

In-depth study examines air quality in metro Phoenix

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Tom Cahill displays the air-quality monitoring equipment he sets up outside the CLCC Building on Arizona State University's West campus. Readings from the equipment were reported in the article Cahill published in the journal *Atmospheric Environment*

Air can be considered a great equalizer – we all have to breathe it. Arizona State University faculty member Tom Cahill is interested in adding to our knowledge base of air quality in metropolitan Phoenix, and he uses monitoring equipment that he has set up on ASU's West campus in pursuit of that goal.

Cahill, associate professor in ASU's New College of Interdisciplinary Arts and Sciences, is the author of an article in the journal *Atmospheric Environment* that digs deeper into the composition of [particulates](#) in the Valley's air than typical [air-quality](#) monitoring provides. The study also follows month-to-month variations in air quality over the course of a full year, while most studies are only conducted over short time periods.

Unlike many air monitoring sites that simply report overall levels of particulate matter in the air, along with compounds like ozone and carbon dioxide, Cahill's study gathered data on the range of sizes of airborne particles.

"This information is important because the upper parts of our respiratory systems can filter out larger particles, while smaller ones can make it down into the lungs and into our bloodstream," Cahill said.

Larger particles tend to be natural in origin, like dust, spores and pollen. Smaller particles, which can make their way past our natural filters, tend to be man-made as the result of burning everything from gasoline to diesel fuel to wood.

Cahill describes those smaller particles as "nastier," in other words, more toxic and reactive, than the larger ones. To keep the air in your home as healthy as possible, he recommends using a high-efficiency filter for your heating/air conditioning system, and to change it regularly.

"Filters are rated for their capture efficiency," Cahill explained. "The

bad ones have a rating around three, while the good ones are in the six to nine range."

He is less enthusiastic about stand-alone room filters, saying they only are effective for a small volume of air in a localized area.

To help avoid contributing to the problem of dangerous particulates in the air, Cahill recommends combining trips when you are driving around town. An engine that is started up cold is worse for emitting particulates than one that is warmed up.

And of course engines start out colder in the lower temperatures of winter, which is also the time of year when particulates get trapped closer to the ground in the metropolitan Phoenix and create a "brown cloud."

"People tend to blame wood burning in winter for our higher particulate readings that time of year," Cahill said. "Wood is a factor, but the much larger issue is the temperature inversions that occur when cold air sinks closer to the ground and gets trapped under warmer air above. In summer pollutants can make their way to the upper atmosphere, but in winter they are trapped in a smaller volume of air near the surface, and we end up with a higher concentration of particulates in the air we breathe."

Unfortunately we can't regulate meteorology, Cahill said, so we try to help alleviate the situation through no-burn days that he considers only marginally effective.

It seems ironic that particulate levels are lower in the summer, when video of massive dust storms sweeping through the Valley are seen on the news around the country. But Cahill explains that while the storms are impressive, they don't last long, and the larger particulates they stir

up settle back down to the ground fairly quickly. So they don't have much of an impact on the overall monthly averages.

By collecting air samples at ASU's West campus, Cahill was able to compare his results with those collected at the Environmental Protection Agency's "supersite" in Phoenix, on 17th Avenue between Indian School and Camelback Roads. This is the only EPA sampling site in metropolitan Phoenix that measures organic compounds, not just the basic pollutants. Both sets of readings show the identical trend of more particulates in the winter and fewer in the summer; the wintertime particulate concentrations were higher at the supersite than at the West campus.

Cahill's data bolsters the sparse amount of data that is currently available related to [air](#) quality in desert environments. "There are plenty of studies focusing on Southern California," he said. "But we have a different climate and topography. There are five million people in metropolitan Phoenix and only one EPA toxics-measuring supersite, and no supersites in Tucson."

"Tom's work is meaningful both to the scientific community and the community at large," said Roger Berger, director of New College's School of Mathematical and Natural Sciences. "This is indicative of New College's commitment to conducting innovative research that benefits society."

Provided by Arizona State University

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