tpo_3_passage_2

The vast grasslands of the High Plains in the central United States were settled by farmers and ranchers in the 1880s. This region has a semiarid climate, and for 50 years after its settlement, it supported a low-intensity agricultural economy of cattle ranching and wheat farming. In the early twentieth century, however, it was discovered that much of the High Plains was underlain by a huge aquifer (a rock layer containing large quantities of groundwater). This aquifer was named the Ogallala aquifer after the Ogallala Sioux Indians, who once inhabited the region. The Ogallala aquifer is a sandstone formation that underlies some 583,000 square kilometers of land extending from northwestern Texas to southern South Dakota. Water from rains and melting snows has been accumulating in the Ogallala for the past 30,000 years. Estimates indicate that the aquifer contains enough water to fill Lake Huron, but unfortunately, under the semiarid climatic conditions that presently exist in the region, rates of addition to the aquifer are minimal, amounting to about half a centimeter a year. The first wells were drilled into the Ogallala during the drought years of the early 1930s. The ensuing rapid expansion of irrigation agriculture, especially from the 1950s onward, transformed the economy of the region. More than 100,000 wells now tap the Ogallala. Modern irrigation devices, each capable of spraying 4.5 million liters of water a day, have produced a landscape dominated by geometric patterns of circular green islands of crops. Ogallala water has enabled the High Plains region to supply significant amounts of the cotton, sorghum, wheat, and corn grown in the United States. In addition, 40 percent of American grain-fed beef cattle are fattened here. This unprecedented development of a finite groundwater resource with an almost negligible natural recharge rate-that is,virtually no natural water source to replenish the water supply-has caused water tables in the region to fall drastically. In the 1930s, wells encountered plentiful water at a depth of about 15 meters; currently, they must be dug to depths of 45 to 60 meters or more. In places, the water table is declining at a rate of a meter a year, necessitating the periodic deepening of wells and the use of ever-more-powerful pumps. It is estimated that at current withdrawal rates, much of the aquifer will run dry within 40 years. The situation is most critical in Texas, where the climate is driest, the greatest amount of water is being pumped, and the aquifer contains the least water. It is projected that the remaining Ogallala water will, by the year 2030, support only 35 to 40 percent of the irrigated acreage in Texas that is supported in 1980. The reaction of farmers to the inevitable depletion of the Ogallala varies. Many have been attempting to conserve water by irrigating less frequently or by switching to crops that require less water. Others, however, have adopted the philosophy that it is best to use the water while it is still economically profitable to do so and to concentrate on high-value crops such as cotton. The incentive of the farmers who wish to conserve water is reduced by their knowledge that many of their neighbors are profiting by using great amounts of water, and in the process are drawing down the entire region's water supplies. In the face of the upcoming water supply crisis, a number of grandiose schemes have been developed to transport vast quantities of water by canal or pipeline from the Mississippi, the Missouri, or the Arkansas rivers. Unfortunately, the cost of water obtained through any of these schemes would increase pumping costs at least tenfold, making the cost of irrigated agricultural products from the region uncompetitive on the national and international markets. Somewhat more promising have been recent experiments for releasing capillary water (water in the soil) above the water table by injecting compressed air into the ground. Even

if this process proves successful, however, it would almost triple water costs. Genetic engineering also may provide a partial solution, as new strains of drought-resistant crops continue to be developed. Whatever the final answer to the water crisis may be, it is evident that within the High Plains, irrigation water will never again be the abundant, inexpensive resource it was during the agricultural boom years of the mid-twentieth century.

question 1

According to paragraph 1, which of the following statements about the High Plains is true?

A Until farmers and ranchers settled there in the 1880s, the High Plains had never been inhabited.

B The climate of the High Plains is characterized by higher-than-average temperatures.

C The large aquifer that lies underneath the High Plains was discovered by the Ogallala Sioux Indians.

D Before the early 1900's there was only a small amount of farming and ranching in the High Plains.

question 2

According to paragraph 2, all of the following statements about the Ogallala aquifer are true EXCEPT:

A The aquifer stretches from South Dakota to Texas.

B The aquifer' s water comes from underground springs.

C Water has been gathering in the aquifer for 30,000 years.

D The aquifer' s water is stored in a layer of sandstone.

question 3

Which of the sentences below best expresses the essential information in the highlighted sentence in the passage? Incorrect choices change the meaning in important ways or leave out essential information.

A Despite the current impressive size of the Ogallala aquifer, the region' s climate keeps the rates of water addition very small.

B Although the aquifer has been adding water at the rate of only half a centimeter a year, it will eventually accumulate enough water of fill Lake Huron.

C Because of the region' s present climatic conditions, water is being added each year to the aquifer.

D Even when the region experiences unfortunate climatic conditions, the rates of addition of water continue to increase.

question 4

In paragraph 3, why does the author provide the information that 40 percent of American cattle are fattened in the High Plains?

A To suggest that crop cultivation is not the most important part of the economy of the High Plains

B To indicate that not all economic activity in the High Plains is dependent on irrigation

C To provide another example of how water from the Ogallala has transformed the economy of the High Plains

D To contrast cattle-fattening practices in the High Plains with those used in other region of the United States

question 5

According to paragraph 4, all of following are consequences of the heavy use of the Ogallala aquifer for irrigation EXCEPT:

A The recharge rate of the aquifer is decreasing.

B Water tables in the region are becoming increasingly lower.

C Wells now have to be dug to much greater depths than before.

D Increasingly powerful pumps are needed to draw water from the aquifer.

question 6

According to paragraph 4, compared with all other states that use Ogallala water for irrigation, Texas

A has the greatest amount of farmland being irrigated with Ogallala water

B contains the largest amount of Ogallala water underneath the soil

C is expected to face the worst water supply crisis as the Ogallala runs dry

D uses the least amount of Ogallala water for its irrigation needs

question 7

Paragraph 5 mentions which of the following as a source of difficulty for some farmers who try to conserve water?

A Crops that do not need much water are difficult to grow in the High Plains.

B Farmers who grow crops that need a lot of water make higher profits.

C Irrigating less frequently often leads to crop failure.

D Few farmers are convinced that the aquifer will eventually run dry.

question 8

According to paragraph 6, what is the main disadvantage of the proposed plans to transport river water to the High Plains?

A The rivers cannot supply sufficient water for the farmer’ s needs.

B Increased irrigation costs would make the products too expensive.

C The costs of using capillary water for irrigation will increase.

D Farmers will be forced to switch to genetically engineered crops.

question 9

Look at the four squares [ ] that indicate where the following sentence could be added to the passage. Where would the sentence best fit?

The vast grasslands of the High Plains in the central United States were settled by farmers and ranchers in the 1880s. This region has a semiarid climate, and for 50 years after its settlement, it supported a low-intensity agricultural economy of cattle ranching and wheat farming. In the early twentieth century, however, it was discovered that much of the High Plains was underlain by a huge aquifer (a rock layer containing large quantities of groundwater). This aquifer was named the Ogallala aquifer after the Ogallala Sioux Indians, who once inhabited the region. The Ogallala aquifer is a sandstone formation that underlies some 583,000 square kilometers of land extending from northwestern Texas to southern South Dakota. Water from rains and melting snows has been accumulating in the Ogallala for the past 30,000 years. Estimates indicate that the aquifer contains enough water to fill Lake Huron, but unfortunately, under the semiarid climatic conditions that presently exist in the region, rates of addition to the aquifer are minimal, amounting to about half a centimeter a year. The first wells were drilled into the Ogallala during the drought years of the early 1930s. The ensuing rapid expansion of irrigation agriculture, especially from the 1950s onward, transformed the economy of the region. More than 100,000 wells now tap the Ogallala. Modern irrigation devices, each capable of spraying 4.5 million liters of water a day, have produced a landscape dominated by geometric patterns of circular green islands of crops. Ogallala water has enabled the High Plains region to supply significant amounts of the cotton, sorghum, wheat, and corn grown in the United States. In addition, 40 percent of American grain-fed beef cattle are fattened here. This unprecedented development of a finite groundwater resource with an almost negligible natural recharge rate-that is,virtually no natural water source to replenish the water supply-has caused water tables in the region to fall drastically. In the 1930s, wells encountered plentiful water at a depth of about 15 meters; currently, they must be dug to depths of 45 to 60 meters or more. In places, the water table is declining at a rate of a meter a year, necessitating the periodic deepening of wells and the use of ever-more-powerful pumps. It is estimated that at current withdrawal rates, much of the aquifer will run dry within 40 years. The situation is most critical in Texas, where the climate is driest, the greatest amount of water is being pumped, and the aquifer contains the least water. It is projected that the remaining Ogallala water will, by the year 2030, support only 35 to 40 percent of the irrigated acreage in Texas that is supported in 1980. The reaction of farmers to the inevitable depletion of the Ogallala varies. Many have been attempting to conserve water by irrigating less frequently or by switching to crops that require less water. [] Others, however, have adopted the philosophy that it is best to use the water while it is still economically profitable to do so and to concentrate on high-value crops such as cotton. [] The incentive of the farmers who wish to conserve water is reduced by their knowledge that many of their neighbors are profiting by using great amounts of water, and in the process are drawing down the entire region's water supplies. [] In the face of the upcoming water supply crisis, a number of grandiose schemes have been developed to transport vast quantities of water by canal or pipeline from the Mississippi, the Missouri, or the Arkansas rivers. [] Unfortunately, the cost of water obtained through any of these schemes would increase pumping costs at least tenfold, making the cost of irrigated agricultural products from the region uncompetitive on the national and international markets. Somewhat more promising have been recent experiments for releasing capillary water (water in the soil) above the water table by injecting compressed air into the ground. Even if this process proves successful, however, it would almost triple water costs. Genetic engineering also may provide a partial solution, as new strains of drought-resistant crops continue to be developed. Whatever the final answer to

the water crisis may be, it is evident that within the High Plains, irrigation water will never again be the abundant, inexpensive resource it was during the agricultural boom years of the mid-twentieth century.

question 10

Directions: An introductory sentence for a brief summary of the passage is provided below. Complete the summary by selecting the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. This question is worth 2 points.

A. The use of the Ogallala for irrigation has allowed the High Plains to become one of the most productive agricultural regions in the United States.

B. Given the aquifer' s low recharge rate, its use for irrigation is causing water tables to drop and will eventually lead to its depletion.

C. Releasing capillary water and introducing drought-resistant crops are less-promising solutions to the water supply crisis than bringing in river water

D. The periodic deepening of wells and the use of more-powerful pumps would help increase the natural recharge rate of the Ogallala.

E. In Texas, a great deal of attention is being paid to genetic engineering because it is there that the most critical situation exists.

F. Several solutions to the upcoming water supply crisis have been proposed, but none of them promises to keep the costs of irrigation low.