Made in the Shade:

The Current Situation and Possible Future of U.S. Urban Forests

Meet Dr. Dwyer:

I like being a scientist because I like learning new things and sharing them with people who can use them.

Dr. Dwyer

Meet Dr. Nowak:

I like being a scientist because it allows me to answer questions that have never been answered before.

Dr. Nowak

Meet Ms. Noble:

I like being a scientist because it allows me to understand, appreciate, and take an active role in protecting our beautiful natural environment.

Ms. Noble

Meet Ms. Sisinni:

I like being a scientist because my job is defined by my imagination. This means I get to explore the world and sometimes learn things that no one else knew before.

Ms. Sisinni

Thinking About Science

One of the goals of science is to be able to predict what might happen in the future. No one really knows for sure what will happen in the future, even with scientific information, however, scientists can make a fairly good guess.

One of the ways that scientists predict what will happen in the future is to examine what has happened over time. Let's say, for example, that a scientist has observed that the number of frogs living in an

Glossary

mammals (**mam** ulz): Warm-blooded animals that have a backbone; Females have glands to produce milk for feeding their young.

absorbing (ab **zôrb** *ing*): Attracting and taking in another substance.

carbon dioxide (**kär** bun di **ox** id): A gas made up of carbon and oxygen with no color or smell.

natural resources (**nach** ur ul **re** sôr sez): Things in nature that take care of a human need, such as oil.

status (**stat** us): The state or condition of something.

estimate (**es** tuh mat): To make a general but careful guess about the size, quality, value, or cost of something.

census (**sen** sus): An official count of all the people in a country, including other information such as their sex, age, and occupation.

crowns (krownz): The top parts of things.

average (**av** rij): The number gotten by dividing the sum of two or more quantities by the number of quantities added.

analyze (**an** uh liz): To separate something into its parts in order to examine them.

data (**dat** uh): Facts or figures studied in order to make a conclusion.

analysis (uh **nowl** uh sis): Separating something into its parts to examine it.

radiation (ra de **a** shun): The process of sending energy out in rays from atoms and molecules.

Pronunciation Guide

a	as in ape	ô	as in for
ä	as in car	u	as in use
e	as in me	ü	as in fur
i	as in ice	oo	as in tool
o	as in go	*ng*	as in sing

Accented syllables are in **bold**.

area between 1981 and 2003 went down every year. If you were the scientist, would you predict that the number of frogs will go down over the next 5 years or stay the same?

You can see that if scientists are going to make useful predictions concerning the future, they need to know what has happened in the past over a period of time.

Thinking About the Environment

The scientists in this study examined a special kind of forest. This kind of forest is probably familiar to you, but you never guessed that it is called a forest!

This special forest is called an urban forest, and it is defined as the trees and other plants that grow where people live, work, and play. An urban forest includes trees that grow along the street, in your schoolyard, in parks, and anywhere else in the community (figure 1).

An urban forest, like a rural forest, provides homes for animals, such as birds, small *mammals*, and insects. They make places more beautiful, reduce noise, and provide shade. They also reduce flooding by slowing or stopping some rain from hitting the ground and by *absorbing* rainwater. Urban forests keep the air cleaner by absorbing *carbon dioxide*. They also provide places for people to play and learn about the natural

Figures 1a, 1b, and 1c. Examples of urban forests.

environment. People don't always think of the trees and other plants near their homes as *natural resources*, but they are!

Introduction

The scientists in this study were asked to determine the current *status* of urban forests in the United States. The scientists decided to find out how much land is covered by trees in cities, towns, villages, and other areas. The scientists were also asked to predict the future of urban forests, so they tried to answer this question: "Will there be more or less urban forests in the future?"

Reflection Section

- Do you think that the scientists visited every city, town, and village where people live across the United States to count the number of trees within urban forests? Why or why not?
- If you were the scientist, how would you *estimate* the current status of urban forests across the United States?

Method

The scientists could not visit every city, town, village, and suburban area in the United States and count the trees. That would have taken them years and years! Instead, they used information collected by other scientists.

First, they used information from the United States *census* to identify the areas of the country where most people live (figure 2). Then they used maps created by USDA Forest Service scientists that show how much of the land area where people live is covered by the *crowns* of trees (figure 3).

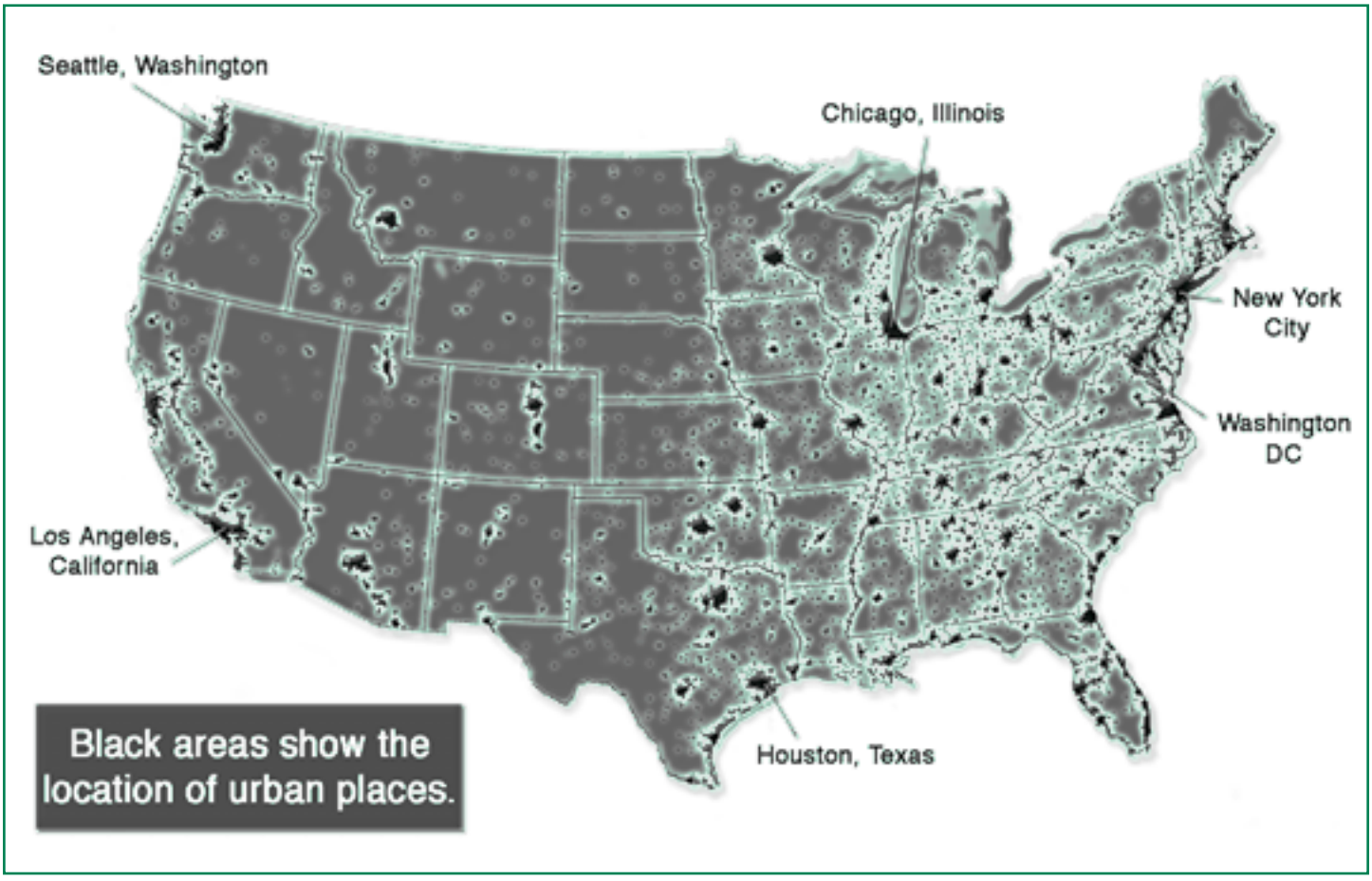


Figure 2. Location of urban places. This map of the United States was drawn from a photograph taken from space at night.

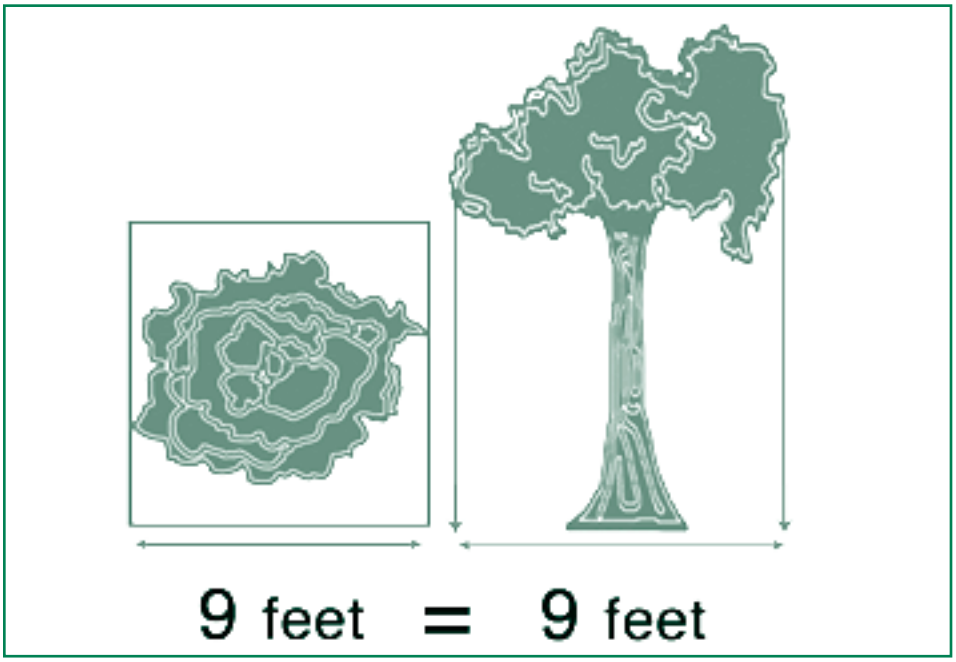


Figure 3. Tree crown and its relationship to the measurement of tree cover.

Reflection Section

- Do you think that the scientists will be able to predict what might happen in the future, based on the information that they collected? Why or why not?

Results

The scientists found that 8 out of every 10 Americans live in cities, towns, villages, or suburban areas. (What percentage is that? Divide 8 by 10 to find out.) The scientists found that these areas where people live have about 27 percent tree cover (figure 4, pg. 37). This means that a little over one- quarter of the land where people live is covered by tree crowns. Surprisingly, this is not much less than for all lands in the United States, which is almost 33 percent. There is more tree cover in cities, towns, and suburban areas in the Eastern United States, as compared with the midwestern, western, and southwestern areas of the country.

The scientists discovered that the amount of land across the United States that is taken up by buildings, roads, and parking lots has tripled during the past 20 years. The rural forests are being replaced by buildings, roads, parking lots, grassy areas, and trees and other plants that are planted around or near the built structures. If the amount of land taken up by buildings, roads, and parking lots continues to increase in the future, there will be less rural forests and more urban forests across the United States.

Reflection Section

- Why do you think there is more tree cover in the Eastern United States than in the midwestern, western, and southwestern areas of the country?
- Do you think that in the future, more or less rural forests will be replaced by buildings, roads, parking lots, and urban forests? Why?

Implications

Urban forests are an important part of the places where people live. The scientists believe that urban forests will become even more important in the future. More land is being used for buildings, streets, and parking lots. People will need to have urban forests around them to provide the benefits listed in "Thinking About the Environment." (Can you name some of those benefits?)

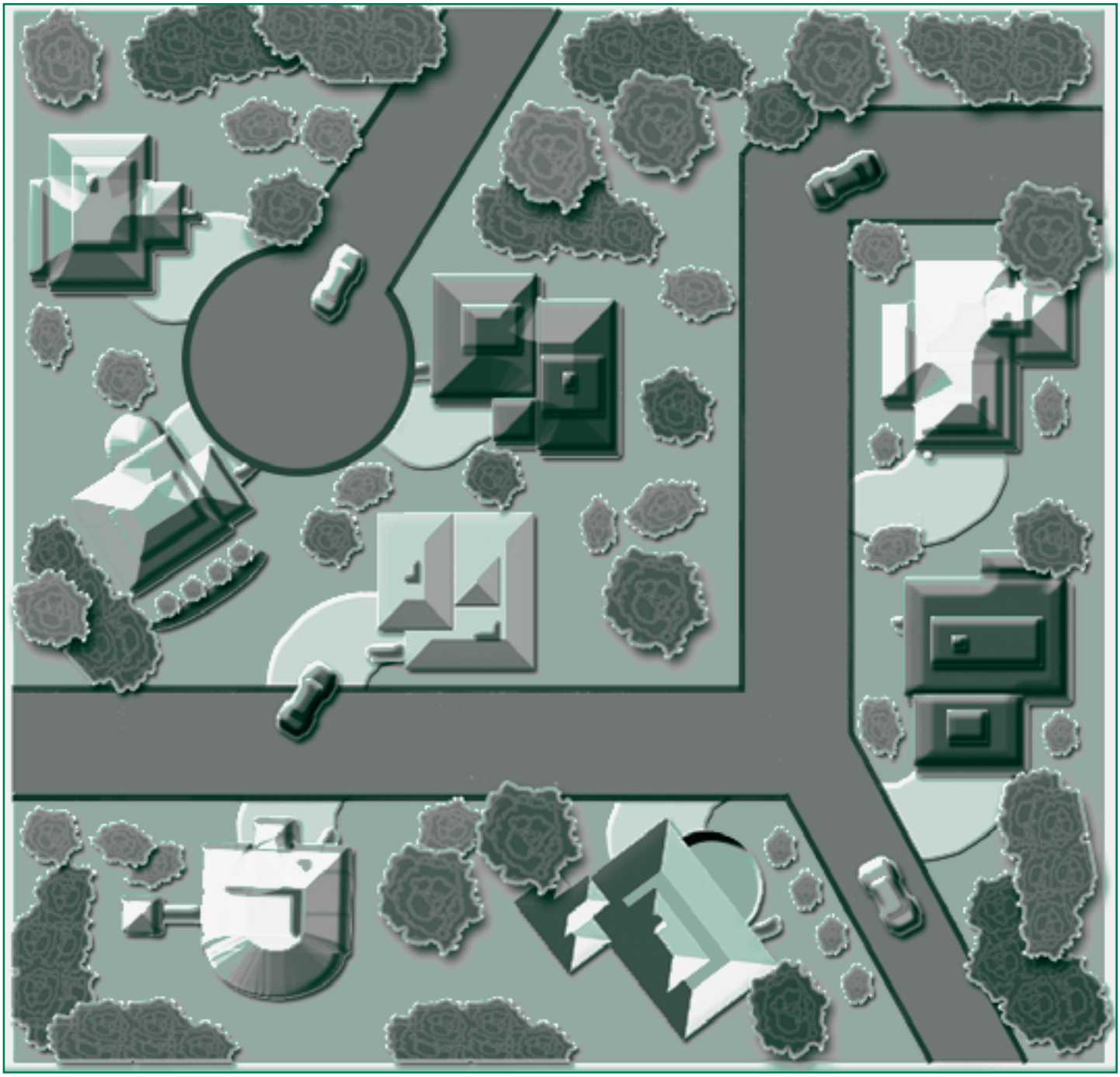


Figure 4: On the average *across the United States, 27 percent of the areas where people live are covered in trees.*

Reflection Section

- Would you consider your schoolyard or local park area an urban forest? Why or why not?
- Think about your own use of urban forests. What are some of the benefits you get from having an urban forest near where you live or play?

From: Dwyer, John F.; Nowak, David J.; Noble, Mary Heather; and Sisinni, Susan M. 2000. *Connecting people with ecosystems in the 21st century: An assessment of our nation's urban forests.* Gen. Tech. Rep. PNW-GTR-490. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 483 p.

FACTivity

Sometimes, the temperature is too hot for people to feel comfortable outside. Urban forests might have an impact on how hot or cool you feel in the warmer months. The question you will answer in this FACTivity is: How does being in the shade affect how hot you feel?

The method you will use to answer this question is:

1. Get two thermometers. Place one thermometer outside under some shade, such as among tree branches. If there are no trees near you, place one thermometer outside under a bush or other vegetation where it will receive shade.

2. Place the second thermometer as close as possible to the first, but in a place where it will receive full sun. Leave the thermometers in place for at least 30 minutes before making your first observation.

3. Record the temperature registered by each of the thermometers.

4. Have one person in your class observe and record the temperatures at the beginning of the class period, another person observe and record the temperatures during the middle of class, and a third person observe and record the temperatures at the end of the class period.

5. Also observe and record the cloud conditions at the time each observation is made. Use the chart below as a guide for your recording.

Date and time	Temperature–In the shade (°F or °C)	Temperature–In the open (°F or °C)	Cloud conditions (1-5)

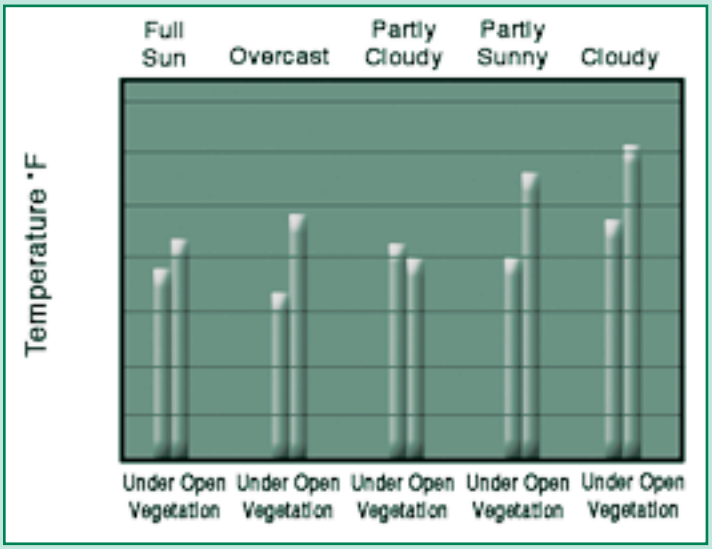
6 Observe and record the temperature and cloud conditions for at least 9 school days (or almost 2 weeks). (How many observations will you have? Multiply 3 X 9.) On the 10th day, you will *analyze* your *data*. Use the following to observe and record cloud conditions:

Cloud conditions:

1 = Clear (full sunshine, sharp shadows, no clouds)
2 = Overcast (Hazy sunshine, fuzzy shadows)
3 = Partly cloudy (Mostly full sunshine, some clouds over the sun at times)
4 = Partly sunny (Mostly cloudy, some periods of full sun)
5 = Cloudy (No periods of sunshine)

7 Separate your recorded data into categories based on cloud conditions. For example, place all of the 1's (full sun) together, all of the 2's together, all of the 3's together, and so forth.

8 Create a bar chart for each cloud condition that occurred during your observation and recording. Bar charts are also called histograms. See the example below.



9 After you have created all of your bar charts, compare the charts with one another. Is each cloud condition different? If so, how?

10 Now compute the average of all of the temperature recordings taken in open conditions, and the average of all of the temperature recordings taken under vegetation. To calculate the average, add all of the temperature recordings and divide the total by the number of observations. Compare the two averages. From your *analysis*, answer the question posed at the beginning of this FACTivity.

Your results probably show a difference between the temperature recorded in the sun as compared with the temperature recorded in the shade. Were you surprised? Probably not, as you know that you feel hotter in the sun than you do in the shade. Did you know that in both cases the air temperature is actually the same? You feel hotter in full sun because the sun's *radiation* falls on your skin and heats it. The sun does the same thing with the thermometer. It feels cooler under trees because the shade keeps the sun's radiation from heating your skin.