

(cartoon image)

Water in the Desert – southern Morocco

1. (cartoon)
2. Water in the Desert – southern Morocco
3. INTRODUCTION
4. **Water is life.**
5. **This is true in Arizona.**
6. **This is true in Mexico.**
7. **This is true in southern Mexico.**
8. Before we go any further, think about the activity you completed on water priorities. What was essential to you? What was important? What did you rank as completely optional?
9. Think of all the ways you get and use water during the day. One of the most obvious ways, and one which certainly makes our lives more pleasant, is that we can get and drink water whenever we want.
10. While it is extremely easy for us to get a drink of water whenever we want one, this is not true in many parts of the world, including southern Morocco.
11. FINDING WATER
12. Before we take our visual journey through southern Morocco, you need to learn how to look for signs of water in the desert. What stands out to you in this picture.
13. Almost always, when you see bright green, broadleaved trees somewhere in the desert, it means there is water. There might be a small spring or stream nearby, or underground water.
14. For those of us that live in the desert, usually we have to be a bit like detectives to figure out where there might be water. If you want to know where water is, look for low places where there is a greater amount of green plants.
15. This picture was taken in the Sonoran Desert of Tucson, Arizona. The light green in the foreground of this picture is clearly different from the surrounding desert. It indicates that there is either water on the surface or close to the surface. Otherwise, that kind of broadleaved tree wouldn't be able to survive in the desert.
16. -----
17. Can you tell where the riparian area is in this picture?
18. So you have learned that light green trees in dry areas is a sign that water is present, and looked at a few different examples of riparian areas in American deserts. You are ready to travel to southern morocco to learn a little more about water in the desert.
19. **You are ready to go to Morocco.**
20. THE SAND DESERT

21. **The first place we will visit is the sandy part of the Sahara Desert. This is the Sahara Desert we see in the movies.**
22. **Morocco is at the northwestern edge of the Sahara Desert.**
23. **When people image the Sahara...**
24. **...they usually picture dune fields.**
25. **This is Erg Chebbi, a dune field at the southeastern edge of Morocco.**
26. *(map)*
27. **What do you think it would feel like to ride in the sand dunes of the Sahara at sunset.**
28. **As far as you can look in any direction, there is nothing to see but waves of sand.**
29. Tourists ride into the dune fields at sunset.
30. *(image)*
31. Tourists leave the dune fields shortly after sunrise.
32. **They don't ride into the dune fields during the day, nor do they stay there. Why?**
33. **If you guessed that tourists visit the dune fields at sunrise and sunset because the daytime heat is too intense, you are correct!**
34. In addition to the heat and lack of water, there is another barrier to human survival in the desert.
35. **Camels have some natural protection against this threat, but people do not.**
36. *(image)*
37. **So, in addition to protection from the heat, why else are tents essential for humans to survive in the desert?**
38. **Any guesses now about why shelter is essential for people in southern Morocco?**
39. **Tents provide important shelter during sandstorms.**
40. Occasionally, there is water at Erg Chebbi because it is at the **edge of the dune field.**
41. Despite what you may have seen on TV or in the movies, very, very few people live in the dune fields. Why do you think that is?
42. **People cannot live without water. The sand dunes do not have water.**
43. So, people didn't live in the heart of the dune fields in the past, and they don't live there now.
44. Most of the Sahara is actually **rock desert**, not sand.
45. **Sand dunes, such as those of Erg Chebbi, make up 10% of the Sahara Desert.**
46. **The remaining 90% is what is known as hamada, which simply means rock desert.**
47. ROCK DESERT: HAMADA
48. **This rock desert is where people live.**
49. Imagine travelling through the hamada.
50. Do you see any Circle K's?
51. WATER AND SURVIVAL

52. If it is over 100 degrees out, and a person doesn't have any water, some sources say they will survive less than 3 days.
53. When the temperature rises to 130 degrees, some sources say a person couldn't live for more than a day without water.
54. This picture was taken from an air-conditioned car that was probably no hotter than 90 degrees. We were driving down a one-lane dirt road far from any city or town when we saw these women walk by. Can you see what they're carrying?
55. Southern Morocco is in many ways a difficult place to live.
56. RAINFALL AND TEMPERATURE
57. In the summer of 2010, the temperature in Tucson, Arizona reached about 110 degrees Fahrenheit. In the summer of 2010, the temperature in southern Morocco reached to over 130 degrees Fahrenheit.
58. **Look at the amount of rain indicated by the two lightest colors on this key.**
59. As you can see, most of southern Morocco receives between 0 and 3.9 inches of rain each year. The pink arrow shows one of the cities in southern Morocco, Ouarzazete, and the yellow area shows the dune fields of Erg Chebbi.
60. Now we will briefly look at human settlement patterns in relation to water.
61. HUMANS AND WATER IN THE DESERT
62. **Throughout history, humans have settled by water. It is fascinating looking for evidence of this in this desert.**
63. **There is evidence that pre-historic people lived by water throughout what is now southern Morocco.**
64. **Would you ever guess that this used to be a wet enough place to support a diverse large-malla population?**
65. **Petroglyphs left behind by people who lived here over 5,000 years ago provide evidence that this did indeed used to be a wetter place.**
66. (image)
67. (giraffe)
68. (elephant)
69. **Humans from historic times have also consistently settled by water.**
70. **For example, there are the remains of a very old Jewish village.**
71. This is a Kasbah. Kasbahs were built on hills overlooking oasis villages. The wealthy family in charge of a Kasbah would have over 100 people living there. The way to think of it was that it was a bit like a castle.
72. Moroccan houses were built with a central courtyard to let in light, with the rest of the room being built low and dark to allow for the cooling effect of the stucco walls.
73. ---
74. Modern cities and villages in southern Morocco are also built close to water.

75. This city is built along the green ribbon of an oasis.
76. This small village is built near an oasis.
77. Here is another modern town by an oasis.
78. **Many oases in southern Morocco are diminishing in size.**
79. **This restaurant is located at the far end of an oasis that is drying out.**
80. Now we're going to come back to the personal level and think about how we as individual people use water.
81. INDIVIDUAL WATER USE
82. On a hot summer day in Tucson, Arizona, what do you think people do to cool off?
83. On a hot summer day in southern Morocco, in a house that does not have air-conditioning, or a swimming pool, and very often may not have running water, people stay inside on hot summer days, because it is at least 10 degrees cooler in the shade than it is in the sun.
84. In the United States we also use water to take care of our pets...
85. ...and show animals.
86. **In southern Morocco, only a few people have pets. These boys are washing their pony, an animal that will work for their family. When people don't have cars, they use ponies and donkeys to transport themselves, and fruit, and vegetables, and grains, and materials for building houses, and other things, from one place to another.**
87. WATER USE AT SCHOOLS
88. Now think about how you use water at school.
89. **How long do you go after recess before getting a drink of water? One minute? Five minutes? Ten minutes?**
90. What if your classroom didn't have a water fountain?
91. What if there wasn't a water fountain at your entire school?
92. What if there were no sinks?
93. What if there was no running water at your school at all?
94. This small village school in southern Morocco does not have any running water.
95. The school does not have the money to buy water right from the village behind the oasis, and the village cannot afford to donate the scarce resource.
96. So how do you think the children and the teachers at this school get something to drink?
97. -(image)
98. **The students get their drinking water from this spring.**
99. There are interesting toads in this tiny spring.
100. Animal tracks show that goats also sometimes drink from the spring.
101. **As this school doesn't have running water, this means that it does not have bathrooms.**

102. **While your first instinct may be to laugh, if you had to live that way for even a week, it would not seem funny to you at all.**
103. **The lack of bathrooms is one of the reasons that many of the girls drop out of school at about the age of 12.**
104. Not all schools in southern Morocco are without running water? This is the drinking fountain for students at another small village school.
105. GETTING A DRINK
106. Think of all the different ways you can get a drink of water, or something else, if you need it. I'll bet you can think of at least 5, right off the top of your head.
107. Before plastic was created, people in Morocco would carry water home from the spring in heavy ceramic- potter- jugs. They would store the jugs in racks like the one shown here, at a Zawaya, which is a religious brotherhood.
108. Many people still get their water from local springs or streams in the oases. The difference is that they can now carry it home in plastic.
109. While there are many environmental downsides to plastic, it is far lighter to carry on a long, hot walk back from a well than a ceramic or glass jug.
110. This clean pool of water in a healthy oasis is an example of the kind of place people might go to collect water for drinking, bathing, cooking, or washing.
111. Often, people need to get their water from wells, as most streams in southern Morocco are intermittent streams. An example of an intermittent stream is seen here.
112. **An intermittent stream has water sometimes, but not all the time.** In dry years, an intermittent stream may have no water at all.
113. **Here's another intermittent stream in southern Morocco.** In the desert southwest of the United States, we usually call intermittent streams washes or arroyos. Sometimes my students just call them a ditch.
114. This is an example of an intermittent stream in Mexico, about an hour's drive from Arizona.
115. SOCIETAL WATER USE
116. Now, instead of just thinking about things on an individual level – what you think, what your friend thinks, that your teacher thinks, what I think –
117. We're going to think for a minute about societal uses of water – how large groups of people use water.
118. Until recently, 50 years ago or less, the people who couldn't get their water from rivers or small pools in an oasis got their water from small wells.
119. **This is an example of a complicated line of wells that used to bring water from the base of far away mountains to the crops in an oasis.**
120. This is an example of a line of the wells. People used to have to climb 25 feet down into these wells and crawl along the tunnels between entrance points to clear out

cave-ins and other debris. It was dangerous and hard work. The people doing this job got few benefits from it. The majority of the water went to wealthy landowners. One benefit of this system was that the water was deep enough underground and the complexity of the system also kept the water use in the oasis at the sustainable level.

121. (image)

122. Warm temperatures and sunshine are great for growing crops, in both southern Morocco and other really dry places in the world, the problem is, they need a lot of water.

123. This pump is bringing up water to fill the tank you just saw, and the water is being used to grow grapes, date palm, and henna.

124. This is a satellite image of Ouarzazete in southern Morocco. The brown indicates very, very dry land, and you can see where the pink arrow is, there's an enormous lake there. How could there be an enormous lake in a desert that receives less than 4 inches of rain a year?

125. Here we've zoomed in a little closer, and again, notice how very, very dry it is, and the only green extends along what might be a river, though it's difficult to see any water in it. So again, how did this lake get here?

126. (image)

127. Here is a satellite image of a similar mystery lake in Arizona. Just like the lake in Ouarzazete, Morocco, this lake near Page, Arizona is surrounded by brown, dry desert.

128. Both the Moroccan lake and the American lake are human-made. They were created when great rivers in both those countries were dammed to provide lakes that could then provide hydroelectric power. The damming of rivers is very complex, and has a very complicated series of effects on the environment.

129. ACCESS

130. In the United States, 98% of people have access to running water. In Morocco, the number is far smaller. Access is a real issue. People living in the same town, or the same city, may not have equal access to water. A few examples follow.

131. Many people do not have running water in this village. The family that I stayed with had a large tank of water delivered for us all to use. This is typical of the kind of generosity we saw throughout the country.

132. Often access to water is not equally shared. This neighborhood near the Kasbah in Ouarzazete does not always have running water.

133. Though these people can usually buy some water at a store, or access a public pump somewhere.

134. This neighborhood in Ouarzazete is less than a ten minute drive from the one you just saw. They do have running water.

135. CONCLUSION

- 136.** Hopefully this very short trip to look at life in the desert of southern Morocco has given you a different perspective on both water issues and your day to day life.
- 137.** Just as these children's drawings provide varied perspectives on how they see their community, so will you have many ideas on how to solve water issues facing both people and environment. Morocco was used as an example, but these problems are very present in all nations of the world. They can be more hidden in wealthy nations like the United States, but the issues are still here.
- 138.** (blank slide) (THE END)
Brief slideshow of assorted images of Morocco follows