THE NATURAL ENVIRONMENT OF CENTRAL MOAB

by
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Introduction

In conjunction with the publication of the preliminary reports of Emory University's "Archaeological Survey of Central Moab,"[1] the writer feels that it would be very useful to describe this same region's natural setting. In spite of evidence to the contrary, widespread misunderstanding exists with regard to the environment of Transjordan's plateau, many people still thinking of this area as desolate and climatically inhospitable. Hopefully, this essay can contribute toward a better understanding of the actual, present-day conditions that surround Moab's ancient settlements. Once this preparatory task has been accomplished, it is the responsibility of the archaeologists to discover the ecological contexts of individual sites within specific periods of time.

Such an emphasis on environmental setting is necessary for a more thorough understanding of a given region's economic and social developments. Indeed, interest in the environmental contexts of ancient cultures is one of the most pervasive features of contemporary archaeological research.[2] Clarke suggests that the current archaeological scene may be described by reference to its morphological, anthropological, ecological, and geographical paradigms. Of these four models, the ecological approach has become closely associated with the present emphasis on the use of systems thinking in the formulation of archaeological theory.[3] Of course, a discussion of the systems approach is beyond the scope of this article. An acknowledgement of the significance of environmental data in today's archaeology does point to the value of the following description of Central Moab's geographical setting, geology and topography, soils, climate, water resources, and flora.

Geographical Setting

When examining the geographical situation of even a small section of the Levant, such as Central Moab, it is necessary to identify the geopolitical relationships that prevailed in ancient times. If, however, the region under investigation is virtually unmentioned in ancient literature, as is the case with Central Moab, and if one desires to give more attention to the internal economic and social developments of this area, it becomes even more crucial to focus attention upon the various aspects of the natural environment. Since geography determines environmental conditions, as well as influencing cultural relationships, the geographical situation of the central Moabite plateau is understood as the fundamental dimension of its ecological setting.

The Position of Central Moab in the Levant

For the purpose of geographical study, the Levant is customarily divided into four north-south zones: (1) the coastal plain, (2) the western highlands, (3) the Jordan rift, and (4) the eastern plateau. The latter zone is often called "Transjordan." These four north-south Levantine

[1] J. Maxwell Miller, Archaeological Survey of Central Moab: 1978, *BASOR,* 234 (1979), p. 43-52; *idem.,* Archaeological Survey South of Wadi Mujib: Sites Revisited, *ADAJ,* 23 (1979), p. 79-92; *idem.,* Renewed Interest in Ancient Moab, *Perspectives in Religious Studies,* 8 (1981), p. 219-229; James R. Kautz, Tracking the Ancient Moabites, *BA,* 44 (1981), p. 27-35.

[2] Gordon R. Willey and Jeremy A. Sabloff, *A History of American Archaeology,* London, p. 151-156, 189-191.

[3] David L. Clarke, Models and Paradigms in Contemporary Archaeology, p. 1-60 in David L. Clarke (ed.), *Models in Archaeology,* London, 1972; *idem., Analytical Archaeology,* London, 1968.

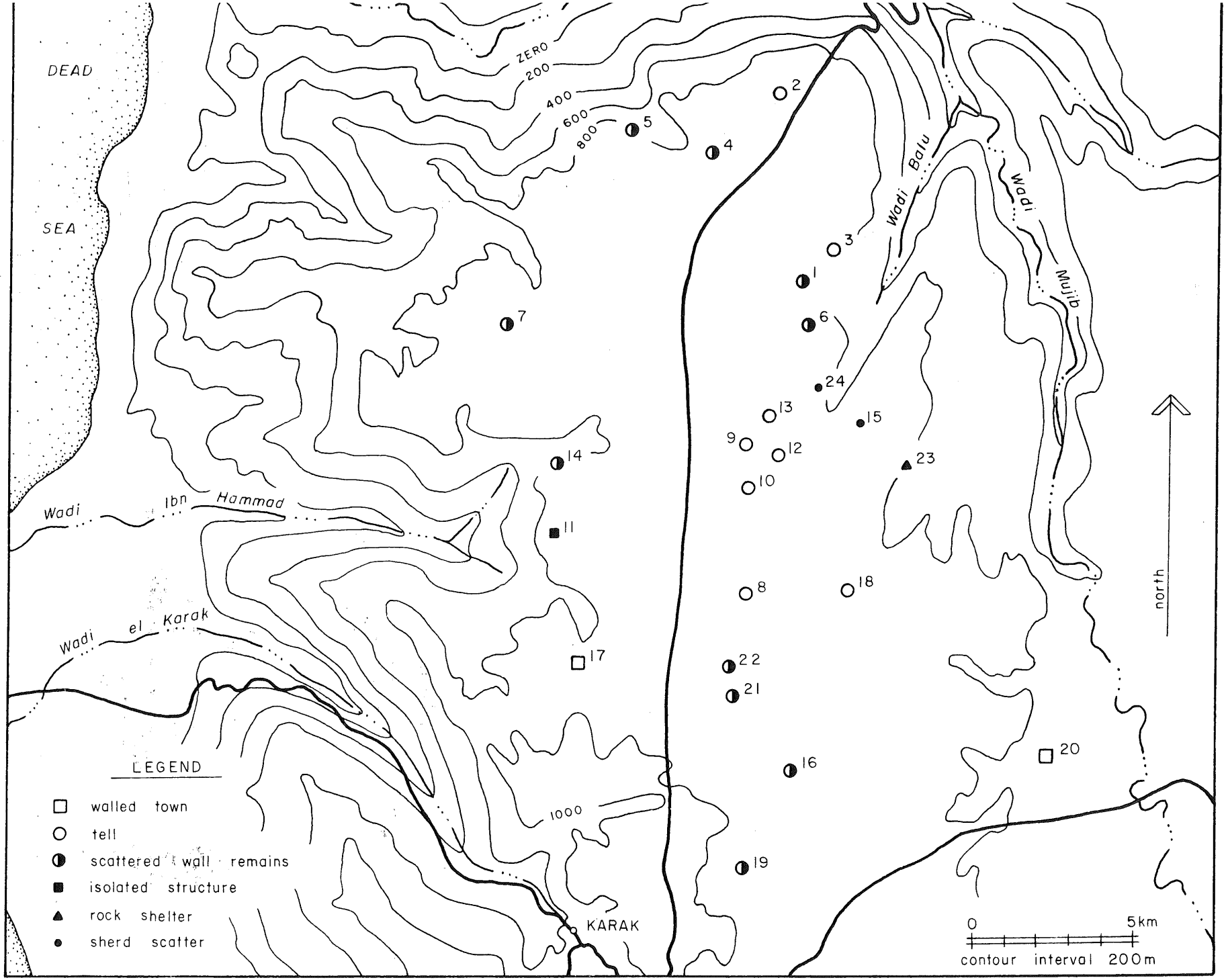

Fig. 1: EBA Sites in Central Moab

zones are interrupted by four west-east depressions or "zones of structural weakness": (1) the Aleppo-Euphrates depression, (2) the Homs-Palmyra corridor, (3) the Galilee-Bashan depression, and (4) the Beersheba-Zered depression.[4] The Moabite plateau is situated immediately to the north of the latter depression.

Between these four west-east depressions are found four "realms," geographical subdivisions that have produced a variety of lifestyles. Each of these realms is found on both sides of the Jordan; this "dual quality" results in eight different regions. The four major realms are: (1) the Northern realm, (2) the Syro-Phoenician realm, (3) the Palestinian realm, and (4) the realm of the Southland. The third region, the Palestinian, is subdivided into the Cisjordan hills and valleys and the tableland of Transjordan.[5] The latter of these two realms encompasses the plateau of Moab. Thus, the territory of Central Moab is located on the eastern plateau of the Levant, north of the Beersheba-Zered depression, on the Transjordanian tableland of the Palestinian realm.

The Boundaries of Central Moab

The region of Moab itself has been subdivided in at least two ways. Aharoni recognizes only two divisions: "Like the two halves of Gilead divided by the Jabbok, there are also two parts of Moab, divided by the deep river bed of the Arnon, which becomes near the Dead Sea one of the largest and most impressive ravines of Palestine."[6] While agreeing with Aharoni on the role of the Arnon, or Wadi el-Mujib, as an effective boundary, Miller and Pinkerton, directors of the Archaeological Survey of Central Moab, recognize the existence of three regions within ancient Moab: (1) Northern Moab is the territory north of Wadi el-Mujib; (2) Central Moab is the area on the plateau between Wadi el-Mujib and the Kerak-Qatrana road; and (3) Southern Moab is the section of the plateau that is located between the Kerak-Qatrana road and Wadi el-Hasa. These last two divisions, the central and southern zones of the Moabite plateau are not identified in an arbitrary manner, i.e., such divisions have not been made for the convenience of dividing the plateau into manageable units for different seasons of the survey. While the road that connects Kerak and Qatrana does not represent an obvious natural boundary, Wadi el-Kerak cuts deeply into the western half of the plateau near this line. Moreover, Southern Moab, the territory south of the highway, exhibits a sharp rise in elevation until it reaches Wadi el-Hesa, a phenomenon which demarcates the central portion of the plateau from its southern counterpart.[7] A more precise delineation of the boundaries of Central Moab, as defined by Miller and Pinkerton, will further clarify the environmental conditions of this section of the Transjordanian tableland.

Central Moab's northern boundary is Wadi el-Mujib, the most important river flowing into the Dead Sea from the east.[8] The significance of this perennial stream was recognized by Musil, who describes Moab as "das zum Wassergebiet des Arnon-el-Mogib gehorige Hochland am Ostufer des Toten Meeres."[9] While Van Zyl questions this statement in terms of the Mujib's role in the whole region of Moab,[10] it is certainly true that a large part of Central Moab is drained *and* watered by this wadi and its many tributaries.

Although his estimates of the Mujib's width and depth were low, Smith was quite correct in his description of Wadi el-Mujib as an enormous trench that cuts across the

[4] Denis Baly, *The Geography of the Bible,* New and Revised Edition, New York, 1974, p. 8-9.

[5] *Ibid.,* p. 9-14.

[6] Yohanan Aharoni, *The Land of the Bible: A Historical Geography,* Translated by A. F. Rainey, Philadelphia, 1967, p. 36. Becaue of its important role in the history of Israel, Aharoni gives more attention to the *Mishor,* the plain of Moab that is located on the northern side of the Mujib. Aharoni properly observed that little is known about the cities and villages of the southern part of Moab, but he referred to this region as the "nucleus of Moab."

[7] Baly, *Geography,* p. 32, 230; Friedrich Bender, *Geology of Jordan,* Berlin, 1974, p. 9.

[8] A. H. Van Zyl, *The Moabites,* Leiden, 1960, p. 56.

[9] Alois Musil, *Arabia Petraea,* Vol. 1, Vienna, 1907, p. 1.

[10]. Van Zyl, Moabites, p. 46.

Moabite plateau.[11] The Mujib originates in the vicinity of Lejjun; from that point the stream flows north-northwest for *ca.* 24 kms., and then it courses an equal distance to the west, finally discharging its water into the Dead Sea.[12] Wadi el-Mujib's headwaters are passable, but its west-east ravine presents a formidable barrier; the rims of the canyon are up to 4.8 kms. apart, while the wadi has cut a bed up to 750 m. deep.[13] Thus, Wadi el-Mujib was an effective border during much of Transjordan's history, but the canyon did not lead to the development of wholly distinct cultures on its two sides.

The Moabite plateau extends for *ca.* 30-50 kms. to the east of the Dead Sea,[14] but the Central Moab Survey recognized the north-south canyon of the Mujib and its headwaters as the eastern boundary of reconnaissance. Historically, Moab did not exceed this eastern end of the fertile plateau,[15] although the edge of the eastern desert does not actually begin for some distance beyond the eastern limit of the current survey. The land beyond the Mujib soon becomes too dry for sedentary occupation, but the merging of the desert with the diminished plateau occurs in a gradual zone of transition.[16] Members of the Central *Limes Arabicus* Project are currently surveying the plateau beyond the north-south branch of the Mujib, and the publication of this survey will produce a clearer picture of settlement in this area.

As was mentioned above, the southern boundary of Central Moab, the Kerak-Qatrana road, is not as obvious as other boundaries in this region. Nevertheless, the highway does separate two somewhat different geographical zones. The Miller-Pinkerton team worked in Central Moab during the summers of 1978 and 1979, and the survey will continue to the south of the Kerak-Qatrana road during the 1982 season. Following this third and final season of fieldwork, the heart of the Moabite plateau, stretching from Wadi el-Mujib to Wadi el-Hesa, will have been covered. The latter wadi, while not as spectacular in appearance as the Mujib, also served as an imposing geopolitical boundary in antiquity, the dividing line between Moab and Edom.

The Jordan rift forms the western limit of the central Moabite plateau; the escarpment has produced cultural, historical, and environmental consequences for the ancient and modern inhabitants of this region. The plateau stands over 1,300 m. above the Dead Sea, and Wadi el-Mujib and Wadi el-Kerak have cut deep chasms out of the high, western face of the escarpment. Although this western boundary is sharply delineated, even these steep cliffs have not precluded the possibility of contact with peoples to the west of the plateau.

Geology and Topography

The plateau of Moab rises abruptly from the coast of the Dead Sea. This highland is the southern continuation of the Anti-Lebanon range, and the plateau represents a genuine mountain tableland.[17] The western escarpment of Transjordan rises between 610 m. and 1,067 m. above sea level, or 1,067 m. to 1,524 m. above the floor of the Jordan Valley.[18]

An interesting geomorphology is displayed by the highlands on the eastern rim of the Wadi Arabah-Jordan Graben. While the plateau slopes gently downward towards Jordan's eastern desert, the western ascents to the top of the plateau are quite steep. For example, in the area to the south of Kerak, the elevation of the plateau descends from 1,305 m. above sea level (Jebel Dabab) to 392 m. below sea

[11] George Adam Smith, *The Historical Geography of the Holy Land,* 25th ed., London, 1966, p. 377.

[12] E. D. Grohman, "Arnon," *IDB,* Vol. 1, New York, 1962, p. 230.

[13]. 1[3] Baly, *Geography,* p. 231; F.-M. Abel, *Geographie de la Palestine,* Vol. 1, Paris, 1933, p. 156, 177, 487-489.

[14] Efraim Orni and Elisha Efrat, *Geography of Israel, .3rd revised edition, Jerusalem, 1971, p. 110.*

[15] *Van Zyl, Moabites,* p. 48.

[16] Aharoni, *Land of the Bible,* p. 33; E. D. Grohman, Moab, *IDB,* Vol. 3, New York, 1962, p. 410-411; Orni and Efrat, *Geography, of Israel, p. 106, 110; Smith Historical Geography,* p. 338.

[17] Van Zyl, *Moabites,* p. 51; Aharoni, *Land of the Bible,* p. 33.

[18] Paul G. Philips, *The Hashemite Kingdom of Jordan: Prolegomena to a Technical Assistance Program;* Chicago, 1954, p. 36.

level (the level of the Dead Sea). This frightening descent occurs within a distance of only 13 kms.[19]

The Moabite plateau gradually rises in elevation as it stretches southward from Wadi el-Mujib. Even the uplifted, western rim of the plateau reaches its highest point in the southern part of Jordan, west of Ma'an.[20] Otherwise, the surface of the tableland in Central Moab presents a gently rolling, unbroken skyline; only Jebel Shihan, an extinct volcano, stands out from the level plain.[21]

Transjordan was uplifted after the Mesozoic; this movement came at the same time that the Jordan rift was formed. This geological uplift was strongest on the western rim of the plateau.[22] The entire "Transjordanian block" is tilted upward from the limestone plateau in the east towards the west, and the block culminates along the intensively disturbed "arched rim of the Graben."[23]

The tableland of Moab is built of layers of Cenomanian and Senonian limestone, with hard Nubian sandstone below. Such non-porous layers of hard sandstone explain the presence of the numerous perennial rivers in Transjordan. These ancient rocks, particularly the Nubian sandstones, are broadly exposed on the western escarpment of Moab and on the sides of the deep gorges. The extinct crater of Shihan and the warm springs in the Dead Sea Valley bear testimony to ancient volcanic activity in this region.[24]

Soils

The soils of the Middle East have suffered severely at the hand of man since pre-Neolithic times.[25] Nevertheless, the exploitation and erosion have left the soils of Moab in relatively fertile condition. Since Transjordan borders the desert, it is natural to find loess soil in Moab, but there have been additional soil-producing agents at work in this region.[26]

During the geological history of the Levant, Cisjordan was frequently covered by the waters of Tethys, the great ancestor of the Mediterranean Sea. Thus, the rocks of Palestine were formed by marine deposition; this produced the limestone and chalk covering of Palestine. Transjordan was less frequently submerged in this primeval sea, and the marine deposits to the east of the Jordan rift are much thinner. The desert sandstones, which were formed on dry land, are more common in Transjordan, especially in the highlands of the south.[27]

Although the Transjordanian limestones rest upon thick deposits of Nubian sandstone, the geological processes have still produced a type of Mediterranean soil in Moab. The rich, deep red soils, the typical Mediterranean *terra rossa,* are produced by the weathering of hard limestones.[28] The soils of the Transjordanian plateau have been given the hybrid designation "sub-Mediterranean-chestnut-brown terra rosa."[29] Transjordan's Senonian chalk is usually soft, less fertile, and useless for building, but some of these Senonian deposits have formed into harder chert.[30]

Since the Mediterranean soil is porous, it absorbs the winter rains, and the grain is able to extract moisture in the summer months.[31] The red soils, when located in relatively flat areas, are suitable

[19] Baly, *Geography,* p. 29, 233-234; Bender, *Geology,* p. 9; Orni and Efrat, *Geography of Israel,* p. 106.

[20] Bender, *Geology,* pp. 9, 23.

[21] Baly, *Geography,* p. 31.

[22] *Ibid.,* pp. 17- 22-26; Orni and Efrat, *Geography of Israel,* p. 106.

[23] Bender, *Geology,* p. 23.

[24] Aharoni, *Land of the Bible,* pp. 11-13, 33, 36; Baly, *Geography,* pp. 16, 19-20; Orni and Efrat, *Geography of Israel,* pp. 110-111; Smith, *Historical Geography,* p. 371.

[25] Karl W. Butzer, Physical Conditions in Eastern Europe, Western Asia and Egypt Before the period of Agricultural and Urban Settlement, p. 35 in I. E. S. Edwards, C. J. Gadd and N. G. L. Hammond (eds.), *CAH,* 3rd ed., Vol. 1, Part 1, Cambridge, 1970.

[26] Baly, *Geography,* pp. 77-79; Smith, *Historical Geography,* p. 336; M. Zohary, Ecological Studies in the Vegetation of the Near Eastern Deserts, I: Environments and Vegetation Classes, *IEJ,* 2 (1952), p. 205; Van Zyl, *Moabites,* p. 53.

[27] Baly, *Geography,* p. 16.

[28] Aharoni, *Land of the Bible,* p. 11; Baly, *Geography,* p. 79; Bender, *Geology,* pp. 187-189.

[29] Phillips, *Hashemite Kingdom of Jordan,* p. 47.

[30] Aharoni, *Land of the Bible,* p. 11; Baly, *Geography,* pp. 22, 255.

[31] Baly, *Geography,* p. 21-22.

for the cultivation of cereals, tomatoes, melons, tobacco, and many other crops. The less fertile yellow soils are found in narrow regions on both sides of the rift, and this soil is suited for cereal production with dry-farming methods. If irrigation were developed, more intensive cultivation could be undertaken in these less fertile areas.[32]

Climate

The vast majority of the Middle East displays a typical Mediterranean climate with an annual rhythm of summer drought and winter rain.[33] A Mediterranean climate dominates the highlands on both sides of the Jordan, including the plateau of Moab.[34] This type of climate may be described as having a relatively uniform annual temperature sequence, mild and wet winters, hot and dry summers, and a reversed annual temperature and rainfall curve.[35] The Palestinian region has only two major seasons; a dry summer lasts from mid-June until mid-September, and a rainy season prevails in the cooler half of the year.[36]

Baly offers six rules that explain the differences in the climatic zones of Palestine: (1) rainfall tends to *decrease* as one moves from north to south; (2) rainfall tends to *decrease* as one moves from west to east, i.e., away from the sea; (3) rainfall *increases* on the seaward slopes of hills and mountains; (4) rainfall *decreases* sharply on the eastern slopes; (5) temperature tends to *decrease* with an increased elevation; and (6) *range* in temperature tends to *increase* with distance from the sea and decrease in rainfall.[37] These factors facilitate a better understanding of Moab's wind, rainfall, and temperature patterns.

The Role of Wind in Central Moab's Climate

The Transjordanian plateau is characterized by a relatively high movement of winds. Dry, westerly winds prevail from April through October, the summer months. The sea breeze overflows the plateau edge about 3:00 p.m. in the summer, but this is too late in the day to moderate the daily temperature.[38]

Winds are predominantly from the southwest from November until March; this southwesterly wind brings the winter rains to the plateau. Easterly winds are common in the winter months; these icy desert winds bring cold temperatures as they sweep undisturbed across the high tableland.[39]

The hot, dust-laden winds *(sirocco* or *Khamsin)* arrive in the spring to burn up the green landscape; these scorching winds often reappear in the fall. The active winds, high temperature, and relatively low level of humidity combine to produce a high rate of evaporation in Jordan.[40]

Rainfall in Central Moab

Rainfall in the Middle East is largely determined by physiography and the disposition of land and sea in relation to the winter, rain-bearing wind. The topographic incline of Moab's western escarpment arrests and cools the atmosphere on the edge of the plateau, and this produces an abundant rainfall on the plateau.[41] While the western slope of

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[32] Bender, *Geology,* p. 187-189.

[33] W. B. Fisher, *The Middle East: A Physical, Social and Regional Geography,* 6th ed., London, 1971, p. 65. Baly, *Geography,* p. 43-55, includes a full discussion of the major factors that determine the climatological patterns in the eastern Mediterranean.

[34] Orni amd Efrat, *Geography of Israel,* p. 106, suggest that Transjordan is a geological and climatological continuation of its counterpart on the western side of the Jordan rift.

[35] Phillips, *Hashemite Kingdom of Jordan,* p. 37-38.

[36] Baly, *Geography,* p. 43. Phillips, *Hashemite Kingdom of Jordan,* p. 45-46, simply suggests that Transjordan has a humid winter and an arid summer.

[37] Baly, *Geography,* p. 54.

[38] *Ibid.,* p. 46, 60; Bender, *Geology,* p. 15; Phillips, *Hashemite Kingdom of Jordan,* p. 39, 45-46.

[39] Aharoni, *Land of the Bible,* p. 33; Baly, *Geography,* pp. 47-49; Bender, *Geology,* p. 15; Phillips, *Hashemite Kingdom of Jordan,* p. 39.

[40] Aharoni, *Land of the Bible,* p. 33; Baly, *Geography,* p. 52-53; Bender, *Geology,* p. 15; Phillips, *Hashemite Kingdom of Jordan,* p. 39, 42-46.

[41] Aharoni, *Land of the Bible,* p. 33; Fisher, *Middle East,* p. 66; Phillips, Hashemite Kingdom of Jordan, p. 40.

the highlands and the tableland itself do not experience a scarcity of rain in the winter months, the eastern depression and desert fringe do not receive enough precipitation to allow cultivation. Of course, this transitional zone fluctuates with the climate and the technological capability of man.[42]

An extreme concentration of rainfall within a few months of the year is charactristic of most of the Middle East.[43] The country of Jordan is dominated by a winter rainfall regime.[44] The rainy season begins in the latter half of October and lasts until early May; January, February, and March are Transjordan's wettest months. Indeed, Orni and Efrat point out that this area often receives 50 percent of its annual rainfall in the month of February. The months of June, July, August, and September are completely dry, and the first part of October and the latter part of May are normally dry.[45]

The inhabitants of the central Moabite plateau can usually expect to receive between 200 mm. to 400 mm. of rainfall per year,[46] but there is a wide range of variation from year to year. The average annual rainfall at Kerak from 1937/1938 to 1973/1974 was 360.7 mm., and the rainfall range for these thirty-seven seasons was 101.9 mm. to 661 mm.[47] Kerak has fifteen days out of the year with only a trace of precipitation (i.e., 1 mm. or more) in a dry year, but a favorable year will have fifty-four days of precipitation.[48]

Frontal rains are the principal source of moisture for agriculture on the plateau. Moab has five or six months of rainfall in the growing season, and this is sufficient to allow a fairly productive season of rainfall-dependent farming.[49]

Temperature in Central Moab

The elevation of the Moabite plateau results in a temperate climate; the tableland stands above the almost tropic heat that surrounds it to the west and south. Relatively cool to moderate temperatures prevail in the region, with the annual temperature isotherm on the plateau ranging between 11°C and 17°C. The coldest weather comes in January and February, and snow may appear in the highlands at this time of year. Moab's winter is colder than Cisjordan's because of the plateau's height, distance from the Mediterranean, and exposure to icy, desert winds. There are still generally nine or ten frost-free months in Jordan's growing season.[50]

Water Resources

The supply of water is the transcending limiting occupance element in Jordan. Life seems to exist at the upper level of the water supply. When the supply increases, as in a season of favorable rainfall, life expands and living conditions are correspondingly better; conversely, when the supply of water is reduced, and in places where sufficient water is not available, life is blighted and suppressed. Community locations are associated with water, and other considerations are subordinated...[51]

While these observations would certainly hold true for ancient setlements on the plateau, even modern pumping facilities have not eliminated the vital connections between water sources and communities. Glueck and the participants in the Central Moab Survey discovered again and again that modern villages are built on

[42] Fisher, *Middle East,* p. 93; Phillips, *Hashemite Kingdom of Jordan,* p. 141; Kay Prag, The Intermediate Early Bronze-Middle Bronze Age: An Interpretation of the Evidence from Transjordan, Syria, and Lebanon, *Levant,* 6 (1974) p. 72; Van Zyl, *Moabites,* p. 48-49, 54.

[43] Baly, *Geography,* p. 48.

[44] Jack R. Harlan, Natural Resources of the Southern Ghor, *AASOR,* 46 (1981) p. 155.

[45] Orni and Efrat, *Geography of Israel,* p. 146; Phillips, *Hashemite Kingdom of Jordan,* p. 42.

[46] Bender, *Geology,* p. 10; Orni and Efrat, *Geography of Israel,* p. 137.

[47] Harlan, Natural Resources, p. 155-156.

[48] Phillips, *Hashemite Kingdom of Jordan,* p. 42.

[49] *Ibid.,* pp. 40, 45-46.

[50] Baly, *Geography,* p. 60; Orni and Efrat, *Geography of Israel,* p. 145; Phillips, *Hashemite Kingdom of Jordan,* p. 45-46; Smith, *Historical Geography,* p. 335-336.

[51] Phillips, *Hashemite Kingdom of Jordan,* p. 54, 56.

or near the ruins of ancient sites. Since water is still a major factor in sedentarization, this tendency to resettle in proven locations is to be expected.

Because of a generally deficient rainfall, Middle Eastern hydrography is discussed in terms of topography and geological structure in the formation of river systems.[52] Although Central Moab receives rain in relative abundance, the contours of the plateau and its karstic limestone composition determine the availability of water. Along with the Palestinian hills to the west of the Jordan River, the Transjordanian highlands are a major water-producing region.[53] The western side of Central Moab receives rainfall in large amounts, but much of the water is quickly drained off the tableland by numerous, deeply-eroded scarp streams.[54] In addition to the many *awdiyah* (wadis) flowing to the west, the upper tributaries of the Wadi el-Mujib drain the eastern side of the plateau. Harlan notes that "heavy rains in the highlands commonly cause flash floods; walls of water come crashing down through the canyons rolling boulders and cutting away the banks."[55] A large amount of Central Moab's rainfall percolates readily into the porous limestone; once this seeping water reaches deeper, watertight strata, it flows horizontally until the water appears in the springs on the western slopes of the plateau.[56] A few springs appear on the top of the plateau, and many water sources are found in the wadis that dissect Moab. Although the Mujib is a perennial stream, the distance from the top of the plateau to the floor of the wadi tends to increase the importance of the springs and water storage systems on the escarpment itself. Thus, the plateau's rapid drainage and deep water table emphasize the crucial role of the winter rains in the feeding of springs.[57]

Flora

Three major factors determine the composition and density of the plant cover in this part of the Levant: (1) the position of the country at a crossroads of the Middle East, (2) the Mediterranean climate and the "border of aridity," and (3) the activity of man.[58] While the first two factors actually determine the potential vegetation in this region, the third factor, the impact of man, has profoundly *changed* the vegetational landscape of Palestine and Transjordan.[59] Indeed, the flora of the southern Jordan highlands has been severely degraded. Harlan states that "under present population pressures, degradation is extreme."[60] Deforestation and overgrazing have produced areas that are virtually devoid of plant cover, and the natural vegetation has been largely replaced by farming crops. Erosion has played an enormous role in the transformation of the plant landscape in Central Moab.[61]

Palestine and Transjordan are situated at the junction of three of the world's major vegetation regions: (1) Mediterranean, (2) Irano-Turanian, and (3) Saharo-Sindian.[62] Moab is located in the Mediterranean and Irano-Turanian

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[52] Fisher, *Middle East,* p. 32.

[53] Phillips, *Hashemite Kingdom of Jordan,* p. 56-57.

[54] Baly, *Geography,* p. 211-212, points out that these scarp streams were assisted in their formation by lines of structural weakness on the plateau's western edge. This allowed these *awdiyah* (wadis) to cut farther back into the plateau, and even more of the ravines drained in the direction of the Dead Sea.

[55] Harlan, *Natural Resources,* p. 156.

[56] Aharoni, *Land of the Bible,* p. 11; Phillips, *Hashemite Kingdom of Jordan,* p. 57; Smith, *Historical Geography,* p. 70-72; Van Zyl, *Moabites,* p. 54.

[57] Richard T. Antoun, *Arab Village: A Social Structural Study of a Transjordanian Peasant Community,* Bloomington, 1972, p. 5.

[58] Orni and Efrat, *Geography of Israel,* p. 164.

[59] Butzer, Physical Conditions, p. 35; Orni and Efrat, *Geography of Israel,* p. 166; Phillips, *Hashemite Kingdom of Jordan,* p. 52.

[60] Harlan, Natural Resources, p. 163.

[61] Baly, *Geography,* pp. 24, 52, 77, 115-117; Orni and Efrat, *Geography of Israel,* p. 176; Phillips, *Hashemite Kingdom of Jordan,* p. 53-54, 138.

[62] Kamel S. Abu Jaber, Jordan, *Encyclopaedia Britannica* Vol. 10 (1974) p. 270.

phytogeographical zones, and the majority of Central Moab falls within the Mediterranean zone. The latter zone normally receives an annual precipitation of 350 mm. or more, and such Mediterranean regions usually contain Aleppo pine, deciduous Tabor oak, evergreen Mediterranean oak, styrax, terebinth, carob, and pistachia. A few areas within Jordan still have specimens of these trees, but the overwhelming percentage of the land is now covered by crops or grasses.[63]

The plateau's eastern limits fall within the Irano-Turanian vegetation zone. Normally, this plant zone will receive between 200 mm. and 300 mm. of rainfall per year. Irano-Turanian territory is characterised by an absence of trees, and its plant life appears stunted. Brush, small shrubs, and steppeland grasses prevail, but even this ground cover is sparse.[64]

Smith described Moab as a treeless plateau, a high, barren moor with few areas of brush. While Smith admited that this region looked rather desolate, he noted that its fertility is surprising and, even in his day, the plateau was heavily cultivated in wheat.[65] The wheat of the Kerak district is still thought of as one of the best quality grains in the Middle East.[66] In Tristram's report of 1873, *The Land of Moab,* Hayne described the region to the south of the Mujib as having no trees, shrubs, or bushes. Most of the plateau was covered by grass, a situation that caused Hayne to describe Moab as virgin grazing ground.[67] Indeed, the sheep and goats are still present in great numbers, but this area also produces such crops as wheat, barley, chickpeas, lentils, eggplant, tomatoes, and watermelons, to name just a few. Unfortunately, grapes, figs, and olives, so valuable to the economy of the Palestinian hills, are not grown in large quantities on the highlands of Transjordan.[68]

Conclusion

Basically, this essay is intended to introduce the reader to the present-day natural setting of Central Moab's numerous ruins. It is also hoped that this discussion will help to eliminate some of the misunderstanding concerning the environment of the Transjordanian plateau as a whole. To be sure, there are desert areas within Jordan's borders, but it is also true that a large portion of this country has enough favourable climatic conditions, agricultural potential, and water resources to allow its modern inhabitants to prosper. Further examination of Jordan's ancient settlements, including those in the land of Moab, will undoubtedly prove that the same held true for their occupants.

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[63] Baly, *Geography,* pp. 80, 82; Bender, *Geology,* p. 11; Orni and Efrat, *Geography of Israel,* p. 167: Van Zyl, Moabites p. 53.

[64] Baly, *Geography,* p. 80, 82; Bender, *Geology,* p. 13; Fisher, *Middle East,* p. 92-93; Orni and Efrat, *Geography of Israel,* p. 172.

[65] Smith, *Historical Geography,* p. 336-337, 343.

[66] Benjamin Shwadran, *Jordan: A State of Tension,* New York, 1959, p. 16.

[67] W. Amherst Hayne, On the Flora of Moab, p. 101-141 in H. B. Tristram *et al., The Land of Moab: Travels and Discoveries on the East Side of the Dead Sea and the Jordan, New York,* 1873.

[68] Phillips, *Hashemite Kingdom of Jordan,* p. 101-141, gives a realtively up-to-date survey of Transjordan's agricultural production. Cf. Baly, *Geography,* p. 82-86.