of proposals that address about how to create places with pleasing environmental qualities. In 1903, he establishes Letchworth Garden City. In 1920, he founds Welwyn Garden City. The goal of these projects is to combat the unhealthiness of increasingly crowded and polluted cities.	Idea	
1898	C.E.	52	Gifford Pinchot, an important figure in conservation management, becomes head of the Forestry Division of the U.S. Department of Agriculture.	Event	
1898	C.E.	52	The mosquito is found to be a carrier of malaria, according to Ronald Ross.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1898	C.E.	52	Radium and polonium are uncovered by Pierre and Marie Curie.	Event	
1899	C.E.	51	Franz Boaz founds the Columbia University Department of Anthropology. This event signals the further institutional establishment of anthropology as a significant discipline in the study of the human-environment relationship.	Event	
1899	C.E.	51	The Rivers and Harbors Act is implemented. The Rivers and Harbors Act is the predecessor to the 404 program of the Clean Water Act of 1972. The 404 program makes it a necessity to have a permit in order to dredge and fill water bodies in the United States. The Rivers and Harbors Act endows the U.S. Army Corps of Engineers with managing navigable waterways by creating a program that gives permits to dredging or filling rivers and harbors around the country.	Idea	
1900	C.E.	50	Vladimir Köppen produces the Köppen Climate Classification System. The Köppen Climate Classification provides the basis for how humans begin to systematically organize and classify various environments according to climate.	Idea	
1900	C.E.	50	India endures a major drought. This drought is an environmental	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			disaster which causes between a quarter million to 3.25 million deaths.		
1900	C.E.	50	Galveston, Texas witnesses a hurricane with one of the highest death counts in American history.	Event	
1900	C.E.	50	A boy from Ohio shoots the last wild passenger pigeon.	Event	
1900	C.E.	50	The first international conservation treaty is adopted in London's Convention for the Preservation of Animals, Birds, and Fish in Africa.	Idea	
1900	C.E.	50	The Earth contains over 20 million square kilometers of agricultural land.	Event	
1900	C.E.	50	Coal replaces wood as the dominant fuel source in the United States.	Event	
1900	C.E.	50	The human population increases to 1.65 billion.	Event	
1900	C.E.	50	Patagonia becomes formally opened to agriculture and sheep raising. Agriculture and shepherding increase and leave their impress on the Patagonian landscape.	Event	This date represents the core of the time range from the late-1800s (1875 C.E.) to the early 1900s (1925 C.E.).
1901	C.E.	49	The Kenya-Uganda railroad spans from Mombasa's coast to Lake Victoria, which opens the area to British and Asian colonists and markets.	Event	
1901	C.E.	49	Ellen Semple publishes the essay "The Anglo-Saxons of the Kentucky mountains: A study in anthropogeography." The paper argues that	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the rough and isolated terrain of the Appalachian region influences the rough and lawless nature of the people who inhabit the area. This essay presents an environmental determinist image of a culture and has been a source of criticism for the determinist and anthropogeography approach.		
1901	C.E.	49	The Alamo Canal is installed on the Colorado River for the purposes of irrigation.	Event	
1901	C.E.	49	Aleksandr Ivanovich Voeikov follows the step of George Perkins Marsh by publishing about the human-caused destruction of the environment.	Idea	
1901	C.E.	49	*The Laws of radiation* is written by Max Plank.	Idea	
1902	C.E.	48	Willis Carrier becomes the father of air conditioning due to the creation of air conditioning systems that can be controlled in terms of temperature and humidity. Air conditioning represents a human response to the climatic conditions of the environment in order to create more habitable dwellings. Carrier is one of the most widely recognized faces of mechanized air conditioning.	Event	
1902	C.E.	48	The American Anthropological Association (AAA) is established. The AAA is regarded as a	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			significant organization for anthropology and understanding human culture.		
1902	C.E.	48	California sets aside its first state park: Big Basin State Park.	Event	
1902	C.E.	48	Peter Kropotkin publishes *Mutual aid*, which politicizes thinking about the human-environment relationship and has influenced work in political ecology.	Idea	
1902	C.E.	48	On 8 May, Mount Pelée erupts on Martinique, a Caribbean Island, causing 28,000 deaths and the classification of *nuée ardente*, a pyroclastic flow that is created when a lava dome collapses. The eruption of Mount Pelée causes intense destruction, especially in the town of St. Pierre. The event is an example of the impacts that environmental hazards can have on humans.	Event	
1902	C.E.	48	The Reclamation Act is passed in the U.S. on 17 July. The Reclamation Act is signed by Theodore Roosevelt authorizing the irrigation of arid landscapes in the American West. The Roosevelt Dam and Salt River Project are begun. The piece of legislation gives the federal government more power to alter the country's waterways. It is a response to the pressure for the federal government to mitigate	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			issues relating to the habitability of the American West.		
1903	C.E.	47	Argentina establishes South America's oldest protected area. This protected area suggests how U.S. ideas permeate throughout the world in the interests of conservation and preservation.	Event	
1903	C.E.	47	Theodore Roosevelt establishes Pelican Island as a Federal Bird Reservation. This Federal Bird Reservation marks a significant point in the institutionalization of the U.S. Fish and Wildlife Service. The agency gains much of its organizational identity from this conservation territory.	Event	
1903	C.E.	47	The United States commences the industrial tuna fishing industry.	Event	
1903	C.E.	47	On 7 December, Wilbur and Orville Wright fly the first powered aircraft. The invention and use of powered flight mark a threshold moment in avian forms of human-environment interaction, especially as airplanes begin to be improved upon and widely used.	Event	
1904	C.E.	46	The Louisiana Purchase Exposition in the St. Louis World's Fair features a cooled auditorium with 1,000 seats. People from around the world experience the effects	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			of air conditioning on indoor environments.		
1904	C.E.	46	The Association of American Geographers (now the American Association of Geographers, or AAG) is founded, which brings forth research and thinking about the human-environment relationship.	Event	
1904	C.E.	46	In Larderello, Italy, the first attempt to convert geothermal energy into electricity occurs.	Event	
1904	C.E.	46	Halford Mackinder develops the Heartland model, which is a land-based idea of gaining political power. It is published in *The geographical pivot of history*.	Idea	
1904	C.E.	46	Whaling begins in the Antarctic region.	Event	
1905	C.E.	45	The National Audubon Society is formed. The National Audubon Society begins as a formal coalition of numerous state-level Audubon societies. This organization has been politically influential in the protection of various endangered species of bird.	Event	
1905	C.E.	45	The Reorganization Act officially designates the United States Forest Service (USFS) under the Department of Agriculture. The USFS has been an instrumental governmental entity in the management and conservation of forested environments	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			and other land types in the U.S. public domain. The act promotes the connection of forestry with agricultural practice.		
1905	C.E.	45	The Klamath Basin (located in California and Oregon) is drained and dammed for agriculture and irrigation through the Klamath Reclamation Project.	Event	
1905	C.E.	45	Harold Des Voeux comes up with the term 'smog' to describe the air quality and visibility in the increasingly congested and polluted city of London.	Idea	
1905	C.E.	45	Albert Einstein presents the Special Theory of Relativity.	Idea	
1905	C.E.	45	Roald Amundsen successfully navigates the Northwest Passage.	Event	This date represents the core of the time range from 1903 to 1906 C.E., rounded up to the nearest year.
1905	C.E.	45	From 1905 to 1908 C.E., Élisée Reclus publishes *L'homme et la terre*, which details his thoughts on social environmental justice and the human-environment relationship.	Idea	This date marks the beginning of the multi-volume publication.
1906	C.E.	44	The U.S. Antiquities Act is passed. Among its stipulations, the Antiquities Act allows the U.S. President to create national monuments by setting aside land in the federal public domain and declaring these areas off-limits to development. It also allows for ruins and archaeological sites to	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			be examined and excavated. Additionally, federal penalties come with anyone who illegally excavates, destroys, or does damage to a ruin or monument on public land.		
1906	C.E.	44	Stuart Cramer coins the term 'air conditioning'. Air conditioning and the spread of related technologies become household items through diffusion and an important phenomenon for human-environment adaptation.	Idea	
1906	C.E.	44	The U.S. Food and Drug Administration (FDA) is established from the Pure Food and Drugs Act. The FDA has been largely responsible for addressing health-related problems concerning food and drugs.	Idea	
1906	C.E.	44	Upton Sinclair publishes *The jungle*. Sinclair's book garners attention to the problems and hazardous conditions of the meatpacking industry. The publication helps to usher in the U.S. Food and Drug Administration.	Idea	
1906	C.E.	44	A trend in cod fishing begins through the French's invention of the large steam trawler.	Event	
1906	C.E.	44	San Francisco is affected by a major earthquake on 18 April. This earthquake, along with the 1925 Santa Barbara earthquake and	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the 1933 Long Beach earthquake, calls attention to the problems relating to building architecture. This environmental hazard causes new adaptations to the environment. The 1906 earthquake causes a series of fires. The disaster fuels motivation for damming the Hetch Hetchy Valley.		
1907	C.E.	43	The Irrigation Age begins as the Reclamation Service is separated from the U.S. Geological Survey. This is an example of a way of periodizing the early Bureau of Reclamation's early history of installing water controls.	Event	
1907	C.E.	43	The Japanese Ashio Riot occurs regarding the environmental and human health problems caused by the Ashio Copper Mine.	Event	
1907	C.E.	43	Frederic Clements adopts the term 'ecotone' to describe the transition zones among ecosystems.	Idea	
1907	C.E.	43	The decay of uranium is used to determine the age of rocks.	Event	
1907	C.E.	43	From 1850 to 1964 C.E., oil shales are discovered and mined in central Scotland causing spoil tips in the landscape because of the open mining practices.	Event	This date represents the core of the time range from 1850 to 1964 C.E.

Model T Interval: 42 to 24 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1908	C.E.	42	The first oscillating fan becomes a commodity. The proliferation of oscillating fans is another example of the widespread adoption of air conditioning technologies in the late-1800s.	Event	
1908	C.E.	42	Human ecology is termed after being used in a 1907 course by J. Paul Goode at the University of Chicago, entitled 'Plant, animal, and human ecology.'	Idea	
1908	C.E.	42	The Model T ushers in an era of automobile production with the internal combustion engine.	Event	
1909	C.E.	41	The word 'gene' becomes a widespread term to describe the ideas put forth by Gregor Mendel. Genes can be used represent minute forms of human-environment interaction and knowledges. As the twentieth century nears the end, genetics are able to be modified by humans to serve societal purposes. The term genetics is coined by William Bateson in 1905.	Idea	
1909	C.E.	41	The International Joint Commission (IJC) helps to mitigate water issues between Canada and the United States.	Event	
1909	C.E.	41	Theodore Roosevelt and Kermit Roosevelt convey the romanticism of the safari by traveling to British East Africa and	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			killing over 500 game animals.		
1909	C.E.	41	The International Opium Commission convenes in Shanghai to address the regulation and trade of drugs.	Event	
1909	C.E.	41	Robert Edwin reaches five miles south of the North Pole.	Event	
1909	C.E.	41	The Plastics Age begins when Bakelite is produced.	Event	
1910	C.E.	40	More than 12,000 square kilometers of forest is destroyed by a fire in the Northern Rockies.	Event	
1910	C.E.	40	The U.S. Bureau of Mines is formed to manage and consult projects relating to the mining of rock, ore, and minerals. The Bureau of Mines is implemented to sustain a certain set of standards for the human extraction of rock, ore, and minerals through mining.	Event	
1910	C.E.	40	The Eugenics Record Office opens in the United States. The Eugenics Record Office aims to build a database of family pedigrees and identify unfit citizens. The institution represents a way of using perceptions of the body and social Darwinism to further the eugenics movement and 'scientifically-supported' racism.	Event	
1910	C.E.	40	Glacier National Park is established by U.S. Congress. Glacier National Park is an	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			example of how political governance, territorialization, and conservation efforts intersect. In 1932, the park merges with Waterton Lakes National Park to become the Waterton-Glacier International Peace Park, the first of its kind. It is a key place for monitoring the effects of climate change on glacial landscapes.		
1910	C.E.	40	Sweden creates Europe's first national park.	Event	
1910	C.E.	40	In the *Principles of scientific management*, Frederick Winslow Taylor proposes the 'scientific management' of manufacturing.	Idea	
1910	C.E.	40	The third wave of the common Industrial Revolution occurs with the use of internal combustion engines, along with the production of heavy industries, such as metals, vehicles, rubber, and glass.	Event	This date represents the core of the time range from the beginning of the 1880s (1880 C.E.) to the end of the 1930s (1940 C.E.)
1910	C.E.	40	Frank Lloyd Wright develops the Prairie School of architectural thought, aimed at open and unified floor plans with low, horizontal structures.	Idea	This date represents the core of the time range from 1900 to 1919 C.E., rounded up to the nearest year.
1910	C.E.	40	The sleeping sickness spreads throughout East Africa due to the tsetse fly from 1900 to 1920 C.E.	Event	This date represents the core of the time range from 1900 to 1920 C.E.
1910	C.E.	40	The pneumonic plague devastates Manchuria. Manchuria is overcome by the pneumonic plague, which kills	Event	The earlier date, 1910 C.E., is used over the later date, 1911 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			60,000 citizens. The illness is an example of an environmental hazard.		
1911	C.E.	39	Canada establishes the world's first federal park agency, an idea which helps to change the nature of environmental governance in the twentieth century.	Idea	
1911	C.E.	39	Ellen Churchill Semple releases *Influences of the geographic environment: On the basis of Ratzel's system of Anthropo-Geography*, which stimulates environmental determinist thinking and debate in geography and elsewhere.	Idea	
1911	C.E.	39	The percentage of humans living in urban areas raises to 75 percent.	Event	
1911	C.E.	39	The North Pacific Seal Fur Convention becomes the first international meeting to regulate the stocks of marine organisms.	Idea	
1911	C.E.	39	American Game Protective Association is founded.	Event	
1911	C.E.	39	Petroleum is refined by thermal cracking, a method developed by W. Burton.	Event	
1912	C.E.	38	The U.S. Department of Agriculture, influenced by the U.S. Golf Association, embarks on research relating to the breeding of turf-grass.	Event	
1912	C.E.	38	Arthur Pigou, an economist, advocates for the government	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			taxation of industries that degrade the environment. Environmental pollution is viewed as having an external social cost. Pigou's ideas are articulated in *The economics of welfare* from 1920.		
1912	C.E.	38	Alfred Wegener proposes the theory of plate tectonics, which aids in understanding environmental hazards and other aspects of the human-environment relationship.	Idea	
1912	C.E.	38	Katmai erupts, causing one of the twentieth century's largest volcanic eruptions.	Event	
1913	C.E.	37	William Mulholland aids in the construction of an aqueduct to change the channel of the Owens River and provide water to Los Angeles, California.	Event	
1913	C.E.	37	Henry Ford produces the first moving assembly line at Highland Park factory near Detroit, which is a threshold moment for mass production.	Event	
1913	C.E.	37	The Haber-Bosch process pioneers the synthesis of inorganic fertilizers.	Event	
1913	C.E.	37	Max Laue develops the method to examine the shape and character of protein molecules through X-ray crystallography.	Event	
1913	C.E.	37	Niels Bohr develops the theory for an atom's structure, which aids in understanding the human-environment	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			relationship at the smallest levels.		
1913	C.E.	37	A major drought occurs in the Sahel in Africa.	Event	This date represents the core of the time range from 1910 to 1916 C.E.
1913	C.E.	37	The Australasian Antarctic Expedition (AAE) explores part of the Australian Antarctic Territory. This expedition is led by Sir Douglas Mawson. The group left behind a collection of huts which represent only one of six preserved settlement remains in the territory. This event represents the human exploration of the environment.	Event	This date represents the core of the time range from 1911 to 1914 C.E., rounded up to the nearest year.
1913	C.E.	37	On 6 December, Congress approves the motion to dam the Tuolumne River in the Hetch Hetchy Valley, which fuels enough opposition to influence environmental movements.	Event	
1914	C.E.	36	The Harrison Narcotics Tax Act limits the uses of cocaine. The implementation of the Harrison Narcotics Tax Act is an example of shifting attitudes toward human use of cocaine as an environmental resource and product of consumption.	Idea	
1914	C.E.	36	The Panama Canal, overseen by George Goethals, is constructed in Central America.	Event	
1914	C.E.	36	The last known passenger pigeon dies in the Cincinnati Zoological Garden.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1915	C.E.	35	George J. Miller creates the National Council for Geographic Education, which has helped to address the human-environment relationship in K-12 geography.	Event	
1915	C.E.	35	The Era of Protection reaches its core in wildlife conservation. This period refers to the range of time in which environmental protection becomes a norm in Western policy and governance.	Event	This date represents the core of the time range from 1900 to 1929 C.E.
1915	C.E.	35	Cornell's dean of agriculture, Liberty Hyde Bailey, advocates for biocentrism in *The holy Earth.*	Idea	
1915	C.E.	35	In *Cities and evolution*, Patrick Geddes proposes that urban planning is an extension of a place and therefore should account for the cultural and natural characteristics that make a place distinctive.	Idea	
1915	C.E.	35	Albert Einstein presents the General Theory of Relativity, which aids in understanding the human-environment relationship.	Idea	
1916	C.E.	34	The National Park Service is created through the National Park Service Act. The National Park Service has often served as the preservationist counterpart of the utilitarian Forest Service, though this relationship has been called into question by some, like	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmental historian Richard White.		
1916	C.E.	34	Frederic E. Clements publishes *Plant succession: An analysis of the development of vegetation*. Clementsianism is made possible through the publication of Plant Succession, along with Frederic E. Clements's other publications. In this book, Clements argues that formations of vegetation progress through a series of stages which culminate in a climax, or state of ecological equilibrium. This climax is an idealized way of modeling how the climate impacts the arrangement of vegetation. This way of looking at ecology begins to influence how humans and their environment relate to one another.	Idea	
1916	C.E.	34	Hawaii National Park is reserved by U.S. Congress, which later becomes Hawaii Volcanoes National Park and Haleakala National Park.	Event	
1916	C.E.	34	World War I gives rise to the Great Influenza Pandemic. World War I causes a pandemic of influenza that infects about one-fifth of the global population, an example of humans being affected by environmental and social conditions.	Event	This date represents the core of the time range from 1914 to 1918 C.E.
1916	C.E.	34	Zoning is implemented in New York City's land use planning as an	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			attempt to ensure human health and foster an ordered assemblage of economic development.		
1916	C.E.	34	Pollen analysis is first used by Lennart von Post in 1916 to reconstruct past climates.	Event	
1917	C.E.	33	The New Empire Theater is the first documented theater to be cooled by mechanized air conditioning. Air conditioning emerges in various buildings, such as theaters.	Event	
1917	C.E.	33	Denmark puts forth a wide-ranging conservation act. Denmark's conservation act represents one of the early attempts to institutionalize conservation practices in the political realm outside the United States.	Idea	
1917	C.E.	33	Present-day Thessaloniki (previously Salonika) experiences a massive fire. The destruction caused by the Thessaloniki fire completely levels the city of Salonika, which began around 316 B.C.E. Around 70,000 individuals are left without a home. This is an example of fire as an environmental hazard in urban communities.	Event	
1917	C.E.	33	Mt. McKinley National Park is created in Alaska in 1917 because	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			of environmentalist support.		
1918	C.E.	32	The U.S. Migratory Bird Treaty Act is passed by the U.S. The Migratory Bird Act allows for federal agencies like the Fish and Wildlife Service to regulate and enforce laws relating to human interaction with migratory birds.	Idea	
1918	C.E.	32	Spain becomes the fourth European nation to adopt a national park system.	Event	
1918	C.E.	32	Katmai National Monument is created in Alaska because of environmentalist support.	Event	
1918	C.E.	32	Canada ratifies the Migratory Bird Treaty.	Idea	
1918	C.E.	32	Three drainage canals (North New River, Hillsboro, and West Palm Beach) are installed to drain the Everglades.	Event	This date represents the core of the time range from 1906 to 1930 C.E.
1918	C.E.	32	The Spanish Influenza Epidemic occurs around the world, resulting in between 50-100 million deaths.	Event	The earlier date, 1918 C.E., is used over the later date, 1919 C.E.
1919	C.E.	31	Grand Canyon National Park is established in the United States. The Grand Canyon National Park has a profound significance and symbolism for tourism and conservation efforts. It is expanded in 1975 to include Marble Canyon National Monument and Grand Canyon National Monument, among other territories.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1919	C.E.	31	Japan digs its first geothermal wells to access energy.	Event	
1919	C.E.	31	National Parks and Conservation Association is founded.	Event	
1919	C.E.	31	Air masses, fronts, and cyclonic storms are theorized by Jacob Bjerknes.	Idea	
1919	C.E.	31	Ernest Rutherford conducts the first artificially-created nuclear reaction.	Event	
1920	C.E.	30	U.S. Congress passes the Federal Water Power Act to allow for hydroelectric projects outside of the federal government.	Idea	
1920	C.E.	30	War Communism is present in the Soviet Union from 1918 June to 1921 March C.E. War Communism occurs during the Russian Revolution and refers to the nationalization of industry, seizing private businesses, and a requisition of excess grain from peasants. This period is an example of how governance can shape attitudes toward the environment and human relationships toward the environment.	Event	This date represents the core of the time range from 1918 to 1921 C.E., rounded up to the nearest year.
1921	C.E.	29	Robert E. Park and Ernest W. Burgess begin to combine ideas from biological and human ecology.	Idea	
1921	C.E.	29	The Geysers, California becomes the first U.S. site to incorporate the digging of geothermal wells.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1921	C.E.	29	The Soviet Union endures a major drought. This drought is an environmental disaster which results in a quarter million to five million deaths in the regions of Ukraine and Volga.	Event	The earlier date, 1921 C.E., is used over the later date, 1922 C.E.
1922	C.E.	28	The Colorado River Compact is established. The legislation delegates water rights and usage based on the Colorado River basin's seven primary states. The compact is altered in 1948 to change the percentage of water allocated to each state (CO: 52%; UT: 23%; WY: 14%; NM: 11).	Idea	
1922	C.E.	28	Robert Flaherty's film, *Nanook of the North*, reaches theaters. Nanook of the North provides an idealized representation of 'Eskimo' life, an example of early films looking at the human-environment relationship. Flaherty also produces subsequent films on indigenous lifeways, like *Moana: A romance of the Golden Age* (1926) and *Tabu: A story of the South Seas* (1931).	Idea	
1922	C.E.	28	Lucien Febvre publishes *La terre et l'évolution humaine* which encapsulates the historian's ideas on the human-environment relationship, especially regarding the ways that phenomenon evolves over long durations in regional contexts.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1922	C.E.	28	The International Geographical Union (IGU) is established in Brussels. In 1996, it promotes studies in land use and cover change.	Event	
1922	C.E.	28	Brownfields, urban areas that have fallen out of use, begin to be remediated and repurposed in the United States.	Event	
1922	C.E.	28	The Izaak Walton League is founded.	Event	
1922	C.E.	28	Gran Paradiso, Italy's first national park, is created to preserve the alpine ibex.	Event	
1922	C.E.	28	The National Coast Anti-Pollution League forms to address the negative impacts that pollution from oil and hazardous waste have on tourism and the environment.	Event	
1922	C.E.	28	Harlan Barrows expresses the geographic connection to ecology in the American Association of Geographers Presidential Address, "Geography as human ecology."	Idea	
1923	C.E.	27	Frances Kate Hosali establishes the Society for the Protection of Animals in North Africa. Francis Kate Hosali begins SPANA after she and her daughter Nina Hosali witness the maltreatment of animals during their 1921 trip to Mostaganem, Algeria. This is an example of environmental activism and the promotion of	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			an ethic for human treatment of non-human lifeforms.		
1923	C.E.	27	The Reclamation Service is renamed to the Bureau of Reclamation. The Bureau of Reclamation has had a varied past in the U.S. federal government. This moment demonstrates the intensifying influence of the Bureau. Shortly thereafter, the Hoover Dam is authorized to be built.	Event	
1923	C.E.	27	Tokyo, Japan experiences 140,000 deaths by a massive earthquake.	Event	
1923	C.E.	27	The Alaska Railroad is completed, connecting the following areas: Seward, Whittier, Anchorage, Denali, and Fairbanks.	Event	
1923	C.E.	27	The Berkeley School of geography is established by Carl O. Sauer and contributes toward the understanding of cultural ecology, the humanized landscape, and human-environment interactions.	Idea	
1923	C.E.	27	Ernest W. Burgess develops the concentric zone model, an example of modelling urban land use.	Idea	
1924	C.E.	26	The U.S. Immigration Act imposes limitations for people considered to have inferior pedigrees. The Immigration Act is an example of politically	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			instituted eugenics and racialization.		
1924	C.E.	26	Geographer Ellsworth Huntington writes *Civilization and climate*, which holds that climate plays a major role in the development of human societies	Idea	
1924	C.E.	26	The Belgian-French Louise Eugénie Alexandrine Marie David becomes the first European woman to arrive in Lhasa, Tibet.	Event	
1924	C.E.	26	In June, the Gila Wilderness in Gila National Forest is deemed the first unofficial wilderness area in the United States.	Event	
1925	C.E.	25	Santa Barbara is affected by a large earthquake. This earthquake, along with the 1906 San Francisco earthquake and the 1933 Long Beach earthquake, calls attention to the problems relating to building architecture. This environmental hazard results in new adaptations to the environment.	Event	
1925	C.E.	25	Charlie Chaplin films *Gold Rush*. The film depicts the harshness of an Alaskan winter, a representation of humans interacting with extreme environments.	Idea	
1925	C.E.	25	Africa's first national park is created by Belgium's King Albert.	Event	
1925	C.E.	25	The factory ship becomes a way to	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			promote industrial fishing and whaling.		
1925	C.E.	25	Carl Sauer publishes the "Morphology of landscape," which helps to make the study of human and natural landscapes a fundamental component of geography.	Idea	
1925	C.E.	25	Virunga National Park, in the Democratic Republic of the Congo, becomes the first African national park.	Event	
1925	C.E.	25	From 1910 to 1940 C.E., Tuscany, Italy adopts Francesco de Larderel's method of geothermal energy to heat its industrial and residential edifices.	Event	This date represents the core of the time range from 1910 to 1940 C.E.
1925	C.E.	25	In the 1920s, Andrew Ellicott Douglass provides the first use of dendrochronology to date prehistoric indigenous cultures in the American Southwest. Dendrochronology has been a method to date certain aspects of the human-environment relation, an approach to build a scientific narrative of this interaction.	Event	This date represents the core of the 1920s.
1925	C.E.	25	On 18 March, the Tri-State tornado results in 689 deaths in Missouri, Illinois, and Indiana.	Event	
1925	C.E.	25	During the early-1900s C.E., fast food emerges. The concept of fast food takes old in Southern California and reflects the standardization and McDonaldization of the landscape.	Idea	This date represents the early-1900s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1925	C.E.	25	During the early-1900s C.E., the cod industry collapses due to overfishing. The collapse of the cod industry is an example of human interaction of the environment (in this case, supplying markets with fresh cod) and how that relationship might implode through overuse.	Event	This date represents the early-1900s C.E.

Agro-Industrial Interval: 24 to 11 B.P.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1926	C.E.	24	Henry Gleason publishes "The individualistic concept of the plant association." Gleason's article is an objection to the ideas of ecological succession advanced by Frederic E. Clements. It is one of the innumerable examples of how certain ways of thinking about the human-environment relationship are contested.	Idea	
1926	C.E.	24	Kruger National Park in South Africa is established to become a representation of conservation, as well as state-led white nationalism and the marginalization of non-white peoples.	Event	
1926	C.E.	24	A hurricane hits Florida, resulting in what would today be $70 billion in damage.	Event	
1926	C.E.	24	Compound fertilizers are produced, including nitrogen, phosphorus, and potassium.	Event	
1926	C.E.	24	The first liquid-fuel rocket is shot by Robert H. Goddard.	Event	
1926	C.E.	24	Television is developed by J.L. Baird.	Event	
1927	C.E.	23	The Dominican Republic's first nature preserve is established. The Dominican Republic sets aside this piece of land for the purposes of preserving the Yaque River watershed.	Event	
1927	C.E.	23	F.W. Murnau films *Sunrise*. *Sunrise* is a drama which depicts	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the transition from the rural area to the city and how the environment is represented.		
1927	C.E.	23	The Mississippi River floods, which calls for New Deal-era flood prevention programs.	Event	
1927	C.E.	23	The first polychlorinated biphenyls (PCBs) are synthesized.	Event	
1927	C.E.	23	In *Being and time*, Martin Heidegger argues that human consciousness is part of the world it perceives.	Idea	
1927	C.E.	23	Griffith Taylor presents a racialized view of environmental determinist ideals in *Environment and race*. It is regarded as an example of the negative and misconceived ways that environmental determinism has been used in understanding the human-environment relationship.	Idea	
1927	C.E.	23	Charles Lindbergh makes the flight from New York over the Atlantic to Paris.	Event	
1928	C.E.	22	Sir Alexander Fleming discovers penicillin. The discovery of penicillin becomes one way that humans limit the negative impacts of the bacteria in the environment that cause illness. Penicillin has been known to cause a range of side effects in the human body.	Event	
1928	C.E.	22	Thomas Midgley Jr. and others popularize the use of	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			chlorofluorocarbons (CFCs). Midgley develops CFCs as a contribution to General Motor's Frigidaire to develop a refrigerant that was safe for human use. CFCs are a way for humans to modify their environment to make it more habitable. They also show how capitalist practices can influence the environment in different ways, such as ozone depletion.		
1928	C.E.	22	The U.S. Army Corps of Engineers is authorized to augment control over the Mississippi River through building more infrastructure.	Event	
1928	C.E.	22	K. Klages, a German geographer, provides one of the earliest examples of agroecology research, labelling his work 'crop ecology', a way to understand the impacts of conventional agriculture on the environment, and vice versa. The term now refers to the ecology of the food system in its totality. Agroecology does not become a widely-used term and area of study until the 1970s.	Idea	
1928	C.E.	22	In *The new exploration*, Benton Mackaye advocates for leaving portions of urban areas undeveloped, especially along the ridge crests of watersheds to create	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			natural embankments against flooding.		
1928	C.E.	22	The U.S. Supreme Court declares that the Texas Railroad Commission is a suitable form of petroleum management.	Idea	
1928	C.E.	22	During the late-1920s C.E., an agricultural revolution occurs as industrial agriculture (later, genetic engineering) becomes more widespread.	Event	This date represents the late-1920s C.E., rounded up to the nearest year.
1928	C.E.	22	Gilbert Walker publishes his findings of the El Niño-Southern Oscillation events, which help explain the series of droughts occurring in India in the late 1800s.	Idea	This date represents the late-1920s C.E., rounded up to the nearest year.
1929	C.E.	21	Joseph Stalin imposes collective agricultural practices. Collective agriculture involves a coalition of farms or village participating in the production of food. The Soviet Union makes collective agriculture part of state control.	Event	
1929	C.E.	21	The Annales school of historical thought is helped through the establishment of *Annales: Histoire, Sciences Sociales*, which advances much of the Annales ideas on time and the human-environment relationship, including the idea that *genres de vie* occur over an extended period of time (*longue durée*), while wars, economic crises, and political	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			conflicts occur in short, intense intervals.		
1929	C.E.	21	Derwent Whittlesey introduces the concept of sequent occupance, a way of understanding how groups leave lasting impresses on the landscape.	Idea	
1929	C.E.	21	The first rocket with meteorological technology is launched by Robert Goddard.	Event	
1929	C.E.	21	Northwest China endures a severe drought from 1928 to 1930 C.E. The drought leads to a deadly famine of around three million mortalities.	Event	This date represents the core of the time range from 1928 to 1930 C.E.
1930	C.E.	20	Freon becomes sold by General Motors and DuPont. Freon is used for refrigerators. Freon releases chlorofluorocarbons which dissolve the ozone layer.	Event	
1930	C.E.	20	The Plant Patent Act is passed by U.S. Congress. The Plant Patent Act allows for the patenting of plants that can be asexually reproduced for commercial purposes. The legislation permits intellectual ownership over certain varieties of plant species in the environment.	Idea	
1930	C.E.	20	Du Pont invents synthetic rubber (neoprene).	Event	
1930	C.E.	20	The Netherlands' Aruba receives the first large desalting plant.	Event	
1930	C.E.	20	Acrylic plastics and polyvinyl chloride are introduced.	Event	
1931	C.E.	19	A massive flood affects communities along	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			China's Yellow River. The flood on China's second largest river shows how environmental hazards affect people. The event occurs during the period when dams become the key response to flood control.		
1931	C.E.	19	The Convention on the Regulation of Whaling convenes to address issues of whaling management.	Idea	
1932	C.E.	18	The Waterton-Glacier International Peace Park is created by U.S. and Canada.	Event	
1932	C.E.	18	Frank Lloyd Wright proposes the "Broadacre City" idea, which advocates for the decentralization of urban planning to create one-acre residential lots.	Idea	
1932	C.E.	18	The first synthetic herbicide is created in France.	Event	
1932	C.E.	18	Aldous Huxley publishes *Brave new world* which provides a pop-cultural, apocalyptic take on modernization.	Idea	
1932	C.E.	18	The splitting of an atom is demonstrated by J.D. Cockcroft and E.T.S. Walton.	Event	
1932	C.E.	18	Ukraine experiences mass starvations due to the requisition of grain by the Soviet Union. This period of Ukrainian starvation is an example of how environmental resources (i.e., food) become unevenly distributed by the	Event	The earlier date, 1932 C.E., is used over the later date, 1933 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Soviet Union. People living in the Soviet Union's more urbanized areas are prioritized over Ukrainians.		
1933	C.E.	17	Long Beach is affected by a devastating earthquake. This earthquake, along with the 1906 San Francisco earthquake and the 1925 Santa Barbara Earthquake, calls attention to the problems relating to building architecture.	Event	
1933	C.E.	17	The thirteenth Dalai Lama is buried in salt to ward off malevolent spirits, an example of religious use of environmental resources for symbolic rituals.	Event	
1933	C.E.	17	The Civilian Conservation Corps is created in 1933 to promote conservation efforts relating to the use and management of water and energy resources.	Event	
1933	C.E.	17	The Institute of British Geographers is founded, eventually merging with the Royal Geographical Society in 1995.	Event	
1933	C.E.	17	Italy receives its first Florence-to-Rome railroad.	Event	
1933	C.E.	17	Aldo Leopold publishes *Game management*, one of the first books on the subject of managing wildlife and habitats.	Idea	
1933	C.E.	17	Ukraine, Kuban, and North Caucasus suffer a drought. This drought is an	Event	This date represents the core of the time range from 1932 to 1934 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmental disaster which results in the deaths of 5-10 million people.		
1933	C.E.	17	On 18 May, the Tennessee Valley Authority (TVA) begins as a response to the Great Depression as a way to stimulate the Appalachian region. The organization builds dams and other structures for economic gain. The TVA builds 16 dams along the Tennessee River basin from 1933 to 1945. It also performs various types of integrated watershed management.	Event	
1933	C.E.	17	A significant wind takes the topsoil layer off of around 10,000 South Dakota farms on 11 November. This event connects to the agricultural and environmental conditions during the Dust Bowl.	Event	
1934	C.E.	16	The Taylor Grazing Act is passed in the United States. The Taylor Grazing Act helps to establish the U.S. Grazing Service, one of the two agencies that merged to create the Bureau of Land Management (BLM). The Taylor Grazing Act is a significant reflection on how to manage public grasslands and similar ecosystems.	Idea	
1934	C.E.	16	Robert Flaherty produces the film, *Man of Aran*. *Man of Aran* is an example of how	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			humans are affected by dangerous aspects of the environment. In this film, a tide rises, and fishermen confront a shark.		
1934	C.E.	16	The Migratory Bird Hunting and Conservation Stamp Act (Duck Stamp Act) is passed by the U.S. This piece of legislation allows the federal government to collect fees from hunters of waterbirds as a way to advance improvements of bird habitats.	Idea	
1934	C.E.	16	Lewis Mumford defines three periods of technology's history in *Technics and civilization*: eotechnics, paleotechnics, and neotechnics.	Idea	
1934	C.E.	16	Florida's Everglades National Park is created.	Event	
1934	C.E.	16	The Moroto Typhoon devastates Osaka, Japan.	Event	
1934	C.E.	16	From 1930 to 1937 C.E., the Dust Bowl drought occurs in the United States and Canada during the Great Depression. The Dust Bowl represents a combination of unsustainable agricultural practices and soil management mixed with a long-term drought which creates widespread famine and dust storms.	Event	This date represents the core of the time range from 1930 to 1937 C.E., rounded up to the nearest year. Multiple boundaries exist for the beginning and end of the Dust Bowl.
1934	C.E.	16	The construction of the Hoover Dam transpires from 1931 to 1936 C.E. The 'engineering ecstasy' that Donald	Event	This date represents the core of the time range from 1931 to 1936 C.E., rounded up to the nearest year.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Worster (1993) talks about during the twentieth century is appropriately demonstrated by the building of the Hoover Dam. The $49 million project uses engineering as a way to modify and control waterways.		
1934	C.E.	16	Argentina founds South America's oldest National Park Service. The National Park Service in Argentina is a prescriptive response by the country to ideas from the United States and elsewhere in the institutionalization of environmental preservation and management.	Event	
1934	C.E.	16	On 11 May, the first "Great Blow" of the Dust Bowl covers the sky in airborne sediment reaching all the way to Chicago and Washington, D.C.	Event	
1935	C.E.	15	Arthur Tansley introduces the term 'ecosystem'. Ecosystems are dominant ways for humans to analyze and understand environmental systems. Ecosystem becomes a term that is widely used in addressing the human-environment relationship.	Idea	
1935	C.E.	15	The U.S. Forest Service mandates the 10 a.m. policy. The 10 a.m. policy advocates that all wildfires be extinguished by 10 a.m. on the next day, an example of human	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			management of the environment.		
1935	C.E.	15	The Wilderness Society is created and has promoted environmental movements as well as the adoption of the 1964 Wilderness Act.	Event	
1935	C.E.	15	Wallace Carothers from Du Pont invents nylon.	Event	
1935	C.E.	15	Sudan creates its national park system.	Event	
1935	C.E.	15	U.S. Congress passes the Public Utility Holding Company Act. The legislation prevents utility companies from conducting unregulated activities using profits from regulated industry.	Idea	
1935	C.E.	15	Monsanto dominates the American market in the production of polychlorinated biphenyls (PCBs).	Event	
1935	C.E.	15	Paul Sears conveys concern over environmental degradation in the Dust Bowl-era *Deserts on the march*.	Idea	
1935	C.E.	15	The Soil Conservation and Domestic Allotment Act is passed by the U.S. to set up soil conservation districts within the country.	Idea	
1935	C.E.	15	The American Wildlife Institute (now the Wildlife Management Institute) is established.	Event	
1935	C.E.	15	Cost-benefit analysis (CBA) begins to be used in the United States as a way to assess flood control and water projects.	Idea	This date represents the core of the 1930s.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			CBA refers to an economic approach that makes sense of the feasibility of a particular project or policy. It becomes employed by the U.S. federal government as a way to justify the development of projects relating to flood control and other water-related forms of governance and management.		
1935	C.E.	15	Fire ants arrive in Mobile, Alabama in cargo ships from South America. Human-environment interaction comes in the form of transporting invasive species into different realms of the world. The introduction of fire ants has seen a broad increase in the numbers across the southeastern United States.	Event	This date represents the core of the 1930s.
1935	C.E.	15	The organic farming movement takes shape, primarily in the United Kingdom by figures such as Lady Eve Balfour.	Idea	This date represents the core of the 1930s.
1935	C.E.	15	In April, the Natural Resources Conservation Service (NRCS), originally the Soil Conservation Service before 1994, is formed in the U.S. Department of Agriculture.	Event	
1935	C.E.	15	On 14 April, a series of blizzards occurs across the United States, causing dust and soil to take over the skies. This event leads to the coining of the phrase 'Dust Bowl' which is	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			now a period which remains an integral component toward understanding the human-environment relationship through time in North America.		
1936	C.E.	14	The Sichuan Province of China experiences a drought. This drought causes around five million fatalities and the displacement of around 34 million people.	Event	
1936	C.E.	14	Sacha Guitry films *Roman d'un tricheur*. The film tells the story of a child whose family had been poisoned by hazardous mushrooms. It is an example of humans being negatively impacted by the environment.	Idea	
1936	C.E.	14	Okefenokee Swamp in Georgia becomes a wildlife refuge.	Event	
1936	C.E.	14	The U.S. passes the Rural Electrification Act to bring electricity to all parts of the country.	Idea	
1936	C.E.	14	The National Wildlife Federation is formed.	Event	
1936	C.E.	14	Mexico ratifies the Migratory Bird Treaty.	Idea	
1936	C.E.	14	Cost-benefit thinking is applied to the passage of the Flood Control Act of 1936.	Idea	
1937	C.E.	13	The Pittman-Robertson Act is established. The Pittman-Robertson Act provides U.S. funding for fish and wildlife projects, offering the financial capacity for conservation practices.	Idea	
1937	C.E.	13	The Hindenburg zeppelin explodes due to hydrogen gas's	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			combustible nature, which causes 35 deaths.		
1937	C.E.	13	The first modern, sanitary landfill is opened in Fresno, California.	Event	
1937	C.E.	13	Petroleum begins to be extracted from offshore oceanic areas.	Event	
1937	C.E.	13	Friedrich Bayer & Co. develops polyurethane.	Event	
1937	C.E.	13	A vaccination is produced for yellow fever.	Event	
1937	C.E.	13	Greenbelt, Maryland is built as part of Franklin D. Roosevelt's New Deal as a model for 'Garden Cities' in the U.S.	Idea	
1937	C.E.	13	Ducks Unlimited is founded.	Event	
1937	C.E.	13	The Wildlife Society is founded as a professional organization for wildlife management.	Event	
1937	C.E.	13	The Aid in Wildlife Restoration Act is passed by U.S. Congress.	Idea	
1938	C.E.	12	George Callender observes that the Earth's atmosphere has been getting warmer since the dawn of the Industrial Revolution. Callender's study is an early attempt to observe climatic change and attribute the phenomenon to human industrial activities.	Idea	
1938	C.E.	12	New England and Long Island suffer around 300 deaths due to a hurricane.	Event	
1938	C.E.	12	Lewis Mumford publishes *The culture of cities*, which models	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			urban development in six stages: eopolis, polis, metropolis, megalopolis, tyrannopolis, and nekropolis.		
1938	C.E.	12	London passes legislation to establish greenbelts within the city.	Idea	
1938	C.E.	12	After a period of agricultural problems, farmers in the United Kingdom transition to forms of mixed farming.	Event	

Nuclear Revolution: 1939 to 1945 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1939	C.E.	11	The U.S. Fish and Wildlife Service is established. The U.S. Fish and Wildlife Service (FWS) becomes another government entity to manage wildlife resources in the United States. It forms as a merger of the Bureau of Biological Survey and the Bureau of Fisheries. The FWS is given to the Department of Interior.	Event	
1939	C.E.	11	John Steinbeck publishes *The grapes of wrath*. *The grapes of wrath* is a fictional take on one of the most disastrous events in the history of the human-environment relationship: the Dust Bowl.	Idea	
1939	C.E.	11	Jean Renoir films *La regle du jeu*. *La regle du jeu* tells the story of a rabbit hunt among bourgeois people which turns into a game of killing an outsider within the group. It is an example of a dangerous and wild representation of nature and the hunt.	Idea	
1939	C.E.	11	John Ford films *Drums along the Mohawks*. Ford's films offer an aesthetic representation of nature in the American West.	Idea	
1939	C.E.	11	German Carl Troll introduces the term 'landscape ecology,' a field of study which influences geographers like Karl Butzer.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1939	C.E.	11	Nuclear power becomes possible through the successful implementation of uranium fission.	Event	
1939	C.E.	11	Frank Lloyd Wright introduces the concept of 'organic architecture' in the book, *An organic architecture*, as a perspective to design buildings that blend in with the landscape's natural setting.	Idea	
1939	C.E.	11	Richard Hartshorne argues for the importance of the region in synthesizing the human and non-human elements of the landscape in his book, *The nature of geography*.	Idea	
1939	C.E.	11	The International Association of Landscape Ecology is established.	Event	
1939	C.E.	11	Homer Hoyt proposes the sector model, an example of using conceptual models to understand urban land use.	Idea	
1939	C.E.	11	DDT is first synthesized by Paul Muller.	Event	
1939	C.E.	11	Polyethylene is invented.	Event	
1939	C.E.	11	The first helicopter is created by Igor Sikorsky.	Event	
1939	C.E.	11	The Work Projects Administration begins community gardening activities from 1935 to 1943 C.E. The Work Projects Administration occurs during the Great Depression and facilitates community gardening as a way to	Event	This date represents the core of the time range from 1935 to 1943 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			address the economic crisis during this period.		
1940	C.E.	10	Through a system of locks and dams, the upper Mississippi River gets channelized to allow for more transportation.	Event	
1940	C.E.	10	Griffith Taylor incorporates environmental determinism into his examination of Australia in *Australia: A study of warm environments and their effect on British settlement*.	Idea	
1940	C.E.	10	The Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere occurs.	Idea	
1940	C.E.	10	The first electron microscope is used.	Event	
1941	C.E.	9	Plutonium is discovered by Edwin McMillan and Glen T. Seaborg	Event	
1941	C.E.	9	The United States and Canada experience the widespread use of maximum sustained yield as a form of forestry management from 1937 to 1945 C.E.	Idea	This date represents the core of the time range from 1937 to 1945 C.E.
1942	C.E.	8	Walt Disney films *Bambi*. *Bambi* offers an empathetic representation of animals in film.	Idea	
1942	C.E.	8	Geographer Gilbert F. White advocates comprehensive forms of adaptation to environmental hazards in the doctoral dissertation, *Human adjustment to floods*, which is later published in 1945.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1942	C.E.	8	The V-2 rocket is launched.	Event	
1942	C.E.	8	Uranium's nuclear chain reaction is implemented by Enrico Fermi.	Event	
1943	C.E.	7	Alfred Hitchcock films *Lifeboat*. Hitchcock's *Lifeboat* is a World War II story of shipwreck survivors who are enduring a time out at sea on a lifeboat. It is an example of a film showing human tribulations in an extreme environment.	Idea	
1943	C.E.	7	Despite congressional opposition, President Franklin D. Roosevelt establishes Jackson Hole National Monument as a way to add onto the Grand Teton National Park via the Antiquities Act.	Event	
1943	C.E.	7	Emile Gagnan and Jacques Cousteau invent the self-contained underwater breathing apparatus (SCUBA).	Event	
1943	C.E.	7	DDT is applied to kill typhus-carrying lice in Naples, Italy.	Event	
1943	C.E.	7	The Alaskan Highway is completed, providing a land connection between the state and the lower 48 states.	Event	
1943	C.E.	7	The first plutonium plant is piloted in Oak Ridge, Tennessee.	Event	
1943	C.E.	7	A major drought occurs in the Sahel in Africa from 1941 to 1945 C.E.	Event	This date represents the core of the time range from 1941 to 1945 C.E.
1944	C.E.	6	Smokey Bear is created by the U.S. Forest Service. Smokey Bear is a cartoon character	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			that is involved in education about forest fires.		
1944	C.E.	6	The United States-New Mexico Water Treaty is agreed upon, which is the first environmental treaty between the two countries.	Idea	
1944	C.E.	6	The San Juan earthquake devastates Argentina on 16 January. The San Juan earthquake causes around 6,000 deaths around the city of San Juan. Buenos Aires citizens establish a fund to provide aid to the disaster victims. It is an example of human responses to environmental hazards.	Event	

Acceleration Duration: 1945 C.E. to Present

Spaceship Earth Scene: 1945 to 1970 C.E.

Hiroshima-Nagasaki Interval: 1945 to 1962 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1945	C.E.	5	The Food and Agriculture Organization (FAO) is founded. The FAO is an agency of the United Nations. The goal of this organization is to facilitate agronomic production around the world. The creation of this institution resembles the policy-oriented, economic, and ecological aspects of the human-environment relationship.	Event	
1945	C.E.	5	The demographic transition model is popularized by Frank Notestein. The demographic transition model is proposed in the 1920s but does gain notoriety until 1945 when Notestein expands upon the idea. It is a standardized way of examining the human-environment relationship from the perspective of population change over time among groups.	Idea	
1945	C.E.	5	Grand Rapids, Michigan becomes the first U.S. place to control its city's levels of fluoride. Fluoride is commonly found in drinking water. Fluoridation helps to prevent tooth decay.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			This event is an example of how humans control aspects of their environment to suit human health.		
1945	C.E.	5	Geographer Ellsworth Huntington writes *Mainsprings of civilization*, which argues that civilization develops based on genetic lineage, geographic context, and cultural attributes.	Idea	
1945	C.E.	5	The mass tourism industry commences.	Event	
1945	C.E.	5	In *Phenomenology of perception*, Maurice Merleau-Ponty introduces the idea of the body-subject.	Idea	
1945	C.E.	5	Chauncy Harris and Edward Ullman propose a multiple nuclei model of urban land use.	Idea	
1945	C.E.	5	In "The Horizon of geography," Derwent Whittlesey examines how technology and adaptation have expanded the spatial consciousness of humans throughout history and pre-history.	Idea	
1945	C.E.	5	The first atomic bomb detonates in Alamogordo, New Mexico as a part of the Manhattan Project stationed in Los Alamos, New Mexico.	Event	
1945	C.E.	5	Siberian tigers are believed to have been hunted to extinction or near-extinction as the Japanese occupy Korea between 1910 and 1945 C.E.	Event	
1945	C.E.	5	Small farmers in Honduras are displaced as Salvadorans make	Event	This date represents the core of the 1940s.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			way for the country's cotton boom during the 1940s.		
1945	C.E.	5	The first nuclear weapon is successfully detonated on 16 July.	Event	
1945	C.E.	5	President Harry S. Truman authorizes dropping the 'Little Boy' atomic bomb on Hiroshima on 6 August. On 9 August, the 'Fat Man' detonates in Nagasaki.	Event	
1945	C.E.	5	On 24 October, the United Nations, a key institution in promoting policy and thinking about the human-environment relationship, is established.	Event	
1945	C.E.	5	The end of World War II ushers in a period of industrial agriculture. The period after World War II experiences an increase in the industrialization of agriculture, especially with regard to the development of technologies for breeding, fertilizers, machines for cultivation, and irrigation infrastructure.	Event	
1945	C.E.	5	Antisystemic social movements emerge in the political and social realms to resist the forces of production in a certain historical period.	Idea	
1945	C.E.	5	The Great Acceleration begins as human activities ramp up and cause large-scale impacts on the Earth system.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1945	C.E.	5	The Soviet Union launches its nuclear program as World War II concludes. The Soviet Union starts to develop its capacity for nuclear power and weaponry. Nuclear energy is one form of human-environment interaction that has transformed the global environment after World War II. Two underground test sites include Novaya Zemlya Island (Arctic Circle) and Semipalatinsk, Kazakhstan.	Event	
1946	C.E.	4	The Atomic Energy Act is passed in the United States. The Atomic Energy Act helps establish the Atomic Energy Commission. Nuclear technology has been a prime influence in human manipulation of and impact on the environment. The commission is later disassembled and taken over by the Nuclear Regulatory Commission in 1976.	Idea	
1946	C.E.	4	The U.S. Bureau of Land Management (BLM) is created. The BLM is instrumental for promoting environmental policies and management for the United States. Two agencies merge to create the BLM: the General Land Office and the Grazing Service.	Event	
1946	C.E.	4	The U.S. Centers for Disease Control is founded. The CDC has	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			been an instrumental organization for tracking the nature and spread of health-related problems for Americans. Health serves as one way to approach the human-environment relationship. The CDC institutionalizes that interaction.		
1946	C.E.	4	The International Convention on the Regulation of Whaling convenes in Washington. This convention results in a multilateral environmental agreement (MEA) about what humans should do in response to a particular environmental problem.	Idea	
1946	C.E.	4	The International Whaling Commission is formed to address problems of whaling management and production.	Event	
1946	C.E.	4	A tsunami from Aleutian Islands off the Alaskan coast results in 170 deaths in Maui, which results in the adoption of the Pacific Tsunami Warning in 1949.	Event	
1946	C.E.	4	The Food and Agriculture Organization (FAO) initiates the Forestry and Forest Products Division.	Event	
1946	C.E.	4	A ship carrying ammonium nitrate, a product of the chemical industry, explodes and results in around 500 deaths.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1946	C.E.	4	The first automated computer is developed.	Event	
1946	C.E.	4	Xerography is invented by Chester Carlton.	Event	
1946	C.E.	4	After being established in 1944, the World Bank begins its initiative to help rebuild the global infrastructure after World War II. This occurs on 25 June.	Event	
1946	C.E.	4	The great Ukrainian famine occurs under Stalin's rule.	Event	The earlier date, 1946 C.E., is used over the later date, 1947 C.E.
1947	C.E.	3	The General Agreement on Tariffs and Trade (GATT) forms. The goal of GATT is to foster trade among nations around the world. This political alliance is criticized for its prioritization of large corporations over 'fair trade' policies. Stemming from the Bretton Woods Conference of 1944, GATT is a manifestation of the economic and political forces involved in the human-environment relationship.	Idea	
1947	C.E.	3	The United Nations Educational, Scientific, and Cultural Organization (UNESCO) forms, which has been an important agency for the creation of national parks.	Event	
1947	C.E.	3	Numerous minks on U.S. ranches are diagnosed with transmissible mink encephalopathy (TME).	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1947	C.E.	3	Water resource conflicts ensue after India is divided into Pakistan and India.	Event	
1947	C.E.	3	John K. Wright's "*Terrae incognitae*: The place of imagination in geography" is published detailing his ideas of terrae incognitae (totally unexplored territories) in the geographic imagination.	Idea	
1947	C.E.	3	Kenya establishes the Amboseli National Park.	Event	
1947	C.E.	3	The first offshore platform to extract hydrocarbons is installed off the Gulf Coast of Louisiana.	Event	
1947	C.E.	3	Radiocarbon dating is developed by W.F. Libby.	Event	
1947	C.E.	3	Henri Lefebvre begins publishing the three-volume *Critique of everyday life* to uphold the Marxist idea of alienation as a social, economic, political, and ideological issue. The volumes are published individually in 1947, 1961, and 1981 C.E.	Idea	
1948	C.E.	2	Paul Herman Muller receives the Nobel Prize for his discovery of dichlorodiphenyl-trichloroethane (DDT) as an insecticide. The discovery of DDT causes a threshold moment in the use of chemical insecticides to make the environment more habitable to humans.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1948	C.E.	2	The Era of Game Management reaches its core in wildlife conservation. It represents the incorporation of hunting and fishing as types of interactions in certain parks and reserves.	Event	This date represents the core of the time range from 1930 to 1965 C.E.
1948	C.E.	2	William Vogt publishes *Road to survival*. In *Road to survival*, Vogt introduces the well-known equation for carrying capacity: carrying capacity is the ratio of biotic potential to environmental limits (C = B: E). This equation gives a theoretical approach to thinking about carrying capacity and the human-environment relationship at a global, new-Malthusian level.	Idea	
1948	C.E.	2	The Federal Water Pollution Control Act (FWPCA) is passed by U.S. Congress. The FWPCA is the predecessor to the Clean Water Act of 1972. It primarily focuses on sanitation and sewage treatment, with no stipulations on the quality of water.	Idea	
1948	C.E.	2	The International Union for the Conservation of Nature and Natural Resources (IUCN), also the World Conservation Union, is founded. The IUCN, also called the World Conservation Union, comprises of scientists and species enthusiasts which advances the idea of threatened and	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			endangered non-human species and environments.		
1948	C.E.	2	The Atomic Bomb Casualty Commission is established to follow up on the bombing of Hiroshima on 6 August 1945, in attempt to understand the effects of the nuclear bomb on human health	Event	
1948	C.E.	2	The World Health Organization (WHO) is founded to provide research, funding, and training to address global health issues, such as epidemics in developing countries.	Event	
1948	C.E.	2	The Universal Declaration on Human Rights is developed by the United Nations.	Idea	
1948	C.E.	2	The Central and Southern Florida Project for Flood Control (C&SF Project) is passed to further institutionalize management and drainage of the Everglades.	Event	
1948	C.E.	2	Edward Tolman introduces 'mental maps' as a way of describing how animals, human and non-human, orient themselves in their world. The term is expanded upon in the work of geographers like Peter Gould after 1966.	Idea	
1948	C.E.	2	The Organization for Economic Cooperation and Development (OECD) forms (originally the Organization for European Economic	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Cooperation) to coordinate policies relating to the economy and the environment, among other financial issues.		
1948	C.E.	2	The transistor is produced by Bell Laboratories.	Event	
1949	C.E.	1	Aldo Leopold publishes *A Sand County almanac*. Aldo Leopold's *A Sand County almanac* is a significant resource for human-environment thinking. More specifically, it introduces the 'land ethic,' a way of communing with the environment in a more responsible manner. Another idea is 'thinking like a mountain,' emphasizing the need for longer-term perspectives in environmental management.	Idea	
1949	C.E.	1	Roberto Rossellini films *Stromboli, terra di Dio*. *Stromboli, terra di Dio* tells the story of a woman who wants to leave her hostile island home but feels stuck and ultimately is caught by a volcanic eruption after trying to escape her abusive spouse.	Idea	
1949	C.E.	1	Andrew Clark publishes *The invasion of New Zealand by people, plants, and animals*, which illustrates how colonization results in environmental transformations.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1949	C.E.	1	André Aubréville first uses the term 'desertification' to describe how the Sahara Desert expands into savanna grasslands. Since then, desertification has become a problem of human-environment interaction.	Idea	
1949	C.E.	1	The British pass the National Parks and Access to the Countryside Act.	Idea	
1949	C.E.	1	Fernand Braudel writes *La Méditerranée et le monde méditerranéen à l'époque de Philippe II*, giving a long-duration, Annales-based account of the human ecology of the Mediterranean region.	Idea	
1949	C.E.	1	George Orwell publishes *1984* which provides a pop-cultural, apocalyptic take on modernization.	Idea	
1950	C.E.	0	Dr. M. King Hubbert creates a model that estimates the global amount of oil reserves and determines the peak in which oil production meets a decline as resources diminish.	Idea	
1950	C.E.	0	Oil and gas take up 55 percent of the U.S. energy.	Event	
1950	C.E.	0	Venezuela becomes the leading world exporter of oil. This event reflects the political and economic influences over fossil fuel resources in the human-environment relationship.	Event	This date represents the core of the time range from 1929 to 1970 C.E., rounded up to the nearest year.
1950	C.E.	0	A wave of industrialization	Event	This date represents the core of the time range from the

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			happens with the mass production of petrochemicals and automobiles from the 1930s to the 1970s C.E.		beginning of the 1930s to the end of the 1970s C.E.
1950	C.E.	0	The Uranium Age occurs.	Event	
1950	C.E.	0	W.S. Robinson takes note of the ecological fallacy in "Ecological correlations and the behavior of individuals," published in *American Sociological Review*. The ecological fallacy describes the misguided inference that an individual is most likely going to represent the aggregate characteristics of the population or geographical context.	Idea	
1950	C.E.	0	The Livestock Revolution represents a soaring increase in the industrial production of livestock, which is instigated by the United States.	Event	
1950	C.E.	0	The Green Revolution begins. The Green Revolution reflects the widespread adoption of industrial agriculture in developing countries. This period includes the use of high-yielding variety seeds (HYVs), irrigation, and chemical fertilizers. The diffusion of these technologies is meant to help the poorest in the countries, but ultimately provide more benefits to the relatively well-off folks. The period becomes a time when environmental impact	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			statements (EIS) are widely used to report on a project's environmental impacts. The most transformative portion of this period occurs between 1966 and 1972.		
1951	C.E.	-1	The U.S.-based Nature Conservancy is formed.	Event	
1951	C.E.	-1	Ludwig von Bertalanffy coins the idea of general system(s) theory to address the biological aspects of open systems and to bridge divides among the silos of scientific subdisciplines.	Idea	
1951	C.E.	-1	The World Meteorological Organization replaces the International Meteorological Organization, which had been in effect since 1873.	Event	
1951	C.E.	-1	Idaho receives the first nuclear electric plant.	Event	
1951	C.E.	-1	The Canadian Association of Geographers holds its first meeting in May.	Event	
1952	C.E.	-2	Scientists Robert Briggs and Thomas King produce the first clones of frogs. The cloning of frogs and other animals (i.e., mice beginning in the 1980s) is an example of human modification of the environment through the replication of an organism.	Event	
1952	C.E.	-2	London undergoes an episode of smog that turns deadly, resulting in over 12,000 deaths	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			from a series of primary and secondary pollutants.		
1952	C.E.	-2	Resources for the Future (RFF) becomes the first think tank to focus on environmental issues and natural resource problems	Event	
1952	C.E.	-2	W.D. Billings comes up with the idea of the holocoenotic environment, in which an array of environmental influences, human and non-human, living and non-living, can affect a life form, such as a plant.	Idea	
1952	C.E.	-2	The first hydrogen bomb is detonated.	Event	
1952	C.E.	-2	Bikini Atoll becomes a testing site for U.S. nuclear bombs from 1946 to 1958 C.E. Nuclear testing at Bikini Atoll is an example of how nuclear arms have transformed environments. Around twenty-three nuclear bombs are detonated during this period. This place-based example connects to the broader context of human-induced nuclearization of the environment.	Event	This date represents the core of the time range from 1946 to 1958 C.E.
1953	C.E.	-3	Mount Everest is successfully ascended for the first time. Exploration, being one expression of the human-environment relationship, is embodied in the summit of Mount Everest by mountaineers Tenzing	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Norgay and Edmund Hillary.		
1953	C.E.	-3	Eugene P. Odum publishes *Fundamentals of ecology*. Odum's *Fundamentals of ecology* provides a postwar definition of carrying capacity, a state of equilibrium for a particular environment. Other definitions for carrying capacity are present. Carrying capacity has four primary definitions. First, it refers to the amount of people and items that can be transported on ships, steamboats, animals, and trains. Second, it represents the capacity of a landscape to accommodate for livestock and wildlife. Third, carrying capacity, defined by Eugene P. Odum, can be seen as a theoretical deduction in which an environment has reached an ultimate state of equilibrium. Fourth, carrying capacity can represent the Neomalthusian idea that the global environment has limits to what it can accommodate. Overall, carrying capacity creates a parameterization for just how much humans can utilize an aspect of their environment before it goes beyond its limits.	Idea	
1953	C.E.	-3	Francis Crick and James Watson discover	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the double helix structure of deoxyribonucleic acid (DNA). The double helix helps to establish a connection between genetics and physics. This solution to understanding the structure of DNA helps to understand the human-environment relationship at its most fundamental components.		
1953	C.E.	-3	New York City undergoes an episode of smog that turns deadly.	Event	
1953	C.E.	-3	The Netherlands performs the Delta Project, a form of land reclamation occurring after a major series of storms destroyed the country's dikes and flooded the previously protected areas.	Idea	
1953	C.E.	-3	South Korea adopts hydroelectric power.	Event	
1953	C.E.	-3	Fred Schaefer's "Exceptionalism in geography: A methodological examination" critiques Richard Hartshorne's idiographic regional geography and instead advocates for the nomothetic search for theories of geographic phenomena.	Idea	
1953	C.E.	-3	Dwight D. Eisenhower proposes to the United Nations the idea of using nuclear energy for peaceful means.	Idea	
1953	C.E.	-3	On 31 January, the Netherlands endures the 'Battle of the Floods', which inundates much of the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			country and causes 1,800 deaths.		
1954	C.E.	-4	A coup instigates the exile of the president of Guatemala. This coup is facilitated by the U.S. Central Intelligence Agency (CIA) and the State Department. The event is encouraged by United Fruit Co. as a way to quell protests about peasant rights in working within banana republics. Particularly, President Arbenz desires to redistribute latent banana holdings to the poor. That does not happen, due to the economic and political power of United Fruit.	Event	
1954	C.E.	-4	Los Angeles, California undergoes an episode of smog that turns deadly.	Event	
1954	C.E.	-4	The Geneva Agreements lead to the creation of a "natural" political border between North and South Vietnam, using the Bei-Hai River.	Idea	
1954	C.E.	-4	The British Fairtry is the world's first factory-freezer trawler.	Event	
1954	C.E.	-4	The International Convention for Prevention of Pollution of the Sea by Oil convenes.	Idea	
1954	C.E.	-4	The first photoelectric cell is developed by Bell Laboratories	Event	
1955	C.E.	-5	The Air Pollution Control Act is passed in the United States. The Air Pollution Control Act is the first piece of legislation of its kind in the U.S. It	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			helps fund investigations into the nature of air pollution.		
1955	C.E.	-5	Mao Zedong brings collective agriculture under state control. The goal of collective agriculture for the People's Republic of China is to allow for more time to expand the country's industry and capital within the communist economy.	Event	
1955	C.E.	-5	Julian Steward introduces 'cultural ecology' as a phrase. Cultural ecology is an important realm of study for the human-environment relationship. It has ties to anthropology and geography and tries to understand how cultures interact with the environment, with a focus on adaptation.	Idea	
1955	C.E.	-5	John Ford films *The searchers.* Ford's films offer an aesthetic representation of nature in the American West.	Idea	
1955	C.E.	-5	Luis Bunuel films *La mort en ce jardin.* Buenel's *La mort en ce jardin* depicts bourgeois characters trying to find their way through a jungle. The harshness of the jungle represents nature as wild in reaction to human civilization.	Idea	
1955	C.E.	-5	Ukrainians, more than half-a-million, are moved to the Kazakh and Altay steppe to grow grain.	Event	
1955	C.E.	-5	Through a series of events (i.e., Abercrombie's 1944	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Greater London Plan; the Town and Country Planning Act of 1947), Britain makes greenbelts a requirement for urban planning.		
1955	C.E.	-5	Finland transitions from agrarian to industrial during the 1950s C.E. Finland represents a European country that does not transition to an industrial country until later in the twentieth century, an alternative geographic context for the human-environment relationship.	Event	This date represents the core of the 1950s.
1955	C.E.	-5	During the 1950s C.E., African colonial leaders declare wildfires as a 'necessary evil' for range management. The declaration of fire as a 'necessary evil' represents a transition in perceptions of fire management from suppression to controlled burns.	Idea	This date represents the core of the 1950s.
1955	C.E.	-5	During the 1950s C.E., the problem of heavy metals on human health is revealed through human exposure to mercury, which causes the neurological Minamata disease.	Idea	This date represents the core of the 1950s.
1955	C.E.	-5	Viruses can be crystallized to help create vaccines during the 1950s C.E.	Event	This date represents the core of the 1950s.
1955	C.E.	-5	During the 1950s C.E., the proliferation of electronics begins in Route 128 in Massachusetts and	Event	This date represents the core of the 1950s.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Silicon Valley in California.		
1955	C.E.	-5	The United States road network expands at a remarkable pace during the 1950s C.E. This activity leads to publications like the 2003 *Road ecology: Science and solutions.*	Event	This date represents the core of the 1950s.
1955	C.E.	-5	Islands in the Caribbean transition from an economy based heavily in agriculture toward one centered on tourism, manufacturing, and services. This transition among the Caribbean Islands creates a large-scale transformation in how these islandscapes are perceived and used.	Event	This date represents the middle of the 1950s C.E.
1956	C.E.	-6	Glen Canyon Dam is constructed in Arizona as the United States' second highest concrete-arch dam, an example of human engineering and manipulation of waterways.	Event	
1956	C.E.	-6	The first commercial fission reactor is produced. The first commercial fission reactor helps to harness nuclear energy for human purposes.	Event	
1956	C.E.	-6	The Fish and Wildlife Act is passed by U.S. Congress. The Fish and Wildlife Act gives the Fish and Wildlife Service more power to set aside places as refuges. It is a political prescription to protect non-human life from destructive human activities.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1956	C.E.	-6	London undergoes an episode of smog that turns deadly, similar to the event in 1952.	Event	
1956	C.E.	-6	Nepal adopts the Ancient Monuments Protection Act which advocates for political forms of environmentalism.	Idea	
1956	C.E.	-6	The United Kingdom passes the first Clean Air Act as a political way to control the rate of atmospheric pollution.	Idea	
1956	C.E.	-6	Pierre Teilhard de Chardin introduces the concept of the noösphere, which refers to the abstract sphere of the human mind.	Idea	
1956	C.E.	-6	*Man's role in changing the face of the Earth* is published following a symposium (what Sauer and others called the "Marsh Festival") on human-environment interactions at Princeton University.	Idea	
1957	C.E.	-7	The Mekong Committee addresses how to manage the Mekong River across international borders.	Event	
1957	C.E.	-7	Karl A. Wittfogel writes *Oriental despotism: A comparative study of total power* which highlights his idea of 'hydraulic civilization', in which totalitarian societies center their political influence on water access.	Idea	
1957	C.E.	-7	The National Academy of Science proposes that burying nuclear	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			waste has environmental benefits.		
1957	C.E.	-7	On 29 July, the International Atomic Energy Agency (IAEA) forms in the United Nations, partly due to Dwight D. Eisenhower's "Atoms for Peace" speech on 8 December 1953.	Event	
1957	C.E.	-7	On 4 October, the Soviet satellite Sputnik is launched into space, the first of its kind.	Event	
1958	C.E.	-8	The U.S. Food, Drug, and Cosmetic Act is passed, which prevents the approval of chemical additives to food, pharmaceuticals, and cosmetics that may induce cancer in humans and animals. Humans create laws like this piece of legislation to regulate corporate and organizational behavior towards the environment and society.	Idea	
1958	C.E.	-8	The United States passes the Delaney Amendment to the Federal Food, Drugs, and Cosmetics Act. The Delany Amendment bans the use of carcinogenic food additives through the use of zero tolerance. Monsanto and others work to repeal the amendment successfully in 1997.	Idea	
1958	C.E.	-8	Presented to researchers by indigenous peoples, Madagascar's rosy periwinkle is found to be a valuable medicine for Hodgkin's disease	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			and childhood leukemia.		
1958	C.E.	-8	New Zealand installs its first geothermal power plant.	Event	
1958	C.E.	-8	On 29 July, the National Aeronautics and Space Administration (NASA) is established by Dwight D. Eisenhower.	Event	
1958	C.E.	-8	In March, Charles Keeling begins measuring carbon dioxide levels in Mauna Loa, Hawaii. Keeling's measurements spearhead the efforts to measure atmospheric carbon dioxide over time. The results show a substantial increase in the gas as the world accelerates technologically. The readings bring up the key question of how humans have changed the climate through history.	Event	
1958	C.E.	-8	Oil is found on Alaska's North Slope near the Kenai Peninsula and the Cook Inlet.	Event	This date represents the late-1950s C.E., rounded up to the nearest year.
1959	C.E.	-9	Ecuador's first national park is established in the Galapagos Islands. Ecuador's creation of a national park is an example of environmental governance through political acts of territorialization and land management. It becomes a UNESCO World Heritage Site in 1978.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1959	C.E.	-9	François Truffaut films *Les 400 coups*. *Les 400 coups* depicts nature as an outlet of escapism by telling the story of a college student who leaves university to venture to the Normandy beach.	Idea	
1959	C.E.	-9	Garrett Hardin publishes *Nature and man's fate*. Hardin's book connects to the idea that disease, famine, and societal chaos will ensue if population continues to grow beyond the carrying capacity of the environment.	Idea	
1959	C.E.	-9	Mary Leakey discovers the 1.75-million-year-old *Australopithecus boisei* fossil.	Event	
1959	C.E.	-9	Shippingport, Pennsylvania becomes the first place with a civilian nuclear power plant.	Event	
1959	C.E.	-9	The Netherlands finds extensive reserves of petroleum creating an oil boom, an over-dependence on natural resources (as opposed to manufacturing), and the so-called "Dutch Disease" or an economic downturn.	Idea	
1959	C.E.	-9	The Nile River Treaty is a transboundary river agreement between Egypt and Sudan.	Idea	
1959	C.E.	-9	Mexico installs its first geothermal power plant.	Event	
1959	C.E.	-9	The Charles Darwin Foundation for the Galápagos Islands begins efforts to preserve endangered species and is imitated	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			by the Seychelles Islands Foundation in 1979.		
1959	C.E.	-9	Walter Rostow formulates modernization theory, which is detailed in the 1960 book *The stages of economic growth: A non-Communist manifesto.*	Idea	
1960	C.E.	-10	Jane Goodall embarks on her 45-year study of social behaviors of chimpanzees. Jane Goodall's study of chimpanzees at the Gombe Stream Chimpanzee Reserve helps to understand non-human complex social behaviors. Goodall's work aids in the understanding of human evolutions and their relationship to their close primate relatives. In 1964, Goodall notices that chimps can use man-made objects and make plans. In 1966, she finds that chimps could contract AIDS. In the 1970s, she experiences chimps engaged in expressing wonder, participating in wars and cannibalism, and moving among social contexts.	Event	
1960	C.E.	-10	Hybrid corn replaces nonhybrid corn. Hybrid corn is an example of how agricultural industrialization changes the genetics and biology of cash crops. Hybrid corn is created from the breeding of two types of corn, thanks to the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			developments made by agronomic science. Hybrid corn begins to be produced in the early 1900s but becomes a product of cultural diffusion by the second half of the twentieth century.		
1960	C.E.	-10	The Arctic National Wildlife Refuge (ANWR) is created, largely due to motivations by scientists and conservationists. This oil-rich area is also rich in ecological significance, which is why there are moves to preserve it during this period.	Event	
1960	C.E.	-10	Michelangelo Antonioni films *L'avventura*. Antonioni's *L'avventura* is an early film that questions the dehumanization of urbanization and industry.	Idea	
1960	C.E.	-10	The U.S. passes the Multiple-Use and Sustained-Yield Act (MUSY) for the Forest Service. The MUSY builds a five-part framework for the duties of the U.S. Forest Service: management of recreation, range, timber, watersheds, and fish and wildlife. It outlines in political legislative form the types of human-environment interaction for the agency.	Idea	
1960	C.E.	-10	Nepal establishes the Aquatic Protection Act.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1960	C.E.	-10	A tsunami kills 61 Hawaiians and 160 Japanese.	Event	
1960	C.E.	-10	The California State Water Project increases the state's capacity for water storage and transport.	Event	
1960	C.E.	-10	The United States installs its first geothermal power plant.	Event	
1960	C.E.	-10	The largest earthquake on record (9.6 magnitude) occurs in Chile.	Event	
1960	C.E.	-10	In *Image of the city*, Kevin Lynch proposes five ways or organizing knowledge about the urban environment: landmarks, nodes, paths, districts, and edges.	Idea	
1960	C.E.	-10	Walter Rostow writes *The stages of economic growth: A Capitalist manifesto* which fuels ideas about development and human-environment interactions. This book is a response to the economic boom of the time and the Cold War, an idea which has given way to ecological modernization or ecological rationality.	Idea	
1960	C.E.	-10	In "The Problem of social cost", Coase argues that bargaining and incentivizing businesses will make them more likely to adopt sustainable environmental practices.	Idea	
1960	C.E.	-10	The *Trieste* is operated by Jacques Piccard and	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			descends to the Mariana Trench.		
1960	C.E.	-10	Mao Zedong's "Great Leap Forward" campaign takes shape from 1958 to 1961 C.E. The "Great Leap Forward" is Communist China's failed attempt at increasing the steel industry, a mechanized and economic vision of human-environment interaction.	Event	This date represents the core of the time range from 1958 to 1961 C.E., rounded up to the nearest year.
1960	C.E.	-10	From 1958 to 1962 C.E., the Chinese famine, one of the most severe famines in modern times, leads to around 25 million deaths.	Event	This date represents the core of the time range from 1958 to 1962 C.E.
1960	C.E.	-10	The first meteorological satellite, Tiros-1, is launched into Earth's orbit on 1 April.	Event	
1960	C.E.	-10	On 21 May, Southern Chile a massive 'Ring of Fire' earthquake.	Event	
1960	C.E.	-10	On 10-14 September, the Baghdad Conference conceives of the Organization of the Petroleum Exporting Countries (OPEC).	Idea	
1961	C.E.	-11	H.A. Paulsen Jr. and F.N. Ares, like other scholars, find that a steady-state capacity for grazing does not exist in the natural world. The idea from Paulsen and Ares contradicts the work that Eugene P. Odum advances in the early 1950s. Focusing on the American Southwest, the two scholars find that	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			sustained capacities for grazing is a myth.		
1961	C.E.	-11	Western Europe assembles the Union for Protection of New Varieties (UPOV). The UPOV provides protection for newly produced varieties of plant species. The goal is to establish a multinational framework for the protection of plant patents. The United States joins in 1981.	Event	
1961	C.E.	-11	Gilbert F. White expands upon his idea of "range of choice" in "The choice of use in resource management," published in *Natural Resources Journal*. The 'range of choice' perspective is developed by White to describe the spectrum of decision-making that can make human use of an environment either more or less likely to create major landscape transformations or hazards.	Event	
1961	C.E.	-11	Hawaii implements the first State Land Use Law, providing zoning state-wide according to conservation, urban, rural, and agricultural.	Idea	
1961	C.E.	-11	The World Wildlife Fund (WWF) begins in Switzerland to aid in conservation efforts. It transforms into the world's largest private organization dedicated toward conservation.	Event	
1961	C.E.	-11	The 'El Tor' cholera strain becomes a pandemic beginning in Celebes, Indonesia.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1961	C.E.	-11	Jean Gottmann shows the development of megacities and their impacts on transforming territories and human-environment interactions in *Megalopolis: The urbanized northeastern seaboard of the United States*.	Idea	
1961	C.E.	-11	The Antarctic Treaty of 1961 is signed and put into effect to suspend territorial claims of Antarctica.	Idea	
1961	C.E.	-11	Jane Jacobs influences urban planning with four conditions for city diversity in *The death and life of great American cities*.	Idea	
1961	C.E.	-11	A Hoechst, Badische Ailin- und Soda-Fabrik (BASF) ammonia synthesis plant explodes in Oppau, Germany, resulting in around 600 deaths.	Event	
1961	C.E.	-11	*The day the Earth caught fire* is a movie featuring the global warming of the planet due to nuclear testing.	Idea	
1961	C.E.	-11	The silicon chip is invented by Texas Instruments.	Event	
1961	C.E.	-11	Yuri Gagarin and Alan Shepard conduct the first manned space flight in the Freedom 7 on 5 May.	Event	

Silent Spring Transition: 1962 to 1970 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1962	C.E.	-12	Cesar Chavez and Dolores Huerta establish the United Farm Workers by combining the National Farm Workers Association and the Agricultural Workers Organization. Chavez has been a key figure for migrant labor and civil rights of Latinos and Chicanos. The United Farm Workers addresses issues relating to farm workers and migrant labor. Chavez's work and that of others help to spawn the environmental justice movement.	Event	
1962	C.E.	-12	Rachel Carson publishes *Silent spring*. Almost a decade and a half after Paul Herman discovers DDT, Carson publishes *Silent spring*, which describes the environmental and health hazards brought about by the use of chemical insecticides. The book marks the beginning of the environmental movement and a surge in environmental education.	Idea	
1962	C.E.	-12	Murray Bookchin publishes *Our synthetic environment*. Bookchin's *Our synthetic environment* is a critique of industrial capitalism and its impacts on the environment.	Idea	
1962	C.E.	-12	Arthur Lamothe films *Bûcherons de la manouane*. Lamothe	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			creates a film that shows the human-environment relationship from the perspective of Quebec loggers.		
1962	C.E.	-12	General Motors and Standard Oil sells the Ethyl Corporation, previously a provider of the company's leaded gasoline.	Event	
1962	C.E.	-12	The Cuban Missile Crisis sparks fears of nuclear war between the United States and the Soviet Union.	Event	
1962	C.E.	-12	James Parsons blends the man-land tradition of Carl Sauer with the problems of species overexploitation in *The green turtle and man*.	Idea	
1962	C.E.	-12	Thomas Kuhn argues that scientists operate under a certain ontological paradigm in their approach to researching about the world. These ideas are communicated in *The structure of scientific revolutions*.	Idea	
1962	C.E.	-12	The testing of nuclear weapons from 1945 to 1962 C.E. causes a 'bomb effect', in which radionuclides are released into the atmosphere in large quantities, causing a change in 14C, or 'bomb carbon', concentrations.	Idea	
1962	C.E.	-12	John H. Glen, Jr. makes the first American orbit of the Earth on February 20.	Event	
1963	C.E.	-13	Since the 1920s, Mercury has polluted the Hyakken Harbor and the Minamata	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			River by the Chisso factory (opened in 1907) in Japan. This event is an example of biomagnification, in which the high levels of mercury pollution in a nearby river of a Japanese factory leads to the poisoning of humans and other biota.		
1963	C.E.	-13	The first Clean Air Act is passed in the U.S. This Clean Air Act creates a national initiative to consider the environmental impacts of human-caused air pollution.	Idea	
1963	C.E.	-13	The Limited Test Ban Treaty is signed by the United States, Soviet Union, and the United Kingdom. The Limited Test Ban Treaty forbids nuclear testing underwater, in the atmosphere, and in outer space. The document reflects the influence that the early promoters of the environmental movement, like Barry Commoner, have had on environmental legislation.	Idea	
1963	C.E.	-13	The Red List of Threatened Species is developed by the International Union for the Conservation of Nature and Natural Resources (IUCN). The Red List is the IUCN's approach toward calling attention to the increasing numbers of endangered species due to human transformation of the environment.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1963	C.E.	-13	Pierre Perrault and Michel Brault film *Pour la suite du monde.* Perrault and Brault depict an empathetic relation to the environment by telling the story of islanders on Isle-aux-Coudres who try to revitalize traditional fishing practices by capturing a whale, which is ultimately sent to a New York aquarium.	Idea	
1963	C.E.	-13	The nation that would become Singapore earns its image as a 'garden city' through an intensive tree-planting campaign. Singapore is an example of a highly urban area (it becomes a country two years later) that incorporates tree-planting and botanical gardens into its city planning, a nod to the ideas proposed by Ebenezer Howard in 1898.	Event	
1963	C.E.	-13	Members from Germany, France, Luxembourg, the Netherlands, and Switzerland sign the International Convention for the Protection of the Rhine against Pollution (ICPR).	Idea	
1963	C.E.	-13	Arthur Robinson produces the compromise projection to create a pleasing map reading experience.	Idea	
1963	C.E.	-13	Ed Lorenz contributes toward understanding chaos and Earth systems by proposing	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the butterfly effect. The butterfly effect holds that the outcomes of systems are dependent on their initial conditions. Deriving from chaos theory, the butterfly effect helps humans to make sense of the chaotic nature of environmental systems.		
1963	C.E.	-13	The Agung volcano erupts in Bali, Indonesia.	Event	
1964	C.E.	-14	The U.S. Wilderness Act is passed, establishing the National Wilderness Preservation System. This legislation is an important contribution to American ecological thought and impacts land management policies and practices in the eastern half of the United States.	Idea	
1964	C.E.	-14	Michelangelo Antonioni films *Red desert*. Antonioni's *Red desert* is a film that interrogates the dehumanization of urbanization and industry.	Idea	
1964	C.E.	-14	Kuwait passes legislation to regulate oil pollution in its water bodies.	Idea	
1964	C.E.	-14	Nepal passes the Plant Protection Act.	Idea	
1964	C.E.	-14	Anchorage, Alaska experiences a massive 'Ring of Fire' earthquake.	Event	
1964	C.E.	-14	The U.S. Surgeon General declares that smoking tobacco is carcinogenic.	Idea	
1964	C.E.	-14	Wilfred Thesiger publishes *The marsh*	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Arabs, which details his account of the lifeways for the Marsh Arabs of the Tigris River Delta before the marsh is drained and the group disbands in the 1970s.		
1964	C.E.	-14	The Land and Conservation Fund is developed to provide financial support for large recreation projects in the United States.	Event	
1964	C.E.	-14	The Land and Water Conservation Act is passed in the United States on 3 September. The Land and Water Conservation Act provides funds for public parks and recreational areas. More connection to the human-environment relationship is needed.	Idea	
1965	C.E.	-15	Ester Boserup publishes *The conditions of agricultural growth: The economics of agrarian change under population pressure*. Boserup develops a theory which holds that population pressure is the precondition for the creation of innovations for agricultural production, a position that contradicts the ideas of Thomas Robert Malthus.	Idea	
1965	C.E.	-15	The Akosombo Dam is constructed. The Akosombo Dam is an example of how dams can proliferate the spread of infectious diseases. The reservoir for the Akosombo Dam is linked to a sharp	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			increase in urinary schistosomiasis among folks living in Ghana.		
1965	C.E.	-15	U.S. Congress passes the Motor Vehicle Air Pollution Control Act to regulate vehicle emissions.	Idea	
1965	C.E.	-15	U.S. Congress passes the Solid Waste Disposal Act to enforce regulations on solid waste disposal.	Idea	
1965	C.E.	-15	Abel Wolman performs the first study of urban metabolism, a framework for understanding the flows and uses of natural resources in urban areas.	Idea	
1965	C.E.	-15	The German-Luxembourg National Park is created and eventually confronts the negative effects of unregulated rock climbing on fern populations in the area.	Event	
1965	C.E.	-15	The United States Agency for International Development (USAID) is established to implement population policies and programs in developing countries.	Event	
1965	C.E.	-15	Roger Revelle helps to publish the White House report, *Restoring the quality of our environment*.	Idea	
1965	C.E.	-15	Radical environmental theory begins to influence environmental activism from the 1950s to the 1970s C.E. Radical environmental theorists are influenced by the ideas of the Frankfurt	Idea	This date represents the core of the time range from the beginning of the 1950s (1950 C.E.) to the end of the 1970s (1980 C.E.).

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			School, Murray Bookchin, and Marxism in promoting activism in response to the technological, political, economic, and social domination over the environment. These acts of dissent put radical environmental thought into effect.		
1965	C.E.	-15	During the 1960s, Svante Oden introduces the concern about acid rain and acidification. Acid rain happens largely because of industrial processes and fossil fuel burning. These human activities emit sulfur dioxide and nitrogen oxides into the atmosphere which form acidic compounds when interacting with oxygen, water, and other components of the atmosphere. Oden's discovery brings to light the human impacts that have occurred since the Industrial Revolution. Fish stocks are declining in the Scandinavian region and precipitation is shown to become more acidic.	Idea	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, the environmental justice movement develops alongside the Civil Rights Movement. The environmental justice movement takes a human-environment spin on the Civil Rights movement, confronting issues of human rights	Idea	This date represents the core of the 1960s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			and environmental degradation.		
1965	C.E.	-15	During the 1960s, ape-language projects are begun to understand human-ape communication. These projects are an example of interspecies communications, a phenomenon which has been present throughout human history with the environment. Another example is the use of commands in the domestication of dogs.	Event	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, range management and forestry witness a paradigm shift from fire suppression to controlled burning. Ecological research reveals the benefits of controlled burning in the United States. It represents a transition in fire-based human-environment interaction at the governmental level.	Idea	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, environmental history begins to develop as a discipline which addresses the human-environment relationship through time.	Idea	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, Honduras clears large swaths of forest to allow for pastures to support its burgeoning livestock market.	Event	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, the Soviet Union produces krill fishing fleets to meet global demands for shrimp.	Event	This date represents the core of the 1960s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1965	C.E.	-15	During the 1960s, Hawaii sees a surge in tourism due to the proliferation of airplanes.	Event	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, the diversion of riverways for agriculture by the Soviet Union causes a significant diminishing of the Aral Sea's volume. It also results in the creeping environmental problem of desertification in the surrounding basin.	Event	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, abstraction, or removal of water, from the Aral Sea increases the salinity and lowers its level.	Event	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, Howard Odum proposes systems ecology in which all social and environmental systems can be explained in terms of available energy.	Idea	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, new Left activism encourages the practices of green politics and activism in Europe.	Idea	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, Canadian Roger Tomlinson, the 'father of geographic information systems', produces the first automated spatial information system.	Event	This date represents the core of the 1960s C.E.
1965	C.E.	-15	During the 1960s, Sir Peter Scott begins to develop a series of Red Data books to call attention to the species that are impacted the most by human	Idea	This date represents the core of the 1960s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			intervention. These books are supported by the International Union for Conservation of Nature (IUCN).		
1965	C.E.	-15	During the 1960s, Donald Janelle discusses the idea of time-space convergence in which transportation innovations shrink the time it takes to travel over space. These ideas are produced in "Spatial reorganization: A model and concept", among other works.	Idea	This date represents the core of the 1960s C.E.
1965	C.E.	-15	On 11 April, the 'Palm Sunday' outbreak of tornadoes results in the largest Midwestern outbreaks (more than five tornadoes) on record for the twentieth century	Event	
1965	C.E.	-15	In November, amidst the crisis of the blackout in the northeastern U.S., the country creates the North American Reliability Council.	Event	
1965	C.E.	-15	The Nam Pong and Nam Pung dams are built along the Mekong River in Thailand.	Event	The earlier date, 1965 C.E., is used over the later date, 1966 C.E.
1965	C.E.	-15	UNESCO declares the decade from 1965 to 1974 to be the International Hydrological Decade. This declaration calls attention to the importance of water management and treatment.	Idea	
1965	C.E.	-15	The United Farm Workers begins a five-year Great Grape Boycott. The Great Grape Boycott helps to	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			raise awareness about the problematic working conditions and poverty associated with the production of table grapes.		
1965	C.E.	-15	Climate modeling is introduced as a way to understand how climates change in the past to predict future climates. Climate modeling is a tool used by climatologists and other scientists in part to determine how humans have affected the Earth's climate in the past and how that knowledge can be applied to anthropogenic effects in the future. Early models are simpler compared to present-day models. Zero-dimensional models (radiative equilibrium) are first employed during this time. By the early 1970s, two-dimensional models begin to be developed.	Event	This date represents the middle of the 1960s C.E.
1965	C.E.	-15	The pollution of Lake Baikal by Bakailsk Paper Works triggers the Russian environmentalist movement. Lake Baikal is the world's oldest, largest, and deepest freshwater lake.	Event	This date represents the middle of the 1960s C.E.
1966	C.E.	-16	The Endangered Species Preservation Act is passed by U.S. Congress. This act focuses on the human initiatives to preserve the whooping crane and charismatic bird species. The Secretary of the Interior is	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			empowered to curate a list of endangered wildlife and fish, as well as to purchase land for species protection.		
1966	C.E.	-16	The National Wildlife Refuge System Administration Act is established by U.S. Congress. The legislation delineates various management strategies and standards for wildlife refuges, such as allowing certain forms of hunting, fishing, and recreation, provided that they do not negatively impact the ecosystem.	Idea	
1966	C.E.	-16	E.F. Schumacher co-founds the Intermediate Technology Development Group to address nature-society issues.	Event	
1966	C.E.	-16	In 1966, Barbara Ward and Kenneth Boulding adopt Spaceship Earth to echo the fact that humans are dependent on Earth's closed system.	Idea	
1966	C.E.	-16	The International Covenant on Economic, Social and Cultural Rights is adopted by the United Nations.	Idea	
1966	C.E.	-16	The International Covenant on Civil and Political Rights is adopted by the United Nations.	Idea	
1966	C.E.	-16	The International Law Association establishes *The Helsinki Rules on the Uses of the Waters of International Rivers* to ensure equitable use	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			of water bodies among political entities.		
1966	C.E.	-16	On 22 July, the 'Ato do Iguaçu' (Iguaçu Act) is passed by Paraguay and Brazil. The act exists to recognize the ability for both countries to benefit from the Itiapu Dam on the Parana River. The negotiation incorporates political conflict/cooperation and human transformation of the environment.	Idea	
1967	C.E.	-17	Lynn White Jr. publishes "The Historical Roots of Our Ecologic Crisis" in the journal *Science*. White makes the case that technology and religion have been the main forces in driving the anthropocentric capacity for environmental degradation.	Idea	
1967	C.E.	-17	The Air Quality Act is passed in the United States. The Air Quality Act, similar to the Clean Air Act of 1970, permits greater enforcement of air pollution regulations as well as funding for the expansion of research on the subject.	Idea	
1967	C.E.	-17	Roderick Nash publishes *Wilderness and the American mind*. Nash's *Wilderness and the American mind* is based on his dissertation which suitably aligns with the Wilderness Act of 1964. Nash outlines how the idea of	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			wilderness infiltrates the historical image of the American West.		
1967	C.E.	-17	Ian McHarg writes *Design with nature*. McHarg's *Design with nature* is a significant work on ecodesign. The book proposes ways to create human settlements that work with environment, not against it.	Idea	
1967	C.E.	-17	The Dominican Republic passes Law 206. Law 206 aligns with Cold War policies of human-environment interaction by declaring forests to be under the property and management of the government. During this year, a dozen loggers are killed during a raid by military personnel at an informal logging camp.	Idea	
1967	C.E.	-17	Robert MacArthur and Edward O. Wilson propose island biogeography theory based on their studies of islands in the Caribbean. Island biogeography theory is the idea that an island's size and distance determine the equilibrium population of life. The island theory influences conservation practices as well as the single large or several small reserves (SLOSS) Debate. The SLOSS Debate combines spatial scale with ecological processes to decide if a large swath of reserved land works better or worse than the	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			same amount of land divided into smaller plots.		
1967	C.E.	-17	Oil begins to be successfully extracted in Ecuador's Amazon basin. The discovery and extraction of petroleum is an example of commodifying the environment and transforming it in the process.	Event	
1967	C.E.	-17	Clarence Glacken publishes *Traces on the Rhodian shore: Nature and culture in Western thought from ancient times to the end of the eighteenth century*. Glacken's *Traces on the Rhodian shore* helps to establish the historiographical basis for the human-environment relationship. It is a treatise that finds three pervading themes in the field of study: the environment as divinely created, the environment's effects on humans, and human abilities to transform the environment.	Idea	
1967	C.E.	-17	Sweden passes its Environmental Code and establishes an Environmental Protection Agency (EPA).	Idea	
1967	C.E.	-17	Tensions over water scarcity give rise to the Arab-Israeli War.	Event	
1967	C.E.	-17	Jean Piaget proposes four stages of progression for spatial cognition development in children: 1) sensorimotor stage, 2) preoperational stage, 3)	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			concrete operations, and 4) formal operations.		
1967	C.E.	-17	Environmental Defense Fund is established.	Event	
1967	C.E.	-17	DNA is first synthesized by Stanford biochemists.	Event	
1967	C.E.	-17	Agent Orange' is sprayed by the U.S. Air Force during the Vietnam War from 1962 to 1971 C.E. 'Agent Orange' refers to a form of herbicidal warfare, in which herbicide (Agent Orange) is sprayed by the U.S. Army in South Vietnam. The spraying ends induces long-term health problems, including Hodgkin's lymphoma and leukemia, for those exposed to the chemical. Ultimately, the intentional degradation of the environment for strategic purposes becomes a health hazard to populations.	Event	This date represents the core of the time range from 1962 to 1971 C.E., rounding up to the nearest year.
1967	C.E.	-17	In March, the *Torrey Canyon* spill near the United Kingdom becomes the first significant oil spill to gain worldwide concern.	Event	
1968	C.E.	-18	PCB is a chemical discovered in Japan's rice paddies. Reports of more than 17,000 instances of PCB infection call attention to the chemical's impact on rice paddies in Japan. It is a testament to the problems caused by introducing chemicals into an environment.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1968	C.E.	-18	Roy Rappaport publishes *Pigs for the ancestors: Ritual in the ecology of a New Guinea people*. Rappaport's book involves a cultural materialist approach to human ecology. According to cultural materialism, cultural phenomena can be examined through the material relations between humans and the environment. Rappaport studies the Maring culture of Papua New Guinea and finds that belief systems and rituals help keep humans in harmony with their environment. These findings face severe criticisms regarding the conflation between cultural practices, environmental influence, and the relative isolation of the culture communities that Rappaport studies.	Idea	
1968	C.E.	-18	The Biosphere Conference is coordinated by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). The Biosphere Conference is the first of its kind to address issues relating to both intergovernmental conservation and resource-use. It helps to establish the Man and the Biosphere Program in 1971, which sets aside sites	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			around the world of ecological significance.		
1968	C.E.	-18	Paul Ehrlich publishes *The population bomb*. Ehrlich's *The population bomb* becomes a hugely popular resource and catchphrase critiquing the enormous impact that human overpopulation has had on the global environment.	Idea	
1968	C.E.	-18	Paul Ehrlich and colleagues establish the Zero Population Growth Group. The Zero Population Growth group advocates for methods of population control in order for humans to live within the Earth's environmental limits.	Event	
1968	C.E.	-18	Garrett Hardin publishes the "Tragedy of the commons". The "Tragedy of the commons" holds that population change increases resource use, which impacts the carrying capacity of the surrounding area that is within the common or public domain.	Idea	
1968	C.E.	-18	Japan authorizes the Basic Law for Environmental Pollution Control.	Idea	
1968	C.E.	-18	Edward Abbey publishes *Desert solitaire*, an important example of modern nature writing	Idea	
1968	C.E.	-18	Gilbert F. White helps to establish the National Flood Insurance Program.	Event	
1968	C.E.	-18	The social revolution occurring in Paris,	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			France fosters the creation of European green movements and activism.		
1968	C.E.	-18	The impurities caused by the pollution of polychlorinated biphenyls (PCBs) trigger the Yusho outbreak in Kyushu, Japan, caused by rice oil contaminated by PCB.	Event	
1968	C.E.	-18	Jack Westoby coins the term 'social forestry' as a community-based form of forest practices in "Changing objectives of forest management," delivered at the Eight World Forestry Congress in Jakarta, Indonesia.	Idea	
1968	C.E.	-18	In April, the Club of Rome begins. The Club of Rome is a think tank that incorporates diverse perspectives from around the world. The group includes a coalition of scientists, politicians, and other figures to address key problems occurring in society, such as economic, political, social, and environmental issues.	Event	
1968	C.E.	-18	On December 21, the Apollo 8 mission orbits the moon for the first time.	Event	
1968	C.E.	-18	On 2 October, the National Wild and Scenic Rivers Act is passed in the United States. The act allows the federal government to respond to and manage a selection of	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			rivers at risk of degradation.		
1969	C.E.	-19	California experiences the first oil spill in United States history. National attention is directed to America's first oil spill, which results in more than 200,000 gallons of oil.	Event	
1969	C.E.	-19	International Fund for Animal Welfare is established, which provides the economic capability to protect animals, preserve ecosystems, rescue animals, and advocate for animal rights. As of 2018, this organization is comprised of offices in 15 countries and has projects in over 40 countries.	Event	
1969	C.E.	-19	The International Association against Painful Experiments on Animals is established, which focuses primarily on ethics relating to the use of animals in experiments, tests, vivisections, and procedures.	Event	
1969	C.E.	-19	The Bhutan Forest Act is passed, with the National Forest Policy proceeding it five years later. This act is a political prescription for forest management in Bhutan.	Idea	
1969	C.E.	-19	James Lovelock and Lynn Margulis propose the Gaia hypothesis. The Gaia hypothesis imagines the biosphere as self-regulating system and works as a single organism.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1969	C.E.	-19	The Endangered Species Conservation Act is passed by U.S. Congress. The Endangered Species Conservation Act builds upon the Endangered Species Preservation Act of 1966 by endowing the Secretary of Interior to consider foreign endangered species and enforcing the illegal importation of products by endangered species.	Idea	
1969	C.E.	-19	‘Fire stick farming’ is coined by Rhys Jones. Fire stick farming' is a description of Aboriginal burning practices in Australia, a country which never adopts policy of fire suppression.	Idea	
1969	C.E.	-19	Robert T. Paine introduces the ecological term, 'keystone species'.	Idea	
1969	C.E.	-19	The California oil spill results in the widespread diffusion of concern for the environmental problems caused by oil dependence and other hazardous human impacts.	Event	
1969	C.E.	-19	Students and faculty at the Massachusetts Institute of Technology (MIT) form the Union of Concerned Scientists.	Event	
1969	C.E.	-19	The Environmental Impact Assessment is introduced as a tool for environmental management through the U.S. National Environmental Policy Act of 1970.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1969	C.E.	-19	Sir Walter William Herbert becomes the first to reach the North Pole.	Event	
1969	C.E.	-19	Friends of the Earth is established as an international grassroots network dedicated to environmental issues.	Event	
1969	C.E.	-19	Charles A. Reich's *The greening of America* and Theodore Roszak's *The making of a counter culture* influences youth-led revolutionary tactics toward confronting systemic, technocratic problems plaguing the contemporary human-environment relationship.	Idea	
1969	C.E.	-19	The International Convention on Civil Liability for Oil Pollution Damage occurs.	Idea	
1969	C.E.	-19	The International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties gathers.	Idea	
1969	C.E.	-19	The U.N. Population Fund (also: Fund for Population Activities) collects funding to implement family planning programs in developing countries.	Event	
1969	C.E.	-19	The Scientific Committee on Problems of the Environment is established by the International Council for Science.	Event	
1969	C.E.	-19	The Cuyahoga River and boats/infrastructure along it are set afire on three major occasions (1936, 1952, 1969	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			C.E.) due to the high concentrations of industrial waste. The Cuyahoga River is an example of how the industrialization of human-environment interaction causes harmful consequences. The 1969 fire inspires public outcries for improving the quality of the Cuyahoga water and calls attention to other disasters of human-induced water pollution.		
1969	C.E.	-19	The Apollo 11 successfully lands on the moon on 20 July.	Event	

Green Governance Scene: 1970 to 1975 C.E.

Earth Day Interval: 1970 to 1973 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1970	C.E.	-20	One of the largest lobbying organizations for environmentalism, the League of Conservation Voters, is established. David Brower, who was the first executive director of the Sierra Club, helped to create the League of Conservation Voters as a way to insert environmental concerns into the political realm.	Event	
1970	C.E.	-20	West Germany begins an Emergency Program for Environmental Protection. The initiative is an example of how environmental thought diffused among geopolitical realms during the 1970s. There are three principles for this program: the prevention principle, the polluter-pays principle, and the cooperation principle.	Idea	
1970	C.E.	-20	The Clean Air Act is passed in the U.S. The legislation is a response to the prevalence of human-caused pollution of the environment calling for regulations on airborne contaminants. It proposes greater enforcement of air quality and pollution management. The document also creates a series of requirements for	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			emissions from vehicles. The act is amended in 1990 to implement acid rain control programs.		
1970	C.E.	-20	East Pakistan experiences the deadliest tropical cyclone, resulting in over 500,000 deaths. The 'Bhola Cyclone' is an example of environmental hazards in East Pakistan.	Event	
1970	C.E.	-20	Beaver Defenders is established. Beaver Defenders is one of the variety of organizations dedicated toward the protection of one species of animal from human intervention, exploitation, and maltreatment. This organization has given rise to others, including Beavers: Wetland and Wildlife (BWW).	Event	
1970	C.E.	-20	The Controlled Substances Act adds restrictions to the use of certain drugs. The Controlled Substances Act makes cocaine and other drugs illegal to purchase, sell, or have. This piece of legislation reflects changing environmental attitudes toward substances like cocaine.	Idea	
1970	C.E.	-20	Lake Erie is proclaimed ‘dead’ by scientists. Lake Erie is deemed uninhabitable for human and non-human species because of hazardous waste materials.	Event	
1970	C.E.	-20	The European Union establishes its first regulations on vehicle	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			emissions. The EU's directive is indicative of the regulatory state of environmental governance, or environmentality.		
1970	C.E.	-20	François Truffaut films *L'Enfant sauvage*. The film illustrates the idea of wildness in the human-environment relationship. In the film, a boy who has lived most of his life outside of civilization is introduced back into society.	Idea	
1970	C.E.	-20	A tropical cyclone hits the delta of the Ganges River, killing around half a million people in Bangladesh. This tropical cyclone results in one million deaths, an example of environmental hazards.	Event	
1970	C.E.	-20	The Plant Variety Protection Act (PVPA) is passed by U.S. Congress. The PVPA grants intellectual property rights for seed plants that are novel and reproduce sexually, an expansion of the Plant Patent Act of 1930.	Idea	
1970	C.E.	-20	Kudzu is declared a weed.	Event	
1970	C.E.	-20	The Natural Resources Defense Council (NRDC) is established by the Ford Foundation to address issues of environmental protection.	Event	
1970	C.E.	-20	The Netherlands passes the Surface Water Act.	Idea	
1970	C.E.	-20	Peru experiences a massive 'Ring of Fire' earthquake.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1970	C.E.	-20	The California Environmental Quality Act (CEQA) is the state's response to the National Environmental Policy Act to promote transparency for human management of natural resources.	Idea	
1970	C.E.	-20	California passes its California Endangered Species Act for a state-level response to species preservation.	Idea	
1970	C.E.	-20	The European antinuclear movement takes shape in resistance to the environmental and societal problems of nuclear warfare.	Idea	
1970	C.E.	-20	In *Our ecological crisis*, the National Geographic Society states its stance on the impending environmental problems and promotes conservation.	Idea	
1970	C.E.	-20	Waldo Tobler introduces the first law of geography: everything is related to everything else, but near things are more related than distant things.	Idea	
1970	C.E.	-20	Environmental Action is established.	Event	
1970	C.E.	-20	IPAT is proposed by Ehrlich and Holdren.	Idea	
1970	C.E.	-20	The Nuclear Non-Proliferation Treaty (NPT) emerges.	Idea	
1970	C.E.	-20	The Rocky Flats Plant is operated by the Atomic Energy Commission (AEC) and Dow Chemical in the production of nuclear resources for	Event	This date represents the core of the time range from 1952 to 1988 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			weapons manufacturing. It is the site of radioactive material leaks and major destructive fires from 1952 to 1988 C.E.		
1970	C.E.	-20	The environmental movement promotes environmental ethics, greening of society, and 'regulatory state'. President Lyndon Johnson and notable politicians transform the state into an entity of environmental regulation.	Idea	This date represents the core of the time range from the 1960s to the 1970s C.E.
1970	C.E.	-20	Mali endures a severe drought from 1968 to 1972 C.E.	Event	This date represents the core of the time range from 1968 to 1972 C.E.
1970	C.E.	-20	Lubbock, Texas endures $530 million worth of damage from a tornado outbreak on 11 May.	Event	
1970	C.E.	-20	The National Oceanic and Atmospheric Administration (NOAA) is founded on 3 October. NOAA is developed to foster knowledge about marine systems and resources.	Event	
1970	C.E.	-20	Six thousand elephants out of twenty-three thousand starve to death during a drought at Tsavo National Park. The event triggers thinking about human-environment systems and park management.	Event	The earlier date, 1970 C.E., is used over the later date, 1971 C.E.
1970	C.E.	-20	On 22 April, the first Earth Day is held. Earth Day represents the idea of an annual event which calls for increased awareness of environmental issues. It is inspired by	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Wisconsin Senator Gaylord Nelson.		
1970	C.E.	-20	On 2 December, the U.S. Environmental Protection Agency (EPA) is established by Richard Nixon. The EPA involves the recognition that human impacts on the environment need to be regulated in appropriate ways.	Event	
1970	C.E.	-20	On 1 January, Richard Nixon passes the National Environmental Policy Act (NEPA). Viewed as the 'Magna Carta' of environmental policy, the National Environmental Policy Act is an important piece of legislation which advocates a greater harmony between humans and the environment through such implementations as the environmental impact statement (EIS) and assessment (EIA).	Idea	
1971	C.E.	-21	The Aswan High Dam is officially dedicated to control floods on the Nile River. It creates Lake Nasser. The Aswan Dam is an example of engineering rivers in human-environment interactions.	Event	
1971	C.E.	-21	The Alaska Native Claims Settlement Act is passed. The Alaska Native Claims Settlement Act provides compensation for the loss of indigenous land in the interests of oil extraction.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1971	C.E.	-21	Greenpeace is established, beginning with activism against nuclear weapons and expanding to address other environmental issues. Greenpeace is an organization that supports activism relating to a cadre of issues on the environment. The primary modes of this activism include peaceful protests and the application of creative communications to bring to light environmental problems occurring globally. In 1979, Greenpeace turns into Greenpeace International.	Event	
1971	C.E.	-21	The Consultative Group for International Agricultural Research (CGIAR) is formed to facilitate international agricultural research centers (IARCs). The CGIAR is created to address fundamental agricultural problems and mitigate food crises that have been a subject of concern during this time. It comprises of idea sharing and collaboration among research labs and public agencies.	Event	
1971	C.E.	-21	The Denmark Ministry of the Environment is created. The organization represents the country's attempt to build capacity for environmental issues.	Event	
1971	C.E.	-21	Estonia establishes the first national park,	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Lahemaa National Park. Estonia sanctions a territory for environmental conservation, setting the political intention for preserving a sought-after landscape.		
1971	C.E.	-21	John W. Bennett writes *Northern Plainsmen: Adaptive strategy and agrarian life*, which provides a human ecology of Great Plains and how humans have adapted to the environment.	Idea	
1971	C.E.	-21	Japan creates the Environment Agency.	Event	
1971	C.E.	-21	Canada establishes the Department of the Environment.	Event	
1971	C.E.	-21	The UNESCO Man and the Biosphere Program is established.	Event	
1971	C.E.	-21	The Nam Ngum dam is built in Laos.	Event	
1971	C.E.	-21	North Sea Oil becomes systematically extracted.	Event	
1971	C.E.	-21	The Animal Welfare Institute and Fund for Animals establishes the 'Save the Whales' campaign, which calls for boycotting Japanese products as a protest against whale poaching.	Event	
1971	C.E.	-21	The F-Scale (Fujita Scale) assesses tornado strength based upon the damage done to the built landscape. The enhanced Fujita Scale is developed in 2007.	Idea	
1971	C.E.	-21	The War on Drugs is a campaign started by the Nixon Administration as a way to combat drug use and trafficking in	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the United States. Drugs comprise of substances from the environment used to alter a human's physical or mental state and can have beneficial or malevolent qualities. The War on Drugs includes setting fire to poppy fields, coca trees, and marijuana outgrowths.		
1971	C.E.	-21	The Californian San Fernando Valley experiences structural damage due to an earthquake.	Event	
1971	C.E.	-21	Nicholas Georgescu-Roegen demonstrates the ties among energy dependence, fossil-fuel economies, and socio-ecological systems in the book *The entropy law and the economic process.*	Idea	
1971	C.E.	-21	The London-situated International Institute for Environment and Development (IIED) is established.	Event	
1971	C.E.	-21	Norman Newton's book *Design on the land: The development of landscape architecture* helps to transform landscape architecture from a private to a professional endeavor.	Idea	
1971	C.E.	-21	James Anderson collaborates with U.S. agencies and scholarly organizations to develop a land-use classification system, which includes urban or built-up, agricultural, range, forest, water, wetland, barren land, tundra,	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			and perennial snow or ice.		
1971	C.E.	-21	The Sierra Club Legal Defense Fund is established.	Event	
1971	C.E.	-21	Clean Water Action is established.	Event	
1971	C.E.	-21	The International Fund for Compensation for Oil Pollution Damage is established.	Event	
1971	C.E.	-21	The Nimbus Series allows for some of the first advanced microwave remote sensing of the atmosphere during the time range between 1964 to 1978 C.E.	Event	This date represents the core of the time range from 1964 to 1978 C.E.
1971	C.E.	-21	From 1968 to 1973 C.E., drought leads to desertification and environmental management issues in the West African Sahel.	Event	This date represents the core of the time range from 1968 to 1973 C.E., rounded to the nearest year.
1971	C.E.	-21	On 2 February, the Ramsar Convention on Wetlands of International Importance convenes. This convention results in a multilateral environmental agreement (MEA) about what humans should do in response to a particular environmental problem.	Idea	
1972	C.E.	-22	The Ocean Dumping Act is signed into law in the United States. The Ocean Dumping Act requires companies to obtain a license from the Environmental Protection Agency for dumping industrial, medical, and radioactive waste into U.S. waters. The Act	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			is revised in 1988 to forbid all dumping into territorial waters. This is a political regulation of human-caused environmental hazards.		
1972	C.E.	-22	Florida begins to develop laws to ensure the protection of the Everglades. These motions, which include the Land Conservation Act, are influenced by the increase in population in the area, which can have detrimental effects on the Everglades ecosystems.	Idea	
1972	C.E.	-22	The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) is signed into law. The FIFRA mandates that manufacturers of chemicals provide any unlicensed products for the Environmental Protection Agency (EPA) to examine for hazardous effects.	Idea	
1972	C.E.	-22	Dichlorodiphenyl-trichloroethane (DDT) is banned by U.S. Congress. DDT becomes an insecticide that is a key influence on mainstream environmental thought. Its detrimental effects on human and non-human life are especially pronounced. The U.S. follows Sweden and Norway, which ban DDT two years earlier in 1970. Congress bans the chemical because it is shown to cause cancer. Regardless, DDT continues to be sold in	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			less developed countries.		
1972	C.E.	-22	The Foxfire books begin to be published and compiled by B. Eliot Wigginton. The Foxfire books, named after a local fungus in Georgia, is a collection of folklore from the southern portion of the Appalachian region of the United States.	Idea	
1972	C.E.	-22	Donella Meadows and colleagues publish *Limits to growth*. The study considers the problem of environmental limits on human overpopulation and consumption. The publication features results from one of the first computer models trying to characterize the trajectory of human population consumption, overpopulation, and environmental limits.	Idea	
1972	C.E.	-22	The Clean Water Act (Federal Water Pollution Control Act) is established in the United States. The legislation aims to regulate pollution in hydrological systems and maintain/improve water quality in the United States. The act creates the National Pollutant Discharge Elimination System (NPDES) and the 404 program. This political document puts into play type of human-environment relationship that is enforced politically and economically and is	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			directed toward one part of human interaction with the Earth system. The legislation is influenced by the stipulations enumerated in the Commerce Clause of the U.S. Constitution, which gives Congress the ability to regulate commerce among nations, states, and Native American reservations.		
1972	C.E.	-22	The Great Lakes Water Quality Agreement takes shape. This agreement is made between the United States and Canada prescribing ways to improve the water quality in the Great Lakes, which have been subjected to the industrial pollution propagated by the Rust Belt. The agreement is renewed in 1978.	Idea	
1972	C.E.	-22	The Marine Mammal Protection Act is passed by U.S. Congress. Like many of the other regulatory pieces of legislation during the environmental movement, the act provides stipulations for a specific problematic issue of human-environment interaction. In this case, the act enforces the sustainability of dolphin populations and habitats in the United States.	Idea	
1972	C.E.	-22	William Leiss publishes *The Domination of nature*.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Leiss's *The Domination of nature* calls attention to the levels of degradation that humans have imposed on the environment. Leiss traces the idea of human domination over nature from the Scientific Revolution to the present.		
1972	C.E.	-22	The term 'ecotage' is introduced. Ecotage' and an environmentally motivated form of sabotage. It is first coined by Sam Love and David Obst.	Idea	
1972	C.E.	-22	Werner Herzog films *Aguirre, the wrath of God*. Herzog's film recounts the exploration of Spanish colonists in the Peruvian highlands. It shows the perception of nature as wild in colonial experiences in the New World.	Idea	
1972	C.E.	-22	Germany's Basic Law is amended to include environmental protection. The amendment to Germany's Basic Law allows for human governance over polluting the environment with waste, noise, and emissions.	Idea	
1972	C.E.	-22	The Coastal Zone Management Act is passed by U.S. Congress as form of environmental regulation.	Idea	
1972	C.E.	-22	Anthony Downs proposes the 'issue attention cycle', which cues into environmental perception in	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			connection to mass media.		
1972	C.E.	-22	The Netherlands passes the Air Pollution Act.	Idea	
1972	C.E.	-22	Landsat Multispectral Scanner (MSS) is a satellite program that has attempted to photograph and document the Earth's surface.	Event	
1972	C.E.	-22	Japan produces krill fishing fleets to meet global demands for shrimp.	Event	
1972	C.E.	-22	The London Convention, or the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, is one of numerous international agreements on maritime pollution.	Idea	
1972	C.E.	-22	California enacts a law to require the delineation of areas of seismic hazard.	Idea	
1972	C.E.	-22	The Biological Weapons Convention builds upon the 1925 Geneva Protocol to ban biological warfare.	Idea	
1972	C.E.	-22	The World Heritage Convention is established to create an initial list of the first UNESCO World Heritage Sites.	Event	
1972	C.E.	-22	California passes its Coastal Protection Act as a coordinated effort for coastal management and planning.	Idea	
1972	C.E.	-22	The Barcelona Convention for the Protection of the Mediterranean Sea Against Pollution convenes.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1972	C.E.	-22	The Oslo Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft convenes.	Idea	
1972	C.E.	-22	The Convention for the Conservation of Antarctic Seals convenes.	Idea	
1972	C.E.	-22	Tasmania and Australia feature the first ecocentric political parties.	Event	
1972	C.E.	-22	Cultural Survival is established.	Event	
1972	C.E.	-22	Negative Population Growth is established.	Event	
1972	C.E.	-22	John Rawls publishes the "Theory of justice" which has been applied in issues relating to the ethics of natural resource use.	Idea	
1972	C.E.	-22	Japan ratifies the Migratory Bird Treaty.	Idea	
1972	C.E.	-22	The Sychelles Islands Foundation is created to protect endangered and endemic species.	Event	
1972	C.E.	-22	The International Institute for Applied Systems Analysis is founded and begins analyzing social-ecological systems, such as energy supply and demand.	Event	
1972	C.E.	-22	The publication, *Only one Earth*, lays the philosophical foundation for the United Nations Conference on the Human Environment	Idea	
1972	C.E.	-22	From 1932 to 1972 C.E., the Tuskegee Study transpires. In 1927 C.E., this study ends because it inhumanely introduces syphilis to African-American males.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1972	C.E.	-22	Joseph W. Meeker ushers in the idea of literary criticism in *The comedy of survival*. Meeker spearheads literary ecology, which examines the human-environmental relationships embedded in works of literature. The work contributes to the broader area of ecocriticism.	Idea	
1972	C.E.	-22	The United Nations Environment Programme (UNEP) is established on 15 December.	Event	
1972	C.E.	-22	On 23 July, the first satellite remote sensing system, ERTS-1 (Earth Resource Technology Satellite), is launched into space.	Event	
1972	C.E.	-22	During 5-15 June, the United Nations Conference on the Human Environment occurs. The UN Conference on the Human Environment is the pioneering event that examines the connection between development and environmental issues. For example, it holds countries responsible for the environment during times of war. Participants come from 113 countries. It fosters the development of the United Nations Environment Programme (UNEP).	Idea	
1972	C.E.	-22	In October, the European Union passes its own environmental protection law, an example of transferring environmental values	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			to the realm of governance.		
1972	C.E.	-22	The Convention Concerning the Protection of the World Cultural and Natural Heritage convenes through the United Nations Educational, Scientific, and Cultural Organization (UNESCO). It occurs from October 17 to 21 November.	Idea	
1972	C.E.	-22	In February one of the twentieth century's deadliest blizzards occurs in Iran. This blizzard is an environmental hazard that results in around 4,000 mortalities.	Event	
1972	C.E.	-22	In July, a meeting is held in Stockholm to bring attention to the problems that acid rain has had on the ecosystems of the Scandinavian region and Canada. This meeting, attended by 33 countries, represents a formal political event thanks to efforts from Svante Oden and others in putting forth acid rain as a detrimental effect of industry and technology on the environment.	Idea	

OPEC Transition: 1973 to 1975 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1973	C.E.	-23	Herman Daly publishes "The steady-state economy: Toward a political economy of biophysical equilibrium and moral growth." The steady-state economy is Herman Daly's call for a form of ecological economics that would balance the Earth's material and energy system.	Idea	
1973	C.E.	-23	The U.S. Endangered Species Act is passed. The Endangered Species Act gives the federal government more power to respond to animals at risk of extinction. It follows the Endangered Species Preservation Act of 1966 and the Endangered Species Conservation Act of 1969.	Idea	
1973	C.E.	-23	The Trans-Alaska Pipeline Authorization Act is passed. The Trans Alaska Pipeline Authorization Act (TAPAA) gives the federal government the authority to construct a pipeline to make the oil on Alaska's North Slope more available for production.	Idea	
1973	C.E.	-23	The Organization of Petroleum Exporting Countries (OPEC) triggers an oil embargo and energy crisis. During this year, OPEC ceases providing the United States and Western Europe with oil. This decision is made because of the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			western countries' support for Israel in their war with Syria and Egypt. This event is an example of how one political event has implications for an environmental decision for energy use.		
1973	C.E.	-23	Jim Lovelock and others discover that chlorofluorocarbons (CFCs) are present in the atmosphere. Lovelock's collaborative discovery shows that chlorofluorocarbons, then a common ingredient in refrigerants and aerosols, have permeated into the atmosphere, with distinguishable concentrations over the Atlantic Ocean. The authors, with the limited amount of information that they have at the time, incorrectly believe that these traces have no conceivable hazard.	Idea	
1973	C.E.	-23	The Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) advances an agreement regarding illegal trading of endangered flora and fauna. The CITES agreement, put into effect on 1 July 1975, attempts to establish an agreement over the illegal international and national trading of endangered plants and wildlife. Signed by 166 nations, the CITES agreement is a	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			response to the problems that this type of trading has on biodiversity.		
1973	C.E.	-23	Deep ecology is introduced by philosopher Arne Naess in the essay "The shallow and the deep, long-range ecology movement: A summary" (1973). Deep ecology is a critical overview of society's dominance over nature. Naess introduces the processes of self-realization and ecocentrism to place humans as a part of the holistic environment and not in the dominant, alienated sense.	Idea	
1973	C.E.	-23	Denmark aligns with contemporary Western environmental policy by adopting an environmental protection act, an illustration of how the environmental movement permeates among countries during the 1960s and 70s.	Idea	
1973	C.E.	-23	The first genetically modified organism (GMO) is created by Stanley Cohen and Herbert Boyer. The first GMO is a key illustration of human modification of the environment at the genetic level. This GMO is produced by introducing a recombinant plasmid into a bacterium of *E.coli*.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1973	C.E.	-23	Israel establishes its Ministry of the Environment.	Event	
1973	C.E.	-23	Canada adopts the Federal Environmental Assessment and Review Process.	Idea	
1973	C.E.	-23	Bernard Quinn Nietschmann writes *Between land and water: The subsistence ecology of the Miskito Indians, Eastern Nicaragua*, which gains significance in indigenous and cultural ecology scholarship.	Idea	
1973	C.E.	-23	The European Union (EU) incorporates the polluter pays principle in the "Principles of a Community Environmental Policy."	Idea	
1973	C.E.	-23	E.F. Schumacher publishes *Small is beautiful*, which combats industry, consumption, and globalization by advocating a transformation in human-environment interactions.	Idea	
1973	C.E.	-23	William Bunge publishes *The geography of human survival* which criticizes the social and political problems of human dependence on technology.	Idea	
1973	C.E.	-23	Chile becomes a neoliberal experiment in free trade and lax environmental regulations due to the influence of Augusto Pinochet and the "Chicago Boys."	Event	
1973	C.E.	-23	Oregon passes its Oregon Land Use Act to require counties and	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			cities to produce comprehensive land use plans that meet state standards and regulations.		
1973	C.E.	-23	In *The Coming of the post-industrial society*, Daniel Bell develops the idea of a post-industrial society as a way of describing the erosion of social relations, power structures, and bourgeois culture after the negative effects of industrialization set in.	Idea	
1973	C.E.	-23	Canada launches its Anik satellite.	Event	
1973	C.E.	-23	The Ecology Party takes shape in the United Kingdom.	Event	
1973	C.E.	-23	The book, *Models of doom*, criticizes the pessimistic ideas provided by the *Limits to growth* publication.	Idea	
1973	C.E.	-23	The Cousteau Society is established.	Event	
1973	C.E.	-23	The International Convention for Prevention of Pollution from Ships (MARPOL 73/78) is organized to address the management of ship-based marine pollutants.	Idea	
1973	C.E.	-23	Project Tiger is implemented to protect India's tiger populations.	Event	
1973	C.E.	-23	P.S. Martin proposes the overkill hypothesis in “The discovery of America: The first Americans may have swept the Western Hemisphere and decimated its fauna within 1000 years,” published in *Science*.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			The overkill hypothesis concerns the mass extinction of megafauna in the Americas and Australia, with the claim that humans have played a role in the phenomenon.		
1973	C.E.	-23	NASA launches Skylab, a human-operated space laboratory, on 14 May.	Event	
1973	C.E.	-23	Mechai Viravaidya leaves his government position in Thailand to begin the Population and Community Development. Viravaidya is a Thai activist for birth control to curb population growth and support environmental carrying capacities.	Event	The earlier date, 1973 C.E., is used over the later date, 1974 C.E.
1974	C.E.	-24	The Eastern Wilderness Act is passed by U.S. Congress. The Eastern Wilderness Act allows for preserving wilderness landscapes in the eastern portion of the United States. This act arises from a concern for the region's industrial and polluted environment.	Idea	
1974	C.E.	-24	Ecofeminism is coined by Francoise d'Eaubonne. Ecofeminism holds that the human destruction of the environment through industrialization is a patriarchal force in society.	Idea	
1974	C.E.	-24	Robert May provides the first application of nonlinear equations associated with chaos theory to model the	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			intersections of population growth and carrying capacity. May's attempt to apply chaos theory to ecological phenomena represents one approach to analyzing complex ecological systems, a topic which has been expanded upon in complexity science.		
1974	C.E.	-24	Mario J. Molina and F.S. Rowland identify concerns about chlorofluorocarbons and their role in destroying ozone molecules within the atmosphere. Molina and Rowland build upon the ideas of Lovelock and others by showing that CFCs indeed impose a conceivable hazard on the atmosphere. CFCs, introduced by Thomas Midgley Jr. in 1928, have by then become widespread as refrigerants and aerosols.	Idea	
1974	C.E.	-24	Ghana launches the Environmental Protection Council (EPC). The EPC, which coordinates environmental management initiatives, is an example of Ghana's political move to address environmental problems and humans' role in the creation of those problems.	Event	
1974	C.E.	-24	Harry Evan coins the term 'industrial ecology'.	Idea	
1974	C.E.	-24	Garrett Hardin introduces the idea of	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			lifeboat ethics. Garrett Hardin describes lifeboat ethics as a guide for addressing the cataclysmic problems created by overpopulation. Hardin uses the lifeboat image to convey a sense of human impact on the environment through overpopulation and extending beyond the carrying capacity of ecosystems.		
1974	C.E.	-24	The U.S. passes the Safe Drinking Water Act (SDWA) which provides regulations (i.e., Maximum Contaminant Levels) on public water systems governed by the country. It is amended in 1986 and 1996 to add new contaminants and include filtration requirements, disinfecting public water, and banning lead in piping, among others.	Idea	
1974	C.E.	-24	Dennis Pirages and Paul Ehrlich introduce the Dominant Social Paradigm (DSP), a perception which holds that humans are dominant over all other species in the environment. The authors advocate for a New Social Paradigm (NSP) that prioritizes corporate environmental accountability.	Idea	
1974	C.E.	-24	Gilbert F. White, the 'father of floodplain management', establishes the Natural	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Hazards Research and Application Information Center.		
1974	C.E.	-24	Immanuel Wallerstein introduces world systems theory (WST) in the book *The modern world system: Capitalist agriculture and the origins of the European world-economy in the sixteenth century*. It makes the claim that the 1800s ushered in a capitalist economy as the all-encompassing world system, leading to social and environmental problems of class, uneven development, and production.	Idea	
1974	C.E.	-24	Lester Brown establishes the Worldwatch Institute to research on policy-making relating to society, nature, energy, and economics.	Event	
1974	C.E.	-24	Yi Fu Tuan's "Humanistic geography" helps to recognize the importance of the body for human-being-in-the-world in geography.	Idea	
1974	C.E.	-24	Sherry Ortner helps to develop the idea of ecofeminism in "Is female to male as nature is to culture?"	Idea	
1974	C.E.	-24	David Harvey publishes "Population, resources, and the ideology of science" which is an important paper showing how human-environment interactions factor into the capitalist system. It also suggests that the	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			population-resource theories of Malthusianism are social constructs and not scientific realities.		
1974	C.E.	-24	Yi Fu Tuan writes a key text on humanistic views on environmental perception entitled *Topophilia* (love of place).	Idea	
1974	C.E.	-24	In Cocoyoc, Mexico, the Symposium on Patterns of Resource Use, Environment and Development Strategies convenes to address the misuse of environmental resources.	Idea	
1974	C.E.	-24	The European Environmental Bureau (EEB) is formed to lobby for environmentalism in the European Union.	Event	
1974	C.E.	-24	In *The production of space*, Henri Lefebvre argues that space is influenced and shaped through representations of space, spatial practices, and spaces of representation. Capitalism plays an essential role in the production of space.	Idea	
1974	C.E.	-24	David Ley performs a humanistic interpretation of the racialized geographies of everyday life in an African-American neighborhood in Philadelphia. The work is produced in *The black inner city as frontier outpost: Images and behavior of a Philadelphia neighborhood*.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1974	C.E.	-24	The Paris Convention for the Prevention of Marine Pollution from Land-Based Sources convenes.	Idea	
1974	C.E.	-24	The International Energy Agency (IEA) is founded to facilitate energy policies among countries of the Organization for Economic Cooperation and Development (OECD).	Event	
1974	C.E.	-24	In "Does Economic growth improve the human lot?", the Easterlin Paradox emerges from a study that finds the material standard of living does not necessarily make people happier.	Idea	
1974	C.E.	-24	Environmental Policy Institute is established.	Event	
1974	C.E.	-24	The Bucharest World Population Conference addresses the 'population problem' from a neo-Malthusian perspective.	Idea	
1974	C.E.	-24	In March, the initial protest for the Chipko Andolan Movement (important for ecofeminism) commences in response to a denial of the proposal by the Dasholi Gram Swarajya Sangh (DGSS) to receive an allotment of ash trees. The Chipko Andolan Movement begins in Uttarkhand, located in the Himalayan region of India. The movement embodies environmentalist values toward government-based logging in the country.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			The movement, as an idea, diffuses around the world and inspires similar movements. It also is an example of how environmentalism is recounted from different perspectives, such as that of women's roles in environmental protection, as well as local peasants and their environmental rights.		

Overshoot Scene: 1975 to 1992 C.E.

Petrophilia Interval: 1975 to 1979 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1975	C.E.	-25	Edward Abbey publishes *The Monkey Wrench Gang*. Abbey's *The Monkey Wrench Gang* is a fictional book advocating for non-violent act of civil disobedience for the sake of environmental protection. Monkeywrenching becomes a big idea used to describe acts of disobedience which slow down technology's impact on the environment.	Idea	
1975	C.E.	-25	The Era of Environmental Management reaches its core in Western countries. The time period refers to the widespread institutionalization of environmental governance.	Event	This date represents the core of the time range from 1966 to 1984 C.E.
1975	C.E.	-25	U.S. Congress passes the Car Corporate Average Fuel Economy (CAFE) Standards through the Energy Policy and Conservation Act. The CAFE Standards are set in place as a response to the Arab oil embargo of 1973 and 1974. The goal of this political legislation is to better conserve energy use. One of the objectives is to double the miles per gallon to 27.5 by 1985.	Idea	
1975	C.E.	-25	Bruce Ames creates the Ames test to	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			understand a carcinogen's ability to mutate genes. The Ames test is used on microorganisms to understand how certain carcinogens impact the mutations of genetic material.		
1975	C.E.	-25	By this time, catalytic converters became widespread in North America. Catalytic converters reduce the number of emissions from combustion engines. The catalytic converter becomes an essential way to reduce automobile emissions. It is a response to the growing knowledge of the negative impacts that car pollution has on the environment	Event	
1975	C.E.	-25	The United States bans lead in gasoline. Lead is an element which has detrimental effects to humans if exposed. Lead poisoning among Americans causes economic and political decisions that result in the removal of the element from all gasoline.	Event	
1975	C.E.	-25	The *Belgrade Charter--A global framework for environmental education* is developed. The U.N. document represents the first international statement on the importance of environmental education.	Idea	
1975	C.E.	-25	Steven Spielberg films *Jaws*. Jaws is a famous example of how animals are perceived as dangerous to humans.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1975	C.E.	-25	Rosemary Ruether publishes *New woman/New Earth*. This publication represents a significant contribution toward ecofeminist thought.	Idea	
1975	C.E.	-25	Australia passes the Great Barrier Reef Marine Park Act. This act protects the Great Barrier Reef ecosystem from drilling and mining. It also helps to form the Great Barrier Reef Marine Park Authority (1976), which enforces management and preservation regulations.	Idea	
1975	C.E.	-25	The Radiation Effects Research Foundation is established by the United States and Japan to continue long-term studies of radiation among those individuals and future generations affected by the nuclear bombings of Hiroshima and Nagasaki.	Event	
1975	C.E.	-25	The European Community (EC) and Mediterranean nations form the Mediterranean Action Plan in Barcelona, also called the 'Blue Plan', to address problems of pollution in the Mediterranean Sea.	Idea	
1975	C.E.	-25	Greenpeace expands to issues of whale poaching with its Project Ahab program.	Event	
1975	C.E.	-25	Edward O. Wilson publishes *Sociobiology*, inviting research and debate over the biological influences on human behavior.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1975	C.E.	-25	The Tennessee Valley Authority's nuclear power plant in Browns Ferry, Alabama experiences a lapse in communication between the control room and the reactor due to a fire. This event causes the Union of Concerned Scientists (UCS) to question the safety of government-managed nuclear technology.	Event	
1975	C.E.	-25	The United Nations organizes the First Conference on Women and Development, held in Mexico City, which strengthens the feminist movement.	Idea	
1975	C.E.	-25	Typhoon Nina in China causes 62 dams to fail, including the Banqiao Reservoir.	Event	
1975	C.E.	-25	Geoffrey and Susan Jellicoe write *The landscape of man: Shaping the environment from prehistory to the present day* which provides a history of the built landscape through human history.	Idea	
1975	C.E.	-25	In *The theory of environmental policy*, Baumol and Oates come up with the least-cost theorem, which holds that charging for pollution is the least-cost approach to achieving standards of environmental quality.	Idea	
1975	C.E.	-25	The movie, *A boy and his dog*, depicts survivors living underground.	Idea	
1975	C.E.	-25	Ernest Callenbach publishes *Ecotopia* as	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmentalism emerges.		
1975	C.E.	-25	From 1965 to 1985 C.E., Japan undergoes an 'environmental miracle' by reversing many of its environmentally destructive practices, which in turn reinforced its economy.	Event	This date represents the core of the time range from 1965 to 1985 C.E.
1975	C.E.	-25	During the 1970s, Norway introduces environmental accounting. Environmental accounting refers to the assessment of how environmental conditions may affect finances among companies.	Idea	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, the rubber tapper movement begins. The rubber tapper movement is one of the numerous workers' rights movements that stems out of the societal problems associated with resource extraction.	Idea	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, research on hydrogen cars begins to be conducted.	Event	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, environmental litigation begins to expand as more lawsuits regarding human impact on the environment are filed.	Event	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, air travel becomes cheap enough to allow for the *Rough Guide* and *Lonely Planet* to produce guidebooks for travelers to experience	Event	This date represents the core of the 1970s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			foreign and domestic places.		
1975	C.E.	-25	During the 1970s, the Dredged Material Research Program of the U.S. Army Corps of Engineers opens possibilities for wetland restoration ecology.	Event	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, Germany develops ideas pertaining to the precautionary principle. The precautionary principle tries to minimize negative environmental outcomes by making more environmentally sensible decisions, regardless of a lack of scientific findings.	Idea	
1975	C.E.	-25	During the 1970s, fair trade starts to form as a social movement for environmentally and socially responsible production and consumerism.	Idea	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, the Transamazon Highway begins to be constructed to colonize and extract resources in areas deep into the Amazon.	Event	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, 'Forests for the People' programs begin to be created in communities to allow more participatory access to wood as a fuel source.	Idea	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, agroecology, the study of the totality of the food system, formalizes as a research discipline.	Idea	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, G. Malcom Lewis and	Idea	This date represents the core of the 1970s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Louis de Vorsey begin to develop a cartobibliographic archive of American Indian maps which detail indigenous perceptions of the human-environment relationship through time. Indigenous cartographies gain widespread recognition in geography in 1998's History of Cartography Project.		
1975	C.E.	-25	During the 1970s, the use of asbestos undergoes strict regulations in the United States and other Western countries.	Event	This date represents the core of the 1970s C.E.
1975	C.E.	-25	During the 1970s, Dehesa, a mixed form of grazing and cultivation combined with interspersed trees, is a traditional practice in Spain and Portugal that gets phased out as socio-economic changes occur. The dehesa landscapes have largely reverted back to shrublands.	Event	This date represents the core of the 1970s C.E.
1975	C.E.	-25	Corporate fishing industries begin to overtake smaller-scale fishermen in the arctic region of Alaska, Canada, Greenland, Scandinavia, and Russia. This phenomenon connects various parts of human-environment phenomena, notably the global market demand for fish, the industrialization of fishing, and the resulting complications for local and indigenous populations	Event	This date represents the core of the 1970s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			living in the arctic region.		
1975	C.E.	-25	The fifth wave of industrial practice begins to take shape during the 1970s. It is characterized by the growth of electronics, lean production, synchronous engineering, and computer integrated engineering	Event	This date represents the core of the 1970s C.E.
1975	C.E.	-25	In January, the Strait of Malacca in Indonesia experiences a massive Japanese-caused oil spill.	Event	
1975	C.E.	-25	On 6 May, Omaha, Nebraska endures $1.132 billion worth of damage from a tornado outbreak.	Event	
1975	C.E.	-25	The United Kingdom experiences a contingent drought due to irregular precipitation patterns in agricultural areas.	Event	The earlier date, 1975 C.E., is used over the later date, 1976 C.E.
1975	C.E.	-25	Permaculture is introduced by Bill Mollison and David Holmgren. Permaculture is the ecological approach to design that focuses on the synergy between modern and indigenous traditions within a permanent place.	Idea	This date represents the middle of the 1970s C.E.
1976	C.E.	-26	The Toxic Substance Control Act is passed into law by U.S. Congress. This legislation places restrictions on polychlorinated biphenyl, another form of political regulation on the human-environment relationship.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1976	C.E.	-26	The Resource Conservation and Recovery Act is passed by U.S. Congress. This piece of legislation is largely influenced by the investigative work of Erin Brockovich, who took great strides to examine how pollution of water sources affects human health. Such forms of management include the identification of types of waste that are generated, how to safely manage on and off-site hazardous waste, how to transport hazardous waste, and locating ideal places for waste disposal. It is one of the first examples of cradle-to-grave regulation. Cradle-to-grave regulation is an approach to environmental management which considers the importance of adopting management policies that address hazardous wastes from their production to their final place of disposal. It is a way of communicating the temporal importance of managing industrial hazardous waste. The RCRA is amended in 1984 to accommodate for other issues relating to waste management (i.e., landfill requirements, permit deadlines, and generators of small amounts of waste).	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1976	C.E.	-26	The U.S. Federal Land Policy and Management Act (FLPMA) is passed. FLPMA helps to more clearly define the duties of the Bureau of Land Management (BLM). The BLM becomes responsible for federal public lands with the intention of multiple-use, sustained yield.	Idea	
1976	C.E.	-26	The Cuban constitution is amended to include a greater responsibility of the government and public toward the environment. Like other countries, Cuba prioritizes the environment in the language of its constitution. Environmental issues thus take more precedence in the political realm, at least on paper.	Idea	
1976	C.E.	-26	Sagarmatha National Park is established, which covers the southern portion of Mount Everest. The creation of Sagarmatha National Park helps to slow the rate of deforestation around Mount Everest, a form of environmentally-based governance and territoriality.	Event	
1976	C.E.	-26	The U.S. National Forest Management Act (NFMA) is passed. This act, which has connections to the Forest Management Act of 1897, authorizes the selective clear-cutting of forests managed by the U.S.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Forest Service. It is a type of human-environment regulation.		
1976	C.E.	-26	The Toxic Substances Control Act is passed by U.S. Congress. The Toxic Substances Control Act is, for the most part, an unsuccessful piece of legislation that tries to prevent the introduction of hazardous substances from entering the market.	Idea	
1976	C.E.	-26	The Tangshan earthquake claims 250,000 lives.	Event	
1976	C.E.	-26	Liberia creates the Forestry Development Authority.	Event	
1976	C.E.	-26	The Man and the Biosphere Program establishes its first reserves.	Event	
1976	C.E.	-26	Papua New Guinea establishes the Office of Environment and Conservation (OEC) in the Department of Lands, Surveys, and Environment. It later turns into the Department of Environment and Conservation.	Event	
1976	C.E.	-26	The U.S. Fisheries Conservation and Management Act creates restrictions on salmon fishing and allows for repopulating salmon populations.	Idea	
1976	C.E.	-26	James C. Scott publishes *The moral economy of the peasant* which emphasizes the importance of learning from the quickly-eroding moral qualities	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			of traditional peasants in Southeast Asia.		
1976	C.E.	-26	The American Zoo and Aquarium Association (AZA) develops a code of ethics for how animals should be treated in captivity.	Idea	
1976	C.E.	-26	Robert Bailey coins the term 'ecoregion' which has been one approach to regionalizing complex ecosystems.	Idea	
1976	C.E.	-26	The American Society for Environmental History is established, which helps to understand the human-environment relationship through time.	Event	
1976	C.E.	-26	Colorado's Big Thompson River canyon flash flood results in 146 deaths.	Event	
1976	C.E.	-26	Anne Buttimer introduces the lifeworld, the taken-for-granted everyday lifeways in "Grasping the dynamism of the lifeworld."	Idea	
1976	C.E.	-26	Edward Relph publishes *Place and placelessness* as a phenomenology of place. The term "placelessness" refers to the standardization and homogenization of landscapes in the human-environment relationship.	Idea	
1976	C.E.	-26	The Soviet Union ratifies the Migratory Bird Treaty.	Idea	
1976	C.E.	-26	Due to land shortages, the Maldives clears out cemeteries and mosques on the main island of Male' from 1974 to 1978 C.E.	Event	This date represents the core of the time range from 1974 to 1978 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1977	C.E.	-27	The Green Belt Movement begins through the leadership of Wangari Maathai. The Green Belt Movement advocates for employment that has an environmental benefit. The movement is an example of ecofeminism because it encourages the training of women in forestry, agriculture, and environmental education.	Idea	
1977	C.E.	-27	The U.S. Department of Energy is founded. The Department of Energy begins after the price spike in oil caused by the Organization of the Petroleum Exporting Countries. Its creation is an example of how dependence on fossil fuels can lead to societal problems.	Event	
1977	C.E.	-27	The Trans-Alaska Pipeline is constructed. The Trans Alaska Pipeline is a landmark that symbolizes the tensions between political entities, indigenous groups, and environmental problems. It results in the ethnocide of native groups affected by the pipeline.	Event	
1977	C.E.	-27	Wendell Berry publishes *The unsettling of America: Culture and agriculture*. Wendell Berry has influenced human-environmental thinking, especially in the critique of industrial agriculture	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			present in U.S. policy and economics. *The unsettlement of America: Culture and agriculture* is an early representation of this farmer and writer from Henry County, Kentucky.		
1977	C.E.	-27	The 1972 Federal Water Pollution Control Act is amended and changed to be the Clean Water Act. These 1977 amendments to the now-termed Clean Water Act include exemptions to the 404-permit program (i.e., agriculture) and a broader definition of 'waters' according to the Environmental Protection Agency. These changes are put in play in part due to the NRDC v. Callaway suit in 1975 which requires the U.S. Army Corps of Engineers to adopt the EPA's definition of 'waterways'. These amendments are an example of how the human-environment relationship develops over time in the realm of governance.	Idea	
1977	C.E.	-27	The Cuban National Commission for Environmental Protection and the Rational Use of Natural Resources is created. This organization in Cuba represents the coalition of leaders interested in addressing the mitigation of	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmental issues facing the country.		
1977	C.E.	-27	The U.S. Office of Surface Mining Reclamation and Enforcement is developed. The U.S. Office of Surface Mining Reclamation and Enforcement is set up to manage environmental hazards and enforce regulations of strip coal mining.	Event	
1977	C.E.	-27	The U.N. Nairobi Conference on Desertification gathers. The U.N. Nairobi Conference calls attention to the impact of desertification, a term first introduced by A. Aubreville in 1949. Desertification represents on systemic outcome of human-environment interactions.	Idea	
1977	C.E.	-27	Starhawk publishes *The spirit dance: A rebirth of the religion of the great goddess*. Starhawk's *The spirit dance* combines neopaganism and ecofeminism to promote a female-centric, cosmological interpretation of the human-environment relationship.	Idea	
1977	C.E.	-27	The *Tbilisi Declaration* is formed. This U.N. declaration provides possibilities for formal/informal environmental education and provides an overview for international collaboration on the topic.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1977	C.E.	-27	The Sekem project creates a series of 150 farms dedicated toward sustainability. This Egyptian project seeks to incorporate more sustainable approaches to agriculture, an example of incorporating environmentalist ideals with adaptation to the environment.	Event	
1977	C.E.	-27	Regulations are placed to combat the increased concentrations of phosphorous in the artificial lakes of Norfolk Broads. The increased phosphorus is an example of cultural eutrophication, the human-induced nutrient enrichment of a body of water.	Event	
1977	C.E.	-27	Garrett Hardin publishes *Exploring new ethics for survival*. Hardin's book connects to the idea that disease, famine, and societal chaos will ensue if population continues to grow beyond the carrying capacity of the environment.	Idea	
1977	C.E.	-27	An Idaho dam on the Teton River fails because it is built on loess, resulting in 11 deaths and 25,000 individuals displaced.	Event	
1977	C.E.	-27	The acceptance of the communist Gabcikovo-Nagymaros reservoir-dam project occurs between Czechoslovakia and Hungary, sparking one of the largest environmental protests in Eastern Europe.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1977	C.E.	-27	Kenya bans sport hunting in favor of other forms of tourism, such as wildlife photography.	Event	
1977	C.E.	-27	Morris King Udall helps to pass the U.S. Strip Mining Control and Reclamation Act, which enforces the reclamation of land that is mined for coal.	Idea	
1977	C.E.	-27	The Union of Concerned Scientists publishes *The risks of nuclear power*, which influences changes in the federal government's policy and practice toward the management and safety of nuclear technology.	Idea	
1977	C.E.	-27	A major drought in the United States forces many citizens to consider replacing their turf lawns with xeriscaping.	Event	
1977	C.E.	-27	The U.N. Conference on Water is held in Mar del Plata, Argentina.	Idea	
1977	C.E.	-27	J. Hartwick introduces the Hartwick Rule in "Intergenerational equity and the investing of rents from exhaustible resources" of the *American Economic Review*. The Hartwick Rule is an idea from sustainable economic development. It holds that economic growth can only occur if the money produced from exhaustible energy resources is invested in the creation of more sustainable forms of capital in the future.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1977	C.E.	-27	The German Öko-Institut is formed to support environmental research.	Event	
1977	C.E.	-27	Basaltic lava flow from Nyiragongo overruns 400 houses and causes 72 deaths around Goma, Democratic Republic of Congo. A similar case occurs in 2002.	Event	
1977	C.E.	-27	Italy launches its Sirio satellite.	Event	
1977	C.E.	-27	Japan launches its Sakura satellite.	Event	
1977	C.E.	-27	The Green Party, also known as the Green List for the Protection of the Environment, takes shape in Germany.	Event	
1977	C.E.	-27	A windstorm in the San Joaquin Valley (California) spreads coccidioidomycosis-contaminated soil across around 87,000 square kilometers.	Event	
1977	C.E.	-27	Sea Shepherd Conservation Society is established.	Event	
1977	C.E.	-27	In "On Geoengineering and the carbon dioxide problem", C. Marchetti coins 'geoengineering' as human ways of using technology to modify the atmosphere.	Idea	
1977	C.E.	-27	An Ekofisk oilfield blows in Norway's part of the North Sea.	Event	
1977	C.E.	-27	In *A guide for the perplexed*, E.F. Schumacher criticizes the materialism of scientific attitudes toward the environment and proposes a more environmentally	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			harmonious way of living.		
1977	C.E.	-27	The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD) transpires.	Idea	
1977	C.E.	-27	The Apple II personal computer is developed.	Event	
1978	C.E.	-28	The *Amoco Cadiz*, a supertanker, spills over 68 million gallons of oil off the French coast after it crashes into the Portsall Rocks. The commodification, transport, and dependence of oil reflects the paradox of humans depending on one aspect of the environment (i.e., fossil fuels) while degrading other systems in the process (i.e., oil spills). The spill was a costly event for the American Oil Company, France, and affected ecosystems.	Event	
1978	C.E.	-28	The United States bans the production and consumption of chlorofluorocarbons as aerosol propellants. This move is an example of how scientific findings influence environmental policy in the 1970s. The concern over the ozone layer perpetuated by the work of Mario J. Molina, F.S. Rowland, and others influences the political thinking of U.S. policymakers.	Event	
1978	C.E.	-28	The U.S. passes the Public Utilities Regulatory Policies	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Act. The Public Utilities Regulatory Policies Act 1978 influences political thinking about how to regulate human energy-use. More specifically, the legislation sparks a greater need for co-generators, which applies waste heat from one activity to fuel another activity.		
1978	C.E.	-28	Ecocriticism is termed by William Rueckert. Rueckert coins 'ecocriticism' as an approach to understand the socio-environmental aspects found in literature.	Idea	
1978	C.E.	-28	Mary Daly publishes *Gyn/Ecology*. This publication represents a significant contribution toward ecofeminist thought.	Idea	
1978	C.E.	-28	Susan Griffin publishes *Woman and nature: The roaring inside her*. This publication represents a significant contribution toward ecofeminist thought.	Idea	
1978	C.E.	-28	J.H. Connell introduces the intermediate disturbance hypothesis, which holds that higher amounts of biodiversity can be witnessed in places with intermediate disturbances.	Idea	
1978	C.E.	-28	President Jimmy Carter proposes fifteen Alaskan national monuments through the authority of presidential proclamation under the Antiquities Act.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1978	C.E.	-28	Nigeria passes the Land Use Act.	Idea	
1978	C.E.	-28	The U.S. Tanker Safety Act is enacted in large part due to public concerns over the *Argo Merchant* oil spill.	Idea	
1978	C.E.	-28	The United States declares 200 miles of the Rio Grande to be a National Wild and Scenic River.	Event	
1978	C.E.	-28	The *Tennessee Valley Authority vs. Hiram G. Hill* case is the first one of its kind in which the U.S. Supreme Court makes an interpretation based upon the Endangered Species Act of 1973. It results in the temporary moratorium on dam construction of the Little Tennessee River, to assess the endangered snail darter living in the area's waterway.	Idea	
1978	C.E.	-28	Riley Dunlap and Kent Van Liere introduce the "New Environmental Paradigm" (NEP) scale.	Idea	
1978	C.E.	-28	The Department of Energy begins to consider prospects for potential nuclear waste underground burial sites, such as Yucca Mountain.	Event	
1978	C.E.	-28	Germany adopts a certification strategy to promote more environmentally-friendly products, entitled the "Blauer Engel", or blue angel.	Idea	
1978	C.E.	-28	Redwood National Park becomes the first U.S. park to have an	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			extensive program dedicated to forest restoration.		
1978	C.E.	-28	Dioxin spreads throughout Seveso, Italy after a chemical explosion.	Event	
1978	C.E.	-28	The U.S. begins to deregulate the natural gas industry.	Event	
1978	C.E.	-28	SEASAT is launched to examine oceanic processes.	Event	
1978	C.E.	-28	On 25 April, the waste pollution in Love Canal causes health problems among people living in the area, resulting in the water body being labelled a public health hazard by Dr. Robert Whalen, the New York State Commissioner of Health. Love Canal reveals the problems of human misuse of environmental resources and how those practices circle back and negatively impact humans. Jimmy Carter declares a state of emergency on Love Canal on 7 August 1978. Around 239 families are moved during this time.	Event	
1978	C.E.	-28	On 1 December, Dian Fossey learns that poaching has led to the killing of Digit, a gorilla that she has studied in her research on the nature of primates. Fossey begins an anti-poaching campaign in response to the killing of Digit. She is later murdered on 26 December 1985. Her work shows poaching	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			as an aspect of environmentalist thinking in the human-environment relationship.		
1978	C.E.	-28	The Boll Weevil Eradication Program (BWEP) is adopted in cotton-producing states in the American South. The BWEP is a human response to the damage that the boll weevil causes to cotton production in the American South.	Event	
1978	C.E.	-28	Excusive Economic Zones (EEZ's) are established. EEZ's allow for countries to control up to 200 miles away from their initial coastline. The development of EEZ's is especially crucial for the spread of fisheries and the political forces involved in this form of human-environment interaction.	Event	This date represents the late-1970s C.E., rounded up to the nearest year.
1978	C.E.	-28	William R. Catton and Riley E. Dunlap propose a 'new human ecology' which stresses the sociological aspects of the environment.	Idea	This date represents the late-1970s C.E., rounded up to the nearest year.

Sagebrush Interval: 1979 to 1987 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1979	C.E.	-29	Citizens to End Animal Suffering and Exploitation (CEASE) is established. CEASE is a nonprofit that addresses problems relating to the cruelty and exploitation of animals by humans.	Event	
1979	C.E.	-29	The U.S. Supreme Court case *Philadelphia vs. New Jersey* prevents a New Jersey law that would prohibit garbage imported from Philadelphia. This case is one example of how the U.S. Commerce Clause is used to address and control an interstate environmental problem.	Idea	
1979	C.E.	-29	The U.S. Supreme Court case *Hughes v. Oklahoma* prevents an Oklahoma law that would prohibit exporting minnows to preserve and protect the state's fish. *Hughes v. Oklahoma*, like *Philadelphia v. New Jersey*, shows how the interconnections of places, environmental problems, and the U.S. legal system combines to address interstate environmental issues. In both cases, commerce holds priority over environmental policies.	Idea	
1979	C.E.	-29	UNESCO introduces the concept of buffer zones for community-based conservation. Community-based conservation involves	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the interrelation between local peoples and conservation practices. Buffer zones allow for locals to continue traditional practices around a protected area. The success of these zones is questionable, but it does link multiple human-environment phenomena and prescribe a solution to the problem of conservation and the well-being of locals affected by the creation of parks and reserves.		
1979	C.E.	-29	The Federal Emergency Management Agency (FEMA) is established to mitigate disasters.	Event	
1979	C.E.	-29	F.F. Coppola films *Apocalypse now*. Coppola's film uses the jungle as a symbol of nature's mysterious aspects that confound humans living in the world.	Idea	
1979	C.E.	-29	The Bonn Convention on the Conservation of Migratory Species convenes. This convention results in a multilateral environmental agreement (MEA) about what humans should do in response to a particular environmental problem.	Idea	
1979	C.E.	-29	The U.N. Economic Commission for Europe (UNECE) Convention on Long-Range Transboundary Air Pollution convenes. This convention results in a multilateral	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmental agreement (MEA) about what humans should do in response to a particular environmental problem.		
1979	C.E.	-29	The first World Climate Conference gathers in Geneva. The World Climate Conference convenes and acts as the first multinational collaborative to address climatic change and human response.	Idea	
1979	C.E.	-29	Guinea-Bissau establishes its Ministry of Natural Resources. The Ministry of Natural Resources is a form of environmental governance that seeks to enforce regulations and laws regarding the environment.	Event	
1979	C.E.	-29	The Narmada Dam is constructed along the Narmada River in India to serve Shri Jawahar Lal Nehru's vision of a dammed river system on the country's major riverways. It's installation is protested by activists like Medha Patkar.	Event	
1979	C.E.	-29	China's one child policy is instituted to control population growth.	Idea	
1979	C.E.	-29	Basil Rossi writes *Recycling and non-waste technology*, which details many of the early recycling ideas that he developed during his time operating the Asian Recycling Association in Manila, the Philippines.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1979	C.E.	-29	The Sagebrush Rebellion Bill is passed in Nevada to review its public lands and advocate for more state control over resources. Assembly Bill 413, as it is formally called, introduces the idea of the Sagebrush Rebellion movement.	Idea	
1979	C.E.	-29	The World Health Organization (WHO) helps to eradicate the smallpox disease, with the last attack on a human in 1977 Somalia.	Event	
1979	C.E.	-29	Roger Hart publishes *Children's experience of place* as an important work on the environmental psychology and geographies of children.	Idea	
1979	C.E.	-29	The Convention on the Elimination of All Forms of Discrimination Against Women convenes.	Idea	
1979	C.E.	-29	Peirce Lewis provides a series of axioms for interpreting the landscape in his book chapter entitled "Axioms for reading the landscape."	Idea	
1979	C.E.	-29	Palimpsest, first used by Donald Meaning in *The interpretation of ordinary landscapes*, describes the multilayered semiotics, representations, and interactions of different cultures and practices in a place.	Idea	
1979	C.E.	-29	David Seamon publishes *Geography of the lifeworld*, a phenomenological	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			perspective on the human-environment relationship. One important idea is the "place ballet." The place ballet is the habitual orchestration of human and non-human activities that occur in and make up a place.		
1979	C.E.	-29	Around three million people die in the flooding events of Southern China.	Event	
1979	C.E.	-29	*The China syndrome*, a movie about a nuclear meltdown, airs just twelve days before the Three Mile Island nuclear accident.	Idea	
1979	C.E.	-29	The World Meteorological Organization (WMO) creates the World Climate Programme (WCP) to monitor and mitigate human-environment issues related to climate.	Event	
1979	C.E.	-29	Free-market liberalism expands in the political sectors of the United States and United Kingdom with the tenure of Ronald Reagan and Margaret Thatcher. The political initiatives seek to remove regulations on the economy and the environment. One important example of their policies comes with Reagan's hiring of James G. Watt as Secretary of the Interior and Anne M. Burford as the head of the Environmental Protection Agency (EPA).	Idea	The earlier date, 1979 C.E., is used over the later date, 1980 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1979	C.E.	-29	On 10 April, Wichita Falls, Texas endures $840 million worth of damage from a tornado outbreak.	Event	
1979	C.E.	-29	On 28 March, Three Mile Island experiences a 'loss-of-coolant' problem. The Three Mile Island nuclear plant's near-nuclear meltdown is an event which sticks in the minds of people who either hear about it or have been affected by it. Carolyn Merchant mentions the event in her book *The death of nature*. Merchant, an environmental historian, refers to the event as an example of the Earth becoming sick due to the rationalized, scientific, and patriarchal views of nature that have become prevalent in society.	Event	
1979	C.E.	-29	On 19 September, the Convention of European Wildlife and Natural Habitats is organized.	Idea	
1980	C.E.	-30	The Alaska National Interest Lands Conservation Act (ANILCA) is passed. ANILCA expands the amount of land in Alaska owned by the federal government. This area, which adds to the Arctic National Wildlife Refuge, designates huge regions of land as refuges managed as public realm.	Idea	
1980	C.E.	-30	Bahrain's government establishes the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Environmental Protection Committee and the Environmental Protection Technical Secretariat. The creation of these two agencies represents Bahrain's interest in creating legislation relating to the protection and conservation of natural resources. The organizations allow for more coordination with environmental enforcement.		
1980	C.E.	-30	The World Conservation Strategy is developed by the International Union for Conservation of Nature and Natural Resources. The strategy is presented as the first global plan on the conservation of resources and includes collaboration from leaders of various governments, non-governmental organizations, among others. It also introduces the idea of sustainable development.	Idea	
1980	C.E.	-30	Cuban provinces and municipalities receive similar, smaller-scale versions of the National Commission for Environmental Protection and the Rational Use of Natural Resources. Environmental governance takes a scalar turn from the national to the local within the municipalities and provinces of Cuba.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1980	C.E.	-30	Carolyn Merchant writes *The death of nature: Women, ecology and the Scientific Revolution*. Merchant's *The death of nature* posits that the organic vision of nature has died and been replaced by a mechanized nature.	Idea	
1980	C.E.	-30	The anarchic movement Earth First! begins. Earth First! is inspired by Aldo Leopold, Edward Abbey, and Rachel Carson. The group is dedicated toward the defense of the environment from human destruction.	Idea	
1980	C.E.	-30	The U.S. Supreme Court decides in *Diamond vs. Chakrabarty* that organisms can indeed be patented. This case is brought to the Supreme Court's attention because of Ananda Chakrabarty's attempts to patent a genetically modified organism beginning in 1972. The court's decision opens the commercial market up to patenting GMOs as intellectual property.	Idea	
1980	C.E.	-30	The Bayh-Dole Act is passed by U.S. Congress. The Bayh-Dole Act permits federally-funded research to be used in private industry. This act benefits the privatization and intellectual property rights associated with gene and gene technology licensing.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			This permissive form of human-environment interaction bridges the gap between universities and corporations.		
1980	C.E.	-30	Jordan creates its Department of Environment within the Ministry of Municipal, Rural and Environmental Affairs.	Event	
1980	C.E.	-30	*The gods must be crazy*, a film which takes place in Botswana and South Africa, is directed by Jamie Uys.	Idea	
1980	C.E.	-30	The *Winters vs. United States* case rules that water rights are given to public lands and American Indian reservations for specific purposes.	Idea	
1980	C.E.	-30	Mount St. Helens erupts in Washington State, causing an edifice collapse of the volcano.	Event	
1980	C.E.	-30	The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) convenes.	Idea	
1980	C.E.	-30	The Nurek dam, one of the world's tallest dams, is built in Tajikistan.	Event	
1980	C.E.	-30	People for the Ethical Treatment of Animals is established.	Event	
1980	C.E.	-30	Around 1,162,000 hectares of forest, 72,00 hectares of grassland, and a vast swath of wetlands are converted to farmland since 1700.	Event	
1980	C.E.	-30	Malaysia transitions from producing raw materials to industrial	Event	This date represents the core of the 1970s to the 1990s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			manufacturing of computers and electronics.		
1980	C.E.	-30	The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is passed by U.S. Congress. The CERCLA endows the federal government with the ability to give funding (Superfunds) to locate and clean up hazardous wastelands. In terms of human-environment interactions, this bill represents the point where toxic and derelict landscapes caused by humans becomes a political issue dealt by the federal government.	Idea	
1980	C.E.	-30	The Iran-Iraq war begins as a fight to seize control of oil resources.	Event	
1980	C.E.	-30	The United Nations declares the 1980s as the International Drinking Water Supply and Sanitation Decade.	Idea	
1980	C.E.	-30	In March, People for Ethical Treatment of Animals (PETA) is established. PETA is one of the numerous organizations dedicated toward the promotion of ethical animal treatment. The organization has become an influential political and social advocate for animal rights protection.	Event	
1981	C.E.	-31	Julian Simon publishes *The ultimate resource*. Simon's book takes an economist's perspective	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			on the issue of population growth, overconsumption, and the environment. Simon declares overpopulation to be a myth because humans are endowed with the capabilities of solving environmental problems.		
1981	C.E.	-31	Cuba passes the Environmental Protection and Rational Use of Natural Resources Act. The development of the capabilities for environmental governance culminates in the passage of this act.	Idea	
1981	C.E.	-31	Cheese becomes one of the first commercially-used products that use genetically modified organisms. Cheese production illustrates the impact that human modification of genes can have on market demands and on the environment.	Event	
1981	C.E.	-31	A *Der Spiegel* story brings to light the problems of acid rain on the degradation of Germany's forests. This story brings widespread attention to the effects of human-induced acid rain on the health of forested areas in Germany and elsewhere.	Idea	
1981	C.E.	-31	Lois Gibbs establishes the Citizens Clearinghouse for Hazardous Wastes (CCHW). The CCHW is a response to the hazardous waste dumping that caused	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the Love Canal disaster in New York. In 1997, the CCHW changes its name to the Center for Health, Environment, and Justice, a title which reflects its broader environmental campaigns.		
1981	C.E.	-31	The Great Barrier Reef becomes a UNESCO World Heritage Site. The Great Barrier Reef is a significant marine ecosystem which is extremely sensitive to human activities and environmental changes, such as acidification and ocean warming.	Event	
1981	C.E.	-31	A sinkhole, 1,000-foot in diameter, forms in Winter Park, Florida.	Event	
1981	C.E.	-31	Amartya Sen publishes *Poverty and famines* which argues that famine is more of a matter of access to food supply rather than a shortage of food. Sen makes the case that people are entitled to certain environmental rights, such as access to food. This idea spawns thinking in community-based natural resource management.	Idea	
1981	C.E.	-31	The Senegalese create their own environmental ministry to address issues of environmental governance within the African nation.	Event	
1981	C.E.	-31	The American Zoo and Aquarium Association (AZA) initiates Species Survival Plans (SSPs) to provide zoo-based solutions for preserving endangered species.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1981	C.E.	-31	Edward Relph introduces the concept of environmental humility, the idea that the human-environment relationship is both an ecological and existential issue in which non-human life and landscapes should be viewed with care. It is a receptive, unpretentious way of viewing the environment as it is.	Idea	
1981	C.E.	-31	Rolando V. Garcia criticizes the failure of the International Federation of Institutes for Advanced Study (IFIAS) to systematically investigate the human impacts on global drought and the food crisis of 1972. These ideas are published in two volumes: *Drought and man: Nature pleads not guilty* and *The constant catastrophe: Malnutrition, famines and drought*.	Idea	
1981	C.E.	-31	The term 'xeriscaping' is coined by the Denver Water Department.	Idea	
1981	C.E.	-31	The decline in Canada's cod stocks becomes a noticeable problem.	Event	
1981	C.E.	-31	The IBM personal computer is introduced to the public.	Event	
1981	C.E.	-31	Environmental policies begin to influence international and domestic trade during the time range between 1971 and 1991 C.E.	Event	This date represents the core of the time range from 1971 to 1991 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1981	C.E.	-31	On 5 June, the first cases of the AIDS virus are observed in the United States after a report from the U.S. Centers for Disease Control and Prevention. The AIDS virus is the product of an embodied human-environment relationship.	Event	
1982	C.E.	-32	Bat Conservation International is established. Bat Conservation International is an organization dedicated toward the preservation of bats in the world. It reflects the values and attitudes of people in the contribution of bats to healthy ecosystems.	Event	
1982	C.E.	-32	Ecological modernization emerges as a school of thought. Joseph Huber and others provide initial contributions around this time. Ecological modernization examines the responses of institutions to problems posed by human interaction with the environment. It is often viewed as an improved and critical articulation of sustainable development. It accepts technology and industry as inevitable aspects of the modern world. Ecological modernization also conceives that economic success can be achieved while also protecting the environment. It holds that environmental	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			policy regulations may aid in the relationship between the environment and economy.		
1982	C.E.	-32	Coastal erosion leads to the loss of hundreds of dwellings in Grand Popo and Finagnon, Benin. About twenty meters of coast are lost annually in Benin. The 1982 event represents the environmental connection to hazards against habitations.	Event	
1982	C.E.	-32	David Brower establishes the Earth Island Institute (EII). The EII facilitates projects relating to conservation and environmentalism, including rainforest protection, reducing pollution, and advocating for sustainable agricultural practices.	Event	
1982	C.E.	-32	The United Nations Convention of the Law of the Sea (Law of the Sea Treaty) occurs and is applied in 1994. The Law of the Sea Treaty delineates a buffer of 200-350 nautical miles for coastal countries. This treaty is a form of governance which limits oceanic activities and ownership to certain political entities according to proximity to the coastline.	Idea	
1982	C.E.	-32	Murray Bookchin publishes *The ecology of freedom*. Bookchin's *The ecology of freedom* seeks to develop and expand upon the theory of social ecology,	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			which examines the ways in which social structures and human domination of the environment produce environmental crises. The book argues for the dismantling and replacement of current societal structures.		
1982	C.E.	-32	The Minerals Management Service is created. The U.S. Minerals Management Service addresses the issue of managing revenue from ore and mineral mining and enforces regulations on offshore drilling sites along the continental shelf.	Event	
1982	C.E.	-32	Protests occur over the proposal of a hazardous waste landfill for polychlorinated biphenyls (PCB)-contaminated soil in Warren County. Warren County is predominantly African American. This event is an example of activism against environmental racism.	Event	
1982	C.E.	-32	Terri Nash films *If you love this planet*. This movie is an example of the 'Era of Controversies' in nature film. The United States Supreme Court reserves the right to call this movie and others 'political propaganda'.	Idea	
1982	C.E.	-32	George Mully films *Acid from heaven*. This movie is an example of the 'Era of Controversies' in nature film.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1982	C.E.	-32	Seaton Findlay films *Acid rain: Requiem or recovery?*. This movie is an example of the 'Era of Controversies' in nature film.	Idea	
1982	C.E.	-32	Pharmaceutical companies and researchers begin to apply genetically modified organisms at an industrial level, through such products as insulin. 1982 is the time when the U.S. Department of Agriculture supports the use of GMOs to produce human insulin, an example of genetic-level human-environment interaction. In 1987, the Chakrabarty decision is expanded to include the patenting of animals, except for humans (outlined in the 13th Amendment).	Event	
1982	C.E.	-32	The World Charter for Nature upholds the precautionary principle as one important form of human-environment decision-making.	Idea	
1982	C.E.	-32	Vandana Shiva founds the Research Foundation for Science, Technology, and Ecology in Dehradun, India, which addresses environmental issues between global and local interests and practices.	Event	
1982	C.E.	-32	Morris King Udall helps to pass the Southern Arizona Water Rights Settlement Act, which helps to establish the	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			water rights of Indian Nations in the U.S.		
1982	C.E.	-32	David Harvey writes *Limits to capital*, which expands upon his ideas regarding the place of nature within the context of capitalism. In here, Harvey expands on the "spatial fix" concept, which he first coined in a 1975 *Antipode* article entitled, "The geography of capitalist accumulation: A reconstruction of the Marxian theory." a spatial fix is a way to describe how capitalist structures avoid high labor wages by staging and investing production (grounding capital) in different places with lower wages, such as the Global South.	Idea	
1982	C.E.	-32	U.S. Congress passes the Nuclear Waste Policy Act.	Idea	
1982	C.E.	-32	The World Resources Institute is established.	Event	
1982	C.E.	-32	Galen Cranz writes *The politics of park design. A history of urban parks in America* as a history of landscape architecture in the United States.	Idea	
1982	C.E.	-32	El Chichon erupts causing a global surface cooling over the period of around three years.	Event	
1982	C.E.	-32	Jimmy Carter authorizes the *Global 2000 report to the President* which details many of the ongoing environmental	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			problems happening around the world.		
1982	C.E.	-32	Co-op America is established.	Event	
1982	C.E.	-32	Times Beach, Missouri is evacuated due to dioxin pollution.	Event	
1982	C.E.	-32	The King Mahendra Trust for Nature Conservation in Nepal is created to protect endangered and endemic species.	Event	
1982	C.E.	-32	Borneo suffers the burning of around 4 million hectares of rainforest due to the El Niño event, with 2 million more burned in 1997 to 1998.	Event	The earlier date, 1982 C.E., is used over the later date, 1983 C.E.
1983	C.E.	-33	The International Tropical Timber Agreement (ITTA) is formed from a collection of members of the tropical timber industry and conservationists. The Agreement fosters closer ties between tropical timber and environmental values. Another updated ITTA is signed in 1994 and applied in 1997.	Idea	
1983	C.E.	-33	Bob Brown and 1500 people are arrested for protesting the Franklin River Dam. Bob Brown is a prominent Australian Green Party politician and environmental activist. After his incarceration for protesting the Franklin River Dam, he goes on to be elected as a member of the Tasmanian House of Assembly. This is an example of an Australian activist	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			integrating environmental values into the political system.		
1983	C.E.	-33	William Cronon publishes *Changes in the land: Indians, colonists and the ecology of New England*. In this book, Cronon draws important contrasts in human-environment interaction between the European colonists and the Native Americans. He contradicts earlier perspectives by arguing that European farms did more to transform the environment by clearing forests, leeching the soil, and redirecting waterways.	Idea	
1983	C.E.	-33	The Save Our Everglades program begins. The Save Our Everglades program advocates for the protection of the Florida Everglades, an example of human mobilization to put forth standards for human-environment interaction.	Event	
1983	C.E.	-33	Indonesia experiences a major destruction of forests due to a massive fire in the Kalimantan Timur Province.	Event	
1983	C.E.	-33	The California Supreme Court decides in *National Audubon Society vs. Superior Court of Alpine County* that Los Angeles violated the public trust doctrine by damaging Mono Lake through upstream diversions by the city.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1983	C.E.	-33	Senegal passes the Code de l'Environnment which gets updated in 2000.	Idea	
1983	C.E.	-33	Tanzania authorizes the National Environment Council Act to create and enforce environmental policy within the country.	Idea	
1983	C.E.	-33	Members of the European Union ratify the Common Fisheries Policy to implement sustainable fisheries regulations.	Idea	
1983	C.E.	-33	*The day after* is a movie about the nuclear holocaust.	Idea	
1983	C.E.	-33	*Silkwood* is a movie depicting the effects of nuclear radiation.	Idea	
1984	C.E.	-34	Yosemite National Park is declared a World Heritage Site by the United Nations Educational, Scientific and Cultural Organization (UNESCO).	Event	
1984	C.E.	-34	Adaptive management is proposed by Kai N. Lee in the Northwest Power Planning Council. Adaptive management provides a useful framework for designing policy related to the intersections of environment and society from a scientific and applied perspective. To Kai N. Lee, adaptive management acts as a scientifically-guided compass to orient the management of resources, particularly in the United States. Adaptive management	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			later expands to a variety of ways of responding to issues relating to complex socio-environmental issues from a policy standpoint.		
1984	C.E.	-34	E.O. Wilson introduces his biophilia hypothesis. Biophilia is an idea which holds that humans have evolved the capacity to have affection and concern for their environment.	Idea	
1984	C.E.	-34	The overturning of Lake Monoun overturns and claims 37 lives.	Event	
1984	C.E.	-34	The Ok Tedi mine in Papua New Guinea is opened to become one of the world's largest copper mines.	Event	
1984	C.E.	-34	Neil Smith publishes *Uneven development* which examines uneven geographical development (UGD) and production of nature (denaturalizing) in capitalist society.	Idea	
1984	C.E.	-34	Morris King Udall helps to pass the Arizona Wilderness Act, which claims around 1.5 million acres of wilderness land in the state.	Idea	
1984	C.E.	-34	The Worldwatch Institute publishes *State of the world*, an important text for environmental policy-making and globally-conscious citizenship.	Idea	
1984	C.E.	-34	Cutler Cleveland and colleagues introduce the idea of energy return on investment (EROI) in "Energy and	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the US economy: A biophysical perspective." EROI is a way of calculating the amount of energy that is used to produce an energy resource versus the energy that the product creates.		
1984	C.E.	-34	Ann Spirn writes *The granite garden* which necessitates the role of the landscape architect in urban design.	Idea	
1984	C.E.	-34	National Toxics Campaign is established.	Event	
1984	C.E.	-34	The Mexico World Population Conference emphasizes the importance of family planning to control human population growth.	Idea	
1984	C.E.	-34	Ivory makes a comeback as a way for the Japanese to show off their wealth. The demand for ivory by the Japanese upper-class cuts the African elephant population by almost one-half, from 1,300,000 to 750,000. The fetishization of ivory by the wealthy leads to an enormous impact on the elephant species.	Event	This date represents the core of the time range from 1979 to 1989 C.E.
1984	C.E.	-34	Richard Leakey uncovers the Turkana Boy (a mostly complete *Homo erectus* skeleton) and the WT17000 skull of *Australopithecus aethiopicus*.	Event	The earlier date, 1984 C.E., is used over the later date, 1985 C.E.
1984	C.E.	-34	On 5 May, the Itiapu Dam begins to generate electricity. The massive Itiapu Dam, one of the Seven	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Wonders of the World, starts to convert hydropower into electricity. The event illuminates the connections between the natural systems, resource use, and human transformation of the environment. Dams especially influence the rate and timing of seasonal floods in a watershed.		
1984	C.E.	-34	Mali endures a severe drought.	Event	The earlier date, 1984 C.E., is used over the later date, 1985 C.E.
1984	C.E.	-34	A 'modern media' famine occurs in Ethiopia. The Great African Famine leads to at least 300,000 deaths within the country.	Event	The earlier date, 1984 C.E., is used over the later date, 1985 C.E.
1984	C.E.	-34	On 3 December, the Bhopal gas tragedy occurs. The Union Carbide pesticide plant leads methyl isocyanate (MIC) into the atmosphere, which causes 2,000 mortalities and 300,000 injuries in Bhopal, India. There are multiple reasons for why this tragedy transpired. However, faulty engineering and safety standards represent the main causes. This event leads to a settlement between Union Carbide and India. For the most part, those affected by the disaster receive little, if any, compensation. This industrial disaster, one of the world's worst, sparks conversation about the hazardous	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			problems associated with the chemical industry. Such talks have led to the creation of the Responsible Care Program of the Chemical Manufacturing Association.		
1985	C.E.	-35	The Bucharest Declaration is passed. The Bucharest Declaration is an agreement among six countries that have access and use of the Danube River. It calls for environmental regulations to mitigate issues of pollution, river-use, habitat protection, and conservation.	Idea	
1985	C.E.	-35	The passage of the Farm Security Act results in the creation of the Conservation Reserve Program. It advocates for a set-aside scheme of reserving certain swaths of agricultural land to resist soil erosion, maintain wildlife, and protect water bodies. The Conservation Reserve Program facilitates land and soil conservation and sustainability by encouraging agriculturalists to set aside land for 10 to 15 years to preserve highly erodible soils. It is a prescription to introduce conservation practices in agriculture.	Idea	
1985	C.E.	-35	Devall and Sessions publish *Deep ecology: Living as if nature mattered* which	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			facilitates a conversation about the nature of deep ecology. The concept of deep ecology does not gain much consideration until Devall and Sessions' book. As a result, deep ecology becomes a subject of study and debate.		
1985	C.E.	-35	Dave Foreman publishes "Ecodefense: A field guide to monkey wrenching". Foreman, a co-founder of Earth First!, composes an instructive guide to ecotage, or acts of sabotage dedicated toward the protection of the environment.	Idea	
1985	C.E.	-35	Dennis O'Rourke films *Half life: A parable for the Nuclear Age*. O'Rourke's film is a warning of the environmental and societal problems caused by nuclear research.	Idea	
1985	C.E.	-35	Claude Lanzmann films *Shoah*. Lanzmann's documentary focuses on memory and the Holocaust. It explores the places where the concentration camps, once filled with prisoners, are discarded and taken over by the forest. It is a solemn example of how human memories fade away and are disregarded in the landscape.	Idea	
1985	C.E.	-35	The Ganges Action Plan is implemented to address the problems of intense pollution of the Ganges River. One	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			of the proposals is to produce treatment plants for solid waste to accommodate the vast quantities of sewage in the water. It is a political prescription for the environmental problems that humans have caused to the river.		
1985	C.E.	-35	The Vienna Convention for the Protection of the Ozone Layer convenes. This convention results in a multilateral environmental agreement (MEA) about what humans should do in response to a particular environmental problem.	Idea	
1985	C.E.	-35	Mexico City experiences a massive 'Ring of Fire' earthquake.	Event	
1985	C.E.	-35	James C. Scott publishes *Weapons of the weak*, which details the emergence of the agrarian capitalist class in Malaysia. The book examines how peasants are marginalized and are capable of forms of resistance.	Idea	
1985	C.E.	-35	Thailand builds fish farms to meet the global shrimp-flavored sauces.	Event	
1985	C.E.	-35	To mitigate leaks and environmental pollution, U.S. Congress demands that all underground storage tanks and piping be protected in some way.	Event	
1985	C.E.	-35	U.S. Congress proposes a	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			"Coordinated Framework" which seeks to regulate genetically engineered organisms (GEOs) through the cooperation of the Food and Drug Administration, Environmental Protection Agency, and the Department of Agriculture's Animal and Plant Health Inspection Service.		
1985	C.E.	-35	Piers Blaikie's book, *The political economy of soil erosion in developing countries* helps form the basis for contemporary political ecology.	Idea	
1985	C.E.	-35	Piers Blaikie and Harold Brookfield co-author *Land degradation and society*, a key text in the beginnings of political ecology.	Idea	
1985	C.E.	-35	Donna Haraway publishes "A cyborg manifesto."	Idea	
1985	C.E.	-35	Case 7615 in Brazil is a multi-national case involving the human rights violations of the Yanomamis by pollution of their water sources.	Idea	
1985	C.E.	-35	The Brazilian Landless Workers' Movement (Movimento Sem terra) is founded in Cascavel with the intention of reforming land use in the country by occupying underused or uncultivated land.	Idea	
1985	C.E.	-35	Nevado del Ruiz in Colombia erupts, resulting in 23,000 deaths.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1985	C.E.	-35	Ian Bentley and colleagues come up with the design principles needed for a responsive environment in *Responsive environments*.	Idea	
1985	C.E.	-35	India establishes the National Wastelands Development Board (NWDB) to promote tree growing in the countries unused or degraded areas.	Event	
1985	C.E.	-35	Rainforest Action Network established.	Event	
1985	C.E.	-35	The Conservation Fund established.	Event	
1985	C.E.	-35	A meeting is held in Villach, Austria announces the problems of anthropogenic climate change and sets the precedent for the Intergovernmental Panel on Climate Change (IPCC).	Idea	
1985	C.E.	-35	A hole in the ozone layer over Antarctica is observed.	Event	
1985	C.E.	-35	AT&T creates a fiber optic cable that can field 300,000 phone calls at once.	Event	
1985	C.E.	-35	From 1965 to 1985, twenty-eight environmental laws are established in Costa Rica. This remarkable series of environmental laws puts Costa Rica in the limelight as a model for environmentally-conscious, sustainable governance. Costa Rica effectively becomes an idealization of the	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			human-environment relationship.		
1985	C.E.	-35	Mali bans burning for the sake of fire suppression and conserving forests. The banning of burns in forests embodies an alternative to the paradigm shift of controlled burns in the Global North.	Event	This date represents the core of the 1980s C.E.
1985	C.E.	-35	During the 1980s, the Blue Revolution goes into full effect as aquaculture grows and expands. The Blue Revolution idea comes from the Green Revolution and represents the global expansion and intensification of fish production.	Event	This date represents the core of the 1980s C.E.
1985	C.E.	-35	During the 1980s, ecotourism gains prominence in the Costa Rican economy. Ecotourism, or environmentally-based tourism, becomes a significant component of Costa Rica's economy and public image. In terms of the human-environment relationship, ecotourism creates a complex intersection of market-based environmentalism, idealized images of place, and issues relating to governance.	Event	This date represents the core of the 1980s C.E.
1985	C.E.	-35	During the 1980s, decreasing the intensification of agriculture becomes popular as people become more interested in the quality of food and organic,	Idea	This date represents the core of the 1980s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			sustainable approaches to farming.		
1985	C.E.	-35	Live Aid convenes in July. Live Aid is a concert dedicated toward raising funds for helping alleviate starvation in the famine-induced country of Ethiopia. This concert calls attention to the problems of starvation in the Global South and raises money to assist in mitigating the famine in Ethiopia.	Event	
1985	C.E.	-35	Extractive reserves begin to be implemented in the Amazon of Brazil after the National Council of Rubber Tappers and Rural Workers Union. Extractive reserves become politically instituted by Brazil in 1990. Extractive reserves emphasize a community-based form of conservation rather than the greenlining and displacement of local populations for the sake of environmental preservation.	Idea	
1986	C.E.	-36	The Slow Food Movement calls to attention the problems of fast food corporations like McDonald's.	Idea	
1986	C.E.	-36	Mad cow' disease, or Bovine Spongiform Encephalopathy, is discovered by authorities in the United Kingdom. Mad cow disease represents how humans affect and are affected by the resources in their	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			surroundings. In this case, the human use of cattle ultimately quickens the spread of mad cow disease among cows and humans alike.		
1986	C.E.	-36	The U.S. Supreme Court case *Maine v. Taylor* successfully rules that Maine can prevent imports of baitfish that may contain harmful parasites. The *Maine v. Taylor* decision is an example of how commerce and environmental legislation come together when addressing interstate socio-environmental problems. In other cases, commerce may be prioritized over the environment. However, the *Maine v. Taylor* ruling is an exception.	Idea	
1986	C.E.	-36	U.S. Congress passes the Superfund Amendments and Reauthorization Act (SARA). The SARA augments the Superfund trust to $8.5 billion, as well as require industries to disclose chemical uses to the public. This political prescription is a way to make one negative form of human-environment interaction more manageable and transparent.	Idea	
1986	C.E.	-36	Robert O'Neill and colleagues publish *A hierarchical concept of ecosystems*. The book argues that an	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			ecosystem comprises of a series of relationships that occur at different spatial and temporal scales.		
1986	C.E.	-36	The Nampho Dam is completed in North Korea. The Nampho Dam represents one of the world's largest flood-prevention dams. Located in North Korea, the infrastructure is placed to control flooding and allow for controlled irrigation and the separation of salt and fresh water.	Event	
1986	C.E.	-36	The International Geosphere-Biosphere Program (IGBP) is established by the International Council of Scientific Unions (ICSU). In 1994, it collaborates with the International Human Dimensions Programme (IHDP) on Global Environmental Change to understand the dynamics of land use and cover change (LUCC). The IGBP is a key organization of interdisciplinary research that has helped to develop global environmental change as an area of study, especially for human-environment interaction.	Event	
1986	C.E.	-36	Jordan develops the National Environment Action Plan.	Idea	
1986	C.E.	-36	Th U.S. Emergency Planning and Community Right-to-Know Act begins the toxics release inventory (TRI) for industrial	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			pollution within the country.		
1986	C.E.	-36	U.S. Congress orders that all the country's chemical weapons be destroyed.	Event	
1986	C.E.	-36	El Salvador experiences a massive earthquake.	Event	
1986	C.E.	-36	The Declaration on the Right to Development is proposed by the United Nations.	Idea	
1986	C.E.	-36	The International Atomic Energy Agency (IAEA) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency transpires.	Idea	
1986	C.E.	-36	The International Atomic Energy Agency (IAEA) Convention on Early Notification of a Nuclear Accident gathers.	Idea	
1986	C.E.	-36	Lithuania's Green Movement begins to form.	Idea	
1986	C.E.	-36	The Rainforest Alliance is established.	Event	
1986	C.E.	-36	A moratorium on commercial whaling is put in place after being passed by the International Whaling Commission in 1982. In 1993, Norway ends up rejecting the proposition and returns to its commercial whaling practices.	Event	
1986	C.E.	-36	In August, the overturning of Lake Nyos in Cameroon kills 1,800 individuals.	Event	
1986	C.E.	-36	On 31 December, the overshoot of the sustainable ecological footprint occurs in the world, causing the	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			world's first overshoot day.		
1986	C.E.	-36	On 21 February, the French SPOT-1 satellite becomes the first one of its kind to integrate multispectral and panchromatic sensors to examine the Earth surface.	Event	
1986	C.E.	-36	On 26 April, the Chernobyl power plant explodes. The explosion of the Chernobyl power plant in the Ukraine leads to the permanent evacuation of around 135,000 people. In the years following the event, radioactive content continues to travel across the continent, showing the long-term effects of human impacts on the environment through energy use. The results also lead to carcinogenic problems among the people exposed to the explosion.	Event	

Sustainability Transition: 1987 to 1992 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1987	C.E.	-37	The Montreal Protocol on Substances that Deplete the Ozone Layer is made available for signing. The Montreal Protocol is a significant agreement about curbing the use of chemicals and resources that are believed to deplete the ozone layer of the atmosphere.	Idea	
1987	C.E.	-37	The International League of Doctors for the Abolition of Vivisection (ILDAV) is established. ILDAV, also known as LIMAV, is founded in Switzerland to abolish animal experimentation as a method for preventing and treating human diseases.	Event	
1987	C.E.	-37	The Cairo Guidelines on Waste Trading are developed. The document provides applicable solutions for managing hazardous wastes and is ratified by the Basel Convention.	Idea	
1987	C.E.	-37	*Our common future*, or the Brundtland Report, is published by the World Commission on Environment and Development (WCED). *Our common future* advances the idea of sustainable development as a plan to reconcile current needs with the livelihoods of future generations.	Idea	
1987	C.E.	-37	The first debt-for-nature swap occurs in Bolivia. Bolivia is forgiven of its $650,000 by Conservation International in exchange for promoting	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			conservation projects within the country.		
1987	C.E.	-37	Denmark creates the Plan for the Aquatic Environment, which responds to problems of water quality from pollution by sectors like agriculture.	Idea	
1987	C.E.	-37	The report *Toxic waste and race in the United States* is written. This report represents the first American study of the connection between hazardous waste dumping and race. It is conducted by Dr. Benjamin F. Chavis, Jr. and the United Church of Christ Commission on Racial Justice (UCCCRJ).	Idea	
1987	C.E.	-37	The Florida Surface Water Improvement and Management Act is passed to improve water quality in the state's watershed management districts.	Idea	
1987	C.E.	-37	Peter Watkins films *The journey*, a 15-hour documentary on the environmental hazards of nuclear testing.	Idea	
1987	C.E.	-37	Mongolia establishes its Ministry of Environmental Protection.	Event	
1987	C.E.	-37	U.S. Congress authorizes the creation of monitored retrievable storage facilities to temporarily harbor nuclear waste, via the Nuclear Waste Policy Act. The legislation also increases interest in Yucca Mountain as an underground nuclear waste site.	Idea	
1987	C.E.	-37	Nepal passes the Wild Life Conservation Act.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1987	C.E.	-37	The Chesapeake Bay Agreement is adopted to reduce nitrogen and phosphorous levels by 40 percent by 2000.	Idea	
1987	C.E.	-37	The Society for Ecological Restoration is founded to address the study of restoration ecology.	Event	
1987	C.E.	-37	The Union of Concerned Scientists publishes *The risks of nuclear power*, which influences changes in the federal government's policy and practice toward the management and safety of nuclear technology.	Idea	
1987	C.E.	-37	The Mountain States Legal Foundation becomes a stable organization for the Wise Use Movement. One of its policy issues includes allowing motorized off-road vehicles on public lands.	Event	
1987	C.E.	-37	Heroin becomes mass produced and widespread.	Event	
1987	C.E.	-37	The first meeting of the Society for Conservation Biology meets at Montana State University.	Event	
1987	C.E.	-37	In *The Modern urban landscape*, Edward Relph shows how the forces of technology, planning, architecture, and society interact to create cities.	Idea	
1987	C.E.	-37	Irrigation diversion and evaporation causes the Aral Sea to shrink to two smaller lakes: the Small Sea and the Large Sea.	Event	
1987	C.E.	-37	Conservation International is established.	Event	
1987	C.E.	-37	A barge with Long Island garbage travels to four	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			foreign countries in search of a place to dump the community's solid waste and is turned away after 164 days at sea.		
1987	C.E.	-37	Deborah E. Popper and Frank J. Popper introduce the idea of the Buffalo Commons in a *Planning* article entitled "Great Plains: From dust to dust."	Idea	
1988	C.E.	-38	The Intergovernmental Panel on Climate Change (IPCC) begins to form. The IPCC is a coalition of scientists and leaders who are interested in understanding the causes of climate change and how to mitigate it. The IPCC later recognizes that humans have unequivocally altered the Earth's global climate.	Event	
1988	C.E.	-38	Rubber tapper Chico Mendes is murdered, bringing international attention to human rights abuses and the destruction of forest biomes in the Amazon. This event causes people worldwide to consider the detrimental effects of economic development in the Amazon.	Event	
1988	C.E.	-38	Liberia creates the Division of Wildlife and National Parks through its Wildlife and National Parks Act.	Idea	
1988	C.E.	-38	Madagascar adopts a National Environmental Plan to promote sustainability.	Idea	
1988	C.E.	-38	James O'Connor expands upon Karl Marx's ideas about capitalism by arguing that contemporary environmental crises have	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			stemmed from treating nature as a marketable product. The self-destructive exploitation of nature results in the second contradiction of capitalism.		
1988	C.E.	-38	The California Clean Air Act is passed, mirroring the federal Clean Air Act at the state level.	Idea	
1988	C.E.	-38	Wildfires destroy half of Yellowstone National Park, a phenomenon which challenges the weaknesses and hazards of the fire suppression policies in place.	Event	
1988	C.E.	-38	Zebra mussels, an invasive species for hydrological ecosystems, move from Europe into the Americas. They are discovered in Lake St. Clair.	Event	
1988	C.E.	-38	William Bunge publishes *The nuclear war atlas*, which is a critical geographic interpretation of nuclear weaponization.	Idea	
1988	C.E.	-38	The American Convention on Human Rights in the Area of Economic, Social, & Cultural Rights convenes.	Idea	
1988	C.E.	-38	The European Union begins to adopt the "set aside scheme." The set-aside scheme is a form of environmental management that reserves agricultural landscapes so that they can be rehabilitated to resist soil erosion, maintain wildlife, and protect water bodies.	Idea	
1988	C.E.	-38	The South African Share Block Control Act of 1980 is amended to make it easier to acquire land	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			for game ranching and recreation.		
1988	C.E.	-38	India develops its Forest Policy of 1988 to advocate for joint-forest management in the country.	Idea	
1988	C.E.	-38	AT&T creates Trans-Atlantic Telecommunications (TAT-8), the world's first transoceanic fiber optic cable.	Event	
1988	C.E.	-38	The Toronto Conference on the Changing Atmosphere gathers to call for the cutting of emissions and develop a framework for the law of the atmosphere.	Idea	
1988	C.E.	-38	The U.N. General Assembly declares climate change a concern for humankind.	Idea	
1988	C.E.	-38	The Convention on Regulation of Antarctic Mineral Resource Activities occurs.	Idea	
1988	C.E.	-38	*Akira*, a film by Katsuhiro Otomo, delivers a story of cataclysmic environmental change.	Idea	
1988	C.E.	-38	In August, the Wise Use Movement gathers for a Multiple Use Strategy Conference in Reno, Nevada, resulting in Alan Gottlieb's *The wise use agenda.*	Idea	
1988	C.E.	-38	An earthquake forces the closing of the Armenian Metsamor nuclear power plant. An earthquake causes great damage to the Metsamor nuclear power plant. Eventually, to the detriment of many environmentalists, the plant is reopened.	Event	
1989	C.E.	-39	The International Coffee Agreement is developed.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			The International Coffee Agreement is a Cold War-based pact that causes unpredictable market prices for coffee producers. It is an example of how broader political and economic forces (*i.e.*, Cold War) influence the human-environment relationship in certain regions and markets, like places that cultivate, process, and sell coffee.		
1989	C.E.	-39	The Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) begins in Zimbabwe. CAMPFIRE allows for local indigenous groups in Zimbabwe to own land and utilize natural resources in exchange for promoting environmental protection.	Event	
1989	C.E.	-39	The Costa Rican National Institute of Biodiversity forms. The Costa Rican National Institute of Biodiversity becomes an influential organization in the management of practices relating to biodiversity conservation. The group is also controversially known for its connections to large pharmaceutical bioprospectors.	Event	
1989	C.E.	-39	Bill McKibben writes *The end of nature*, which holds that humans have destroyed idealized conceptions of nature by transforming the environment through industry and technologies.	Idea	
1989	C.E.	-39	John Javna, Sophie Javna, and Jesse Javna write *50 simple things*	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			you can do to save the Earth. This book represents one of the numerous publications to arise in the 80s and 90s that address the idea of green consumerism, or an environmentalist ethic of purchasing, producing, and consuming products.		
1989	C.E.	-39	Ramachandra Guha publishes *The unquiet woods: Ecological change and peasant resistance in the Himalaya*. Guha's book gives a history of Himalayan forests along with the environmentalist Chipko movement. It vividly illustrates the oft-contested relationship among peasant politics, society, and ecology.	Idea	
1989	C.E.	-39	Ramachandra Guha publishes "Radical American environmentalism and wilderness preservation." This essay challenges the imperialist idea of forcing Global North conservation agendas on Global South countries, which has created numerous problems in the more marginalized areas.	Idea	
1989	C.E.	-39	Lesotho passes its National Environmental Plan to promote sustainable development.	Idea	
1989	C.E.	-39	Mauritius establishes the Ministry of the Environment and the Department of Environment.	Event	
1989	C.E.	-39	Vandana Shiva writes *Staying alive: Women, ecology and development* as an ecofeminist exploration of women and nature.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1989	C.E.	-39	The U.N. Convention of the Rights of the Child convenes.	Idea	
1989	C.E.	-39	Robert Ayres and colleagues coin the term "industrial metabolism" in *Industrial metabolism, the environment, and application of materials-balance principles for selected chemicals*. Industrial metabolism is an analogy which compares industrial processes and the functions of a living organism. The materials-balance perspective is an idea promoted in environmental economics that recognizes the dependence of the economic system on ecosystems and their interrelated interactions of plants and animals.	Idea	
1989	C.E.	-39	The Climate Action Network forms to address institutional and individual approaches to climate change mitigation.	Event	
1989	C.E.	-39	Hepatitis C is discovered.	Event	
1989	C.E.	-39	Prior informed consent (PIC) becomes a requirement for exporters in the shipment of hazardous chemicals. It is adopted by the Food and Agriculture Organization (FAO) and the United Nations Environment Programme (UNEP).	Idea	
1989	C.E.	-39	More than 500 nuclear tests affect the area around Semipalatinsk (Semey) in Kazakhstan from 1945 to 1989 C.E.	Event	
1989	C.E.	-39	James Andreoni coins the "warm glow effect" in "Giving with impure	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			altruism: Applications to charity and Ricardian equivalence," published in the *Journal of Political Economy*. The warm-glow effect connects to the feeling of satisfaction in purchasing some type of good from the environmental good, such as endangered species protection, carbon credit, and wilderness areas, among others. It has been a way of critiquing the relation between consumerism and environmentalism.		
1989	C.E.	-39	Andy Clark develops the 007 Principle in *Microcognition: Philosophy, cognitive science, and parallel distributed processing*. The 007 principle holds that complex animals use cues in the environment as ways of understanding their relationship to it, rather than performing the costly task of storing all environmental information.	Idea	
1989	C.E.	-39	On 25 April, a tornado in Bangladesh kills around 1,300 people.	Event	
1989	C.E.	-39	In January, *Time* magazine calls the endangered Earth as its "Person of the Year."	Idea	
1989	C.E.	-39	On 24 March, the *Exxon-Valdez* oil spill occurs in Prince William Sound off the Alaskan coast. More than 11 million gallons of oil leaks from the Exxon-Valdez, leading to $43 million in economic damages. The event results in the passing of the Oil Pollution Act which placed strict	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			regulations for oil tankers.		
1989	C.E.	-39	On 17 October, the Loma Prieta earthquake devastates San Francisco. An elevated freeway in Oakland collapses during this 1989 earthquake, an example of the effects that a natural disaster has on the humanized built landscape.	Event	
1989	C.E.	-39	In September, the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) bans international trade of ivory and other sought-after elephant products. The international ivory ban is created due to the interplay of political and environmental discourses. Later, ivory becomes associated with political discourses on terrorism as well as negative human impacts on biodiversity.	Idea	
1989	C.E.	-39	On 22 March, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal is adopted as the first international agreement on the global management of hazardous waste. The goal of the convention is to establish a framework for more effective and ethical management, reduction, and transportation of hazardous waste internationally. Hazardous waste is identified by the Basel Convention as a global political issue for human-environment interactions.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			The convention does not go into full effect until 20 countries ratify it on 5 May 1992.		
1990	C.E.	-40	The Human Genome Project is established and is completed by 2000. The Human Genome Project seeks to understand the human body's 20-25 thousand genes. The U.S. Department of Energy and the National Institutes of Health (NIH) contributes $3 billion toward the project.	Event	
1990	C.E.	-40	In its first assessment report, the Intergovernmental Panel on Climate Change (IPCC) make the point that global climatic change threatens the environment, and that humans are the likely cause. The IPCC progresses in its understanding of climatic change, global warming, and human impacts on the phenomenon.	Idea	
1990	C.E.	-40	The Constitution of Benin is altered to include responsibilities for ensuring a sustainable environment. This change to Benin's Constitution is a political discourse which adopts environmentalist rhetoric in important legislation.	Idea	
1990	C.E.	-40	Daniel B. Botkin publishes *Discordant harmonies: A new ecology for the 21st century*. Botkin's book depicts a shift in ecological thinking from the balance of nature paradigm to the theory of disequilibrium. Botkin also challenges	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			conventional ideas of environmental management, demonstrating that not all environmental management achieves desirable outcomes.		
1990	C.E.	-40	The Acid Rain Program is created through the Clean Air Act. The Acid Rain Program illustrates how carbon trading, a proposal to reduce emissions that change the climate, is implemented. It seeks to put a cap on power plants' emissions of sulphur dioxide and provide resources for new technologies that emit less of the gas.	Event	
1990	C.E.	-40	The Clean Air Act is amended to include new standards for air quality, emissions from vehicles, acid rain, smog, the depletion of the ozone, among others. Among these, the act establishes the phaseout of the use of chlorofluorocarbons in the atmosphere. Today, the relatively safer hydrochlorofluorocarbons (HFCs) and hydrofluorocarbons (HFCs) are more widespread. It advocates for market-based environmental regulation through the creation of the Acid Rain Control Program.	Idea	
1990	C.E.	-40	Cuba creates the Ministry of Science, Technology, and the Environment, a government agency charged with deploying and enforcing environmental policies within the country.	Event	
1990	C.E.	-40	The Paris Club allows for bilateral debt-for-nature	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			swaps among the 19 countries in the group. The Paris Club instigates a coalition of countries that swap debts to each other in exchange for conservation activities.		
1990	C.E.	-40	Robert Bullard writes *Dumping in Dixie*. Bullard's *Dumping in Dixie* is a landmark work in exploring environmental racism from the social scientific perspective.	Idea	
1990	C.E.	-40	Estonia passes the Nature Protection Act and the Act on Sustainable Development. These pieces of legislation begin to establish the country's political capacity for environmental governance, or environmentality.	Idea	
1990	C.E.	-40	Iceland establishes its Ministry for the Environment.	Event	
1990	C.E.	-40	India's government begins to implement forms of joint forest management. Joint forest management encourages forest management that involves a coalition and collaboration among government entities and local communities.	Idea	
1990	C.E.	-40	Lithuania forms its Environmental Protection Department (later the Ministry of Environmental Protection in 1994).	Event	
1990	C.E.	-40	The Netherlands develops its Nature Policy Plan, which results in the formation of a National Ecological Network.	Idea	
1990	C.E.	-40	The northern spotted owl is listed under the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			endangered species list, which calls attention and debate around issues of conservation of indicator species and old-growth forests.		
1990	C.E.	-40	The Farm Bill is adopted to increase the institutional and governmental visibility of organic agriculture in the United States.	Idea	
1990	C.E.	-40	The Mexican olive ridley leather industry ceases when sea turtles are recognized as endangered species.	Event	
1990	C.E.	-40	The insecticide toxaphene is banned throughout the United States.	Event	
1990	C.E.	-40	Dolphin safe' tuna is an example of human values toward how species of wildlife and fish are affected by certain industries.	Idea	
1990	C.E.	-40	Morris King Udall helps to pass the Arizona Desert Wilderness Act, which declares 2.4 million acres of Arizona wilderness.	Idea	
1990	C.E.	-40	The Tongass Timber Reform Act helps to preserve around one million acres of watersheds by regulating the amount of timber that can be harvested.	Idea	
1990	C.E.	-40	Bella Abzug establishes the Women's Environment and Development Organization (WEDO), which empowers women in decisions relating to social and environmental justice.	Event	
1990	C.E.	-40	Zambia passes the Environmental Protection and Pollution Control Act.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1990	C.E.	-40	The Earth contains over 40 million square kilometers of agricultural land.	Event	
1990	C.E.	-40	On 14 February, a photo was taken from the Voyager 1 spacecraft of the Earth. This image inspires the idea of the Pale Blue Dot. The pale-blue dot is a form of scaling the Earth from outer space. As photos of the Earth are taken from missions to outer space, people get a sense of their planet's relation to the Solar System	Idea	
1990	C.E.	-40	Large environmental organizations are accused of environmental racism by the Southwest Organizing Project and the Gulf Coast Tenants Union for failing to include people of color in their institutional boards and decision-making.	Idea	
1990	C.E.	-40	The African Charter on the Rights and Welfare of the Child occurs.	Idea	
1990	C.E.	-40	The New Delhi Statement for the Global Consultation on Safe Water and Sanitation is delivered.	Idea	
1990	C.E.	-40	The International Society for Ecosystem Health is established.	Event	
1990	C.E.	-40	The Netherlands adopts soft engineering to counter erosion by building up its beaches through the 'building with nature' project.	Idea	
1990	C.E.	-40	Billie Lee Turner and colleagues edit and publish *The Earth as transformed by human action: Global and regional change in the biosphere over the past*	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			300 Years, a key stock-taking of research on the human-environment relationship since the 1700s.		
1990	C.E.	-40	The Budongo Forest Project is enacted to encourage conservation and research of chimpanzee populations in forest reserves of Uganda.	Event	
1990	C.E.	-40	The Second World Climate Conference convenes, calling for the stabilization of greenhouse gas emissions and the adoption of target emission goals for each country.	Idea	
1990	C.E.	-40	The financial sector begins to voice concern about the economic impacts of global warming. In 1996, Gerling, a German insurance company, publishes one of the first books on the economic impacts and risks of global climate change on the financial sector.	Idea	
1990	C.E.	-40	The Multilateral Fund is created to provide financial support for developing countries to achieve the standards outlined in the Montreal Protocol.	Event	
1990	C.E.	-40	The Hubble Space Telescope is launched.	Event	
1990	C.E.	-40	The United Kingdom experiences a contingent drought due to irregular precipitation patterns in agricultural areas.	Event	This date represents the core of the time range from 1988 to 1992 C.E.
1990	C.E.	-40	On 18 August, the Oil Pollution Act is passed by the George H.W. Bush Administration, which proposes more	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			accountability for oil spill events.		
1990	C.E.	-40	In November, the Global Environment Facility begins to fund programs on climate change, biodiversity, pollution of international waters, and ozone levels in developing countries. The Global Environment Facility is regarded as one of the largest grant awarding institutions to stimulate research on environmental problems at the international level. For example, it has granted over $141 million for projects that address persistent organic pollutants (POPs).	Event	
1990	C.E.	-40	The International Decade for Natural Hazard Reduction begins.	Idea	
1990	C.E.	-40	Through the Renewable Energy Sources Act of 1990, Germany progresses in becoming a global leader in wind energy power. From 1990 to 2006 C.E., Germany quickly takes on the role of a leader in sustainable energy use, which advances environmental values in the political and economic realms of society.	Idea	
1990	C.E.	-40	An Age of Migration begins as humans become highly mobile through the innovation of transportation technologies.	Event	
1991	C.E.	-41	G.M. Grossman and A.B. Krueger develop the environmental Kuznets curve in *Environmental impacts of a North American Free Trade Agreement*. The	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmental Kuznets curve is a visual that communicates the idea that the growth of the economy stimulates the improvement of ecosystems as more efficient technologies are adopted. First phases occur: 1) environmental degradation as a side-effect of GNP, 2) environmental degradation as a major cost, 3) environment as a limit, 4) environment as a policy matter, and 5) environment as a priority.		
1991	C.E.	-41	The U.S. Food and Drug Administration (FDA) finds that 36 percent of food imports to the country contain harmful portions of pesticides. The FDA shows how the global diffusion of pesticides ultimately continues to affect Americans.	Event	
1991	C.E.	-41	Robert Chambers and Gordon Conway publish their paper, "Sustainable rural livelihoods: Practical concepts for the 21st Century". Chambers and Conway (1991) publish an influential paper which has been used as a cornerstone for governments and non-governmental organizations. The overall goal of the paper is to prescribe solutions to combat poverty. An important aspect of the discussion is how to ensure that decisions do not just benefit the elite, but also the locals in impoverished countries.	Idea	
1991	C.E.	-41	The Costa Rican Instituto Nacional de	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Biodiversidad (InBio) establishes an economic and institutional partnership with U.S. pharmaceutical corporation Merck and Company. The partnership is created to facilitate research in both sustainability and bioprospecting.		
1991	C.E.	-41	Cambodia begins to augment its environmental policies. During this year, Cambodia augments the powers of its Ministry of Environment to conserve and protect the country's landscape. The agency is tasked with advancing sustainability in collaboration with the Ministry of Agriculture, Forestry, and Fisheries.	Event	
1991	C.E.	-41	The Colombian Ministry of the Environment is established. The Ministry of the Environment manages the country's parks and preserves. It is an example of using governance to manage human-environment interaction in Colombia.	Event	
1991	C.E.	-41	The Congo passes the Law of the Environment, which establishes the Ministry of Environment and the National Environmental Action Plan. Contemporary issues in human-environment interactions diffuse to countries like the Congo, where environmental management and the creation of protected areas become a norm.	Idea	
1991	C.E.	-41	W.M. Stigliani and colleagues introduce the concept of the chemical	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			time bomb in *Chemical time bombs: Definition, concepts, and examples*. Chemical time bombs are threshold moments in the physical landscape when toxic substances are suddenly released in the environment. This can happen due to alterations in land use or the conditions of climate or soil.		
1991	C.E.	-41	William Cronon publishes *Nature's metropolis: Chicago and the Great West*. In *Nature's metropolis*, Cronon shows how Chicago's situation between the east and west makes it an ideal city for industry and markets. Through grain, lumber, and meat, Chicago facilitates the rapid degradation and transformation of the American West.	Idea	
1991	C.E.	-41	The First National People of Color Environmental Leadership Summit convenes. Its participants outline the fundamental principles of environmental justice and defines ways to address issues of environmental racism.	Idea	
1991	C.E.	-41	The Oakland Hills fire decimates neighborhoods in California. This fire is intensified due to the planting of eucalyptus trees which has highly flammable leaves.	Event	
1991	C.E.	-41	The Madrid Protocol is formed. The Madrid Protocol bans the extraction of resources from Antarctica. This motion is influenced by such environmental	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			organizations as Greenpeace International.		
1991	C.E.	-41	Donna Haraway publishes *Simians, cyborg, and women: The reinvention of nature*, which introduces the metaphorical image of nature as a 'scheming trickster' and advocates for cyborg ecologies. Cyborg ecologies makes the case that the world is comprised of networks, human and non-human, and that it is important to understand how ideas, objects, and beings are connected biologically, socially, technologically, and so on. It helps to identify the links between synthetic and organic.	Idea	
1991	C.E.	-41	South Korea's Dusan industrial plant pollutes the Nakdong River with over 30 tons of phenol-contaminated waste, which results in strict environmental regulations after the fact.	Event	
1991	C.E.	-41	Kyrgyzstan updates its environmental policy from its previous Soviet-era legislation.	Event	
1991	C.E.	-41	New Zealand passes the Resource Management Act to establish environmental regulations and enforcement.	Idea	
1991	C.E.	-41	The Gulf War results in thousands of gallons of oil being intentionally spilled in the Persian Gulf by Iraq.	Event	
1991	C.E.	-41	Montenegro is declared the world's first ecological state.	Idea	
1991	C.E.	-41	Vandana Shiva establishes Navdanya which has pushed for the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			protection of environmental resources through seed banks, organic agricultural practices, and creating a closer relationship between the producers and consumers.		
1991	C.E.	-41	Vandana Shiva publishes *Ecology and the politics of survival*, which confronts the appalling lack of local and traditional knowledges in environmental decision-making.	Idea	
1991	C.E.	-41	The Ukraine produces krill fishing fleets to meet global demands for shrimp.	Event	
1991	C.E.	-41	The smooth barked gum tree in Borneo is found to remedy the effects of HIV. The University of Illinois at Chicago researchers return to Borneo for more samples, only to discover that the area was deforested.	Event	
1991	C.E.	-41	Conflicts over water rights occur in India along the Cauvery River between Karnataka and Tamil Nadu.	Event	
1991	C.E.	-41	Over 50,000 cubic meters of raw sewage pollutes the Kuwait Bay due to the destruction of a sewage plant by the Iraq military during the Gulf War.	Event	
1991	C.E.	-41	The World Congress for a Healthy Planet becomes an important event for the Women's Environment and Development Organization to gain recognition from the U.N. Conference on Environment and Development.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1991	C.E.	-41	The U.S.-Canada Air Quality Agreement helps to implement transboundary environmental regulations on the human activities that cause acid rain.	Idea	
1991	C.E.	-41	Environmental security plans begin to be included in U.S. National Security Strategies.	Idea	
1991	C.E.	-41	The Wellington Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific Ocean gathers.	Idea	
1991	C.E.	-41	Germany incorporates a packaging ordinance to require major producers to take back and recycle or obtain energy from post-consumer packaging.	Idea	
1991	C.E.	-41	The Special Conference on Environmental Accounting is coordinated by the International Association for Research in Income and Wealth (IARIW).	Idea	
1991	C.E.	-41	The Environmental Impact Assessment in a Transboundary Context occurs, sponsored by the U.N. Economic Commission for Europe (ECE).	Idea	
1991	C.E.	-41	The first experiments transpire at the Biosphere 2 complex in Arizona, modeled after the Earth's biosphere.	Event	
1991	C.E.	-41	*Caring for the Earth* is published by the World Conservation Union and supported by the World Wildlife Fund and the United Nations Environment Programme.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1991	C.E.	-41	During the period between 1981 and 2000 C.E., over forty million people contract the AIDS virus. The AIDS virus diffuses around the world and becomes a major health hazard, causing around fifty percent of deaths.	Event	This date represents the core of the time range from 1981 to 2000 C.E., rounded up to the nearest year.
1991	C.E.	-41	On 15 June, Mount Pinatubo erupts in the Philippines, causing mass destruction and a short disruption of the global climate.	Event	
1991	C.E.	-41	On 25 June, Brazil puts an end to tax incentives to reduce Amazon deforestation. Unfortunately, the old incentives continue to be utilized.	Event	
1991	C.E.	-41	In October, the Protocol on Environmental Protection to the Antarctic Treaty of 1961 (Antarctic Environment Protocol) is adopted.	Idea	
1991	C.E.	-41	On 7 September, a major hailstorm in Alberta, Canada causes an insurance crisis and creates the Alberta Severe Weather Management Society which begins to fund cloud seeding practices.	Event	

Sustainable Development Scene: 1992 to 2014 C.E.

Agenda 21 Interval: 1992 to 1995 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1992	C.E.	-42	Switzerland passes legislation to recognize animals as beings, not as things. This motion emphasizes the ethical significance of animals and expresses this politically through legislation.	Idea	
1992	C.E.	-42	Azerbaijan establishes the Environmental Protection and Nature Utilization plan, which intends to identify important environmental regulations for protections and enforcement.	Idea	
1992	C.E.	-42	A minimum wage increase is halted in Panama. This Panama minimum wage increase is protested by Chiquita, which threatens to suspend all grower contracts in the country. Because of Chiquita's political influence and economic resources, the banana corporation's wishes are met.	Event	
1992	C.E.	-42	Belize passes its Environmental Protection Act. The Environmental Protection Act in Belize represents the political adoption of conservation ideals in managing the country's environmental resources.	Idea	
1992	C.E.	-42	The *Critical Mass* phenomenon occurs for the first time among	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			bicyclists in San Francisco. The *Critical Mass* phenomenon refers to a regular event in which bicyclists join to take over the streets of a city in protest of the automobile culture. The event has spread to numerous cities and represents an alternative form of transportation that has less impacts for the environment.		
1992	C.E.	-42	The Convention on Biological Diversity (CBD) convenes at the U.N. Conference on Environment and Development (UNCED). The CBD is an international agreement that promotes the idea of sustainability and biodiversity preservation among countries. It prescribes a standard set of human-environmental values at an international scale. Its official recognition occurs in December of 1993 by 188 members. A supplement is added to the CBD called the Cartagena Protocol on Biosafety in September 2003. The Cartagena Protocol addresses the international management and transportation of genetically modified organisms (GMOs).	Idea	
1992	C.E.	-42	The Association for the Study of Literature and the Environment is organized. The Association for the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Study of Literature and the Environment (ASLE) begins to advance ecocriticism as a methodological approach and research domain in literary studies.		
1992	C.E.	-42	Around 70,000 farmers are evicted from Los Haitises National Park in the Dominican Republic. These evictions are a result of the green militarization techniques imposed by the government of the Dominican Republic.	Event	
1992	C.E.	-42	The Farmers' Market Nutrition Program (FMNP) is formed. The FMNP aims to give produce to women, infants, and children, an example of using farmers' markets to appropriate agricultural resources to serve societal needs.	Event	
1992	C.E.	-42	Al Gore publishes *Earth in the balance*. Gore's influential book warns of a human-induced environmental crisis. One of the obstacles that Gore sees is the inability for political and economic will to change by the time environmental catastrophe arrives.	Idea	
1992	C.E.	-42	Wil Gesler discovers that engagement with the environment can lead to positive outcomes in psychological health.	Idea	
1992	C.E.	-42	The Environmental Protection Agency (EPA) establishes the Office of Environmental Justice.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1992	C.E.	-42	Lithuania adopts the Environmental Protection Act to address issues related to atmospheric and water pollution, among other environmental problems.	Idea	
1992	C.E.	-42	Namibia adopts a Green Plan to address the country's environmental problems, such as desertification.	Idea	
1992	C.E.	-42	Nigeria passes the Environmental Impact Assessment Act and develops he Acacia Tree Plan Experiment to address issues of deforestation.	Idea	
1992	C.E.	-42	A.S. Mather develops forest transition theory in "The forest transition," published in *Area*. The forest transition thesis claims that as a country becomes more developed economically and socially, its forest cover undergoes a u-shaped curve rapid deforestation followed by a reverse-effect of reforestation. This effect occurs because of the increasing abandonment of rural areas in favor of flocking to urban centers and the adoption of more efficient agricultural techniques (thus leading to the decreased role of farmers).	Idea	
1992	C.E.	-42	The Integrated Environmental Plan is established to foster U.S./Mexico	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmental issues along the international border.		
1992	C.E.	-42	Ulrich Beck publishes *Risk society*, which discusses how human dependence on technology generates risk on both the levels of nature and society.	Idea	
1992	C.E.	-42	The International Dolphin Conservation Program (IDCP) is developed to reduce the number of dolphins affected by the tuna fishing industry to a zero-mortality status. The IDCP is made effective by the 1995 Panama Declaration.	Event	
1992	C.E.	-42	The International Conference on Water and the Environment convenes in Dublin, Ireland to address water planning.	Idea	
1992	C.E.	-42	Mexico's Water Law is developed to regulate the quality of water.	Idea	
1992	C.E.	-42	Zambia establishes the Environment Council of Zambia.	Event	
1992	C.E.	-42	The Association of Southeast Asian Nations creates its first free trade agreement (AFTA), which has environmental implications for industrial activities and natural resources among the nations.	Event	
1992	C.E.	-42	Australia adopts a national drought policy to mitigate the tensions between agricultural production and environmental stability.	Idea	
1992	C.E.	-42	The World Bank publishes *World development report*	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			1992: Development and the environment to articulate the value of considering the environment and development together in future policies.		
1992	C.E.	-42	The British Standards Institute creates the first environmental management system.	Idea	
1992	C.E.	-42	Mary Louise Pratt examines how race and nature become conflated in negative ways in *Imperial eyes: Travel writing and transculturation*.	Idea	
1992	C.E.	-42	After the Earth Summit, the U.N. Commission on Sustainable Development is established to manage the response to Agenda 21.	Event	
1992	C.E.	-42	*V. cholerae* 0139 Bengal causes a major epidemic in South Asia.	Event	
1992	C.E.	-42	Hurricane Andrew, one of the U.S.'s most expensive disasters, results in $15 billion in damage.	Event	
1992	C.E.	-42	In *Medicine man*, the protagonist played by Sean Connery searches the rainforest for a cure to cancer.	Idea	
1992	C.E.	-42	In *Naked gun 22*, the protagonist goes up against lobbyists for oil, coal, and nuclear energy.	Idea	
1992	C.E.	-42	In the United Kingdom's Environmental Protection Act, Recycling Credits are authorized to incentivize recycling	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			entities through the money saved from waste disposal.		
1992	C.E.	-42	During 3-14 June, the Earth Summit, or the United Nations Conference on Environment and Development, occurs. The participants convene in Rio de Janeiro and address ideas regarding alternative energy source, water shortages, and other human-environment issues. The summit produces three important documents: Agenda 21, the Forest Principles, and the Rio Declaration on Environment and Development.	Idea	
1992	C.E.	-42	On 17 March, the Convention on the Protection and Use of Transboundary Watercourses and International Lakes encourages multinational agreements on watershed management.	Idea	
1992	C.E.	-42	In *The diversity of life*, Edward O. Wilson considers the twenty-first century as the Era of Restoration or Century of Restoring the Earth.	Idea	
1992	C.E.	-42	The European Union adopts the Maastricht Treaty as its system of environmental law.	Idea	
1992	C.E.	-42	William M. Denevan publishes "The Pristine Myth: The landscape of the Americas before 1492." The Pristine Myth refers to the	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			misconception that there are environments which have been unaffected by human intervention. The phenomenon is especially associated with the period before Christopher Columbus's exploration of the New World.		
1993	C.E.	-43	The Three Gorges Dam begins construction on the Chang Jiang (Yangtze) River, displacing over 1.2 million people. The Three Gorges Dam is the largest hydroelectric dam in the world. This human installation affects the surrounding landscape and hydrology of the region, as well as the human and non-human inhabitants both up and downstream.	Event	
1993	C.E.	-43	George Ritzer introduces the concept of McDonaldization in *The McDonaldization of society*. McDonaldization (similar terms: Coca-colonization and Americanization) is the global standardization and control of consumptive practices to optimize economic profit over time and space. It is a term to facilitate critical thinking about the processes of standardizing places for economic gain.	Idea	
1993	C.E.	-43	The government of Albania institutes the National Plan of Action on Environment. The plan	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			uses funds from the World Bank to augment the organizations responsible for the country's resource protection and pollution control. Though this initiative does lead to environmental improvements, the improvements are uneven. Numerous hotspots of pollution, especially soil contamination, are identified in a 2001 U.S. study.		
1993	C.E.	-43	Much of the economic obstacles for Argentina's mining sector are lifted. Mining represents a significant portion of Argentina's economy. Regulations of mining resources are lifted as a solution to increase exports and promote Argentina's position in the global economy.	Event	
1993	C.E.	-43	Richard Auty develops the resource curse hypothesis in *Sustaining development in mineral economies: The resource curse thesis*. The resource curse hypothesizes that international mining operations tend to be concentrated in remote areas in places of extreme poverty.	Idea	
1993	C.E.	-43	Arsenic is discovered in groundwater of Bangladesh. In Bangladesh, arsenic is found in the groundwater and has since resulted in many	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Bangladeshi peoples having high concentrations of Arsenic in their systems.		
1993	C.E.	-43	Denmark adopts a green tax reform. The Danish green tax reform reorients taxation from the working and middle class toward natural resources. It is an economic response to environmental degradation caused by the extraction of resources.	Idea	
1993	C.E.	-43	The Midwest experiences extreme flooding because of increased amounts of precipitation. This event triggers a series of political changes in natural hazard mitigation, including the Federal Emergency Management Agency's (FEMA) founding of the Mitigation Directorate.	Event	
1993	C.E.	-43	Ghana develops a National Environmental Policy and National Environmental Action Plan (NEAP). These two initiatives expand the ability of Ghana's government to address environmental issues within the country while also promoting economic growth.	Idea	
1993	C.E.	-43	Ghana establishes the Ministry of Environment, Science and Technology. The governmental organization provides institutional capacity to regulate and enforce	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			rulings about human use of environmental resources. It later transitions to being called the Environmental Protection Agency (EPA), a clear offshoot of the United States EPA.		
1993	C.E.	-43	Guinea-Bissau passes the National Environment Action Plan and the National Commission on Environment. This plan and the associated governmental agency are an example of applying Global North concepts of environmental governance in the Global South.	Idea	
1993	C.E.	-43	Nepal develops the Nepal Environment Policy and Action Plan.	Idea	
1993	C.E.	-43	Maria Mies and Vandana Shiva publish *Ecofeminism*, which addresses the ties between environmentalist and feminist issues, arguing for breaking ties with capitalism in favor of more harmonious ways of human-environment interaction.	Idea	
1993	C.E.	-43	Waste carried by the 1993 floods of the U.S. Midwest double the dead zone extent in the Gulf of Mexico. The dead zones result from increased eutrophication in the water bodies.	Event	
1993	C.E.	-43	In *We have never been modern*, Bruno Latour argues that modernity has two dimensions: a purification (separating	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the human from the non-human) and mediation (producing human/non-human hybrids).		
1993	C.E.	-43	Geographic information systems become melded with the Internet, with the introduction of programs like Xerox PARC Map Viewer, creating a key moment in the future of mapping and spatial information systems.	Event	
1993	C.E.	-43	La Via Campesina (International Farmers Movement), an agrarian reform movement, is established in Mons, Belgium.	Idea	
1993	C.E.	-43	The Forest Stewardship Council is a certification program founded to foster sustainably management forestry activities.	Event	
1993	C.E.	-43	The Friends of the Earth and the National Taxpayers Union initiate the "Green Scissors" initiative which calls Congress to cut billions of dollars from its environmentally hazardous federal programs.	Idea	
1993	C.E.	-43	The first World Water Day occurs on 22 March. The worldwide event is sponsored by the United Nations.	Idea	
1993	C.E.	-43	Th U.S. Department of Defense launches its 24-satellite system into operation. This constellation of satellites augments the	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			use of global positioning systems (GPS) for navigation.		
1993	C.E.	-43	In April, cryptosporidium infects over 400,000 people living in and around Milwaukee, Wisconsin. Cryptosporidium causes diarrhea in humans and is carried in drinking water. It is often spawned by poor sanitation and intensive dairy farming. The spread of this pathogen relates to certain types of human-environmental activities, especially regarding livestock and water management.	Event	
1993	C.E.	-43	In January, the Braer oil spill takes place off the Shetland Islands in Scotland, causing a spill of 80,000 tons of oil.	Event	
1993	C.E.	-43	On 5 November, Monsanto receives approval by the U.S. Food and Drug Administration to commercially administer bovine growth hormone (rbGH or rbST) for cows. Bovine growth hormone intensifies milk production in cows but is accepted by the U.S. FDA despite the questionable lack of testing on part of Monsanto.	Event	
1993	C.E.	-43	On 30 September, the Environmental Protection Agency (EPA) forms the National Environmental Justice	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Advisory Council (NEJAC).		
1993	C.E.	-43	The 'race-to-the-bottom' hypothesis replaces Keynesian economics and becomes a widespread term to identify the phenomenon of countries lowering their legal standards to allow for more capital flow across borders.	Idea	This date represents the early-1990s C.E., rounded up to the nearest year.
1994	C.E.	-44	Chile inaugurates its General Environmental Framework Law, which embodies the human-environment ideals of sustainability, the eradication of poverty, and equitable development. The law coincides with the creation of the National Environmental Commission (CONAMA) to take on environmental issues for the Chilean government.	Idea	
1994	C.E.	-44	Croatia passes the Nature Protection Act, the Environmental Protection Act, and the Agricultural Land Act. The passage of these three environmental acts exemplifies the adoption of environmentalist ideals at the political level in the Croatian government. The goal of the first two acts is to alleviate environmental problems and advancing sustainable practices. The Agricultural Land Act attempts to reform agriculture to prevent the use of harmful	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			pesticides and improve land management.		
1994	C.E.	-44	Ian Munt conflates eco-tourism with the idea of ego-tourism in "Eco-tourism or ego-tourism?", published in *Race and Class*. Green greed and ego-tourists are similar terms used to critique the financially-driven and superficial nature of ecotourism. In 1977, Graham M.S. Dann outlines the ego-enhancement effect of tourism ("ego-tourism") in "Anomie, ego-enhancement and tourism," published in *Annals of Tourism Research*.	Idea	
1994	C.E.	-44	Egypt passes Law 4. Law 4 reorganizes the Egyptian Environmental Affairs Agency so that it may address issues relating to environmental planning, management, and policy.	Idea	
1994	C.E.	-44	President Bill Clinton helps to establish the Northwest Forest Plan. The Northwest Forest Plan represents a political attempt to protect forested habitats, restore environments, and provide economic gains for local places through collaborative approaches across an ecosystem.	Idea	
1994	C.E.	-44	Ghana passes the Forest and Wildlife Policy. This piece of legislation represents the motive of a Global South country to create and uphold	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmental regulations toward certain aspects of human-environment interaction.		
1994	C.E.	-44	Haiti's National Assembly establishes the Ministry of the Environment.	Event	
1994	C.E.	-44	W.R. Grace tries to patent oil from the neem tree, which is eventually taken away in 2005 due to neem oil's connections to traditional knowledges among other reasons related to biopiracy.	Event	
1994	C.E.	-44	International trade ceases for Japanese jewelry which uses hawksbill turtle shells.	Event	
1994	C.E.	-44	Tomatoes are the first crop to be genetically modified and sold on the market. The method creates Flavr Savr, a flavoring enhancement paste.	Event	
1994	C.E.	-44	The U.N. Convention to Combat Desertification convenes and is officialized on 26 December 1996.	Idea	
1994	C.E.	-44	California endures the Northridge Earthquake, a costly environmental disaster which originated in the Santa Monica Mountains Thrust Fault.	Event	
1994	C.E.	-44	Piers Blaikie writes *At risk*, a key political ecology text for policy-making and legislation related to nature-society issues.	Idea	
1994	C.E.	-44	Val Plumwood publishes *Feminism and the mastery of nature*, an ecofeminist	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			perspective on the mutual inferiority that occurs when asserting that women are closer to the environment by being able to reproduce.		
1994	C.E.	-44	Green imperialism is coined by Richard Grove in *Green imperialism: Colonial expansion, tropical island Edens, and the origins of environmentalism, 1600-1860*. Green imperialism is a modern critical expression of ecotourism and other forms of environmental management and knowledge production. It specifically critiques how the Global North exercises power over the Global South.	Idea	
1994	C.E.	-44	South Africa adds certain environmental rights to its constitution.	Idea	
1994	C.E.	-44	Robert Kaplan warns against the problems of environmental insecurity in West Africa and elsewhere in the *Atlantic Monthly* article "The coming anarchy."	Idea	
1994	C.E.	-44	The Everglades Forever Act advocates the restoration of the Florida Everglades and decrease in pollution.	Idea	
1994	C.E.	-44	The American Planning Association adopts an updated land use classification system, building off James Anderson's 1971 system, accounting for multiple geographic scales.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1994	C.E.	-44	A large portion of the Southern Ocean becomes a sanctuary for whales.	Event	
1994	C.E.	-44	The European Conference on Sustainable Cities and Towns convenes in Aalborg, Denmark.	Idea	
1994	C.E.	-44	The European Union develops the Packaging and Packaging Waste Directive to identify objectives for regulating, reusing, and managing waste produced from product packaging.	Idea	
1994	C.E.	-44	The Cairo World Population Conference focuses on population and development, as well as the evolving role of contraceptives in population control.	Idea	
1994	C.E.	-44	The Second Sulfur Protocol (SSP) to the 1979 Convention on Long-Range Transboundary Air Pollution is adopted in Oslo.	Idea	
1994	C.E.	-44	Southern California establishes the Regional Emissions Clean Air Incentives Market (RECLAIM) to engage in the trading of emissions to reach air pollution objectives.	Event	
1994	C.E.	-44	On 11 February, President Bill Clinton signs Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," to make environmental justice a priority for all	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			federal government agencies.		
1994	C.E.	-44	On 1 January, the North American Free Trade Agreement (NAFTA) is established between Mexico, Canada, and the United States. NAFTA involves increased trade among the U.S., Mexico, and Canada. Worries over the environmental detriments of industrialization result in the establishment of the Commission for Environmental Cooperation and the Border Environment Cooperation Commission.	Idea	
1994	C.E.	-44	In July, Brazil's Plano Real economic reform program creates a period of hyperinflation, which creates a peak in Amazon deforestation and conversion to agriculture and ranching.	Idea	
1994	C.E.	-44	On 21 March, the Framework Convention on Climate Change (FCCC) is put into effect. The FCCC provides a suite of standards and objectives that nations around the world may opt into to reduce greenhouse gases (GHGs) and promote successful mitigation efforts for human-induced climate change.	Idea	
1994	C.E.	-44	Michael H. Glantz details the concept of creeping environmental problems (CEPs),	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			which are beginning to be addressed by the National Center for Atmospheric Research and the UN Environmental Programme. CEPs are small changes that compound over time to create an environmental crisis.		
1994	C.E.	-44	In September, Germany Bundestag proposes the Closed Substance Cycle and Waste Management Act. This piece of legislation proposes a closed cycle form of waste management in which all waste is recycled or repurposed within Germany.	Idea	

Ecosystem Services Interval: 1995 to 2002 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1995	C.E.	-45	Chicago experiences a catastrophic heat wave. The Chicago heat wave is an environmental hazard that leads to the deaths of around 520 people.	Event	
1995	C.E.	-45	The Japanese religious cult, Aum Shinrikyo, causes a dozen deaths and hundreds of injuries by releasing sarin in five Tokyo railway trains. This attack is a form of bioterrorism, one form of humans using the environment to harm other humans for ideological reasons.	Event	
1995	C.E.	-45	The Armenian Metsamor nuclear power plant is prepared to be reopened. The reopening of the Metsamor power plant causes worldwide concern by environmentalists due to its past problems with earthquake hazards.	Event	
1995	C.E.	-45	The International Conference on Biosphere Reserves convenes. This conference develops a series of ten directions for biosphere reserves around the world. It alters and expands the Man and the Biosphere program's two original tasks, which is research and monitoring of biosphere reserves.	Idea	
1995	C.E.	-45	The 'mad cow' epidemic devastates cattle industries in Europe (especially Great Britain), as well	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			as causing illness and death (i.e. variant Creutzfeldt Jakob Disease) among humans. 'Mad cow' disease, also Bovine Spongiform Encephalopathy, diffuses among cattle producers and causes a major economic setback for the cattle industry in Europe. Humans are also affected by the disease, with some fatalities.		
1995	C.E.	-45	Lawrence Buell publishes *The environmental imagination: Thoreau, nature writing, and the formation of American culture*. Buell's book outlines four ways to examine literature from an ecocritical perspective: 1) the textual presence of the non-human environment, 2) the importance of non-human interests in developing the story, 3) ethical grounding for literary representations of the human-environment relationship, and 4) the dynamic processual nature of the environment in stories.	Idea	
1995	C.E.	-45	Croatia passes the Air Protection Act, which is the Eastern European country's version of the United States' Clean Air Act. It aims to improve air quality and mitigate problems regarding air pollution.	Idea	
1995	C.E.	-45	William Cronon challenges the idea of wilderness in his edited	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			collection, *Uncommon ground: Rethinking the human place in nature*. Cronon shows how human conceptions of wilderness and the American West change over time to mean very different things.		
1995	C.E.	-45	The Czech Republic creates the State Environmental Policy, which empowers the Ministry of the Environment to enforce environmental regulations.	Idea	
1995	C.E.	-45	Equatorial Guinea earns the status as one of Sub-Saharan Africa's most prominent producers of oil. Equatorial Guinea becomes a leading producer of oil, a financial influence for natural resource extraction in the region of Sub-Saharan Africa.	Event	
1995	C.E.	-45	"Eastward Ho! Revitalizing Southeast Florida's Urban Core" is arranged. "Eastward Ho!" is an initiative directed at limiting urban sprawl and improving areas of environmental deterioration.	Idea	
1995	C.E.	-45	The Kobe earthquake becomes the most expensive disaster in the 1900s.	Event	
1995	C.E.	-45	Ken Saro-Wiwa is executed for opposing Shell Oil's industrial activities in Nigeria.	Event	
1995	C.E.	-45	Hungary passes the Environment Act, which attempts to enforce the reduction of chemical pollution,	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			regulate radioactive contamination of food, and increase incentives for preventative technologies.		
1995	C.E.	-45	The Malawi Constitution calls for the prevention of environmental degradation and the promotion of better living environments for humans and non-human life.	Idea	
1995	C.E.	-45	The reformed Mekong River Commission (MRC) attempts to increase cooperation among nations along the Mekong River, advocating making it a medium for markets rather than battlefields.	Event	
1995	C.E.	-45	Peru establishes the National Environmental Council to enforce environmental regulations.	Event	
1995	C.E.	-45	Kobe, Japan experiences a massive 'Ring of Fire' earthquake.	Event	
1995	C.E.	-45	Independent certification becomes a widespread strategy to promote sustainable timber harvesting in tropical countries and elsewhere.	Idea	
1995	C.E.	-45	Uganda amends its constitution to make environmental quality a right and creates the Ministry of Water, Land, and Environment.	Idea	
1995	C.E.	-45	The U.N. Agreement Relating to the Conservation and Management of Straddling Fish Stock	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			and Highly Migratory Fish Stocks is adopted.		
1995	C.E.	-45	Gray wolves are reintroduced into the Greater Yellowstone Ecosystem (GYE).	Event	
1995	C.E.	-45	Nancy Peluso publishes "Whose woods are these? Counter mapping forest territories in Kalimantan, Indonesia" to show how maps from dominant institutions tend to write the human-environment narrative and write over the perspectives of local groups.	Idea	
1995	C.E.	-45	Two-thirds of the population of Montserrat become environmental refugees because of the eruption of the Soufriere Hills volcano.	Event	
1995	C.E.	-45	Dengue re-emerges in South America after being dormant since the 1970s.	Event	
1995	C.E.	-45	A yellow fever epidemic takes precedence in the Americas.	Event	
1995	C.E.	-45	The Intergovernmental Panel on Forests forms.	Event	
1995	C.E.	-45	*Waterworld* is a movie about a giant flood influenced by global warming and other apocalyptic causes.	Idea	
1995	C.E.	-45	During the 1990s, Bernard Quinn Nietschmann helps to create the first indigenous atlas through the Berkeley group GeoMap.	Event	This date represents the core of the 1990s C.E.
1995	C.E.	-45	During the 1990s, community-based environmental	Idea	This date represents the core of the 1990s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			planning (CBEP) emerges as a bottom-up approach to environmental decision-making.		
1995	C.E.	-45	During the 1990s, developing countries adopt ecotourism as a primary development strategy.	Idea	This date represents the core of the 1990s C.E.
1995	C.E.	-45	During the 1990s, the Great Whale River Hydro-Electric Project adopts a holistic approach to developing hydro-electric infrastructure in Quebec, Canada, arguing for the combination of ecological, ethical, and practical approaches.	Idea	This date represents the core of the 1990s C.E.
1995	C.E.	-45	During the 1990s, game ranches become popular areas for hunting in South Africa and around the world.	Event	This date represents the core of the 1990s C.E.
1995	C.E.	-45	During the 1990s, the Internet and World Wide Web become widely used for transmitting information and communication.	Event	This date represents the core of the 1990s C.E.
1995	C.E.	-45	The new urbanism movement is developed and outlined by the Congress for the New Urbanism (CNU) Charter, advocating for fresh design approaches to modern cities that reduce car dependence and enhance walkability.	Idea	This date represents the core of the time range from 1993 to 1996 C.E., rounding up to the nearest year.
1995	C.E.	-45	On 1 January, the World Trade Organization commences its duties for facilitating trade negotiations among countries.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1995	C.E.	-45	In November, the Intergovernmental Panel on Climate Change (IPCC) releases its second report, which reiterates the claims that humans have had an impact on the Earth's atmospheric composition and climate.	Idea	
1995	C.E.	-45	The warm winter in New Orleans results in termite infestations of the city's famous 'mighty oaks.'	Event	The earlier date, 1995, is used over the later date, 1996.
1995	C.E.	-45	The 'first generation' of genetically modified organisms (GMOs) are produced (i.e. corn, rice, soybean, canola).	Event	This date represents the middle of the 1990s C.E.
1995	C.E.	-45	The formal study of ecosystem services begins to be developed and is solidified through papers written by Robert Costanza and colleagues, such as the 1997 *Nature* article, "The value of the world's ecosystem services and natural capital." Ecosystem services represent the various amenities that the environment provides for sustaining human life and well-being. Such services include water supplies, nutrient cycling, pollination, refugia, and food production. The four types of services include provisioning, regulating, supporting, and cultural services. Payments for ecosystem services are influenced by the ideas of Ronald Coase to provide incentives to	Idea	This date represents the middle of the 1990s C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			industries that feature sound environmental practices.		
1995	C.E.	-45	The European movement against genetically modified organisms (GMOs) takes form.	Idea	This date represents the middle of the 1990s C.E.
1996	C.E.	-46	Pacific Gas and Electric Co. pays $333 million to Hinkley, California in an out-of-court settlement about the contamination of drinking water with hexavalent chromium. The Pacific Gas and Electric Co. is the U.S.'s biggest direct-action lawsuit. It represents how corporate degradation of the environment affects local communities.	Idea	
1996	C.E.	-46	Biotech crops are first introduced. Biotech crops come from genetically modified organisms (GMOs) and are intended to produce higher yielding, pest-resistant, and disease-resistant crops. The introduction of these crops represents how human transformations of the environment can operate at the genetic level through industrial agriculture.	Event	
1996	C.E.	-46	Bahrain's Environmental Affairs Agency begins to promote policies of sustainable development. The Environmental Affairs Agency involves the adoption of sustainable development practices as a principle of policy in Bahrain, especially	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			with regards to controlling biodiversity, protecting natural resources, and addressing human health issues relating to environmental practices.		
1996	C.E.	-46	Canada passes the Oceans Act. The Oceans Act is Canada's response to managing activities along its coastal zones. Canada has more coastline than any other country. The legislation reflects concern over the continued problems with the degradation of these coastal zones by anthropogenic activities.	Idea	
1996	C.E.	-46	The Federal Agriculture Improvement and Reform Act is passed. The Federal Agriculture Improvement and Reform Act is a political intensification of ties between national, state, and local entities in promoting sustainable agriculture.	Idea	
1996	C.E.	-46	Jacques Perrin films *Microcosmos*. This film celebrates non-human elements of the environment and why they are significant in their own right.	Idea	
1996	C.E.	-46	Ghana passes the Energy Policy. This piece of legislation represents the motive of a Global South country to create and uphold environmental regulations toward certain aspects of	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			human-environment interaction.		
1996	C.E.	-46	Los Angeles, California adopts the Los Angeles River Master Plan, which proposes methods for sustainable development and flood mitigation along the waterway.	Idea	
1996	C.E.	-46	Controversy spreads over the creation of the Grand Staircase-Escalante National Monument by the Clinton Administration.	Event	
1996	C.E.	-46	Nepal passes the Environment Protection Act.	Idea	
1996	C.E.	-46	Andrew Light and Eric Katz introduce the idea of environmental pragmatism to combat the lack of solutions in environmental activism, research, and policy-making.	Idea	
1996	C.E.	-46	The First International Conference on Addressing the Environmental Consequences of War convenes.	Idea	
1996	C.E.	-46	The Nonindigenous Aquatic Nuisance Prevention and Control Act is passed by U.S. Congress, changing names in 1996 to the National Invasive Species Act.	Idea	
1996	C.E.	-46	Bonnie McCay and Svein Jentoft introduce the feedback effect as an argument for community-based natural resource management. It refers to the idea that local forms of environmental	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			management foster better forms of conservation because the decisions directly impact the decision makers in the community.		
1996	C.E.	-46	Mathis Wackernagel and William Rees (Vancouver, Canada) define the analytical approach to measuring the ecological footprint in *Our ecological footprint: Reducing human impact on the Earth*.	Idea	
1996	C.E.	-46	The European Union develops the Ambient Air Quality Assessment and Management Directive, which focuses on the following pollutants: arsenic, cadmium, carbon monoxide, hydrocarbons, nitrogen oxides, and sulfur dioxide, among others.	Idea	
1996	C.E.	-46	The Habitat II "City Summit," or the second U.N. Conference on Human Settlements, gathers to develop strategies for sustainable urban communities.	Idea	
1996	C.E.	-46	David Harvey publishes *Justice, nature, and the geography of difference* which is a historical-materialist approach to capitalist problems in people-environment relationships.	Idea	
1996	C.E.	-46	Sweden adopts E-Zones, environmental zones planned for ensuring environmental quality in the country.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1996	C.E.	-46	Richard Peet and Michael Watts publish *Liberation ecologies*, an important resource in political ecology.	Idea	
1996	C.E.	-46	The World Water Council is created to influence decision-making among water experts and international organizations.	Event	
1996	C.E.	-46	The World Food Summit occurs.	Idea	
1996	C.E.	-46	Non-representational theory is developed by geographer Nigel Thrift and others to find a post-phenomenological challenge to the idea that the world can only be understood through representations. This theory focuses engaging with the practices and performances occurring in a landscape.	Idea	
1996	C.E.	-46	One of the largest meningitis epidemics occurs in West Africa due to the ongoing drought in the region.	Event	
1996	C.E.	-46	The International Human Dimensions Programme on Global Environmental Change (IHDP) is formed by the International Council for Science and the International Social Science Council (ISSC).	Event	
1996	C.E.	-46	February 1996 marks the introduction of Mapquest to the public. Mapquest is a two-dimensional geographic information system that becomes	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			accessible through the internet.		
1996	C.E.	-46	On 13 May, a tornado in Bangladesh kills 700 people.	Event	
1996	C.E.	-46	In September, the International Organization for Standardization (ISO) creates ISO 14000, a framework of environmental management that helps to minimize waste and pollution while increasing recycling practices.	Idea	
1997	C.E.	-47	G. Conway coins the "Doubly Green Revolution" in *The Doubly Green Revolution: Food for all in the twenty-first century*. The Doubly Green Revolution envisions an age in which the productivity of the Green Revolution is reconciled with conservation.	Idea	
1997	C.E.	-47	Stanley Prusiner wins the Nobel Prize for his research on bovine spongiform encephalopathy. Prusiner's Nobel status highlights the value that humans place on cattle as an economic resource and human health.	Idea	
1997	C.E.	-47	Jared Diamond publishes the controversial *Guns, germs, and steel*. Among its scholarly contributions, the book reignites debate over the idea of environmental determinism to examine the human-	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environment relationship.		
1997	C.E.	-47	The National Wildlife Refuge System Improvement Act is passed. The National Wildlife Refuge System Improvement Act serves as an update to the National Wildlife Refuge System Administration Act of 1966. It involves an expansion and adaptation of the previous act to better connect to more contemporary needs more than thirty years later.	Idea	
1997	C.E.	-47	Ramachandra Guha and Juan Martinez-Alier publish *Varieties of environmentalism: Essays North and South*. For Guha and Martinez-Alier, it is false to claim that the Western version of environmental philosophy is the only framework. The authors examine environmentalism in its various forms around the world.	Idea	
1997	C.E.	-47	After around twenty-five percent of its hedgerows were removed from 1945 to 1985, Britain creates the Hedgerow Regulations which help to preserve these historic rows of vegetation (some around 700 years old) that divide up territory.	Idea	
1997	C.E.	-47	Indonesia passes Law No. 23, the Law Concerning Environmental Management.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1997	C.E.	-47	The Sea of Japan witnesses a major oil spill which triggers environmentalist concerns.	Event	
1997	C.E.	-47	U.S. Congress considers kudzu as a Federal Noxious Weed.	Event	
1997	C.E.	-47	The United Nations International Mine Ban Treaty is developed due to the International Campaign to Ban Landmines (ICBL), which demonstrates the power that non-governmental organizations (NGOs) have on affecting environmental policy	Idea	
1997	C.E.	-47	To prevent harm on transboundary rivers, the U.N. Convention on the Law of the Non-Navigational Uses of International Watercourses adopts the equitable utilization principle.	Idea	
1997	C.E.	-47	Burundi endures the largest typhus epidemic since the Second World War.	Event	
1997	C.E.	-47	The Treaty to Ban Landmines is signed during the Chemical Weapons Convention.	Idea	
1997	C.E.	-47	The U.N. General Assembly conducts a global assessment of freshwater resources and addresses basic needs and human rights for water access.	Idea	
1997	C.E.	-47	The Convention on the Law of the Non-Navigational Uses of International Watercourses prioritizes human rights over economic development in	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			international conflict on water bodies.		
1997	C.E.	-47	Sheep are cloned by Ian Wilmut.	Event	
1997	C.E.	-47	British Petroleum concedes that fossil fuel burning leads to global warming of the atmosphere.	Idea	
1997	C.E.	-47	From the 1990s to the early-2000s, Bt cotton is a genetically modified organism that spreads in agricultural use from the United States to countries like China and India. Bt cotton is resistant to a type of bacteria that negatively impacts cotton plants: Bacillus thuringiensis. It leads the conversion to genetically modified organisms (GMOs) among agriculturalists around the world. The development of this strain of cotton is an example of human modification of the environment at the genetic level and transformation at the landscape level.	Event	This date represents the core of the time range from the 1990s (1990 C.E.) to the early-2000s (2003 C.E.). It is rounded up to the nearest year.
1997	C.E.	-47	James Lee Witt becomes director of the Federal Emergency Management Agency (FEMA) from 1993 to 2001 C.E. This time range is referred to as the 'Witt Revolution' because it signifies a streamlining and reorganization of FEMA's management system.	Event	This date represents the core of the time range from 1993 to 2001 C.E.
1997	C.E.	-47	A 'modern silent famine' happens in North Korea.	Event	This date represents the core of the time range from 1995 to 1999 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
1997	C.E.	-47	On 11 December, the Kyoto Protocol to the United Nations Framework Convention on Climate Change is made available for support. The Kyoto Protocol involves the promise by countries to reduce their greenhouse gas emissions. The initiative becomes international law in March of 2005. One significant component of the Kyoto Protocol is the clean development mechanism (CDM), which defines avenues for industrialized countries (Annex 1 countries) to achieve their greenhouse gas objectives in an economically-feasible manner.	Idea	
1997	C.E.	-47	In July, flooding in the Moravian region of the Czech Republic results in the release of hazardous waste from landfills, agricultural fields, and industry into the water system. The July 1997 flooding is an example of regional environmental hazards relating to the harmful chemicals that humans use to transform and utilize the environment.	Event	
1997	C.E.	-47	From 1997 to 1998, 75 million people are impacted by drought and wildfires in Indonesia. The large-scale drought and wildfires in Indonesia show how fire affects	Event	This date is based upon the beginning of the drought event.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			air quality and human health.		
1997	C.E.	-47	In 1997 and 1998, U.N. Commission on Sustainable Development meets for its sixth session.	Idea	The earlier date, 1997, is used over the later date, 1998.
1998	C.E.	-48	The Angolan General Environment Law establishes the Ministry for Urbanization and Environment. The Angolan government is one of a variety of political entities in the Global South to begin building the institutional capacity for sustainability and conservation. The Ministry for Urbanization and Environment represents that connection between Western environmental discourses and governance in the Global South.	Idea	
1998	C.E.	-48	Bhutan creates a framework to bolster the National Environment Commission and the Nature Conservation Division. Bhutan gives political power for governmental agencies to implement policies relating to environmental management and planning.	Idea	
1998	C.E.	-48	The U.S. Tropical Forest Conservation Act prompts debt-for-nature swaps with Bangladesh, the Philippines, the Caribbean, and Latin American countries. The Tropical Forest Conservation Act is an	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			economic approach to mitigating conservation efforts in areas with significant amounts of tropical forests.		
1998	C.E.	-48	Jennifer Wolch proposes 'Zoopolis' which imagines a city in which plants and animals are viewed as residents along with humans. Zoopolis represents one image of an idealized human-environment relationship that reflects the attitudes of ecodesign.	Idea	
1998	C.E.	-48	The Earth Liberation Front (ELF) and Animal Liberation Front (ALF) commit arson by igniting buildings situated on Vail Mountain in Colorado. The goal of this act is to sabotage the development of infrastructure for tourism and recreation on Vail Mountain, which serves as an ideal habitat for lynx and other flora and fauna.	Event	
1998	C.E.	-48	The Ganges River floods, causing 1000 deaths and the homelessness of around 30 million people.	Event	
1998	C.E.	-48	Niger develops the National Environmental Plan for Sustainable Development.	Idea	
1998	C.E.	-48	James C. Scott publishes *Seeing like a state* which argues that political entities often do not take local knowledges into	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			account in decision-making.		
1998	C.E.	-48	The Indian Supreme Court orders that all buses transition to compressed natural gas (CNG) for making transportation less environmentally impactful.	Idea	
1998	C.E.	-48	Ten thousand lives are claimed by a tsunami in Papua New Guinea.	Event	
1998	C.E.	-48	The U.N. Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade convenes.	Idea	
1998	C.E.	-48	The Alliance for Forest Conservation and Sustainable Use is started by the World Wildlife Fund and the World Bank.	Event	
1998	C.E.	-48	China passes the Total Amount Control Program for the eastern portion of the country as an initiative to mitigate human activities related to acid rain.	Event	
1998	C.E.	-48	The International Conference on Water and Sustainable Development meets in Paris, France.	Idea	
1998	C.E.	-48	E.O. Wilson coins 'consilience' as a call to form a bridge between the sciences and the humanities to explore issues like the human-environment relations.	Idea	
1998	C.E.	-48	The Aarhus Convention on Access to Information, Public Participation in Decision-Making and	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Access to Justice in Environmental Matters is signed.		
1998	C.E.	-48	The first virtual globe, Earth Browser, is introduced to the public through the program *Planet Earth*.	Event	
1998	C.E.	-48	Factor four is introduced by Weizsäcker, Lovins, and Lovins, in *Factor four: Doubling wealth--halving resource use*. The factor four refers to the idea that if the productivity of resource use is improved by a factor of four, then humans can be twice as rich and decrease environmental impacts by 50 percent.	Idea	
1998	C.E.	-48	Indigenous- and community-conserved areas become popular after the Khonoma Tragopan Sanctuary project in India. These territories combine a variety of uses, including the protection of the place's ecology and maintaining traditional cultural values and practices.	Idea	This date represents the late-1990s C.E., rounded up to the nearest year.
1999	C.E.	-49	Over 500 tons of animal feed is found to contain accidental traces of PCB in Belgium farms. PCB is a carcinogenic chemical which leads to more than 2 million chickens being slaughtered and put to waste.	Event	
1999	C.E.	-49	The West Nile Virus emerges. First observed in 1937 Uganda, the West Nile Virus arises and is first	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			found in New York City, an example of environmental hazards and human health.		
1999	C.E.	-49	The Arctic Council is established. The Arctic Council is a coalition of countries and indigenous peoples occupying territories in the arctic region, in effort to facilitate a co-management of natural resources.	Event	
1999	C.E.	-49	Australia passes the Environment Protection and Biodiversity Conservation Act to identify and mitigate the government's responsibilities to the environment.	Idea	
1999	C.E.	-49	Azerbaijan passes the Law on Environmental Protection and the Law on Environmental Safety, which set the foundation for more effective environmental legislation in Azerbaijan.	Idea	
1999	C.E.	-49	The European Union bans the use of bovine growth hormone in cows. The European Union bans the human manipulation of cow hormones which are shown to produce more milk. This is a response to the negative impacts that bovine growth hormone has on humans and cows.	Event	
1999	C.E.	-49	Ecomanagerialism emerges from the work of Timothy W. Luke in "Training eco-managerialists: Academic	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmental studies as a power/knowledge formation," published in *Living with nature: Environmental discourse as cultural politics*. Ecomanagerialism refers to the consideration of environmental management from a pragmatic perspective to approaching environmental problems. The goal is to protect aspects of the environment while also maintaining economic and political objectives.		
1999	C.E.	-49	The Mountain Cloud Forest Initiative is established as a part of the United Nations Environment Program (UNEP). The Mountain Cloud Forest Initiative is a plan for humans to protect cloud forests, high-altitude forests in tropical region. This plan helps to establish cloud forests as parks and reserves.	Idea	
1999	C.E.	-49	The book *Defending illusions: Federal protection of ecosystems* makes the case that environmental laws and policies represent outdated ecological concepts and ought to be updated with existing knowledges.	Idea	
1999	C.E.	-49	Ten countries band together to form the Nile Basin Initiative. The partnership involves countries that use the Nile River in	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			attempt to advance sustainable practices and cooperation across boundaries.		
1999	C.E.	-49	Robert Monderie and Richard Desjardins produce *L'erreur boréale*. Monderie and Desjardins offer a critique on how capitalism has influenced deforestation in northern Quebec.	Idea	
1999	C.E.	-49	The Eastern Navajo sues the Nuclear Regulatory Commission (NRC). This lawsuit seeks to forbid the NRC from mining for uranium on Navajo territory.	Idea	
1999	C.E.	-49	Germany introduces the Eco-Tax Reform. The Eco-Tax Reform combines the protection of climate by taxing energy and fuel consumption while also generating more sustainable forms of employment.	Idea	
1999	C.E.	-49	Ghana passes the Land Policy. This piece of legislation represents the motive of a Global South country to create and uphold environmental regulations toward certain aspects of human-environment interaction.	Idea	
1999	C.E.	-49	Ghana passes the Sanitation Policy.	Idea	
1999	C.E.	-49	Ghana passes the Water Resources Policy.	Idea	
1999	C.E.	-49	The 'Battle in Seattle' protest occurs in Seattle, Washington against the World	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Trade Organization (WTO). The 'Battle in Seattle' is significant because it ranks among significant protests against the prevailing nature-society problems caused by economic globalization.		
1999	C.E.	-49	Hurricane Floyd becomes North Carolina's most expensive storm of the twentieth century.	Event	
1999	C.E.	-49	The Environmental Protection Agency (EPA) creates the Blue Ribbon Panel on Oxygenates in Gasoline to regulate the amount of methyl tertiary butyl ether (MTBE) pollution.	Event	
1999	C.E.	-49	Taiwan experiences a massive 'Ring of Fire' earthquake.	Event	
1999	C.E.	-49	Health and environmental hazards plague Serbia and Montenegro after NATO bombings.	Event	
1999	C.E.	-49	Joseph Bové drives a truck into a McDonald's as a protest against the McWorld diffusion that American fast food has spawned.	Event	
1999	C.E.	-49	After a series of hurricanes (Dennis, Floyd, and Irene), North Carolina experiences an environmental crisis due to the creation of dead zones from the pollution of lagoons and rivers by hog waist. The dead zones result from increased	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			eutrophication in the waterways.		
1999	C.E.	-49	The North Atlantic Treaty Organization performs ecocide by bombing the chemical, fertilizer, and refinery plants of Pančevo, Serbia.	Event	
1999	C.E.	-49	The Comprehensive Everglades Restoration Plan (CERP) proposes to reduce drainage canals, flood infrastructure, and pollution caused by runoff to restore the Everglades of Florida.	Idea	
1999	C.E.	-49	With the help of Robert W. Kates, the National Research Council lays the foundation for the discipline of sustainability science in *Our common journey: A transition toward sustainability*.	Idea	
1999	C.E.	-49	Nipa virus is observed among Malaysian pig farms.	Event	
1999	C.E.	-49	South of Buenos Aires, 5,300 tons of oil are released in the Rio de la Plata.	Event	
1999	C.E.	-49	In April, the Rhine Convention is signed which forms the legal foundation for the International Commission for the Protection of the Rhine (previously the International Commission for the Protection of the Rhine against Pollution).	Idea	
1999	C.E.	-49	In December, landslides and heavy rain result in over 30,000 deaths in Vargas, Venezuela, one of the largest	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmental disasters of its type in the region.		
1999	C.E.	-49	On 18 June, the "Ambush of Global Capitalism" involves a network of demonstrators around the world.	Event	
2000	C.E.	-50	Jacques Cluzaud and Michel Debats film *Le peuple migrateur*. This film celebrates human and non-human elements of the environment and why they contain intrinsic value.	Idea	
2000	C.E.	-50	The Era of Conservation Biology and Sustainable Development reaches its core in Western countries.	Event	This date represents the core of the time range from 1985 to 2014 C.E.
2000	C.E.	-50	Germany passes the Renewable Energy Sources Act, which expands upon earlier legislation (the Electricity Feed Act of 1991) to make renewable and clean energy sources a top priority for German energy consumption.	Idea	
2000	C.E.	-50	Researchers observe that Mount Kilimanjaro's glaciers and ice fields are quickly receding.	Event	
2000	C.E.	-50	Mauritius adopts the National Solid Waste Management Strategy to mitigate problems relating to hazardous waste dumping.	Idea	
2000	C.E.	-50	Qatar creates the Supreme Council for the Environment and Natural Sanctuaries to address issues of desertification and	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			biodiversity within the country.		
2000	C.E.	-50	Sierra Leone passes the Environment Protection Act.	Idea	
2000	C.E.	-50	Vietnam passes its Water Resources Law to enforce water quality regulations.	Idea	
2000	C.E.	-50	The United States sprays herbicides to destroy drug crops in Colombia.	Event	
2000	C.E.	-50	The Yosemite Valley Plan updates the 1980 General Management Plan to balance environmental goals with increasing tourism.	Idea	
2000	C.E.	-50	The Anthropocene is coined by P.J. Crutzen and E.F. Stoermer.	Idea	
2000	C.E.	-50	The Cartagena Protocol on Biosafety of the Convention on Biological Diversity is adopted, which lists the responsibilities that exporters have in transferring living modified organisms internationally.	Idea	
2000	C.E.	-50	The global life expectancy for humans is 67 years.	Event	
2000	C.E.	-50	The human population increases to around 6 billion.	Event	
2000	C.E.	-50	Hybrid vehicles are marketed by two Japanese car companies.	Event	
2000	C.E.	-50	California suffers a major electricity crisis.	Event	This date represents the core of the time range from 1999 to 2001 C.E.
2000	C.E.	-50	In April, guerrilla gardening is used as a humorous method for protesting during the A16 demonstrations in Washington, D.C.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2000	C.E.	-50	On 8 September, the U.N. Millennium Declaration sets out a series of goals to promote worldwide sustainable development.	Idea	
2000	C.E.	-50	NASA's Digital Earth brings geographic information systems (GIS) into the public eye.	Event	This date represents the turn of the twenty-first century C.E.
2001	C.E.	-51	Letters containing anthrax are sent to the senatorial offices of Tom Daschle and Patrick Leahy and some important news media outlets. The anthrax-contaminated letters infect seventeen people and 5 deaths. They are sent a few weeks after the September 11 attacks on the U.S. World Trade Center. Anthrax is a part of the environment which acts as a poison for humans.	Event	
2001	C.E.	-51	The Bureau of Land Management establishes the National Landscape Conservation System. The system gives the BLM the ability to manage its various wilderness areas, national monuments, historic trails, and wild and scenic rivers, among others.	Event	
2001	C.E.	-51	General Electric is found guilty of polluting the Hudson River with polychlorinated biphenyls, especially during the period from 1947 to 1977. GE Corp. becomes	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			culpable for polluting the Hudson River and is tasked with dredging part of the waterway that has experienced the most pollution.		
2001	C.E.	-51	The Roadless Area Conservation Rule is put into effect. This rule makes clear that the Forest Service cannot install roads or clear-cut forests on over 58 million acres of the agency's land.	Idea	
2001	C.E.	-51	The Treaty on Plant Genetic Resources for Food and Agriculture is approved. The United Nations meeting of the Food and Agricultural Association develops this treaty to address problems relating to the patenting of genetically engineered and modified plant species. The treaty addresses issues relating to the uneven distribution of financial benefits for genetic engineering between the Global North and South, as well as the negative impacts that patented genetically modified organisms (GMOs) would have on local farmers in the South.	Idea	
2001	C.E.	-51	El Salvador experiences a massive 'Ring of Fire' earthquake.	Event	
2001	C.E.	-51	The U.S. Supreme Court decides in *Whitman vs. American Trucking Association* that the Environmental Protection Agency (EPA) should set air	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			quality standards regardless of the financial impact.		
2001	C.E.	-51	The G-8 is attacked by antiglobalization protestors.	Event	
2001	C.E.	-51	Robert Paehlke coins the bioregionalist promise, which holds that local communities have a better knowledge and connection to the places they live. It is an argument for community-based natural resource management.	Idea	
2001	C.E.	-51	Denis Cosgrove writes *Apollo's eye: A cartographic genealogy of the Earth in the Western imagination* which details his investigations on how the Apollo mission influenced the ways Westerners perceive Earth and their relation to it.	Idea	
2001	C.E.	-51	The Water Resources, Human Rights and Governance Conference meets in Nepal.	Idea	
2001	C.E.	-51	The Water for People & Nature: Forum on Conservation & Human Rights convenes among the Council of Canadians.	Idea	
2001	C.E.	-51	The International Conference on Freshwater meets.	Idea	
2001	C.E.	-51	The European Charter on Water at the United Nations addresses in part the human right to water.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2001	C.E.	-51	Keyhole introduces Earth Viewer, a virtual globe technology.	Event	
2001	C.E.	-51	Freshwater Consultation in Berlin develops the Bonn Recommendations for Action and the Bonn Charter for Safe Drinking Water.	Idea	
2001	C.E.	-51	Around fifteen thousand cases of the West Nile Virus infection are observed by the U.S. Centers for Disease Control and Prevention. The West Nile Virus arises and is first found in New York City, an example of environmental hazards and human health.	Event	This date represents the core of the time range from 1999 to 2003 C.E.
2001	C.E.	-51	In January, the Intergovernmental Panel on Climate Change (IPCC) releases its third report, which holds that the climate has indeed changed since the beginning of the Industrial Revolution and has correlations to anthropogenic influence.	Idea	
2001	C.E.	-51	On 22 May, the Stockholm Treaty on Persistent Organic Pollutants is adopted by the United Nations.	Idea	
2001	C.E.	-51	The 11 September terrorist attacks of the U.S. World Trade Center highlight the sheer amount of asbestos in buildings. Asbestos causes health problems in the lungs. Although asbestos has been recognized as harmful since the 1970s, it continues to	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			create issues, especially in the 9/11 terrorist attacks on the World Trade Center. The event also leads to a change in the management policies of the Federal Emergency Management Agency (FEMA), making the organization part of the Department of Homeland Security.		

Green Capitalist Interval: 2002 to 2009 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2002	C.E.	-52	The government of Algeria initiates the National Environment Plan. The Algerian National Environment Plan falls under the Ministry of Regional Planning and Environment. The objective of the plan is to create more access to potable water, enhance waste management practices, and promote biodiversity, including the creation of national parks. This is an example of the diffusion of political practices to foster more environmentally sound practices within a country. It is a product of the diffusion of conservation ideals and management practices.	Idea	
2002	C.E.	-52	Germany alters its constitution to provide protection for animals and recognize them as beings with rights. Germany's move to consider animals as beings with rights represents another political recognition of animals on a more equal plane with humans.	Idea	
2002	C.E.	-52	Australia and the United States form the U.S.-Australia Bilateral Climate Agreement. This agreement between the U.S. and Australia initiates conversation into how the two can reduce greenhouse gas emissions.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2002	C.E.	-52	The Convention on Biological Diversity adopts its strategic plan. The CBD is an international agreement to slow the loss of biodiversity and promote sustainable development.	Idea	
2002	C.E.	-52	Madagascar bans burning for the sake of fire suppression and conserving forests. The banning of burns in forests embodies an opposite approach to the controlled burns employed by Western countries.	Event	
2002	C.E.	-52	The U.S. Food and Drug Administration (FDA) takes on the task of helping to respond to threats of bioterrorism. The FDA becomes responsible for responding to bioterrorist threats or using the environment to do harm to a group of people in the name of a cause.	Event	
2002	C.E.	-52	Greenpeace activists gain access to the British Sizewell nuclear facility. This demonstration shows the level of vulnerability for nuclear energy facilities, a sense of insecurity that can lead to significant human and environmental consequences.	Event	
2002	C.E.	-52	Liberia passes a suite of environmental laws, including the Environment Protection Act, National Environment Policy, and the Environment	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Protection and Management Law.		
2002	C.E.	-52	Eric Klinenberg publishes *Heat wave*, which draws attention to the failures of the media to appropriately communicate about environmental crises.	Idea	
2002	C.E.	-52	Mozambique formulates its National Environment Management Program.	Event	
2002	C.E.	-52	The Greater Limpopo Transfrontier Park is created through cooperation between Mozambique and South Africa.	Event	
2002	C.E.	-52	The National Organic Certification Standards are published in the United States.	Idea	
2002	C.E.	-52	California adopts standards for automobile emissions through the Pavley Bill.	Idea	
2002	C.E.	-52	The United Nations declares 2002 to by the International Year of Ecotourism.	Idea	
2002	C.E.	-52	In *The intemperate rainforest*, Bruce Braun seeks to denaturalize nature by distinguishing between two social constructions of nature, Canadians of European descent (humans as separate from nature) and the First Nations (people as part of nature).	Idea	
2002	C.E.	-52	Sarah Whatmore proposes the idea of a theoretical blend of nature and society to form 'hybrid geographies' in *Hybrid*	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			geographies: Nature cultures spaces.		
2002	C.E.	-52	The National Organic Standards are established by the U.S. Department of Agriculture.	Idea	
2002	C.E.	-52	The European Union Waste Electrical and Electronic Equipment (WEEE) places regulations on industry to promote sustainable production.	Idea	
2002	C.E.	-52	The World Water Forum Conference Series occurs (1997, 2000, 2003, 2006 C.E.).	Idea	This date represents the core of the time range from 1997 to 2006 C.E., rounding up to the nearest year.
2002	C.E.	-52	The World Summit on Sustainable Development occurs from 26 August to 4 September. The event helps to establish the Global Earth Observation System of Systems (GEOSS). The Johannesburg World Summit on Sustainable Development involves the gathering of leaders and sharing of ideas about sustainable development, which is one environmentalist form of human-environment interaction. A significant outcome of the conference is the Global Forum on Oceans, Coasts, and Islands, which addresses sustainable development in coastal areas. Other initiatives are mentioned in the World Summit's "Plan of Implementation."	Idea	
2002	C.E.	-52	In March, the United Kingdom implements	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the first economy-wide initiative for carbon trading. The United Kingdom's decision to use carbon trading demonstrates an economic response to the increasing level of anthropogenic, climate-changing gas emissions.		
2002	C.E.	-52	In November, the U.N. Covenant on Economic, Social and Cultural Rights is formulated. The Covenant contains General Comment 15 which discusses why access to water is a human right.	Idea	
2002	C.E.	-52	In November, over 20 million gallons of oil is leaked from the *Prestige* off the Spanish and French coasts.	Event	
2003	C.E.	-53	The '3 by 5' initiative is begun by the United National Joint Program on HIV/AIDS (UNAIDS) and the World Health Organization (WHO). The '3 by 5' initiative seeks to increase access to antiretroviral treatment (ART) to three million people in the poorest countries. This action never reached its goal but did end up aiding in the treatment of numerous people. This initiative relates to human responses to inequalities caused by interactions between society and environment (i.e., viruses).	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2003	C.E.	-53	Vladimir Putin petitions the United Nations for $22 million to update the technologies of the Bakailsk Paper Works to reduce its pollution. Putin's call to the United Nations is an example of prescribing a technological solution to the pollution caused by waste products from Bakailsk Paper Works.	Idea	
2003	C.E.	-53	The George W. Bush Administration passes the Healthy Forests Restoration Act. The Healthy Forests Restoration Act holds that thinning forests will lead to less fire hazards and allow for financial gain by private timber companies. Such a prescription has been criticized by some and supported by others.	Idea	
2003	C.E.	-53	The Clear Skies Initiative is advanced by the President George W. Bush administration. The initiative makes changes to the Clean Air Act of 1970 by weakening much of its provisions, loosening caps on emissions, deregulating much of the power plant activity, and making obsolete many of the proposals of the Clean Air Act. The Clear Skies Initiative is an example of taking one political advancement of human-environment interaction and	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			implementing a alternative approach.		
2003	C.E.	-53	A heat wave hits Europe and is attributed to around 35,000 deaths.	Event	
2003	C.E.	-53	Liberia establishes the Protected Forest Area Network for conservation purposes.	Event	
2003	C.E.	-53	The cleanup of the Rocky Flats Plant's radioactive waste is completed.	Event	
2003	C.E.	-53	Impoverished Iraqis steal over 200 barrels from the Tuwaitha nuclear plant filled with nuclear waste, dump them into waterways, and use the containers for food and water storage.	Event	
2003	C.E.	-53	The Global Footprint Network is established as a research group dedicated toward developing and measuring the ecological footprint as the human-environment relationship changes.	Event	
2003	C.E.	-53	Severe acute respiratory syndrome (SARS) creates a pandemic spreading from China to over 32 countries and resulting in around 800 deaths.	Event	
2003	C.E.	-53	The Montreal Process develops a set of criteria for sustainable forestry.	Idea	
2003	C.E.	-53	The European Union's Restriction of Hazardous Substances puts regulations on industry to promote sustainable production.	Idea	
2003	C.E.	-53	This year is identified by the United Nations	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			as the International Year of Freshwater.		
2003	C.E.	-53	From 2000 to 2005, a drought in Australia necessitates restrictions of water use in urban areas. This period shows how drought and increasing urbanization come into conflict in the human-environment relationship.	Event	This date represents the core of the time range from 2000 to 2005 C.E.
2003	C.E.	-53	In December, Iran experiences an earthquake (7.5 on the Richter scale) that causes 40,000 deaths and 100,000 displaced peoples.	Event	
2003	C.E.	-53	On 4 November, the "Network of GMO Free Regions" is created as a part of the European protest against genetically modified organisms.	Event	
2004	C.E.	-54	A ruling requires Halliburton Energy Services to pay $4.2 billion in a class-action lawsuit for asbestos contamination. Asbestos is a resource that has been useful as an insulation and building material but also poses environmental hazards to human health.	Idea	
2004	C.E.	-54	*State of fear* is published by Michael Crichton. *State of fear* is a novel that depicts the fictional story of ecoterrorists forming a tsunami to hasten the adoption of climate change-based forms of legislation.	Idea	
2004	C.E.	-54	Haiti gets devastated by Tropical Storm	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			Jeanne, resulting in thousands of deaths and major flood damage.		
2004	C.E.	-54	Taiwan passes the National Land Planning Act to enforce conservation policies within the country.	Idea	
2004	C.E.	-54	Alfred W. Crosby expands upon ecological imperialism in *Ecological imperialism: The biological expansion of Europe, 900-1900*. Ecological imperialism considers the non-human elements that are involved in the success of European colonization to create New-Europes. This can include regions with comparable climates, domesticated animals, and disease.	Idea	
2004	C.E.	-54	A state court in India prohibits the industrial over-extraction of groundwater in one of its villages.	Idea	
2004	C.E.	-54	The Arctic Climate Impact Assessment incorporates indigenous knowledges of long-term weather and climatic patterns occurring in the region.	Idea	
2004	C.E.	-54	A settlement of $60 million is provided for victims and communities affected by the dumping of polychlorinated biphenyls (PCBs) in the Fox River and Green Bay, Wisconsin.	Idea	
2004	C.E.	-54	Michael Shellenberger and Ted Nordhaus publish "The death of	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			environmentalism: Global warming politics in a post-environmental world." Post-environmentalism refers to the view that the twenty-first century is facing an array of different environmental problems compared to those of the late 1900s. As such, these problems will require different solutions.		
2004	C.E.	-54	NASA's World Wind, an open-source virtual globe technology, is introduced to the public	Event	
2004	C.E.	-54	The global fish market expands from $15.7 billion in 1980 to $71 billion in 2004. Fish become high-value commodities worldwide which cause market intensification. Increasing demand has led to problems related to fisheries not being able to efficiently replenish fish populations.	Event	
2004	C.E.	-54	On 26 December, the 'Boxing Day' tsunami forms from a 9.0 magnitude earthquake under the Indian Ocean and claims over 275,000 lives. The tsunami is an environmental disaster in the areas of Indonesia, Thailand, Burma, India, and Sri Lanka. Around 200,000 deaths are estimated from the event.	Event	
2005	C.E.	-55	The Joint United Nations Program on HIV/AIDS observes that around two-thirds	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			of AIDS carriers are in Sub-Saharan Africa. These findings from the Joint UN Program on HIV/AIDS demonstrate how the socio-environmental conditions can play a part in the uneven distribution and proliferation of the AIDS virus.		
2005	C.E.	-55	Afghanistan obtains the title of country with the highest infant mortality rate. With around 17.5 percent of infants dying in the country, Afghanistan endures the environmental hazards caused by a decade of war inside its borders. One example includes civilian encounters with landmines embedded within farmland and elsewhere. Severe drought and the overall destruction of the country's infrastructure also play a role in the human-environment relationship in Afghanistan.	Event	
2005	C.E.	-55	The Environmental Protection Agency finds that 2,4-D, a herbicide, does not negatively impact human health when used according to the instruction manual. 2,4-D is an example of navigating the impacts of using chemicals in managing aspects of the environment.	Idea	
2005	C.E.	-55	Richard Lauv introduces the idea of nature deficit disorder. Nature deficit disorder is a term to describe	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			the negative psychological effects that children experience when they withdraw from environmental encounters.		
2005	C.E.	-55	The European Patent Office denies a patent because it contains fungicidal properties of the neem tree that trace back to indigenous knowledges in India. The decision by the European Patent Office reaffirms the ethical attitude that indigenous knowledges are not to be used for profit. This enforcement is an example of the evasion of biopiracy.	Idea	
2005	C.E.	-55	The Millennium Ecosystem Assessment is published. The Millennium Ecosystem Assessment builds upon the 1987 Brandt Commission Report, *Our common future*. The report emphasizes the problem that humans are living on borrowed time and that ecosystem services are being overexploited.	Idea	
2005	C.E.	-55	Luc Jacquet films *March of the penguins*. This film celebrates non-human elements of the environment and why they are significant in their own right.	Idea	
2005	C.E.	-55	Los Angeles, California establishes the Revitalization Master Plan which attempts to cultivate more wildlife along the Los Angeles River basin.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2005	C.E.	-55	In *Environmentality: Technologies of government and the making of subjects*, Arun Agrawal connects Foucault's ideas of governmentality to the environment, coining the term "environmentality." Environmentality refers to the ways in which the environment is governed through political processes.	Idea	
2005	C.E.	-55	Rwanda creates its own Environmental Management Authority to regulate and enforce environmental laws.	Event	
2005	C.E.	-55	The explosion of a Chinese mine results in the deaths of 203 miners.	Event	
2005	C.E.	-55	The World Trade Organization meeting in the Yucatan is met with antiglobalization demonstrations.	Event	
2005	C.E.	-55	U.S. Congress passes the Energy Policy Act to support transportation operated by biofuel and hydrogen.	Idea	
2005	C.E.	-55	The initial Millennium Ecosystem Assessment report declares the need to understand the positive and negative relations between human development and ecosystem services. The report also does a stock-taking of biomes converted for human use, among other human-environmental phenomena.	Idea	
2005	C.E.	-55	Google Earth, a three-dimensional	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			geographic information system, is introduced to the public after being purchased from the Keyhole Corporation in October 2004.		
2005	C.E.	-55	Jared Diamond publishes *Collapse: How societies choose to fail or succeed*. According to Jared Diamond, a civilization collapses according to five factors: self-imposed environmental damage, climatic change, war and conflict, extent of trading partnerships, and societal response to changes. It has been regarded as a form of neo-determinism by critics.	Idea	
2005	C.E.	-55	Heavy monsoon rains in India cause over 1000 deaths in the country, 447 of those in Mumbai.	Event	
2005	C.E.	-55	The combination of drought and locust invasions causes a food crisis in Niger, putting 12 million people at risk.	Event	
2005	C.E.	-55	The Hyogo Framework of Action is developed from the World Disaster Reduction Conference as the United Nations' response to the need for natural hazards and risk mitigation.	Idea	
2005	C.E.	-55	In August, Hurricane Katrina devastates the city of New Orleans, Louisiana and surrounding areas. The aftermath of Hurricane Katrina facilitates evaluating the human-environment	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			relationship in the context of social inequalities, hazards, risk, and vulnerability. The event has become a talking point for a slew of human-environmental issues, including why the use of best available technology (BAT) would have made the city more resistant to hurricanes.		
2005	C.E.	-55	In March, the Central American Free Trade Agreement is signed. Like its North American predecessor, the agreement is met with protests regarding the environmental and socioeconomic consequences for such localized practices as subsistence agriculture in places like Guatemala.	Idea	
2005	C.E.	-55	The United Nations declares the period between 2005 and 2015 C.E. as the International Decade for Action, Water for Life.	Idea	
2005	C.E.	-55	In January, the Alliance of Small Island States (AOSIS) organize an event with affiliates of the United Nations to discuss issues surrounding sustainable development and environmental hazards. The AOSIS discusses sustainable development in small island nations amid climatic changes, environmental disasters, and sea level rise. The event acts as	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			a political demonstration by island nations regarding the detrimental environmental issues of island nations.		
2006	C.E.	-56	The documentary, *An inconvenient truth*, gains popularity. Al Gore, the former U.S. Vice President, puts forth *An inconvenient truth* to communicate the hazardous effects of climate change.	Idea	
2006	C.E.	-56	New Zealand is considered by Yale University as the most environmentally friendly of 133 countries. This ranking shows how practices vary among nations in terms of how society conducts itself in its relation to nature.	Event	
2006	C.E.	-56	Scientists find that avian bird flu has the potential of becoming deadlier. This idea is an example of how pathogens coevolve with human transformation of the environment.	Idea	
2006	C.E.	-56	This year is declared by the United Nations as the International Year of Deserts and Desertification, which serves as a strategy to call public attention to issues and research relating to arid lands.	Idea	
2006	C.E.	-56	In July, an oil spill leaks around 15 thousand tons of oil into the Mediterranean from the Lebanese Jiyeh power plant.	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2007	C.E.	-57	U.S. Congress passes the Energy Independence and Security Act to augment the use of biofuels and increase the Corporate Average Fuel Economy (CAFE) standards.	Idea	
2007	C.E.	-57	In November, the Intergovernmental Panel on Climate Change (IPCC) releases its fourth report, which finds with very high confidence that human activities since 1750 have had a net impact on the warming of the planet's atmosphere.	Idea	
2007	C.E.	-57	In September, U.S. General Assembly adopts the Declaration on the Rights of Indigenous Peoples, which affects the global treatment and awareness of indigenous ecological knowledges and practices.	Idea	
2008	C.E.	-58	In South Africa, a prepaid water program in Soweto is denied because it infringes upon the right to water.	Idea	
2008	C.E.	-58	Edward Relph introduces a "pragmatic sense of place." A pragmatic sense of place is a place-based attitude which addresses human-environment issues at the local level. It emphasizes the significance of confronting global changes by appreciating the distinctive qualities that make up places.	Idea	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2008	C.E.	-58	Cloud seeding, a form of climatic engineering that attempts to produce clouds, is applied during the 29th Olympic Games in Chinese cities to try to reduce haze from all its air pollution.	Event	
2008	C.E.	-58	In May, the Wenchuan earthquake (Sichuan, China) results in over 70,000 deaths.	Event	

Planetary Boundaries Transition: 2009 to 2014 C.E.

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2009	C.E.	-59	Damian F. White, Chris Wilbert, and colleagues expand upon the study of technonatures, in *Technonatures: Environments, technologies, spaces, and places in the twenty-first century.* Technonatures refer to state of the human-environment relationship in which natural resources are extracted, protected, and produced solely by technological activities. The result is a hybrid type of environment.	Idea	
2009	C.E.	-59	The European Union develops the Climate and Energy Package to reduce greenhouse gas emissions and promote energy efficiency.	Idea	
2009	C.E.	-59	Rockström and colleagues propose the big idea of planetary boundaries. The term "planetary boundaries" refers to the idea that there are limits to where humans can safely interact with the environment (safe operating space) without the Earth system reaching a threshold of instability. The initial six boundaries include climatic change, nitrogen cycle, ozone depletion, ocean acidification, global freshwater use, and land-use change.	Idea	
2010	C.E.	-60	The Mauna Loa Observatory in Hawaii records the level of	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			atmospheric carbon dioxide at 390 parts per million, which is almost 39 percent more than the time before the Industrial Revolution.		
2010	C.E.	-60	On 10 April, the British Petroleum oil spill causes an environmental disaster in the Gulf of Mexico.	Event	
2010	C.E.	-60	In January, the Haiti earthquake results in over 200,000 human deaths.	Event	
2011	C.E.	-61	A magnitude 6.2 earthquake destroys much of Christchurch, New Zealand. The event results in over 181 deaths and multiple instances of earthquake-triggered quicksand. It is regarded as an aftershock after the September Darfield earthquake in 2010.	Event	
2011	C.E.	-61	The Durban Agreement on Climate Emissions is developed.	Idea	
2011	C.E.	-61	The world population reaches 7 billion.	Event	
2011	C.E.	-61	The Deepwater Horizon oil rig explodes off the coast in the Gulf of Mexico. The event is the largest marine oil disaster in the history of the United States.	Event	
2011	C.E.	-61	In March, an earthquake/tsunami causes more than 21,000 deaths around the area of Tohoku, Japan.	Event	
2012	C.E.	-62	Fukushima, Japan experiences a nuclear accident due to the proximity of a nuclear	Event	

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
			powerplant to an incoming tsunami.		

Long Emergency Scene: 2014 C.E. to Present

Date	BP or CE	Date (B.P.)	Description	Category (Idea/ Event)	Time Frame
2014	C.E.	-64	The Intergovernmental Panel on Climate Change (IPCC) releases its fifth report, which reasserts with very high confidence that human activities since 1750 have had a net impact on the warming of the planet's atmosphere.	Idea	
2014	C.E.	-64	Elizabeth Kolbert publishes *The Sixth Extinction: An unnatural history*. The sixth extinction refers to the mass extinction of flora and fauna because of human activities after the dawn of the Industrial Revolution.	Idea	