Name _____ Period _____ Date _____

BUOI 1: Ecology Unit Unpacked

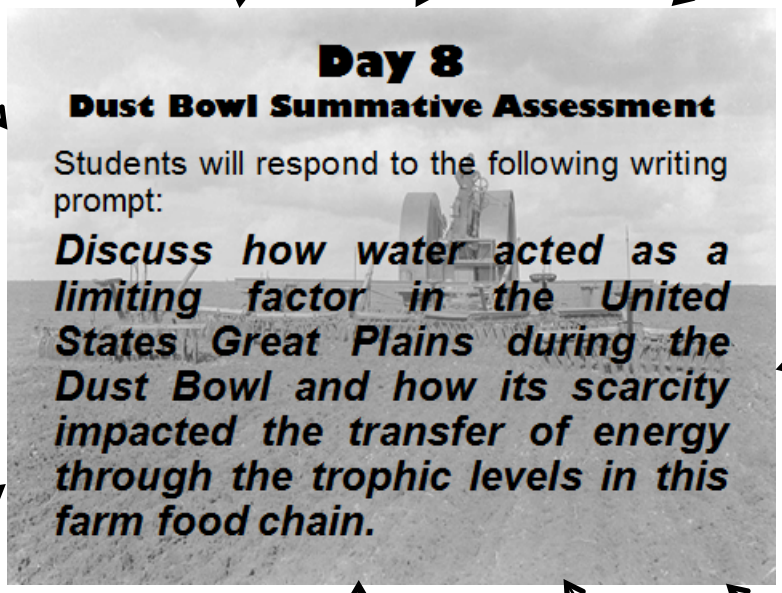
On a scale of 1-5 rate your level of understanding for each statement.

A reduction in organisms in a trophic level has impacts on organisms in other trophic levels.

Both environmental and human factors contributed to the Dust Bowl.

How the Dust Bowl impacted policy decisions in its aftermath.

One's diet should consist of a balance of macromolecules: carbohydrates, lipids (fats), and proteins.



These biological macromolecules are essential for the proper function of the human body.

Available energy decreases by 90% as you move from the first trophic level to subsequent levels.

The United States Great Plains is considered to be a temperate grassland biome, whose communities have reached climax.

Water is the limiting factor that should drive the management decisions in this scenario.

The climatic conditions and farming practices during the Dust Bowl generated a disturbance in ecological communities, which resulted in secondary succession.

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

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

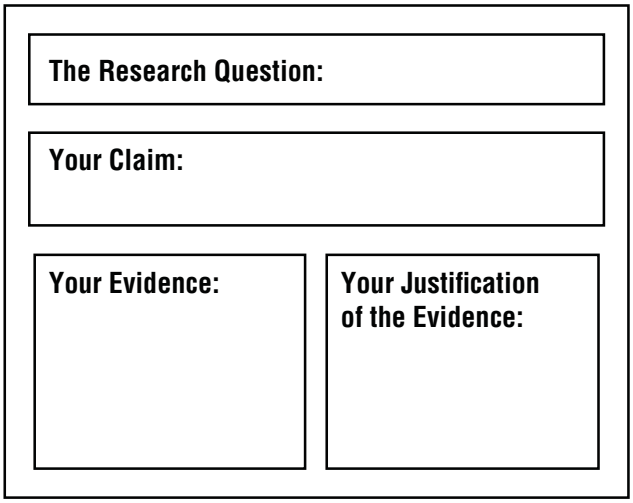
Imagine that you and the other members of your group are a family of wheat farmers living in Oklahoma, and it is October 15, 1934. It was a very dry year (less than 10 inches of rain fell from January 1, 1934 to October 1, 1934, compared to the average of approximately 42 inches per year), and your crops 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.

9 SURVIVING WINTER IN THE DUST BOWL

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.

Figure 9.3. Components of the Whiteboard



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?

- 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.

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

The Research Question: What should your family do to survive the winter?

My Claim:

Our Evidence:

Our Justification of the Evidence:

Dust Bowl Reflection and Some Just in Time Teaching

1. After reading the article, ***The Dust Bowl***, discuss how human practices affected the sustainability of wheat crops and contributed to the Dust Bowl.

2. After reading the article, ***The Dust Bowl***, discuss how United States policy decisions were shaped by lessons learned during the Dust Bowl.

3. Sketch the food chain(s) from “Surviving Winter in the Dust Bowl.”

4. As you analyze the food chain(s) above, identify the limiting factor that most influenced your management decisions and explain your rationale.

Dust Bowl Reflection and Some Just in Time Teaching

5. After completing the supplementary activity, “Food Chain—Gizmo Data Set and CEJ Questions & Template,” explain why the loss of organisms in the first trophic level is particularly devastating to a food chain/web and ecosystem.

6. After reading ***The Right Mix of Carbs, Proteins, and Fats***, and analyzing your resource management plan, what nutritional deficits and health concerns might your family face?

After reviewing the diagrams on succession, photographs of the United States Great Plains during the Dust Bowl & today, and the text, “Interesting Facts About Temperate Grasslands,” answer the following questions:

7. What type of succession has occurred in the United States Great Plains since the Dust Bowl? Cite textual evidence to support your response.

Dust Bowl Reflection and Some Just in Time Teaching

8. A biome is a complex biotic community characterized by distinctive plant and animal species maintained under the climatic conditions of the region, which has developed to climax. A temperate grassland, such as the United States Great Plains, is considered to be a biome. What accounts for the discrepancy in the climax community described in the diagrams of succession and the one that exists presently in the Great Plains? Cite textual evidence to support your response.

9. After completing the supplementary activity, “Rabbit Population By Season Gizmo Data Set and CEJ Questions & Template,” discuss a scenario that might result in the community the rabbits live in to undergo secondary succession.

The Dust Bowl

1 And then the dispossessed were drawn west — from Kansas, Oklahoma, Texas, New Mexico; from Nevada and Arkansas, families, tribes, dusted out, tractored out. Car-loads, caravans, homeless and hungry; twenty thousand and fifty thousand and a hundred thousand and two hundred thousand. They streamed over the mountains, hungry and restless — restless as ants, scurrying to find work to do — to lift, to push, to pull, to pick, to cut — anything, any burden to bear, for food. The kids are hungry. We got no place to live. Like ants scurrying — John Steinbeck. *The Grapes of Wrath*, 1939

A promised land

2 When pioneers began to migrate across the country in the middle of the 19th century, they were in search of ideal farmland. What they saw, in the vast expanse of prairie in the Midwest, was a promised land. The grass that covered the plains stood six feet high and stretched all the way from Canada south to Texas. Homesteaders flocked to the grasslands, certain that they had found the richest soil in the world and the ideal place to settle down. Men began to clear the land — using the endless prairie to grow wheat, and the trees to build houses, barns and outbuildings.

3 What was unknown to these early pioneers was that the grass and trees was that the grass of the plains essentially nourished and held the soil in place with their tough roots. When they were gone, the moisture that would have gone to the roots ran off into creeks, streams and rivers — basically carrying the land with it. The scene was set for the Dust Bowl.

4

In 1930, there was no better place to be a farmer than in the Southern Plains, where men and women had turned untamed prairie into one of the most prosperous regions in the whole country. The rest of the nation was struggling with the initial effects of the Great Depression, but in wheat country, farmers were reaping a record-breaking crop.

5 With the onset of World War I, the demand for wheat had been astonishing. Farmers were paid record prices. Thus, to the farmer, it made sense to turn every inch of the Southern Plains into profit. During the war, the land produced millions and millions of bushels of wheat and corn, which helped to feed America as well as numerous nations overseas.

6 The farming practices that made the plains so productive were beginning to take a toll on the land. The grasslands had been deeply plowed and planted. During the years when there was adequate rainfall, the land produced bountiful crops. However, as a drought that started in the early 1930s persisted, the farmers kept plowing and planting with increasingly dismal results.

7 In 1930 and early 1931, the Oklahoma and Texas panhandles were known as the most prosperous regions in the nation. For plains farmers, the decade opened with prosperity and growth. But in the summer of 1931, those farmers would face the most

difficult eight years of their lives.... The rain simply stopped.

Cause and effect

Dust storm, 1930s

8 It had taken a thousand years for Nature to build an inch of topsoil on the Southern Plains, but it took only minutes for one good blow to sweep it all away. The water level of lakes dropped by five feet or more. The wind picked up the dry soil that had nothing to hold it down. Great black clouds of dust began to blot out the sun. In some places, the dust drifted like snow, darkening the sky for days, covering even well-sealed homes with a thick layer of dust on everything. Dust storms engulfed entire towns.

9 The primary impact area of the Dust Bowl, as it came to be known, was on the Southern Plains. The Northern Plains weren`t so badly affected, but the drought, dust, and agricultural decline were felt there as well. The agricultural devastation helped to lengthen the Great Depression, whose effects were felt worldwide.

10 One hundred million acres of the Southern Plains were turning into a wasteland of the Dust Bowl. Large sections of five states were affected — Texas, Oklahoma, Kansas, Colorado and New Mexico.

11 In 1932, the national weather bureau reported 14 dust storms. The next year, they were up to 38. The dust was so thick that people scooped up bucketsful while cleaning house. Dust blocked exterior doors; to get outside, people had to climb out their windows and shovel the dust away. Dust coated everything.

12 Nevertheless, farmers kept on plowing, hopeful that the rains would return in a matter

of days, or perhaps months. In the spring of 1934, the massive drought impacted 27 states severely and affected more than 75 percent of the country. The Dust Bowl was result of the worst drought in U.S. history.

A meager existence

13 Families survived on cornbread, beans, and milk. People were beginning to give up hope, and a mass exodus — the largest migration in American history — ensued from the plains. Many families packed their belongings, piled them on their cars and moved westward, fleeing the dust and desert of the Midwest for Washington, Oregon and California. They were willing to work for any wage at all, planting and harvesting other people`s lands.

Oklahoma refugees from Dust Bowl

14 When those families reached the borders of those western states, they were not well received — too many people already there were out of work. Many California farms were corporate owned, meaning they were larger and more modernized than what the farmers were used to. Families often lived in tar-paper shacks with no floor or plumbing. By 1940, 2.5 million people had moved out of the Dust Bowl states toward the Pacific states.

15 In the fall of 1934, with cattle feed depleted, the government began to buy and destroy thousands of starving livestock. Of all the government programs during that time, the cattle slaughter was the most wrenching for farmers. Although it was difficult for farmers to give up their herds, the cattle slaughter helped many of them avoid bankruptcy.

Dust storm, 1930s

16 In the spring of 1935, the wind blew 27 days and nights without stopping. People and animals began to die of suffocation and "dust pneumonia."

Soil conservation

17 The government began to offer relief to farmers through President Franklin D. Roosevelt's New Deal. Roosevelt believed it was the federal government`s duty to help the American people get through the bad times like the Dust Bowl. During the first three months of his presidency, a steady stream of bills were passed to relieve poverty, reduce unemployment and speed economic recovery. While these experimental programs did not end the Depression, the New Deal helped the American people immeasurably by taking care of their basic needs and giving them the dignity of work, and hope during trying times.

18 Hugh Hammond Bennett, who came to be known as "the father of soil conservation," had been leading a campaign to reform farming practices well before Roosevelt became president. Bennett called for "...a tremendous national awakening to the need for action in bettering our agricultural practices." He urged a new approach to farming in order to avoid similar catastrophes.

19 In April 1935, Bennett was on his way to testify before a Congressional committee about his soil conservation campaign when he learned of a dust storm blowing into the capitol from the western plains. At last, he believed that he would have tangible evidence of the results of bad farming practices. As the dust settled over Washington and blotted out the midday sun, Bennett exclaimed, "This, gentlemen, is what I have been talking about." Congress responded by passing the Soil Conservation Act of 1935. In addition, the Roosevelt administration put its full weight and authority behind the improvement of farming techniques to prevent a recurrence of the Dust Bowl.

20 President Roosevelt ordered that the Civilian Conservation Corps plant a huge belt of more than 200 million trees from Canada to Abilene, Texas, to break the wind, hold water in the soil, and hold the soil itself in place. The administration also began to educate farmers on soil conservation and anti-erosion techniques, including crop rotation, strip farming, contour plowing, terracing and other beneficial farming practices.

21 In 1937, the federal government began an aggressive campaign to encourage Dust Bowlers to adopt planting and plowing methods that conserve the soil. The government paid the reluctant farmers a dollar an acre to practice one of the new methods. By 1938, the massive conservation effort had reduced the amount of blowing soil by 65 percent. Nevertheless, the land failed to yield a decent living.

22 In the fall of 1939, after nearly a decade of dirt and dust, the skies finally opened. With the rain`s return, dry fields soon yielded their golden wheat once more, and just as quickly as it had begun, the Dust Bowl was, thankfully, over.

Directed Note-Taking

Directions: Record notes containing the most important information relevant to the guiding question.

"The Dust Bowl"

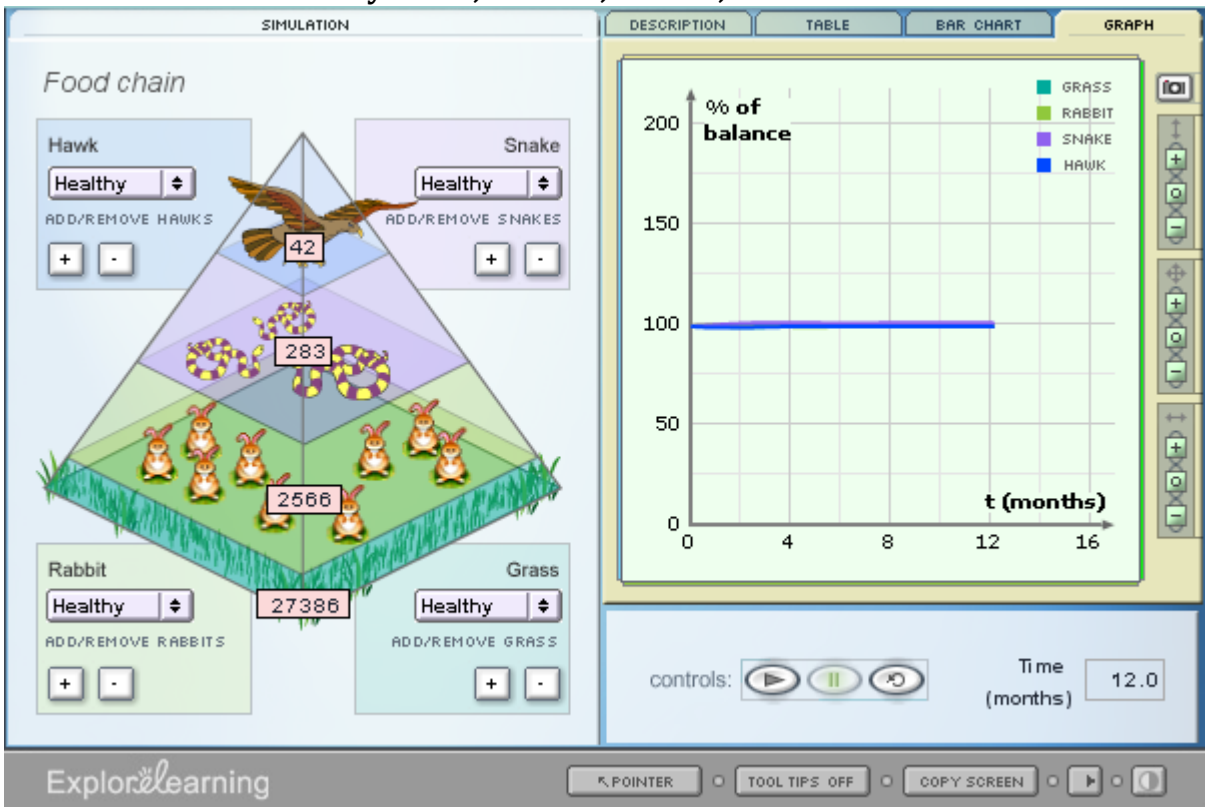
Text from… http://www.u-s-history.com/pages/h1583.html

Guiding Questions: How did human practices contribute to the Dust Bowl? How were United States policy decisions influenced by lessons learned during the Dust Bowl?

		Check Relevant Categories	
Paragraph	Notes	Human Practices	Policy Decisions

Paragraph	Notes	Human Practices	Policy Decisions

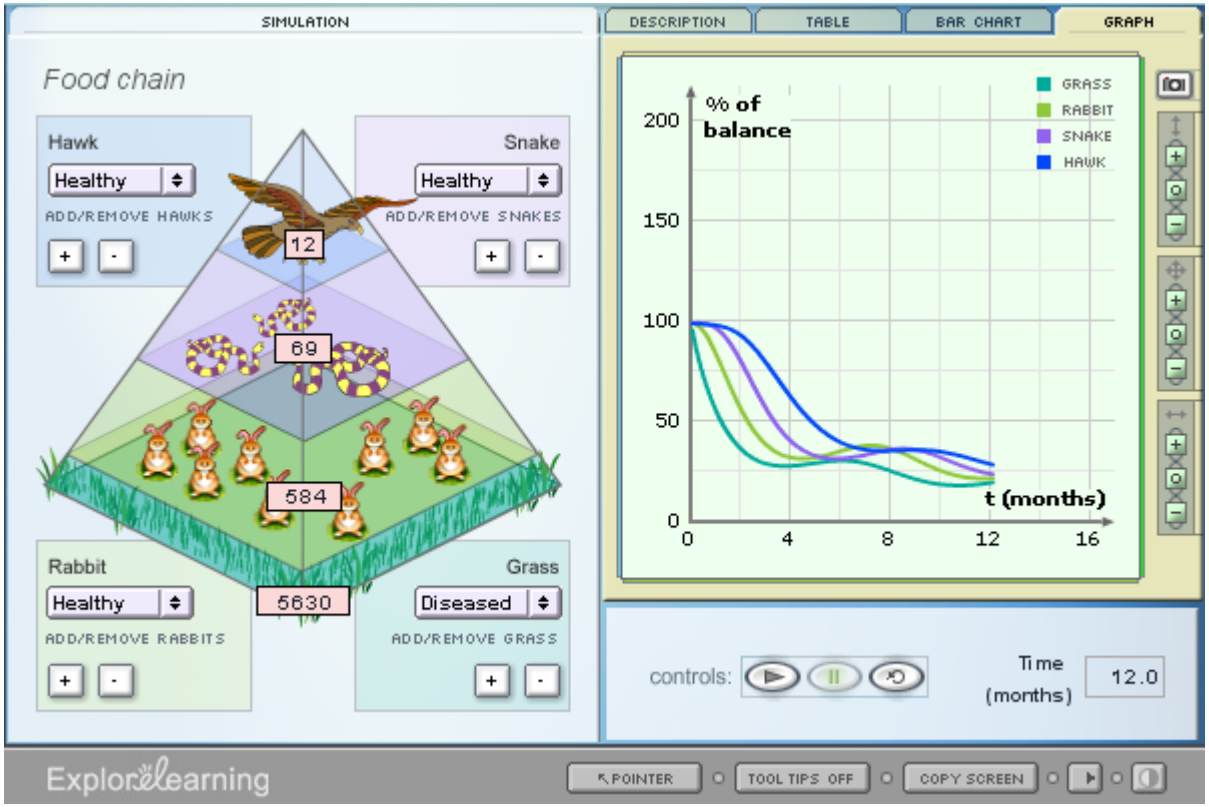
Food Chain: Healthy Grass, Rabbits, Snakes, and Hawks



Month	Grass	Rabbits	Snakes	Hawks
0	27303	2567	278	42
0.5	27306	2575	279	41
1	27285	2579	280	41
1.5	27260	2579	281	41
2	27246	2577	282	41
2.5	27247	2573	283	41
3	27265	2569	283	41
3.5	27295	2565	283	41
4	27329	2563	283	42
4.5	27361	2562	283	42
5	27387	2562	283	42
5.5	27404	2563	283	42
6	27411	2564	283	42
6.5	27411	2566	283	42
7	27405	2567	283	42
7.5	27397	2568	283	42
8	27389	2568	283	42
8.5	27383	2568	283	42
9	27379	2568	283	42
9.5	27377	2567	283	42
10	27378	2567	283	42
10.5	27380	2566	283	42
11	27383	2566	283	42
11.5	27385	2566	283	42
12	27386	2566	283	42

Data and graphics were generated using ExploreLearning Gizmos: Food Chain

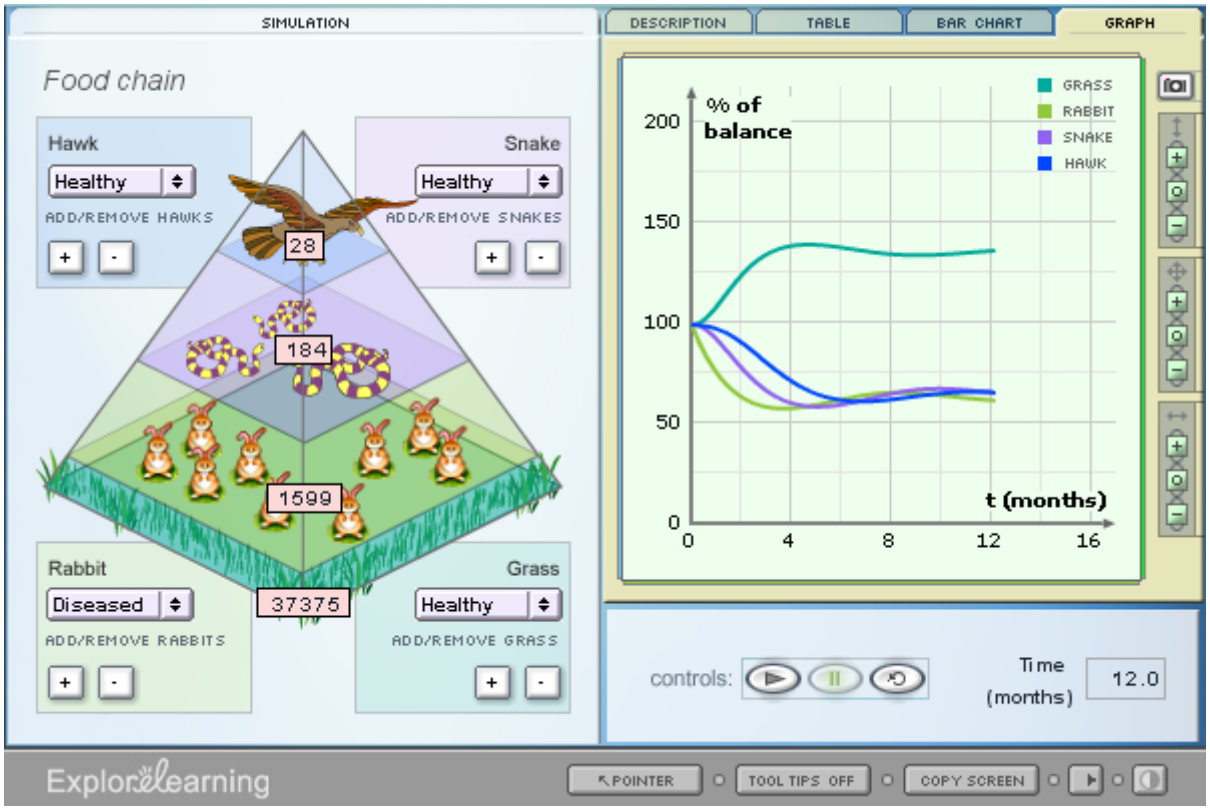
Food Chain: Diseased Grass



Month	Grass	Rabbits	Snakes	Hawks
0	26374	2567	278	42
0.5	19439	2442	278	41
1	14983	2135	270	41
1.5	11982	1766	251	40
2	10008	1431	222	39
2.5	8791	1174	188	36
3	8129	999	157	33
3.5	7867	894	131	29
4	7881	843	113	26
4.5	8062	833	101	23
5	8305	853	94	20
5.5	8509	892	91	18
6	8584	938	91	17
6.5	8470	979	93	16
7	8155	1001	96	15
7.5	7674	994	100	15
8	7098	955	103	15
8.5	6512	891	104	15
9	5991	814	102	15
9.5	5586	737	98	15
10	5323	670	91	15
10.5	5206	621	84	14
11	5230	590	78	14
11.5	5378	578	72	13
12	5630	584	69	12

Data and graphics were generated using ExploreLearning Gizmos: Food Chain

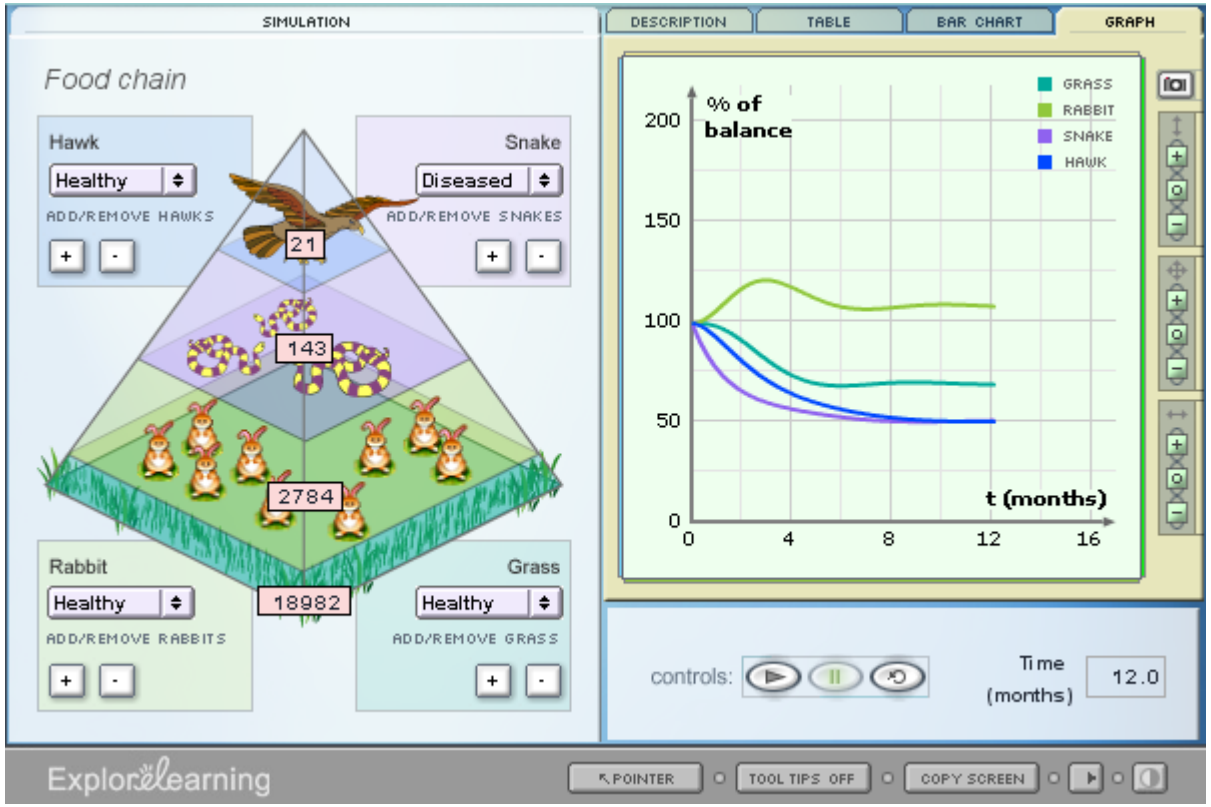
Diseased Rabbits



Month	Grass	Rabbits	Snakes	Hawks
0	27303	2526	278	42
0.5	28178	2181	272	41
1	30066	1929	256	41
1.5	32277	1752	236	39
2	34303	1632	216	38
2.5	35894	1555	199	36
3	37007	1511	185	33
3.5	37704	1495	176	31
4	38077	1498	169	30
4.5	38207	1517	165	28
5	38164	1546	164	27
5.5	38004	1581	165	26
6	37776	1616	168	26
6.5	37519	1647	171	26
7	37269	1673	175	26
7.5	37053	1690	179	26
8	36891	1698	183	26
8.5	36794	1697	186	26
9	36764	1689	188	27
9.5	36794	1676	189	27
10	36873	1660	189	27
10.5	36987	1642	189	28
11	37117	1626	187	28
11.5	37251	1611	186	28
12	37375	1599	184	28

Data and graphics were generated using ExploreLearning Gizmos: Food Chain

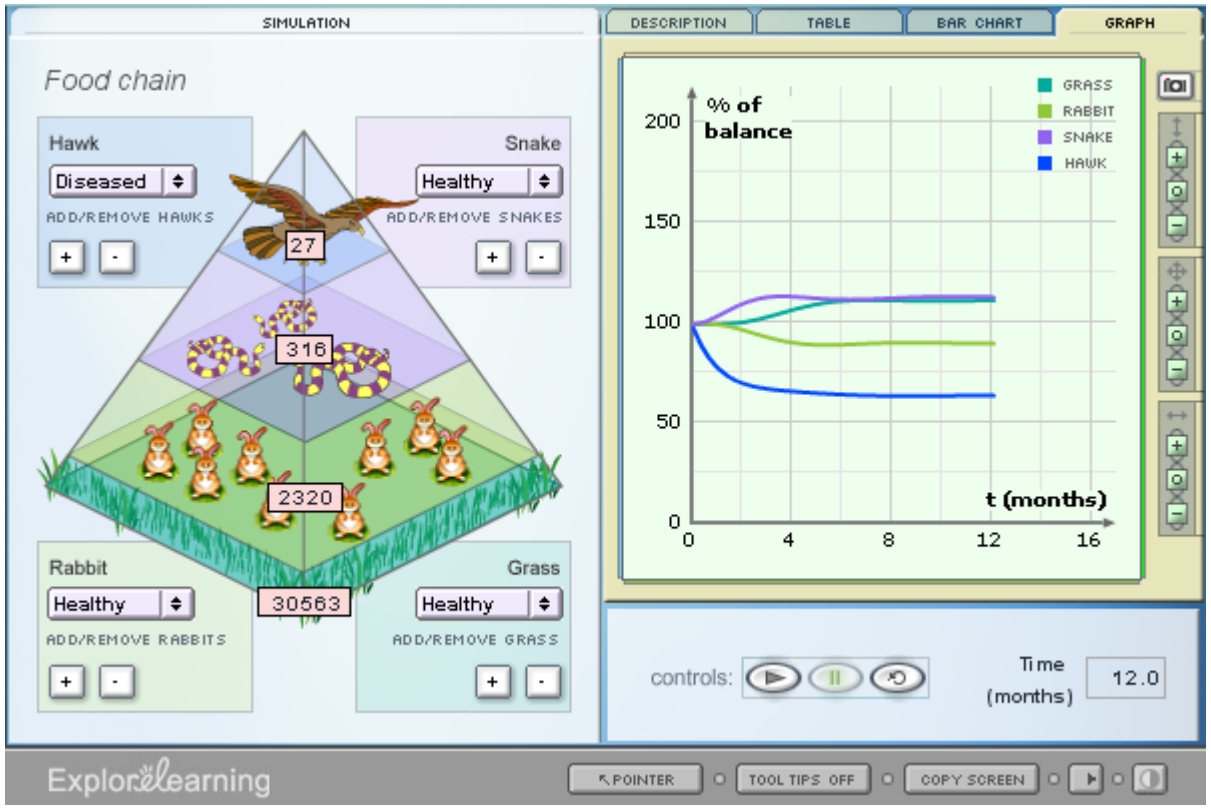
Diseased Snakes



Month	Grass	Rabbits	Snakes	Hawks
0	27303	2567	274	42
0.5	27235	2629	238	40
1	26813	2756	213	38
1.5	25965	2903	195	36
2	24794	3028	183	33
2.5	23477	3102	174	31
3	22186	3119	168	30
3.5	21046	3085	163	28
4	20131	3021	159	27
4.5	19465	2945	155	26
5	19042	2872	153	25
5.5	18830	2814	150	24
6	18784	2774	148	24
6.5	18849	2752	146	23
7	18969	2748	144	23
7.5	19096	2755	143	22
8	19195	2768	142	22
8.5	19247	2783	142	22
9	19249	2796	141	21
9.5	19212	2805	141	21
10	19152	2807	142	21
10.5	19086	2805	142	21
11	19030	2799	142	21
11.5	18994	2792	143	21
12	18982	2784	143	21

Data and graphics were generated using ExploreLearning Gizmos: Food Chain

Food Chain: Diseased Hawks



Month	Grass	Rabbits	Snakes	Hawks
0	27303	2567	278	41
0.5	27308	2572	283	36
1	27318	2562	291	32
1.5	27399	2534	300	30
2	27598	2492	307	29
2.5	27924	2445	313	29
3	28353	2399	316	28
3.5	28834	2360	317	28
4	29312	2330	317	28
4.5	29739	2312	315	27
5	30083	2303	314	27
5.5	30332	2302	313	27
6	30490	2306	313	27
6.5	30571	2312	313	27
7	30595	2320	313	27
7.5	30585	2325	314	27
8	30557	2329	315	27
8.5	30528	2331	315	27
9	30506	2331	316	27
9.5	30495	2329	316	27
10	30497	2327	317	27
10.5	30509	2324	317	27
11	30526	2322	316	27
11.5	30545	2320	316	27
12	30563	2320	316	27

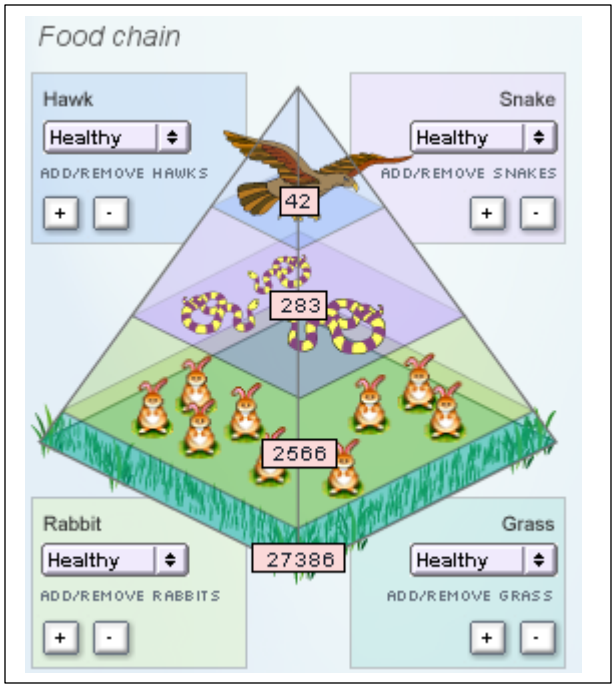
Data and graphics were generated using ExploreLearning Gizmos: Food Chain

Food Chain Analysis Using the Claim—Evidence—Justification (CEJ) Model

Using the data provided, use the CER template below to address the prompt.

Explain how disease at each trophic level impacts this ecosystem.

If Diseased, Then…	Claim	Evidence	Justification
Grass			
Rabbits			
Snakes			
Hawks			



As you review this energy pyramid of a healthy food chain, explain the discrepancy between the number of producers, primary consumers, secondary consumers, and tertiary consumers.

What happens to the available energy as you move up this energy pyramid? Why?

Explain how the Law of Conservation of Energy applies to this living system.

Finding the Right Mix of Carbs, Proteins, and Fats

A healthy diet consists of carbohydrates, proteins and fats. But what's the right combination? Which carbohydrates do you need? How much protein? What kind of fat?

Here are some answers from nutrition experts.

Protein

Protein is an essential component of bone, muscle, skin, hair, and other parts of your body. The body makes protein from amino acids found in protein-rich foods, but it can't store amino acids, so you have to eat protein every day.

Sources: The amino acids that make up proteins are often called essential and nonessential amino acids. Essential amino acids are those the body can't make so they must be in a daily diet; nonessential amino acids are those the body is able to make. "Complete proteins" are proteins that contain all the essential amino acids. Complete proteins are found in red meat, fish, poultry, milk, and eggs. An egg white is an excellent source of complete protein, with milk a close runner-up. Meat is also a good source of complete protein; different types of meat may vary in fat content, but all meat contains the same amount of protein. "Incomplete proteins" are those that do not contain all the essential amino acids. These are found in plants. Some plants contain more protein than others, but no plant contains all the essential amino acids. By eating a variety of plant foods, your diet can include all the essential amino acids. Vegetarians can easily obtain adequate amounts of essential amino acids from plant proteins as long as they consume adequate calories and a variety of foods.

For good health: Eat a variety of proteins from different food groups.

Carbohydrates

Carbohydrates include sugars, starches, and fiber. Sugars and starches are important to a balanced diet because they provide energy for the body. During digestion, sugars and starches break down into the simple sugar glucose and enter the bloodstream. Although fiber is a carbohydrate, the body uses it for other purposes than as a source of energy.

Sources: Simple carbohydrates, which are naturally occurring sugars, are found in milk, honey, fruits, and, to a lesser extent, vegetables. Complex carbohydrates, the starches, are found in vegetables, grains, and beans. Fiber, another complex carbohydrate, is found in both fruits and vegetables. Fiber is either soluble (dissolves in water) or non-soluble (doesn't dissolve in water). The skin of an apple, for instance, contains nonsoluble fiber; the pulp of the apple contains a soluble fiber called pectin.

http://healthcare.utah.edu/healthlibrary/related/doc.php?type=1&id=2504

For good health: Get most of your carbohydrates from less-processed whole foods, such as fresh fruits, vegetables, and whole grains. Eat 2 cups of fruit, 2-1/2 cups of vegetables, and three to eight servings, in 1-ounce equivalents, of grains daily. At least half of your servings should be whole grains. One slice of bread, 1 cup of ready-to-eat cereal, or a half cup of cooked rice, cooked pasta, or cooked cereal count as one serving of grains.

Fats

The body needs fat for energy, to pad organs and to transport vitamins. Too much fat can fuel obesity, high cholesterol, and heart disease. But not all fats harm you if eaten in moderation. Monounsaturated and polyunsaturated fats may actually help lower cholesterol. Saturated fats and trans fats may increase cholesterol and are associated with an increased risk for heart disease. All fats have 9 calories per gram; this is more calories than protein or carbohydrates.

Sources: Monounsaturated fats are found mainly in olive oil, canola oil, and nuts. Polyunsaturated fats are found mainly in vegetable oils, such as soybean, corn, and canola oils. Saturated fats are found mainly in red meat, but butter, cheese, poultry, palm oil, lard, solid shortenings, and whole or reduced-fat milk also contain saturated fat. Trans fats, although found in small amounts naturally in some foods, are mostly created by the process of hydrogenating vegetable oils. Like saturated fats, trans fats can increase a person's cholesterol levels.

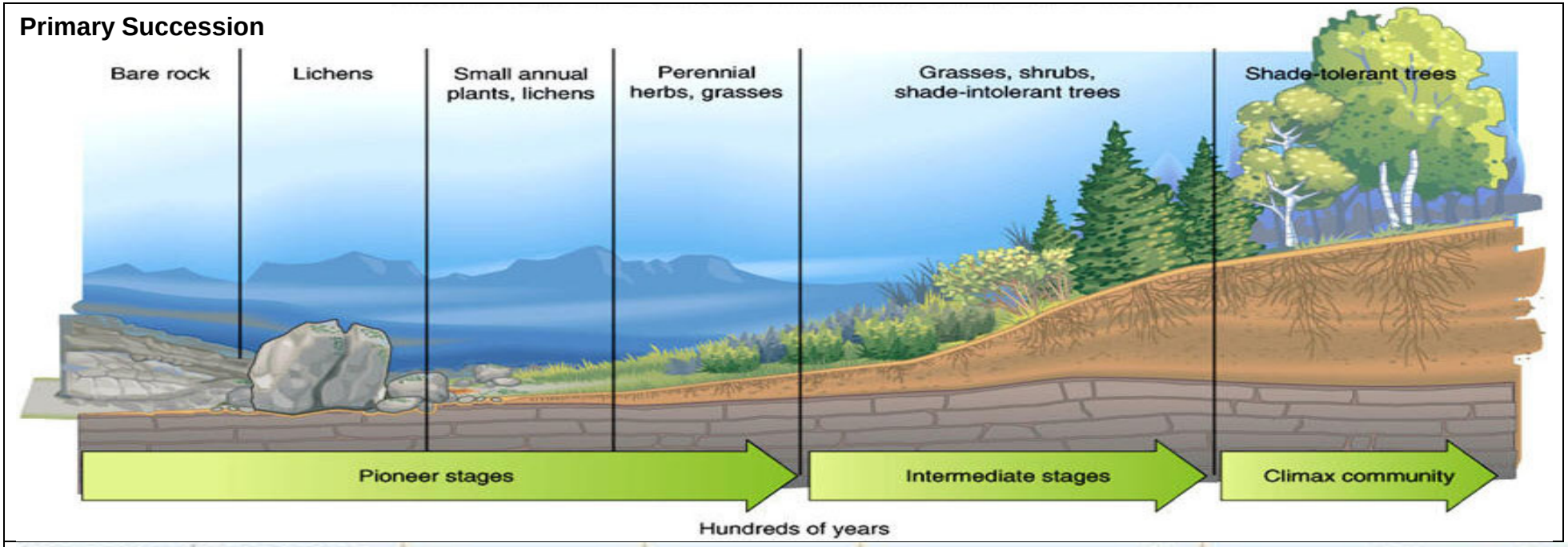
For good health: Limit fast food and processed foods, use low-fat dairy products, and replace saturated fats, such as butter with monounsaturated fats like olive oil.

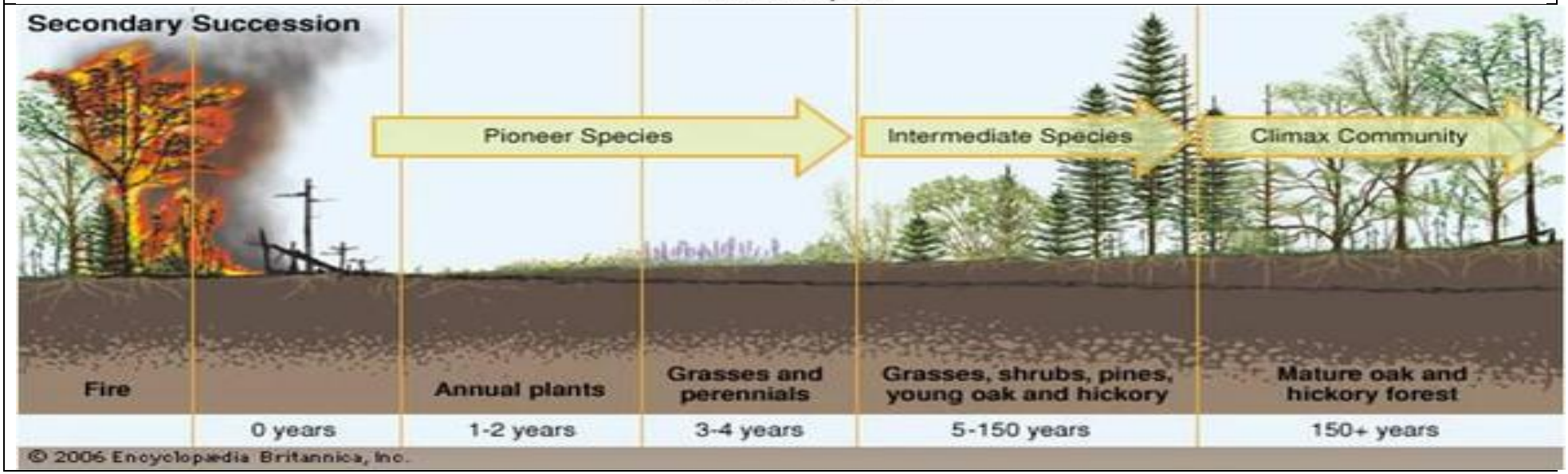
How much?

The Food and Nutrition Board of the Institute of Medicine suggests these guidelines for a healthy diet:

- Carbohydrates: 45 to 65 percent of total daily calories
- Fat: 20 to 35 percent of total daily calories

Protein: 10 to 35 percent of total daily calories





Primary and secondary succession are two different types of ecological succession, which involves the natural progression of biological life from one condition to another. Specifically, primary succession is the beginning of natural progression that includes a “pioneering” of plant life. Secondary succession is the progression of life that follows the disruption of the primary succession due to disturbances that reduced the population of the initial inhabitants.

Interesting Facts About Temperate Grasslands (Great Plains—United States)

http://traveltips.usatoday.com/interesting-temperate-grassland-61857.html

Temperate grasslands typically exist between deserts and forests where they act as a transitional biome. Grassland are further broken down into two groups, including prairie and steppes. Prairies feature tall species of grass while steppes include short grass types. Most temperate grasslands receive just 10 to 30 inches of rain each year with most of it occurring in late spring and early summer.

Location

Most temperate grasslands are located in Africa, South America, Hungary, Russia and North America. Most of the grasslands exist north of the Tropic of Cancer at 23.5 degrees north in latitude and south of the Tropic of Capricorn at 23.5 degrees south in latitude. In North America, temperate grasslands thrive in the western part of the country where they are known as the plains while in South America, they're known as pampas.

Influences

The soil of the temperate grassland consist of a dark, fertile loam. The decay of the grasses that grow there contributes to the nutrient-rich soil, helping the next generation of plants to grow and thrive. The fertile soil has played a big role in much of the grasslands being used for farmland, particularly in the United States where the grasslands are much smaller than they once were. Fire also plays a role in keeping the grasslands full of short vegetation rather than trees and shrubs. If vegetation other than grass started thriving, the whole ecosystem would affect most of the animals that rely on the grasslands for habitat by crowding out the smaller plants they depend on. Larger grazing wildlife also helps keep trees and shrubs from taking over the grasslands.

Seasons

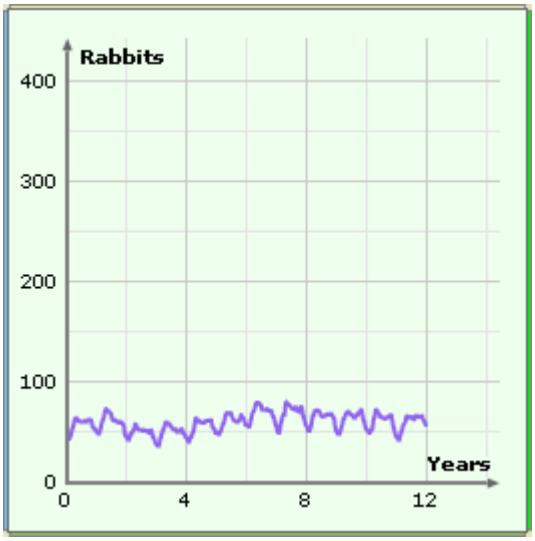
The grasslands go through a dormant and a growing season. During the dormant season, the grasses do not grow due to cold weather. Once the weather warms up in the spring, the grasses start to grow and the grasslands come alive with color as asters, blazing star, coneflowers, goldenrods, sunflowers and wild indigos come into bloom. The plants often live until winter due to their thick stem bases and underground water storage capabilities. Summertime temperatures often reach over 100 degrees Fahrenheit while winter temperatures can drop to 40 degrees Fahrenheit below zero. Blizzards are common in the winter in the U.S. plains areas.

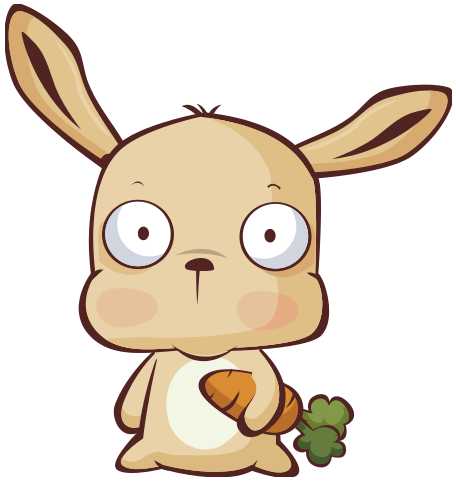
Wildlife

Wildlife that thrives in the African grasslands includes gazelles, zebras, lions and rhinoceroses. The vast plains of the United States used to feed millions of bison until the 1800s, when their numbers were decimated by hunters. Today, plains animals include wolves, prairie dogs, jack rabbits, coyote, badgers, and foxes. Birds such as meadowlarks, quail, hawks and owls also appear on the plains.

Land Availability	Weather Conditions
Little	Harsh Winter Hot Summer

# Rabbits	Season
40	spring
44	
49	
54	
57	
63	
64	summer
62	
58	
59	
59	
59	
60	fall
61	
65	
66	
65	
65	
62	winter
56	
53	
51	
49	
49	

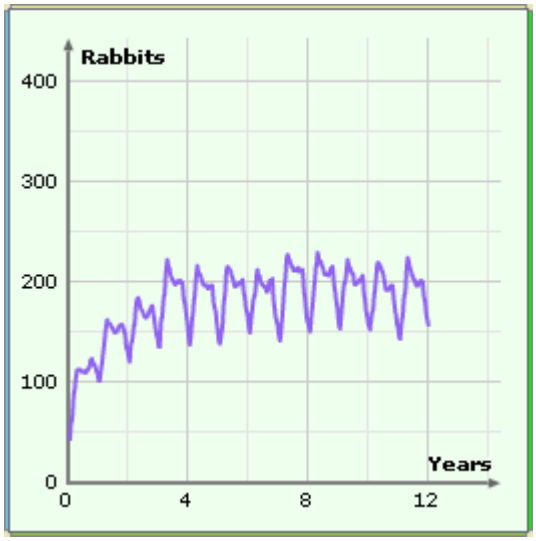


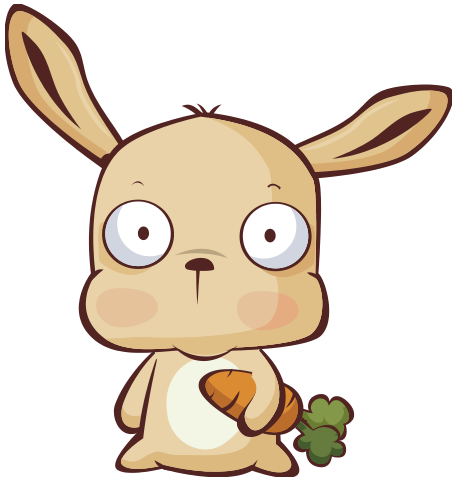


Data and graph were generated using ExploreLearning Gizmos: Rabbit Population by Season

Land Availability	Weather Conditions
Moderate	Harsh Winter Hot Summer

# Rabbits	Season
40	spring
56	
66	
84	
93	
102	
109	summer
109	
109	
108	
107	
107	
106	fall
108	
109	
111	
117	
119	
116	winter
115	
113	
109	
104	
98	

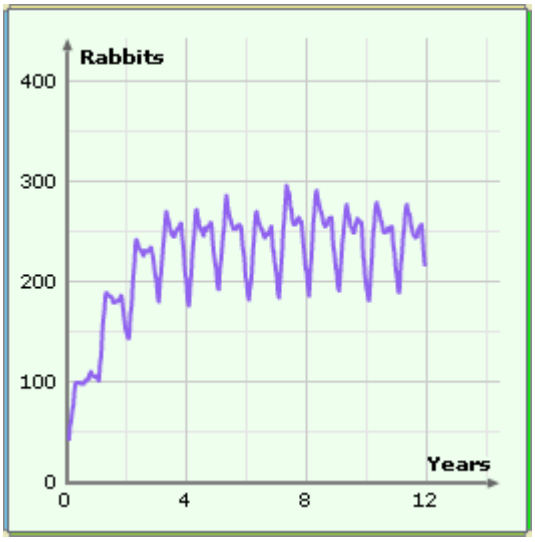


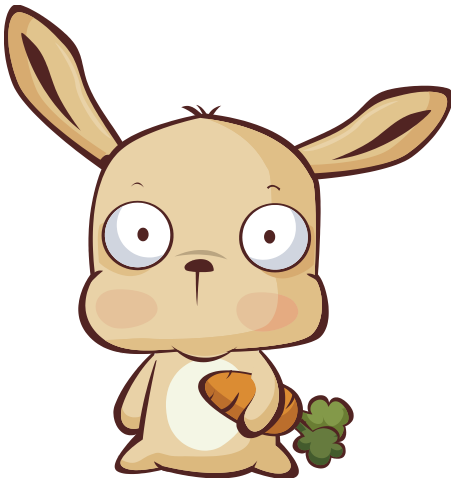


Data and graph were generated using ExploreLearning Gizmos: Rabbit Population by Season

Land Availability	Weather Conditions
Ample	Harsh Winter Hot Summer

# Rabbits	Season
40	spring
54	
62	
70	
86	
94	
96	summer
96	
96	
96	
95	
95	
97	fall
97	
99	
100	
104	
105	
104	winter
103	
103	
102	
102	
101	





Data and graph were generated using ExploreLearning Gizmos: Rabbit Population by Season

The Virtual Nature Trail at Penn State New Kensington

Species Pages

Scientific name: *Sylvilagus floridanus*
Common name: Eastern Cottontail Rabbit

The eastern cottontail rabbit is one of the most common mammals of both the natural and the human generated ecosystems of North America. It is especially abundant in habitats that contain edges of open, grassy fields and thorny or shrubby cover. Both early stage successional ecosystems and many managed suburban landscapes are conducive to both the habitat and food needs of the cottontail. The grass monocultures of some suburban communities, though, do not in themselves provide sufficient food varieties for cottontail nutrition. Further, the simplification of rural habitats (via the large scale consolidation of agricultural fields, the removal of fence rows and hedgerows, the aging and deterioration of shelter belts, and the overgrazing of pastures and range lands) has reduced the extent of some of the habitats that have in the past sustained the eastern cottontail.

Appearance

Cottontails are 15 to 18 inches long and weigh between two and three pounds. They can range in color from a light brown to a darker gray. Habitat characteristics and color tones are important in determining the dominant color type of rabbits found in a particular locale. Cottontails have relatively long, erectly held ears, large back feet and their signature, white, fluffy, "cotton" tail.

Rabbit or Hare?

The term "rabbit" and the term "hare" are often used as synonyms but are not at all interchangeable. The most obvious difference between these two types of small, grazers is the shape of their ears: hares have much longer ears than rabbits and the ears of hares tend to have black colored tips. There are also significant differences in the two groups' burrowing habits (only rabbits make underground burrows) and in the characteristics of their young (rabbits have naked newborns, hares have furred newborns).

Diet

Cottontail rabbits eat a great variety of plant

materials. In the summer green plants are favored. About half of the food consumed are grasses (including bluegrass and wild rye) but wild strawberries, clover, plantain, garden vegetables and a wide array of other plants are also readily eaten as they become seasonally available. In the winter, the cottontail (which does not hibernate) forages out over the surface of the snow cover and consumes dominantly woody plant parts including the twigs, bark, and buds of oak, dogwood, sumac, maple and birch. Feeding patterns vary with season, but typically peak in the two to three hours after dawn and the hour after sunset. Cottontails also consume their own fecal pellets, a behavior that reflects both the recalcitrance of their food materials and the relative inefficiency of the rabbits' digestive systems.

Behavior

The crepuscular ("dusk and dawn") pattern of foraging activity is augmented in the summer by a nocturnal time expansion. During the day, the cottontail stays safely hidden from predators in thickets, brush piles or in hollow logs. Cottontails confronted with danger either freeze in place to take advantage of their cryptic coloration or dart away in a rapid, zigzag manner. Running speeds of the eastern cottontail can reach eighteen miles per hour.

Most cottontails are solitary animals and can be within their home ranges aggressively intolerant of other members of their species. A female's home range varies between one to fifteen acres in size, while a male's range may be as large as one hundred acres. Prior to mating, the male and female cottontails display courtship behaviors that are collectively called "cavorting". The patterns observed in cavorting can include a great deal of running, racing, hopping, and even actual fighting. Fragments of hide and hair are sometimes scattered over several acres as a result of this pre-mating behavior. It is thought that the selective advantage of this behavior is to weed out sick, less agile or less aggressive individuals from the reproductive pool. Mating can occur at any time during the warmer months of the year. Cavorting typically occurs at night.

Life Span and Reproduction

The average life span of an eastern cottontail in the wild is usually less than three years. In captivity, though, a cottontail rabbit can live up to eight years. Cottontails can reproduce by one year of age, and a reproductively mature doe can have up to five litters of three to eight young in a single season! This extremely high potential rate of reproduction can cause rabbit populations to greatly increase in numbers over very short periods of time. A wild population of eastern cottontails typically contains a large number of individuals aged one year or less and is thus almost always on the verge of a population explosion. Females have their litters in grass-lined, surface or subterranean nest cavities. The young are born after a thirty day gestation period and are dependent upon the doe for food for approximately two weeks. At two weeks the small rabbits forage and fend for themselves.

Predation

Many types of predators utilize cottontail rabbits as a food source. Foxes, hawks and owls are the most significant "natural" predators, while feral dogs and human hunters are the most significant "human-generated" predatory forces. Continuous predation pressure is essential to keep the populations of cottontails from growing too large for an ecosystem's resources.

Rabbit Population By Season Using the Claim—Evidence—Justification (CEJ) Model

Using the article on the Eastern Cottontail Rabbit and the data provided, use the CEJ template below to address the prompts.

Prompt	**Claim**	**Evidence**	**Justification**
Why do you think the graphics show rabbit populations with different carrying capacities?			
Why do you think there is seasonal variation in the populations of rabbits?			
Which limiting factor do you think drives the rabbit populations?			

Discuss how water acted as a limiting factor in the United States Great Plains during the Dust Bowl and how its scarcity impacted the transfer of energy through the trophic levels in this farm food chain.