Exploring our own backyard
Learning new vocabulary words can be difficult. But spend a single day driving in and around Phoenix, Arizona and it is easy to understand the definition of “sprawl.” You can see it, hear it, smell it, and touch it. In Phoenix, the boundaries between urban, suburban, and rural areas are being churned into a dusty blur. Habitats and environments big and small are part of the overall mix.

Ecologists are scientists who study the blurred areas and everything in, around, above, underneath, and between. At Arizona State University’s Center for Environmental Studies, scientists are studying the churn and sprawl taking place in Phoenix. They want to better understand a growing young city, a changing pristine desert, and the many smaller worlds found in our own backyards.

The researchers are part of a huge project designed to study the urban ecology of Phoenix. The Central Arizona—Phoenix Long-Term Ecological Research project (CAP-LTER) is a massive and complex data-gathering effort. Started in 1997, the project is funded by the National Science Foundation.

Ecologists are examining two cities (Phoenix and Baltimore, Md.) over a long time period. The idea is to document the negative and positive effects that human occupation has on an urban ecosystem, and what effects the ecosystem has on humans. The project will take decades to complete. From another perspective, it is a project that will never be completed.

CAP-LTER includes many smaller studies. One of those is designed to document all the native desert plants, birds, and creepy crawlies living in and around the metropolitan area.

The ASU scientists don’t count alone. They are assisted by a hearty corps of volunteers known as Ecology Explorers. The group is unique. Many of the scientists in training are too young to drive a car. Others are still mastering the art of tying their own shoes.

The researchers are in the early phases of collecting what scientists call “baseline data.” It is historical information about what central Arizona was like in the last part of the 20th and early 21st centuries. “Baseline data” provides a starting point. It is a compilation of facts and figures that future scientists will use to compare with numbers they compile and with the conditions they observe.

The Ecology Explorers include schoolchildren in kindergarten as well as students in elementary through high school. The students collect specimens of all kinds and learn the proper methods for recording accurate data. All of that information is loaded into computers located on the ASU main campus in Tempe.

Scientists say that community involvement is critical to the success of the CAP-LTER project. The planners purposely built a large educational component into the matrix. “Not only does this assist in the research, it also improves community ecological awareness and inspires kids to develop critical thinking skills,” says Monica Elser, educational liaison for the Center for Environmental Studies.

Ecology Explorers is CAP-LTER’s educational outreach program. Since its inception, Elser says the program has included 77 public school teachers at 54 schools in 22 districts in and around metro Phoenix. Currently, the program is reaching an estimated 2,000 students each year. More teachers sign up as word about the program spreads.

Ecology Explorer programs are also ongoing in local private and charter schools. The idea is to teach science by letting kids get their hands dirty. They are taught to look for patterns in nature. They are taught how to ask focused scientific questions and how to form hypotheses. Then they learn to design experiments, run them, and analyze the results.

In short, students in the program get to learn and do real science. The result has been remarkable, says Dave Boomgaard, a biology teacher at Westwood High School in Mesa. “This project has been a valuable tool for me and my students. The kids really get a kick out of it.” Boomgaard says. “Even though I am a biology teacher, I thought ‘a bug, is a bug, is a bug’ before enrolling in the program and learning more about arthropod research. Now my students and I know different.”
Do You See What I See?

Imagine an inkblot. Now imagine phoning a friend who lives on the other side of the country. Your challenge is to verbally describe to your friend what the inkblot looks like. Okay, now describe your inkblot with enough detail that your friend can illustrate it accurately. What words would you use to explain it? How descriptive would you have to be?

Doing scientific research includes a continuous series of similar challenges. The scientist’s job often includes finding a way to communicate abstract ideas in a way that others can understand, and ultimately replicate. To get the job done, scientists rely on specific terminology and techniques that other scientists understand and know how to use. Teaching young researchers how to tighten their observation skills is essential to any scientific endeavor, especially if that project has long-term ramifications.

Lots of barriers can impede scientific discovery. Teachers who take part in the Ecology Explorers program learn how to overcome those barriers. The program is part of the Central Arizona—Phoenix Long-Term Ecological Research project run in part by scientists at ASU’s Center for Environmental Studies. Last spring, a dozen Phoenix-area elementary, intermediate, and high school teachers took part in a day-long workshop. One exercise was designed to improve the teachers’ understanding of the data gathering processes commonly used in science. They also learned how to relay those skills to students at different learning levels.

The exercise began with a game. Just like the inkblot exercise above, teachers paired off, sitting back-to-back. One teacher explained the inkblot while the other tried to draw it unseen. The illustrators were not allowed to ask questions. They could only rely on the description provided by their partners.

In this instance, the final drawings were way off the mark. The illustrators were not allowed to ask questions. They learned firsthand how a lack of common terminology and detailed observation skills can lead to useless gibberish. Later in the day, teachers got the opportunity to apply newfound understanding during a second exercise. This time the task was to describe the leaf of a common houseplant.

The keys to success were common knowledge among the teachers of basic leaf parts, shapes, and botanical terms. Once such skills are mastered, comparing research notes and adapting skills to age-appropriate and practical classroom exercises seems less daunting.

Lynette Summerill
As part of the program, teachers are immersed in science during workshops and highly competitive summer internships. They learn the specific protocols for collecting scientific samples in CAP-LTER studies on bird populations, ground arthropods, plant diversity, and plant-insect interactions. They also examine water relationships in human and natural environments. All of these studies are then transferred to classrooms and schoolyards across the Phoenix area.

Boomgaard was one of the first teachers to enroll in the program. He says the benefits are tangible. “I received the tools necessary to do meaningful research. And I’ve shared those tools and skills with other teachers at my school,” Boomgaard says.

“My students know that this research is for real. They know that accuracy is not only expected, but that it is being relied upon by others. As a result, the overall quality of our classroom work has improved.”

Lots of educational programs provide mock experiences for students. “This is different. This is a program that offers real research opportunities—where the data matters. It definitely increases the significance of the project for students, and they perform accordingly,” Boomgaard adds.

Gene Lescallette is a science teacher at Desert Mountain High School in north Scottsdale. He is impressed at how the program offers his students the experience of learning the value of scientific collaboration.

For example, students might collect data about birds and native plants during field studies conducted on the school grounds. They then post their findings on an interactive Web site where it can be shared with other students working on similar research. Likewise, his students can use existing data for comparison and to reinforce their own findings.

Lesson plans are also available for use in the classroom. Some are developed by Ecology Explorer’s participating teachers. The teacher-prepared lessons are an essential component of the K-12 outreach program. The classroom lesson plans comply with Arizona academic standards. They also offer a creative and fun way for teachers to present new ideas and expand the students’ imagination and appreciation for science.

Linda Idol teaches fourth and fifth grade at West Point Elementary in Surprise. She says the classroom support offered to participating teachers is exactly what piqued her interest in the program.

Idol has been involved in the program for less than a year. She is impressed with the technology and ASU personnel who are available to come to her school. These scientists conduct experiments and provide on-site support, which she says enriches the experience for her students.

Last spring, Idol’s 21 students studied pill bug reproduction. They counted and identified the insects in and around the schoolyard. Each new discovery was an exciting event that gratified both students and teacher.

“It’s just like Christmas,” she laughs.

Idol said her precocious students were most interested in learning how to tell the difference between male and female pill bugs. “It’s not something we were successful at as yet, but we’ll keep trying,” she says.

Identifying different species of bugs, birds, or plants is not always an easy task. Elena Ortiz-Barney knows. The ASU plant biology graduate student assisted the Ecology Explorers at Machan Elementary in Central Phoenix last spring.

Students at Machan were enthusiastic about identifying and mapping the various native plants growing around their school. Eager to assist, Ortiz-Barney gathered her equipment and headed to the school grounds to do just that. The task turned out to be much more difficult than expected. Especially since the ASU scientist had broad knowledge of such flora, or thought that she did. Perplexed, Ortiz-Barney switched into detective mode to solve the mystery.

She discovered that many of what the students thought were “native” plants actually were cultivated plants and tropical trees from Mexico, South America, Australia, and Africa, including several varieties of aloe.

“This varieties of plants have been used in the area for a long time. As a result, many people assume they are native species,” she says. “That is one reason why this project is so fascinating and equally important in historical terms.”

ECOLOGY EXPLORERS IS A SPECIAL EDUCATION PROGRAM ASSOCIATED WITH THE CENTRAL ARIZONA—PHOENIX LONG-TERM ECOLOGICAL RESEARCH PROJECT. FOR MORE INFORMATION, VISIT THE WEB SITE AT HTTP://CAPLTER.ASU.EDU/EXPLORERS/