

In Search of the Granary of Rome:
Environmental Decline in Roman North Africa

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Abstract

Visitors to North Africa have long noticed a sharp contrast between the lush landscape described in ancient texts which supported Roman cities like Leptis Magna, and the more arid, barren landscape of North Africa today. Environmental historians have traditionally attributed this contrast to a decline in the extent of forests and in agricultural fertility since the start of the Roman period, brought on by an overexploitation of Rome's natural resources. Recently, however, this model has been criticized by several post-colonial and environmental theorists, who argue that the idea of decline in North Africa is a colonial invention that allowed Europeans to exert control over North Africa's Arab and Berber populations. This essay seeks to evaluate the history and the historiography of the North African environment, and of the Mediterranean environment more generally, to uncover the extent to which decline may have occurred. It concludes that environmental decline did indeed occur in North Africa, but the source of this decline was the Roman Empire itself. The nomadic Arab people of North Africa cannot be blamed for the environmental changes which took place before their arrival. At the same time, human-influenced decline must not be ignored when considering the Roman Empire's complex legacy.

In assessing Rome's influence on North Africa, it is useful to consider the beliefs and practices which shaped classical civilization's relationship to the environment throughout the Mediterranean. Two attitudes can be discerned: a reverence for the natural world and its deities, born out of a prehistorical understanding of natural balance, and a philosophical approach, which argued that natural resources should be exploited by human beings. Despite the extent of the influence of the former view relative to the latter, economic and material needs provided many reasons for the people of the Roman Empire to go beyond the natural balance. Deforestation occurred as lumber was needed for fuel, for building materials, and for ships of war. Over-exploitative agriculture contributed by gradually depleting the soil. Mining released new pollutants into air and water, and augmented deforestation. Pastoral animal-

keeping damaged forests' ability to recover from deforestation. Loss of water sources and runoff of high-quality topsoil thus occurred as the forests dwindled.

Literary and archaeological sources provide strong evidence for this assessment in the case of North Africa. Works like Pliny's *Natural History* and Strabo's *Geography* describe North Africa's rich environment in great detail, while historians like Sallust frequently refer to forests in North Africa. Recent archaeological studies using pollen cores, such as the pioneering work of H. Lamb and collaborators, similarly demonstrate that significant amounts of tree pollen were present at the start of the Roman period, and underwent a significant decline relative to grass pollen over the course of Roman presence.

Such evidence suggests that decline did indeed occur in North Africa, and thus the idea of decline cannot be understood as a colonial invention. However, the attribution of this decline to the waves of Arab nomads who entered North Africa in the eleventh century can indeed be discounted. Rome itself was the culprit. Making this distinction between Arab-centered decline and Roman-centered decline allows for a powerful synthesis of environmental history and post-colonial study. The post-colonial assessment of decline also augments the original theory with new insights, suggesting that we need to rethink the devaluation of herding cultures throughout history and challenging some references to forests on philological grounds. Bringing both pictures of the North African environment together reveals the importance of environmental history that is aware both of human power to influence environment and of the extent to which colonial motivations influence historical argument.

In Search of the Granary of Rome: Environmental Decline in Roman North Africa

Introduction

Visitors today to the remains of Roman settlements in North Africa, such as Carthage or Hippo, are greeted with an unexpected and perplexing sight: ruins that everywhere bear the sign of human presence on a massive scale, of aqueducts and gardens and all the needs of a thriving population, surrounded by a desolate and unforgiving landscape that renders these remnants improbable. For generations, historians of classical antiquity have sought to resolve the paradox of desert and city, present across the entire Mediterranean to some degree, but particularly acute in North Africa—of a dichotomy between the landscape as it currently stands and the vivid history we know to have taken place in that landscape under the vast and powerful Roman Empire. How, we must ask, was such an empire, such a wealth of human settlement possible, when today the landscape seems to lack any of the resources necessary to support it? One answer that has compelled many historians over the years is a story of decline. From an environmental perspective, a wealth of scholarship argues, the North African landscape was a victim of its own success. North Africa began as a fertile region with rich soil, abundant wildlife, and heavily forested land, but when the Roman Empire took control of the area in 146 BCE, drawn by those very qualities, the landscape began to change. By expanding cities, building aqueducts, roads and other infrastructure, and binding local farms into their taxation system, the Romans assembled a massive agricultural base for their empire in North Africa, a veritable Granary of Rome. But at the same time, their logging and farming efforts exhausted the land over the duration of their occupation. By the time the last vestige of Roman control vanished in 640 CE, North Africa had become a far more barren, formidable region than the place the Romans had found some seven and a half centuries earlier.

This standard view has dominated scholarship on ancient North African environment, including J. Donald Hughes' *Pan's Travail: Environmental Problems of the Ancient Greeks and Romans*, J. V. Thirgood's *Man and the Mediterranean Forest*, and a number of predecessors.^{1 2} Some, like Hughes, go so far as to suggest that environmental devastation may have been responsible for the decline of the Empire itself. Recently, though, a contrary view has emerged, claiming that the narrative of environmental decline has been overstated. Some, like Diana Davis in *Resurrecting the Granary of Rome*, see the story of decline—indeed, even the story of a Granary of Rome— as a modern colonialist tool to control a subjugated North African population.³ Others, like A. T. Grove and O. Rackham, question whether what we think of as a forest is the same thing that ancient authors described.⁴ These recent studies contend that the environment of North Africa has changed very little, if at all, since classical antiquity, and criticize previous historians for relying on literary sources rather than archaeological studies.

For all that these views differ, I argue here for a synthesis of these divergent perspectives and present a more nuanced picture of environmental decline in North Africa. Recent post-colonial critiques suggest that we need to reconsider our ideas on how environmental decline took place, setting aside, for instance, the idea that the practices of nomadic herders caused the greatest damage. But these critiques ultimately say less about the Romans themselves than about stereotypes of later inhabitants, particularly the Arab nomads of North Africa in the nineteenth century, whom France and other colonial nations sought to control. It is vitally important to untangle the complex network of stereotypes, racial and religious prejudice, and misplaced environmental blame that allowed these colonizers to justify

¹ J. Donald Hughes, *Pan's Travail: Environmental Problems of the Ancient Greeks and Romans* (Baltimore and London: Johns Hopkins, 1994.)

² J. V. Thirgood, *Man and the Mediterranean Forest: A History of Resource Depletion* (London, Academic Press: 1981.)

³ Diana K. Davis, *Resurrecting the Granary of Rome: Environmental History and French Colonial Expansion in North Africa* (Athens, Ohio: Ohio University Press, 2007.)

⁴ A. T. Grove, and O. Rackham, *The Nature of Mediterranean Europe: An Ecological History* (New Haven and London, 2001.)

their invasion of North Africa under the guise of a resurrection of its landscape. Only then can we clearly see the self-serving motives behind colonization. Yet at the same time, we must be careful not to conflate environmental changes that took place under the Romans with those falsely attributed to the colonized Arab population. When we look closely at the Roman Empire itself, overwhelming evidence remains that there *was* a Granary of Rome in North Africa, and that Rome's overexploitation of its resources there left a permanent scar on the region. Both literary and archaeological sources confirm that a very different North Africa existed when Rome sailed into the region, and that the landscape we know today is at least in part a result of Roman presence. Acknowledging the antiquity of environmental changes in no way justifies the colonial narrative—in fact, it destabilizes it, as the theory of ancient decline clears colonized North Africans of any blame for the loss of the forests and fields which once sustained Rome, shifting it to the Romans themselves. As critics of the historiography of the North African Environment, we gain immensely from delving into the evidence for this decline. Our exploration allows us to expose the mechanisms of a modern colonial empire at work, without neglecting the immense environmental losses which took place in ancient times. Acknowledging the tremendous power societies like the Roman Empire possessed to change the very landscape upon which they dwelt is vital in comprehending our own power to maintain or destroy the resources that sustain us.

Defining North Africa

In any historical study of a particular geographic region, the question naturally arises: what space is actually being examined? In our case, when we use the term North Africa, what do we actually mean? The answer has a great deal of significance for what we will find in our examination and the methodology we employ in making it.

The Mediterranean Sea provides a useful guideline by which to locate the protagonists of our story. This partially-enclosed region of ocean, bordered by three continents, Europe to the north, Africa

to the south, and a small part of Asia to the east, has been a guiding environmental factor in the development of Western classical civilization. Indeed, classical civilization is largely defined by its presence in and around the Mediterranean coast, and its use of the Mediterranean Sea as a medium for trade, communication, and cultural interaction. What makes North Africa such a compelling historical subject is its dual position in world history: at once intimately involved in the development of classical civilization, but at the same time a major part of the history of the African continent. We can define North Africa, then, as that region of Africa bordered by the Mediterranean Sea to the north, and influenced by the trade networks, people, ideas, and civilizations that made use of that sea. The Sahara provides a reasonable approximate southern border. Although where North Africa ends and the Sahara begins is difficult to ascertain, the vast desert put a geographic limit on how far south North African culture was able to extend, largely separating it from the “sub-Saharan” African cultures further south. At the same time, it should still be noted that there were ways for ideas and goods to travel back and forth between these two cultural regions through certain trans-Saharan trade networks.

One major historiographical question in defining North Africa is whether to include Egypt in this region. Egypt is notably distinct among Mediterranean societies for its antiquity, dating back to around 3000 BCE in its earliest. Even at the time of the Greeks, more than two thousand years of history had already taken place in Egypt, including several changes of capital city and more than twenty different dynasties.⁵ Thus Egypt has always enjoyed a unique position in the Mediterranean world, respected by a diverse number of societies as a cultural and political ancestor. This makes it very different from other parts of Africa. Egypt’s story is already fairly well known; less known is the story of the rest of northern Africa. And though Egypt, like the rest of northern Africa, fell under the control of the Roman Empire, it did so after its own long dynastic history as well as several centuries of control by the Ptolemaic Greeks.⁶

⁵ Phillip C. Naylor, *North Africa: A History from Antiquity to the Present*, (Austin: University of Texas Press, 2009), 18-22.

⁶ *Ibid*, 23.

Therefore, while Egypt shows us a society in which layers and layers of different human settlements have shaped the landscape since time immemorial, other parts of North Africa show us a sharper contrast between a relatively undeveloped landscape and one heavily influenced by the massive industries of the Roman Empire. This is not to say that one cannot usefully discuss Egypt as part of North Africa. Many, including Phillip Naylor, have done so in order to emphasize their shared contributions to Western culture.⁷ But for the purposes of an environmental study, it seems more apt to focus on the part of North Africa west of Egypt, and bring attention to a region of environmental change that needs to be understood in greater detail. A common term for this region, used by historians and environmental scholars alike, is the Maghrib or Maghreb. This term derives from the Arabic name *jazirat al-maghrib*, meaning “the island of the west,” and refers to the lands west of Egypt.⁸ Throughout this study, the terms Maghrib and North Africa will be used interchangeably.

The Arrival of Rome in North Africa

The history of North Africa and the history of the Roman Empire are intertwined at a fundamental level. Indeed, in many ways, it was North Africa that allowed the prominent Italian city-state of Rome to become a massive, Mediterranean-spanning empire in the first place, and North Africa continued to shape the Empire for the seven centuries of its existence. The conquest of Carthage, Rome’s maritime rival in Africa, was a defining moment in Rome’s history, allowing the young Republic to redefine itself as an entity of power and significance and forcing other civilizations to acknowledge its presence. In acquiring Carthage’s vast territory in North Africa, Rome demonstrated that it was not merely a power within the Italian peninsula, but a culture that could cross continents. Through the conquest of Carthaginian North Africa, Rome was well on the way to empire. Furthermore, as the Empire developed, the people of North Africa played a major role in shaping the culture that emerged in

⁷ Ibid, 2.

⁸ Ibid.

the first pan-Mediterranean society, especially in the development of Christianity. North Africa and Rome were in constant dialogue throughout Rome's reign, with people, commerce, and ideas moving back and forth across the Mediterranean Sea for generations. The Roman Empire can be understood as an empire founded upon this marriage between Italian and African civilizations.

Understanding Rome's influence in North Africa, then, depends upon understanding the people the Romans encountered. The story of North Africa begins even before the Carthaginians, with a people who are today known as the Berbers. Because the ancient Berbers possessed little written tradition of their own, we know them primarily through the writings of visitors to North Africa, including the Carthaginians, Greeks, and Romans. The Berbers are generally regarded as the indigenous North Africans, those who were present before the arrival of societies with written records, and many in Morocco, Algeria, and Tunisia continue to assert a Berber identity today. Their name derives from the Greek *barbaroi* and later Roman term *barbari*, used for those who did not speak Latin and Greek. The Greeks also used the term "Libyans" to refer to the native African population west of Egypt, and later distinguished these city-dwelling, Carthage-influenced Berbers from nomadic herders, whom they called "Numidians."⁹ Though little is known about the origins and culture of these groups, scholars have noted their tendency to maintain their autonomy through local kingdoms and confederations, adapting and learning from each civilization they encountered. The currently accepted theory is that the Berbers arose from a mix of migrating populations from Northeast Africa, sub-Saharan Africa, and Western Europe—a transcultural fusion that would set the tone for North Africa's long history as a series of different cultures arrived and disappeared, each leaving its own unique contribution.¹⁰

Among the first to encounter the Berbers were the Carthaginians, who controlled the greatest part of North Africa when the Romans began their first intercontinental war. Carthage, like Rome, had begun as a city-state and grown into a significant mercantile and military force. Originally, it had been a

⁹ Ibid, 4.

¹⁰ Ibid.

colony of the Phoenicians, a people of Semitic and Indo-European ancestry from the region of Canaan (modern Lebanon and Syria). Around 1200 to 850 BCE, the Phoenicians became a maritime and mercantile power of sorts, spreading a series of independent colonies around the Mediterranean, reaching as far as the Iberian coast.¹¹ Of these, Carthage, founded around the eighth century BCE, grew to take on a position of power surpassing most of its contemporaries. One of the first city-states to rule an empire of any kind, Carthage absorbed many other Phoenician colonies from Libya to Iberia, and by the sixth century BCE was coming into territorial conflict with the Greeks and Romans.¹²

The relationship between the Phoenician-derived Carthaginians and the native Berbers was an interesting and unusual one, marked not so much by conquest as by economic partnership. The Carthaginians exacted tribute only from those Berber tribes nearest them, respecting those in the interior of Africa, particularly in the region of the Sahara, as useful allies and trade partners. Through its nearby tax base, Carthage acquired gold, silver, copper, and tin, and it traded with the distant tribes of the interior for other goods, including wealth from trans-Saharan trade. Thus, the Carthaginians built their empire by serving as middlemen between the people of the Mediterranean and the diverse Berber tribes of Africa. Certain nearby Berber groups were heavily influenced by Carthaginian culture and wealth, especially the Massyli, the Masaesyli, and the Mauri; in turn these tribes served as military partners for Carthage, providing remarkable auxiliary cavalry.¹³

By 580 BCE, the Carthaginians were aggressively expanding, spurred on by conflict with the Greeks, who were doing the same thing. The two cultures clashed for territory in Sicily, Leptis, and Iberia. As a result of these conflicts, Carthage endeavored to solidify its power in North Africa, incorporating Berber tribes into its empire through economic and military alliance as well as conquest. Although the Greek tyrant Agathocles besieged the city of Carthage in 311-307 BCE, the strong loyalty

¹¹ Ibid, 25.

¹² Ibid, 26.

¹³ Ibid.

Carthaginians commanded among the Berber tribes ultimately turned the tide in their favor, and Carthage continued to thrive until the arrival of Rome in the third century BCE.¹⁴

Little detailed information survives about Carthage today, but it was a city-state of no small significance and impact, its population possibly reaching as much as 400,000 at its height. We know some things about its culture: its people used the Phoenician language and alphabet and worshipped Canaanite gods such as Baal and Astarte, and the rituals surrounding these gods may have included child sacrifice. We know that Carthaginian government was essentially an elected council of its most successful commercial leaders, from which generals could be elected during wartime to lead the state long-term. The environmental impact of Carthaginian civilization is perhaps more difficult to gauge. We know that Carthage exported significant amounts of textiles, precious metals, as well as crops like grain, olives and wine.¹⁵ This suggests significant mining and agricultural activity was already underway in North Africa by the sixth century BCE. Therefore, Rome, in establishing its agricultural base, would likely have relied in large part upon agricultural efforts already present in Carthaginian territory. That said, while Carthage dominated North Africa, Rome would eventually incorporate its territory into an empire many times that size, encompassing the entire Mediterranean region. It seems likely, especially given what we know about Rome's trade networks and level of agricultural importation, that the Roman Empire intensified Carthage's agricultural and economic efforts and maintained them at a high level for a much longer period.

Some fifty years or so after the Greeks ceased trying to conquer Carthage, territorial disputes brought the Romans to North Africa for the first time. Carthage and Rome had originally been allies against various enemies, including a number of Greek city-states which tried to establish a foothold on the western Mediterranean. Since about 509 BCE, the two cities had been partners of a sort, each agreeing not to intervene in the other's Mediterranean trade. But the situation changed as Rome began

¹⁴ Ibid, 27.

¹⁵ Ibid.

to gain a greater foothold in Sicily. Formerly Greek city-states on the island had, by the third century BCE, become incorporated into Roman territory—yet they still clashed with Carthage. The conflict came to a head in 264 BCE, when Rome defended pirates who had seized the strategic city of Messana over Carthaginian protests. Before long, the First Punic War (so named for Rome’s term for the Phoenicians) had begun.

Rome was not initially as skilled at naval combat as the more maritime Carthaginians, but quickly found a way to compensate through the use of a device called a “crow”—an expanded plank that allowed Roman armies to board Carthaginian ships and put their superior army into action. By such methods, Rome attacked the ships of Carthage’s Sicilian allies while Carthage attacked the Italian coast. In the end, despite such setbacks as a failed invasion of North Africa, Rome was persistent, and finally won an agreement from Carthage in which it gave up its Sicilian territory in 241 BCE. Afterward, Carthage faced a cascade of problems: a conflict with its unpaid Berber soldiers known as the “Mercenary War,” and a related peasant rebellion. Carthage’s Council suppressed these tensions by increasing the power of its generals and sending them out into the countryside to restore order, but Rome took advantage of this moment of weakness, snatching up Corsica and Sardinia. This aggression contributed significantly to the Second Punic War.¹⁶

By 218 BCE, Carthage had recovered significantly from its struggles with its mercenaries, as well as from its critical loss to Rome. The Iberian Peninsula (today Portugal and Spain) was the site of a massive and successful new campaign to acquire new copper and silver resources. Carthage’s expansion unsettled Rome, which began aggressively protecting its own small holdings in Iberia. In this Second Punic War, Hannibal Barca, whose family had great wealth in Iberia, played a heroic role for Carthage as its military leader. Allying himself with Celtic tribes in Gaul, Iberian tribes, and Berber cavalry, Hannibal developed a massive army and crushed Roman armies time and time again with brilliant tactics—

¹⁶ Ibid, 36-37.

demoralizing Rome's Greek allies enough that many were stirred to revolt. Rome, however, recovered with the aid of clever generals like P. Cornelius Scipio the Elder, who cut the rebellious Greeks off from the Carthaginians and invaded North Africa. In the end, Rome was again victorious, winning another large payment, all of Carthage's holdings in Spain, and a swath of North African territory through its allies in Numidia.¹⁷ Though at first he retained control of the city, Hannibal was eventually forced to flee from Roman agents and eventually committed suicide to avoid capture.¹⁸

Carthage remained theoretically independent, though heavily influenced by Rome, until 149 BCE, when King Masinissa of Numidia aspired to reunite North Africa under one power. Rome's fear of Carthage resurrected spurred it to take action in the Third Punic War. With the help of Numidian allies and the elder Scipio's grandson, Scipio Aemilianus, the Romans razed Carthage and reestablished the Carthaginian part of North Africa as a new province.¹⁹ Rome's power in North Africa expanded further after the ascension of prince Jugurtha in Numidia. Jugurtha's attempts to seize power in the region gave Rome the perfect opportunity to assert itself further, and before long, Rome possessed two African provinces, Africa Vetus (previously Africa Proconsularis) and Africa Nova, which together encompassed almost the entirety of Africa north of the Sahara and west of Egypt.²⁰

After establishing their presence, Romans in North Africa embarked on a campaign of city-building, founding hundreds of new towns and augmenting what communities were already there. Cities like Leptis Magna, Cyrebe, Oea, and Sabratha flourished, while new outposts like Timgad, Djemil, Hippo Regius, and Theveste met with similar success. Even Carthage enjoyed this period. Rebuilt from the ground up by Octavian in 29 BCE, it once again became a cultural, economic and intellectual hub for the Mediterranean. Sophisticated aqueducts supplied the cities of Roman Africa with water, and roads were

¹⁷ Ibid, 38.

¹⁸ Ibid, 39.

¹⁹ Ibid, 40.

²⁰ Ibid, 43.

built between them, connecting them to the Empire's massive system of infrastructure.²¹ In agriculture, too, Rome built heavily upon what was already present. North Africa became known across the Empire for its production of grain, olive oil, and wine, as well as livestock and wool, traded by Berber pastoralists. City-dwelling Berbers quickly became familiar with Latin and Roman customs, serving the new imperial tax system and administration. Meanwhile, a powerful military force known as the Third Augustan Legion—a diverse group of soldiers which included Gauls, Italians, Syrians, Numidians, and more—defended the southern frontier from any Berber tribes unwise enough to raid Roman cities.²²

Over the next few centuries, North Africa remained a vital part of the Roman Empire, contributing to its culture in distinctive ways. Contributors included Terence, a Berber slave who received an education and became a renowned playwright in Rome, Lucius Quietus, an able military commander under Emperor Trajan, and Lucius Apuleius, famed author of *The Golden Ass*, a novel about the rites of Isis. In the later part of the Empire, an entire imperial dynasty emerged from North Africa: the Severans, who halted some of the Empire's decline but significantly militarized it.²³ Then there was Christianity, which found vivid and distinct expression among the people of North Africa, perhaps more than any other region. Many of Christianity's greatest theologians and supporters came from the region, including Tertullian, Origen, and Augustine, whose writings and speeches as bishop of Hippo Regius did more than any other works to define the Christian philosophical tradition for centuries to come. North Africa was also the home of much Christian theological debate, with movements such as Monophysitism and Donatism clashing with the views that would later be called Catholic orthodoxy.²⁴

Rome's gradual decline had given it serious weaknesses by the fifth century CE, and in 430, the Germanic tribe known as the Vandals set out to wrest North Africa from the Romans. Within the next few years, Hippo and Carthage were under their control, and soon the whole of Rome's North African

²¹ Ibid, 47.

²² Ibid, 46-47.

²³ Ibid, 48.

²⁴ Ibid, 50-52.

territory. This was a major blow to the Empire, especially once the Vandals used North Africa as a launching-point from which to capture Corsica and Sicily and lay siege to Rome itself. Yet despite their fearsome reputation for aggression, the Vandals in fact seem to have been a tolerant and sophisticated people. Not only did they make culturally sensitive alliances with Berber frontier tribes, the rich cultural life of Roman North Africa seems to have gone on unabated under their rule, and it is clear that the Vandals enjoyed art, dance, hunting and many other traditionally Roman luxuries.²⁵ Still, the Byzantines, heirs to Roman culture in Constantinople to the east, harbored a great deal of resentment towards the “barbarian” invaders. A century later, in 533, the eastern emperors reclaimed North Africa, returning the Empire to something close to its former size and extent, although they struggled to win the loyalty of local Berber tribes. Carthage and other North African cities once again thrived as major links in the economic network of the Empire. Emperor Heraclius even considered relocating the capital to Carthage in 602.²⁶ However, North Africa would not remain in the hands of the Byzantine Romans, though their civilization would continue for many more centuries. Heavily weakened by war with the Sassanids, the Byzantines could not hold onto North Africa when the Umayyad Caliphate, with its new religion of Islam, swept through the area in later times.²⁷ Thus did a distinctly Roman civilization finally disappear from North Africa, though Muslim civilization would continue to explore and interpret Roman cultural contributions throughout its long history. Rome’s distinct cultural character throughout an eight-hundred-year history in North Africa poses a compelling problem of environmental history: how did the Mediterranean empire transform the North African landscape?

Sources for the Ancient North African Environment

²⁵ Ibid, 53-54.

²⁶ Ibid, 55.

²⁷ Ibid, 58.

The surviving written works of ancient authors are among our best sources for understanding the ancient Mediterranean and the societies of late antiquity. Preserved as they have been over the centuries by faithful copyists who knew the value of recorded ideas, they offer us glimpses into a world that no longer exists. By reading the works of Vergil or Pliny, we can come to understand how Roman citizens saw their place in a world full of gods and natural forces; by reading the works of Polybius or Caesar, we can learn of important historical events and ideas they hoped would never be forgotten. Because these sources, enriched by their place in a broader cultural context, often offer a more comprehensive picture of events and phenomena in the ancient world than any one archaeological study could provide, there is much to recommend them for our study of the ancient North African environment.

In assessing the question of environmental decline in the ancient world, however, we must bear in mind that our collection of relevant sources is highly fragmentary. For one thing, only a fraction of the literary heritage of antiquity has been passed down to us. A variety of factors prevented the transmission of many works: some were not, in their time, considered valuable enough to pass down to future generations, some were deliberately destroyed, and some were simply unlucky, disappearing in accidents or fading into obscurity. And many of the relevant works we do have are incomplete, lacking particular passages or even whole books, which at times can only be recreated from excerpts in the writings of other authors. Although we can still learn much from the works we do have, we should always remember that we are working from only part of the full picture.

The incompleteness of the historical record is particularly obvious when investigating the North African environment. Neither the topic of environmental change nor North Africa itself have been as deeply considered in the materials of extant classical literature as many other topics. Although ancient religious tradition revolved around reverence for nature, no ancient scholar seems to have specifically examined the effect of human civilization on the environment—or if one did, his work is not known to

our modern era. Instead, ancient works discussing the environment often do so obliquely. Often we find discussions surrounding the natural world in large encyclopedic works that seek to gather the sum of human knowledge, including Pliny the Elder's *Natural History* and Strabo's *Geography*. Such works often give illustrative examples of particular changes in particular regions. Works of poetry, like Vergil's *Georgics*, can be very useful in helping us understand ancient experiences and feelings toward the environment more generally. Finally, we can glimpse environmental changes peripherally in a number of other ancient works, including writings on agriculture, such as Varro's *Rustica*, and the works of historians like Sallust, among whose works are texts directly treating North Africa. In using these sources, it is often necessary to read closely and carefully to find relevant—and accurate—details about the ancient environment.

A similar scarcity of ancient documentation also exists in regard to North Africa as a subject, which is perhaps trickier to explain. In general, Rome's provinces seem to have been more vaguely understood in the eyes of Roman writers than the cities of the Italian heartland, but our information on North Africa seems scant even by comparison with our knowledge of Gaul and the British Isles. In the end, this may be more of a modern interpretive problem than an ancient one. American and European writers have tended to focus on the history of Europe, even in their study of antiquity, while underemphasizing the role of Africa in ancient civilization. In part, this scholarly neglect may stem from religious rivalry: Europe's identity and heritage has been held to be a Christian one, while North Africa, today a Muslim region, has been constructed as an other and an outsider. Similarly, texts about North Africa may have suffered from a lack of interest in preservation throughout the hundreds of years between Rome's decline and the rise of modern scholarship.

We need to be cautious, as even such sources as exist concerning the environment in North Africa each carry with them their own set of interpretive problems. For one thing, not all classical authors can be relied upon equally for historicity, and the claims of some may be more suspect than

others. Geographers like Pliny often included both information they themselves could substantiate and rumors passed on by friends and colleagues in their work. The best way to use their evidence, then, involves a careful examination of ancient authors' own use of sources. Claims based on personal experience represent stronger evidence than hearsay, and ideas that we can find confirmed in multiple sources represent the best evidence of all. The best and most conclusive literary sources are those where an eyewitness account is available; unfortunately, very few of these are extant. One of the best of these for the North African environment is the work of historian and geographer Polybius, who visited the region himself in 146 BCE. His writings on geography are sadly fragmentary, but enough is extant of his work and other authors' quotations to give us a good idea of his impressions of the region. Frequently, though, it is necessary to rely on more secondary accounts. Such authors can still present very useful information, with the caveat that we must look closely into these authors' own sources. When an author like Pliny can cite the testimony of a Roman legate who has personally visited North Africa, this represents a much stronger piece of information than uncited hearsay. With careful examination, literary evidence can thus become a powerful tool for envisioning the ancient landscape.

Given the fragmentary nature of literary evidence on ancient North Africa, though, evidence rooted in archaeology is often a useful tool for filling in the gaps. Archaeological methods offer a chance to study the North African region in a way that literary studies cannot; while literature offers us glimpses of perspectives and scenes from various times and places, archaeological studies can give us a large-scale perspective more firmly rooted in a scientific examination of the world. Such an approach can grant an amount of certainty that is difficult to achieve with literary evidence alone. However, archaeology is limited by the regions and extent to which archaeologists are able to study. What is true of one ancient site may not be true of another, and archaeological research is often limited by modern political circumstances. In North Africa, the majority of research, particularly on the environment, has been conducted in relatively stable regions like Morocco. Archaeological sites in Libya undoubtedly have

much more to tell us, but unfortunately these insights will not be accessible to historians for some time. Thus it is important to bear in mind that archaeological sources are fragmentary in their own way, revealing only part of the full picture. Still, they can reveal great insight, particularly when multiple sources are used in conjunction. Some of the very best archaeological studies, such as the recent work of Valerie Andrieu and collaborators on the effects of human presence in the Mediterranean basin, compile data from a broad collection of studies across a diverse set of locations. For a long-term environmental study of a large region like North Africa, such efforts are invaluable. Ultimately, archaeology and literary sources each possess many strengths as tools of historical analysis. Taken together, they provide a compelling picture of the ancient world, and both kinds of sources will be useful for our examination of the ancient North African environment.

Classical Environmental Culture

In assessing the question of environmental change in classical North Africa, it is essential to understand the full context in which these changes took place. As part of the Roman Empire, ancient civilization in North Africa was part of a larger cultural network that spanned the entire Mediterranean. Throughout the region, we see a number of common cultural threads among beliefs about the natural world, as well as shared practices that served to reshape that environment over many centuries. Indeed, the situation in ancient North Africa can best be understood as one particular manifestation of a set of processes that were at work all throughout the classical world. There is much to gain from assessing extant sources on the natural world in a way that reveals these commonalities: how widely accepted worldviews and particular historical practices influenced the ancient Mediterranean environment as a whole. With this larger picture in mind, an examination of the evidence for environmental change in North Africa will be thoroughly augmented by an understanding of how and why environmental change took place in the ancient world.

Ancient beliefs about nature are an essential starting point. The cultural background that the Romans carried with them is fundamental to any investigation of deforestation and decline under the Roman Empire. For instance, when Polybius and Roman general Scipio Aemilianus first explored the North African wilderness, what did they make of it? How did their Roman beliefs and attitudes shape what they saw in that uncharted landscape? Did they see it as terrifying jungle or harsh wasteland? Did they see it as a land rich with potential, needing only human cultivation to bring it to perfection? Did they see it as a place of worship, the home of unknown yet honored gods? How did their encounters with land and people play out with respect to the North African environment?

In other words, to the inhabitants of the Roman Empire, what was the meaning of nature? How did a typical Roman experience the natural world? These questions lead us to think deeply about the cultures of ancient Mediterranean societies and their common heritage. It is well known that Rome, among many other Mediterranean civilizations, drew heavily upon the tradition of the Greek city-states to the east, inspired and influenced by their ideals, art, religion, and society. If we seek to understand the Roman relationship to nature, it is worth examining how the Greeks constructed that relationship and how Roman culture later integrated those ideas. Indeed, Greek stories, myths, and other records, passed down through the ages, serve as a snapshot of early historical encounters with the environment. Examining Greek and Roman societies together with respect to their shared views of the natural world yields great insight into the development of environmental culture, useful not only for understanding the Roman period but also our modern relationship to the environment.

Although attitudes toward the natural world in the ancient Greek city-states were by no means uniform, several themes unite literary, philosophical, and religious sources. Speaking broadly, Greek environmental culture was characterized by two major viewpoints regarding the natural world: an older tradition of reverence for natural spaces, and a number of later philosophical viewpoints, more aggressive in their skepticism about the spiritual character of the landscape, vegetation, and animal life,

but less able to influence society on a broad, overarching scale. Ideas from the older tradition, and to a lesser extent, the later, dominated Greek antiquity. In Rome, where they would come to command a similar influence, they would be reinterpreted and refined, but on a fundamental level remained largely unchanged.

The first viewpoint we might call the “traditional” or “reverent” view of nature: the natural world was a profound, holy place, home to wild but nonetheless powerful and important gods. It was necessary to treat the wilderness “with awe and care.”²⁸ Among the many gods associated with the untamed world were Artemis, hunter-protector of wild animals, Demeter, spirit of the growing grain, Gaia or Ge, the ancestral Mother-Goddess of the fertile earth, and Pan, forest-god who was eventually hailed as a personification of the entire natural realm.²⁹ Most members of the Greco-Roman pantheon embodied powerful natural forces in some fashion or another: consider Poseidon, who ruled the waters and made the earth quake, or Zeus, whose swift thunderbolts demonstrated his power as a god of the sky and its storms—Homer writes of one fierce storm that “Zeus rained the whole night through.”³⁰ And beyond these major deities, locally significant spaces were held to be the homes of other powerful entities: beings like *naiads* in the springs, *oreads* in the mountains, and *leimoniads* in the meadows.³¹ One memorable scene in the *Iliad* features Achilles fleeing the wrath of a local Trojan river-spirit, incensed that the hero has polluted his waters with bloody corpses.³² In short, traditional Greek religion held that the world was rich with gods, and that it was wise to respect whatever powers might dwell wherever one went. Nature could even be a form of communication between divinity and humanity, as in divination through birds, whose movements and flight patterns could reveal to a faithful interpreter a good or bad omen sent down from the gods. Although in literature we see some characters expressing

²⁸ Hughes, *Pan’s Travail*, 45.

²⁹ *Ibid*, 47.

³⁰ Homer, *Odyssey* 14.457, trans. A.T. Murray, (Cambridge, MA, Harvard University Press; 1919.)

³¹ Hughes, *Pan’s Travail*, 49.

³² Homer, *Iliad* 21.210-340, trans. A.T. Murray (Cambridge, MA, Harvard University Press, 1924.)

skepticism about interpreting the will of the gods through nature, like the suitor Eurymachus in Homer's *Odyssey*, these figures are almost always proved arrogant, impious fools. In Eurymachus's case, he misses the omen that Odysseus would soon return and is later killed by the vengeful husband.³³ The point is clear—the gods are deeply present throughout the natural world, and to ignore due reverence to them is to risk one's own destruction.

J. D. Hughes suggests that this careful reverence emerged gradually in prehistoric hunter-gatherer societies as a consequence of an extremely close dependence on the natural world. "Taking too many animals or plants of a critical species resulted in reduction of numbers or even extinction in the tribal hunting range...prohibitions against indiscriminate slaughter appeared and were strengthened as the eventual result of repeated experiences of this kind."³⁴ In other words, endangering the supportive forces that kept the tribe alive was to endanger survival. Over time, insights gleaned about how to avoid ecological damage became part of religious and cultural tradition, as in prohibitions against hunting mother animals together with their young, or the last local male and female representation of a species.³⁵ The idea that a "Lord or Lady of Wild Animals" would punish those who hunted recklessly seems likely to have given rise to the veneration of deities like Artemis, avenger and protector of young animals and pregnant mothers.³⁶ The idea of maintaining a balanced, harmonious natural order would come to characterize Greek relationships with their gods more broadly. To forget to keep all things in balance was to risk divine wrath, as in the Cnidians' attempt to dig a canal across their isthmus. After suffering many injuries, the people of Cnidos were told by the Delphic oracle to stop digging, for "Zeus would have made an island, had he wished it."³⁷ Sacrifices to a god represented a kind of contract with that deity that acknowledged that order was being upheld: the worshipper would give to the god, and in

³³ Homer, *Odyssey* 2.181-182.

³⁴ Hughes, *Pan's Travail*, 27.

³⁵ *Ibid*, 26.

³⁶ *Ibid*, 26, 92-93.

³⁷ Herodotus 1.174

return, the god would provide them with good things.³⁸ Taking care of the environment was one way of worshipping a god, and the fruits of nature a potential reward for one's hard work and devotion. One of Odysseus's speeches of praise in the *Odyssey* compares Queen Penelope to a ruler who acts "with the fear of the gods in his heart...the black Earth bears wheat and barley, and the trees are laden with fruit, the flocks bring forth young unceasingly, and the sea yields fish, all from his good leading; and the people prosper under him."³⁹ In this traditional conception of humankind in relationship to the world, the values of living an upright, moral life, worshiping the gods, and serving as faithful stewards of the natural environment were all closely connected.

Roman society followed largely the same set of ideals, though with a more strongly agricultural flavor. The Greek pantheon was adapted to accord with Roman deities: Poseidon became Neptune, Artemis Diana, Athena Minerva, and so on— and a similar religious culture emerged. That the Romans maintained that same sense of divinity as immanent in the blessings of nature is well attested to by the opening lines of Vergil's *Georgics*, a four-book poetic tribute to nature and agriculture: "O most radiant lights of the firmament..." the poet declares, "...O Liber and bounteous Ceres, if by your grace Earth changed Chaonia's acorn for the rich corn ear, and blended draughts of Achelous with the new-found grapes, and you Fauns, the rustics' ever present gods, tis of your bounties I sing."⁴⁰ In this invocation, Vergil demonstrates that agriculture in Roman society was understood within a deeply religious tradition. It is "by the grace" of the goddess Ceres that the earth brings forth the grain every year, by the god Liber's power that the growing grapes become wine. As the invocation goes on, we see that different gods play different roles within the natural realm: Neptune "sent forth the neighing steed," Pan leaves his woods to become "guardian of the sheep," Minerva is "inventress of the olive," and

³⁸ Hughes, *Pan's Travail*, 53.

³⁹ Homer, *Odyssey*, trans. A. T. Murray, (Cambridge, MA: Harvard University Press, 1919,) Perseus Digital Library, accessed 3/14/2014, 19.111.

⁴⁰ Vergil, *Georgics*, trans. H. Rushton Fairlough, Loeb Classical Library (Cambridge: Harvard University Press, 1999), 1:5-12.

Silvanus carries “a young uprooted cypress” in his hand.⁴¹ To work the land, then, was to participate in a realm that was already deeply alive, full of powers which must be called to one’s aid or at least respected. Italy itself held particular esteem as a land blessed with fertility by the gods: “Hail, land of Saturn, mighty mother of crops, mighty mother of Men,” Vergil declared.⁴² In Roman culture, while there were gods associated with the wilderness, such as Silvanus, who guarded untouched forests, the vast majority of deities and spirits had some connection to agriculture—fitting for a society in which so many worked the land. Roman religion included spirits of farmhouse and storehouse, of the fields, of all major crops, and of all the major activities associated with farming. Romans in the cities were still heavily influenced by the culture of their agricultural ancestors and neighbors, celebrating events throughout the year that were closely associated with the gods and activities of the farmland, such as the festivals of Saturn and Bona Dea, gods of the soil.⁴³ The dominant image of the environment in the Roman Empire, then, as in Greece, was of a realm rich with divine presence to be revered, here interpreted through the lens of an empire that relied heavily on massive agricultural efforts.

But there was another way of looking at the environment in these ancient Mediterranean societies, which began to emerge within the philosophical dialogue going on in places like Athens: that of a resource meant to be exploited effectively by human beings. Aristotle, though he held a deep love for and interest in investigating the natural world, believed that nature was inherently hierarchical: plants existed for the sake of animals, animals for the sake of human beings, and inferior men for the sake of the superior.⁴⁴ In his view, any use of nature that benefited human beings was laudable and worthwhile—a view that would impact environmental philosophy well into the modern era. Other philosophers came to a similar conclusion from other angles: the Epicureans, influenced by Democritus and Leucippus, argued for a purely mechanical universe with no gods or creators; most things in nature,

⁴¹ *Ibid*, 1:15-20.

⁴² *Ibid*, 2.173-174.

⁴³ Hughes, *Pan’s Travail*, 50.

⁴⁴ Aristotle, *Politics*, 1.1252b.

then, found their worth not in a divine mandate, but solely in the uses to which humans put them. The ultimate goal of such a philosophy was bettering the lives of human beings, yielding little concern for a world outside the human sphere.⁴⁵ In a similar vein, Plato had Socrates remark that “the country places and the trees won’t teach me anything, and the people in the city do.”⁴⁶ That said, opposing views were articulated even within the philosophical tradition: Aristotle’s student Theophrastus questioned whether the functions of plants and animals were so immediately apparent, and the Pythagoreans forbade killing animals and certain plants, seeing all things in the universe as part of the same ever-changing reality.⁴⁷ Still, by the coming of Romans to the Athenian philosophical schools in the second century CE, a challenge to traditional images of nature as a realm dominated by divinity and worthy of human reverence had been established.

In Rome, this challenge was more fully realized as new scholars reinterpreted and discussed the ideas of their Greek predecessors. For instance, the Epicurean poet Lucretius helped bring the idea of a world without gods directly to the Roman sphere as well.⁴⁸ But even more influential in Roman culture were the Stoics, who believed in a godless cosmos that nonetheless had unity in a certain overarching “soul.” Even with this sense of ever-present spirit, justice was seen as a relationship that could only exist among human beings, not among animals or plants, and the environment was thus only addressed from an anthropocentric point of view. Neo-Platonists, meanwhile saw everything in the universe, plants and animals included, as the expression of a World-Mind and a World-Soul—but the world itself was a prison to be escaped, a realm of gross matter which must be transcended, and for these philosophers, the natural realm was hardly worth considering, deemphasized in comparison with the rewards of the world

⁴⁵ Hughes, *Pan’s Travail*, 60.

⁴⁶ Plato, *Phaedrus*, 225d, trans. Harold N. Fowler, (Cambridge, MA, Harvard University Press; London, William Heinemann Ltd) 1925.

⁴⁷ Hughes, *Pan’s Travail*, 54, 60.

⁴⁸ *Ibid*, 61-62.

to come.⁴⁹ In general, it seems that the further away these philosophical movements turned from traditional visions of a human society living in humble obedience to the gods, the more they consigned the natural world to irrelevance, or to relevance only as it furthered human aims. To set one's philosophy against centuries of carefully-upheld tradition was to define it in opposition to the methods by which human beings had kept a harmonious balance with the world in which they lived, and among those members of the upper-class who promoted and shared these new ideas, they encouraged a far more aggressive, even exploitative relationship with the natural realm. Still, for all the influence these philosophical movements would exert on later generations of thought, it is difficult to quantify what impact, if any, they had on the real environment of the Mediterranean. As a conversation held primarily among the elite, philosophical discourse on nature seems to have had a limited influence on the lives of the typical Roman farmer or citizen. Ultimately, though the actions of powerful leaders and emperors may reveal the influence of some amount of later skepticism, the older tradition of reverence for the natural world likely remained dominant. Certainly festivals and other religious events, well-known and well-attended by the people of the Roman Empire, continued to celebrate the power and sacredness of the natural world.

Intellectual and cultural history, then, suggest a question regarding the ancient environment: if the dominant Greco-Roman view of nature saw it as a revered and holy realm, why did these Mediterranean societies face such significant environmental decline? The answer lies not in ancient culture, but in ancient material needs. Despite many cultural reasons to sanctify and respect the natural world, ancient societies depended upon that world to supply them with material resources—from the most basic sustenance a poor family needed to live, to the lavish luxuries of gold and silver owned by the Roman emperors. In the end, the economic incentives to conquer and extract value from the natural world often outweighed even the considerable reverence the Greeks and Romans held for their gods.

⁴⁹ Ibid.

Again and again, we see more immediate concerns, often rooted in survival but sometimes in outright greed, taking precedence over established cultural norms to the point where religious rules that might have protected against environmental decline were circumvented or ignored entirely. Examining the actual practices of the Greeks and Romans throughout their world, the lived relationship to the environment they spoke of cherishing, yields a sense of the complex problems which ensnared the North African environment and ultimately led to its decline. Speaking broadly, four material requirements within these ancient Mediterranean societies exerted a powerful effect on the landscape: the need for wood, the need for mineral wealth, the need for agricultural land, and the need for pasture. Examining each in turn reveals a diverse array of incentives for ancient cultures to place material demands over cultural imperatives.

Deforestation

The forestry practices of the Greeks and Romans are an intriguing place to start, not only because the effects of deforestation on the environment are vividly apparent, but also because the need for wood seems to have been a constant concern in every society across the ancient Mediterranean. Wood was one of the most valuable resources in the ancient world, and a standing forest was an untapped trove of wealth and power, ready to be put to use. Pliny the Elder writes in glowing terms of the role trees have played in human civilization, calling them “the most valuable benefits conferred by Nature upon mankind. It was from the forest that man drew his first aliment, by the leaves of the trees was his cave rendered more habitable, and by their bark was his clothing supplied.”⁵⁰ He goes on to give an overview of some of the uses to which trees have been put in his day: “It is by the aid of the tree that we plough the deep, and bring near to us far distant lands; it is by the aid of the tree, too, that we construct our edifices. The statues, even, of the deities were formed of the wood of trees, in the days

⁵⁰ Pliny, *Historia Naturalis* 17.3.5, trans. John Bostock (London: Taylor and Francis, Fleet Street, 1855, Perseus Digital Library.)

when no value had been set as yet on the dead carcass of a wild beast.”⁵¹ Pliny identifies two common uses of wood—construction and shipbuilding—to which we might add a third, namely the use of wood as fuel, often as charcoal. Not only was firewood used commonly in homes for warmth and cooking, but it was essential for religious practices. Sacrifices to the gods relied on burning slain animals, and with the number of public festivals major cities like Athens and Rome regularly held, the amount of wood needed could be immense. In one year, the Athens-led Delian league recorded some twelve tons (150 talents) of logs used for sacrifices.⁵² Wood—especially in the form of charcoal—was also needed to make bronze from copper and tin, and to smelt iron.⁵³ The sale of firewood could thus be a very profitable business. One of Demosthenes’ speeches tells us of a man who held “a considerable source of revenue” by having six donkeys carry away firewood each day, earning him around twelve drachmae daily.⁵⁴ It seems likely that many estates around Athens could have made a tidy profit from bringing firewood into the city in this way.⁵⁵ Aristophanes’ *Acharnians* notes that the charcoal trade with the region of the Parnes Mountains was well-known in Athens and possibly one of the city’s most important sources.⁵⁶ Timber was also useful for almost any kind of construction. In Athens, buildings from the temple of Hephaestus to the Tholos meeting-house to the roof of the Parthenon required enormous amounts of wood, built into doors, rafters and beams.⁵⁷ In Rome, the architect Vitruvius noted that fir and pine were widely used for roof-beams, and even when concrete took over from mud-brick as the dominant material for house construction, wood was still used within foundation walls, to say nothing of its uses in joists, doors, and window-frames.⁵⁸

⁵¹ Ibid, 12.2

⁵² Russel Meiggs, *Trees and Timber in the Ancient Mediterranean World*, (Oxford: Clarendon Press, 1982), 205.

⁵³ Ibid, 204.

⁵⁴ Demosthenes, *Against Phaenippus* 42.7

⁵⁵ Meiggs, *Trees and Timber*, 206.

⁵⁶ Thommen, *Environmental History*, 37.

⁵⁷ Meiggs, *Trees and Timber*, 195-197.

⁵⁸ Ibid, 238.

But perhaps the most prominent factor of all in how the Greeks and Romans affected the extent of their forests was the use of lumber in war. The massive ships by which ancient city-states defended themselves or conquered other lands were built of wood, their hulls of lightweight fir, their timbers the former trunks of tall trees.⁵⁹ To have power over a forest, then, was to have a major advantage in war, and to be without forests was to be at the mercy of one's enemies. Xenophon has Jason of Thessaly, enemy of Athens in the Peloponnesian War, declare, diabolically: "With Macedonia in our possession, the place from which the Athenians get their timber, we shall of course be able to construct far more ships than they!"⁶⁰ Similarly, during their war with Sparta, the Athenians were shocked and dismayed by the capture of their colony of Amphipolis in Thrace, as it was "valuable for the timber it afforded for shipbuilding."⁶¹ Places rich in forests often drew intense conflict as opposing forces struggled for control over these regions. Such was the case in Cyprus and Phoenicia during the Hellenistic war between Ptolemy's Egypt and Antigonos's Syria.⁶² Contemporary accounts suggest that the survival of any particular stretch of forest often depended upon the military and political situation of the region in a given era. When a city's independence and survival depended on mustering a powerful navy, there was little to stop forests from being heavily exploited in the heat of the moment. Additionally, it was common practice for armies to sabotage their enemies with all-out destructive assaults on their natural resources. This secondary form of battle primarily affected farms and orchards, but could inflict damage upon local forests as well.⁶³

All these practices—fuel-burning, construction, and war—strained Mediterranean forests and were capable of causing significant deforestation despite religious reverence for nature. Indeed, it seems that powerful regions tended to use up their forests and were constantly forced to look for new

⁵⁹ Ibid, 118.

⁶⁰ Xenophon, *Hellenica*, trans. Carleton L. Brownson (Cambridge: Harvard University Press, 1921.)

⁶¹ Thucydides, *History of the Peloponnesian War*, trans. J. M. Dent. (New York: E. P. Dutton, 1910.)

⁶² Meiggs, *Trees and Timber*, 134.

⁶³ Thommen, *Environmental History*, 39.

resources elsewhere. Plato, in a powerful passage, argues that Attica, the country surrounding Athens, had lost its forests over the centuries, and notes that “no very long time ago” the hills of Attica were full of trees—suggesting he could see evidence of decline even in his day, recently enough that “the rafters from those felled there to roof the largest buildings are still sound.”⁶⁴ No wonder, then, that the Athenians had to go as far as Macedonia to find enough wood to build their fleet to oppose the Thesalians. They had used up the vast majority of the forests in the immediate area.

Some contemporaries recognized the problem of unceasing deforestation. Not only Plato acknowledged these changes, but also Vergil and Lucretius, later authors who noted the significant damage caused by fires and floods in clear-cut areas.⁶⁵ ⁶⁶Aware that forests were an essential part of their strength, powerful governments like those of Rome and Athens often set aside specific regions of forest to be carefully controlled by the state. Aristotle, for instance, describes as an “indispensable service” the practice of employing officials to watch over a city’s natural resources, “called in some places Land-Controllers and in others Custodians of Forests.”⁶⁷ That said, it was not difficult for those who wanted access to these forested regions to gain forestry privileges—especially if they could make the case that it was in the state’s best interest. Scipio Aemilianus, for instance, found the wood he needed for the fleet that would conquer Carthage in Italian forests belonging to Rome.⁶⁸ And in Cyprus, minerals lying under state land were parceled out to whoever would clear it.⁶⁹ In many ways, the situation was akin to modern governments’ quiet distribution of logging rights in state-held areas for the purpose of economic growth.

⁶⁴ Plato, *Critias* 111B, trans. W.R.M. Lamb, Loeb Classical Library, (Cambridge: Harvard University Press, 1925.)

⁶⁵ Vergil, *Georgica* 1.481.

⁶⁶ Lucretius, *De Rerum Natura* 5.247.

⁶⁷ Aristotle, *Politics*, 6.1321b, trans. H. Rackham, Loeb Classical Library, (Cambridge: Harvard University Press, 1944.)

⁶⁸ Livy, *Ab Urbe Condita* 28.45.18.

⁶⁹ Strabo, *Geography* 14.6.5.

More successful at maintaining ancient forests, though, were the temples which controlled sacred groves. These areas represented a steady resistance to the idea of clear-cutting the forests from the religious view of divinity as inherent in nature. Each sacred grove resembled a small nature preserve, with trees and animals dedicated to a particular god, such as Apollo, spaces called *alsoi* in Greek or, when walled, *temene*.⁷⁰ It was understood that there, no trees would be felled, and the boundary between the natural world and the commercial world would be protected. Indeed, in such places could be found enormous trees, and animals that had disappeared from the rest of the region.⁷¹ In the end, though, sometimes these regions were exploited for their resources in spite of their sacred nature. Special prayers and rituals could be enacted to apologize to the gods and to tree-dwelling spirits to atone for the use of their forests, soothing a sense of impropriety while at the same time providing lumber.⁷² On the whole, though, sacred groves did manage to preserve earlier forests to some degree. By Pausanias's time, the second century CE, the landscape resembled a leopard's coat, spotted with sacred forests.⁷³ The groves were vulnerable, though—when Christian sentiment grew against paganism, it was easy for the new religion to make the case that forest sanctuaries should be destroyed, and only a few survived. Still, those that did represent a small victory by the ancient pagan tradition of balance and reverence against the yearning for lumber for warfare and commerce.

Agriculture and Agricultural Decline in the Ancient World

Agriculture was as potent a factor in the classical relationship to the environment as forestry. Indeed, deforestation and agricultural expansion served as two aspects of the same process: wherever forests faded, new land became available for large agricultural estates.⁷⁴ Understanding ancient

⁷⁰ Thommen, *Environmental History*, 42.

⁷¹ Hughes, *Pan's Travail*, 169-179.

⁷² Cato, *Agricola* 139-140.

⁷³ Hughes, *Pan's Travail*, 176.

⁷⁴ Thommen, *Environmental History*, 80.

agriculture, then, sheds light on the ways in which human beings were able to change the landscape around them.

Mediterranean agriculture has presented specific of challenges to farmers from classical times to the modern day. Arable soils have generally been far from rich, even outside the thin-soiled mountain ranges that cover much of Greece and Italy, and difficult to work with a plow; Pliny writes of soils “apt to load the harrow or ploughshare with enormous clods.”⁷⁵ The climate also presents difficulties: hot summers make growth in that season nearly impossible without a significant amount of irrigation, and the rainy season occurs in winter, when there is less light and heat for plants to grow. On the other hand, these winters are mild enough that some crops can in fact do well in the winter.⁷⁶ Certain crops were thus particularly favored by ancient Mediterranean farmers. At the heart of classical agriculture lay the “Mediterranean triad.” Grain, which provided bread, was a common staple, usually in the form of barley or, more expensively, wheat, which did well in the dry Mediterranean climate, and could be grown over the winter. Then there were grapes, the source of wine, so beloved in classical poetry and song. Vineyards were a major enterprise, their vines able to thrive on trellises, stakes and trees, so long as they were protected from creatures like caterpillars, foxes, and mice. After the vintage in September, the grapes were pressed into wine by careful feet and then fermented in pottery vats. Within a few years, it was drunk mixed with water or used as a purifier.⁷⁷ Finally, there was fruit, grown in the orchards, which so covered Italy that Varro remarked it resembled “one great orchard.”⁷⁸ And chief of these fruits was the olive. Not only was the olive tree sacred in Greece, its oil was a staple and a dietary necessity for the people of the Mediterranean. Olive trees could thrive in a variety of soils, ripening in October, but required careful spacing and many years of growth, so they were most often planted by

⁷⁵ Pliny, *Historia Naturalis*, 17.3, *Historia Naturalis*, trans. H. Rackham, (Cambridge: Harvard University Press, 1947 Loeb Classical Library.)

⁷⁶ Hughes, *Pan's Travail*, 132.

⁷⁷ *Ibid*, 133.

⁷⁸ Varro, *Rustica* 1.8.5.

powerful landowners with money to spend. Other fruits included pears, plums, pomegranates, and eventually the peach, imported in the second century BCE from distant China. Together, grain, grapes, and olives made up a great deal of the classical diet and were of huge importance in ancient commerce. It was not uncommon to find landowners growing all three basic crops at once, with olive trees serving as support for the vines and rows of wheat growing in between. Other notable crops included legumes such as lentils and chickpeas, fodder like alfalfa and clover, sesame, turnips, and hemp. Also common were nuts, including almonds and walnuts.⁷⁹

In Greece, agriculture was at the core of the economy of the *polis*, the ancient-city state, and to be a citizen, whether poor or prosperous, was to be part of a community of farmers and landowners whose lives depended on the cultivation of the natural world. Ancient sources, assuming awareness of contemporary practices, reveal little about their exact methodology. For instance, Hesiod's poem *Works and Days*, which dates back to around 700 BCE, praises hard work on one's farm, and the self-sufficiency it brings, but says little about actual contemporary practice. We do, however, know that in Greece crops were grown according to a two-field system in which half the land lay fallow at any one time. This allowed the soil to recover when it was not in use, fertilized by animal dung.⁸⁰ While only small areas of land between Greece's many mountains and hills were arable, by using about 5.5% of that area (around 32,000 acres) for cereal cultivation, the region of Attica was able to produce, in 329-328 BC, an estimated 27,000 *medimnoi*, or 1,000 tons, of wheat, and 340,000 *medimnoi*, or 11,400 tons, of barley.⁸¹ This would have been enough to feed Athens' estimated 50,000 people, but to provide for the entirety of the Attic region, further supplies were needed—during the fourth century BCE, enough cereals were imported from other parts of the Mediterranean, particularly the Black Sea, to feed 130,000 more.^{82 83}

⁷⁹ Hughes, *Pan's Travail*, 133-135.

⁸⁰ Thommen, *Environmental History*, 37.

⁸¹ *Ibid*, 35.

⁸² Demosthenes, *Orations*, 20.31.ff

⁸³ R. J. Hopper, *Trade and Industry in Classical Greece*, London, 1979.

Individual farmers could not supply Athens or other great *poleis* alone—rather, unifying forces like the Athenian government were important to providing sustenance for a thriving populace. Often land was controlled and leased by a powerful family—in Athens around 600 BCE, smaller farmers surrendered a sixth of their yield to such families, and were thus known as *hektemori*, “sixthers.”⁸⁴ Archaeologists in the Agrileza Valley in Attica have found the land holdings of one Timesios to constitute almost the entire valley. Similarly, in the Charaka Valley, archaeologists have found no less than 35-40 farms, in which about a quarter of the land was owned by humble peasants, but the vast majority appear to have been owned by large-scale farmers running operations of around 60 acres each. Overall, it was a heavily hierarchical system in which the top ten percent of the population held almost half of the farmland.⁸⁵ The city-state, however, could serve as a mechanism for altering this system. Around 600 BCE, Solon famously reformed the political system to provide relief for the struggling *hektemoroi*, restricting new land grabs and abolishing previous debts for the poor citizenry.⁸⁶ Thus political concerns could have a very real effect on how land was used. Wars and tensions between these powers could drastically reshape the landscape as well. Thucydides writes of Spartan armies punishing Attica with massive crop destruction:

Not content with laying waste to whatever had shot up in the parts which they had before devastated, the invaders now extended their ravages to lands passed over in their previous incursions; so that this invasion was more severely felt by the Athenians than any except the second.⁸⁷

Yet for all the size and power of these political and cultural systems, the actual practice of Greek land cultivation remained relatively simple, without large-scale production. Thommen writes that Greek

⁸⁴ Thommen, 34.

⁸⁵ Ibid, 35-36.

⁸⁶ Plutarch, *Solon*, 1.52, 1.94.

⁸⁷ Thucydides, *History of the Peloponnesian War*, 3.26, ed. J. M. Dent, trans. Richard Crawley, (New York, E. P. Dutton, 1910.)

agriculture, rather than breaking with the past, experienced “neither any revolutionary technological innovation in agriculture nor any mechanization.” Instead, there were gradual improvements in previously-existing tools and methods.⁸⁸

For the Romans, the economic opportunities inherent in an enormous, expanding empire made agriculture a source of massive wealth as well as sustenance. Wealthy landowners who leased land to tenants remained as powerful as ever in the first several centuries CE, and conquest brought more and more landed wealth into the economy of the Empire.⁸⁹ By taxing the farmers of these newly-incorporated provinces, Rome ensured there would always be steady tax revenue to support imperial projects and line the purses of its most powerful citizens. It also ensured that the city of Rome would be able to feed its thriving population by importing grain and essential products from massive agricultural efforts in the conquered territories—about 150,000 tons of cereals a year in the reign of Augustus at the turn of the era. Spain provided Rome with oil and wine, Egypt and Sicily cereals, and North Africa olives and cereals. But even with these imports, there were still often notable import shortages, meaning that agriculture in Italy itself played a significant role in feeding the populace.⁹⁰ Farmed fields with crop rotation dominated in a diversity of forms—usually alternating a year of cultivation for each field with a year spent fallow, during which it could be used for grazing animals. Two-field rotation was most common, but three-field rotation was also an increasingly popular option, and in these fields, a number of cereals and vegetables could be grown in turn, especially when fertilizer was used to reduce the amount of time a field spent fallow. Vergil wrote extensively on all these subjects, and also discussed the use of fire to replenish fields, noting that it could awaken “some hidden strength” in the earth that nourished crops—a clear demonstration of an understanding in Roman times that the soil could be replenished or overexploited, and that it was necessary to take utmost care to ensure agricultural

⁸⁸ Thommen, 33.

⁸⁹ Ibid, 30.

⁹⁰ Thommen, 79.

practices maintained that balance.⁹¹ In addition to cereals, olives, grapes, and various other fruits and vegetables were grown.⁹²

As earlier in Greece, certain powerful Roman landowners controlled large swaths of cultivated land. The upper class often controlled large vineyards and olive groves on estates some 60-250 acres in size, some even larger— Pliny the Younger's holdings were said to be well over 20,000 acres in total. The estate of Cato, author of *On Agriculture*, included an olive plantation of 150 acres, a wine estate of 60 acres, with wine and olive presses, a granary with a threshing floor, land for sheep and draught oxen, fields of cereals, grown by poorer tenant farmers, and pastureland for herders in winter.⁹³ The Roman state was powerful with regard to land, however, and thus able to grapple with these powerful landowners on the subject of how Roman territory should be distributed and cultivated. After the Second Punic War, for instance, areas that had been devastated by Carthaginian attacks were confiscated by Rome as public land, or *ager publicus*, and reapportioned to farmers who needed them. At other times, though, those who favored land reform faced steep opposition from powerful landowning interests: when tribunes Tiberius and Gaius Gracchus proposed distributing *ager publicus* to the poorest of the poor in 143 BCE, granting them each nineteen-acre farms, both times the upper classes prevented these proposals from being carried out effectively.⁹⁴ The largest Roman estates, known as *villae rusticae*, usually centered around a landowner's large residential house, with stables, storehouses, and other necessary buildings clustered around as needed. Such massive operations required the efforts of a great number of people, including slaves, administrators, and diverse craftsmen, as well as animal labor—multiple teams of oxen were needed to plow properties that could reach as much as 120-250 acres in area. These *villae* placed significant environmental pressure on the landscapes in which they dwelt: wood was needed for a number of everyday activities, and this wood

⁹¹ Vergil, *Georgics* 1.71

⁹² Thommen, *Environmental History*, 80, 84.

⁹³ *Ibid.*, 81.

⁹⁴ *Ibid.*

was usually obtained by clearing the surrounding forests. In the later period of the Empire, by the third century CE, large estates had begun leasing to smaller farmers known as *coloni*; in terms of tax yields and profits, these *coloni* were more effective for landowners than slave labor, which declined somewhat, even if it did not disappear entirely. Large-scale agricultural efforts quickly appeared in the Roman provinces as the Empire expanded, providing the perfect way for the powerful to profit from newly acquired lands.⁹⁵

The danger, however, inherent in establishing such an intensive level of agriculture was the risk of rendering the landscape unusable for future generations. Historical research on environmental decline has long suggested that classical civilizations overexploited their landscapes through unscrupulous agriculture, leading to a long-term decline in the quality of the soil. It was certainly known in classical times that there were better and worse practices in agriculture over the long term. A careful farmer would replenish the soil through crop rotation, planting legumes or other crops that were known to have a positive effect in alternate years. However, these practices were not ubiquitous. Not all farmers were so careful, and indeed, some had little opportunity to be, as small farms, local soils, and local conditions limited what species could be planted for fallowing. Enough farming was conducted without care for the realities of soil depletion that a large number of writers in ancient times describe significant decline.⁹⁶ In the works of poets such as Lucretius and Hesiod, there is a strong sense that harvests have declined since earlier times, and large, long-established cities are known to have passed laws to prohibit farmers from deserting older fields, and to increase the amount of grain imported from abroad—both symptoms of declining soil quality.⁹⁷ Columella, along with many other agricultural writers, put it well in noting that that people of his generation could “hardly recall a time when grain crops, throughout at least the greater part of Italy, returned a yield of four for one.” Columella makes it

⁹⁵ Ibid, 83-84.

⁹⁶ Hughes, *Pan's Travail*, 139.

⁹⁷ Ibid, 130-131.

very clear that he sees this not as a fault of Nature itself, but of human mismanagement.⁹⁸ Many ancient city-states, including both Sparta and Athens, are known to have expanded their territory precisely because of ecological crises closer to home.⁹⁹ All in all, there is much reason to believe that the loss of high-quality soil was a constant problem in ancient times, and soil depletion served as a factor in the desire to expand outward and a gradual but continuing reality as this territorial expansion took place.

Mining and Pollution

Another major source of environmental damage in the classical world was mining, which was known even in ancient times to unleash pollutants into the world and have a detrimental effect on the landscape. Though we tend to think of pollution as a modern problem, the product of a heavily industrialized society, it was a significant problem for an entity like the Roman empire, which needed to acquire metal and other mineral resources for military, economic, and cultural reasons, and so began mining—and polluting—on a hitherto unprecedented scale.

Of course, mining and quarrying had been carried out in the Mediterranean since the time of the earliest civilizations. In the Aegean, the Mycenaean had mined silver at Laurium since before 1500 BCE, and in Italy, the Etruscans and other civilizations had established iron mines since long before the presence of Rome.¹⁰⁰ But the Romans in particular were hailed for the extent, technological prowess, and yield of their mines. In Spain, where Rome became famous for its silver-, gold-, and copper-mining endeavors, some silver mines stretched to 800 feet deep, and the city of Carthago Nova's mines alone employed some 40,000 workers in 179 BCE.¹⁰¹ An empire of Rome's extent relied heavily on these massive undertakings. Consider, for instance, that it took some 38 tons of iron to equip a single Roman

⁹⁸ Columella, *Rerum Rustica*, 3.3. Loeb Classical Library, trans H. B. Ash, 1941, Bill Thayer, (University of Chicago, <http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Columella/home.html>, accessed 5 March 2014.)

⁹⁹ Thommen, *Environmental History*, 34.

¹⁰⁰ Hughes, *Pan's Travail*, 117.

¹⁰¹ *Ibid*, 118.

legion in its entirety. No wonder, as Rome's armies grew to incorporate men from all of its conquered provinces, that mining operations needed to be expanded from Etruria and Elba to a number of locations beyond Italy.¹⁰² Silver, too, was needed in large amounts for coinage, with some 125 tons already in circulation by the second century BCE. Then there were desirable luxury goods and decorative materials like granite and porphyry, which were imported from Egypt, or marble, which was obtained from Asia Minor and Numidia as well as Greece.¹⁰³ The Roman Empire's vast extent, then, was both its gift and its curse: it allowed it to mobilize mining on a massive scale, reaching to far-off lands for their resources, but it also required a heightened effort to obtain enough resources to support such an enormous empire.

What were the consequences of all this mining and quarrying for the natural world? Mining in had diverse effects, all generally detrimental to the environment. The scarring of the landscape is perhaps the most obvious, its effects clear even today. Significant deforestation was the result of mining in many areas, such as around the mines at Laurium, where "a great scar" had appeared upon the forests of Attica, which "by the time of Strabo...had been completely bared."¹⁰⁴ At a place called *Scapte Hyle*, or "excavated forest," Herodotus tells us that "a whole mountain there has been turned upside down in the search for gold."¹⁰⁵ In some cases, this could literally occur as the earth itself was scarred and displaced. Pliny tells the story of excavation through collapse in a Roman mine:

When these operations are all completed, beginning at the last, they cut away the wooden pillars at the point where they support the roof: the coming downfall gives warning...the mountain, rent to pieces, is cleft asunder, hurling its debris to a distance with a crash which it is impossible for the human imagination to conceive; and from the midst of a cloud of dust, of a density quite incredible, the victorious miners gaze upon this downfall of Nature. Nor yet even

¹⁰² Thommen, *Environmental History*, 121.

¹⁰³ Ibid.

¹⁰⁴ Hughes, *Pan's Travail*, 122.

¹⁰⁵ Herodotus 6.46

then are they sure of gold, nor indeed were they by any means certain that there was any to be found when they first began to excavate, it being quite sufficient, as an inducement to undergo such perils and to incur such vast expense, to entertain the hope that they shall obtain what they so eagerly desire.¹⁰⁶

Smashing apart mountains, then, was to some an acceptable price to pay for the possibility of obtaining precious metals. Erosion also often followed excavation as protective cover no longer prevented hillsides from washing away.¹⁰⁷

In addition to changes to the immediately visible landscape, problems of pollution ensued. Water was needed for drainage and processing ores, particularly in hydraulic mining, which used large jets of water to blast ores out of the earth. The Romans often diverted the flow of rivers for such purposes, not only depriving local farmers of water for irrigation, but leaking poisons such as lead, mercury, and arsenic into drinking water. A mine could continue to produce pollution through runoff long after it had been abandoned.¹⁰⁸ Air pollution was also a major problem. Mines were ventilated so as to allow torches as light sources underground, and the thick, smoky air that left these shafts was almost always contaminated by the minerals in the ore being mined. The process of smelting released further fumes into the air. Strabo notes that silver-workers in Spain built their furnaces “lofty, in order that the vapor, which is dense and pestilent, may be raised and carried off.”¹⁰⁹ Mine workers suffered most clearly from this kind of pollution, experiencing ill health and notably shortened lives, but it had consequences for all. Measurements of ice cores from Greenland reveal a notable increase in lead

¹⁰⁶ Pliny, *Historia Naturalis*, 33.21, trans. John Bostock, (London: Taylor and Francis, 1855, Perseus Digital Library, accessed 19 Feb 2014.)

¹⁰⁷ Hughes, *Pan's Travail*, 123.

¹⁰⁸ *Ibid*, 117-123.

¹⁰⁹ Strabo, *Geography*, 3.2.8, trans. George Bell & Sons, (London, 1903, Perseus Digital Library, accessed 19 February 2014.)

concentrations for the entire world around the time the Romans began more intensive smelting around the second century BCE.¹¹⁰

Roman authors and classical writers in general were aware of the dangers of industrial activity. Pliny lamented that human beings would tear apart the “bulwark” nature had made for “holding together the bowels of the earth” for the sake of “luxurious inclinations.”¹¹¹ He slammed mankind for a tendency toward greedy delving without trying to repair the damages caused, digging into our Mother earth’s “entrails” “as though each spot we tread upon were not sufficiently bounteous and fertile for us!”¹¹² Other authors, such as Ovid, voiced similar criticism. In general, though, these authors approached pollution and the alteration of the landscape through a lens contrasting luxury with morality. Only by limiting our greedy desire for luxurious metals could we win the respect of the gods, and to do otherwise was to offend them and nature. This differs somewhat from a modern concept of environmentally conscious mining, which would emphasize responsibility and reparation, rather than piety. At the same time, these authors also suggested measures aimed at what we would recognize as a concept of sustainability, cautioning mankind to limit itself to the surface of the earth, where renewable resources could be harvested continuously and safely.¹¹³ All in all, Roman efforts to acquire mineral resources would not seem unfamiliar to our own industrialized society. Though some voices called for caution against over-exploiting the earth’s mineral wealth, ultimately the needs of a massive empire meant that these appeals would go largely unheeded as mining operations grew ever bigger and more intensive—even if a significant environmental impact was the consequence.

Animals in Ancient Agriculture and Civilization

¹¹⁰ Hughes, *Pan’s Travail*, 127.

¹¹¹ Pliny, *Historia Naturalis*, 36.125, trans. John Bostock, (London: Taylor and Francis, 1855, Perseus Digital Library, accessed 19 Feb 2014.

¹¹² *Ibid*, 33.1.

¹¹³ Thommen, *Environmental History*, 122-121.

A further factor in environmental change, of no small significance for North Africa, was animal life, particularly as it came to be of use to human beings. Animals had always loomed large in images of nature, serving as powerful symbols of the divine and as mediators between human beings and nature. Consider, for instance, the prehistoric images, discussed above of a “Lord or Lady of the Animals” which would eventually come to be understood through deities like Aphrodite and Diana. Many gods were worshipped as animals and through animal attributes, and animal sacrifice was an integral part of worshipping the gods.¹¹⁴

Hunting and fishing had been practiced, with a deep reverence for its divine patrons, since time immemorial. Some Greeks and Romans considered the hunter’s life a better and purer way of living than life in a greedy, unjust city.¹¹⁵ Notably, however, hunters, in addition to providing for their own needs, often supplied those same city-dwellers with leather, meat, and various luxury products. Demand for exotic animal products from foreign lands was similarly high. One such product was ivory, which was a boon to all kinds of art and ornament from sculpture to furniture.¹¹⁶ The Romans, though, introduced a more dramatic use for exotic creatures: spectacle. Private sport-hunting in game preserves and fish ponds had been a pastime of the elite since the Hellenistic era, but by the second century CE, killing interesting animals had become a very public experience. In circus games, gladiatorial contests, and other festivals, Roman warriors fought animals in mock-hunts before a roaring crowd in the arena. The animals, often chosen for their exotic allure, included lions, snakes, panthers, leopards, giraffes, hippopotami, crocodiles, elephants, and more. The government of Rome went to no small expense to transport these creatures from places like Libya, Thessaly, and Egypt, providing free food, accommodations, and generous assistance to all who were part of the animal trade.¹¹⁷ Both abroad and near the Greek and Roman heartland, populations of these animals diminished or went extinct entirely.

¹¹⁴ Thommen, *Environmental History*, 45.

¹¹⁵ Hughes, *Pan’s Travail*, 92.

¹¹⁶ *Ibid*, 94.

¹¹⁷ *Ibid*, 102.

Lions, for instance, had once come down out of Greek mountains to attack invading Persians.¹¹⁸ But these lions had disappeared by the time of Christianity.¹¹⁹ Their absence is not surprising, perhaps, when a leader like Caesar could slaughter 400 lions, 40 elephants, several bulls, and a giraffe just in celebration of his victories in Africa.¹²⁰ The restless search for more animals for the arena undoubtedly had major repercussions for the diversity of Mediterranean wildlife, and so likely contributed to environmental changes.

Perhaps more damaging over the long term, though, if more subtle, were the effects of everyday animal husbandry. In part, the extent of animal keeping's influence relied on its ubiquity. It was essential to the basic practices of classical society. As Thommen notes, "for the Romans...keeping animals was of basic economic and social importance."¹²¹ Just as hunted animals provided both food and useful materials, domesticated animals served humankind in a variety of ways, from sustenance to clothing to transportation. Cattle provided meat and leather, and were instrumental in plowing the fields of large villas.¹²² Sheep, too, provided milk and wool. Donkeys, mules, goats and pigs were also common, along with poultry and bees. Animal husbandry was seen a source of great wealth, and the lower class acquired animals both as a means of sustenance and as a means of social advancement.¹²³ Many of these animals were grazing animals, so transhumance, the practice of moving flocks and herds to and from moister pastures in the dry summer, was often practiced, if not extensively. The scholar Marcus Varro, for instance, wrote in his guide to farming, *Rerum rusticarum*, that his own flocks "wintered in Apulia which passed the summer in the Reatine Mountains."¹²⁴

¹¹⁸ Herodotus, 7.125.

¹¹⁹ Thommen, *Environmental History*, 47.

¹²⁰ *Ibid*, 95-96.

¹²¹ *Ibid*, 95.

¹²² *Ibid*, 80, 84.

¹²³ *Ibid*, 84, 95.

¹²⁴ Varro. *Rustica*, trans Rev. T. Owen, (Oxford University Press, Charing Cross, London, 1800, accessed from Eighteenth Century Collections Online, 17 October 2013.)

Many scholars have identified these very herds as a source of significant environmental damage, surprising as it may seem. Land considered unsuitable for cultivation, where cultivation was no longer taking place, or where wealthy landowners had space to spare, was often used as pasture. In practice this meant that herders grazed their animals in spaces where forests had been uprooted or cut down, and their presence contributed to keeping the landscape that way. Of the four common species which were most commonly herded in Greco-Roman agriculture, all had a unique way of hindering the regrowth of cut-down forests. Cattle enjoy grass and leaves, which may have led some herders to cut down saplings and branches for them to munch. Pigs favor acorns, chestnuts and beechnuts, and when allowed to root around in a forest, can easily destroy its means of reproduction. Sheep pull up many plants by the roots and eat grass down to the soil. Goats eat almost anything, but do the most damage to bushes and young trees. All in all, these animals, when land was overgrazed, had the power to strip the remnants of forests bare and prevent their recovery. J. D. Hughes stresses that while grazing animals cannot “by themselves” destroy mature forests, they can make an already damaged landscape worse, particularly when multiple species of animals graze upon the remnants of a forest. It was well known in ancient times that goats were particularly destructive. Plato, in his *Laws*, alludes to contemporary debate between goat-herders and their critics which put goats on trial for “doing damage on cultivated land.”¹²⁵ Similarly, the comic poet Eupolis includes a chorus of goats in one of his plays, who humorously sing through a very long list of the plants they devour, including everything from “the tender shoots of pine, ilex, and arbutus” to “ash, fir, sea oak, ivy, and heather.” Hughes, in his discussion of the poet’s passage, notes that this list includes the majority of the most common plants in the Mediterranean ecosystem.¹²⁶ Compounding the problem was the fact that goats were among the most common herd animals in the ancient Mediterranean, as they were easy to manage and highly adaptable in their appetites. Furthermore, transhumance ensured that any vegetation was always grazed upon when it

¹²⁵ Plato, *Laws*, 1.639a.

¹²⁶ Hughes, *Pan’s Travail*, 78.

was in growth and most vulnerable.¹²⁷ All in all, animal herding, though not in itself a noticeable source of change, exacerbated many environmental problems.

Towards a Comprehensive Theory of Decline in the Mediterranean

Taking all of these factors—deforestation, intensive agriculture, industrial mining, and animal husbandry—into account allows us to understand the mechanisms by which environmental decline may have occurred throughout the Mediterranean. Not only is each of these effects of human presence highly suggestive of environmental change on its own, but when taken together, they present a compelling picture of how smaller effects may have contributed to a large-scale decline in the Mediterranean environment over the long term. Scholarship on the Mediterranean environment has long recognized how these effects fit together into a larger theory of decline. To understand this theory, a scenario for how all of these factors might affect a typical Mediterranean landscape over time may be helpful as a standard for comparison with North African realities.

We begin with a hypothetical forested region—perhaps one near a major Roman city in North Africa. While there certain cultural factors might aid in preserving this forest—particularly a deep religious reverence for nature as an aspect of the divine—a need for lumber, fuel, and other resources a forest could provide are likely to outweigh the ancients' sense of reverence. Particularly in wartime, when massive amounts of lumber are needed for shipbuilding, a previously protected forest might begin to disappear or diminish. After deforestation occurs, the space may be turned over to become agricultural land, used by the farmers who provide Rome with the grain and produce supplies needed to support a massive empire. In fact, the continuing need for further agricultural space may be one of the reasons the forest was cleared in the first place. The use of the land for agriculture makes it unlikely that the forest will regrow for some time, as its seeds will have little opportunity to sprout. Even if human

¹²⁷ Ibid, 78-79.

beings abandon the space, if the land has been mismanaged, it is possible that the quality of the soil has already declined from prior exploitation. With reduced soil quality, it may not be physically or biologically possible for the landscape to return to its previous state. Meanwhile, any mining projects that have occurred in the area may have also reduced the quality of the soil or the quality of nearby sources of water for growing vegetation. Even if new seeds begin to sprout, herds of animals may eat those seeds and growing plants before they have the chance to achieve full growth and reproduce. Indeed, voracious species such as sheep and goats may leave the soil almost entirely exposed. If nothing changes about this situation, the landscape which once supported a forest may soon be unable to support much vegetation at all.

At this point, erosion becomes a very present danger without the cover a forest provides. This is especially true in the Mediterranean, where heavy rainfall defines the winter months.¹²⁸ Erosion was already known in ancient times to have heavily altered many landscapes that once held trees. Plato noticed this process in Greece, and condemned it, comparing the rocky mountains that remained to “the skeleton of a sick man, all the fat and soft earth having wasted away, and only the bare framework of the land being left.” What a shame, he lamented, that the soil “keeps on sliding away ceaselessly and disappearing in the deep!”¹²⁹ Another side of erosion, as he suggests, was the alteration of the coastline. Often, the soil and silt of eroded mountains was washed into rivers and down into the weak tides of the Mediterranean Sea. Over time, certain coastlines were pushed much further out to sea as a result of siltation, some of it triggered by deforestation. This could have a massive effect on the local environment, creating wetlands, clogging harbors, and altering the distribution of water sources.¹³⁰

Meanwhile, the absence of forest also affects the water supply, as forests influence how precipitation flows through them. Trees, other forest plants, and forest soil hold water and regulate its

¹²⁸ Hughes, *Pan's Travail*, 83.

¹²⁹ Plato, *Critias*, 111b.

¹³⁰ Hughes, *Pan's Travail*, 84.

flow into springs and streams over the course of a year. Ancient authors such as Pausanias, Pliny, and Plato remarked on the close relationship between forests and water. Without watershed forests, flooding usually ensued, as was the result when Rome used up the forests surrounding the Tiber. Regular flooding was a problem for centuries afterward. At the same time, preexisting water sources, like rivers and springs, often became muddy, dried up, and disappeared when their protective forests were gone.¹³¹ Thus the loss of our hypothetical forest might have an effect on the quality of life for people living nearby: they may have to abandon their homes and fields and move to where water is more readily available.

After several hundred years of human habitation, then, our once-forested region may look markedly different. Not only are its trees and wildlife gone, but the rich soil that sustained them has disappeared, too, used up and washed away. The springs and rivers around which the nearby cities once built themselves have dried up, and the distance to the coast has changed. In fact, there may be few people left at all—just rocky, difficult soil, little water, and the ruins of cities which once held thriving communities. This is a picture very like the one we encounter today in North Africa, and that condition is no coincidence. Striving to understand the difference between ancient North Africa and the Maghrib as it appears in the modern era, first-wave environmental historians have crafted an account of environmental decline in the region. This account offers a compelling explanation of the mechanisms by which such massive changes might have taken place. With this in mind, we now face several questions. How can we demonstrate that North Africa indeed changed in the ways investigated by this model? Can we show that it did so for the reasons the model suggests? And does this model hold up against recent criticisms from postcolonial and alternative environmental scholars who disagree about the processes that have shaped the Maghrib? To answer these questions, we must turn to the direct evidence for environmental change in North Africa.

¹³¹ Ibid, 83.

The Literary Evidence

So far, our study has examined a number of practices which suggest classical societies brought on deforestation and environmental decline throughout the Mediterranean. The question remains, however: did these changes take place in North Africa, and to what degree? Did the Roman Empire find the Maghrib a fertile, forested land, and leave it exhausted and bare? We can begin to explore this question by examining the literary evidence for a lost, fertile North Africa.

We best glimpse North Africa through two different kinds of Roman nonfictional writing: geographical works like Pliny's *Natural History* that seek to present a comprehensive picture of the classical world, and historical texts in which North Africa plays a pivotal role in the saga of the Roman Empire. In works like these, we find a number of passages suggesting Rome encountered a very different North Africa at the start of its imperial expansion from the one it left behind.

Probably our most immediate source for the North African environment during this pivotal moment in history comes from the *Histories* of Polybius. Polybius was a Greek who integrated himself into Roman society as it began to expand its territory, travelled and worked closely with Scipio Aemilianus, the general who won control over North Africa from Carthage in 146 BCE.¹³² At the end of the war, Polybius was present at Scipio's final victory and, shortly afterward, travelled down the coast of northwest Africa to explore the region on Scipio's behalf. His account of his travels confirms that the region was a place of lush forests and abundant wildlife. Unfortunately, we lack the full text of Polybius's geographical essay within his encyclopedic *Histories*, which would have dealt very heavily with his travels. It was not preserved as well as the rest of his natural history, and today survives only in fragments. Still, relevant fragments offer much insight into his experiences. In one extant passage,

¹³² Marijean H. Eichel and Joan Markley Todd, "A Note on Polybius' Voyage to Africa in 146 B.C.," *Classical Philology*, Vol. 71, No. 3 (Jul., 1976), pp. 237-243.

Polybius launches a fiery refutation of the published work of a previous historian-geographer, who had imagined the region of North Africa barren: “The excellence of the soil of Libya [Africa] must excite our admiration. But one would feel inclined to say of Timaeus, not merely that he had never studied the country, but that he was childish and entirely unintelligent in his notions.”¹³³ Polybius also emphasizes the diversity and splendor of the region’s wild animals as a sign of its richness:

The supply of horses, oxen, sheep, and goats in it is beyond anything to be found in any other part of the world; because many of the tribes in Libya do not use cultivated crops, but live on and with their flocks and herds. Again, what writer has failed to mention the vast number and strength of its elephants, lions, and panthers, or the beauty of its buffalos, or the size of its ostriches? Of these not one is to be found in Europe, while Libya is full of them. But Timaeus, by passing them over without a word, gives, as though purposely, an impression exactly the reverse of the truth.¹³⁴

This passage, however fragmentary, is the eyewitness account of an individual who visited the region of North Africa and had ample opportunity to confirm for himself the richness of its landscape. And what we glimpse in fragments of Polybius’s account is corroborated by Pliny the Elder, who three centuries later, used the full text of Polybius as one of his sources for writing his *Natural History*, and would have had ample opportunity to pore over his full geographical work. Here is his summary of Polybius’s account: “Scipio Aemilianus, during his command in Africa, placed a fleet of vessels at the service of the historian Polybius for the purpose of making a voyage of discovery in that part of the world. After sailing round the coast, Polybius reported that beyond Mount Atlas in a westerly direction there are forests teeming with the wild animals that Africa engenders....”¹³⁵ Again, Pliny’s account, reconstructed as it is,

¹³³ Polybius, *Histories* 12.1, trans. Evelyn S. Shuckburgh, (London, Macmillan, 1889, reprint Bloomington 1962, accessed on Perseus Digital Library, 14 November 2013.

¹³⁴ Ibid.

¹³⁵ Pliny the Elder 5.1.2, *Historia Naturalis*, trans. H. Rackham, (Cambridge: Harvard University Press, 1947 Loeb Classical Library.)

reveals the testimony of a traveler who had the opportunity to see for himself the environment he was describing—his claim that North Africa possessed large forests and a diversity of wild creatures is hardly a tenuous assertion.

Pliny himself goes on to provide a great deal more information about the North African landscape in his *Natural History*, making his fresh contributions another excellent source. In addition to Polybius, he cites such figures as Carthaginian leader Hanno and Roman commander Suetonius Paulinus, both of whom had personally explored the region.¹³⁶ While Pliny does note parts of Africa containing large deserts, he also describes regions of lush forests and rich wildlife. For instance, he describes Mount Atlas (today considered a mountain chain that stretches through Morocco, Algeria, and Tunisia) as “shaded by dense woods and watered by gushing springs on the side facing Africa, where fruits of all kinds spring up of their own accord with such luxuriance that pleasure never lacks satisfaction.”¹³⁷ Similarly, the account of the region according to Suetonius Paulinus “agrees with that of all the other authorities, but he [Suetonius] also states that the regions at the base of the range are filled with dense and lofty forests of an unknown kind, with very tall trunks remarkable for their glossy timber free from knots, and foliage like that of the cypress except for its oppressive scent...the neighbouring forests swarm with every kind of elephant and snake.”¹³⁸ Pliny also describes groves of olive trees, “forests with a multitude of wild beasts,” including elephants, near Carthage, and a region of exceptional fertility called Byzacium where can be found soil “paying the farmers interest at the rate of a hundredfold.”¹³⁹

Some have raised objections to relying on Pliny as a source to demonstrate North Africa’s fertility, noting that he records many fantastical tales alongside his collection of facts. While it is true that Pliny touches on implausible stories, a careful reading shows that he usually endeavors to distinguish these from accounts he knows to be based on solid evidence. For instance, instead of stating

¹³⁶ Ibid, 5.1.8-14.

¹³⁷ Ibid, 5.1.6.

¹³⁸ Ibid, 5.1.14-15.

¹³⁹ Ibid, 5.1.3, 5.4.27, 5.3.25.

as fact that there are headless humanoid creatures in eastern Africa called Blemmyae, he qualifies this by merely saying it has been “reported” rather than confirmed.¹⁴⁰ In general, Pliny expresses a cautious skepticism about mythically-inclined accounts of other lands. Discussing an island near Mauretania said to have been visited by Hercules, he remarks that “of the famous grove in the story that bore the golden fruit [there is] nothing else except some wild olive trees. No doubt less wonder may be felt at the portentous falsehoods...by people who reflect that our own countrymen, and these quite recently, have reported little less miraculous stories about the same matters...”¹⁴¹ At times, Pliny approaches a systematic investigation of how such myths emerge around associated ideas, as when he discusses how a winding sea-channel might have given rise to a myth of a guardian serpent.¹⁴² Pliny seems to include these stories not so much because he believes them, but because he feels the need to capture the complete picture of a place, including the popular culture which surrounds it. One might accuse him of being overly generous in his inclusions, but he is far from credulous.

In a similar vein, the Greek geographer Strabo offers us another excellent glimpse of North Africa in a cultural context that encompasses the whole Mediterranean world. Strabo divides North Africa into several regions separated by cultural and climatological variations, some of which are more fertile and prosperous than others. While Libya, his name for the region immediately west of Egypt, is “inferior” to Europe for its deserts and scattered nomadic settlements, the rest of the North African coastline is far more fertile.¹⁴³ Save for a few dry patches here and there, the Greek geographer tells us, “The whole of the coast opposite to us between the Nile and the Pillars [the Straits of Gibraltar], and

¹⁴⁰ Ibid, 5. 8.45.

¹⁴¹ Ibid, 5.1.4.

¹⁴² Ibid, 5.1.4.

¹⁴³ At times there is some amount of confusion between meanings when Strabo uses the Greek term “Libya.” As in other Greek geographical texts of the era, sometimes the term Libya can refer to the whole of North Africa, but other times it refers to a more specific region immediately west of Egypt. In this passage, though, context makes it clear that Strabo means a particular area, rather than the whole extent of Africa, as he immediately goes on to contrast “Libya” with other parts of North Africa.

particularly that part which was subject to the Carthaginians, is settled and prosperous.”¹⁴⁴ The western region of Marusia, for instance, is incredibly rich, agreed by all to be a “fertile country” “supplied with both lakes and rivers.” Not only does this region possess abundant natural resources, including forests “surpassing in the size and the number of [their] trees,” “and many animals, such as seven-cubit lampreys, crocodiles, and species “similar to those in the Nile,” Romans have long recognized it a resource for the imperial economy.¹⁴⁵ The area is extraordinarily “productive of everything,” and in particular “supplies the Romans with the tables that are made of one single piece of wood, very large and most variegated.”¹⁴⁶ This notable piece of information about wood shows us that Strabo, in his description of Maurusia, was not relying merely on hearsay. People actually travelled to these Maurusian forests on a regular enough basis that their wood could be incorporated into Roman luxury products. The material evidence for a rich environment in that part of Africa was thus apparent throughout the Empire. Strabo goes on to relate further things that can be found in this lush and productive region: “a vine so [long] that it can hardly be encircled by the arms of two men,” herbs and stalks that grow “twelve cubits high and four palms thick,” and a variety of other wild animals, including “serpents...elephants and gazelles and *bubali* [antelopes]...lions and leopards...and a great number of apes.”¹⁴⁷ Outside of Marusi, other fertile areas included Abile, “which abounds in wild animals and large trees,” “marshy regions and lakes” near Cirta, and a region near Caesareia where two crops of grain can be grown a year, where the ground barely needs to be sown to produce “a perfect summer crop.”¹⁴⁸ While Strabo relates some fantastical stories about these regions, like Pliny, he treats the most outlandish claims with a good bit of skepticism. For instance, he calls the idea that the Emporicus Gulf possesses a cave that admits seven stadia of sea, and, within, an altar of Hercules that is never touched

¹⁴⁴ Strabo, *Geography* 17.3.1, trans. Horace Jones (London: Heinemann, 1932, Loeb Classical Library.)

¹⁴⁵ *Ibid*, 17.3.4.

¹⁴⁶ *Ibid*.

¹⁴⁷ *Ibid*.

¹⁴⁸ *Ibid*, 17.3.6, .7, .11

by the tide, one of the “fabrications” of historians who came before him. “Nearly as bad” is the unfounded assertion that near that same gulf lie the ruins of three hundred abandoned Tyrian settlements.¹⁴⁹ Strabo himself constantly evaluates his sources for accuracy, as when he points out the contradiction between Poseidonius’s assertion that the rivers of Libya are “few and small,” while Artemidorus claims that they are “many and large.” He goes on to explain why these two authors might come to different conclusions, situating his own ideas in the context of a careful historiography of the region.¹⁵⁰ For Strabo, as for Pliny, the relation of some exaggerated tales does not mean he believes them without question. Rather, he includes them to provide a complete picture of the important ideas surrounding a region—“to pass over them in silence,” he argues, would “cripple my history.” In many ways, we can be grateful for their inclusion: they not only show us North Africa as Strabo sought to depict it, but also give us some sense of the intellectual controversies and folklore surrounding that landscape.

We also glimpse images of the North African environment in other historical works. While the bulk of Rome’s empire-expanding wars after its victory over Carthage took place in northern Europe and the eastern Mediterranean, several histories reveal that military presence was once again needed in North Africa, and thus can show us the region through the eyes of the soldiers who travelled there. One of the best in this regard is Sallust’s account from the first century BCE, *The War with Jugurtha*. The region of Numidia had helped Rome achieve victory over neighboring Carthage during the Punic Wars; now, many years later, Jugurtha, grand-nephew of that Numidian king, seized the throne from relatives and began to consolidate power in the region, forcing Rome to get involved.¹⁵¹ Sallust, a political ally of Caesar, was, thanks to his role in the conflict, appointed governor of Numida around 46 BCE, giving him

¹⁴⁹ Ibid, 17.3.3.

¹⁵⁰ Ibid, 17.3.10.

¹⁵¹ Sallust, *The War With Jugurtha* 12-13, trans. J. C. Rolfe, (London: Heinemann, 1920, Loeb Classical Library.)

the opportunity to do additional research for his historical writings.¹⁵² Though at times he simplified chronology where he found it necessary, Sallust had an immediate view of the conflict, and a great deal of experience with living in the Numidian environment. Indeed, he takes some time near the beginning of his account to give a description of the region, so that readers may have some background on “the nations there with which the people of Rome have had wars or alliances.” Sallust limits himself to what he knows for fact, stating he “could not easily give an account based on certain information” in the case of areas which “are seldom visited because of the heat or difficulty of access.”¹⁵³ Even with that caveat, however, what Sallust does know is considerable. He relates that the soil is “fertile in grain and favorable to flocks and herds,” if less full of trees and water. Life is abundant in Africa, both for the dangerous wild animals in which “the country abounds,” and for the native people, who commonly live long, healthy lives, with little risk of disease.¹⁵⁴ Throughout Sallust’s account of the Jugurthine war, we see many indications of this fertility. For instance, while Sallust suggests that forests may not have been as extensive as in other regions of Africa, there were many moments when they played a role in Jugurtha’s story. Jugurtha led his troops through “woody places and by-paths” to avoid detection, set up a battle-line near a hill “clothed with wild olive, myrtles, and other varieties of trees,” and retreated to a “wooded district of natural strength” when on the run.¹⁵⁵ These forested areas were not only notable landmarks, but played a vital role in determining the course of the war. Agriculture, too, was of great importance, and appears to have met with good success among the local peoples. Jugurtha was able to supply his fortresses with “an abundance of grain,” while the Roman armies, against their commanders’ orders, were able to live off local agriculture, easily acquiring food and cattle from ransacked

¹⁵² J. C. Rolfe, introduction to Sallust, *The War With Jugurtha*, trans. J. C. Rolfe, (London: Heinemann, 1920, Loeb Classical Library), xiii.

¹⁵³ *Ibid*, 17.

¹⁵⁴ *Ibid*.

¹⁵⁵ *Ibid*, 38, 48, 54.

farmhouses, even selling Rome's grain allotments to acquire massive quantities of Numidian bread.¹⁵⁶ The Roman commander Metellus even took deliberate advantage of Numidia's agricultural resources by stationing his army in the cosmopolitan town of Varga, "believing...that the large number of traders would aid his army in getting supplies and serve as a protection to those which he had already prepared."¹⁵⁷ In addition to cereal agriculture, herding was commonplace throughout Numidia. Jugurtha ransacked his enemies' cattle, and in more remote parts of Numidia, such as the area near Capsa, grazing dominated agriculture among the common people, as grain mostly went into the storehouses of the ruling class. From Sallust's deeply familiar account, it becomes clear that while some parts of Numidia were more fertile than others, in many places the region was able to support thriving forest ecosystems, major agricultural endeavors, and pasture enough to graze large numbers of cattle. This record suggests that, at least during the first century, North Africa was indeed able to support large-scale Roman agricultural efforts, as well as enough forested land to provide a significant amount of natural resources for Rome.

The account attributed to Julius Caesar of his battles against his enemies in North Africa, *The African War*, reveals a similar picture. Caesar's authorship is now disputed, but if *The African War* and its sibling works describing the Roman Civil War (*The Alexandrian War and The Spanish War*) were not written by Caesar, they were indisputably written by one or more soldiers who fought in Caesar's campaigns, based on the faithful record of military events within.¹⁵⁸ In *The African War*, we thus not only have a record of a loyal soldier's careful observations about Caesar's campaigns, but also another account of North Africa by an individual who had personally been there and travelled through its landscape. While the author of *The African War* may not be quite as well-versed in the region as Sallust, a former governor, and does not attempt to provide a geographical overview as Sallust does, we can

¹⁵⁶ Ibid, 92, 44.

¹⁵⁷ Ibid, 47.

¹⁵⁸ A. G. Way, General Introduction to Caesar, *Alexandrian, African, and Spanish Wars*, trans. A. G. Way (Cambridge: Harvard University Press, 1955), pp3-5.

learn a great deal about the North African environment by looking at what he says about the landscape. The areas through which Caesar travels include significant forests in North Africa. While when Caesar first arrives in the area, we are told that “timber is scarce,” particularly around the town of Ruspina, this may have more to do with Caesar’s enemies than any inherent quality of the territory. The author describes how Caesar’s opponents had already “ransacked” the area of grain and gathered it into a few well-fortified towns, leaving these lands “abandoned and laid waste.”¹⁵⁹ It seems likely, then, that the same is true for timber—the scarcity more accurately represents the political condition, in which Caesar and his enemies fiercely hoard resources from each other, than anything about the North African climate. Outside the area of Ruspina, the text suggests evidence of more extensive forests. Notably, Caesar’s men are able to forage for wood once they travel some distance from the Ruspina-area fortifications.¹⁶⁰ Much later, Caesar, attempting to cross a large ravine, is also forced to contend with “an ancient olive grove, dense and thickly planted with trees” in which his enemies lie in hiding.¹⁶¹ Thus, the author’s account of Caesar gives additional weight to Sallust’s suggestion that North Africa possesses great forests.

The African War also suggests a significant agricultural presence in the region. Although Caesar is initially frustrated to find that his enemies have hoarded all the grain in the area, weakening his campaign, that men could “[collect] corn¹⁶² from the whole of Africa and [convey] into a few well-fortified towns” suggests a sophisticated agricultural network was in place.¹⁶³ Indeed, over the course of Caesar’s travels, it becomes clear how effectively the Roman Empire managed to tie North African agriculture into its political and economic systems. Turning a kingdom into a province, as Caesar does in Zama and Sulci, is as simple as rewarding those who “barred their gates” to their former king, and

¹⁵⁹ Caesar, *Alexandrian War, African War*, trans. A. G. Way (Cambridge: Harvard University Press, 1955), 20.

¹⁶⁰ *Ibid*, 31.

¹⁶¹ *Ibid*, 50.

¹⁶² Grain.

¹⁶³ *Ibid*, 20.

establishing that local farms shall now send one-eighth of their produce to Roman authorities as taxes.¹⁶⁴ This network allows Caesar's entrenched enemies to initially have the upper hand, but, before long, Roman forces are also able to take advantage of the agricultural system. The town of Thysdra, for instance, sends envoys to Caesar with some "three thousand measures of wheat," offering it to the Roman army in exchange for a guarantee that their full grain stock will be placed under protection; Caesar responds with a great deal of gratitude.¹⁶⁵ Grain storage appears to be of utmost importance throughout these African towns; the author writes of a ubiquitous "custom among the natives," in which grain is placed in secret underground vaults beneath farmhouses and fields.¹⁶⁶ Such carefully-protected stores of grain are a constant presence throughout the text as Caesar and his enemies vie for control over the food supplies by which to feed an army. All of these references paint a vivid picture of North Africa as a major agricultural province. By Caesar's time, it seems, North African agriculture was a productive enterprise, capable of producing vast surpluses of grain and supporting major military campaigns. As in Sallust's account, the story of Caesar's efforts suggests that North Africa possessed abundant natural resources—and for Rome, Africa held a pivotal position in the Empire for precisely this reason. Overall, then, while there are many gaps in our knowledge, ancient literary sources strongly indicate that the fertility and natural abundance of North Africa during ancient times is no mistake. Across a variety of genres and authors, we see the same image over and over again: Africa is a land full of forests, with soil fertile enough for massive agricultural efforts, gifted with an astounding abundance of plant and animal life.

The Archaeological Evidence

Critiques of the traditional model of the ancient North African environment, arguing against the notion that human activities in the Mediterranean precipitated decline, have questioned the use of

¹⁶⁴ Ibid, 97-98.

¹⁶⁵ Ibid 36.

¹⁶⁶ Ibid, 64.

ancient literary works as a source for information about its climate. Skeptics argue that these works are fragmentary and their authors prone to falsehood and bias, and that historians across the ages have blithely passed on a particular interpretation of their work, emphasizing decline without questioning the traditional view. Some of these claims have already been addressed in the discussion of the literature, above, and it should be clear here that these ancient authors do not fit the stereotype of babbling storytellers who had never been to North Africa. Many of them were, in fact, intimately familiar with the region, and those who were not brought a sophisticated sense of the truth to their writing, questioning the veracity of other authors and providing an explicit list of the sources by which they arrived at their ideas. That historians have relied on these accounts for centuries is no accident—their voices represent a thorough and reasoned study of the ancient Mediterranean from the perspective of its inhabitants.

At the same time, though, in asking us to look beyond the literary picture, recent critics of extant literary sources help guide us toward a fresh and exciting perspective. Particularly promising in the last few decades has been the archaeological perspective on environmental decline. Recent studies on the physical remains of the ancient world have benefited from the latest scholarship and from a host of new and exciting methods, including palynological analysis and computer modeling. Although some critics have suggested a conflict between archaeological and literary approaches, in fact, they complement each other, showing us different aspects of the same world. Indeed, in the case of North Africa, despite arguments to the contrary, the archaeological evidence echoes what we have seen in the literary evidence above: that North Africa was a fertile region until its decline over the course of the Roman occupation.

One of the best sources of physical evidence for this is palynology, the study of ancient plant pollen. Stratified pollen grains often survive well in lakes or caves, and microscopic examination can identify them by species and thus reveal something about ecosystems which no longer exist.¹⁶⁷

¹⁶⁷ J. D. Hughes, "Ancient Deforestation Revisited," *Journal of the History of Biology*, 2011.

Radiocarbon dating can then be used to trace the progression of an environment over time. One of the foremost studies in this regard is H. F. Lamb and his collaborators' study of vegetation change over the last 18,000 years in what is now Morocco. Taken from Lake Tilgamine in the vicinity of the Atlas Mountains—the very range about which Pliny and Polybius wrote, Lamb's pollen core sample reveals how the landscape in the Atlas region has changed over the centuries, and when these changes took place. He and his co-researchers divide the contents of the sample into a number of different species of plants, some like shrubs and grasses, some cultivated plants, and a variety of trees. Each species' presence is then charted throughout time based on each layer of the core, from 18,000 years ago to the modern day. Particularly interesting for our purposes is the period roughly 2250 years ago, or around 250 BCE, the time of the growing Roman Republic. Lamb notes a significant decline in ash tree pollen in that era, suggesting the first sign of human presence in the region is the stripping of ash for forage. *Cedrus* and *quercus*, the great trees of the Mediterranean, also decline slightly. From there, we enter a notably more severe state of decline by 1600 years ago, around 350-400 CE.¹⁶⁸ By this time, the Roman Empire was well-established throughout the Mediterranean and entering the later phase of its history, with a new capital established at Constantinople in the east. This was the period in which Roman citizens travelled from continent to continent, the age of great North African cities like Carthage and Hippo, and the age of great North African figures like Augustine. In all likelihood, these palynological studies indicate that the massive building and agricultural efforts now in place brought on significant decline. During this period, Lamb writes, all tree species declined significantly, especially oaks, while species of grass and shrubs increased—evidence of land being heavily cleared by the Romans.¹⁶⁹ Although one or two species would recover slightly in the medieval period, overall, the forest landscape seems to have suffered a significant decline.

¹⁶⁸ H. F. Lamb, U. Eicher, and V. R. Switsur, "An 18,000-Year Record of Vegetation, Lake-Level and Climatic Change from Tigmamine, Middle Atlas, Morocco.," *Journal of Biogeography*, Vol. 16, No. 1 (Jan 1989), 72.

¹⁶⁹ *Ibid.*

The work of Valerie Andrieu and her team has also been very useful in this regard. Andrieu's research has sought to compile all the most effective studies of ancient Mediterranean palynology from 1990 to 1994 into one enormous computerized database that spans the entire Mediterranean over the last 10,000 years.¹⁷⁰ In one of their examples, they cite a core taken from the coast of modern Morocco that reveals significant deforestation. Oak species decline significantly over the course of several hundred years, reaching "complete destruction" of the deciduous oak by 800 CE.¹⁷¹ Other data from the western Mediterranean suggest the appearance of walnut around 2270 years ago coincides with the founding of Roman colonies in the area, and the subsequent decline in beech and oak and rise in cultivated plant pollen represents the clearing of land, indicating human intervention.¹⁷²

Further insight into the lost environment of North Africa comes from computer-based modeling techniques, which propose new ideas of climactic conditions based on a set of scientific principles and physical data. Oreste Reale and Jagadish Shukla, using such a model, suggest that the overall climate of North Africa has been significantly impacted by deforestation. Using a database of vegetation maps based in part on pollen studies and in part on currently-existing remnants of ancient forests, Reale and Shukla build a model of North Africa throughout the last 10,000 years and demonstrate that in ancient times, conditions were far less arid than they are now. That is to say, both deforestation and an overall decrease in moisture signify the difference between modern and ancient North Africa. Based on their model, Reale and Shukla propose a connection and mechanism for the two changes: albedo, the reflection of light and heat. In the past model, they write, "differential heating between land and sea caused by the albedo change induces a small scale coupled circulation, similar to a monsoon, in which the Mediterranean acts as a source of moisture and the orography of the Atlas enhances the upward

¹⁷⁰ Valerie Andrieu, et al, "A Computerized Data Base for the Palynological Recording of Human Activity in the Mediterranean Basin," *Environmental Reconstruction in Mediterranean Landscape Archaeology*, 1999, 4.

¹⁷¹ *Ibid*, 9.

¹⁷² *Ibid*, 7.

motion.”¹⁷³ In other words, the loss of North African forests created an increase of albedo, and thus a decrease in rainfall over most of North Africa. Not only was human presence responsible for the loss of North African forests, but in deforesting the region, human beings changed the climatic patterns of the region for future inhabitants of the region. Few examples of the power which human beings have long possessed to change their environment could be more vivid than that.

Post-Roman North African History

After the disappearance of Roman power in North Africa, the Maghrib passed into the control of the Arabic Umayyad Caliphate. Over the centuries that followed, North Africa was heavily shaped by a diversity of Arabic cultures. The Arab-influenced religion of Islam also shaped the culture of the Maghrib in much the same way that Christianity defined medieval Europe to the north.¹⁷⁴ A number of notable Muslim states emerged from these Arabic groups and the local Berbers, among them some of the most powerful political entities in the Middle Ages, including the Fatimids, the Mamluks, and the Berber-led Almoravids and Almohads.¹⁷⁵ Muslim civilization, inspired by the Prophet Muhammad, took root in North Africa thanks to the Umayyad Caliphate, which established itself as the successor to his teachings and territory. Around 670 CE, the Caliphate began efforts to establish itself west of Egypt; by 698, the Caliphate had defeated the last Byzantine forces in Carthage and established nearby Berber groups as loyal vassal states. Iberia also came into its possession shortly afterward, creating a Vandal-Arab cultural exchange. But the Umayyad caliphate toppled by 750 CE, giving way to the Abbasid caliphate. Over the next several centuries, different Muslim groups emerged as powerholders in different parts of what had

¹⁷³ Oreste Reale and Jagadish Shukla, “Modeling the effects of vegetation on Mediterranean climate during the Roman Classical Period.” *Global and Planetary Change* Vol. 25, 2000.

¹⁷⁴ Naylor, *North Africa*, 62.

¹⁷⁵ *Ibid*, 7.

been the Umayyad Caliphate: including the Aghlabids in Tunisia, the Rustamids in Algeria, and the Idrisids in Morocco.¹⁷⁶

In the eleventh century CE, further waves of nomadic Arab tribes swept through the Maghrib, and at the same time, Berber tribes began to assert their own power. Two such Berber states, the Almoravids and the Almohads, established a pan-Maghrib unified Muslim empire, the legacy of which continues to act as a symbol of Maghribi unity today.¹⁷⁷ After the Almohads faded in the thirteenth century CE, Turkish Mamluks became prominent in North Africa and Egypt; later, in the sixteenth century, another group of Turks, the Ottoman Empire, defeated the Mamluks and established their own regencies throughout North Africa. This highly transcultural empire, which rewarded talented administrators regardless of ethnic background or even religion, clashed with the Habsburg Christians in Europe, and maintained a political presence throughout the Maghrib and Middle East into the nineteenth century.¹⁷⁸

In these later years of Ottoman influence, European colonialism became a major factor in North Africa's place in the world. France under Napoleon successfully invaded Ottoman Egypt in the eighteenth century, revealing that the once-mighty Ottomans were in decline. In the nineteenth century, other powers, such as Portugal, Great Britain, and Spain, began to take an interest in controlling North Africa.¹⁷⁹ While Morocco successfully maintained its independence for some time, France took control of Algiers in 1830 and established it as Algeria, a province that would become central to its strength. In the later part of the nineteenth century and early twentieth, Morocco and Tunisia became French protectorates, Spain conquered Western Sahara, and Italy attempted to wrestle Tripolitania from the Ottomans. This scramble for power left North Africa fragmented and entirely in the hands of various

¹⁷⁶ *Ibid*, 87.

¹⁷⁷ *Ibid*, 107.

¹⁷⁸ *Ibid*, 109.

¹⁷⁹ *Ibid*.

European powers by the start of the First World War.¹⁸⁰ Gradually, after the World Wars and the complete disintegration of the Ottoman Empire, North African regions began to achieve independence and assert their own national identities. By 1962, all of the Maghrib but Western Sahara had been completely decolonized.¹⁸¹ Today, these decolonized North African nations—Libya, Tunisia, Algeria, Morocco, and Western Sahara—are still dealing with the consequences of the colonial period. As these countries endeavor to create new political and cultural identities in the modern world, they find themselves grappling with both the enduring legacy of the Maghrib's integral role in classical civilization, and the scars of political and ideological manipulation at the hands of colonial European powers over the last few centuries.¹⁸² These are not only key issues for modern North Africa's political and cultural future, they are key issues for understanding its environmental history in light of the colonial period.

The Post-Colonial Critique of Environmental Decline

In the last few decades, scholars of environmental history have begun to pay close attention to the ways in which European colonialism has shaped narratives about the North African environment. Post-colonial theory has emerged as a powerful tool for rethinking the history of colonized nations. By investigating the ideas and needs of colonial empires, post-colonial scholars have exposed the massive systems of ideology by which colonizers established their will over the colonized. The result of this insight has been an impressive expansion of our understanding of colonized nations, as well as a general re-evaluation of colonial Western Europe's place in the world and relationship to world history.

In recent years, some scholars have suggested that the history of environmental decline in North Africa may need to be significantly rethought as well. These authors, most notably Diana Davis in *Resurrecting the Granary of Rome* and A. T. Grove and O. Rackham in *The Nature of Mediterranean*

¹⁸⁰ Ibid, 141.

¹⁸¹ Ibid, 168.

¹⁸² Ibid, 191.

Europe: an Ecological History, argue that, in fact, a history of decline never occurred, that the celebrated “Granary of Rome” in North Africa never existed, and that the bare, inhospitable North Africa we see today is almost identical to the region the Romans encountered in the third century BCE. Such a theory would seem to fit well with an understanding of colonial ideology. As Davis tells it, by advancing the notion that the landscape was in decline, European colonial empires were able to justify their own takeover as a means of “resurrecting” a fallen landscape.¹⁸³ By a thorough misreading of literary evidence and a dearth of proper archaeological evidence, it is argued, these colonial empires thus put forth an incorrect history of environmental decline in the Mediterranean.

These criticisms have merit, especially in that they force us to confront the ways in which colonial misrule has used a particular reading of environmental history to its ideological advantage. But the misuse of history as a tool for colonial self-aggrandizement does not necessarily prove the original account false, and the claim of falsehood lacks compelling proof. Recent reassessment of ancient environmental history ignores or mischaracterizes a wealth of literary evidence, much of it detailed above, that historians have long recognized as highly suggestive of environmental decline in the Maghrib. And as we have seen, recent archaeological evidence, far from destabilizing this picture of environmental decline, also continues to affirm a forested and thriving ancient North Africa. Finally, recent critiques of theories of environmental decline often oversimplify and misrepresent Mediterranean history over the long-term, conflating classical, medieval and colonial history through the grandiose characterization of the “granary of Rome” as a colonial “myth.” In conflating these periods and cultures, some of these challenging accounts seem to treat the ancient past almost as an afterthought; rather than seeking insight into ancient history through rethinking contemporary ideology, these authors seem largely concerned with using the Roman era as a lens by which to illuminate the colonial era, and their study of the former suffers for it. Overall, the argument they make—that North

¹⁸³ Diana K. Davis, *Resurrecting the Granary of Rome: Environmental History and French Colonial Expansion in North Africa*, (Athens, Ohio, Ohio University Press, 2007,)2.

Africa never had the kind of agricultural and ecological presence attributed to it in ancient texts—cannot be sustained.

This is not to say that we should ignore the challenges of postcolonial theory, however. They force us to acknowledge that our understanding of the ancient environment has not been achieved without significant errors along the way, in part due to the oppressive ideologies of a historical tradition shaped by centuries of European colonial rule. When we reexamine those influences, we can see problems in the decline theory which have generally been overlooked, in particular, an aggressive undervaluation of the effects of herding, and a sometimes problematic emphasis on wilderness at the expense of colonized people. In addition, recent postcolonial accounts give us the opportunity to reassess both literary and archaeological evidence for environmental decline in the light of recent advances in textual criticism and the field of environmental science. A survey of some of the most notable of these works and their major arguments against decline, one that takes into account both the strengths and failings of such an approach, will allow us to understand the story of the North African landscape in more depth by placing it within a modern historiographical context.

Ideological Mechanisms of Empire

The great strength of the post-colonial critique of environmental decline in North Africa is the way it reveals the intersection of the mechanisms of European colonial empire with the history of environmental change in the Mediterranean. To be sure, those European empires which began to take over North Africa in the eighteenth and nineteenth centuries capitalized on the story of North Africa's decline. In Algeria, for instance, French colonial administrators "fashioned a justification and imperative for their colonial project" in restoring the glory of a fallen landscape. France used the need to reforest the landscape as an excuse for requisitioning vast amounts of land from Arab and Berber locals in a

short amount of time.¹⁸⁴ This reason was a perfect veil for more insidious motivations. Although French leaders and scholars maintained that “the forest...must always come above all else,” in reality France, like other budding European empires, needed cheap labor, wood, land for grain in response to famine, and land for profitable crops like tobacco and cotton.¹⁸⁵ And it is also true that many early environmental scholars, including George Perkins Marsh, Augustin Bernard, and Paul Boudy, were influenced by French colonial writing, so that environmental history, including where North Africa is concerned has never been entirely free from colonial agendas.¹⁸⁶

However, to characterize the entire idea that Rome despoiled a fertile North Africa—that there ever was a fertile North Africa—as a colonialist invention ignores a crucial detail of the construction of these colonial narratives of decline: they place the blame for decline on Arab nomads, rather than on the Roman Empire. Indeed, this is the central feature of these colonialist theories: a racially-charged obsession with the Arabs of the Maghrib as “destroyers” of the vitality of the landscape, and Europeans as those who can revitalize it. Prior to the colonial conquest, few European sources give any special importance to the eleventh-century surge of Arab nomads in North Africa.¹⁸⁷ But by the 1840s, authors like Professor L. Moll were ranting that the Arabs had torn apart Africa with a “destructive rage,” placed it under a “veil of desolation,” and deserved to “disappear as have disappeared the antediluvian animals” as a similarly backward and unfit race.¹⁸⁸ White Europeans would restore the landscape at the same time they brought European culture to the region, and thus civilization would “annihilate the Arab.”¹⁸⁹ Arab nomads were heavily contrasted with the more sedentary Kabyle Berbers, who were often praised as exemplars of proper land use. As politician Auguste Warnier remarked, “Where the land is desolate, without trees, one is in Arab territory; on the contrary, where there is beautiful cultivation,

¹⁸⁴ Davis, *Resurrecting the Granary of Rome*, 5-6.

¹⁸⁵ *Ibid*, 102, 47.

¹⁸⁶ *Ibid*, 76, 101, 140.

¹⁸⁷ *Ibid*, 23.

¹⁸⁸ *Ibid*, 39.

¹⁸⁹ *Ibid*, 61.

beautiful woods and forests, one is in Berber territory.”¹⁹⁰ As a source for these claims, European colonizers relied heavily on selective quotations from fourteenth-century Arab historian Ibn Khaldun to paint the influx of Arab nomads in the eleventh century as a plague of “locusts” who ruined gardens and cut down all the trees.”¹⁹¹ Such a racially and politically charged account of environmental decline is very different from a decline attributed to the Roman Empire at its height. For one thing, theories placing blame on the Arabs differ in historical setting by more than four hundred years at the very minimum.

Yet the two theories—that a fertile North Africa existed, and was destroyed by Roman presence, and that a fertile North Africa existed, and was destroyed by a nomadic Arab presence—are, surprisingly, often conflated in recent studies. This is particularly the case when authors decry the historical existence of any fertile North Africa whatsoever. O. Grove and A. T. Rackham, in their massive study of the Mediterranean environment, *The Nature of Mediterranean Europe: An Ecological History*, dismiss any theory that the landscape has changed in the Mediterranean as a manifestation of overblown, emotion-driven theory “characteristic of the Age of Enlightenment.”¹⁹² For them, it does not matter whether damage is said to have been done “by Ottoman Turks, Venetians, Arabs, Romans.” All theories of decline, and suggestions that decline can be addressed through deliberate action, are based on false premises that serve to “flatter the vanity of governments, who like to be told they can command even the very trees to grow or not grow.” It is also a colonial issue: Grove and Rackham note that the British “took over Cyprus in 1878 partly because they thought they knew better than the Cypriots how to manage the island.”¹⁹³ Brent Shaw, strangely, first dismisses the concept of a Granary of Rome a “myth” but shortly thereafter admits that it is a myth that is “partially true,” and that “North Africa was one of the major grain exporting regions that supported the urban populace of Italy

¹⁹⁰ Ibid, 97-98.

¹⁹¹ Ibid, 3

¹⁹² A. T. Grove, and O. Rackham, *The Nature of Mediterranean Europe: An Ecological History*, (New Haven and London, 2001,) 11.

¹⁹³ Ibid, 10.

and...Rome itself.”¹⁹⁴ Diana Davis briefly acknowledges that significant land degradation did occur under the Romans themselves—suggesting that there was at one point a fertile landscape to degrade.¹⁹⁵ But elsewhere she seems to treat this notion almost as an afterthought by stressing the colonial underpinnings of the theory of an “apparently highly fertile” Granary of Rome.¹⁹⁶ When she cites upon Lamb’s pollen core evidence for decline, she expresses doubt that old, dead tree stumps are traces of ancient forests because “what nearly all of the Maghreb data shows is that the significant changes in tree pollen took place thousands of years before present, and well before either of the ‘Arab invasions.’”¹⁹⁷ This assertion is quite true—but what Davis neglects to mention is that these major changes in pollen *do* take place during the height of the Roman period, as noted above.¹⁹⁸ Of course, Davis emphasizes the lack of Arab involvement, as destabilizing this colonial trope is the focus of her study. But speaking more broadly, throughout these recent works, we encounter the same problems again and again: a conspicuous failure to distinguish between different theories of decline and a tendency to dismiss them all equally as products of the colonial period. The distinction between the idea that Roman civilization caused a decline and that Arab nomadic tribes caused a decline is actually crucial for history and for a post-colonial understanding of North African ecology. The latter is rooted in nineteenth-century notions of race and colonial conquest, while the former demonstrates how a massive political force like the Roman Empire left a mark on the landscape in which it dwelt. To dismiss both out of hand is to ignore the powerful changes human actions can create in the natural world.

The Value of Literary Sources

¹⁹⁴ Brent D. Shaw, *Environment and Society in Roman North Africa*, (Aldershot, Hampshire: Variorum, 1995,) 389.

¹⁹⁵ Davis, *Resurrecting the Granary of Rome*, 5.

¹⁹⁶ *Ibid*, 5.

¹⁹⁷ *Ibid*, 10

¹⁹⁸ Lamb et al, “An 18,000-Year Record of Vegetation, Lake-Level and Climatic Change, 72.

There is also a tendency in these recent critiques to dismiss ancient literary sources, somewhat contemptuously, as too prone to error and foolishness to be useful for a study of environmental history. This position is faulty. Literary sources can be as helpful as archaeological sources, as we have seen. While the works of ancient authors require a closer, more careful reading than those of modern scholars to avoid spurious or peripheral information, this does not mean they are devoid of solid, reliable information. We have seen, above, some of the ways in which natural historians like Pliny question their sources for accuracy and express doubts about the reliability of fantastical tales.¹⁹⁹ This nuanced reading is a far cry from the idea that all these ancient authors did was pass along hearsay. Although Davis and others cast doubt on ancient sources like Pliny for writing about regions in North Africa “without ever having traveled to such locations themselves,” these authors very clearly understood the importance of eyewitness testimony.²⁰⁰ While Pliny’s use of Polybius and Suetonius Paulinus causes Davis to deemphasize the reliability of his account, that the natural historian can cite these two authors is part of what gives his assertions the ring of truth. By pointing the reader to the accounts of those who had actually visited the region, Pliny demonstrates an awareness of the need for compelling evidence, and grounds his argument in concrete experience, in a fashion similar to the way modern scholars use citation to point readers toward the sources on which they rely for their claims. In neither case does such deference make an argument weaker. At times it seems that Davis, who approaches ancient history from colonial history, and Grove and Rackham, who approach ancient history from environmental studies, appeal toward a popular stereotype of ancient authors as unsophisticated in their methods and thus unreliable. When understood within the context of their era’s techniques, however, it is clear that ancient geographers and authors relied on deliberate methods and recognized the importance of reliable data. The evidence they present must be considered and evaluated in light of archaeological and scientific sources. It cannot simply be brushed aside.

¹⁹⁹ Pliny, *Historia Naturalis*, 5.1.4.

²⁰⁰ Davis, *Resurrecting the Granary of Rome*, 17.

These, then, are the major weaknesses of the recent post-colonial critique of environmental decline: a poor fit with current evidence, a tendency to conflate different historical agents for decline, and a tendency to dismiss literary sources out of hand. The contemporary theory that significant decline never occurred in North Africa or even the Mediterranean is unlikely to supersede the long-standing theory that environmental decline has been a major factor in North African history anytime soon.

New Insights of the Post-Colonial Critique

This new critique can, however, teach us much. Not only do the studies of Davis, Grove and Rackham, and others reveal how environmental history has in the past been used as a tool to further the objectives of powerful nations, they also make clear some significant weaknesses of the traditional account. In particular, aided by recent insights in archaeological and historical analysis, we now recognize that the standard description of decline in some ways overrepresents the environmental danger of pastoralism, and may also mislead us about the nature of the forests at stake. A brief consideration of these revealed assumptions and flaws will help put environmental decline in the Roman period under clearer light.

Forests are one area in which further scrutiny is needed. In this study, we have discussed forests and the decline of forests in North Africa at some length. When we invoke the word “forest” in such a discussion, the image that tends to come to mind is of a dark, dense and crowded forest: a landscape clustered with thick trees very close together, presenting a formidable obstacle to any traveler. This is the image of a forest that is deeply familiar to those who have grown up under the European cultural tradition—the “mysterious woods” of popular folklore and fairy tale. However, recent scholars like Grove and Rackham, as well as others, have suggested that it may be a mistake to envision this kind of forest in North Africa, or even in the Mediterranean more generally. Rather, these critics argue, European scholars have been trained to look for the thicker forests which are more familiar in the

northern part of Europe and in “the dramatic wooded badlands of the Papal States,” and often overlook the sparser, more scattered forests of other parts of the Mediterranean like North Africa.²⁰¹ Should we revise our picture of North Africa’s forests? A substantial philological case can be made for such a reassessment. Within our literary sources, certain Greek and Latin words with a more complicated linguistic history are often translated into English simply as “forest.” Latin makes a distinction between the terms *saltus* and *silva*, which is notable in works like Pliny’s *Natural History*. *Silva* refers to a densely-packed wood in a more traditional European sense. But *saltus* generally refers to a looser forest in which trees are widely spaced. According to Lewis and Short, *saltus* is broad enough in meaning to encompass any uncultivated space that can be used for pasture in some way, and can be translated forest-pasture, woodland-pasture, mountain woodland, or even wooded ravine.²⁰² Pliny uses both at various points in his discussion of North Africa. When quoting Polybius’s description, the term Pliny uses is *saltus*.²⁰³ Elsewhere, though, including in his own description and his report from Suetonius Paulinus, the term used is *silva*, and “dense” *silva* at that.²⁰⁴ In Greek works such as those of Strabo, confusion arises from a single word, *hyle*. *Hyle*, in its most basic meaning, means plant matter, and it was adopted by philosophers to mean matter in a more abstract sense. In an environmental context it is extraordinarily vague, meaning anything from forest to copse, grove, brushwood, undergrowth, and firewood.²⁰⁵ Thus, in some cases, if not all, we may wish to revise our image of a North African forest, and see it more as a loose collection of trees than a dense and jungle-like growth. The Maghrib may not have had as extensive a green carpeting as we might like to imagine.

That said, there is not a strong case to be made, as Grove and Rackham argue, that the ancient Mediterranean was “not, after all, very different” from the modern Mediterranean, and ancient forested

²⁰¹ Grove and Rackham, *The Nature of Mediterranean Europe*, 8.

²⁰² Charlton T. Lewis, Charles Short, *A Latin Dictionary*, 1958 ed, s. v. “saltus,” “sylva.”

²⁰³ Pliny, *Historia Naturalis*, 5.1.2.

²⁰⁴ *Ibid*, 5.1.8, 5.1.9.

²⁰⁵ Henry George Liddell, Robert Scott, Henry Stuart Jones, and Roderick McKenzie, *A Greek-English Lexicon*, 1996 ed., s. v. “ὕλη.”

areas should be more properly understood as savannah.²⁰⁶ Not only does Pliny's use of *silva* in some passages suggest that there were definitely some very substantial forests, archaeological and literary sources dispute an extreme reduction of the size and mass of Mediterranean forests. Consider, for instance, Strabo's discussion of the "tables that are made of one single piece of wood," as well as Lamb's survey of pollen cores in Morocco.^{207 208} These sources suggest that we should not be quick to imagine all of North Africa's forests as illusory. Still, there is a case to be made for revising our estimate of the extent and nature of Mediterranean forests slightly, in recognition of the fact that northern European images of forests do may have caused a misapprehension of the forests of the Mediterranean.

The other major insight of the recent post-colonial critique is that environmental historians may have been overly unkind to pastoral cultures and their theoretically destructive animals. Recent research has suggested that grazing animals may actually be beneficial for the Mediterranean environment, and, if properly integrated into agriculture, can prevent fires and even aid in agricultural productivity.²⁰⁹ Some have argued that the ability of grazing animals to destroy the remnants of forests and thus augment environmental decline has been vastly overstated, particularly when poor subsistence herders are their masters, rather than larger, profitable flocks. As David Siddle puts it, "the main agent of environmental destruction seems rather to have been the search for profit rather than subsistence."²¹⁰ Siddle identifies a strong cultural tension throughout Mediterranean history that has biased environmental scholars against pastoralism, a division that emerges out of both ancient and modern class lines. For the very poorest in the Mediterranean world, the goat has long represented a "measure of subsistence security." For the wealthier members of society, however, pastoralism, especially goat-based pastoralism, has seemed a phenomenon of the periphery, associated with "danger, anarchy, fear,

²⁰⁶ Grove and Rackham, *The Nature of Mediterranean Europe*, 15, 190.

²⁰⁷ Strabo, *Geography* 17.3.1.

²⁰⁸ Lamb et al, "An 18,000-Year Record of Vegetation, Lake-Level and Climatic Change."

²⁰⁹ David Siddle, "Goats, Marginality, and the Dangerous Other," *Environment & History* Nov2 009, Vol. 15 Issue 4, p521.

²¹⁰ *Ibid*, 523-524.

and evil,” and these attitudes have carried through Christianity and into the modern day.²¹¹ This strain of thought is evident throughout ancient sources: consider the Cyclopes in the *Odyssey*, dangerous monsters who do not “mingle not with others,” but live apart, tending their goats and sheep, with “heart set on lawlessness.”²¹² It seems clear that this cultural fear of herding, what Siddle calls “goatism,” was a major factor in what led colonial Europeans to mistrust Arab pastoral nomads and blame them for environmental decline. Again and again we see the nomadic Arabs condemned as “wild tribesmen” who are “lazy” and “degraded by all the vices.”²¹³ As mentioned, the Arab nomads were often contrasted with the far more sedentary Berber tribes, who were set up as a shining example for them to follow, and it was hoped that the North African environment could be restored largely by “the progressive fixation of the natives to the soil.”²¹⁴ In fact, it is now understood that the Arabs’ pastoral practices were well adapted to cycles of drought, soil quality, and local plant ecology.²¹⁵ This combination of European racism, anti-Muslim biases, and anti-pastoralism sentiment is one of the ugliest legacies of the colonial period, and we have much to gain from challenging its hold on environmental history. Today, contemporary research is beginning to stress Arab nomadism as a possible source of replenishment after the intensive agricultural practices of the Romans, and it is thought that “conservation of Mediterranean landscapes...can only be ensured by continuation of the agro-pastoral functions under which these landscapes evolved.”²¹⁶ As Siddle notes in regards to Turkey, “forest and goat management existed side by side... for at least 500 years without any appreciable degradation.”²¹⁷ A new assessment, then, of herding cultures’ role in environmental change is needed, one that stresses that with proper management instead of ruthless economic exploitation, pastoralism

²¹¹ Ibid, 528.

²¹² Homer, *Odyssey* 9.187, trans. A.T. Murray, (Cambridge, MA., Harvard University Press; 1919.)

²¹³ Davis, *Resurrecting the Granary of Rome*, 42.

²¹⁴ Ibid, 52.

²¹⁵ Ibid, 30.

²¹⁶ Ibid, 5.

²¹⁷ Siddle, *Goats*, 523.

is a viable subsistence strategy that can exist alongside other forms of agriculture without damaging the natural environment.

The postcolonial critique of environmental decline thus both offers a new way of looking at the history of the North African environment and strengthens and clarifies the original theory of decline. While forests may not have originally been as massive and dense as some theorists once imagined, and while the role of herders and their animals may not have been as significant as thought in causing decline, on the whole, the notion of a long-term decline in the forests and soil quality of North Africa remains a compelling theory, backed up by evidence drawn from both archaeological and literary sources.

Reflections

Decline, in the end, offers a robust model of the difference between the North African landscape of today and the landscape we are familiar with in antiquity. An exploration of the major factors in environmental decline in ancient Mediterranean history, together with an understanding of how environmental ideas have been misused by colonial powers, accounts clearly for the degradation of the region: the greatest factor in North Africa's decline since the start of the Roman period was Rome itself. North Africa was once the green, verdant landscape described in the writings of ancient geographers, rich with a diversity of animals and vegetation. But centuries of exploitation by a powerful pan-Mediterranean empire took their toll. Forests shrank and faded away as generations of Roman citizens sought wood for construction projects, for fuel, and for ships of war. Many species of wild animals disappeared, overhunted for luxury products and for spectacular slaughter in Roman arenas; agriculture, as part of the great Roman commercial system, expanded into former forests and led to decreased soil quality; to some degree domesticated animal herds may have also contributed to a decline in vegetation. The climate shifted, sources of water vanished, and the landscape which had once

sustained a number of great Roman colonies was no longer able to support them. While many in the Roman world were aware that human actions could affect the environment, and spoke of the need to maintain a harmonious balance with nature, others disturbed that balance irreparably. Few intended to damage nature's long-term viability, but economic and other systemic factors gave Roman citizens reasons to concentrate on the short term, depleting the Empire's natural resources for warfare, for politically-minded shows of splendor, and for commercial success in a world in which large-scale enterprises were heavily rewarding. North Africa, where fertility and natural splendor seemed inexhaustible, was hit particularly hard relative to other regions. In the end, the Roman Empire lost the natural abundance North Africa once held by overestimating its resilience—by treating North Africa as an inexhaustible resource, the Empire ensured that resource would soon be exhausted for the many generations that followed.

Throughout the history of research on the North African environment, it is striking how rarely the Roman Empire has been implicated for this decline. One might think that Rome would be the most immediately identifiable suspect: as the earliest political and cultural force to establish itself on a massive scale, it was perfectly positioned to cause large-scale changes to the territory under its domain. Yet in the works of environmental scholars the tendency has been to assign blame to some other entity, such as the wave of Arab nomads that swept into North Africa during the Middle Ages in the writings of so many colonial-era European scholars, or to attempt to ignore the issue altogether, as do Grove and Rackham. Only recently have scholars begun to address Rome directly and unambiguously as a source of these changes.²¹⁸

Why have so many authors, for so long, insisted on shifting the blame? One possibility is that acknowledging the Roman Empire's failure to maintain the landscape in its possession clashes with later European culture's tendency to idealize the Empire as a shining, perfect civilization which all others

²¹⁸ Bruno Messerli and Matthias Winiger, "Climate, Environmental Change, and Resources of the African Mountains from the Mediterranean to the Equator," *Mountain Research and Development* 12 no. 4 (1992.)

should strive to emulate. Renaissance and later scholarship, in particular, has often depicted Rome as a temporary, bright light against the so-called darkness of prehistory and the darkness of the Middle Ages. This improbable image has led many to declare all of Rome's institutions and practices perfect and laudable, from its political structure to its agricultural practices. It would be incongruous, given broad laudation of Roman tradition, if the Empire's own presence caused the loss of agricultural fertility in North Africa. Far better to blame a society with very different land-use practices, such as the nomadic Arab tribes, than to imply that Rome's practices were in some way out of balance.

Yet Romans also failed—and in terms as grand as the Empire's scope. Even as Rome exerted powerful influence across a large swath of territory and had lasting effects for world history, does not mean that it was perfect or even necessarily admirable, as it connected diverse societies through industry and trade as never before, it wrought devastating environmental change through the complexity and extent of its political conflicts and the sophistication of its technology. Recognizing the ways in which Roman practices degraded the ancient world, is a cautionary step toward identifying the ways modern practices are linked to environmental decline in our own world.

Indeed, environmental decline in the Roman period can best be understood as part of a large pattern of environmental change throughout world history. Many changes in North Africa have occurred relatively recently. As Shaw notes, much of the forest cover in Algiers was lost during the wars of 1871-1872, and perhaps "the greatest proportion of the loss of North Africa's forests took place within the last century, primarily in the half-century between 1890 and 1940."²¹⁹ For all their passionate invective about the sanctity of the Maghrib's landscape, European colonizers, seeking lumber, proved capable of destroying some 1,000,000 hectares of forest in Algeria alone—perhaps revealing the true motivation at work in their efforts to wrest control from the Arabs.²²⁰ Today, the story continues, as further decline looms as a distinct possibility as the nations of the Maghrib endeavor to establish a presence in a world

²¹⁹ Brent D. Shaw, *Environment and Society in Roman North Africa*, (Aldershot, Hampshire: Variorum, 1995,)392.

²²⁰ *Ibid*, 393.

where industrial wealth is a major source of power. Contemporary environmental changes dwarf many of the changes of antiquity.

A long view of the North African landscape obviates historians' representation of environmental decline in the Mediterranean Basin as strictly a phenomenon of the last few hundred years, created by industrial technologies like steam, electricity, plastic and steel. Rome's role in North Africa tells a different story. It shows us that decline is not limited to the modern world. Pollution, deforestation, and soil loss have existed since long before the invention of smog-generating factories. The difference between now and then is primarily of scale—the extent of the damage human society is able to cause in a given period of time. Some have seen Roman decline as part of a larger picture, dating back to Mesopotamia and the Fertile Crescent, in which succeeding civilizations of human beings have steadily used up the landscape around them and been forced to seek new climes—a story that stretches through Carthage, Rome, and beyond.²²¹ The same problem confronts all civilizations: the danger of over-exploiting our resources and leaving ourselves with nothing. J. D. Hughes has argued that Rome's misuse of its resources may have been a major factor in its political and cultural decline.²²² More than anything else, the story of Rome and North Africa demonstrates that human beings have always had the power to reshape the landscape in significant ways—even without understanding the full consequences of their actions.

Many gaps remain in the historiography of the North African environment. Environmental and archaeological sources only take us so far. Many literary sources offer vague and uncertain information, while many individual archaeological digs reveal only their section of space and time. Further research will perhaps identify new sources and fit known texts and archaeological evidence together in new ways. Both the environmental history of the Mediterranean and the history of North Africa need far more scholarly attention than has yet addressed the. Practical problems, such the difficulty of conducting

²²¹ Jared Diamond, *Guns, Germs, and Steel: the Fates of Human Societies*, (New York: Norton, 1997,) 413.

²²² Hughes, *Pan's Travail*, 181.

archaeological studies in certain regions, exacerbate scholarly biases in defining civilization. Classical scholars have understudied North Africa in part because, as a predominantly Muslim region, it does not fit neatly into traditional Western European thought. Yet the region's historical importance in classical antiquity and the Middle Ages cannot be ignored. Addressing this blind spot will be one of the most important challenges of a study of North African history in a global context.

Fresh understanding of environmental history must be founded in an awareness of colonial ideology, inequality, and social injustice. As post-colonial critics have shown in the case of North Africa, for too long environmental history has been used as a tool of the powerful rather than as an instrument of scholarly inquiry. To avoid falling into the same ideological traps as colonial writers, who assumed that a certain kind of land use marked civilization while another kind could be treated as peripheral and irrelevant will be useful here. As William Cronon notes, in discussing how idealizations of nature have had negative effects for Native Americans in recent times, wilderness "is entirely a creation of the culture it holds dear, a product of the history it seeks to deny."²²³ Environmental history and human cultural history cannot be easily separated, for each shapes the other. The two disciplines of environmental history and post-colonial research must be united so that the perspectives of those who inhabit a region like North Africa are not drowned out under the voices of those who think they know the environment best. Ancient North Africa still has much to teach a modern world.

²²³ William Cronon, "The Trouble With Wilderness, or, Getting Back to the Wrong Nature," *Environmental History* (1996) 1 (1): 7-28.

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