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Using plant life to monitor pollution

The demise of the lowly lichen is yielding proof that Moscow's air is becoming increasingly unsafe to breathe. "We may state that no areas of normal and fresh air exist in the city of Moscow," Russian researcher Lev Biazrov told a conference on the environment in Ottawa recently.

Dr. Biazrov divided Moscow into a grid composed of one-kilometre squares and sent his students forth to survey the many varieties of urban lichens. In the thirties, dozens of species were catalogued in areas as busy as Red Square, he says. The new study found that only one or two of the most hardy types have survived in about half the city. In zones around Moscow's radial roads and heavy industries, lichens have completely disappeared. The highest number of species, 18, was found in a park; in 1969, over 30 species were counted in the same area.

Lichens are symbiotic life forms in which fungus and algae co-exist. If conditions change, one will become dominiant over the other, resulting in the death of the organism. Lichens are totally dependent on air, because they have no roots. This makes them excellent indicators of excessive air pollution, says Dr. Biazrov, a biologist who became a lichenologist during research in the Ukraine following the meltdown at the Chernobyl nuclear plant in 1986. While lichens are sensitive to hydrocarbons and other forms of air pollution, they absorb all the radiation they are exposed to and are virtually immune to damage from it; this makes them the perfect host for determining how much radiation has been released and how far it has travelled.

Lichen is normally very adaptable stuff. If conditions are right, "it will grow on rocks, on soil, even on glass," says Dr. Biazrov. He urges continual monitoring of lichens to gauge the success of pollution controls on cars and trucks, and reductions in the emissions from heavy industry around the city.

The comeback of lichens in London a decade ago was hailed as a sign that the air was recovering from the high levels of sulphur dioxide and hydrocarbons that caused its characteristic pea-soup smog. So successful was the return that people complained to researchers that lichens were once again growing in slippery masses between the cracks in sidewalks.

Lichen is the main vegetation in the Canadian Arctic, growing in profusion on rocks and tundra barrens. More than 480 species are native to Ontario. However, lichen research has been more of a priority in Europe.

American wild celery, a green plant with tentacle-like leaves that is common around Lake Huron and Lake Erie, may play the same kind of biomonitoring role for the Great Lakes, says Maciej Biernacki, a University of Windsor biologist. It is extremely efficient in accumulating toxic chemicals such as trichloroethyene, chlorobenzine, PCBs and organochlorines.

A five-year experiment in the Detroit River and Lake St. Clair found a clear connection between exposure to contaminants in the water and the size, number of leaves and flowers of wild celery. The concentrations of chemicals in the plant, which grows in the shallows and is a prime food for ducks, are four times higher than in sediments and 9,000 times higher than in the water, making them a good indicator of pollution hot spots, says Mr. Biernacki. The researchers found plants on the Canadian side of the waterway less polluted than on the U.S. side: "But the birds and fish who eat the plants don't have passports."

– BY WALLACE IMMEN
THE GLOBE AND MAIL.

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