Science for Sustainable Development 10





(Photo by Malak)


Atmospheric Change & Biodiversity

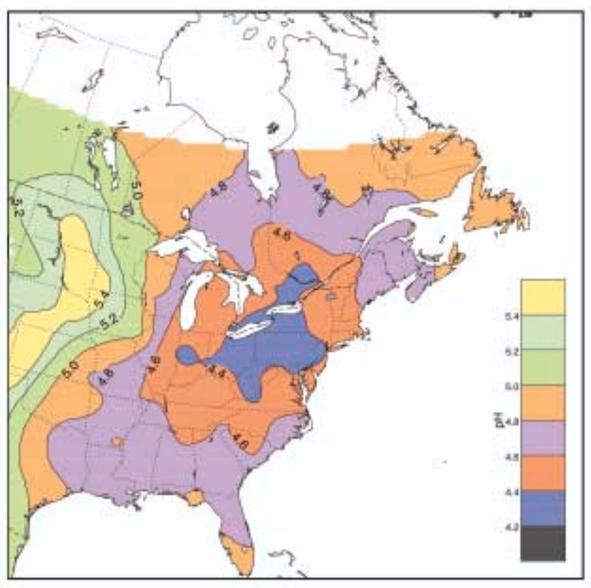
Understanding the Interlinkages

The loss of biological diversity 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.

Atmospheric Threats

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.


1996 Annual mean pH distribution.

Community-Based Monitoring of Biodiversity

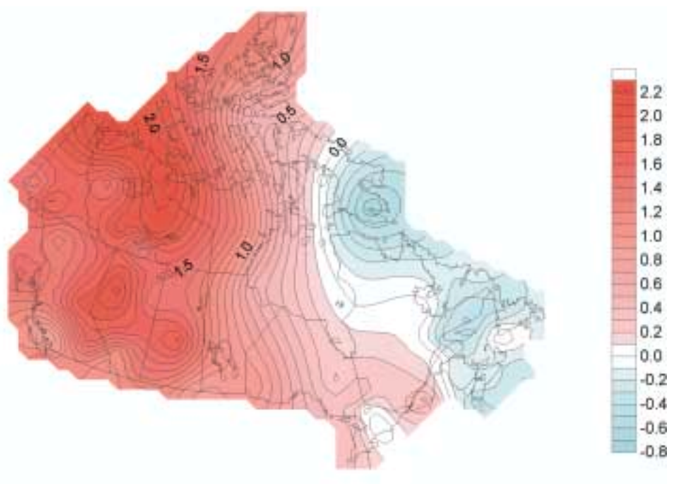
Canada and the Smithsonian Institution in 1994 engaged in a partnership to detect changes in biological diversity. Based on the Smithsonian's tropical one-hectare plot monitoring protocols (SI/MAB), Canada has now established more than 80 SI/MAB plots in forested habitats, as the first step. Monitoring of the forest habitats is followed by monitoring 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 areas. Volunteers, using standardized protocols and training, provide scientifically sound and audited observations of changes in biological diversity across chemical, climate and ecological gradients.


Students learning how to monitor biodiversity.
(Photo by Malak)

Heat as a Driver of Change

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, for example, changes of one degree centigrade in temperature are significant. Using the SI/MAB results for mixedwood forest stands across a climate gradient equal to the anticipated future climate scenarios demonstrates an expected change in forest biodiversity, within this highly impacted agricultural-urban landscape, that will be largely invasive and potentially threatening to the conservation of native species.



Annual linear temperature trends map for the 1948-2000 period.

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

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