

Prairie Habitats: The Formation and Value of Temperate Grasslands

Teachers: This lesson contains three classroom activities with discussion questions related to the AFG video clips about Prairie Habitat. These parts may be used individually or together, depending on the needs of your class.

Note: You can access and view the video clips used in this lesson in the Teacher Resources section of the AFG Web Site (www.pbs.org/americanfieldguide/teachers).

Grade Level:

- Activities 1 and 2: Grades 6-8
- Activities 3 and 4: Grades 7-9

Background Information:

Biomes are major groupings of plants and animals distributed regionally around the world. The occurrence of the plants and animals is closely related to the climate of the area, in particular temperature and rainfall. One of the most familiar examples of a biome is a tropical desert, which is hot and dry and has an associated biota including cacti, snakes, and lizards. In this activity, students will learn about the Temperate Grasslands biome of North America. Commonly called Prairie, it is an endangered ecosystem because the rich soils have been converted to farming in most areas. The activities presented here are designed to give students an overview of the climate and organisms of the North American Prairie.

Curriculum Connections

For related activities about the role of fire in ecosystems, see the AFG video on 'Fires and Fire Suppression'

Related National Standards:

This lesson addresses the following National Content Standards found at:
<http://books.nap.edu/html/nse>

Content Standard C: As a result of their activities in grades 5-8, all students should develop an understanding of

- Populations and Ecosystems
 - The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition.
- Diversity and Adaptations of Organisms
 - Biological evolution accounts for the diversity of species developed through gradual processes over many generations. Species acquire many of their unique characteristics through biological adaptation, which involves the selection of naturally occurring variations in populations. Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment.

Content Standard C: As a result of their activities in grades 9-12, all students should develop an understanding of

- Biological Evolution
 - The great diversity of organisms is the result of more than 3.5 billion years of evolution that has filled every available niche with life forms.
- The Interdependence of Organisms
 - Organisms both cooperate and compete in ecosystems. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.
 - Human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems will be irreversibly affected.

Extension Websites from PBS

- Scientific American – Wild Places
<http://www.pbs.org/saf/1106/teaching/teaching.htm>
This site contains an activity that shows how the growth of trees inhibits prairie growth.
- Lewis and Clark
<http://www.pbs.org/lewisandclark/class/l13.html>
This activity enables students to research some of the animals Lewis and Clark saw on their way across the Great Plains.
- Newtons Apple – Bison Roundup
<http://www.pbs.org/ktca/newtons/11/bison.html>
This is an opportunity to teach statistical sampling using prairie organisms.
- The Living Edens – Canyonlands
<http://www.pbs.org/edens/canyonlands/tonight.htm>
<http://www.pbs.org/edens/canyonlands/rummy.htm>
These two activities are designed to teach about adaptations of prairie organisms.

Activity 1: Who Am I?**Time Allotted:**

15 minutes

Materials:

- Photocopies of familiar Prairie/ Great Plains Organisms (eg: buffalo, prairie dogs, grasses, etc.) with safety pins or string attached so that students can hang them around their neck. For line drawings of organisms from different biomes, go to <http://www.enchantedlearning.com/biomes/>

OR

- Photocopies of organisms from a variety of different biomes with safety pins or strings as described above. Try gluing the photographs of organisms that are from the same biome on construction paper of the same color (for instance, put prairie dogs and bison on yellow, spotted owls and Douglas firs on blue, etc.)

Objectives:

- Students will use their prior knowledge of plants and animals to determine what a mystery organism is.
- Students will be able to define biome.
- Students will become familiar with plant and animals that live in temperate grassland habitats.

Teaching Instructions:

1. Give each student a photocopy of an organism. These should be affixed to their back using safety pins or hung over their neck, facing backwards so that the students cannot see their own organism.
2. This activity will be like a game of 20 questions. Students should walk around the room, showing their card to other students and ask yes or no questions to try to determine what organism they have. Questions might include "am I a plant?", "am I furry?", "am I bigger than a car?", etc. Their objective is to guess their organism within a certain period of time, maybe 3 or 5 minutes.
3. If you chose to use organisms from different biomes, have students whose cards are printed on the same color gather into groups. Have the groups try to determine what they have in common. Use this as a starting point for talking about the concept of biome.

**Watch the AFG Video Segment: "Theodore Roosevelt National Park – Prairie"**

Note: You can access and view the video clips used in this lesson in the Teacher Resources section of the AFG Web site (www.pbs.org/americanfieldguide/teachers).

Discussion Questions for Video Segment

- What makes a prairie?
- Why are certain animals found in prairies but not in other areas?
- Where are prairies and grasslands located?
- What is a biome?

Related Websites

For more background on Temperate Grasslands and North American Prairies, see <http://www.runet.edu/~swoodwar/CLASSES/GEOG235/biomes/tempgrass/tempgras.html>

Activity 2: Prairie Dogs Help Maintain Prairies

Time allotted:

15 minutes

Materials:

Copies of the 'Prairie Dog Den' handout, one per student (attached)

Objectives:

- Students will illustrate how prairie dogs contribute to nutrient and resource cycling on the prairie.
- Students will learn about an example of the interconnectedness of the ecosystem.

Teaching Strategies

1. Hand out the 'Prairie Dog Den' handout. Have students read the top part of the handout so that they know what to look for during the video.
2. Before watching the video, be sure that students understand the term 'aeration' and it's implications for oxygen cycling.

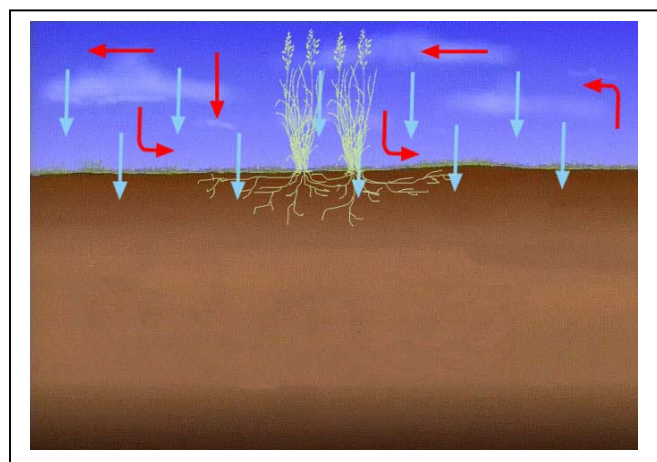
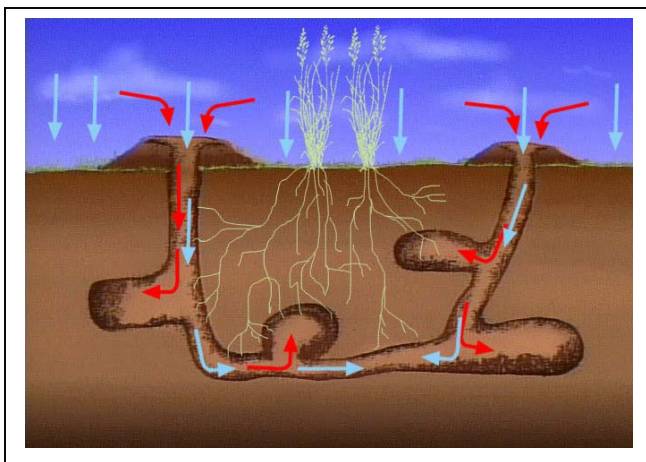


Watch the AFG Video Segment "Prairie Dogs"

Note: You can access and view the video clips used in this lesson in the Teacher Resources section of the AFG Web site (www.pbs.org/americanfieldguide/teachers).

3. Have students fill out the diagram on their prairie dog handouts.
4. Discuss their results.
5. Have students answer the short essay question at the end of the handout.

Assessment Solution Key



Activity 3: Distribution of Biomes**Time allotted:**

30 minutes

Materials:

Color overhead copy of Biome Maps (attached) OR other projection capability

Objectives:

- Students will describe worldwide distribution patterns of Temperate Grasslands.
- Students will compare distribution of major biomes in the United States to understand climate controls on an ecosystem.
- Students will connect abiotic factors to the type of life in a biome.

Teaching Instructions

1. Show students the map in figure 1.
2. Discuss the following (You may want to print these on the chalkboard or make an overhead as they will be revisited later in this lesson):
 - Describe the distribution of temperate grasslands.
 - Why are temperate grasslands located where they are?
 - Why don't they extend all along the latitudes where they are found?
 - Why don't they extend further to the north or south?

**Watch the AFG Video Segment "Iowa's Prairies: From Farmland Back to Prairie"**

Note: You can access and view the video clips used in this lesson in the Teacher Resources section of the AFG Web site (www.pbs.org/americanfieldguide/teachers).

3. Discuss the following question: What did you learn from the video that might answer the questions discussed earlier?
4. Show figures 2 and 3, the worldwide distribution of temperate broadleaf deciduous forests and worldwide distribution of deserts. Have students describe the distribution of these areas. Be sure they focus on latitude, relationship to oceans, and relationship to temperate grasslands as shown in figure 1.

Activity 4: Abiotic Factors in the Biome**Time Allotted:**

30 minutes

Materials:

Student handouts (attached)
Overheads from Activity 3

Objectives:

- Students will determine worldwide distribution patterns of temperate grasslands.
- Students will plot data to determine yearly patterns in climate in a temperate grassland.
- Students will compare climate data from different regions to better understand the impact of abiotic factors on an ecosystem.
- Students will connect abiotic factors to the type of life in a biome.

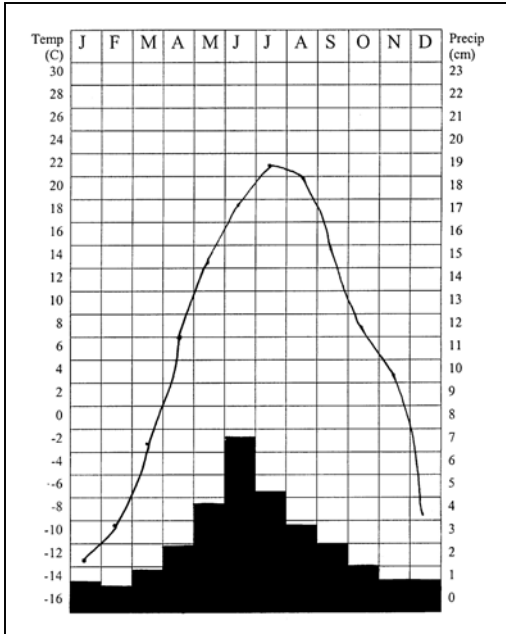
Teaching Instructions

1. Divide class into groups of three after completing Activity 3 above.
2. Distribute student handouts and graph templates (attached).
3. Have each student plot one of the three graphs to save time. Students will graph the average monthly temperature and precipitation for a North American Prairie, a temperate desert, and a temperate deciduous forest. Temperature should be plotted as a line and precipitation as a bar graph on the same sheet (using a double-y axis as shown in the answer key). They will then compare the prairie climate to that of the tropical desert and to that of a temperate deciduous forest.
4. After students have completed the graphs and the questions, revisit the maps and questions from Activity 3.

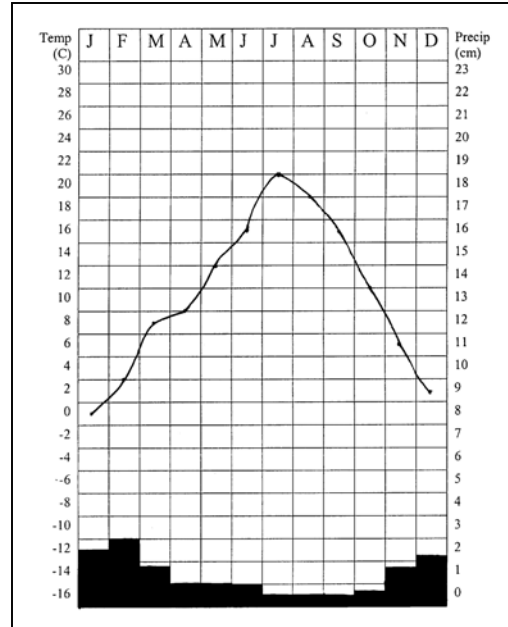
Extension Idea

From the maps in Activity 3, try to predict what biome you live in (see the website; <http://www.runet.edu/~swoodwar/CLASSES/GEOG235/biomes/main.html>, for more biome maps if you don't live in one of the regions shown. Then have students plot data from your area (try typing "average monthly precipitation" and your state name on a web browser to find local data) and then compare it to the three biomes shown. Does it appear to be similar to one, or does it appear to be a different biome?

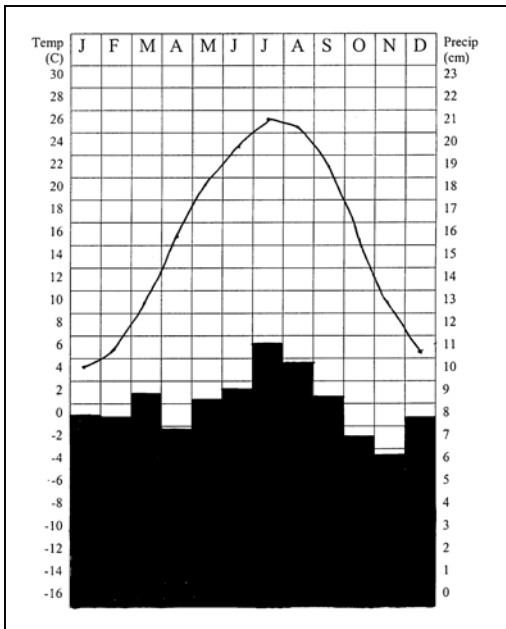
Answer Key



Williston, ND



Reno, NV



Greensboro, NC

Biome Maps

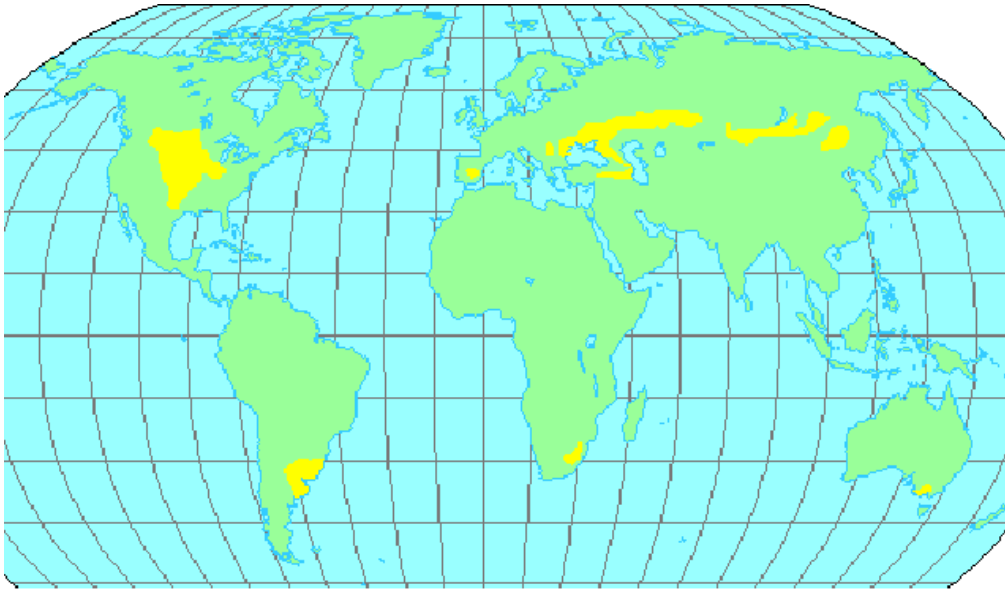


Figure 1: Distribution of Temperate Grasslands worldwide. Used with permission from Susan L. Woodward’s Virtual Geography Department Project ‘Major Biome’s of the World’ at <http://www.runet.edu/~swoodwar/CLASSES/GEOG235/biomes/main.html>

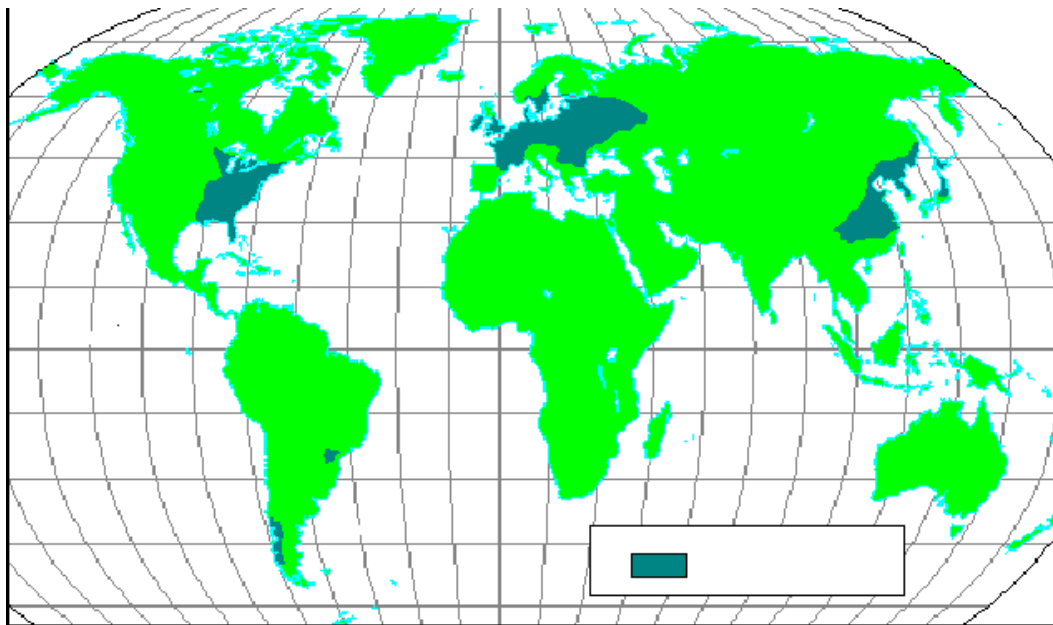


Figure 2: Distribution of Temperate Broadleaf Deciduous Forests worldwide. Used with permission from Susan L. Woodward’s Virtual Geography Department Project ‘Major Biome’s of the World’ at <http://www.runet.edu/~swoodwar/CLASSES/GEOG235/biomes/main.html>

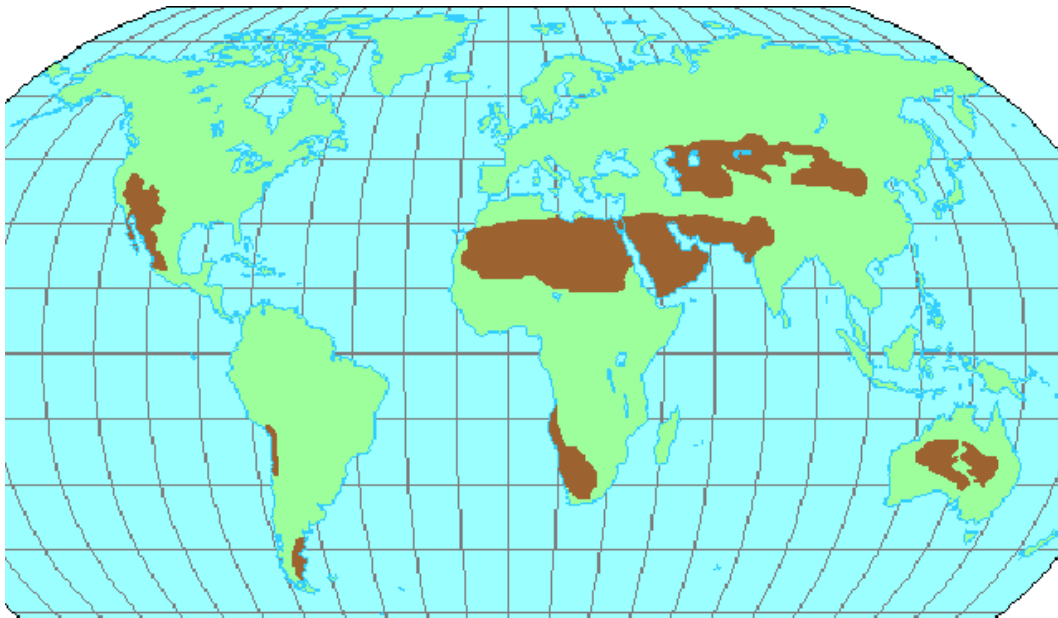


Figure 3: Distribution of Tropical Deserts worldwide. Used with permission from Susan L. Woodward's Virtual Geography Department Project 'Major Biome's of the World' at <http://www.runet.edu/~swoodwar/CLASSES/GEOG235/biomes/main.html>

Student Handout

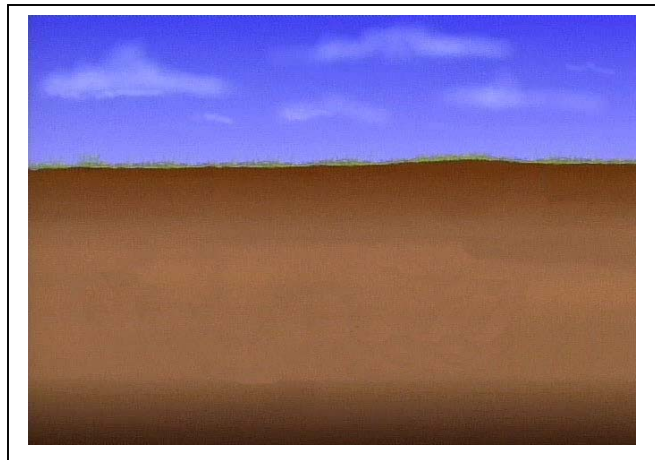
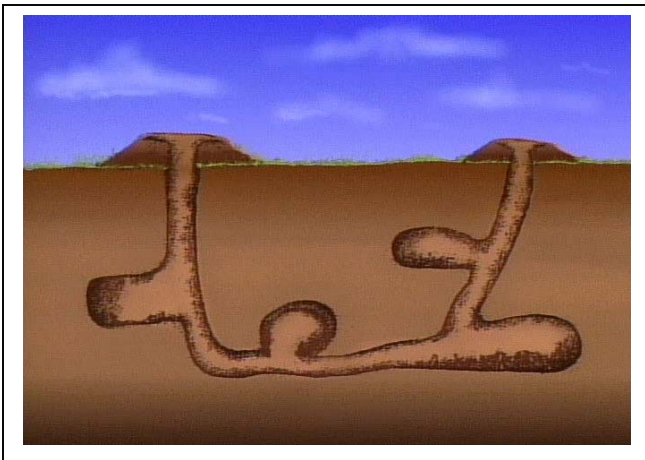
Prairie Dog Den

Background Information

Imagine that a group of prairie dogs have just left the den on the left. What affects will the empty prairie dog burrows have on the ecosystem? Watch the AFG video and jot down the answers to the following questions. Then show how the prairie dog burrow affects the local ecosystem.

Part 1. Watch the American Field Guide video 'Prairie Dogs' and answer the following questions.

1. What other animals use a prairie dog burrow?
2. How does a prairie dog burrow help grasses grow?
3. How might the prairie dog burrow affect the absorption of water into the ground?



Part 2. The diagram on the left shows a recently abandoned prairie dog burrow. The diagram on the right shows ground that has never been dug up. Show how the different types of ground might affect the following:

1. Show where the animals mentioned in the video might go in each of the diagrams. You might draw them in, or simply write their names.
2. Show the path of air and oxygen. Draw a red arrow to represent where air might go.
3. Show the path of water. Use blue arrows to represent water.
4. Show grasses and draw their roots. Remember that roots need air and water to grow. How deep do you think they might be in each environment.

Part 3. Answer the following questions:

1. What advantages does the prairie dog burrow give to other animals in the ecosystem?
2. How does the prairie dog burrow affect oxygenation and watering of the ground?
3. In an area with hot and dry summers, how do you think the prairie dog burrow affects the ability of grasses to survive?

Part 4. Write a short essay to answer the following question:

If prairie dogs were to disappear from an area, how would that affect the diversity of plants and animals of that area? Why?

Student Handout

Climatograms: Abiotic Factors in the Biome

Background Information

What is the difference between a prairie and other biomes? Why do prairies occur where they occur? In this activity you will compare the climate on the prairie with climates from other biomes in the United States to determine what makes a prairie a prairie.

Procedure

To do this, you will plot a climatogram. This is a graph that shows the climate of a region. It contains two kinds of data – average monthly precipitation and average monthly temperature. Since there are two types of data, you will be making two separate graphs on the same piece of graph paper. This is called a double-y graph because there are two Y-axes. The axis on the left is labeled for temperature. Make a line graph showing the temperature data using the left Y-axis. The axis on the right is for precipitation. You will make a bar graph showing precipitation using the right Y-axis.

Step 1. Plot the data below on the graph templates provided. Use the axes as explained in the paragraph above.

Month	Temperature (C)	Precipitation (centimeters)
January	-13.3	1.4
February	-10.5	1.1
March	-3.5	1.8
April	6	2.9
May	12.4	4.7
June	17.5	7.7
July	21	5.2
August	19.9	3.8
September	13.7	2.9
October	7	2
November	-2.5	1.4
December	-9.5	1.4

Table 1: Average Monthly Temperature and Precipitation for Williston North Dakota, 100 miles north of Theodore Roosevelt National Park. North Dakota climate data from: <http://www.soilsci.ndsu.nodak.edu/Enz/enz/almanacs/WillMorpt.PDF>

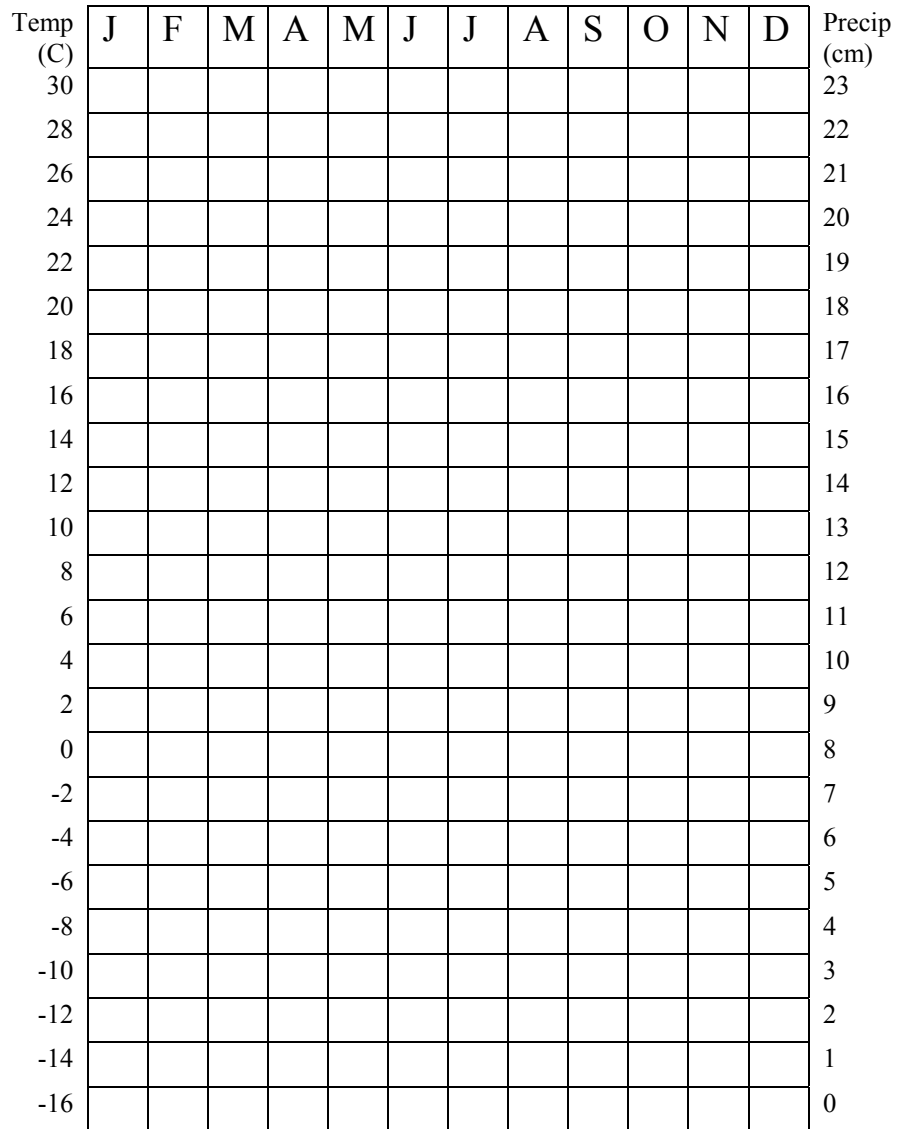
Month	Temperature (C)	Precipitation (cm)
January	3.5	8.5
February	4.6	8.4
March	8.9	9.5
April	14.4	7.9
May	19.2	9.1
June	23.4	9.6
July	25	11.7
August	24.4	10.8
September	21.1	9.3
October	14.7	7.6
November	9.0	6.8
December	4.4	8.4

Table 2: Average Monthly temperature and precipitation for a temperate broadleaf deciduous forest, Greensboro, NC.

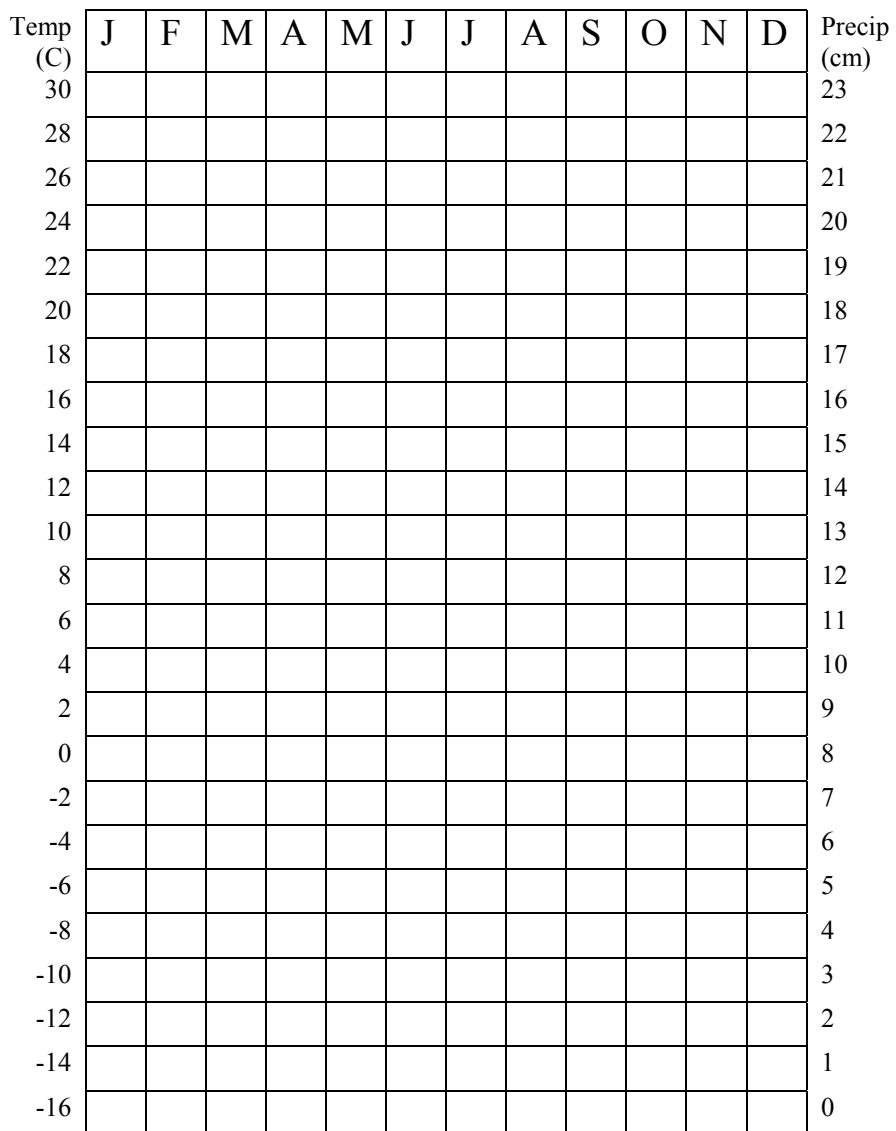
Month	Temperature (C)	Precipitation (cm)
January	-1	2.5
February	2	3
March	7	1.8
April	8	1
May	12	1
June	15	.8
July	20	.5
August	18	.5
September	15	.4
October	10	.6
November	5	1.8
December	1	2.2

Table 3: Average monthly temperature and precipitation for a mid-latitude desert, Reno Nevada.

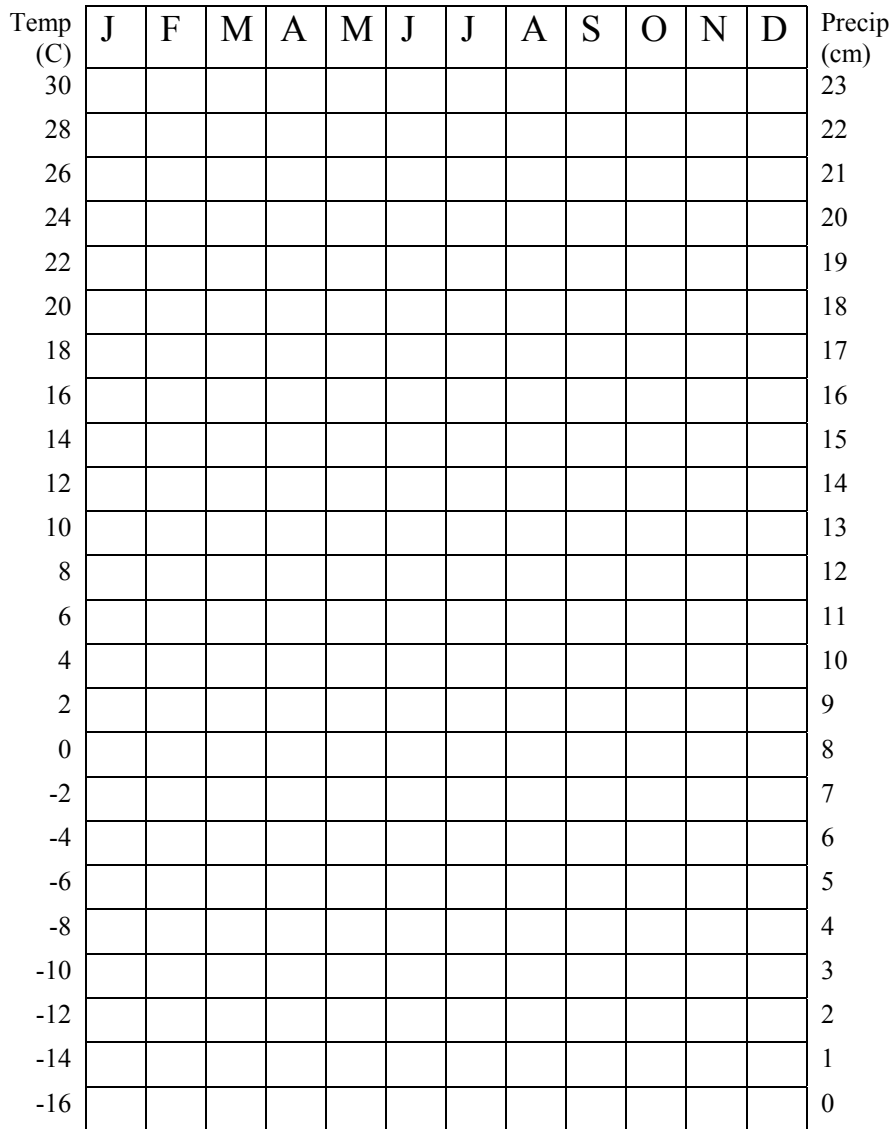
Graph 1: Prairie



Graph 2: Temperate Broadleaf Deciduous Forest



Graph 3: Desert



Step 2. Answer the following analysis questions:

1. Describe the difference in temperature and precipitation:
 - o between a prairie and a temperate forest.
 - o Between a prairie and a temperate desert:
2. Why aren't prairies located in the Southeast or Southwest?
3. What will happen to the amount of prairie ecosystem if global warming and increased precipitation occur in that area?
4. What will happen to the amount of prairie ecosystem if we enter another ice age?
5. Think of typical organisms for each of these biomes. Write down at least two examples for each:

Prairie	Desert	Temperate Forest
---------	--------	------------------
6. Now that you know about the climatic conditions in each environment, how have these organisms adapted for survival in their unique biome?