

Religion and the New Ecology

Environmental Responsibility in a World in Flux

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CHAPTER 5

Judeo-Christian Perceptions of Nature and Its Variability: A Foundation for Environmental Awareness?

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In light of ever-increasing environmental degradation, concerned individuals are seeking ways in which environmental awareness can be fostered among citizens to help turn the tide. Because the development of a new ethic and its adoption through education takes considerable time and could meet with uncertain success, some individuals propose that preexisting beliefs with which people are already comfortable might be employed to foster environmental stewardship. Because religious beliefs are pervasive in many societies, they might serve this goal. To reach the same goal, others would foster environmental stewardship using preexisting beliefs of hunter/gatherer and subsistence agricultural/pastoral societies, because these people must possess an uncanny knowledge of nature simply to persist given nature's vicissitudes (Diamond 1993), and a "new" environmental ethic might be based on this knowledge (Nabhan and St. Antoine 1993).

Employing preexisting belief systems to foster environmental awareness assumes that these systems as a whole are consistent with environmental stewardship. These beliefs must not provide hollow justification for environmental stewardship based on selected references that can be countered by other references to the tradition. A belief system's failure to

consistently support environmental awareness has no relationship to its value in areas other than environmental awareness, such as spirituality, morality, and cultural heritage, but it does undermine its ability to counter the arguments made by forces fostering environmental degradation in the political and economic marketplaces.

Judeo-Christian traditions constitute a convenient foundation for environmental awareness in Western societies, given their pervasive influences through history and today. This tradition not only reflects a strong religious perspective, but many of its tenets are based upon ancestral Hebrew oral traditions, preserved in the book of Genesis, passed down by people who practiced subsistence agriculture and pastoralism. Therefore, at least for Western society, Judeo-Christian traditions may unite religion and subsistence knowledge as a foundation for environmental stewardship (see MacKinnon and McIntyre 1995; Carroll and Warner 1993; Fern 2002).

Adoption of the Judeo-Christian tradition as a foundation for environmental awareness, however, brings its own problems. Lynn White, Jr., (1967) claimed that this tradition is the major cause of environmental degradation in Western civilization because of its devotion to technology. White further argued that devotion to technology stems from biblical passages, especially in Genesis, that convey the tenets that humans have dominion over nature and that nature exists to benefit humans. Therefore, White's thesis has been adopted by some who argue that Judeo-Christian traditions cannot provide a foundation for environmental ethics.

White's thesis concerning the unique environmental destructiveness of the Judeo-Christian tradition can be questioned. First, as Whitney (chapter 1, this volume) points out, his historical interpretations may not be correct. Second, as Hought (chapter 8, this volume) and Rasmussen (chapter 9, this volume) suggest, his use of the common attribution of human dominion over nature in the Bible may be due to selective reading and mistranslation. However, a more basic rationale for refuting White's thesis emerges from the observation that degradation of the environment over the past tens of thousands of years is not restricted to Western civilization or peoples adopting the Judeo-Christian tradition. Whether it was Paleolithic hunters overkilling large mammals (Martin 1973; Mosimann and Martin 1975; Martin and Klein 1984; Belovsky 1988; Alroy 2001) or Mayans farming in unsustainable ways (Deevey et al. 1979), people have an uncanny ability to despoil the environment. Therefore,

environmental degradation brought about by people is not restricted to particular cultural traditions, but may be a human proclivity to over-exploit their environment; this casts doubt on employing any preexisting tradition as a foundation for environmental ethics. Nevertheless, pre-existing traditions may still be useful, if viewed from a “behave as I say, rather than I do” perspective.

In this chapter, the Judeo-Christian view of Nature is examined in several ways. First, what is the tradition’s attitude towards nature (e.g., balance versus dynamic), and is this supported by environmental science? Second, does the tradition recognize the role of nature in its historical development? Third, were ancient Hebrews limited in their ability to understand how nature influenced them and would this have colored their perspective on nature? Finally, by reflecting on these questions, the Judeo-Christian tradition is examined to determine whether it might serve as a sound foundation for enhancing environmental awareness and stewardship.

WHAT IS THE SCRIPTURAL VIEW OF NATURE?

In a comparison of Judaic, Christian, and Islamic theological writings, Nasr (1996) argues that these traditions hold that the natural world is inherently in a state of benign order or harmony, which is unchanging (“balance of nature”). Furthermore, disruption of this harmony is due to human transgressions against God. This is a common literalist, scripturally based interpretation of nature (Cartmill 1993; Richardson 1998), which differs from White’s (1967) interpretation of the Judeo-Christian role in history. Even so, Nasr, like White, claims that part of our transgression may be our faith in secular technology and science, and both would have us solve our ecological crisis by going back to medieval mysticism.

In the “balance of nature” perspective, nature would have been benign for human existence if we had been faithful to God’s will (Cartmill 1993). Ultimate disruption of the “balance” occurred when Adam and Eve ate from the forbidden Tree of Knowledge and were driven out of Eden (Genesis 3), while the massive calamity of the Diluvium was God’s punishment for sinfulness (Genesis 6:2–11). The book of Isaiah, which is so influential to Christian thought, claims that basic characteristics of

nature (e.g., predation, competition, death, etc.) are due to sin (Isaiah 11:6, 65:25), did not exist in the Garden of Eden, and would disappear again if we were faithful to God’s will (Cartmill 1993; Richardson 1998; Fern 2002). Extended to uniquely Christian thought, Paul and Augustine adopt this position and further argue that mankind need not be concerned with nature, because all will become right if we just eliminate sin (Cartmill 1993). Therefore, a scriptural notion of a “balance of nature” is an extension of the essential tenet that God acts through history (Redmount 1998), where nature is but one aspect of history and “balance” is a baseline condition against which God’s displeasure can be assessed.

This is not to say that scripture does not refer to flux in nature. Reference is made to the natural rhythm of seasonal change and the passing of life (Ecclesiastes 3:1–2; Daniel 2:20–21). People are cautioned to be prepared for periodic drought (Genesis 41:33–36), rain storms (Ecclesiastes 11:3), and devastation by locusts (Joel 1:4). However, flux is not the norm, but a disruption of the expected harmony (“balance of nature”) due to sinfulness and God’s displeasure (e.g., drought: Deuteronomy 11:17, 28:23–24 and Amos 4:7; rain: James 5:17 and Psalms 38:22; locusts: Deuteronomy 28:38–42). A striking example of this disruption is when the people of Israel suffer drought and plague, not due to general sinfulness, but due to the sins of their kings, such as Saul (2 Samuel 21:1–14) and David (2 Samuel 24:1–25).

In a philosophical review of the “balance of nature” concept, Egerton (1973) argues that it can be found in many traditions throughout the world, and moreover is a very strong element of ancient Hellenistic teachings, which exerted substantial influence on scripture, and which are much more recent than the oral traditions of the ancient Hebrews who lived in a subsistence economy. This raises the question: how much of the portrayal of nature in scripture may reflect uncanny knowledge of nature that is possibly possessed by hunter/gatherer and subsistence agricultural/pastoral people (Diamond 1993)?

The scripturally based idea of the “balance of nature” should not be confused with science’s view of balance, where the interplay of conflicting natural forces or processes produce patterns in nature, such as planetary motion, trajectories of falling bodies, and the structure of ecological systems (Levin 1999; Botkin 2001; Pimm 1991). Scientists adopting a more static (equilibrium) or transient (non-equilibrium) perspective still agree that interacting processes produce regularities in nature that can be understood at least after the fact, if not always predicted beforehand.

The above points raise questions about the Judeo-Christian tradition's utility as a foundation for environmental awareness. First, if later Hellenistic perspectives obscure the "uncanny" knowledge of nature that ancient Hebrew hunter/gatherers and subsistence farmer/pastoralists may have possessed, then how much environmental knowledge is relayed in scripture? Second, if a literalist reading of scripture is inconsistent with how we scientifically know that nature operates, then can it provide logical arguments against the forces fostering nature's destruction? A non-literalist reading may claim that human-nature relationships in scripture are parables for how people should follow God's laws, but unless these parables relate explicitly to environmental stewardship, what is the foundation for environmental awareness?

WHAT IS THE ROLE OF NATURE IN PRODUCING THE JUDEO-CHRISTIAN TRADITION?

Two recent scientific treatises by Diamond (1997) and Fagan (1999) have argued that we are just beginning to understand how environmental changes have influenced and continue to influence various human cultures. These treatises have their foundation in environmental archaeology, which examines how humans interact with environments (Butzer 1971, 1982). In particular, Fagan (1999) has created what is termed historical climatology, which combines new insights from climate studies and ecology with human history. Fagan argues that ecologists, archaeologists, and anthropologists need to pay greater attention to historical climatology in order to understand the past and future of human societies, and how people influence and are influenced by their environment.

I examine three Biblical events that are fundamental to the Judeo-Christian tradition in light of historical climatology: Noah and the Diluvium, Abraham and his wanderings, and the early emergence of Israel. These environmental scenarios are plausible given archaeological and climatological findings. To examine them, one superimposes chronologies from Biblical archaeology and historical climatology, which immediately raises the treacherous issue of the Bible's historical accuracy. Some archaeologists argue that the Bible is a precise historical document, even claiming that most Biblical characters were real (e.g., Dever 2001). While

some archaeologists argue that the Bible has little historical validity, most concede that it contains kernels of tradition about real events that have become obscured over time (Redmount 1998; Stager 1998; Isserlin 2001). Consequently, gleaning historical fact from the literary epic of the Hebrew people and their relationship with God is a challenge, but not an insurmountable one.¹

The goal of this exercise is to demonstrate how environmental changes in the Near East may have influenced the people responsible for the oral traditions that are the foundation for the Bible and Judeo-Christian tradition. This in turn may cast additional light upon the suitability of this tradition as a foundation for a new environmental awareness.

Noah and the Diluvium

Fagan (1999) relates how paleoclimatological and archaeological findings indicate that an onset of cool, dry conditions reduced the carrying capacity of the land to support early agriculturalists and pastoralists in Asia Minor around 6200 BC. This forced people to seek out lake margins, such as the then freshwater Black Sea, for habitation. Warmer, moister conditions returned around 5800 BC, and the Mediterranean's sea level again began to rise as glaciers continued to recede at the end of the last ice age. At this time, a narrow barrier separated the Mediterranean from the freshwater Black Sea, which was 150 meters lower than the Mediterranean. Approximately 5500 BC, the barrier between the Mediterranean and Black Sea gave way and waters from the Mediterranean rushed into the Black Sea. This made the Black Sea saline and flooded extensive low-lying areas in which most people lived and on which they depended for their subsistence. Thus both long-term and gradual climatic fluctuations that repeatedly occurred with each glacial period during the Pleistocene had profound impacts on the biota used by people in their subsistence pastoral and agricultural economies, leading to a rapid and unexpected natural catastrophe. All of these events are today scientifically explainable, but would not have been understood in the same way by the people at the time.

Ryan and Pitman (1998) argue that the above documented environmental changes and catastrophe are the basis for the Biblical story of Noah and the Diluvium, though Fagan (1999) cautions against trying

to relate this or any Biblical story to real events. Nonetheless, it is tantalizing that Noah's Ark comes to rest on the mountains of Ararat (Genesis 8:4), a region in present Armenia to the southeast of the Black Sea. Furthermore, it is interesting that the Diluvium story is common to a number of ancient Mesopotamian cultures (e.g., the Gilgamesh epic of Sumer), but not elsewhere, including Egypt (Coogan 1998).

If this environmental scenario is the historical basis for the Noah and Diluvium tradition, it is interesting because it refers to a sudden environmental catastrophe, but not the long-term environmental changes that concentrated people around lake margins and resulted in rising sea waters that led to catastrophe. Perhaps Noah's ancestors and neighbors were only impressed by relatively benign and constant conditions around a lake margin, not drought conditions that had forced them to migrate to and concentrate around lake margins over centuries. Nor do these people seem concerned with a rising nearby sea, probably because their subsistence may not have depended on the Mediterranean. This may reflect an inability to grasp long-term and gradual changes, especially those that did not immediately influence daily existence.

Abraham and His Wanderings

Many archeologists believe that the Amorites of northwest Mesopotamia were the ancestors of the Arameans, the people of Abraham (Isserlin 2001), and the Bible states that Abraham's ancestral home was Haran in this region (Genesis 11:31) (May and Metzger 1965). Haran lies south of the mountains of Ararat, which provides some geographical link to the Diluvium tradition (see above). However, when the Bible first mentions Abraham, he is dwelling in southern Mesopotamia near the city of Ur in the Akkadian empire (Genesis 12:31). Abraham leaves Ur and returns to his ancestral home of Haran before moving to Canaan, the dwelling place promised to him by God (Genesis 11:31). Throughout Genesis, Abraham's son, Isaac, and grandson, Jacob, are referred to as coming from Haran (Genesis 24:10 and 29:4). Many Biblical scholars place the Abraham tradition as arising from the end of the third and early second millennia BC (Isserlin 2001; Pitard 1998). Archaeology and historical climatology provide some interesting associations for Mesopotamia during this period.

At the end of the third millennium BC, there appears to have been extensive drought throughout the Near East, India, and Africa (Fagan 1999; Hassan 1997; Rosen 1997; Hole 1997; Wilkinson 1997; Courty and Weiss 1997; Weiss 1997; Weiss et al. 1993; Butzer 1976). We know that this drought led to the abandonment of villages in northwest Mesopotamia such as Abraham's ancestral home (Haran), where agricultural and pastoral economies relied upon rainfall (c. 2200 B.C.) (Weiss et al. 1993; Wilkinson 1997; Courty and Weiss 1997). We know that the Amorites (ancestors to the Arameans, Abraham's people) migrated into southern Mesopotamia where agriculture and pastoralism would have been less affected by drought, because the Tigris and Euphrates Rivers provided water for livestock and irrigation (Weiss et al. 1993). The drought in northwest Mesopotamia was so severe that villages were not resettled for hundreds of years until c. 1900–1728 BC, when climatic conditions became wetter (Weiss et al. 1993; Wilkinson 1997; Courty and Weiss 1997).

The Akkadian empire in southern Mesopotamia constructed a wall of fortresses called the "Repeller of the Amorites" attempting to accomplish what the name implies (c. 2054–2030 BC) (Weiss et al. 1993). Nonetheless, people from the northwest moved into southern Mesopotamia and settled around major urban centers in Akkad and Sumer. This is where Biblical tradition finds Abraham, near Ur in Sumer. However, the drought also reduced carrying capacity in southern Mesopotamia, and these migrants further strained the ability of the land to support sufficient agricultural and pastoral production (Weiss et al. 1993). As a result, political turmoil developed, and by the nineteenth century BC the Akkadian empire collapsed. One can imagine that Abraham returned to his ancestral home of Haran from Ur because of the social collapse in southern Mesopotamia; in fact, the Bible states that Abraham's life was threatened while in Ur, because he was an outsider. On returning to Haran, Abraham would find a landscape still plagued by drought and unfit for agriculture or pastoralism, which may explain his departure for Canaan.

The link between environmental change and social collapse in the late third and early second millennia BC occurs throughout the Near East, Egypt (Butzer 1976; Hassan 1997; Rosen 1997; see Butzer 1997 for refutation), and the civilizations in India (Possehl 1997). In Egypt, the fall of the Old Kingdom after 2160 BC occurred when agriculture, which depended on the flooding of the Nile, failed as floods annually peaked too

early and were too small. Famine resulted and political unrest developed (Butzer 1976; Hassan 1997; Fagan 1999). The Old Kingdom pharaohs claimed to be divine and in control of the Nile's waters; when the pharaohs failed to provide the necessary water, the Old Kingdom fell. Pharaohs in subsequent dynasties still claimed divinity, but never again claimed control of the Nile; rather they became the earthly embodiment of the proper lifestyle (Fagan 1999). Fagan (1999) argues that other societies through history, when based on divine rulers claiming control of the environment, have failed when major environmental changes occurred.

No divine human ruler controls the environment in the Judeo-Christian tradition; only the God of Abraham has this power. In the covenant between God and Abraham, God protects and cares for His people, if they do not transgress. One way that God cares for His people is by maintaining a benign and constant environment. Such a covenant would be attractive to people who have experienced long-term displacement and social upheaval. However, the Bible does not mention the wide-ranging and long-term drought behind the upheaval and displacement. Abraham's people may not have comprehended the long-term and gradual increase in aridity that led to migration to new environs, because it did not immediately influence day to day existence. They may only have understood that they could no longer subsist in southern Mesopotamia with the turmoil or in their ancestral home upon return.

The Early Emergence of Israel

During the thirteenth to tenth centuries BC, there again is evidence of decadal droughts, although less intense and not as widespread as in the third millennium BC (Wilkinson 1997; Maley 1997; Fairbridge et al. 1997; Bryson and Bryson 1997; Lozek 1997; Starkel 1997; Magri 1997; Kayan 1997). These environmental changes again may have taxed the carrying capacity of the land to support agricultural/pastoral economies, and concurrently there was widespread disruption of late Bronze Age societies (Pitard 1998). This was the time of Joshua and Judges when the Hebrews finally gained control of Canaan as promised by God to Abraham, and the nation of Israel formed (Isserlin 2001; Stager 1998; Hackett 1998).

The Hebrews were not the only people moving into Canaan at this time; large-scale movements of other people also threatened the Ca-

naanite status quo, as well as the Egyptian, Assyrian, and Hittite empires (Isserlin 2001; Stager 1998; Hackett 1998). One group of people referred to as the Sea Peoples were probably migrants from the Homeric Mycenaean culture, which collapsed at this time and led to a dark age in Greece (Wood 1985). Biblical Philistines were Sea People moving into Canaan from the west, while the Hebrews moved in from the east; eventually the two met and came into conflict. During this period, Canaanite rulers were nominal vassals of the Egyptian pharaohs and regularly requested military assistance to hold back these migrants. The Canaanite rulers refer to one group of wandering rural people, the Apiru, who are thought by some to be the Hebrews (Pitard 1998; Stager 1998; Isserlin 2001).

This crucial time for the Judeo-Christian tradition may have been a period of turmoil initiated by environmental change. The Bible, however, does not relate these geopolitical events to the environment. Again, these environmental changes were widespread, long-term, and gradual, not sudden, so that people may not have correlated them with societal changes.

Therefore, all of the above Biblical events may have been triggered by known environmental conditions. In fact, these environmental events may not have been unusual, but typical of long-term climatic patterns in the Near East—patterns that science is just beginning to decipher by understanding current climatic processes and by using these to reconstruct past climates.

Short-term Climatological Processes in the Near East

Only recently have we started to gain an understanding of how oceanic water temperatures and salinity create changing patterns in ocean currents and how one wide-ranging pattern (El Nino/Southern Oscillation or ENSO) created by these currents may operate (Fagan 1999). A few years ago, ENSO was recognized for its ability to create droughts and floods on the Indian subcontinent and to cause the collapse of Peruvian fisheries, but now its influence on wet, dry and warm, cool conditions in many regions has been documented. Today, one can hardly view an issue of *Science* or *Nature* without finding something new about ENSO or how oceanic currents influence climate. The ecological effects of these climatic fluctuations is only beginning to be realized (Stenseth et al. 2002).

Our growing understanding of ENSO has led to a realization that it creates self-enhancing conditions so that a combination of particular temperature and salinity conditions persists for a period of time before “jumping” to an alternate combination of conditions, and then “jumping” back again. This creates a pattern of oscillations in the associated climatic conditions for the landmasses influenced by ENSO. In the Near East, periods of drier and wetter conditions appear with a four to ten year frequency and with dramatically varying intensity (Fagan 1999).

ENSO's periodic climatic shifts were in part recognized in Biblical times, because mariners of the Arabian Sea commented on them, as they influenced winds and thereby the ability to sail to and trade with the Indian subcontinent (Fagan 1999). Nonetheless, these people did not recognize that periodic droughts (Genesis 41:33–36) that created famine and accompanying disease outbreaks (Deuteronomy 11:17, 28:23–24; Amos 4:7; Leviticus: 26:26; James 5:17), periodic severe rain storms (Ecclesiastes 11:3; Psalms 38:22, 135:7; Job 37; James 5:17), and periodic locust plagues (Deuteronomy 28:38–42) might be a consequence of the climatic fluctuations that we today call ENSO. However, these are not the long-term or massive climate changes associated above with pivotal Biblical events.

Long-term Climatological Patterns in the Near East

The ENSO climatic pattern is observed in Near Eastern geological deposits (von Rad et al. 1999; Bar-Matthews et al. 1999; Bajjali and Abu-Jaber 2001). However, self-enhancing processes, like ENSO, not only produce basic oscillations between alternate states, but can also produce longer-term emergent oscillations. Paleoclimatological studies in the Near East indicate emergent oscillations occurring with 750-, 250-, 125-, 96-, 56-, 45-, 39-, 30-, 26-, and 14-year periodicity that lead to ENSO being wetter or drier than average (von Rad et al. 1999).

While ENSO is the underlying climatic “machine” in the Near East, it also is modified by other long-term environmental events. For example, large amounts of cold freshwater from melting continental ice sheets were added to the oceans starting at the end of the last period of glaciation (c. 13,000 BC). This influx of cold freshwater changed the oceans' salinity and temperature, and thereby modified ENSO and the climatic patterns that it produced.

Observed long term wet/dry cycles in the Near East have been questioned by some scientists (Butzer 1997; Bottema 1997), but most believe that they are real (Weiss 1997). These changes were not instantaneous but required decades or centuries to be manifested on the biota and cultures. It is the protracted effects of these environmental changes that lead to the confusion over their importance to human societies (Weiss 1997). This may also explain why biblical authors did not recognize them or comment on their importance.

HOW MUCH DID BIBLICAL AUTHORS UNDERSTAND ABOUT ENVIRONMENTAL CHANGE?

People during the times and in the environs in which Judeo-Christian traditions first developed were able to associate short-term environmental changes with the land's ability to support them (i.e., carrying capacity). Egyptians during the third millennium BC erected columns along the Nile to mark flood levels, which were used to predict the availability of water and thereby the amount of land that should be farmed (Butzer 1976). This was an early application of statistical forecasting, because flood levels affected agricultural production. Amounts of food to be stored had to be based on past shortfalls in production (Genesis 41:33–36); while taboos on the harvesting of adult wild birds and fruit had to be related to the next year's production (Leviticus 19:23–25, 25:4; Deuteronomy 22:6–7). These actions manage risk for short-term phenomena, where cause and effect could be established with minimal data or synthesis.

The massive environmental changes associated with biblical events are different from short-term associations made by biblical people. Long-term and gradual changes do not provide immediate associations between the environment and events: the Diluvium must be an act of God because of its suddenness. The breakdown of the land separating the Mediterranean from the Black Sea could not have been anticipated through the slow increase of the Mediterranean sea level. Reduction in carrying capacity due to the droughts of 8200–7800 BC, the third millennium BC, and again in the thirteenth to tenth centuries BC occurred slowly, but when carrying capacity failed, it was conflict between resident and displaced people that was the problem, and this consequence must be God's will.

We have begun to understand long-term climatic patterns in the Near East and elsewhere, because weather records have been accumulated and sophisticated methods have been used to analyze them. ENSO was not identified until the late nineteenth century when British bureaucrats in India had to deal with recurrent famines. They began to correlate weather patterns with crop production and establish a system of weather stations (Fagan 1999). Later, scientists began to investigate ENSO's underlying processes, which required long-term data of greater precision and improved computational capabilities (Fagan 1999). However, we still cannot precisely forecast ENSO, because its self-enhancing character is chaotic (i.e., deterministic, but unpredictable without knowledge of initial conditions) (Fagan 1999). Chaotic dynamics were not identified until the 1960's (Gleick 1987). None of this was available to biblical people.

Without prior knowledge of long-term climatic oscillations, like ENSO, it is even more daunting to identify how climate might influence human populations. A simple mathematical model that is commonly used to portray populations (Hutchinson 1948, 1978; May 1973; Renshaw 1991) can be employed to illustrate how people would have difficulty associating annual weather conditions with the environment's ability to sustain them if there are long-term climatic oscillations. The basic model has a population growing asymptotically to an environmentally determined maximum number (i.e., carrying capacity) (fig. 5.1a). This is called density dependent population growth, because growth diminishes as the population approaches carrying capacity. However, the diminished population growth as carrying capacity is approached may not be due to current population numbers, but past numbers (i.e., time-lagged response), if population members respond to the conditions they experienced while maturing (e.g., past stresses on growth or reproduction) or carrying capacity is temporarily reduced by large populations (e.g., recovery of overexploited resources is inhibited). In this case, the asymptotic approach to carrying capacity becomes oscillatory, with the oscillations increasing in severity and becoming cyclic as the time-lag increases (fig. 5.1b). Furthermore, these oscillations tend to become even more severe and cyclic if birth and death processes occur at particular times, such as seasonally or at specific ages (i.e., discrete dynamics). This can produce oscillations that regularly repeat over time or become chaotic (fig. 5.1c). All of the above traits are typical of human populations. Finally, a varying carrying capacity can be imposed on the population, such as that produced by an environment driven by short-term ENSO cycles and its emergent longer-term cycles.

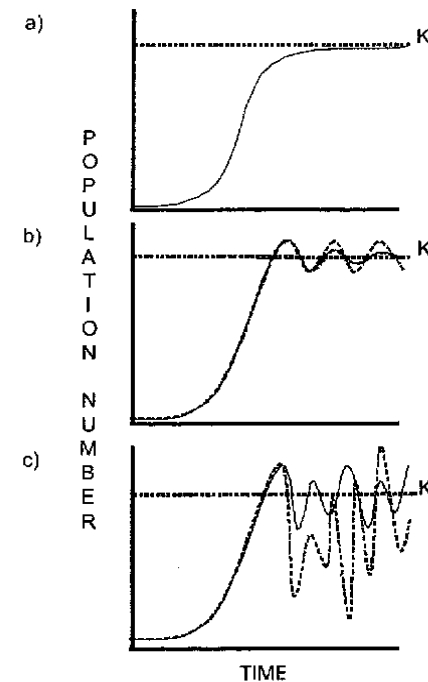


Figure 5.1. Possible population dynamics emerging from the model are plotted. With simple density dependence (a), the population smoothly approaches carrying capacity (K). With time-lagged density dependence (b), the population either approaches K with damped oscillations (solid line) or cyclically overshoots and undershoots K (dashed line), as time lag increases. With discrete growth and density dependence (c), the population can exhibit cycles of varying periodicity (solid line) or can appear to randomly oscillate (chaos: dashed line) as growth rate increases.

To illustrate what the scenario described above would mean for the ability of people to predict how the environment influenced their population, a population model (Hutchinson 1948, 1978; May 1973; Renshaw 1991) with the following parameters was used:

1. Maximum human population growth measured for subsistence agriculture/pastoralism ($\sim 0.04\%$ per annum; Hassan 1981; Angel 1975; Deevey 1960).

2. Environmental cyclicality for the strongest cycles observed in the Middle East (250, 125, 56, 26, 14 and 4 years; von Rad et al. 1999).

3. Time lags dependent on subsistence mode. (For pastoralism or harvesting of wild plants there is no time lag, because livestock or wild plant production is directly linked to current precipitation. However, as agriculture becomes more sophisticated, time lags increase. Storage of crop surpluses produce approximately five-year lags given technologies in the third through first millennia BC. Fallowing and irrigation ameliorate drought effects but diminish long term agricultural production by soil degradation and salination, which produce ten- to one hundred-year time lags).

What might biblical people conclude? A simple intuitive approach, like the ancient Egyptian logic of measuring Nile flood levels to predict agricultural production, plots the current environmentally determined carrying capacity with current population number (fig. 5.2). A positive relationship with little scatter indicates strong environmental control of population. This is not observed except perhaps for environments of long periodicity (about 250 year) and small lag times (less than 20 years). Therefore, simple intuition might lead biblical people to conclude that some unperceivable force, rather than the environment, controls their population or fate as a people. However, the population model generating the relationship between carrying capacity and population numbers (as seen in fig. 5.2) is driven by environmental changes, so simple intuition fails.

With a long-term database and more sophisticated computations, the failure of simple intuition can be overcome. First, a population's density dependent response is more important than total numbers, so annual population growth rate should be examined (current population less last year's population divided by last year's population). Second, annual population growth rate is not a reflection of current carrying capacity but past carrying capacity set by the time lag. A plot of the above values would produce a negative relationship with little scatter if the environment exerts a strong influence on the population. This is observed for all time lags and cycles (fig. 5.3). This simple analysis can be conducted, because the population model, time lags, and cycles are known. Without this knowledge, sophisticated computer analyses are necessary to identify the underlying environmental causes. Is it any wonder that biblical people might not associate pivotal events with environmental changes that are now known to have occurred?

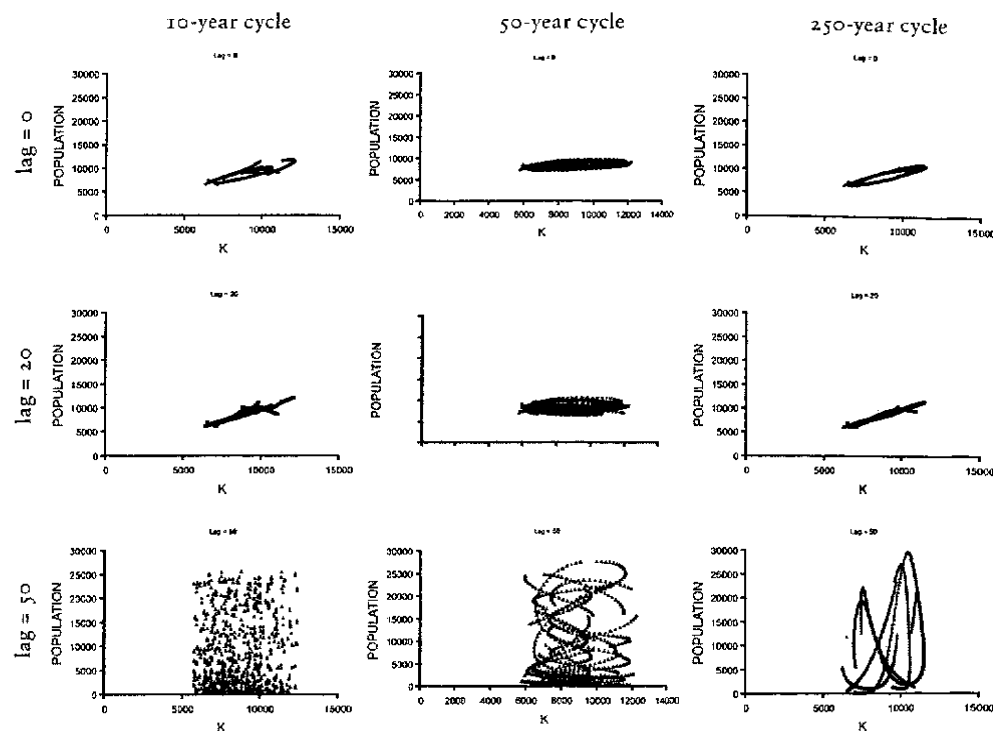


Figure 5.2. The simple relationship between carrying capacity and population number from the data generated by the model are plotted. Carrying capacity is varied with environmental cycles of 10-, 50-, and 250-year periodicity and the population is allowed to exhibit time lags in density dependence of 0, 20 and 50 years.

The environment of pastoralists and agriculturalists in the third to first millennia BC in the Near East was far more complicated than portrayed in the above population model. First, different climate cycles interacted to amplify the wet, dry conditions (Fagan 1999; von Rad et al. 1999). This was not identified until paleoclimates over tens of thousands of years were reconstructed. Second, the economies of people in the Near East during this period influenced population dynamics in more complex ways than the model portrays (Wilkinson 1997). Nonetheless, the model illustrates how environmental influences can be obscured.

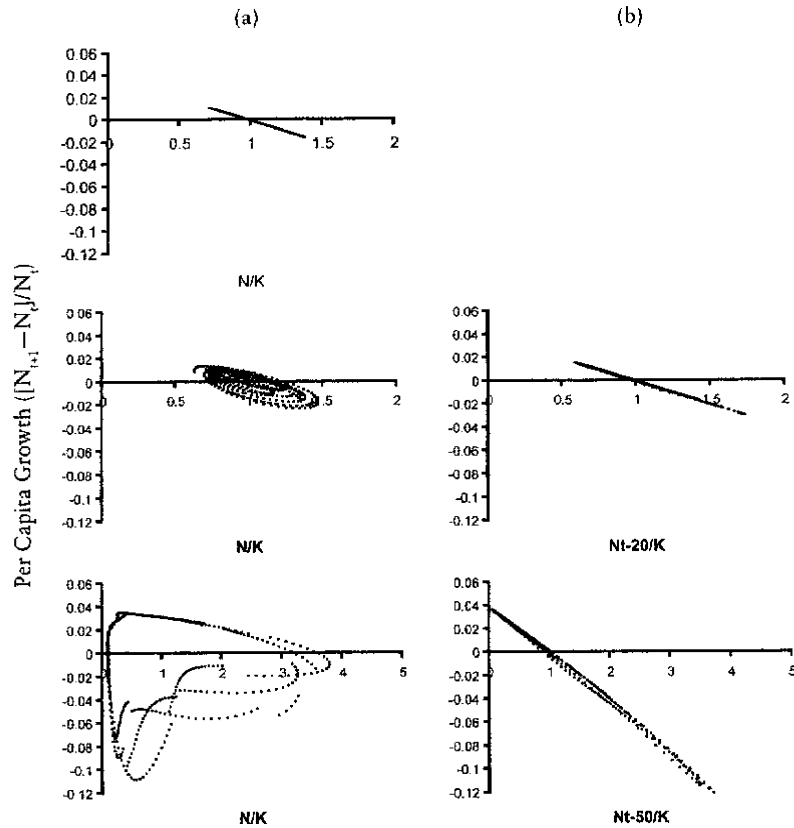


Figure 5.3. Using the data generated from the model with carrying capacity (K) cycling with 50 year periodicity and 0-, 20-, and 50-year time lags in density dependence (L), (a) the relationship between population number relative to carrying capacity (N/K) and per capita population growth rate ($(N_{t+1} - N_t)/N_t$) is plotted; (b) the same data are plotted when the population number relative to carrying capacity is time lagged by the appropriate value (N_{t-L}/K) in the model.

WHAT CAN WE LEARN FROM THE BIBLICAL DEPICTION OF NATURE?

Pivotal events were almost certainly influenced by environmental changes that were not recognized by biblical people. They did recognize

short-term environmental influences from drought, floods, and locusts. Yet they persisted in attributing constant harmony or “balance” to nature. The biblical “balance” may not be literal, but a parable to portray God’s influence. However, there may be another explanation based on a nomadic pastoral heritage. The ancient Greeks’ ancestors were also nomadic pastoralists, and Hellenistic thought held the same view of nature (Egerton 1973, 2001a, 2001b). Perhaps, rather than the Biblical view arising from Hellenistic thought, a common perspective was fostered by nomadic pastoralism.

Subsistence pastoralists should be aware of environmental fluctuations, because animal forage and resulting animal production will respond to environmental factors like rainfall. A nomadic lifestyle can ameliorate environmental variation, if movement between different habitat types and regions leads to more constant environmental conditions. For example, the proximity of hill and plain habitats in Canaan and migration between these areas ameliorated the impact of variable rainfall for pastoralists (Isserlin 2001), as did the Greek landscape. Therefore, a sense of environmental “balance” or constancy could emerge with a nomadic lifestyle.

A nomadic lifestyle and resulting environmental constancy disappear as population increases and movements are restricted because other people are already resident and bar access. In such cases, environmental change leads to social conflict, and the latter is blamed for disruptions, rather than environmental change. Populations grow and conflict increases as agriculture is adopted and becomes more sophisticated. Recognition of the environment’s influence becomes even more obscured, because time lags increase. Therefore, a past with a smaller population becomes idyllic, a Garden of Eden, because stresses were less pronounced in a more constant environment due to mobility. Perhaps, the “balance of nature” is a collective memory of these conditions.

To this point, environment has referred to natural events such as drought; however, as human population increases, environmental degradation can emerge. Therefore, the environment not only affects people, but people affect the environment. Today, human impacts are evident: global climate change, ozone depletion, desertification, deforestation, lost soil fertility, and lost biodiversity. Human impacts have occurred for millennia, but the Bible reflects very little on this, as it does not with environmental impacts on people. Again, anthropogenic impacts are presented as a departure from “balance” due to God’s displeasure.

Desertification, loss of soil fertility, and deforestation were recognized in ancient Mesopotamian official records (Olson 1981), but were merely referenced and not associated with drought, irrigation, or overexploitation. In the Bible, natural reforestation, something we consider beneficial, is viewed as a punishment from God, because productive fields were lost (Isaiah 29:17, 32:15, 32:19). Loss of soil fertility is not understood as arising from human overexploitation but as punishment from God for sins such as murder, rape, and sexual improprieties (Deuteronomy 11:16-17, 28:15-19, 29:22-28; Jeremiah 4:23-28; Hosea 4:2-3; Leviticus 18:24-28). While there are protestations against people fouling land and water (Ezekiel 32:2, 34:18-19), in other passages, it is viewed as a punishment for sin (Revelations 8:8-10, 16:3-4).

Large losses of biodiversity occurred in the Near East over the millennia in which biblical tradition developed. In Syria, gazelles went extinct from hunting by agriculturalists as early as the fourth millennium BC (Legge and Rowley-Conwy 1987). Lions, wolves, and bears were common in biblical times (2 Kings 17:25-26). However, the Bible makes no mention of these losses occurring well before Christ, even though a medieval pilgrim commented on the novelty of hearing a lion near Haifa (Islerlin 2001). Biblical cautions against overexploiting game and fruit (Deuteronomy 22:6-7; Leviticus 19:23-25), even against the destruction of an enemy's fruit trees during warfare (Numbers 13:20; Deuteronomy 20:19-20), refer to the immediate impact on subsistence, not any long-term notion of conservation and sustained productivity.

Biodiversity losses, as well as other environmental degradations, caused by people can require a long time to reach a critical threshold before those degradations (e.g., extinction) become rapid (Gilpin and Soulé 1986). Therefore, Biblical people may not have been able to associate their actions with the effects they produced, just as they were unable to do for long-term natural changes.

THE BIBLE AND ENVIRONMENTAL AWARENESS

In summary, the Bible may present environmental attitudes of a people unable to identify how environmental changes affected their lives, and a view of "nature's balance" emerging from a lifestyle heritage (nomadic pastoralism) that no longer applied to their circumstances. All traditions

reflect the ability of its founders to define their world and a collective cultural memory; therefore, any tradition's utility to increase awareness about modern technical problems may be limited. This assessment applies to the Judeo-Christian tradition as well as to hunter/gatherer traditions of indigenous peoples.

With increasing environmental destruction by growing human populations, more demanding technologies, and accumulating impacts, some individuals are calling for a new environmental ethic to stave off projected environmental disasters (e.g., Leopold 1966). Judeo-Christian traditions with roots in the Bible are an attractive foundation for environmental ethics because of the tradition's pervasiveness in Western civilization. Lynn White (1967) and E. O. Wilson (2002), who attribute environmental degradation in part to Judeo-Christian attitudes, admit this utility. However, aside from expediency, the Judeo-Christian tradition may not be appropriate given its unscientific portrayal of nature and frequent disregard for environmental influences. This raises questions about using biblical tradition to foster environmental awareness.

First, a literal reading of scripture most often portrays nature as hostile towards people, because it is God's instrument for punishment (Nasr 1996; Richardson 1998). Furthermore, scripture treats nature strictly as a source of human sustenance. This is not surprising since the Bible is the epic saga of a heroic people and their covenant with God as told by third to first millennia BC shepherds and farmers. How can this tradition foster environmental "friendliness," when nature is viewed as either hostile or simply utilitarian?

Second, an ethical tenet ("reasonableness") starting with Plato and employed by most subsequent philosophers is that moral schemes cannot be based on premises that are false, because this would discard reason (Fern 2002). The stricture of "reasonableness" does not require ethical schemes to be based on science (i.e., faith is allowed); however, schemes must be consistent with existing knowledge. This questions whether Judeo-Christian traditions, or any traditions, that cannot correctly define the role of environment on people or the role of people on the environment can serve as a rational foundation for environmental awareness. How can this tradition foster environmental awareness, when it does not correctly identify the interplay between people and the environment (cf. Fleming, chapter 7, this volume)?

Many individuals overlook the above difficulties in adopting past traditions as a foundation for environmental awareness and ethics. Whether traditional religious perspectives like Judaism, Christianity, and Islam

(e.g., Nasr 1996; Richardson 1998) or more radical perspectives of ecological theology and deep ecology (e.g., Zimmerman 1987; King 1989; Hinsdale 1991; Himes and Himes 1990; Clifford 1992; Cobb 1988; Swimme 1988; Macy 1988; Fern 2002) are advocated, modern science is de-emphasized, because it defines nature too narrowly. The unifying theme of these perspectives is that science through a materialistic quest for mechanistic explanations demystifies nature, makes it inanimate, and perceives it as having no purpose. In addition, scientific knowledge is viewed as partial truths that do not justify rejection of belief systems that are counter to it. Ultimately, a higher plane of perception about nature that mandates moral protection of the environment is sought, and science is viewed as counter to this goal. Higher planes might include the notion that nature reflects God's beneficence so that its destruction is an affront to God, or that animals are sentient and thus have rights like humans, or that ecosystems have purpose and evolution is directed, reflecting God's will and requiring protection (Fern 2002).

Issues of nature's sentience, purposefulness, and directedness, however, are counter to scientific evidence (Simpson 1967), and thus violate the stricture of "reasonableness." Furthermore, the claim that nature reflects God's beneficence, so that its destruction is an affront to God, is faith-based and cannot be scientifically tested, which makes it no more than a personal belief.

Final cautions in applying any tradition to foster environmental awareness need to be set forth. First, traditions must be invoked carefully and consistently. For example, Luke 12:41-48 is cited by some environmental ethicists as justification for stewardship of the earth; however, this passage, which calls for the care of one's master's property and to be prepared for the master's return, is usually interpreted by theologians as being prepared to answer to God upon death or the second coming. Second, many Judeo-Christian writings that refer to nature are not accepted as canonical by many who believe in the tradition (e.g., the New Testament by Jews, the Apocrypha by many Protestants, or the writings of Christian hermit mystics; Nasr 1996). Third, more environmentally friendly retranslations may be self-serving or lose their relevance to past thought. For example, if human dominion over nature in Genesis is reinterpreted as human care of nature (e.g., Cobb 1988; Himes and Himes 1990), this must be carefully researched and even so may not reflect how the tradition was practiced for millennia. Fourth, one must deal with elements of traditions that are not environmentally "friendly." For example,

while increasing human populations ultimately underlie most environmental problems, the Bible repeatedly advocates human fertility (e.g., Genesis: 1:28, 9:1, 9:7). Finally, because environmental degradation is worldwide and faced by all cultures, an environmental ethic suitable for all people, not just a single culture, is desirable.

All of the difficulties listed for basing environmental ethics on preexisting traditions, as well as the fact that all cultures have produced environmental destruction, lead some to seek new paradigms. Suggestions include our innate love of nature, our dependence on nature, and our evolutionary heritage with nature (biophilia: Wilson 1984, 1996, 1998; Kellert and Wilson 1993). Most are based on a premise that there is a scientific basis for environmental protection, especially an evolutionary imperative. For example, the noted environmental ethicist, Holmes Rolston III (1993) goes so far as to claim that evolutionary science mandates conservation of other species because all species share a large proportion of genes. These paradigms are termed natural philosophy or religious naturalism (Wilson 1998; Fern 2002).

The new paradigms focus solely on the well-being of nature, which is contrary to anthropocentric perspectives of religious-based environmental ethics, like the Judeo-Christian tradition, that stress justice, health and safety, goods and property, and economic development for people (American Baptist Churches 1989; Interfaith Council for Environmental Stewardship 1999; John Paul II 1990; United States Conference of Catholic Bishops 1991). Religious-based environmental ethicists also criticize the new paradigms because they do not provide an ultimate moral imperative—one can justify destroying something that is loved under appropriate conditions, but not if its destruction is forbidden by God—the Socratic dilemma of ethics based on reason alone versus faith (Fern 2002).

The new paradigms are revolutionary, but they are akin to some religious-based environmental ethics. St. Francis of Assisi advocated concern for all living things as our brothers and sisters, a oneness with nature (Himes and Himes 1990). St. Francis's view is contrary to traditional Judeo-Christian perspectives presented by St. Paul and Augustine in which worldly concerns are sinful and nature is of no matter (Cartmill 1993). While Lynn White (1967) lays blame for environmental degradation on the Judeo-Christian tradition, he endorses the revolutionary religious-based environmental ethics of St. Francis. John Paul II (1990) named St. Francis the patron saint of ecology. However, St. Francis's teachings are not the mainstream Judeo-Christian tradition upon which

others would base environmental ethics (see MacKinnon and McIntyre 1995; Carroll and Warner 1993; Fern 2002).

Perhaps the ethics needed to address current environmental problems must be revolutionary. Nearly nine hundred years before St. Francis, St. Basil the Great (AD 329–379) was instrumental in developing theology on the Trinity, the divinity of Christ, and the importance of the Holy Spirit, and he advocated an even more revolutionary environmental attitude:

O God, enlarge within us the sense of fellowship with all living things, our brothers, the animals, to whom thou gavest the earth as their home in common with us. We remember with shame that in the past we have exercised the high dominion of man with ruthless cruelty, so that the voice of the earth, which should have gone up to thee in song, has been a groan of travail. May we realize that they live not for us alone but for themselves and for thee and that they love the sweetness of life. (as cited in Fern 2002, 241)

NOTE

1. For example, one might view biblical patriarchs as lineages or tribes, not as individuals (Isserlin 2001). The challenge of assessing Biblical historicity is no more or less controversial than attempts to document other ancient tales, such as the *Iliad* and *Odyssey* (Wood 1985).

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