

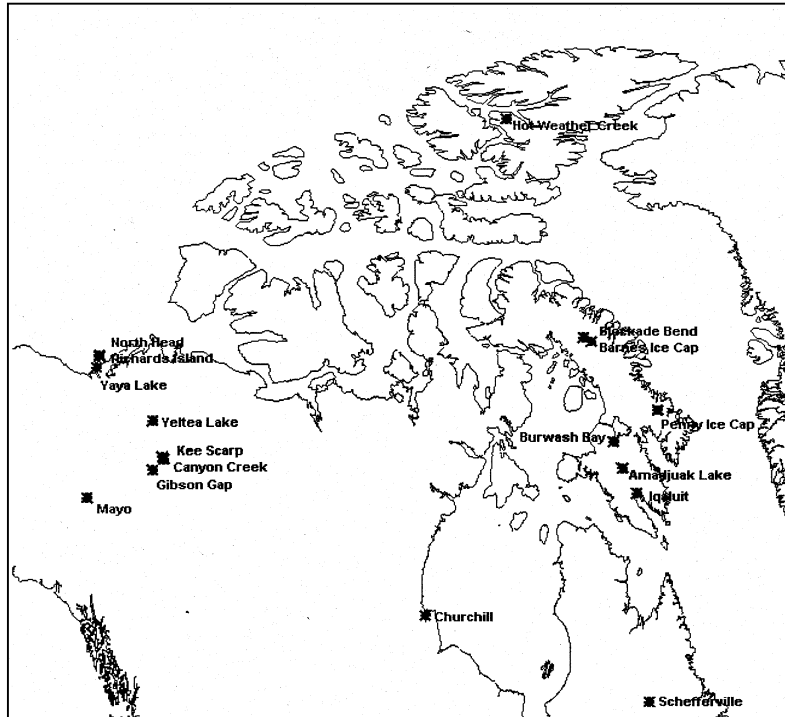
# Arctic Climate/Permafrost Stations

**Joe Eley**

**Climate Research Branch/MSC**

## BACKGROUND

- This network of 19 high latitude stations was originally funded by PERD to study possible changes to the permafrost regime in response to climate warming. Coordination and maintenance of this network was by the former Arctic Division, Canadian Climate Centre
- The observation program started in 1984; its objective was to collect baseline data for 10 years.
- Observed parameters vary by site-air temperature and ground temperature profiles were taken at all sites; other parameters may include: humidity, rainfall, total precipitation, snow depth, wind speed and direction, and incoming solar radiation. Observation period varied from hourly to daily.
- These data sets are potentially useful for modelling permafrost-climate relationships and heat flow in permafrost.



## CURRENT STATUS

- Responsibility for this 19 station network was assumed by Climate Research Branch (CRB) in 1995
- 10 stations have been decommissioned
- Of the remaining 9 stations, partnerships with university and other agency researchers have been established for 8 stations where the researchers service the sites and retrieve data and CRB supplies replacement parts. CRB retains responsibility for servicing the 3 sites
- a digital archive of the data sets is being maintained by CRB

## ARCTIC CLIMATE/PERMAFROST STATIONS

### Climate Research Branch/MS

Site	Lat	Long	Status	Contact	Start	End
Yaya Lake	69.150	134.717	Closed		Aug-90	Aug-95
North Head	69.667	134.350	Closed		Aug-90	Aug-95
Richards Island	69.617	134.333	Closed		Aug-89	Aug-95
Gibson Gap	64.767	127.917	Closed		Aug-88	Aug-95
Yeltea Lake	66.850	127.917	Closed		Aug-90	Aug-95
Blockade Bend	70.400	74.950	Closed		Jul-89	Jul-95
Barnes Ice Cap	70.233	74.017	Closed		Jul-87	May-95
Burwash Bay	65.950	71.300	Closed		Jul-87	Jul-91
Amadjuak Lake	63.567	70.483	Closed		Jul-89	Jul-96
Schefferville	54.8001	66.917	Closed	IW. Pollard (McGill)	Feb-85	1997

### Climate Research Branch Climate/Permafrost stations list

Station Name	Lat Deg	Long Deg	Elev. (m)	Program elements	Frequency of records	Begin rec.	End rec.	Remarks
<b>ACTIVE</b>								
Mayo, Yukon	63.36	135.52	605	Ground Temps to 5m	2X daily	1986		No problems
Canyon Crk, (Norman Wells #1)	65.13	126.31	107	AT/RH/WS/WD/RairdSD;GT to 13m (1 00m GSC)	Hrly, Daily	1985		last site visit 1997
Kee Scarp (Norman Wells #2)	65.18	126.43	304	ATIRHfWSfWD/Rain/SD/Kdn; GT to 45m (100m GSC)	Hrly, Daily	1988		last site visit 1997
Churchill	58.453	94.32	13	AT/RH/SD;GT TO 15m	3-hrly	1986		Site visit Sept/99, loss 6 month of data prior
Iqaluit	63.45	68.28	109	AT/ GT to 5m	3hrly	1988		Site visit Apr/00, install deep sfc temp sensors
Penny Ice Cap	67.165	65.55	186	AT/RH/WS/WD/Kdn/SD;ATgra 0 d/Glacier T to 8m	Hrly	1989		Site visit Apr/00, data loss from Aug/99
Hot Weather Crk	79.58	84.28	115	AT/RHNVSNVD/Kup/Kdn; Rainfall/Snowfall	Hrly, Daily	1988	1997	No problems, annual visits
<b>NOT ACTIVE</b>								
Burwash Bay	65.57	71.18	47	AT/RH/KdnA/VSfWD/Rain; SoilT 10,20,50cm	3-hrly	1989	1995	
Amadjuak Lk, Baffin	64.64	70.29	120	AT/RH/Kdrt/WSAtVD/Pcp/SD; LakeT/SoilT 10,20,50cm	3-Hrly	1989	1995	
Blockade Bend	72.24	74.57	420	AT/RH/KdnAA(SfWD/Pcp/SD; AtmPres/SoilT 10,20,50cm	3-Hrly	1989	1995	
Barnes Ice Cap	70.135	74.15	108	AT/RH/Kdn/WSAtVD/SD;DelT 5 4 - 2.2nVGiacier T 1 in	3-hrly	1991	1995	
Yeltea Lk	66.51	129.49	198	AT/RHfWSAND/Kdn/SD/Rain	3-hrly	1990	1995	
YaYa Lk	69.09	134.42	30	AT/RHfWSAA(D/Kdn/SD/Rain	3-hrly	1992	1995	
North Head	69.40	134.2	5	AT/RHNV/WD/Kdn/SD	Hrly	1990	1995	
Richards Isi	69.37	134.19	20	AT/RHAAISAND/Kdn/SD/Rain	Hrly	1989	1995	
Schefferville	54.48	66.55	593	AT/RH/Rain/WSAAfD/SD; GT to 15m	Hrly Daily	1985	1997	

#### KEY

: AT/RH = Air Temp and RH 1 @ 4m above ground  
 Del T = air temp gradient near ground  
 Rain = Rainfall in a tipping bucket gauge  
 Kdn = global short-wave radiation  
 Pepn = accumulating gauge precip.

WS, WD = wind speed, direction  
 GT = Ground Temps  
 GSC = Geological Survey of Canada  
 SD = Snow depth acoustic gauge

**Objectives for network and data:**

- Supplementary climate monitoring, direct and indirect
- Modelling the fate of permafrost in climate change
- Modelling the effect of permafrost on climate
- Understanding the effect of snow cover on permafrost

**Activities to date:**

- Organize and access to data sets
- Operate some remaining stations
- Direct operations (Norman Wells, Iqaluit, Churchill) 0 Support of partners (provide replacement sensors)
- Analyze the relationships between ground temperature and climate

**FINDINGS:**

- Both permafrost and non-permafrost sites at Norman Wells have a pretty consistent offset of mean annual ground temperature from mean annual air temperature
- Mean annual shallow ground - air temperature profiles make sense in terms of changing climate trends (N Wells, Iqaluit)
- Active layer depths have been estimated for several sites
- High frequency observations are very useful for determining low frequency phenomena with certainty (annual temp requires regular obs 8 times per day)
- Snow depth may not be a profoundly meaningful parameter for this objective, with the temporal variability found in the Mackenzie
- Snow depth is not consistently less on the pipeline right of way than in the bush
- The snow depth sensor (UDGOI) can be improved upon, but is quite useful
- There is no appreciable difference in solar radiation between our site at Norman Wells and the Upper Air station
- There is very little statistical difference in solar radiation between our two delta sites and Tuktoyaktuk

**Contacts:**

Joe Eley (306) 975-5685 [Joe-Eley@ec.gc.ca](mailto:Joe-Eley@ec.gc.ca)  
Paul Louie (416) 739-4351 [Paul.Louie@ec.gc.ca](mailto:Paul.Louie@ec.gc.ca)

Climate-Permafrost Network:  
Mean Annual Air Temp **5-year anomalies**  
relative to 1951 to 1990 mean

