1 00:29:37:04 00:29:40:16 Annenberg Media
2 00:29:40:18 00:30:37:09 §
3 00:30:37:11 00:30:40:08 DEATH VALLEY HASN'T
ALWAYS LOOKED LIKE THIS.
4 00:30:40:10 00:30:42:07 WITHIN THE LAST
100,000 YEARS,
5 00:30:42:09 00:30:45:23 A LAKE 600 FEET DEEP
COVERED THIS VALLEY FLOOR.
6 00:30:45:25 00:30:47:22 THE SURROUNDING SHORELINE
WAS GRASSLAND,
7 00:30:47:24 00:30:51:15 AND THESE HILL SLOPES WERE
COVERED WITH PINE TREES.
8 00:30:51:17 00:30:53:16 THE MILD, RELATIVELY
HUMID CLIMATE
9 00:30:53:18 00:30:56:01 WAS ENJOYED
BY SUCH DIVERSE ANIMALS
10 00:30:56:03 00:30:59:15 AS BISON, ANTELOPE, HORSES,
PELICANS, AND FLAMINGOS.
11 00:30:59:17 00:31:02:00 ALL OF THIS CHANGED
ABOUT 11,000 YEARS AGO.
12 00:31:02:02 00:31:04:15 THE EARTH'S CLIMATE
BEGAN TO WARM,
13 00:31:04:17 00:31:07:16 AND THE GLACIERS OF THE
LAST ICE AGE
14 00:31:07:18 00:31:08:16 MELTED BACK IN RETREAT.
15 00:31:08:18 00:31:10:15 TODAY THE LAKE IS GONE.
16 00:31:10:17 00:31:14:00 IT'S BEEN REPLACED BY THIS
SALT-ENCRUSTED DRY LAKE BED.
17 00:31:14:02 00:31:16:25 WHEN THE LAKE DISAPPEARED,
SO DID THE GRASSES,
18 00:31:16:27 00:31:19:20 AND THE FORESTS RETREATED
UP THE MOUNTAIN SLOPES.
19 00:31:19:22 00:31:22:19 A VERY DIFFERENT COMMUNITY
OF PLANTS AND ANIMALS
20 00:31:22:21 00:31:24:05 NOW INHABIT THIS REGION.
21 00:31:24:07 00:31:26:19 IN SHORT, ALL
OF THE CHARACTERISTICS
22 00:31:26:21 00:31:28:06 OF A TYPICAL DESERT.
23 00:31:28:08 00:31:30:06 BUT DEATH VALLEY
IS NOT ALONE.
24 00:31:30:08 00:31:32:15 WE SEE THIS SAME DRAMATIC
CHANGE IN ENVIRONMENT
25 00:31:32:17 00:31:34:19 IN DESERTS
ALL OVER THE WORLD.
26 00:31:34:21 00:31:36:28 THIS CHANGE IS
THE DIRECT RESULT
27 00:31:37:00 00:31:39:25 OF GEOLOGIC PROCESSES
OPERATING ON A GLOBAL SCALE.
28 00:31:42:21 00:31:44:18 *LOCATED PRIMARILY*
*ALONG THE TROPICS*
29 00:31:44:20 00:31:46:06 *OF CANCER AND CAPRICORN,*
30 00:31:46:08 00:31:50:24 *DESERTS COVER ALMOST*
*1/4 OF THE EARTH'S SURFACE.*
31 00:31:55:00 00:31:57:13 *MOST OF US HAVE*
*A VERY LIMITED,*
32 00:31:57:15 00:31:59:14 *SOMEWHAT STEREOTYPICAL*

*PICTURE IN MIND*

33 00:31:59:16 00:32:02:18 *WHEN WE THINK OF WHAT*
*A DESERT LOOKS LIKE.*

34 00:32:02:20 00:32:06:04 *BUT THE FACT IS*
*THAT DESERTS CAN TAKE*

35 00:32:06:06 00:32:08:01 *MANY SOMETIMES UNEXPECTED*
*SHAPES AND FORMS.*

36 00:32:08:03 00:32:10:28 IF YOU ASK MOST PEOPLE,
THEY WOULD PROBABLY SAY

37 00:32:11:00 00:32:14:04 A DESERT IS A DRY AREA
WITH NO VEGETATION,

38 00:32:14:06 00:32:16:27 BUT THIS ISN'T
A GOOD DEFINITION
FOR SEVERAL REASONS.

39 00:32:16:29 00:32:19:14 THERE ARE MANY DRY AREAS
WITH NO VEGETATION

40 00:32:19:16 00:32:22:01 THAT YOU WOULDN'T
THINK OF AS DESERTS.

41 00:32:22:03 00:32:23:20 ANTARCTICA
IS AN EXAMPLE.

42 00:32:23:22 00:32:26:13 THERE'S ALMOST
ZERO PRECIPITATION
AT THE SOUTH POLE.

43 00:32:26:15 00:32:28:28 WE CAN LOOK AT
POINT BARROW, ALASKA,

44 00:32:29:00 00:32:33:12 WHICH RECEIVES ONLY
FOUR OR FIVE INCHES
OF RAIN A YEAR

45 00:32:33:14 00:32:35:10 AND HAS VERY
LITTLE VEGETATION.

46 00:32:35:12 00:32:37:27 YET THE SOIL THERE
IS WATER SODDEN.

47 00:32:37:29 00:32:39:27 THERE ARE
PONDS AND LAKES.

48 00:32:39:29 00:32:42:09 IT'S HARDLY WHAT YOU'D
THINK OF AS A DESERT.

49 00:32:42:11 00:32:44:11 ON THE OTHER HAND,
SOME DESERTS

50 00:32:44:13 00:32:46:11 HAVE A GREAT DEAL
OF VEGETATION.

51 00:32:46:13 00:32:48:12 THE MOJAVE DESERT
OF EASTERN CALIFORNIA

52 00:32:48:14 00:32:52:21 HAS VAST STANDS
OF GIANT YUCCAS--
THE JOSHUA TREES.

53 00:32:54:09 00:32:57:07 *TO DEVELOP A SIMPLE*
*DEFINITION OF A DESERT,*

54 00:32:57:09 00:32:59:07 *WE CAN FIND*
*A COMMON DENOMINATOR*

55 00:32:59:09 00:33:02:08 *IN EACH OF THESE*
*HARSH DESERT LANDSCAPES--*

56 00:33:02:10 00:33:03:24 *FROM THE POLAR REGIONS*

57 00:33:03:26 00:33:05:23 *OF ANTARCTICA*
*AND NORTHERN ALASKA*

58 00:33:05:25 00:33:08:21 *TO THE VEGETATED SANDS*
*OF THE MOJAVE DESERT.*

59 00:33:11:17 00:33:15:19 *DESERTS ARE REGIONS*
*WITH INFREQUENT PRECIPITATION,*
60 00:33:15:21 00:33:18:24 *AVERAGING LESS THAN*
*25 CENTIMETERS PER YEAR.*
61 00:33:21:03 00:33:24:15 *IN MOST DESERTS, EVAPORATION*
*RATES ARE HIGH ENOUGH*
62 00:33:24:17 00:33:26:28 *TO QUICKLY REMOVE*
*THIS MOISTURE.*
63 00:33:31:08 00:33:32:20 *TO UNDERSTAND*
*THE ORIGIN*
64 00:33:32:22 00:33:35:04 *OF THE EARTH'S*
*HOT SUBTROPICAL DESERTS,*
65 00:33:35:06 00:33:37:04 *THE LARGEST*
*ON THE PLANET,*
66 00:33:37:06 00:33:39:18 *WE MUST FIRST*
*CONSIDER THE EQUATOR.*
67 00:33:43:06 00:33:47:03 *LIKE THE DESERTS THEMSELVES,*
*THE EQUATOR IS A HOT PLACE,*
68 00:33:47:05 00:33:49:09 *BUT IT IS ALSO VERY HUMID,*
69 00:33:49:11 00:33:52:08 *WITH TORRENTIAL RAIN*
*ANY TIME OF YEAR*
70 00:33:52:10 00:33:55:03 *AND STEAMY*
*TROPICAL RAIN FORESTS.*
71 00:33:55:05 00:33:59:25 *WHY ARE THE TROPICS WET*
*AND THE SUBTROPICS DRY?*
72 00:34:03:13 00:34:07:10 *AS THE EARTH ORBITS THE SUN*
*FROM SEASON TO SEASON,*
73 00:34:07:12 00:34:09:25 *THE SUN ALWAYS SHINES*
*DIRECTLY OVERHEAD*
74 00:34:09:27 00:34:12:09 *SOMEWHERE*
*IN THE TROPICAL LATITUDES.*
75 00:34:12:11 00:34:13:24 *THEREFORE, THE SUN'S RAYS*
76 00:34:13:26 00:34:15:25 *STRIKE THE EQUATOR*
*MORE DIRECTLY*
77 00:34:15:27 00:34:18:10 *THAN THE REST*
*OF THE GLOBE.*
78 00:34:18:12 00:34:22:19 *AS THE AIR HEATS UP,*
*WATER EVAPORATES.*
79 00:34:22:21 00:34:25:09 *THE WARM WET AIR RISES,*
80 00:34:25:11 00:34:29:09 *AND AS IT RISES,*
*IT EXPANDS AND COOLS.*
81 00:34:29:11 00:34:32:10 *THE VAPOR IT CONTAINS*
*CONDENSES INTO CLOUDS,*
82 00:34:32:12 00:34:34:22 *MANY OF WHICH*
*RELEASE RAIN.*
83 00:34:36:14 00:34:38:23 *THE COOL AIR*
*IS NOW DRY,*
84 00:34:38:25 00:34:40:23 *BUT MORE AND MORE*
*WARM AIR*
85 00:34:40:25 00:34:42:22 *IS RISING UP*
*BENEATH IT.*
86 00:34:42:24 00:34:46:06 *THIS DISPLACES THE COOL AIR*
*AWAY FROM THE EQUATOR,*
87 00:34:46:08 00:34:49:15 *PUSHING IT NORTH AND SOUTH*
*TOWARD THE SUBTROPICS.*
88 00:34:52:00 00:34:53:28 *BECAUSE OF EARTH'S*

*SPHEROIDAL SHAPE,*

89 00:34:54:00 00:34:56:12 *AIR CURRENTS*
*BEGIN TO CROWD TOGETHER*

90 00:34:56:14 00:34:58:29 *AS THEY MOVE*
*INTO HIGHER LATITUDES.*

91 00:34:59:01 00:35:02:13 *THIS CAUSES THE AIR*
*TO GROW DENSE AND HEAVY,*

92 00:35:02:15 00:35:04:13 *SO THAT IT*
*DESCENDS EARTHWARD*

93 00:35:04:15 00:35:07:12 *ABOUT 30 DEGREES NORTH*
*AND SOUTH OF THE EQUATOR.*

94 00:35:07:14 00:35:09:13 *THE AIR IS*
*COMPRESSIVELY HEATED*

95 00:35:09:15 00:35:12:07 *UPON REACHING*
*LOW ALTITUDES.*

96 00:35:12:09 00:35:15:22 *THE RESULT IS A MASS*
*OF WARM, DRY AIR,*

97 00:35:15:24 00:35:19:21 *FEW CLOUDS,*
*AND LOW HUMIDITY.*

98 00:35:19:23 00:35:22:10 *THIS ENCOURAGES*
*EVAPORATION.*

99 00:35:26:13 00:35:29:11 *THE RESULT IS THE STARK,*
*PARCHED LANDSCAPE*

100 00:35:29:13 00:35:31:25 *OF MOST*
*OF THE WORLD'S DESERTS.*

101 00:35:35:16 00:35:38:14 *A FEW DESERTS OCCUR OUTSIDE*
*THESE SUBTROPICAL LATITUDES*

102 00:35:38:16 00:35:41:04 *IN THE RAIN SHADOWS*
*OF MOUNTAINS,*

103 00:35:41:06 00:35:44:04 *SUCH AS CALIFORNIA'S*
*SIERRA NEVADA.*

104 00:35:45:21 00:35:48:27 *THE RAIN SHADOW EFFECT*
*WORKS AS FOLLOWS.*

105 00:35:48:29 00:35:51:27 *WARM, MOIST AIR MOVES*
*EAST ACROSS THE PACIFIC.*

106 00:35:51:29 00:35:54:26 *IT HITS THE COAST*
*AND IS FORCED UPWARD*

107 00:35:54:28 00:35:57:05 *TO GET OVER*
*THE MOUNTAINS.*

108 00:35:57:07 00:36:00:19 *AS IT RISES,*
*IT EXPANDS AND COOLS,*

109 00:36:00:21 00:36:05:06 *AND ITS MOISTURE*
*TURNS INTO CLOUDS, RAIN,*

110 00:36:05:08 00:36:07:12 *AND SOMETIMES SNOW.*

111 00:36:10:06 00:36:12:05 *THIS LEAVES THE AIR DRY.*

112 00:36:12:07 00:36:14:20 *AS THIS COOL, DRY AIR*
*MOVES DOWN,*

113 00:36:14:22 00:36:17:06 *ON THE LEEWARD SIDE*
*OF THE MOUNTAINS,*

114 00:36:17:08 00:36:19:21 *IT IS COMPRESSED*
*AND HEATS UP AGAIN.*

115 00:36:19:23 00:36:22:05 *THE AIR, NOW WARM*
*AS WELL AS DRY,*

116 00:36:22:07 00:36:24:05 *SUCKS UP*
*WHAT LITTLE MOISTURE*

117 00:36:24:07 00:36:26:18 *MAY BE AVAILABLE*

*FROM THE LAND BELOW,*

118 00:36:26:20 00:36:29:04 *CREATING DESERTS AS IT CONTINUES ITS JOURNEY*

119 00:36:29:06 00:36:32:05 *EAST OF THE SIERRA NEVADA.*

120 00:36:32:07 00:36:34:03 MANY OF THE WORLD'S MOST PROMINENT

121 00:36:34:05 00:36:36:18 OR WELL-KNOWN DESERTS ARE THE RESULT

122 00:36:36:20 00:36:38:19 OF THIS RAIN SHADOW EFFECT--

123 00:36:38:21 00:36:40:19 THE MOJAVE IN THE UNITED STATES,

124 00:36:40:21 00:36:43:01 THE GOBI DESERT IN CENTRAL ASIA.

125 00:36:43:03 00:36:46:01 WESTERN SOUTH AMERICA HAS A SIMILAR SITUATION.

126 00:36:46:03 00:36:48:16 WE HAVE A CHAIN OF MOUNTAINS

127 00:36:48:18 00:36:51:00 DOWN THE WEST COAST-- THE ANDES--

128 00:36:51:02 00:36:54:13 WHICH SERVE AS A BARRIER FORMING THIS RAIN SHADOW.

129 00:36:54:15 00:36:57:12 *ANOTHER FACTOR THAT PLAYS AN INDIRECT ROLE*

130 00:36:57:14 00:36:59:13 *IN THE FORMATION OF DESERTS*

131 00:36:59:15 00:37:01:18 *IS PLATE TECTONICS.*

132 00:37:01:20 00:37:03:18 THE POSITION OF THE CONTINENTS

133 00:37:03:20 00:37:06:17 IN THE POLAR REGIONS OR THE EQUATORIAL REGIONS

134 00:37:06:19 00:37:08:03 OR THE SUBTROPICAL REGIONS,

135 00:37:08:05 00:37:10:21 OF COURSE, IS A FUNCTION OF PLATE TECTONICS.

136 00:37:10:23 00:37:14:04 AS AN EXAMPLE, AFRICA, 250 MILLION YEARS AGO,

137 00:37:14:06 00:37:17:02 IN PERMIAN TIMES, WAS MUCH FARTHER SOUTH,

138 00:37:17:04 00:37:18:18 NEAR THE SOUTH POLE.

139 00:37:18:20 00:37:21:03 WHAT WE CALL THE KALAHARI DESERT NOW

140 00:37:21:05 00:37:23:03 WAS GLACIATED AT THAT TIME.

141 00:37:23:05 00:37:24:18 THAT WASN'T LONG AGO.

142 00:37:24:20 00:37:27:05 THAT WAS ONLY ABOUT 5% OF GEOLOGIC TIME.

143 00:37:28:17 00:37:30:28 *IN THE SOUTHWESTERN UNITED STATES, TOO,*

144 00:37:31:00 00:37:33:25 *THERE IS EVIDENCE OF A ONCE WIDESPREAD DESERT*

145 00:37:33:27 00:37:36:24 *THAT EXISTED 200 MILLION YEARS AGO.*

146 00:37:36:26 00:37:38:09 *FOSSIL DUNES ARE PRESERVED*

147 00:37:38:11 00:37:41:01 *IN THE UPPER WALL*
*OF THE GRAND CANYON*
148 00:37:41:03 00:37:43:27 *AND IN THE SANDSTONES*
*OF ZION NATIONAL PARK.*
149 00:37:43:29 00:37:46:26 *THE VARIED SURFACES*
*OF THE SHIFTING SAND DUNES*
150 00:37:46:28 00:37:50:16 *APPEAR AS CRISSCROSSING*
*SETS OF BEDS.*
151 00:37:50:18 00:37:52:16 *THEIR LARGE SIZE*
*AND COLORATION*
152 00:37:52:18 00:37:54:16 *FROM THE OXIDATION OF IRON*
153 00:37:54:18 00:37:57:16 *SHOW THAT THEY FORMED*
*ON DRY LAND.*
154 00:38:00:23 00:38:03:23 *SINCE THAT TIME,*
*PLANT AND ANIMAL FOSSILS*
155 00:38:03:25 00:38:07:16 *INDICATE THAT THIS REGION*
*BECAME MOIST AND FORESTED.*
156 00:38:07:18 00:38:11:01 *BUT IN RECENT GEOLOGIC TIME,*
*CONDITIONS HAVE BECOME DRIER*
157 00:38:11:03 00:38:14:01 *IN RESPONSE TO PLATE MOTIONS,*
*MOUNTAIN BUILDING,*
158 00:38:14:03 00:38:17:10 *AND THE DEVELOPMENT*
*OF RAIN SHADOWS.*
159 00:38:18:29 00:38:20:28 *SOME LANDS ARE*
*DEPRIVED OF MOISTURE*
160 00:38:21:00 00:38:24:29 *SIMPLY BECAUSE THEY LIE A*
*GREAT DISTANCE FROM THE OCEAN,*
161 00:38:25:01 00:38:27:29 *WHICH IS THE PRIMARY SOURCE*
*OF MOISTURE FOR RAINFALL.*
162 00:38:28:01 00:38:31:13 *IN WESTERN CHINA, THE GOBI*
*AND THE TAKLA MAKAN*
163 00:38:31:15 00:38:34:29 *ARE BOTH LOCKED*
*DEEP INSIDE A LAND MASS.*
164 00:38:35:01 00:38:38:00 *MOIST AIR MASSES PRECIPITATE*
*MOST OF THEIR WATER*
165 00:38:38:02 00:38:40:09 *BEFORE REACHING*
*THESE REGIONS.*
166 00:38:40:11 00:38:43:10 *THE RAIN SHADOW EFFECT*
*OF SURROUNDING MOUNTAINS*
167 00:38:43:12 00:38:44:25 *IS ALSO A FACTOR.*
168 00:38:44:27 00:38:47:18 *A FEW DESERTS EXIST*
*WHERE COLD MARINE WATER*
169 00:38:47:20 00:38:51:18 *COMES INTO CONTACT WITH WARM*
*AIR NEXT TO A COASTLINE.*
170 00:38:51:20 00:38:54:03 *SUCH CONDITIONS PREVAIL*
*ALONG THE COASTS*
171 00:38:54:05 00:38:57:00 *OF NORTHERN CHILE*
*AND SOUTHWEST AFRICA.*
172 00:38:57:02 00:38:59:00 ALONG THE NORTH COAST
OF CHILE
173 00:38:59:02 00:39:01:29 AND THE COAST
OF SOUTHWEST AFRICA
174 00:39:02:01 00:39:05:18 ARE DESERTS
WHICH EXTEND ALL
THE WAY TO THE SEA,
175 00:39:05:20 00:39:08:03 AND THESE DESERTS

ARE QUITE UNUSUAL

176 00:39:08:05 00:39:10:02 BECAUSE THEY OWE
THEIR EXISTENCE

177 00:39:10:04 00:39:13:28 TO COLD OFFSHORE
MARINE CURRENTS.

178 00:39:14:00 00:39:15:28 NOW, IN MANY COASTAL
LATITUDES,

179 00:39:16:00 00:39:20:29 THE AIR COMING
OFF THE OCEAN IS
FULL OF MOISTURE

180 00:39:21:01 00:39:24:14 WHICH IS EVAPORATED
FROM THE SEA,

181 00:39:24:16 00:39:27:25 GIVEN ORDINARY SEA
SURFACE TEMPERATURES.

182 00:39:27:27 00:39:31:10 BUT THESE COLD
MARINE CURRENTS CHILL
THE OVERLYING AIR

183 00:39:31:12 00:39:34:09 AND SO REDUCE
ITS CAPACITY
FOR HOLDING MOISTURE.

184 00:39:34:11 00:39:38:26 THE AIR THAT BLOWS
INLAND, AS A RESULT,
IS VERY DRY,

185 00:39:38:28 00:39:41:05 AND THE RESULT
OF THAT ARE THESE
COASTAL DESERTS.

186 00:39:42:15 00:39:44:14 *SO THERE AREEVERAL WAYS*

187 00:39:44:16 00:39:47:29 *BY WHICH DESERTS CAN*
*COME INTO BEING--*

188 00:39:48:01 00:39:51:22 *SUBTROPICAL DESCENT*
*OF EQUATORIAL AIR CURRENTS...*

189 00:39:54:15 00:39:56:18 *RAIN SHADOW EFFECTS...*

190 00:39:58:08 00:40:02:07 *GREAT DISTANCE OF LAND MASS*
*FROM THE SEA...*

191 00:40:02:09 00:40:05:14 *COLD COASTAL CURRENTS*
*IN WARM LATITUDES...*

192 00:40:06:29 00:40:08:12 *AND IN POLAR REGIONS,*

193 00:40:08:14 00:40:10:26 *THE INABILITY*
*OF COLD AIR MASSES*

194 00:40:10:28 00:40:12:11 *TO HOLD MUCH MOISTURE.*

195 00:40:14:11 00:40:17:11 *MOST OF THESE*
*EXTREME DESERT ENVIRONMENTS*

196 00:40:17:13 00:40:19:10 *CONTAIN MANY*
*UNIQUE LAND FORMS*

197 00:40:19:12 00:40:21:27 *WHICH, DESPITE*
*THE INFREQUENCY OF RAINFALL,*

198 00:40:21:29 00:40:25:13 *ARE OFTEN SHAPED*
*BY RUNNING WATER.*

199 00:40:25:15 00:40:27:21 *THIS SEEMING PARADOX*
*CAN BE EXPLAINED*

200 00:40:27:23 00:40:31:00 *BY THE FACT THAT*
*DESERT RAINSTORMS,*

201 00:40:31:02 00:40:33:24 *WHILE SPORADIC,*
*ARE GENERALLY INTENSE,*

202 00:40:33:26 00:40:36:24 *CREATING FLASH FLOODS.*

203 00:40:36:26 00:40:40:23 *THESE BRIEF, BUT VIOLENT*

*EPISODES ARE HIGHLY EROSIVE,*

204 00:40:40:25 00:40:43:09 *QUICKLY TRANSPORTING*
*ENORMOUS QUANTITIES OF SEDIMENT*

205 00:40:43:11 00:40:47:01 *AND OVER TIME*
*CARVING CANYONS.*

206 00:40:47:03 00:40:50:11 *THESE FLOODS ALSO CAUSE*
*SEDIMENT TO ACCUMULATE*

207 00:40:50:13 00:40:52:28 *AT THE BASE OF MOUNTAINS*

208 00:40:53:00 00:40:56:13 *IN CONE-SHAPED DEPOSITS*
*CALLED ALLUVIAL FANS.*

209 00:40:58:29 00:41:01:27 *THE PHENOMENON OF*
*FLASH FLOODING IN THE DESERT*

210 00:41:01:29 00:41:03:27 *RAISES THE QUESTION*
*OF DRAINAGE.*

211 00:41:03:29 00:41:06:13 *WHERE DOES*
*ALL THE WATER GO?*

212 00:41:06:15 00:41:09:27 DRAINAGE IN DESERTS
IS CHARACTERIZED
BY INTERNAL DRAINAGE.

213 00:41:09:29 00:41:11:27 IT HAS
A DRAINAGE PATTERN

214 00:41:11:29 00:41:14:12 THAT ISN'T CONNECTED
TO THE REGIONAL
DRAINAGE PATTERN.

215 00:41:14:14 00:41:16:26 ONLY THE LARGEST
RIVERS IN THE WORLD--

216 00:41:16:28 00:41:18:27 THE NILE
IN NORTH AFRICA,

217 00:41:18:29 00:41:20:26 THE NIGER
IN WEST AFRICA,

218 00:41:20:28 00:41:23:13 AND THE COLORADO
IN THE UNITED STATES--

219 00:41:23:15 00:41:25:13 PERSIST AS THEY
FLOW THROUGH DESERTS.

220 00:41:25:15 00:41:27:27 MOST RIVERS OR STREAMS
FLOWING INTO A DESERT

221 00:41:27:29 00:41:30:26 WILL SINK INTO THE SOIL
AND DISAPPEAR

222 00:41:30:28 00:41:35:02 OR ELSE COLLECT IN
A POND OR A SALT LAKE.

223 00:41:35:04 00:41:38:09 GENERALLY,
DESERT STREAMS
DISAPPEAR IN DESERTS

224 00:41:38:11 00:41:41:11 BECAUSE OF THE HIGH RATE
OF EVAPORATION

225 00:41:41:13 00:41:44:05 AND ALSO
BECAUSE OF THE
UNCONSOLIDATED NATURE

226 00:41:44:07 00:41:46:27 OF THE SAND AND SEDIMENT
ON THE FLOOR.

227 00:41:46:29 00:41:50:12 A GOOD EXAMPLE IS
THE MOJAVE DESERT
IN CALIFORNIA,

228 00:41:50:14 00:41:53:06 WHERE THERE'S
ONLY ONE STREAM--
THE MOJAVE RIVER--

229 00:41:53:08 00:41:55:06 INVOLVED IN THE
DRAINAGE PATTERN.
230 00:41:55:08 00:41:57:21 IT RISES ON THE EDGE
OF THE MOJAVE
231 00:41:57:23 00:42:00:11 IN THE SAN BERNARDINO
MOUNTAINS, FLOWS
INTO THE MOJAVE,
232 00:42:00:13 00:42:01:26 BUT MOSTLY
IS UNDERGROUND.
233 00:42:01:28 00:42:03:10 THERE'S
ONLY THREE PLACES
234 00:42:03:12 00:42:05:24 WHERE, IN A NORMAL YEAR,
IT SURFACES.
235 00:42:05:26 00:42:09:10 IN WET YEARS, LIKE 1969,
'78, '80, AND '83,
236 00:42:09:12 00:42:12:10 IT WAS ABOVE GROUND
MOST OF THE WAY.
237 00:42:12:12 00:42:15:11 IN FACT, IT FLOWED
OVER INTO SODA LAKE
238 00:42:15:13 00:42:17:21 AND BECAME AN
HONEST-TO-GOODNESS LAKE.
239 00:42:17:23 00:42:20:06 ALTHOUGH IT PLAYS
THE DOMINANT ROLE,
240 00:42:20:08 00:42:22:22 RUNNING WATER ISN'T
THE ONLY GEOLOGIC AGENT
241 00:42:22:24 00:42:24:07 SHAPING
THE DESERT LANDSCAPE.
242 00:42:24:09 00:42:27:07 MOST OF THE YEAR,
THE DESERT SURFACE IS DRY.
243 00:42:27:09 00:42:29:21 THIS ALLOWS
THE WIND TO PICK UP
244 00:42:29:23 00:42:32:06 GRAINS OF SAND AND SILT
AND MOVE THEM.
245 00:42:32:08 00:42:33:19 SAND IS RELATIVELY HEAVY.
246 00:42:33:21 00:42:36:04 IT'S NOT CARRIED FAR
BY THE WIND.
247 00:42:36:06 00:42:38:23 IT'S DEPOSITED AS DUNES
CLOSE TO THE SOURCE.
248 00:42:38:25 00:42:41:08 ON THE OTHER HAND,
SILT IS MUCH LIGHTER
249 00:42:41:10 00:42:42:22 AND FINER GRAINED.
250 00:42:44:14 00:42:47:11 IN A SINGLE STORM,
SILT CAN BE CARRIED
251 00:42:47:13 00:42:49:26 ACROSS ENTIRE CONTINENTS
OR OCEAN BASINS.
252 00:42:53:18 00:42:56:16 *THE AIRBORNE DESERT DUST*
*BLOWN BY THE WIND*
253 00:42:56:18 00:43:00:19 *CONSISTS MAINLY OF PARTICLES*
*OF ROCK AND MINERAL GRAINS.*
254 00:43:00:21 00:43:03:12 *BUT AS THE WIND STREAM*
*CONTINUES AROUND THE GLOBE,*
255 00:43:03:14 00:43:05:11 *IT ALSO CARRIES WITH IT*
256 00:43:05:13 00:43:07:22 *TINY FRAGMENTS*
*OF PLANTS AND ANIMALS,*
257 00:43:07:24 00:43:10:19 *ASH FROM COAL-FIRED*
*ELECTRICAL PLANTS,*

258 00:43:10:21 00:43:13:07 *OTHER INDUSTRIAL DETRITUS,*
259 00:43:13:09 00:43:15:14 *AND OCCASIONALLY*
*GLASSY VOLCANIC ASH.*
260 00:43:17:15 00:43:20:12 *THIS FLOTSAM AND JETSAM*
*IS SHUFFLED AND SIFTED*
261 00:43:20:14 00:43:26:07 *THROUGH THE ATMOSPHERE,*
*STORM AFTER STORM,*
262 00:43:26:09 00:43:29:22 *UNTIL THERE'S HARDLY A SQUARE*
*METER OF THE EARTH'S SURFACE*
263 00:43:29:24 00:43:32:21 *THAT DOES NOT CONTAIN*
*MATERIAL BLOWN IN*
264 00:43:32:23 00:43:35:05 *AT SOMETIME*
*FROM SOMEWHERE ELSE.*
265 00:43:37:29 00:43:41:12 *SOME OF THIS WINDBLOWN*
*DUST CAN BE A BLESSING.*
266 00:43:41:14 00:43:43:27 *THE SOIL OF THE*
*MIDWESTERN UNITED STATES*
267 00:43:43:29 00:43:45:28 *OWES MUCH*
*OF ITS FERTILITY*
268 00:43:46:00 00:43:48:06 *TO WHAT GEOLOGISTS*
*CALL LOESS.*
269 00:43:48:08 00:43:51:05 *LOESS IS MADE UP*
*OF FINE PARTICLES*
270 00:43:51:07 00:43:53:21 *OF SILT AND CLAY*
*THAT HAVE DRIFTED IN*
271 00:43:53:23 00:43:56:05 *OVER THE MILLENNIA*
*FROM BARREN LANDS*
272 00:43:56:07 00:43:58:23 *UNCOVERED BY MELTING*
*PLEISTOCENE ICE.*
273 00:44:02:06 00:44:04:20 *IN EASTERN CHINA,*
*DEPOSITS OF LOESS*
274 00:44:04:22 00:44:06:05 *HAVE REACHED*
*REMARKABLE PROPORTIONS,*
275 00:44:06:07 00:44:08:21 *HUNDREDS OF METERS THICK.*
276 00:44:10:13 00:44:11:25 *FROM TIME IMMEMORIAL,*
277 00:44:11:27 00:44:14:10 *THE CHINESE HAVE CARVED*
*CAVE DWELLINGS*
278 00:44:14:12 00:44:17:16 *OUT OF THIS SOFT, BUT*
*SURPRISINGLY COHESIVE MATERIAL.*
279 00:44:22:03 00:44:23:18 *WINDBLOWN SAND,*
280 00:44:23:20 00:44:26:17 *TOO HEAVY TO BLOW ACROSS*
*OCEANS AND CONTINENTS,*
281 00:44:26:19 00:44:29:02 *BOUNCES AND SKIPS*
*ALONG THE GROUND*
282 00:44:29:04 00:44:33:03 *UNTIL IT IS CAUGHT*
*BY AN OBSTACLE IN ITS PATH.*
283 00:44:33:05 00:44:36:05 *HERE IT BEGINS*
*TO ACCUMULATE,*
284 00:44:36:07 00:44:40:05 *FORMING AN EVEN LARGER TRAP*
*FOR ADDITIONAL SAND.*
285 00:44:40:07 00:44:43:18 *WIND PLUCKS SAND FROM THE*
*WINDWARD SIDE OF THE DUNE,*
286 00:44:43:20 00:44:45:18 *BLOWING IT ACROSS THE CREST,*
287 00:44:45:20 00:44:48:17 *WHERE IT SETTLES*
*ON THE QUIET LEEWARD SIDE.*
288 00:44:48:19 00:44:51:18 *IN TIME, THE ENTIRE DUNE*

*SHIFTS DOWNWIND,*

289 00:44:51:20 00:44:53:08 *GRAIN BY GRAIN,*

290 00:44:53:10 00:44:55:20 *POSSIBLY*
*MIGRATING KILOMETERS*

291 00:44:55:22 00:44:58:24 *FROM ITS POINT OF ORIGIN.*

292 00:44:58:26 00:45:02:19 *A MAJOR SOURCE OF DESERT SAND*
*IS DESERT PLAYAS--*

293 00:45:02:21 00:45:04:19 *LAKE BEDS*
*FROM MORE HUMID TIMES*

294 00:45:04:21 00:45:06:25 *WHICH HAVE LONG BEEN DRY.*

295 00:45:09:04 00:45:12:03 *THE SAME WINDS*
*THAT BUILD UP DUNES*

296 00:45:12:05 00:45:14:02 *MAY ALSO HOLLOW OUT*
*DEPRESSIONS*

297 00:45:14:04 00:45:15:18 *IN THE LAND SURFACE.*

298 00:45:15:20 00:45:20:17 *THESE DISH-SHAPED HOLLOWS*
*ARE CALLED BLOWOUTS.*

299 00:45:20:19 00:45:23:09 SOMETIMES WIND
CAN BE CHANNELED

300 00:45:23:11 00:45:24:25 UH, IN NARROW STREAMS.

301 00:45:24:27 00:45:27:24 UH, IN PARTS
OF THE SAHARA DESERT,

302 00:45:27:26 00:45:30:19 THIS IS HAPPENING,
FOR EXAMPLE,

303 00:45:30:21 00:45:34:20 BETWEEN LONG ROWS
OF PARALLEL DUNES.

304 00:45:34:22 00:45:37:06 UH, WHERE THIS WIND
IS CONCENTRATED

305 00:45:37:08 00:45:38:21 AGAINST THE EARTH'S
SURFACE,

306 00:45:38:23 00:45:41:21 IT CAN BLOW AWAY
VEGETATION,
AND THROUGH TIME,

307 00:45:41:23 00:45:44:05 UH, BIT BY BIT,
CARRY AWAY

308 00:45:44:07 00:45:46:19 THE LOOSE, UH, SOIL
AND SEDIMENT

309 00:45:46:21 00:45:49:20 PRESENT AT THE EARTH'S
SURFACE AS WELL.

310 00:45:49:22 00:45:51:04 UNDER CERTAIN
EXTREME CIRCUMSTANCES,

311 00:45:51:06 00:45:53:21 SO MUCH MATERIAL
MAY BE REMOVED

312 00:45:53:23 00:45:57:06 THAT THE TOP
OF THE WATER TABLE
IS EXPOSED.

313 00:45:57:08 00:46:00:06 THIS PROVIDES
FOR CREATION
OF AN OASIS.

314 00:46:00:08 00:46:03:19 THESE AREN'T COMMON
IN MOST PARTS
OF THE WORLD,

315 00:46:03:21 00:46:07:05 BUT DO OCCUR IN SOME
OF THE LARGER DESERTS.

316 00:46:07:07 00:46:09:16 *MORE COMMONLY SEEN*
*THAN BLOWOUTS*

317 00:46:09:18 00:46:12:06 *IS WHAT'S KNOWN AS*
*DESERT PAVEMENT.*
318 00:46:13:29 00:46:17:17 *AS THE WIND BLOWS AWAY*
*SILT AND PARTICLES OF DUST,*
319 00:46:17:19 00:46:20:17 *EVENTUALLY, ONLY HEAVY CHIPS*
*OF ROCK AND GRAVEL*
320 00:46:20:19 00:46:22:02 *ARE LEFT BEHIND.*
321 00:46:26:10 00:46:29:09 *OVER THOUSANDS OF YEARS,*
*THIS ROCKY WASTE*
322 00:46:29:11 00:46:31:18 *ACCUMULATES*
*AS A LAYER OF STONES*
323 00:46:31:20 00:46:33:04 *RESEMBLING A PAVEMENT*
324 00:46:33:06 00:46:36:01 *WHICH PROTECTS THE LAND*
*FROM FURTHER EROSION.*
325 00:46:36:03 00:46:38:16 *BUT DESERT PAVEMENT*
*IS EXTREMELY FRAGILE*
326 00:46:38:18 00:46:40:10 *AND EASILY DAMAGED.*
327 00:46:40:12 00:46:43:10 *MANY OUTCROPS,*
*AS WELL AS DESERT STONES,*
328 00:46:43:12 00:46:47:04 *ARE ALSO COVERED*
*WITH DESERT VARNISH--*
329 00:46:47:06 00:46:50:03 *A THIN, SHINY COATING*
*ON THE ROCKS*
330 00:46:50:05 00:46:52:06 *THAT INCREASES WITH AGE.*
331 00:46:53:22 00:46:55:05 *THE VARNISH IS COMPOSED*
332 00:46:55:07 00:46:59:21 *OF DARK MANGANESE OXIDE*
*AND CLAYS.*
333 00:46:59:23 00:47:03:05 *ONE EXPLANATION FOR THE*
*FORMATION OF THIS FEATURE*
334 00:47:03:07 00:47:08:03 *INVOLVES WEATHERING,*
*EVAPORATION, AND PRECIPITATION.*
335 00:47:08:05 00:47:13:15 THIS VARNISH FORMS
OVER ROCK SURFACES
THROUGHOUT THE DESERT
336 00:47:13:17 00:47:19:00 AS A RESULT OF,
UM, ACID WEATHERING,
CHEMICAL WEATHERING,
337 00:47:19:02 00:47:20:29 UH, DURING PERIODS
OF RAINFALL
338 00:47:21:01 00:47:24:09 OR HEAVY MOISTURE,
WINTER MOISTURE.
339 00:47:24:11 00:47:25:24 UH, OBVIOUSLY THIS WATER
340 00:47:25:26 00:47:28:24 CAN'T TRAVEL VERY FAR
BEFORE IT EVAPORATES
341 00:47:28:26 00:47:31:09 BECAUSE OF THE DRY
DESERT CONDITIONS
342 00:47:31:11 00:47:33:06 SO IT PRECIPITATES
A RESIDUE
343 00:47:33:08 00:47:36:06 OF DISSOLVED
MINERAL CONSTITUENTS
AS A THIN FILM
344 00:47:36:08 00:47:39:07 ACROSS THE ROCKY SURFACE
OVER WHICH IT'S FLOWING.
345 00:47:39:09 00:47:43:09 HENCE, THE BUILDUP
OVER TIME OF THESE
MANGANESE OXIDES.

346 00:47:43:11 00:47:47:14 *WINDBLOWN CLAY GRAINS*
*ADHERING TO ROCK SURFACES*
347 00:47:47:16 00:47:49:13 *MAY ASSIST*
*VARNISH FORMATION*
348 00:47:49:15 00:47:52:12 *BY SOAKING UP MOISTURE*
*FROM ADJOINING SOIL.*
349 00:47:54:00 00:47:55:27 *MICROBES COULD ALSO*
*PLAY A ROLE*
350 00:47:55:29 00:47:57:13 *IN PRODUCING VARNISH*
351 00:47:57:15 00:47:59:23 *THROUGH COMPLEX*
*BIOLOGICAL PROCESSES.*
352 00:48:02:15 00:48:06:28 *DESERT VARNISH CAN BE*
*2,000 YEARS IN THE MAKING--*
353 00:48:07:00 00:48:08:13 *PROVIDING A WRITING SURFACE*
354 00:48:08:15 00:48:11:03 *FOR ROCK INSCRIPTIONS*
*FROM ANCIENT CULTURES.*
355 00:48:22:15 00:48:25:12 THE DESERT, LIKE
ANY ENVIRONMENT ON EARTH,
356 00:48:25:14 00:48:28:13 IS A RESULT OF
A CRITICAL BALANCE
357 00:48:28:15 00:48:29:28 OF GEOLOGIC CONDITIONS.
358 00:48:30:00 00:48:32:14 CLIMATE, TOPOGRAPHY,
AND PLATE TECTONICS
359 00:48:32:16 00:48:35:12 INTERACT TO DETERMINE
WHETHER AN AREA WILL BE, SAY,
360 00:48:35:14 00:48:39:26 A DESERT OR A FOREST
OR A PRAIRIE GRASSLAND.
361 00:48:39:28 00:48:41:11 HUMAN ACTIVITY, HOWEVER,
362 00:48:41:13 00:48:44:10 IS CAPABLE OF DISRUPTING
THIS NATURAL BALANCE
363 00:48:44:12 00:48:46:01 TRIGGERING A CHAIN OF EVENTS
364 00:48:46:03 00:48:49:21 THAT CAN CAUSE DESERT TO
INVADE A NONDESERT REGION.
365 00:48:49:23 00:48:52:10 THIS PROCESS
CALLED DESERTIFICATION
366 00:48:52:12 00:48:54:12 CAN BE FRIGHTENINGLY RAPID
367 00:48:54:14 00:48:56:26 AND ITS CONSEQUENCES
STAGGERING.
368 00:48:59:22 00:49:02:10 *CONSIDER A FERTILE SPOT*
*LIKE THIS.*
369 00:49:05:12 00:49:07:10 *ITS MOST OBVIOUS*
*CHARACTERISTIC*
370 00:49:07:12 00:49:09:21 *IS ITS COLOR--GREEN.*
371 00:49:13:06 00:49:14:20 *THE GREEN COLOR ARISES*
372 00:49:14:22 00:49:17:26 *BECAUSE THE VEGETATION*
*ABSORBS THE SUN'S ENERGY*
373 00:49:17:28 00:49:21:26 *IN ALL WAVELENGTHS EXCEPT*
*THAT OF THE COLOR GREEN.*
374 00:49:21:28 00:49:23:27 *THIS ABSORPTION*
*OF ENERGY MEANS*
375 00:49:23:29 00:49:25:26 *THERE IS LESS*
*HEAT AVAILABLE*
376 00:49:25:28 00:49:27:26 *TO WARM THE OVERLYING AIR.*
377 00:49:29:16 00:49:31:16 *SO THE AIR IS COOLER*
378 00:49:31:18 00:49:34:00 *AND MORE LIKELY*
*TO PRODUCE RAIN.*

379 00:49:35:10 00:49:37:22 *THE CHANCE OF RAIN*
*IS FURTHER INCREASED*
380 00:49:37:24 00:49:39:22 *BY THE FACT*
*THAT THE VEGETATION*
381 00:49:39:24 00:49:41:21 *IS AN IMPORTANT SOURCE*
*OF WATER VAPOR,*
382 00:49:41:23 00:49:44:05 *RELEASED TO THE AIR*
*THROUGH LEAVES.*
383 00:49:47:27 00:49:51:01 *IF GREAT AMOUNTS*
*OF VEGETATION ARE DESTROYED*
384 00:49:51:03 00:49:54:00 *AS LAND IS DEVELOPED*
*OR OVERGRAZED,*
385 00:49:54:02 00:49:56:14 *THE BARE EARTH*
*MAY BE EXPOSED,*
386 00:49:56:16 00:49:58:28 *REFLECTING HEAT*
*BACK INTO THE ATMOSPHERE.*
387 00:50:02:01 00:50:04:11 *IF THERE ARE*
*NO TREES OR PLANTS*
388 00:50:04:13 00:50:06:11 *TO STORE HEAT*
*AND RELEASE MOISTURE,*
389 00:50:06:13 00:50:08:26 *THE AIR GETS*
*WARMER AND DRIER,*
390 00:50:08:28 00:50:11:28 *AND THERE'S*
*LESS CHANCE OF RAIN.*
391 00:50:12:00 00:50:15:27 *WITH NO TREE OR PLANT COVER*
*FOR ANCHORAGE,*
392 00:50:15:29 00:50:18:11 *THE TOPSOIL*
*CAN ERODE RAPIDLY,*
393 00:50:18:13 00:50:20:25 *DISCOURAGING NEW PLANTS*
*FROM TAKING ROOT.*
394 00:50:24:27 00:50:27:10 *IF THE REGION LIES*
*IN A SEMI-ARID CLIMATE*
395 00:50:27:12 00:50:29:11 *OR NEAR THE MARGIN*
*OF A DESERT,*
396 00:50:29:13 00:50:31:20 *THIS DESTRUCTION*
*OF SOIL AND VEGETATION*
397 00:50:31:22 00:50:34:04 *MAY CONVERT IT*
*INTO NEW DESERT.*
398 00:50:35:21 00:50:37:19 *THIS CHANGE*
*MAY BE PERMANENT*
399 00:50:37:21 00:50:39:03 *FOR ALL*
*PRACTICAL PURPOSES.*
400 00:50:40:13 00:50:42:23 *FOR ONCE*
*DESERTIFICATION STARTS,*
401 00:50:42:25 00:50:45:23 *IT TAKES A COSTLY EFFORT*
*TO STOP.*
402 00:50:48:16 00:50:50:10 *IN THE UNITED STATES,*
403 00:50:50:12 00:50:53:10 *THE MOST DRAMATIC EXAMPLE*
*OF DESERTIFICATION*
404 00:50:53:12 00:50:55:24 *OCCURRED ON*
*THE GREAT PLAINS.*
405 00:50:55:26 00:50:57:11 *THERE HAD ALWAYS BEEN*
406 00:50:57:13 00:51:00:09 *A VERY DELICATE ECOLOGICAL*
*BALANCE IN THIS REGION*
407 00:51:00:11 00:51:03:09 *BETWEEN THE VERY SLIGHT*
*RAINFALL*

408 00:51:03:11 00:51:06:13 *AND THE FRAGILE PLANT LIFE.*
409 00:51:06:15 00:51:10:25 *WHEN RANCHERS STARTED OVERGRAZING THE LAND*
410 00:51:10:27 00:51:13:22 *AND FARMERS BEGAN OVERWORKING THE SOIL,*
411 00:51:13:24 00:51:16:09 *THE SITUATION BECAME EXTREMELY DANGEROUS.*
412 00:51:19:14 00:51:23:24 *ALL IT TOOK WAS THE GREAT DROUGHT OF THE 1930s*
413 00:51:23:26 00:51:27:07 *TO TURN THE PLAINS INTO A RAGING DUST BOWL.*
414 00:51:31:10 00:51:34:13 *FORTUNATELY, THANKS TO CONSERVATION EFFORTS*
415 00:51:34:15 00:51:37:07 *AND A SERIES OF WET YEARS IN THE 1940s,*
416 00:51:37:09 00:51:39:07 *THE WHEAT LANDS OF THE GREAT PLAINS*
417 00:51:39:09 00:51:42:00 *WERE EVENTUALLY SAVED FROM BECOMING A DESERT.*
418 00:51:42:02 00:51:45:15 *IT REMAINS TO BE SEEN WHETHER THE RESULT OF MORE RECENT*
419 00:51:45:17 00:51:49:07 *AND EVEN MORE CATASTROPHIC DESERTIFICATION IN AFRICA*
420 00:51:49:09 00:51:50:27 *CAN EVER BE REVERSED.*
421 00:51:55:04 00:51:57:12 *THIS IS THE SAHEL--*
422 00:51:57:14 00:52:00:29 *A SEMI-ARID REGION TO THE SOUTH OF THE SAHARA DESERT.*
423 00:52:01:01 00:52:05:07 *IN THE 1960s, A SERIES OF ABNORMALLY RAINY YEARS*
424 00:52:05:09 00:52:07:22 *ENCOURAGED FARMERS TO EXPAND THEIR HERDS*
425 00:52:07:24 00:52:09:06 *AND GRAZING LANDS.*
426 00:52:12:08 00:52:14:17 *THEN IN THE EARLY 1970s,*
427 00:52:14:19 00:52:16:29 *THERE WAS A TERRIBLE DROUGHT.*
428 00:52:17:01 00:52:18:28 *THE PLANT LIFE OF THE REGION*
429 00:52:19:00 00:52:20:14 *WAS VIRTUALLY WIPED OUT.*
430 00:52:20:16 00:52:24:07 *SOME 40% OF THE CATTLE DIED.*
431 00:52:24:09 00:52:26:22 *BY THE 1980s, CONTINUING DROUGHT*
432 00:52:26:24 00:52:29:15 *HAD COMPLETELY DENUDED THE SOIL,*
433 00:52:29:17 00:52:31:22 *CREATING CHOKING DUST STORMS*
434 00:52:31:24 00:52:34:08 *AND MIGRATING DUNE FIELDS.*
435 00:52:35:25 00:52:39:06 *THE DESERT WAS CREEPING INTO FORMERLY VERDANT AREAS*
436 00:52:39:08 00:52:44:12 *AT AN AVERAGE RATE OF 10 TO 15 METERS A DAY,*
437 00:52:44:14 00:52:48:07 *DESTROYING THE LIVELIHOODS OF OVER 20 MILLION PEOPLE.*
438 00:52:52:27 00:52:56:20 *MORE THAN 100,000 STARVED TO DEATH.*
439 00:52:56:22 00:52:58:13 *THE SUFFERING WAS*

*PARTICULARLY ACUTE*

440 00:52:58:15 00:53:01:28 *IN ETHIOPIA AND THE SUDAN.*

441 00:53:02:00 00:53:06:06 *THE SAD IRONY IS*
*THAT MODERN TECHNOLOGY*

442 00:53:06:08 00:53:08:06 *HELPED TO*
*MAGNIFY THE DISASTER.*

443 00:53:10:07 00:53:11:20 *PRIOR TO THE DROUGHT,*

444 00:53:11:22 00:53:14:03 *DEEP WATER WELLS HAD*
*BEEN DRILLED IN THE SAHEL,*

445 00:53:14:05 00:53:16:28 *PROVIDING ABUNDANT*
*NEW SOURCES OF WATER*

446 00:53:17:00 00:53:19:01 *FOR LIVESTOCK AND HUMANS.*

447 00:53:19:03 00:53:21:24 *THIS STIMULATED AN*
*EXCESSIVELY LARGE MIGRATION*

448 00:53:21:26 00:53:23:10 *INTO THE AREA.*

449 00:53:23:12 00:53:25:15 *SO WHEN THE DROUGHT STRUCK,*

450 00:53:25:17 00:53:27:23 *THERE WAS EVEN*
*GREATER DEVASTATION.*

451 00:53:30:22 00:53:34:00 *NUMEROUS INTERNATIONAL PROGRAMS*
*ARE CURRENTLY UNDERWAY*

452 00:53:34:02 00:53:36:12 *TO TEACH PEOPLE*
*HOW TO GRAZE THEIR CATTLE*

453 00:53:36:14 00:53:38:23 *AND GROW THEIR CROPS*

454 00:53:38:25 00:53:43:04 *SO AS TO AVOID SIMILAR*
*DISASTERS IN THE FUTURE.*

455 00:53:43:06 00:53:46:03 THERE ARE A NUMBER
OF TECHNIQUES
BEING EMPLOYED

456 00:53:46:05 00:53:48:17 TO PREVENT
DESERTIFICATION.

457 00:53:48:19 00:53:50:18 WATER CONSERVATION
TECHNIQUES--

458 00:53:50:20 00:53:54:18 AGAIN, ONE OF
THE PRIMARY CAUSES
OF DESERTIFICATION

459 00:53:54:20 00:53:58:19 IS THE DEPLETION
OF GROUND WATER
RESERVES--

460 00:53:58:21 00:54:01:19 AND ALSO INTELLIGENT
FARMING TECHNIQUES.

461 00:54:01:21 00:54:05:18 FOR EXAMPLE, IF YOU
MOVE INTO AN AREA
AND DEFOREST IT,

462 00:54:05:20 00:54:08:18 REMOVE
THE VEGETATION
AND THEN PLOW IT,

463 00:54:08:20 00:54:11:18 PARTICULARLY
IN AN AREA
LIKE THE SUBTROPICS

464 00:54:11:20 00:54:13:19 WHERE YOU HAVE THE
PREVAILING WINDS,

465 00:54:13:21 00:54:15:03 YOU CAN LOSE
YOUR TOPSOIL.

466 00:54:15:05 00:54:16:20 SO INTELLIGENT
FARMING TECHNIQUES--

467 00:54:16:22 00:54:22:10 FOR EXAMPLE, THOSE

THAT DON'T REMOVE
ALL THE TREES,
468 00:54:22:12 00:54:25:03 THOSE THAT
DON'T NECESSARILY
PLOW THE GROUND
469 00:54:25:05 00:54:26:18 OR PLOW IT DEEPLY--
470 00:54:26:20 00:54:28:23 ARE BEING
TESTED IN AFRICA,
FOR EXAMPLE,
471 00:54:28:25 00:54:30:24 AND HAVE BEEN
QUITE SUCCESSFUL.
472 00:54:30:26 00:54:33:20 THE YIELD THE FIRST
SEVERAL YEARS
OF FARMING IS LESS,
473 00:54:33:22 00:54:35:21 BUT ON THE LONG RUN,
474 00:54:35:23 00:54:37:06 YOU DON'T
DESTROY THE SOIL.
475 00:54:37:08 00:54:39:01 YOU DON'T
REMOVE THE TOPSOIL.
476 00:54:39:03 00:54:41:01 YOU DON'T
POLLUTE THE STREAMS
477 00:54:41:03 00:54:44:19 FROM PESTICIDES
AND FERTILIZERS.
478 00:54:44:21 00:54:47:20 SO, THERE IS HOPE.
479 00:54:47:22 00:54:50:02 *WHILE HUMAN ACTIVITY*
*CAN INFLUENCE*
480 00:54:50:04 00:54:53:16 *THE EXPANSION OF ARID LANDS*
*ON A SHORT-TERM BASIS,*
481 00:54:53:18 00:54:56:16 *MORE POWERFUL GEOLOGICAL*
*FORCES ARE AT WORK*
482 00:54:56:18 00:54:58:15 *TO CHANGE*
*THE SHAPES OF DESERTS*
483 00:54:58:17 00:55:00:15 *OVER LONG PERIODS OF TIME.*
484 00:55:02:04 00:55:05:02 *GLOBAL CLIMATE CHANGES,*
*STILL POORLY UNDERSTOOD,*
485 00:55:05:04 00:55:08:02 *HAVE CAUSED THE EDGES*
*OF THE EARTH'S DESERTS*
486 00:55:08:04 00:55:10:07 *TO SHIFT BY*
*HUNDREDS OF KILOMETERS*
487 00:55:10:09 00:55:12:10 *OVER THE PAST*
*FEW MILLION YEARS.*
488 00:55:12:12 00:55:14:10 *18,000 YEARS AGO,*
*FOR EXAMPLE,*
489 00:55:14:12 00:55:18:00 *THE DESERTS OF AFRICA*
*WERE MUCH SMALLER*
490 00:55:18:02 00:55:19:20 *THAN THEY ARE TODAY.*
491 00:55:24:28 00:55:27:11 *BUT WHILE THE SIZE*
*OF THE WORLD'S DESERTS*
492 00:55:27:13 00:55:30:11 *HAS FLUCTUATED*
*THROUGHOUT HISTORY,*
493 00:55:30:13 00:55:32:25 *ONE FACTOR*
*HAS REMAINED CONSTANT--*
494 00:55:32:27 00:55:35:09 *DESERTS HAVE ALWAYS*
*BEEN REGARDED*
495 00:55:35:11 00:55:37:29 *AS HOSTILE,*
*EXTREME ENVIRONMENTS.*

496 00:55:38:01 00:55:39:29 *AS A RESULT,*
497 00:55:40:01 00:55:43:04 *WE HAVE TENDED TO OVERLOOK*
*THE GREAT BEAUTY, WONDER,*
498 00:55:43:06 00:55:46:03 *AND POTENTIAL VALUE*
*OF THESE UNIQUE REGIONS.*
499 00:55:48:16 00:55:51:14 THERE IS MORE TO THE DESERT
THAN GEOLOGIC PROCESSES.
500 00:55:51:16 00:55:53:04 DESERTS HAVE
A SURREAL QUALITY
501 00:55:53:06 00:55:54:28 THAT HAS CAPTURED
THE HUMAN IMAGINATION
502 00:55:55:00 00:55:56:13 THROUGHOUT THE AGES.
503 00:55:56:15 00:55:58:00 PERHAPS THIS
IS BECAUSE DESERTS
504 00:55:58:02 00:56:00:15 ARE PLACES OF EXTREMES,
OF CONTRAST.
505 00:56:00:17 00:56:02:15 THIS STARK, SEEMINGLY
LIFELESS EXPANSE
506 00:56:02:17 00:56:04:29 OF BARE ROCK AND SAND
507 00:56:05:01 00:56:08:14 IS ACTUALLY HOME TO A RICH
ASSEMBLAGE OF LIFE FORMS.
508 00:56:08:16 00:56:11:28 THE BLINDING WHITE
OF DUNE SAND AND PLAYA SALT
509 00:56:12:00 00:56:14:14 STANDS IN SHARP CONTRAST
TO ROCK SURFACES
510 00:56:14:16 00:56:16:03 BLACKENED BY DESERT VARNISH.
511 00:56:16:05 00:56:18:14 THE SEARING,
HOT DESERT DAY
512 00:56:18:16 00:56:20:14 IS FOLLOWED BY
THE REFRESHINGLY COOL,
513 00:56:20:16 00:56:21:28 SOMETIMES FRIGID,
DESERT NIGHT.
514 00:56:22:00 00:56:23:29 BUT IN SPITE OF THE FACT
515 00:56:24:01 00:56:25:28 THAT THE DESERT
IS A HARSH ENVIRONMENT,
516 00:56:26:00 00:56:27:18 IT'S ALSO A FRAGILE ONE.
517 00:56:27:20 00:56:29:03 IT DESERVES OUR RESPECT.
518 00:56:29:05 00:56:32:16 BUT IN RETURN, WE
AND THOSE WHO FOLLOW US
519 00:56:32:18 00:56:35:28 CAN CONTINUE TO ENJOY
ITS BECKONING VISTAS,
520 00:56:36:00 00:56:37:27 ITS CLEAN
AND RUGGED BEAUTY,
521 00:56:37:29 00:56:39:12 AND ITS DIVERSE ASSEMBLAGE
522 00:56:39:14 00:56:41:12 OF LIFE FORMS
AND LAND FORMS
523 00:56:41:14 00:56:43:27 UNTIL THE CLIMATE PENDULUM
SWINGS BACK
524 00:56:43:29 00:56:45:12 AND TRANSFORMS THE DESERT
525 00:56:45:14 00:56:49:15 INTO LAKE OR GRASSLAND
OR FOREST ONCE AGAIN.
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