

All Creatures Great and Small ...and Endangered

Tracking squirrels in Arizona

By Joanne Littlefield

Red Squirrel Monitoring Program



Arizona is home to (l-r) Arizona gray, Mt. Graham red, Abert's and Mexican fox squirrels.

Ecologists from the University of Arizona trek through the high elevation forest, looking for signs of squirrels—from the small rare fox and endangered red to the larger-bodied, non-native Abert's and Arizona gray. They want to know what the squirrels like to eat, where they prefer to live, how far they range and what effect fire and predation have on their lifestyle. Providing such data to federal, state and private land managers can assist them in developing more scientifically based plans for managing resources.

Because the success of the research depends on being able to gather data regularly from the squirrels, the first step for students and faculty from the School of Natural Resources is to familiarize the squirrels with live traps. First they leave the traps open to offer easy access to treats such as peanuts or peanut butter. When the team is ready to collect biological data they'll set the traps and check them every one to two hours.

Most of the squirrels in the Southwest are diurnal—they're active during the day. In summer they are most active during the cooler parts of the day, thus in high summer the research team of seasonal technicians and graduate students sets up the traps first thing in the morning, soon after sunrise.

"We focus on this morning period when they've been in the nest all night, and their stomachs are relatively empty," says conservation biologist John Koprowski. A professor of Wildlife and Fisheries Science in the School of Natural Resources of the College of Agriculture and Life Sciences, Koprowski is also director of the Mt. Graham Red Squirrel Monitoring Project.

"They come out and usually go through a big foraging bout of a few hours where they just are exploring, trying to find food. Males are out looking for potential mates and kind of tracking the females."

Monitoring takes place throughout the year. A quarterly trapping effort in March, June, September and December is designed to catch as many animals as possible to assess their survivorship and reproduction. The squirrels are also monitored at times when they are reproducing and the females are nursing their young.



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UA conservation biologist John Koprowski guides a Mount Graham red squirrel into the canvas bag he developed to keep squirrels calm during capture and measurement.

The squirrels are captured, weighed, categorized, tagged and outfitted with a radio collar and transmitter, and then released. Their individual radio stations give biologists a peek into just what they're up to. "Radio Squirrel!" allows researchers to learn about such things as precisely which type of tree is preferred as a home and a pantry, how far is just far enough to wander looking for food or a mate, and how many young might be born at different times of year.

"I can't wait to see where he goes and where he lives," says graduate student Seafha Blount, as the squirrel scurries away. This is her first year of developing data from squirrel middens, habitat plots and radio telemetry. Her graduate research will compare burned and unburned areas on Mt. Graham.

"That's the best, these first few days," Koprowski responds. He has worked with squirrels since he was an undergraduate at The Ohio State University. He was well-settled in his career in Oregon in the mid 1990s when the National Park Service tapped him to study the rare Mexican fox squirrel in the Chiricahua Mountains for a summer. He packed up his family for the summer, returned a second summer and in 2000 made the move permanently to Arizona.

Much smaller than their eastern and northern relatives, the squirrels of Arizona live and die by the health of the "sky island" forests. The term was coined in 1967 for mountaintops of forest surrounded by desert and grasslands in the Southwest. When drought, fire or insects strike, the squirrels often react by having fewer offspring. Thirteen distinct mountain ranges in Arizona are categorized as isolated sky islands. Koprowski is studying and overseeing student research projects on squirrels, other mammals and reptiles in four of these sky islands.

"Much like the miner's canary, squirrels can tell us if the forest is changing and what directions some of those changes are going in," he says. "They are well-adapted to forest life and require mature, healthy forest to be able to survive."

There are five different squirrel species (or subspecies) of interest to UA biologists, ranging from introduced and nuisance species to those

that are indigenous, rare or endangered. In the case of the Mexican (*Sciurus nayaritensis*) and Chiricahua fox squirrels (*S. nayaritensis chiricahuae*) and the Mt. Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*), the populations have dwindled to the point that extra care is taken in trapping and handling them. Over the past 20 years Koprowski has developed a method that keeps the animals calm so the researchers can gather important biological data.

“We run them into a handling device that covers their eyes, and their heart rate drops,” he says. Koprowski uses a triangular-shaped canvas bag that holds the squirrel in close, dark and tight quarters. “They get real mellow and we handle them quickly, less than five minutes.” The goal is to get them back out into nature and their territory as quickly as possible. “Because we’re dealing with an endangered species—that’s critically endangered with only 199 left—we’ve got to take extra care that these things are protected,” Koprowski says.

His capture and release techniques work for a variety of different species and have been so successful that he now has permission from the US Fish and Wildlife Service to handle species that are rare and endangered.

“As you can imagine, they are quite reluctant to hand out a permit to just anyone,” he notes. “We had to prove my techniques and demonstrate that we could handle these guys safely.” The end result is that Koprowski can obtain important ecological information with minimal detriment to the animals.

Squirrels studied in other parts of the United States and Canada usually live between five and six years in the wild, or up to 20 years in captivity. But in Arizona, through the use of radio telemetry, researchers have found that a lifespan of more than two years is rare. One year is spent growing up and another on the various adult things that squirrels do: finding a home, finding a mate, and raising young.

“That tells you something is very different from areas where they are living five or six years,” says Koprowski. “And we think part of that something is predation pressure—many of these animals die as raptor food.”

Two of the raptor species that are feeding on the endangered Mt. Graham red squirrel are actually limited in numbers themselves. Goshawks are a protected species and the Mexican spotted owl is a federally

threatened species, which complicates some of the management schemes, according to Koprowski.

“If you’re trying to increase spotted owl populations, one of the things you’ll want to do is promote conditions that increase food availability,” he says. “Yet that food is an endangered species.”

Summer wildland fires are another threat to the squirrels, especially because they occur at the worst possible time. The squirrels reproduce when food is most abundant, so their ecology is very well-timed with the Arizona monsoon season in part because the trees they eat from have also timed their ecology with the monsoons.

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“That moisture is what allows the trees to protect themselves from insects, to produce larger seed crops and seeds of higher quality, and that in turn feeds back upon the squirrels whose primary food sources are tied to trees and tree seeds,” Koprowski says. Mushrooms, a secondary staple for squirrels, sprout during the monsoons as well.

The fires on Mt. Graham in the Pinaleno Mountains at the end of June 2004 struck at the end of the dry season, when a lot of the habitat was supporting nursing females and their litters. Losing all those young animals that would have been recruited into the adult population was a huge blow, “especially when we know that animals up here already don’t live as long as they might in other areas,” Koprowski says. “Every individual becomes very important when the turnover of the population is very quick with high mortality.”

In the case of the Pinaleno Mountains, wildfire reduced the suitable habitat by between 25 and 40 percent. Koprowski and his students are attempting to assess just how much impact those fires had. They are studying the effects of fire not only in the Pinaleno Mountains, but in the Chiricahuas, Huachucas, Catalinas and Rincons as well. The US Forest Service, Arizona Game and Fish and the US Fish and Wildlife Service all have responsibility for management and conservation decisions.



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Graduate student Seafha Blount uses radio telemetry to locate squirrels on Mt. Graham in eastern Arizona.

“One of the challenges with any species is knowing enough about them to be able to develop a management plan that will be successful in the long term for the species, to permit it to persist,” Koprowski says. He provides the data he collects to different governmental agencies in the hopes that they will make decisions informed by scientific research.

Since 1989 UA researchers have been gathering population information about the Mt. Graham red squirrel. In the past five years, aided with radio telemetry and geographical information systems (GIS), Koprowski and his award-winning research team of graduate students have been able to add considerable wealth to the data. What they learn on Mt. Graham—a relatively simple system primarily under the stewardship of the US Forest Service with few private developments—can be transferred to other ecological settings.

“You know, this is just a single mountaintop, a few hours from the nearest major city,” Koprowski says, “and so to me, we need to be able to get it right here if we want to be able to get it right elsewhere.” ❧

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