# ATMOSPHERIC CHANGE AND BIODIVERSITY : UNDERSTANDING THE INTERLINKAGES

BY
DON. C. MACIVER[1], HEATHER AULD, N. URQUIZO[2], ALICE CASSELMAN[3] AND MARIANNE KARSH[4]

## SUMMARY

The loss of biodiversity is a global crisis. Atmospheric change and human activities are the greatest threats to the sustainability of biological diversity. Likewise, the loss of biodiversity directly affects the structure and functioning of the atmosphere.

The ever-changing atmosphere affects all living beings and is full of surprises. The circulation of air masses around the world carries with it many hazardous chemicals, diseases, infectious insects and climate extremes that can directly and indirectly harm the sustainability of genetics, species, ecosystems and landscapes. Historic evidence clearly demonstrates the devastating impacts of a changing atmosphere on biological diversity.

Numerous atmospheric threats are acting simultaneously, including severe weather patterns; climate variability, extremes, and change; stratospheric ozone depletion; acid precipitation; ground-level ozone; hazardous air pollutants; and toxics. The cumulative effects of these individual atmospheric issues creates a continually changing atmosphere within which wildlife populations are expected to either adapt, migrate, survive or become extinct.

Canada and the Smithsonian Institution, in 1994, engaged in a partnership to detect changes in biological diversity. Based on the Smithsonian's tropical one-hectare plot monitoring protocols (SI/MAB), Canada has now established more than 80 SI/MAB plots in forested habitats, as the first step. Monitoring of the forest habitats is followed by other taxa monitoring programs, such as birds, amphibians, earthworms, butterflies, aquatic and marine species.

Biological diversity monitoring has become a community effort across Canada at schools, conservation authorities, universities, biosphere reserves, parks and other long-term protected area. Volunteers, using standardized protocols and training, provide scientifically-sound and audited observations of changes in biological diversity across chemical, climate and ecological gradients.

Heat is a powerful trigger for biological growth and development. Changes in the availability of heat has been linked to the disappearance of wetlands and woodlots, droughts in agriculture, forest fires and invasive species. In southern Ontario, Canada, for example, changes of one  Celsius degree in temperature are significant. Using the

---

[1] Meteorological Service of Canada, 4905 Dufferin Street, Downsview, Ontario, Canada, M3H 5T4
[2] Rainmakers Environmental Group, P.P. Box 218, Niagara-On-The-Lake, Ontario, Canada, L0S 1J0
[3] Association for Canadian Educational Resources, 3665 Flamewood Drive, Unit 44, Mississauga, Ontario, Canada L4Y 3P5
[4] Arboryiate, 2325 Liverpool Road, Pickering, Ontario, Canada, L1X 1V4

SI/MAB observations for mixedwood forest stands across a climate gradient equal to the anticipated future climate change scenarios demonstrates an expected change in forest biodiversity that will be largely invasive and potentially threatening to the conservation of native species.

Community-based monitoring along with consistent science-based protocols and models provide an effective interlink with policy to assess, for example, the impacts of future climate change on biodiversity. Other studies have focused on the buffering capacity of ecosystem, including their many resident wildlife populations, especially their capacities to mitigate or adapt to the natural and human-induced threats from the atmosphere.