



Branching out

from the Canadian Forest Service

Laurentian Forestry Centre

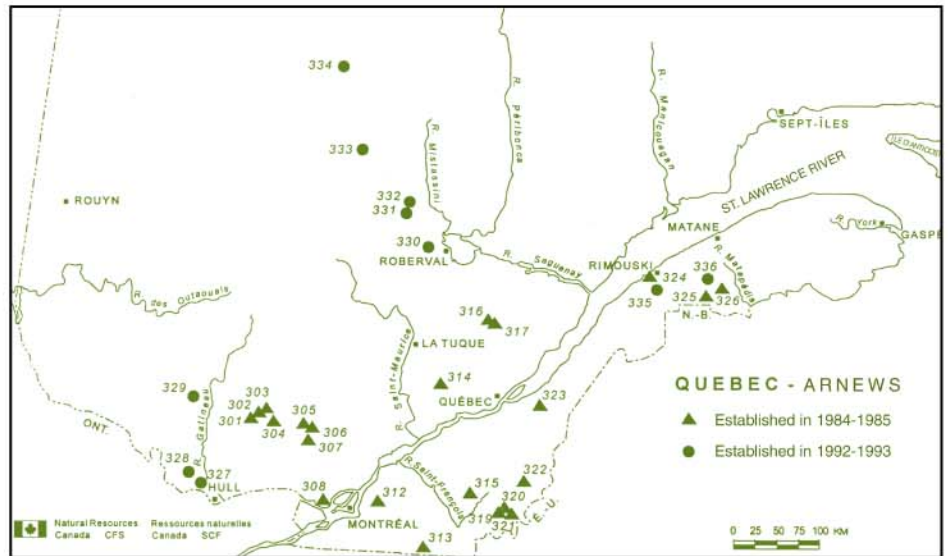


FOREST MONITORING: ARNEWS AND NAMP

Among the activities of the Canadian Forest Service are two initiatives set up to detect damage to forests caused by biotic factors (e.g., insects) and by abiotic factors (e.g., acid rain).

From 1984 to 1999, the **Acid Rain National Early Warning System¹** (ARNEWS) aimed at detecting the first signs of damage to Canada's forests and monitoring changes in vegetation and forest soils. As for the **North American Maple Decline Project²** (NAMP), it aimed at monitoring the condition of sugar maple throughout northeastern North America and it operated from 1988 to 1999.

ARNEWS had 150 study sites in Canada, including 32 in Quebec. NAMP had 233 sites across Canada (24 in Quebec) and the United States in stands that were not managed or that were used for maple syrup production.



Distribution of ARNEWS sites in Quebec based on date when they were established.
Map: J.-P. Bérubé / J. Thibault

This dual network enabled tree condition to be rigorously examined, in particular by annual inspection of tree crowns (quality of foliage, defoliation). In addition, by recording any changes in the chemical characteristics of soils and foliage, ARNEWS made it possible to identify the long-term impacts of acid deposition and other pollutants on ecosystems.

The natural forest mortality rate varies from 1 to 3% and is caused by known

disturbances (insects, diseases, natural thinning). Thanks to the monitoring done under ARNEWS and NAMP, researchers were able to isolate the effects of pollutants and extreme climatic conditions on forest health and suggest possible causes for year-to-year variations (see boxes).

These two monitoring networks have been replaced by three case studies focusing on particular stress factors in forests.

¹ In French: Dispositif national d'alerte rapide pour les pluies acides (DNARPA).

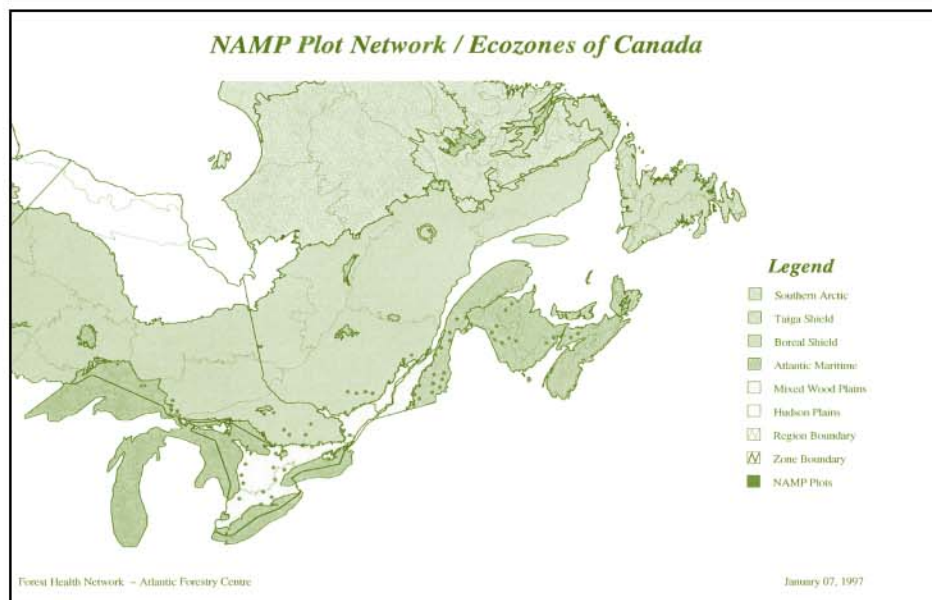
² In French: Projet canado-américain d'étude du dépérissement de l'érable.



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Two of these studies cover eastern Canada: the Forest Indicators of Global Change Project (FIGC), which looks at many of the same sites as NAMP and ARNEWS, and the case study on the impact of the 1998 ice storm and the subsequent recovery, which ends this year (2003).

To ensure the sustainability of Canada's forests, it is essential to maintain a research network that is able to detect damage to forests caused by atmospheric changes (global warming, ground-level ozone, ultraviolet radiation, etc.) and to establish the requisite causal links.



Distribution of NAMP sites across Canada.
Map: R. Simpson (AFC) / J. Thibault (LFC)

EFFECT OF FREEZING RAIN ON NAMP MAPLE STANDS

The 1998 ice storm affected 38 NAMP sites. The risk of moderate or serious damage to the crown was 1000 times higher in the area that received more than 60 mm of freezing rain. Similarly, the risk of damage was 1000 times higher in natural stands than in maple stands managed for sap collection. The damage also increased with site altitude and was more severe in areas where nitrate deposition caused by acid rain was higher. Finally, red maple ran a risk of damage five times higher than sugar maple.

OBSERVATIONS FROM ARNEWS SURVEYS

Critical load calculations show that rain acidity exceeds the capacity of forest ecosystems in most study sites in Quebec. It is difficult, however, to establish a link between decline and the fact that the critical acid load is being exceeded. Other causes of decline were also noted: insect infestations, Armillaria root rot, drought, the age of trees, and competition within the stand. In areas affected by the 1998 ice storm, its effect on tree crowns was still visible in 1999.

USEFUL LINK

**Forest Conditions,
Monitoring and Reporting**
[www.nrcan-rncan.gc.ca/cfs-scf/
science/resrch/conditions_e.html](http://www.nrcan-rncan.gc.ca/cfs-scf/science/resrch/conditions_e.html)

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