plays in the ice cover and circulation of the Arctic Ocean.

- Process studies and regional energy and water cycle analyses directly or indirectly linked to GCIP, MAGS, and GEWEX objectives as illustrated in Figure 2;
- Contributions by the hydrological and hydrometeorological aspects of the Boreal Ecosystems-Atmosphere Study (BOREAS), Beaufort and Arctic Storms Experiment (BASE), and Cryospheric System to Monitor Global Change in Canada (CRYSYS) project;
- Participation in experiments related to improved understanding and modelling of cloud-precipitation-radiation processes for climate and numerical weather prediction models, as contributions to the GEWEX Cloud System Study (GCSS);
- Continued global climate model development and contributions to international projects related to GEWEX, including the International Satellite Cloud Climatology Project (ISCCP), the Global Precipitation Climatology Project (GPCP) and others; and
- Planning for and participation in the Global Observing Experiment of GEWEX (1998+).

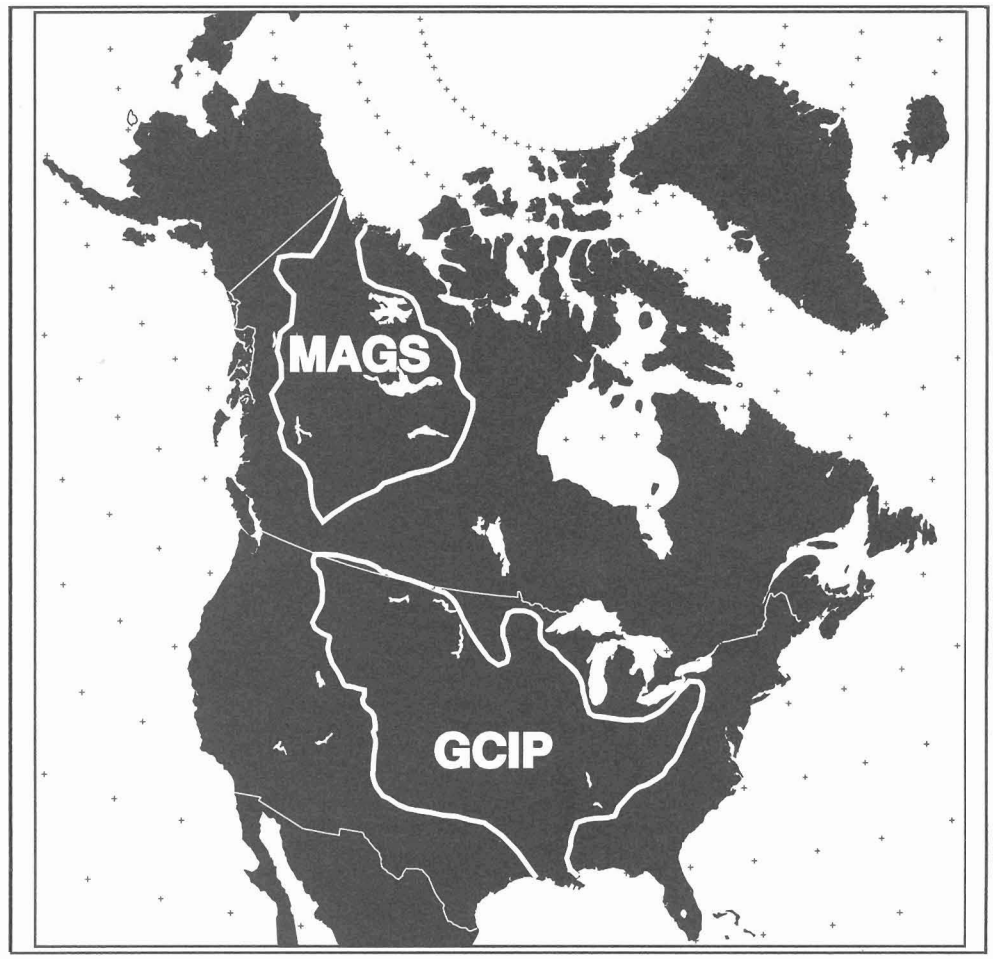

Figure 1: *Locations of the GEWEX Continental-scale International Project (GCIP) and the Mackenzie GEWEX Study (MAGS).*

GEWEX Project Profile:

SNOW HYDROLOGY STUDIES IN BOREAL AND TUNDRA ECOSYSTEMS

P. Marsh and J. Pomeroy
National Hydrology Research Institute

Boreal and tundra ecosystems are characterized by long cold, dry winters, a rapid and abrupt onset of spring, and short cool summers. As a result, precipitation accumulates on the ground as snow for 6 to 9 months of the year; the bulk of annual runoff occurs over a brief 2 to 4 week period in the spring; surface energy fluxes are greatly affected by the underlying permafrost and changing snow covered area; and the low permeability of permafrost keeps most water near the ground surface. The relative importance of processes controlling water fluxes is often different from that found in more temperate climates, and as a result the hydrologic regime is very different and predictive models developed for other environments often do not work very well. A major emphasis of the Canadian GEWEX Programme will be in developing improved models based on a better understanding of these processes.

The major scientific issues to be addressed include:
(1) snow accumulation,
(2) snow sublimation,
(3) snow metamorphism,
(4) snow pack energy balance,
(5) water flux through snow,
(6) runoff source areas and pathways,
(7) modelling, and
(8) scale.

These GEWEX activities have been carried out in conjunction with established research programs of the Cold Regions Project at NHRI field sites near Inuvik and in Prince Albert National Park. The Inuvik site is within the continuous permafrost zone, and is

continued on Page 5

Head of Canadian GEWEX Secretariat appointed

On October 1, 1992, Dr. Terry Krauss was appointed as Head of the Canadian GEWEX Secretariat. Located at the National Hydrology Research Centre in Saskatoon, Dr. Krauss, reports jointly to the Chiefs of the Hydrometeorological Processes Division of the Atmospheric Environment Service (AES) and the Hydrological Sciences Division of the National Hydrology Research Institute of Environment Canada.

Dr. Krauss, a native of Medicine Hat, Alberta, has an M.Sc in meteorology from the University of Alberta, a Ph.D. in the atmospheric sciences from the University of Wyoming, and more than 15 years of experience in conducting both domestic and international atmospheric research and field programs. Before joining Environment Canada, he worked with the Alberta Research Council, the South African Weather Bureau, and INTERA Technologies Ltd.

In his secretariat role Dr. Krauss will coordinate the implementation of Canada's contribution to the international GEWEX program including organizing scientific and planning meetings, informing the national and international science communities on the status of Canadian GEWEX activities, and coordinating the collection and dissemination of data from Canadian and relevant international GEWEX projects. For more information about GEWEX, Terry can be reached at:

Tel. (306) 975-4215 or

Fax (306) 975-5143.

Fiscal Year 1992-1993 Canadian GEWEX Projects

In June 1992, the GEWEX Scientific Committee met in Quebec City to review a number of project proposals from government labs. Based on the recommendations from the Scientific Committee, the Management Committee allocated $170,000 to 10 projects within the following study areas:

Study Area	**(Principal Investigators)**
Distributed Hydrological Modelling	(G. Kite, T. Prowse, L. Welsh)
Snow Process Studies	(J. Pomeroy, P. Marsh, L. Welsh
Atmospheric Water Budgets	(L. Welsh, J. Eley, G. Strong, R. Lawford)
Arctic Clouds and Precipitation	(R. Stewart, G. Isaac, W. Leaitch)
Snow Measurements	(B. Goodison)

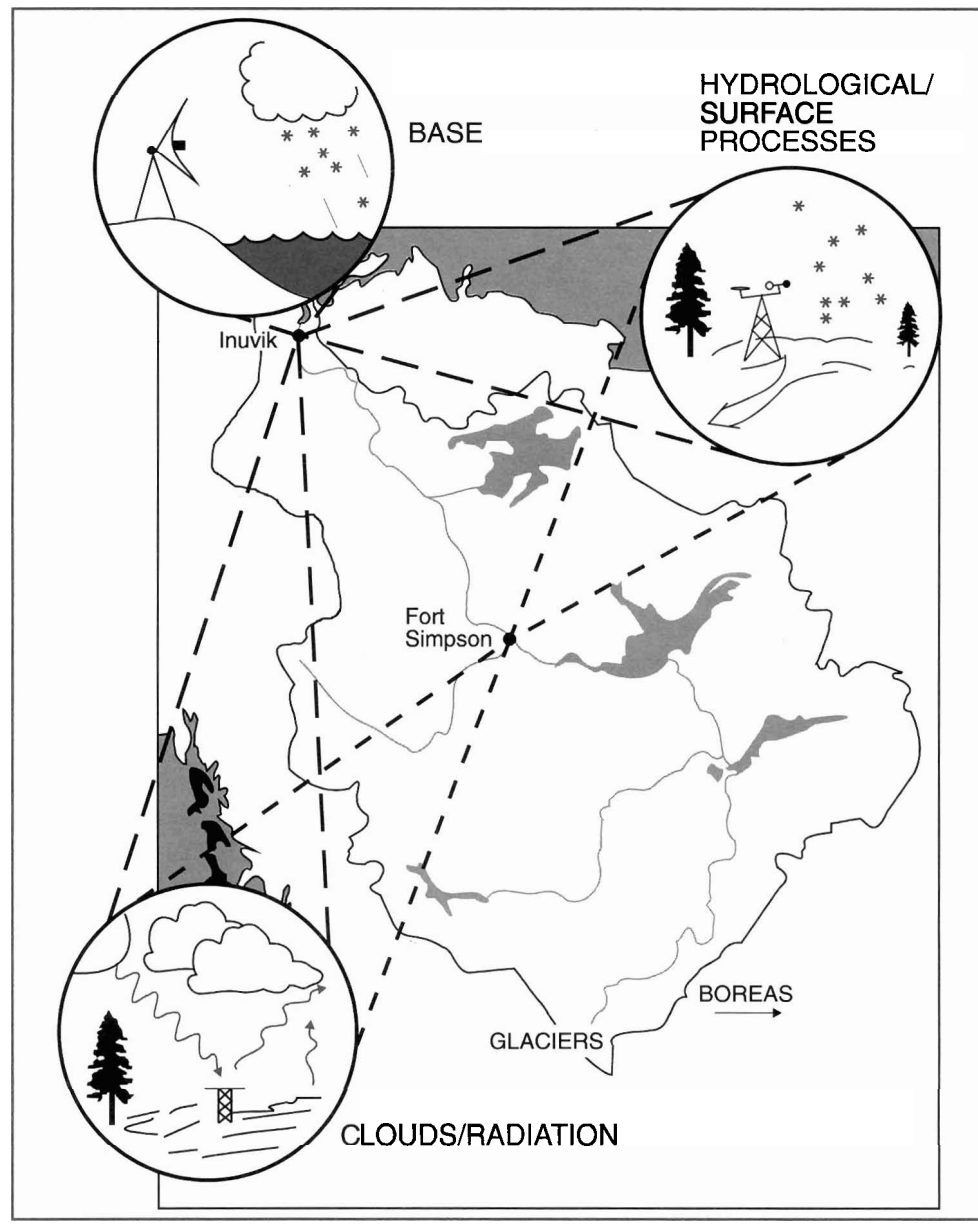

Figure 2: *Schematic representation of the Mackenzie GEWEX Study (MAGS) with hydrological-surface processes, clouds-radiation, and Beaufort and Arctic Storms Experiment (BASE) studies at the Inuvik and Fort Simpson sites.*

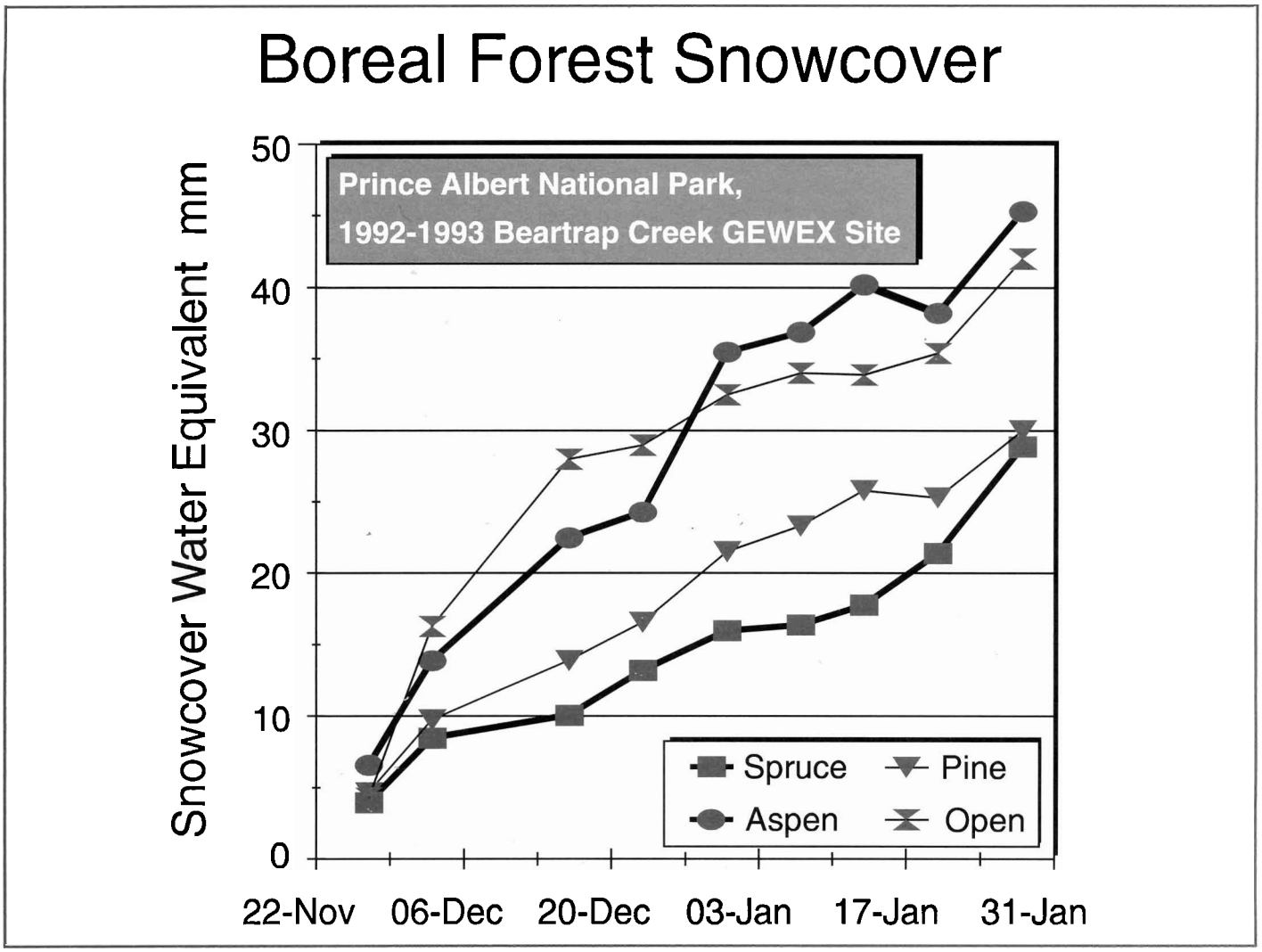

Figure 3: *Measurements of snow cover water equivalent, derived from land cover class snow surveys.*

a dry and relatively cold boreal location at the transition from a coniferous forest to an open tundra environment. The Trail Valley Creek and Havikpak Creek study basins near Inuvik are representative of tundra and forest respectively. The Prince Albert National Park site is immediately south of the southern limit of discontinuous permafrost, is dry and relatively warm, and is located at the southern transition from coniferous to deciduous forest. Work at sites with such a range of conditions, will allow the development of models which are transferable over the range of environments found in the Mackenzie Basin.

Accomplishments in 1992/93

In 1992/93, preliminary field work was carried out at the field sites near Inuvik and in Prince Albert National Park. Detailed field campaigns were conducted at Trail Valley Creek and Havikpak Creek from mid-April until late August, 1992; and at Prince Albert National Park from November 1992 to March 1993.

At Trail Valley Creek, field work concentrated on measurements of snowpack distribution, blowing snow, surface energy balance, and runoff. In addition to ground based measurements, aerial photographs were obtained in order to map changes in snow covered area during the melt period. This will allow a determination of the streamflow contributing area, and will also be used to test modelled changes in snow covered area, and as a comparison with results from other remote sensing techniques. In addition, the remote weather stations at Trail Valley Creek and Havikpak Creek were upgraded, and additional stream measurement stations and soil moisture-temperature stations were installed. These upgrades were financed both by Green Plan and NHRI funds. Initial results have demonstrated the variations in snow cover distribution, surface energy balance, and runoff between forest and tundra sites.

At Prince Albert National Park, field work concentrated on measurements of snow interception by a variety of forest canopy types, the energy balance of

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Philip Gregory, National Hydrology Research Centre, design and production.

these snow covered canopies, and the subsequent sublimation or release of snow. Measurements of snow cover water equivalent, derived from land cover class snow surveys, are shown in Figure 3. Of particular interest was the suspension of a full size, black spruce tree from a weighing mechanism attached to a tower. This experiment allowed the direct measurement of the accumulation and removal of snow from a typical tree. ***In Figure 3, the difference in snow cover water equivalent between spruce and aspen at the end of the period is due to sublimation of intercepted snow.***

Image analysis is being used to characterize the surface area of intercepted snow in the forest canopy for sublimation rate modelling. ***Initial results from the southern boreal forest show that approximately 40% of annual snowfall is captured and subsequently sublimated from boreal forest canopies.*** This could have tremendous implications for atmospheric water vapour fluxes during winter, and snowmelt runoff during spring.

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Canadian GEWEX Update

The interaction of energy and water cycles are key to understanding our climate system and the impacts of climate variability and change are often most pronounced on water availability. The Canadian Global Energy and Water Cycle Experiment (GEWEX) Programme will focus on these important scientific issues in areas of special Canadian interest and competence. To clarify its focus and to provide the Canadian scientific community with better guidance, the Canadian GEWEX Management and Science Committees have prepared several GEWEX related documents. The documents are:

1. The Canadian GEWEX Programme Science Plan (R. Lawford editor).
2. Canadian GEWEX Programme Phase I: Report of the planning meeting and university workshop (T. Krauss editor).
3. Canadian GEWEX Programme - A Conceptual Overview (G. McBean editor).

The GEWEX Science Plan and Conceptual Overview documents have been widely distributed and copies are available from the GEWEX Secretariat. A Call for Proposals to University and Government researchers was issued in early December, 1992. The deadline for proposals from Government researchers for Green Plan funding was January 22, 1993. Letters of intent were requested from University researchers by January 22, 1993. The deadline for proposals for the NSERC Collaborative Special Projects and Programs (CSPP) grant submission was March 24, 1993.

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