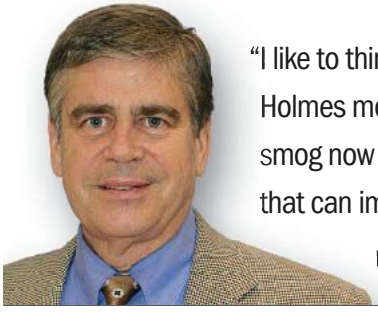

"I like to think the fog in those early Sherlock Holmes movies was actually smog. For the record, smog now refers to any decrease in air quality that can impact visibility and human health."

KARL DANNEBERGER, PH.D., *Science Editor*

Trying to see through the smog

I could not remember the last time I thought about smog. Until, that is, I ran into a few superintendents from China at the 2013 Golf Industry Show in San Diego.

From what I was told (and later confirmed through my own research), for the last few months the smog levels in Beijing and other Chinese cities have been so horrific that hospitals have been overrun with people suffering respiratory problems, stores are running out of face masks and the government is ordering people to stay inside.

Having traveled to Beijing several times myself, it came as quite a shock to hear that the metropolis's streets were quiet and nearly deserted due to high smog levels.

It also came as a surprise to hear that the Chinese government this year finally acknowledged the severity of the smog problem. In the past, officials routinely downplayed it, calling the smog "fog."

"Smog" originally described the combination of smoke and fog that often reduced visibility in European cities during the early 1800s. I like to think the London fog in those early Sherlock Holmes movies was actually smog. For the record, smog now refers to any decrease in air quality that can impact visibility and human health.

Smog occurs when gas and particle emissions derived from industrial causes and compound-producing internal combustion engines are trapped by local weather conditions that enhance the chemical reactions and increase their concentration in the atmosphere.

In the United States, vehicles are the No. 1 smog producer. In places like Beijing, where little environmental consideration is given to rapid growth, both industrial and vehicular pollution are major culprits.

Smog levels are quantified by several different measurements, but the single most important one is called PM 2.5. It stands for Particulate Matter (PM) suspended in air of a size less than 2.5 micrometers. These fine particles suspended like an aerosol are associated with heart disease, strokes, respiratory problems and premature death.

Although we still have a long ways to go to improve our air quality here in the United States, it's not as bad as it was 50 years ago, and it's not as bad as what's occurring now in other cities globally, which started me thinking about the impact of smog on turfgrass.

Most research exploring the impact of smog on turfgrass and plants was done during the 1950s, no doubt reflective of the time when smog and air quality were major concerns in the United States (and they still are).

The best summarization of the impact of smog or air pollution on turfgrass still is James B. Beard's book "Turfgrass: Science and Culture," published in 1973.

Smog symptoms do appear on turfgrasses in the form of an oily glazed appearance due in part to the degradation of chloroplast. Of the turfgrasses, *Poa annua* was found to be sensitive to air pollution and was used as a bioassay indicator in past studies.

Santa Ana, a hybrid bermudagrass released by the California Agricultural Experiment Station in 1966 (initial selection in 1956 at UCLA), in part was released because of its tolerance to smog.

Compared to Tifway and Tifgreen, Santa Ana exhibits a high tolerance to smog. Santa Ana is not widely used in the United States. However, in Australia it is still widely used on golf course fairways — not for its smog tolerance so much as for its salt tolerance and ability to retain color through late fall into winter.

On golf courses and other landscapes where smog is present, turfgrass suffers. And when we look more closely at the situation, it's clear to see that smog and the problems associated with it are overlooked contributors to the decline of turf.

Karl Danneberger, Ph.D., *Golfdom*'s science editor and a professor at The Ohio State University, can be reached at danneberger.1@osu.edu.