

SURVIVING WINTER IN THE DUST BOWL (FOOD CHAINS AND TROPHIC LEVELS) 9

In the 1930s, the states of Kansas, Oklahoma, Colorado, and Texas suffered from a severe drought that lasted for almost a decade. Many farmers struggled because of lack of rain, high temperatures, and high winds. These conditions were made even worse by frequent insect infestations and huge dust storms (see Figure 9.1). The dust storms were so bad and happened so often that these states came to be known as the dust bowl. The farmers who stayed on their land were forced to make difficult choices in order to survive in the face of these hardships (see Figure 9.2).

Figure 9.1. A Dust Storm Approaches Stratford, Texas, in 1935



Figure 9.2. A Farmer and His Sons Walking in the Face of a Dust Storm in Cimarron County, Oklahoma



Imagine that you and the other members of your group are a family of wheat farmers living in Oklahoma, and it is October 15, 1934. It was a very dry year (less than 10 inches of rain fell from January 1, 1934 to October 1, 1934, compared to the average of approximately 42 inches per year), and your crops did not grow well. You and your family planted spring wheat in April and harvested the crop in mid-September. Unfortunately, you were only able to harvest 500 bushels of wheat (1 bushel = 60 pounds), which is much less than 2,800 bushels that you were expecting to harvest (you planted 80 acres of wheat, and you normally are able to harvest 30 to 35 bushels per acre). You only have 500 gallons of potable water left, and you have no way of knowing when it will rain again. You also have a female jersey cow and male bull on your farm, both of which need food and water in order to survive.

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You and the rest of your family decided to use the last of your savings in September to buy the seed and equipment needed to plant a crop of winter wheat. You won't be able to harvest the crop of winter wheat, however, until June (assuming that it grows at all). You therefore need a plan to make sure you and the rest of your family have the food you need to make it through the winter. You have several options:

- Eat the bull. Keep the cow alive but don't feed it. Drink the cow's milk. Eat the cow when the milk production ceases, and then eat the wheat.
- Eat the bull. Keep the cow alive, feed it, and drink the milk. Eat the rest of the wheat.
- Share the wheat with the bull and cow, and keep them alive until the wheat runs out. Then eat the bull and the cow.
- Eat the bull and the cow, and then eat the wheat.

Given all these options (and there are many others), you might be wondering: **What should your group do in order to survive the winter?**

With your group, develop a claim that best answers this research question. Once your group has developed your claim, prepare a whiteboard that you can use to share and justify your ideas. Your whiteboard should include all the information shown in Figure 9.3.

To share your work with others, we will be using a round-robin format. This means that one member of the group will stay at your workstation to share your group's ideas while the other group members go to the other groups one at a time in order to listen to and critique the arguments developed by your classmates.

Remember, as you critique the work of others, you need to decide if their conclusions are valid or acceptable based on the quality of their claim and how well they are able to support their ideas. In other words, you need to determine if their argument is *convincing* or not. One way to determine if their argument is convincing is to ask them some of the following questions:

- How did you analyze or interpret your data? Why did you decide to do it that way?

Figure 9.3. Components of the Whiteboard

The whiteboard template consists of a large outer rectangle containing four smaller rectangular boxes. The top box is labeled 'The Research Question:'. The second box is labeled 'Your Claim:'. The bottom row contains two boxes side-by-side: 'Your Evidence:' on the left and 'Your Justification of the Evidence:' on the right.

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- How do you know that your analysis of the data is free from errors?
- Why does your evidence support your claim?
- Why did you decide to use that evidence? Why is your evidence important?
- How does your justification of the evidence fit with accepted scientific ideas?
- What are some of the other claims your group discussed before agreeing on your claim, and why did you reject them?

Information About Nutritional Values and Dietary Needs

Table 9.1. Dietary Needs

Organism	Weight (Pounds)	Calories (Consumed/Day)	Water Intake (Gallons/Day)	Protein (% of Diet)	Carbohydrate (% of Diet)	Fat (% of Diet)
Human Female*	120–180	1200	0.4	10–35	45–65	20–35
Human Male*	150–200	1800	0.4	10–35	45–65	20–35
Female Cow Lactating**	800–1000	44,000	50	10–20	70–80	10–20
Female Cow Dry	800–1000	30,500	40	10–20	70–80	10–20
Bull (Male Cow)	1000–1200	46,000	45	10–20	70–80	10–20

*Humans can survive without food for 4–8 weeks with a minimal activity level (although this is *not* recommended as serious side effects result). However, humans cannot survive more than 3–5 days without potable water.

** A lactating cow produces approximately 6 gallons of milk per day (1 gallon = 128 ounces, 1 ounce of milk = 28.6 grams of milk).

Table 9.2. Nutritional Information

Food	Serving Size (in grams*)	Calories Per Serving	Total Protein (in grams)	Total Carbohydrates (in grams)	Total Fat (in grams)
Wheat	100	339.0	13.7	72.6	1.9
Cow**	453.6	662.0	95.8	0	161.0
Milk	100	497	26.3	38.4	26.7

* 453.6 grams = 1 pound

** Only 41% of a cow's total weight is consumable.

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Name _____ Date _____

SURVIVING WINTER IN THE DUST BOWL: What Is Your Argument?

In the space below, write an argument in order to persuade another biologist that your claim is valid and acceptable. As you write your argument, remember to do the following:

- State the claim you are trying to support
- Include a sufficient amount of genuine evidence
- Provide a justification of your evidence that explains why the evidence is important and relevant by linking it a specific concept, principle, or an underlying assumption
- Organize your paper in a way that enhances readability
- Use a broad range of words including vocabulary that we have learned
- Make sure your writing has an easy flow and rhythm
- Correct grammar, punctuation, and spelling errors