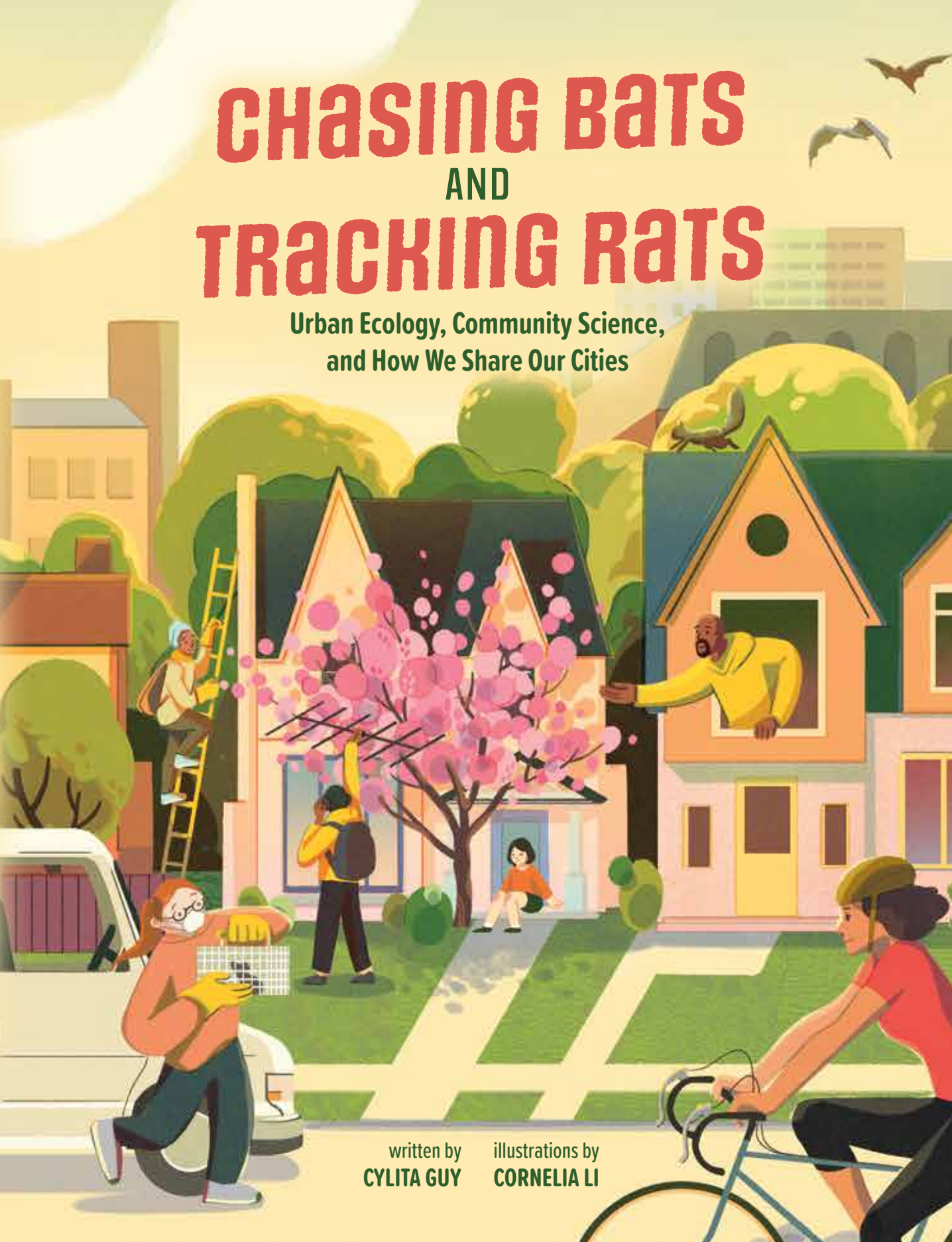
Chasing Bats AND Tracking Rats

Urban Ecology, Community Science, and How We Share Our Cities



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To my parents, who helped a Black,
city kid grow up with a deep love of nature.
I hope this book helps other melanated kids do the same.
—C.G.

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INTRODUCTION
Living in the Urban Jungle

There are more than seven billion people on earth. Over half of these people (around 55 percent) live in cities. That's a lot! And guess what? That number keeps going up. Cities may make life easier for many humans by bringing us closer to things like grocery stores, jobs, and hospitals, but they make it much harder for most wildlife.

Think about it—to build our cities we destroy the natural spaces that are homes for insects, plants, and animals. We make roadways that split forests into smaller pieces. We mow fields so we have parks to play in. Sometimes we even get rid of everything when we pave over the ground to create parking lots. These changes are too much for many plants and animals to handle. Without the right type of habitat, many species can't survive in cities. This means there is often less biodiversity—or different types of plants and animals—in cities compared to natural spaces.

But guess what? Some creatures seem to do okay in cities. In fact, some species do better in cities than in their natural habitats! There is still a lot we don't know about urban wildlife, but scientists are learning more every day. As cities continue to grow and expand, it's important that we understand how city living may be changing the behavior of these species and how living so close to them may be affecting us.

The scientists who study how different species interact with each other and their environments are called ecologists. When most people think of these wildlife scientists, they think of people adventuring in far-off places. Perhaps you've even seen ecologists like these on TV—diving in the ocean or exploring in rainforests. But there is a whole group of ecologists who study the animals and plants living in cities! Ecologists like me. Hi! My name is Cylita and I'm one of the many urban ecologists around the world helping us understand nature in our cities.

Have you ever wondered how far rats scurrying out of dumpsters might travel in the city? Or how many bird species are in your local park? What about the ways that plants can fight climate change in urban areas?

From bats to bees and microplastics to trees, this book will introduce you to urban ecologists who answer questions like these ones. And because science requires teamwork, all of the urban ecologists you'll meet are people that I know and have worked with!

You'll also learn about the wacky ways we do our science in urban environments (like riding a science bike!). Cities are complicated and busy places filled with lots of different challenges to doing research. As urban ecologists, we have to come up with creative approaches to get our data and build cool tools to help answer our questions. Some of my urban ecologist friends even get everyday people—like you!—to help them collect their data.

We want to help you understand why nature is so important in our cities. Humans get a lot of benefits—or ecosystem services—from nature, but we also have a responsibility to keep our environments healthy and protect the species living in them. We also want you to explore your own local biodiversity, so keep an eye out for urban ecology challenges at the end of each chapter. Who knows, while you're out adventuring in your neighborhood, you might even meet one of us—or your own friendly neighborhood urban ecologist!

URBAN ECOLOGY CHALLENGE

Each scientist in this book has created a challenge just for you! These challenges will get you thinking like an urban ecologist, and will show you how to be a protector of your local biodiversity. Before you start, make sure you have a small notebook and pencil. No explorer, adventurer, or scientist goes anywhere without their trusty field notebook!

Look, but don't touch (and please don't feed!)

Throughout this book, you're going to hear stories from scientists who catch and handle wildlife for a living. These scientists—me included—have had years of training and wear special equipment to keep them and the animals they handle safe. When you go out to enjoy the species in your neighborhood, please don't try to touch any of the animals you meet! And don't share your food with them. Although lots of animals beg for human treats, this food can make them sick later.

TALK LIKE AN URBAN ECOLOGIST!

Key Terms

Here are a few special terms we urban ecologists use in our work—terms that will pop up in many chapters in this book. If you're reading and aren't sure what a word means, flip back to this page.

Urban

Also known as cities, urban areas are places where lots of people live and work together.

Suburban

As you move toward the outskirts of cities, homes and people usually become more spread out. These are called suburban areas.

Rural

Outside of cities, people may live in small groups surrounded by farmland and natural areas. These are rural communities.

Wilderness

These are natural areas that haven't been changed by humans, or where human activity is minimal.

Ecosystem services

The benefits humans receive from natural environments and the species inhabiting them. For example, animals and insects pollinate our crops; trees and other plants provide building materials (not to mention the air we breathe!); and wetlands help to filter and purify water.

Hypothesis

Science is all about asking questions about the way the world works. A hypothesis is a well-thought-out answer to a question we have asked, but haven't yet tested with an experiment or through observation. To come up with hypotheses, we often need to do research to get enough information to make a statement about what we think will happen.

Let's say we want to know if plants grow larger when they have access to sunlight. If we did some research, we would find out that plants use the sun's energy to produce their food through photosynthesis. Based on this, we could hypothesize that if a plant is given no light, it won't grow.

Experiment

Once we have asked a question and come up with a hypothesis, we can design an experiment to test it.

To find out if sunlight makes plants grow, we could design an experiment with two plants on a windowsill. We could cover one plant with a box so it gets no light and leave the other uncovered. Since we are only interested in the effect of sunlight, we would want to make sure that nothing else differs between our plants. This means we'd have to use the same species of plant, give them the same amount of water at the same time, and keep them at the same temperature.

Observation

While experiments are an important part of science, most of the urban ecologists you'll meet in this book are trying to make observations about nature in cities (but many urban ecologists do experiments, too). Observation means watching the natural world to understand patterns and see what might change over time. With observational science, we don't manipulate or change anything like we would with an experiment.

For example, if we wanted to know the height of the average middle school student living in Fredericton, New Brunswick, in Canada we couldn't answer this question by doing an experiment. Instead, we would need to go out and make some observations about Fredericton's middle schoolers.

Sampling

When scientists try to make observations about patterns in the world, we can't always measure everything. Instead, we collect information from a smaller part of a population, landscape, or natural process that we want to measure. This is called sampling.

It would be very hard and take a lot of time to measure the height of every single sixth grader in Fredericton, so we might choose to measure the heights of children in classrooms from three different schools across the city. This sample of sixth graders should give us an idea of the overall pattern of heights in all of Fredericton.

Data

Data is all the information we collect and record while sampling or conducting an experiment. With our plant experiment, our data might be daily measurements of the height of each plant. With our sixth graders, it would be measurements of each kid's height. A dataset is a collection of all the data that comes from an experiment or project.

Bias

Bias is a preference for one thing, group, or location over others. Sometimes datasets can be biased toward, or contain only information on, certain groups of people or things because we aren't careful with how we design our experiments or sampling. When our experiments or observations are biased, we can miss important pieces of information that will affect the answers to the questions we ask.

If we measured the heights of only sixth-grade students in Fredericton, our sample would be biased toward sixth graders. We wouldn't be able to use our data to say something about the heights of all middle school students in the city because we wouldn't have height information for the seventh- and eighth-grade students also at the school. To avoid bias, we'd want to measure students from all grades from several middle schools in different neighborhoods so that our sample is representative of the whole population.

Processing

A process is a series of related actions or steps that scientists take to get to an outcome. In urban ecology, processing refers to the steps we take to collect data when we are sampling individual animals, plants, or people in a population.

Many types of information can be collected during processing. An ecologist might want to know how old an animal is, how heavy it is, and its sex (male or female). They might collect several different samples from an individual, including fur, blood, or urine. They might also want to tag the animal or plant so they can identify it later.

Processing the Fredericton sixth graders might involve taking their names (so we know who we've measured), measuring their heights, and recording what school they were from.

Results

Results are the end or outcome of an experiment or sampling. In the plant experiment, the result would be seeing which plant (the one with light or the one without) grew taller. In the example with our sixth graders, the result would be the average height calculated from the data we collected.

CHAPTER 1

CHASING DOWN BIG BROWNS

How much do wildlife rely on city green spaces?

I BET THE LAST TIME YOU PLAYED AT THE PARK, you saw some wildlife sharing it with you. Birds in trees. Squirrels running around. Turtles sunning themselves on rocks in a pond. Parks and green spaces are often the closest thing to the natural habitats of animals and plants in urban environments. So, we like to think of them as being good habitat for wildlife in the city. That's what I thought when I set out to study city bats in High Park—a large green space in Toronto, Canada. It seemed like the perfect habitat for city bats. High Park is full of tall old trees that bats might like to sleep in. It also has a large pond that bats could forage—or hunt—for insects.

But after chasing bats around the park all summer, I'd barely caught any. Where were the bats going at night to feed? Where were they sleeping during the day? It didn't seem like bats were using the park at all. But I was about to learn—in the most dangerous way possible—that this wasn't quite the case . . .

WHO'S AFRAID OF A BIG BROWN BAT?

"The park is closed. What are you still doing here?"

Pausing, I looked up at the large, grumpy police officer standing in front of the picnic table I was sitting at. Around me were a number of strange items: test tubes for storing samples, a margarine container full of measuring tapes, a pile of tiny felt bags, and a kitchen scale. Beside me sat Krista, my bat-catching partner in crime. She and I were now several hours into processing the 25 bats we had caught in the chimney of a nearby house.

I sighed. It was one o'clock in the morning and it had already been a very long night. Earlier that evening, Krista had climbed a ladder and dangled herself and our roost trap over the side of a four-story home. After searching all summer, we'd finally found our first bat colony in a neighborhood filled with large old houses and trees—just a few blocks away from High Park. The people living there had given us permission to climb on the roof that night.

TOOLS OF THE TRADE

Usually I use mist nets to catch bats while they are out flying at night. Mist nets are like big, fine-mesh fishing nets that we put high up in the air between two poles. These nets are split into sections (called tiers) with baggy pockets at the bottom. Unsuspecting bats fly into these nets and get tangled in those pockets. Before starting my processing, I carefully untangle them, making sure they aren't hurt.

When we need to catch bats in areas where there are too many trees or the ground is too hard to put up a mist net, we use harp traps instead. Harp traps are made of a big metal square with fishing line looped around it. Bats try to fly through the fishing line, get caught, and then fall into a bag at the bottom. The roost trap Krista used to catch bats as they left the chimney for the night was a lighter and smaller version of a harp trap.

But the easiest way to catch a bat is when they're roosting in an area that we can get into (like a cave or an attic). Then we can just go up with a gloved hand and pick them off the walls!

As the sun set, I had watched excitedly from a lower section of the roof as our trap filled with bats.

After an hour, Krista had lowered a bag full of squirming bats into my arms! I had almost squealed at the thought of how much data we were going to be able to collect from them. Everything had been going perfectly, until it had come time for Krista to get down from the roof. As Krista stepped onto the first rung of the ladder—she slipped.

Krista had fallen from the ladder and tumbled toward the edge of the roof! But I had jumped forward and grabbed her by the belt just before she fell off. Thinking about it again had my heart racing. Krista's near-death experience had been stressful enough, and now, the police officer shining his light in my face was giving me a headache.

"Ma'am," the police officer said, snapping me back to the present, "please answer my question. What are you doing in the park?"

I explained that I was a scientist who studied bats living in cities. I told the officer about the 25 bats we'd caught and how we had brought them to the park so we could collect information about them before letting them go.

The police officer nodded and asked if he could see one of my bats. I held up my gloved hand. Inside my closed palm, a tiny brown face squirmed, trying to escape. "It's a big brown bat, but they really aren't that big!" I joked. The officer didn't laugh.

"Where are the rest of the bats?" he asked. "Have you let them go already?"

I told him that we hadn't yet because it was so cold. Even though it was a summer night, it was only 10 degrees Celsius (50 degrees Fahrenheit). When bats get cold, they go into a hibernation-like state called torpor. Because they've dropped their body temperature to save energy, torpid bats are slow and sluggish—and they can't fly. I explained that we had to warm up all our bats before we could let them go.

The officer's eyes got larger and larger, until finally he put up his hand to stop me. "Ma'am," he said, squinting. "Do you know that your shirt is moving?"

I looked down. Sure enough, there were several squeaking lumps wiggling around between my sweater and T-shirt. "Of course, officer!" I grinned. "Like I was saying, we have to warm our bats back up. So, the rest of the colony is down my shirt and under my armpit. And it looks like some of them are just about ready to start flying again!"

The police officer shook his head and took off pretty fast.

Bats are not rats

Ever heard that bats are just flying rats with wings? Not true! While both bats and rodents are mammals, bats are their own separate group, Chiroptera. Chiroptera comes from the Greek words *chiro*, meaning hand, and *ptera*, meaning wing. So, Chiroptera literally means "hand wing."

Some other common bat myths debunked: bats won't get stuck in your hair when they're out flying, they aren't blind, and not all species are blood feeders.