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MACKENZIE VALLEY PERMANENT MONITORING PLOT NETWORK: SITE LOCATIONS AND DESCRIPTIONS

R.C. Errington, J.S. Bhatti, E.H.Y. Li

Information Report NOR-X-426
Canadian Forest Service
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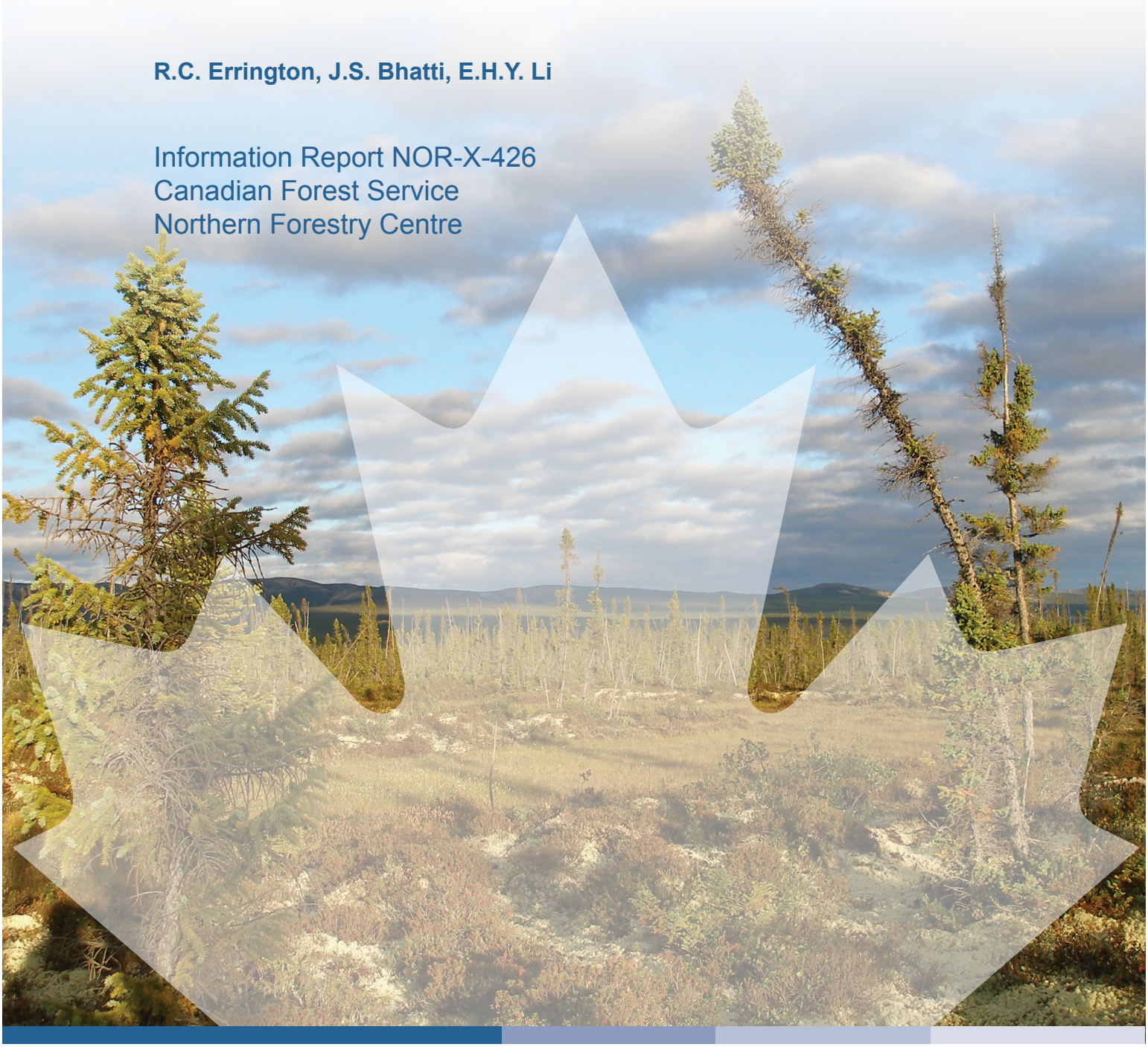

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2018

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Cover image: photograph showing peat plateau and collapse scar features in the Low Subarctic Ecoclimatic Region of the central Mackenzie Valley.

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ABSTRACT

As part of the International Polar Year, a series of 69 permanent monitoring plots was established in forests and permafrost-affected peatlands in the Mackenzie Valley region of Canada's Northwest Territories. Extending from the Mid-Boreal, through the High Boreal, Low Subarctic and High Subarctic Ecoclimatic Regions, this network provides opportunities to examine the effects of changing climatic conditions across both current climatic and local topographic gradients. This report, the first in a series of three, provides basic site information including detailed plot locations and general descriptions. Maps of each site, based on aerial photography or satellite imagery, show the relationships between plots, with surrounding geographical features and general plant community types. The purpose of this report is to document the sites to aid in interpretation of data collected and to enable future researchers to precisely relocate these plots for remeasurement purposes.

RÉSUMÉ

À l'occasion de l'Année polaire internationale, on a érigé une série de 69 parcelles de surveillance permanentes dans des forêts et des tourbières touchées par le pergélisol de la région de la vallée du Mackenzie des Territoires du Nord-Ouest du Canada. Ce réseau, qui débute à la région écoclimatique boréale moyenne et s'étend jusqu'aux régions boréales supérieures ainsi que du bas-subarctique et du haut-subarctique, permet d'examiner les incidences des conditions climatiques changeantes dans les gradients climatiques actuels et les pentes topographiques locales. Le présent rapport, le premier d'une série de trois, fournit des renseignements de base sur les sites, y compris l'emplacement précis des parcelles et des descriptions générales. Des cartes de chaque site, inspirées des photos aériennes ou des images satellitaires, montrent les liens entre les parcelles et les caractéristiques géographiques et les types de groupements végétaux généraux aux alentours. Ce rapport a pour but d'obtenir des informations sur les sites afin de faciliter l'interprétation des données recueillies et de permettre aux prochains chercheurs de trouver avec exactitude ces parcelles pour de nouvelles mesures.

PREFACE

As a contribution to the International Polar Year (IPY) research program, the Canadian Forest Service (CFS) is in the process of preparing a series of three reports describing basic ecosystem characteristics for a network of 69 permanent monitoring plots established in forests and peatlands of the Mackenzie Valley, Northwest Territories. Representative of eleven forested ecoregions along the Mackenzie Valley, from the Alberta border to the Mackenzie delta, this network spans a climatic gradient of 5.9°C (from -8.8 to -2.9°C) of mean annual temperature and 121 mm (from 248 to 369 mm) of annual precipitation, with colder and drier conditions towards the north. The purpose of this network is twofold. The first objective is to provide baseline vegetation and soils data for future comparison with respect to anthropogenic disturbances and climate change. The second objective is to support the more detailed IPY research by placing the small number of more intensively monitored research sites into regional and ecological context and to support carbon cycle modelling and assessment research.

Data from the Mackenzie Valley Permanent Monitoring Plot Network (MVPMPN) have been divided into three reports. This first document, Site locations and descriptions, provides basic site information, including detailed plot locations and general descriptions. This report was designed so that future researchers will be able to precisely relocate these plots for remeasurement purposes.

The second report, A database of stand characteristics, will focus entirely on the mensuration data collected at each of the plots. In addition to individual tree data such as species, height, and diameter (DBH), the stand-level variables of stem density and basal area will also be presented.

The third report, A database of vegetation, soil and groundwater conditions, will detail and summarize understory lichen, moss, liverwort, and vascular plant species abundance data, along with soil descriptions, and classifications. Chemical analyses of soil and groundwater samples will also be detailed in the database and summarized in the report.

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INTRODUCTION

The global mean surface temperature has increased since the late 19th century with each of the past three decades successively warmer than any previous in the instrumental record (IPCC 2013). This warming has been particularly pronounced in northern regions (IPCC 2013). In the latter half of the 20th century, the greatest Canadian temperature increases have been seen in the northwest, where an increase of over 3°C was recorded in winter air temperatures of the Mackenzie Valley region of the Northwest Territories (Zhang et al. 2000; Fig. 1). Northwestern Canada is also projected to be the region most strongly affected by future warming, with a suite of models predicting winter temperature increases from 3.5 to 5.5°C over the 70-year period from 1971–1990 to 2041–2060 (Plummer et al. 2006). This is similar to the projection carried out by Price et al. (2013), who reported that annual mean temperature will increase by as much as 5.5°C (minimum temperature) and 4.5 °C (maximum temperature), with the minimum temperature projected to rise 7.5–8.0°C in winter compared with about 4.0°C in summer. Price et al. (2011) projected that interannual variability in temperatures may decrease throughout the Mackenzie Valley region, although summer temperatures are generally projected to become more variable. These recent and predicted temperature changes, coupled with the presence of large areas of ice-rich permafrost make the Mackenzie Valley one of the most sensitive areas to climate warming in Canada (Kettles and Tarnocai 1999).

Already, this climatic warming has been seen to influence the landscape through collapse of the ground surface as ice-rich permafrost warms and destabilizes (Lantz and Kokelj 2008; Beilman and Robinson 2003) as well as through more subtle increases in thaw penetration and active layer depths (Quinton and Baltzer 2013; Nixon et al. 2003). In the Mackenzie Valley, much of the ice-rich permafrost occurs as peat plateaus, where the aggradation and degradation of permafrost

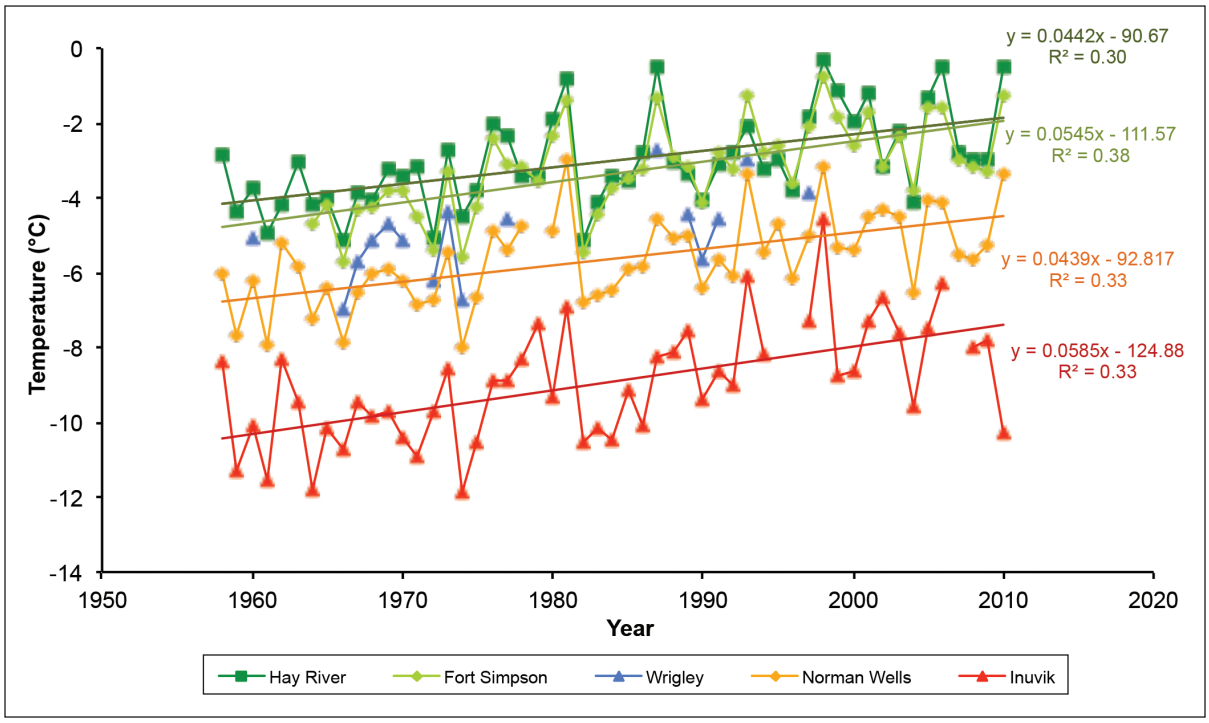


Figure 1. Mean annual temperatures and linear trends from 1958 to 2010 for Inuvik, Norman Wells, Wrigley, Fort Simpson, and Hay River. Data were derived from the Canadian Daily Climate Data (Environment Canada 2007) and Climate Data Online (Environment Canada 2011) for the years of 1958–2006 and 2007–2010, respectively. Years missing 20 or more days were omitted from the record, and linear regressions were not performed for the Wrigley data set where more than half of the annual values were missing.

is known to be a cyclic phenomenon (Zoltai 1993). Recent climatic warming has favored processes of degradation over aggradation, particularly in the southern Mackenzie Valley, resulting in a loss of measured permafrost area from 10 to 51% (Quinton et al. 2011; Beilman and Robinson 2003).

Permafrost thaw within peat plateaus has a dramatic effect on the landscape as the loss of ice volume causes the ground surface to subside approximately 1 meter forming collapse scars (Vitt et al. 1994; Zoltai 1993; Thie 1974). This subsidence affects plant community composition and diversity (Beilman 2001), carbon accumulation (Robinson and Moore 2000), and greenhouse gas dynamics (Startsev et al. 2016; Liblik et al. 1997). These effects can also propagate through the landscape, via changes to the regional hydrology as increasing hydrological connectivity (due to permafrost thaw) can drain landscapes (Quinton et al. 2011; Robinson 2002), while greater active layer depths increase soil water storage and decrease subsurface runoff (Quinton and Baltzer 2013).

While much work was conducted in relation to vegetation and landscape surveys of the Mackenzie Valley in the early 1970s (Forest Management Institute 1974; Crampton 1973; Strang 1973; Zoltai and Pettapiece 1973), much of that work was intended for mapping and classification at a landscape level. Plots established in the 1970s were not permanently marked, nor were the locations adequately documented to allow for remeasurement and detection of ecological changes. The Mackenzie Valley Permanent Monitoring Plot Network (MVPMPN) was designed not only to collect baseline ecological data, but also to provide a series of permanently marked plots with well-documented locations suitable for future remeasurement in a rapidly changing landscape.

With limited resources, the task of baseline ecological data collection in such a large region necessitated a narrowing of the scope to key ecological sites and variables, resulting in a sampling design that integrated both climatic and local topographic gradients. In practice, this resulted in 25 sites distributed across four regions, named according to the nearest community, or the community where field crews were based (Inuvik, Norman Wells, Wrigley, and Fort Simpson). Two or three plots were established at each site, representative of a local topographic gradient encompassing upland forests as well as both peat and permafrost features. In this manner, each site was selected to contain a series of plots representative of permafrost-containing bogs (peat plateaus), areas of permafrost collapse within the peat plateau matrix (collapse scars), and adjacent upland forest environments occurring on mineral soils (uplands). In the northernmost, continuous permafrost region, climatic conditions prevented the formation of true collapse scars and only two plots were established at each site in the Inuvik region.

Field work was conducted in the summers of 2007 and 2008, with some preliminary scouting and methods testing in 2006. A collaborative effort between the Canadian Forest Service (CFS) and the Government of the Northwest Territories Forest Management Division (GNWT FMD), field crews were led by CFS employees, with GNWT FMD regional offices supplying additional crew members and logistical support. A range of biotic and abiotic data was collected at each plot:

- tree inventories, including breast height diameter (DBH), species, and height for trees ≥ 1.3 m tall;
- inventories of small trees by species and height class (0–0.49 m; 0.5–0.99 m; 1–1.29 m) for trees < 1.3 m tall;
- tree ages at breast height for representative canopy trees;
- understory vegetation descriptions, including species present and percent cover;
- depth of the organic layer or active layer depth as measured with a soil probe at multiple plot locations;
- soil characteristics, including depth of horizons, color, field texture, coarse fragment content, mottling, and effervescence;
- soil properties, including bulk density, organic matter content, carbonate content, pH, C content, N content, P content, and particle size analysis for mineral soils;

- moisture conditions, including depth to the water table;
- groundwater chemistry, including pH, electrical conductivity, NO_3, NH_4, Cl, SO_4, Na, K, Ca, and Mg content.

More details of the plot design and layout are included in the Site Selection and Field Layout sections of this report. This report documents site and plot locations where the data were collected. Two other reports and accompanying databases will document the detailed baseline data collected: Errington and Bhatti (A database of stand characteristics, in preparation) covers the first three items in the preceding list, and Errington and Bhatti (A database of vegetation, soil and groundwater conditions, in preparation) covers all remaining items listed above.

BIOGEOCLIMATIC CONTEXT OF THE NETWORK (STUDY AREA)

Canada's longest river (Government of Canada 2013), the Mackenzie, flows north from Great Slave Lake to the Beaufort Sea through the Interior Plains physiographic region, and along the eastern margin of the Boreal and Taiga Cordillera (Natural Resources Canada 2009; Crampton 1973). Sandwiched between the mountainous Cordilleran ranges to the west and the Precambrian bedrock plains of the Canadian Shield to the east (Crampton 1973; Ecosystem Classification Group 2008), the bulk of the Mackenzie Valley is contained within the northern portion of the Interior Plains, designated as the Taiga Plains Ecozone. The Taiga Plains exhibit the low relief and level to gently rolling plain that are also characteristic of the more southerly Prairie and Boreal Plains Ecozones (Ecological Stratification Working Group 1995). Underlain by horizontal sedimentary limestones, shales, and sandstones, the surficial geology is dominated by organic peat deposits, with a lesser component of undulating to hummocky morainal and lacustrine material. Alluvial deposits are also present and associated with the major river systems (Ecological Stratification Working Group 1995).

The climate of the Taiga Plains is variable, with a distinct gradient from north to south. A number of long-term weather stations are present in the Mackenzie Valley. Examination of the 1971–2000 Canadian Climate Normals (Environment Canada 2002) reveals a gradient in mean annual temperature of 5.9°C (-8.8°C to -2.9°C) and mean annual precipitation of 120.6 mm (248.4 mm to 369.0 mm), with the coolest and driest climates in the north at Inuvik and the warmest and wettest climates in the south at Hay River and Fort Simpson (Fig. 2). This climatic gradient is reflected in the permafrost zonation, with the Sporadic Discontinuous, Extensive Discontinuous, and Continuous Permafrost Zones replacing each other from south to north, underlying 10–50%, 50–90%, and 90–100% of the terrain, respectively (Fig. 3). The Ecoclimatic Regions of Canada (Ecoregions Working Group 1989) also incorporate this climatic variation, and its impact on regional vegetation with the delineation of the Mid-Boreal, High Boreal, Low Subarctic and High Subarctic Ecoclimatic Regions

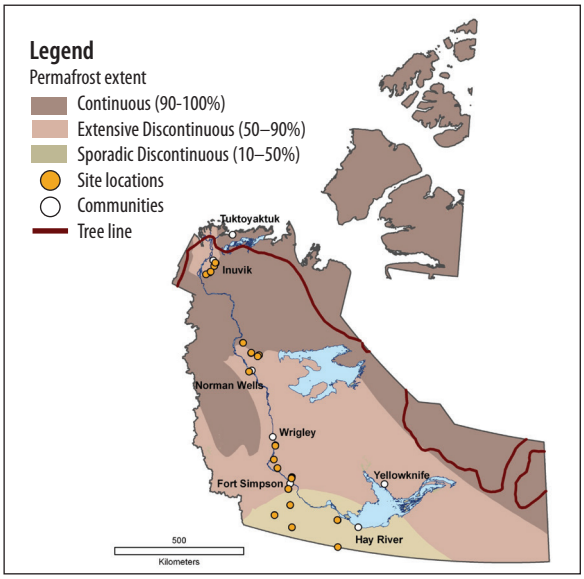


Figure 3. Permafrost zones within the Northwest Territories showing permanent monitoring site locations in relation to the approximate tree line, major lakes, the Mackenzie River, and local communities. Original permafrost map data provided by The Atlas of Canada (http://atlas.gc.ca/ ©2007). Produced under licence of Her Majesty the Queen in Right of Canada, with permission of Natural Resources Canada.

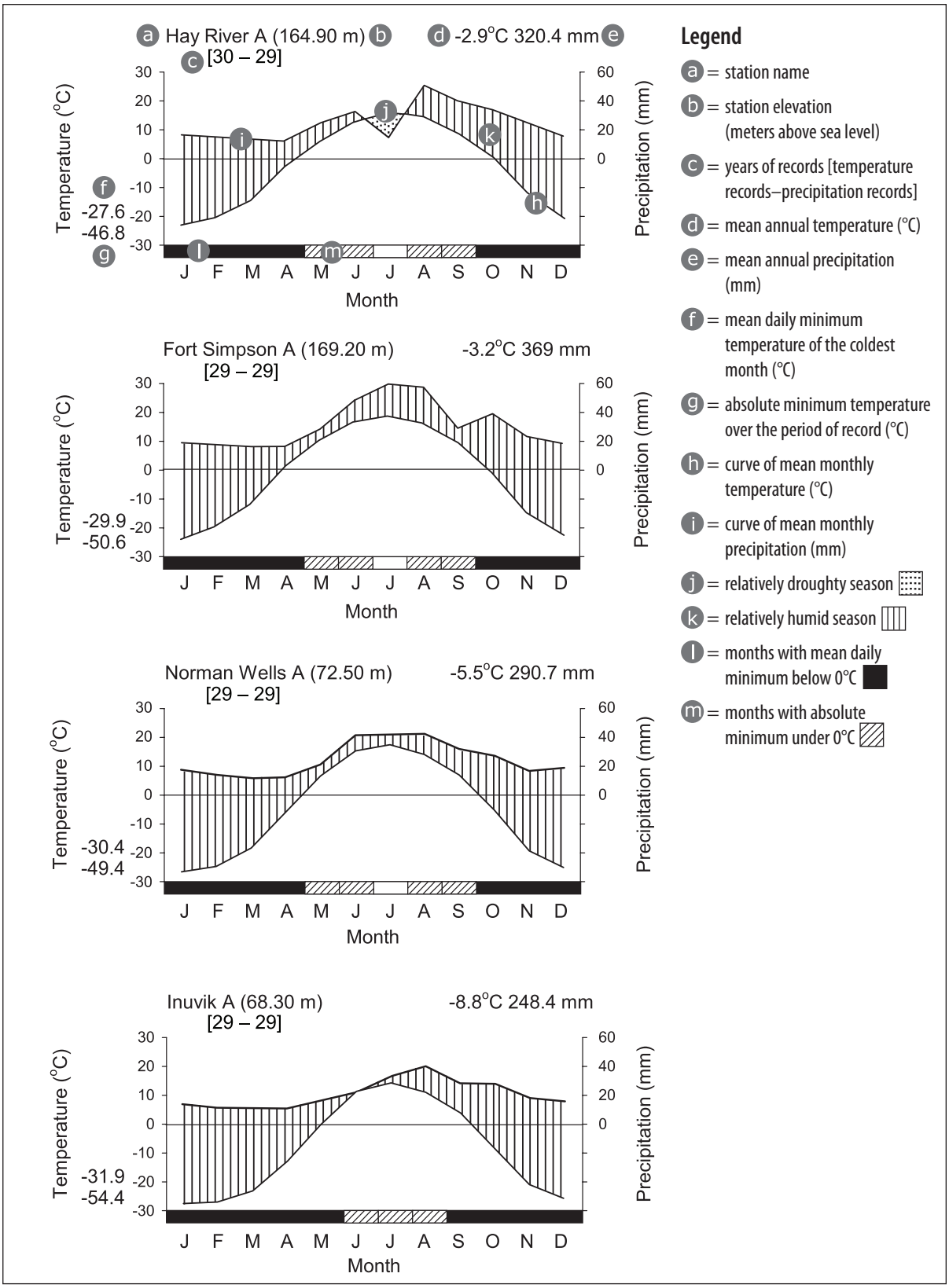


Figure 2. Climate diagrams for Inuvik, Norman Wells, Fort Simpson, and Hay River, presented from south (top) to north (bottom). Data are derived from the Canadian Climate Normals or Averages 1971–2000 (Environment Canada 2002) and the National Climate Data and Information Archive (Environment Canada 2011). Interpretation of the diagrams follows Walter (1963).

within the Mackenzie Valley (Fig. 4a). These ecoclimatic regions are directly incorporated into the level III ecoregions of the NWT Ecosystem Classification Group (2007, 2008, 2010, Fig. 4b). A further ecological subdivision of the Taiga Plains, the level IV ecoregions (Ecosystem Classification Group 2007) identify broadly recurring vegetation and landform patterns within the climatic framework.

For the purposes of this study, 11 target (level IV) ecoregions were identified along the Mackenzie Valley. One ecoregion selected was the Central Mackenzie Plain, which was identified as part of the adjacent Taiga Cordillera, rather than the Taiga Plains. During the course of the study, a revision of the cordilleran ecoregions within the Northwest Territories (Ecosystem Classification Group 2010) separated this ecoregion into High Boreal and Low Subarctic components, the Central Mackenzie Valley HBb and Central Mackenzie Plain LSb, respectively. No plots were placed in the more northern Central Mackenzie Plain LSb; consequently, future references will be to the 11 sampled ecoregions only (Fig. 5). Within each ecoregion, two or three sites were selected for study.

Although not strictly part of the MVPMPN, one additional site was established south of Fort McMurray, near the community of Anzac, in northern Alberta (Fig. 6). Located in the Mid-Boreal Ecoregion, within the Isolated Patches Permafrost Zone, this site no longer contains permafrost. The legacy of permafrost is reflected in the collapse feature studied (an internal lawn), in which a relatively small island of permafrost thawed within a permafrost-free bog matrix causing the surface to subside approximately 50 cm below the surrounding bog (Vitt et al. 1994). Plots were located in upland forest, bog, and internal lawn environments.

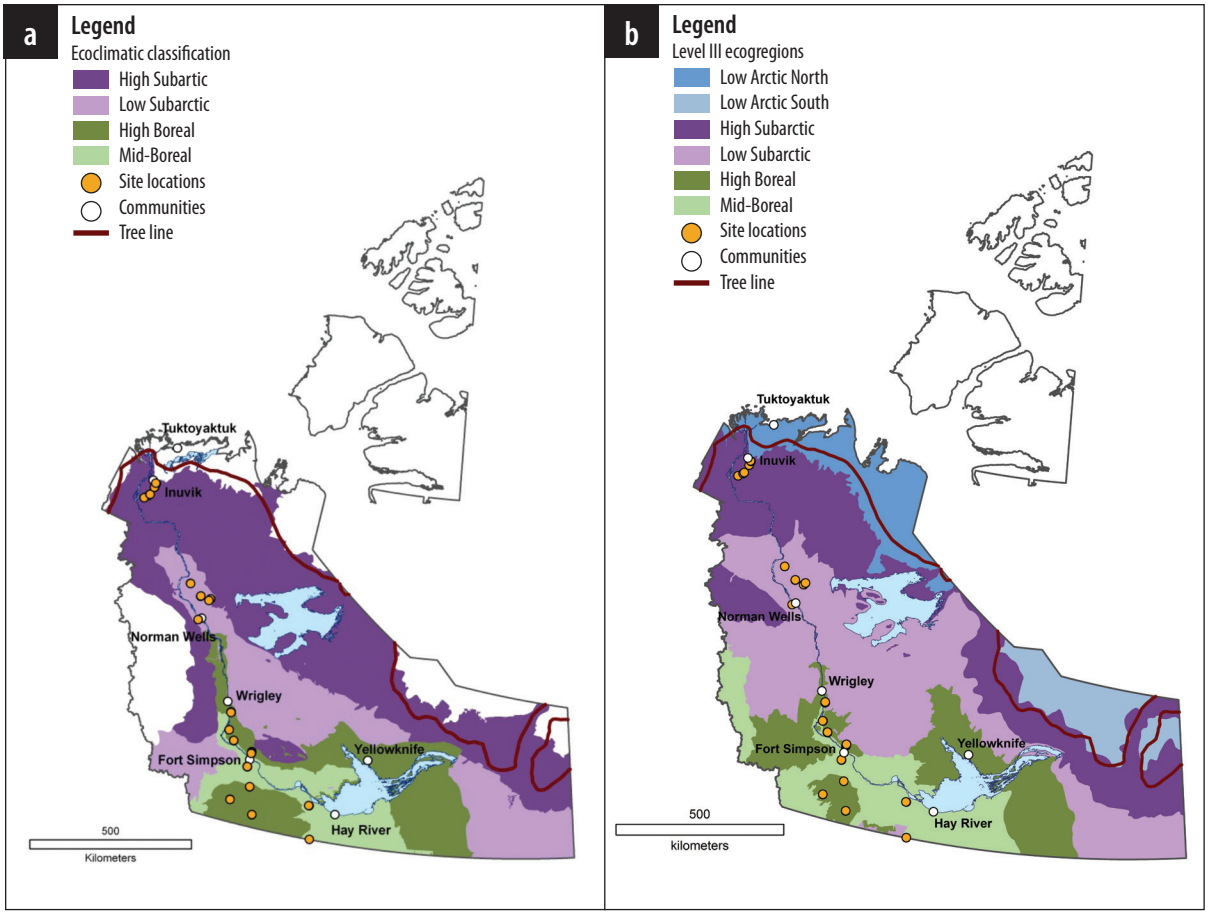


Figure 4. Ecoclimatic classification of the Northwest Territories (NWT) as originally described by a) the Ecoregions Working Group (1989) and as updated by b) the Ecosystem Classification Group (2007, 2008, 2010, 2012, 2013) showing monitoring site locations with respect to the approximate tree line, major lakes, the Mackenzie River, and local communities.

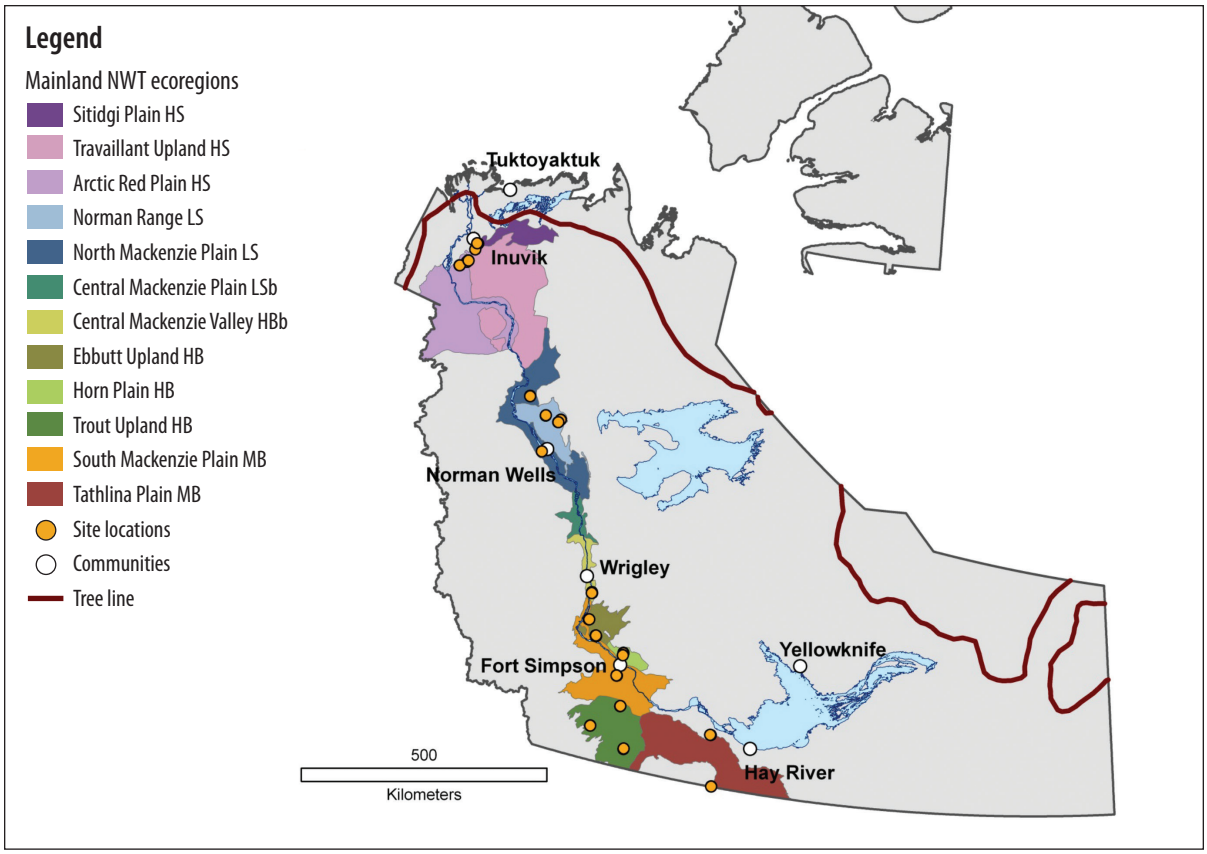


Figure 5. Forested ecoregions (Ecosystem Classification Group 2007, 2010) along the Mackenzie Valley, Northwest Territories (NWT). Plot locations are shown in relation to the approximate tree line, major lakes, the Mackenzie River, and local communities.

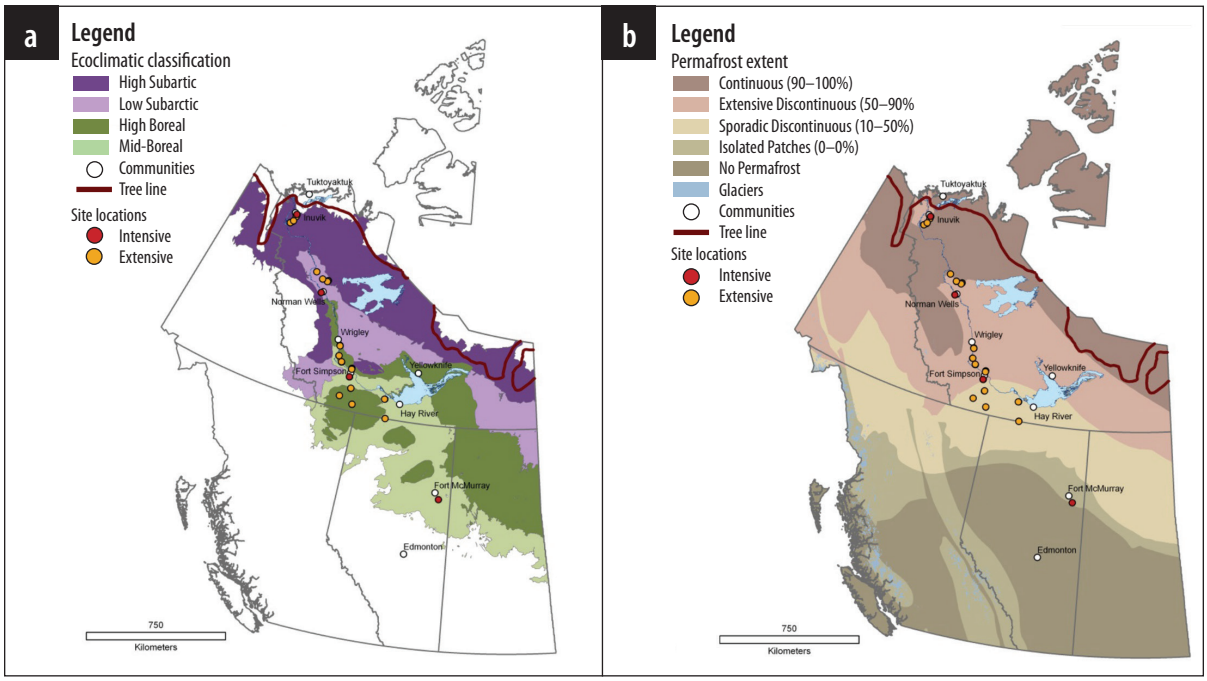


Figure 6. Location of permanent monitoring plots within the context of a) ecoclimatic regions and b) permafrost zones of western Canada. Intensive sites represent those studied more intensively for carbon cycling and greenhouse gas exchange within the International Polar Year program while extensive sites provide a baseline of plant community, tree, and soil conditions throughout the Mackenzie Valley. Original permafrost map data provided by The Atlas of Canada (http://atlas.gc.ca/ ©2007). Produced under licence of Her Majesty the Queen in Right of Canada, with permission of Natural Resources Canada.

METHODS – SITE SELECTION AND FIELD LAYOUT

In the summers of 2007 and 2008, 25 sites, including 69 plots and 17 sub-transects, were established in the forests and peatlands of the Mackenzie Valley, with an additional site (3 plots) established in northern Alberta. Each site was selected to contain a series of plots along a local topographic gradient. Plots were located in areas of permafrost-affected peatlands (peat plateaus), areas of permafrost thaw (collapse scars), and adjacent forest environments occurring on mineral soils (upland forests) (Fig. 7). No plots with collapse scars were included in the six most northern sites near Inuvik because of climatic limitations in the High Subarctic, Continuous Permafrost Zone. In the most southern site in Alberta, where permafrost is more limited on the landscape, plots were located in permafrost-free bog and internal lawn environments rather than the usual peat plateau and collapse scar areas.

Researchers used Google Earth (Google Inc. 2005–2008) imagery to identify potential plot locations before field visits. The initial survey focussed on peat plateaus with evidence of at least one collapse scar large enough to contain a 20- x 20-m plot. Additionally, the sites were free of anthropogenic disturbance and, ideally, from 100 to 1000 m from the nearest access road (in road-accessible areas).

Each plot was laid out as a 20- x 20-m square with metal pigtails marking the corners and midpoints of each side; the plot center and northwesternmost corner were marked with aluminum posts and signs designating the

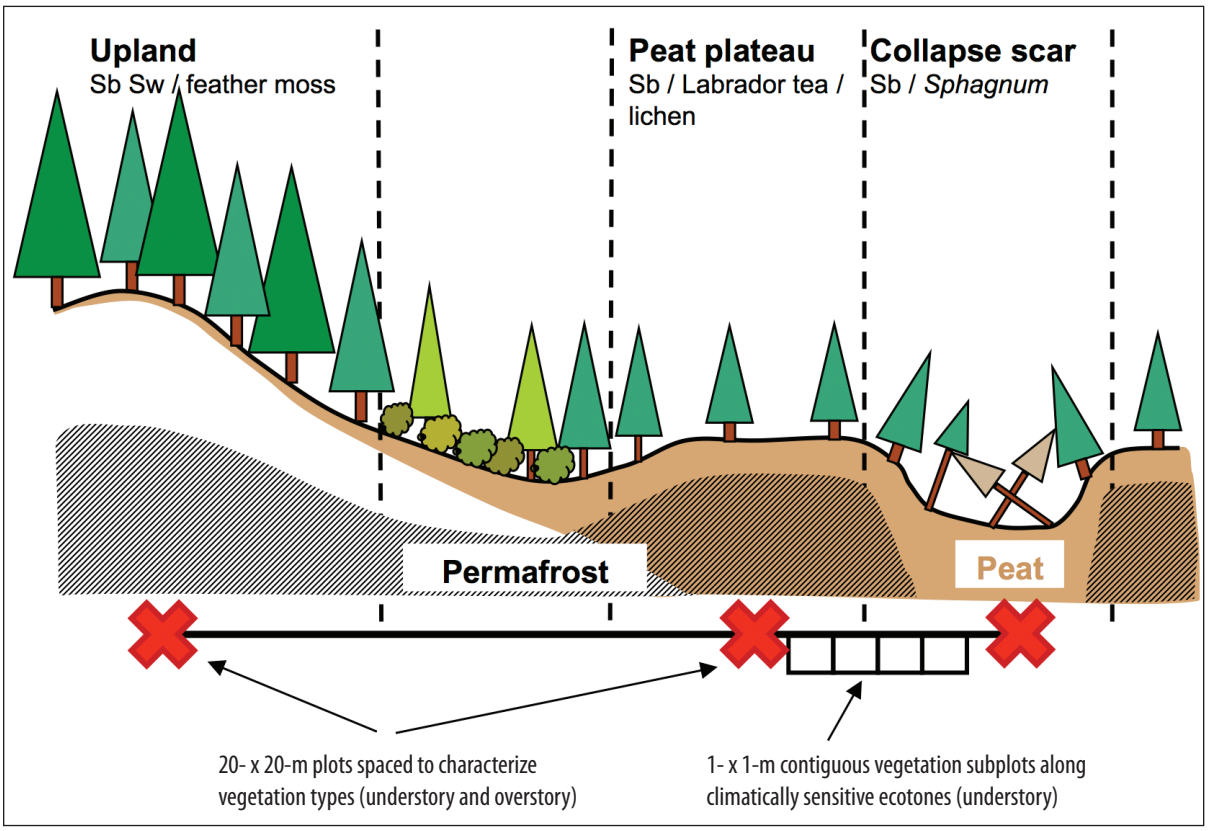


Figure 7. Sample site layout encompassing upland, peat plateau, and collapse scar environments with typical vegetation types along a topographic landscape gradient. Large 20- x 20-m plots are used to characterize the main vegetation types, and a sub-transect consisting of contiguous 1- x 1-m plots is used to record the current understory vegetation and permafrost conditions along the abrupt gradient from peat plateau to collapse scar. Soils and active layer depths vary along this gradient, which are evident with a transition from mineral (white) soils, in the upland, to organic (brown) soils in the peat plateau and collapse scar. The shallowest active layer depths are found in the peat plateaus, and permafrost (hatched) is absent from collapse scars.

plot name, plot center or NW corner, and date established (Fig. 8). For each site location, the distance between the different plots is provided on the site location map. Eight 1- x 1-m vegetation plots were also marked with pigtails and located in the plot corners, as well as midway along the diagonals to the plot center (Fig. 8). Although pigtails in all four corners were used when surveying the vegetation subplots in the field, only pigtails lying along the main subplot diagonals were left as permanent markers. The plot orientation was recorded using the azimuth of the side pointing northerly towards the northwesternmost corner (Fig. 8). In five plots, the dimensions were modified slightly to accommodate limitations imposed by the size and shape of the target vegetation type on the landscape.

A handheld GPS device was used to collect locations for both the plot center and the NW corner, and a track was created to approximate the location of the plot boundary. To more conveniently relocate plots in the field, a tie line was created for each site. For sites accessed from roads, the start of each tie line (point of commencement, POC) was located in reference to a feature observable from the road, usually a culvert or other stream crossing, or a road junction. Each tie line was flagged at the edge of the road right-of-way and, at the POC, POT (tie line end point, point of termination), and at 50-m or 100-m stations. The flagging was labeled with the site name, tie line azimuth, distance along the tie line (0 m at the POC), date established, and surveyor's initials. An alternate flagging color was used to distinguish the POC, POT, and the stations from the flagging used to mark vegetation along the tie line between stations. Distance and direction from each plot were recorded to the nearest tie line station to clearly define the relative position of all plots within a site. For sites accessed via helicopter, all plots were still tied into one or two main tie line(s) with the collapse scar generally considered to be the most easily identifiable feature from the air and, as such, would provide

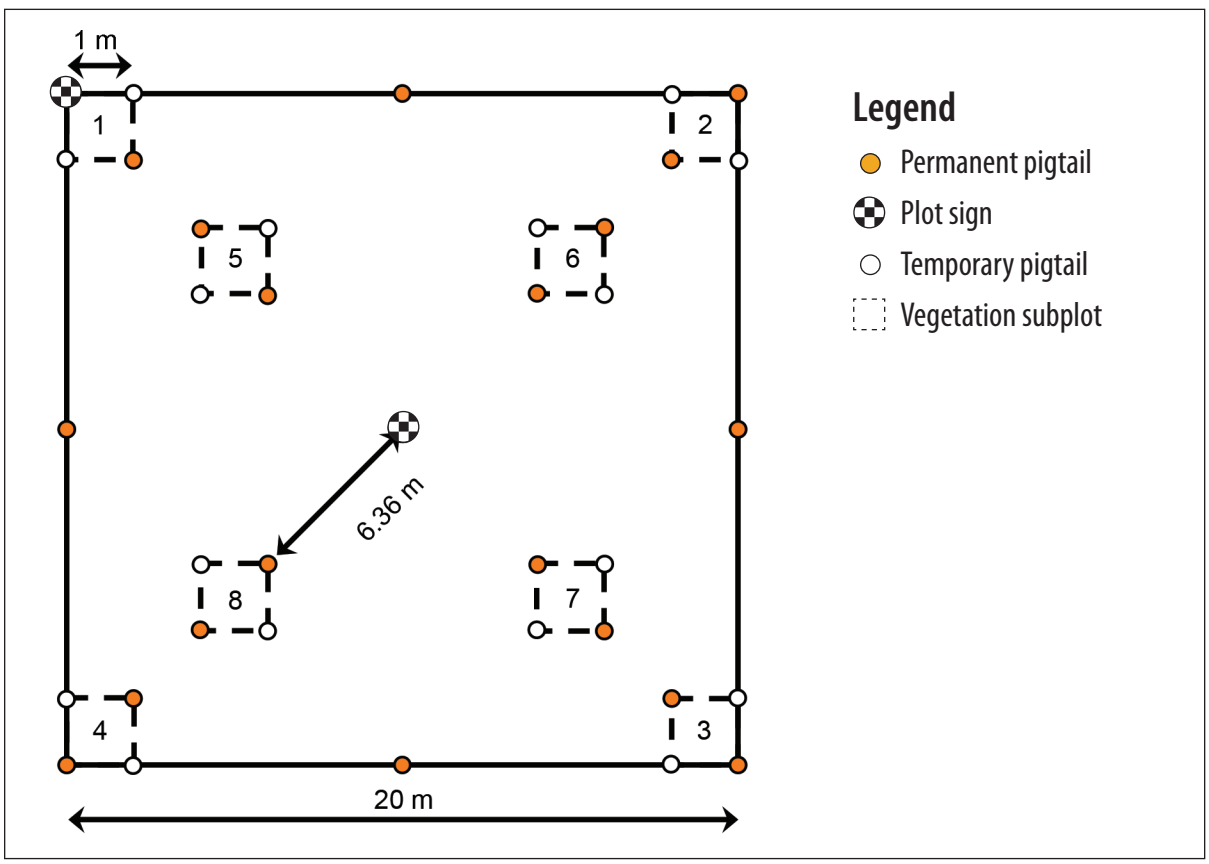


Figure 8. Plot layout, showing locations and dimensions of the eight understory vegetation subplots, as well as the location of permanent and temporary plot markers.

the best way to relocate the site. Tie line distances were measured using a hip chain and no attempt was made to correct slope distance to horizontal distance because of the low relief of the landscape.

In addition to the two or three plots present at each site, most sites also contained a sub-transect, consisting of a series of five to nine contiguous 1- x 1-m plots established across a sensitive gradient of permafrost collapse (Fig. 9). This sub-transect is, in most cases, located perpendicular to a collapse scar boundary, with plots extending from the peat plateau to the collapse scar proper, and encompassing a region of what was presumed to be actively collapsing permafrost. In the more northern sites, where collapse scars were not present on the landscape, sub-transects were either not established or they were established across polygonal trenches in sites where polygonal patterning was evident on the peat plateau. All sub-transects were marked with pigtails denoting the 1- x 1-m plot corners and the locations were tied to a corner of either the peat plateau or collapse scar plot, rather than directly to the site tie line.

Figure 9. Field layout of a sub-transect (FS 06) with pink-flagged pigtails marking the corners of contiguous 1- x 1-m subplots extending from collapse scar (lower) to pleat plateau (upper) vegetation.

SITE DATA GROUPINGS

Within the site information section of this report, sites are grouped into five regions, named according to the closest community or community where field crews were based when sampling the sites: Inuvik, Norman Wells, Wrigley, Fort Simpson, and Anzac. These are groupings of convenience and, particularly for the southern sites, do not necessarily reflect the most appropriate climatic groupings as the closest long-term weather station for a site in the Fort Simpson region may be in Hay River or a site in the Wrigley region may be geographically closer to Fort Simpson (Fig. 3). Site locations in each of these regions are shown in Figures 10–14, and plot coordinates are provided in Tables 1–5. Table 6 provides a summary of each site location in terms of ecoclimatic region, ecoregion, and permafrost zone.

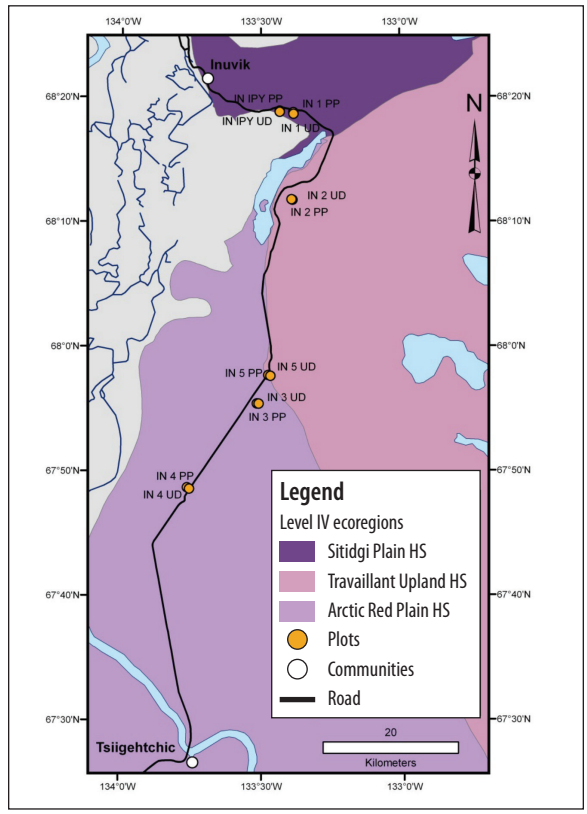


Figure 10. Permanent monitoring plots in the Inuvik region. Plot locations are shown in relation to roads, major water bodies, local communities, and target ecoregions (Ecosystem Classification Group 2007).

Table 1. List of plot locations in the Inuvik region

	Latitude (N)				Longitude (W)			
Plot[a]	Degrees	Minutes	Seconds	DD[b]	Degrees	Minutes	Seconds	DD[b]
IN 1 PP	68	18	47.8	68.31328	133	23	0.1	133.38336
IN 1 UD	68	18	39.9	68.31108	133	22	59.4	133.38317
IN 2 PP	68	11	46.5	68.19625	133	23	14.1	133.38725
IN 2 UD	68	11	48.7	68.19686	133	23	26.1	133.39058
IN 3 PP	67	55	25.3	67.92369	133	30	54.5	133.51514
IN 3 UD	67	55	24.7	67.92353	133	30	30.4	133.50844
IN 4 PP	67	48	41.5	67.81153	133	45	43.2	133.76200
IN 4 UD	67	48	35.2	67.80978	133	45	15.4	133.75428
IN 5 PP	67	57	42.6	67.96183	133	28	27.1	133.47419
IN 5 UD	67	57	38.6	67.96072	133	27	59.7	133.46658
IN IPY PP	68	18	54.9	68.31525	133	25	56.7	133.43242
IN IPY UD	68	18	49.5	68.31375	133	25	56.2	133.43228

[a]PP = peat plateau; UD = upland forest.
[b]DD = decimal degrees.

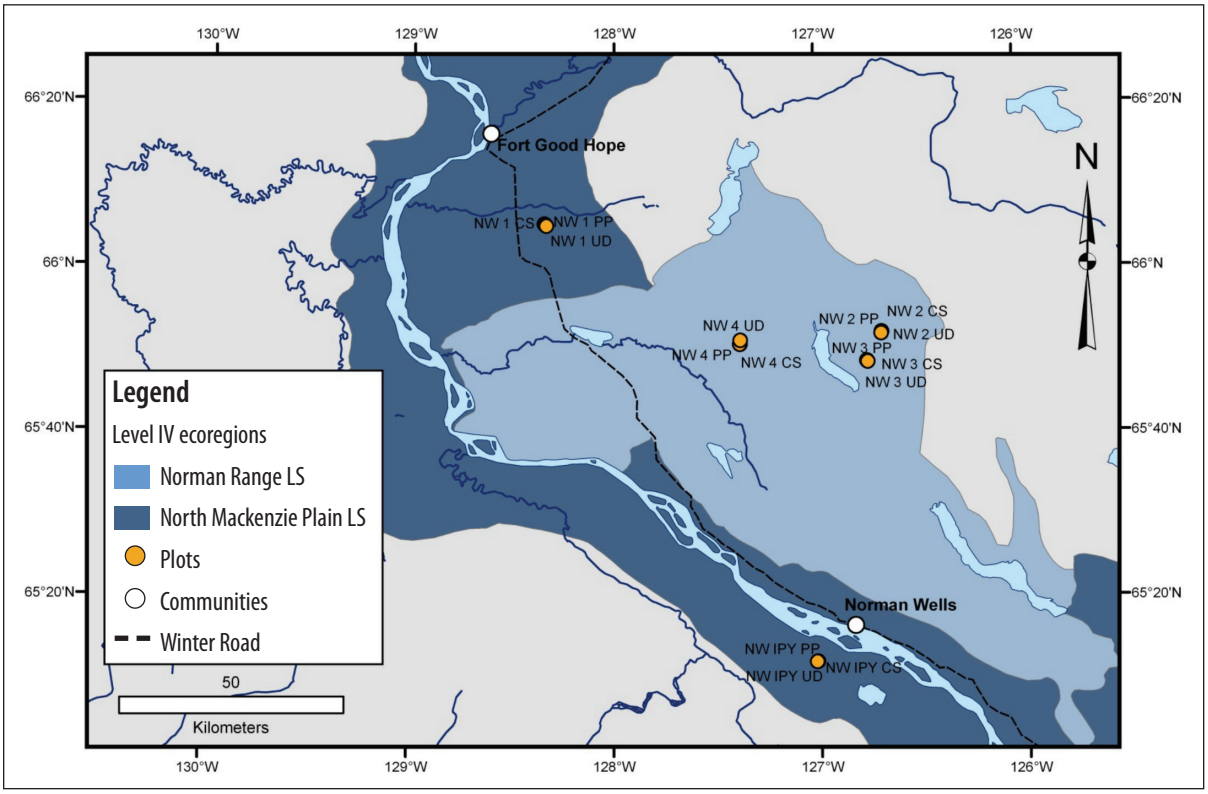


Figure 11. Permanent monitoring plots in the Norman Wells region. Plot locations are shown in relation to roads, major water bodies, local communities, and target ecoregions (Ecosystem Classification Group 2007).

Table 2. List of plot locations in the Norman Wells region

	Latitude (N)				Longitude (W)			
Plot[a]	Degrees	Minutes	Seconds	DD[b]	Degrees	Minutes	Seconds	DD[b]
NW 1 CS	66	5	46.7	66.09631	128	20	47.2	128.34644
NW 1 PP	66	5	43.7	66.09547	128	20	39.1	128.34419
NW 1 UD	66	5	33.0	66.09250	128	20	12.5	128.33681
NW 2 CS	65	52	30.2	65.87506	126	40	34.8	126.67633
NW 2 PP	65	52	32.0	65.87556	126	40	42.0	126.67833
NW 2 UD	65	52	20.2	65.87228	126	40	45.7	126.67936
NW 3 CS	65	49	2.2	65.81728	126	45	5.7	126.75158
NW 3 PP	65	49	2.3	65.81731	126	45	8.8	126.75244
NW 3 UD	65	48	55.8	65.81550	126	44	52.0	126.74778
NW 4 CS	65	51	10.0	65.85278	127	22	39.3	127.37758
NW 4 PP	65	51	10.7	65.85297	127	22	43.8	127.37883
NW 4 UD	65	51	39.6	65.86100	127	22	33.4	127.37594
NW IPY CS	65	12	36.5	65.21014	127	0	50.1	127.01392
NW IPY PP	65	12	36.3	65.21008	127	0	52.0	127.01444
NW IPY UD	65	12	34.6	65.20961	127	1	1.2	127.01700

[a]PP = peat plateau; UD = upland forest; CS = collapse scar.
[b]DD = decimal degrees.

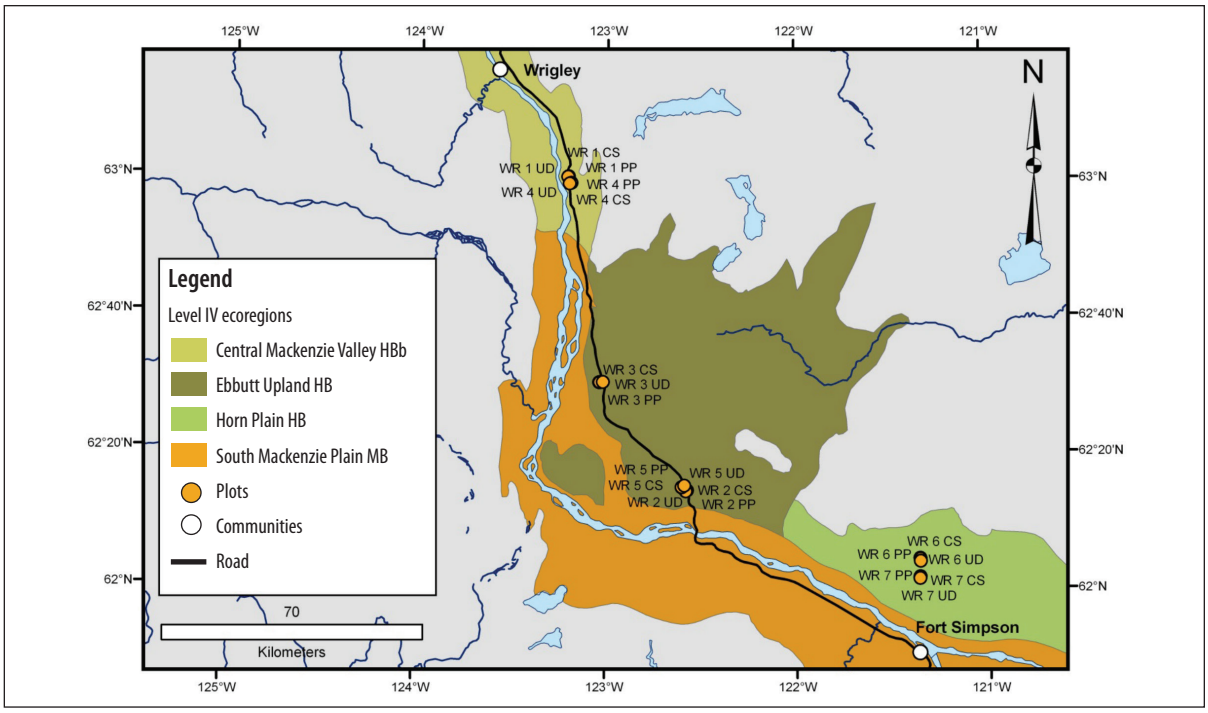


Figure 12. Permanent monitoring plots in the Wrigley region. Plot locations are shown in relation to roads, major water bodies, local communities, and target ecoregions (Ecosystem Classification Group 2007, 2010).

Table 3. List of plot locations in the Wrigley region

	Latitude (N)				Longitude (W)			
Plot[a]	Degrees	Minutes	Seconds	DD[b]	Degrees	Minutes	Seconds	DD[b]
WR 1 CS	63	0	38.6	63.01072	123	12	32.3	123.20897
WR 1 PP	63	0	38.7	63.01075	123	12	27.5	123.20764
WR 1 UD	63	0	36.6	63.01017	123	12	37.9	123.21053
WR 2 CS	62	14	44.1	62.24558	122	34	16.7	122.57131
WR 2 PP	62	14	43.7	62.24547	122	34	20.4	122.57233
WR 2 UD	62	14	37.2	62.24367	122	34	42.0	122.57833
WR 3 CS	62	30	32.0	62.50889	123	2	9.1	123.03586
WR 3 PP	62	30	32.4	62.50900	123	1	59.7	123.03325
WR 3 UD	62	30	35.4	62.50983	123	0	58.1	123.01614
WR 4 CS	62	59	41.7	62.99492	123	11	38.5	123.19403
WR 4 PP	62	59	42.2	62.99506	123	11	35.0	123.19306
WR 4 UD	62	59	37.3	62.99369	123	12	9.7	123.20269
WR 5 CS	62	15	11.1	62.25308	122	35	58.3	122.59953
WR 5 PP	62	15	12.8	62.25356	122	35	59.6	122.59989
WR 5 UD	62	15	26.6	62.25739	122	35	11.0	122.58639
WR 6 CS	62	4	37.1	62.07697	121	21	22.1	121.35614
WR 6 PP	62	4	30.1	62.07503	121	21	20.3	121.35564
WR 6 UD	62	4	11.0	62.06972	121	21	14.3	121.35397
WR 7 CS	62	1	54.2	62.03172	121	21	25.9	121.35719
WR 7 PP	62	1	50.9	62.03081	121	21	26.8	121.35744
WR 7 UD	62	1	39.1	62.02753	121	21	26.9	121.35747

[a]PP = peat plateau; UD = upland forest; CS = collapse scar.
[b]DD = decimal degrees.

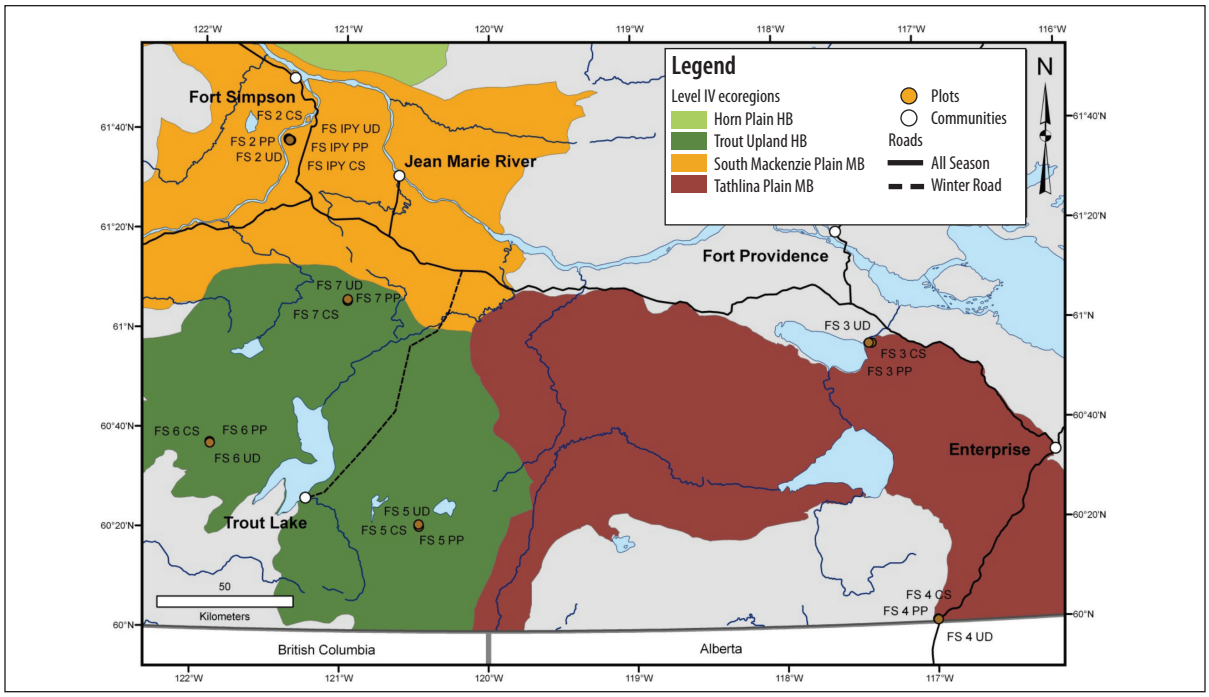


Figure 13. Permanent monitoring plots in the Fort Simpson region. Plot locations are shown in relation to roads, major water bodies, local communities, and target ecoregions (Ecosystem Classification Group 2007).

Table 4. List of plot locations in the Fort Simpson region

	Latitude (N)				Longitude (W)			
Plot[a]	Degrees	Minutes	Seconds	DD[b]	Degrees	Minutes	Seconds	DD[b]
FS 2 CS	61	38	32.1	61.64225	121	24	24.2	121.40672
FS 2 PP	61	38	29.1	61.64142	121	24	23.3	121.40647
FS 2 UD	61	38	22.3	61.63953	121	24	20.2	121.40561
FS 3 CS	60	56	26.2	60.94061	117	21	48.8	117.36356
FS 3 PP	60	56	26.0	60.94056	117	21	52.7	117.36464
FS 3 UD	60	56	28.4	60.94122	117	22	59.3	117.38314
FS 4 CS	60	00	27.0	60.00750	116	59	30.3	116.99175
FS 4 PP	60	00	25.1	60.00697	116	59	30.9	116.99192
FS 4 UD	60	00	19.9	60.00553	116	59	19.1	116.98864
FS 5 CS	60	21	3.5	60.35097	120	28	24.5	120.47347
FS 5 PP	60	20	54.3	60.34842	120	28	14.6	120.47072
FS 5 UD	60	21	22.4	60.35622	120	28	22.1	120.47281
FS 6 CS	60	37	21.0	60.62250	121	54	4.9	121.90136
FS 6 PP	60	37	22.0	60.62278	121	54	2.1	121.90058
FS 6 UD	60	37	5.2	60.61811	121	53	57.7	121.89936
FS 7 CS	61	06	12.0	61.10333	120	58	29.1	120.97475
FS 7 PP	61	06	11.7	61.10325	120	58	24.2	120.97339
FS 7 UD	61	06	28.8	61.10800	120	58	24.3	120.97342
FS IPY CS	61	38	10.4	61.63622	121	23	51.7	121.39769
FS IPY PP	61	38	13.2	61.63700	121	23	51.0	121.3975
FS IPY UD	61	38	15.1	61.63753	121	23	51.2	121.39756

[a]PP = peat plateau; UD = upland forest; CS = collapse scar.
[b]DD = decimal degrees.

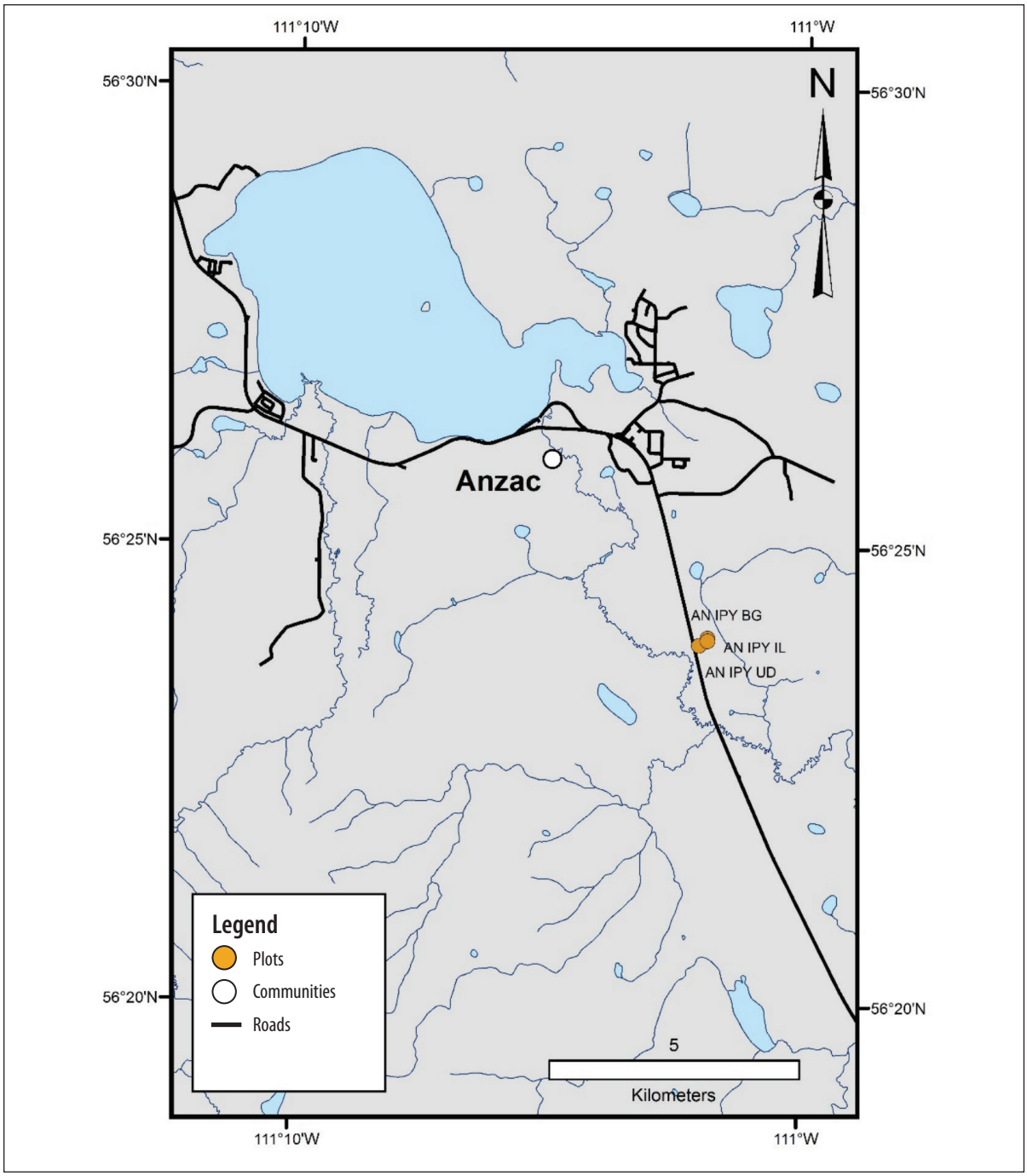


Figure 14. Permanent monitoring plots in the Anzac region. Plot locations are shown in relation to roads, major water bodies, and local communities.

Table 5. List of plot locations in the Anzac region

	Latitude (N)				Longitude (W)			
Plot[a]	Degrees	Minutes	Seconds	DD[b]	Degrees	Minutes	Seconds	DD[b]
AN IPY IL	56	23	58.9	56.39969	111	01	52.5	111.03125
AN IPY BG	56	24	00.6	56.40017	111	01	52.6	111.03128
AN IPY UD	56	23	55.8	56.39883	111	02	02.6	111.03406

[a]BG = bog; UD = upland forest; IL = internal lawn.
[b]DD = decimal degrees.

Table 6. Classification and distribution of sites according to ecoclimatic region, ecoregion, and permafrost zone

Site	Ecoclimatic region	Ecoregion	Permafrost zone
IN 01	High Subarctic	Sitigi Plain HS[a]	Continuous
IN 02	High Subarctic	Travaillant Upland HS[a]	Continuous
IN 03	High Subarctic	Arctic Red Plain HS[a]	Continuous
IN 04	High Subarctic	Arctic Red Plain HS[a]	Continuous
IN 05	High Subarctic	Travaillant Upland HS[a]	Continuous
IN IPY	High Subarctic	Sitigi Plain HS[a]	Continuous
NW 01	Low Subarctic	North Mackenzie Plain LS[a]	Continuous
NW 02	Low Subarctic	Norman Range LS[a]	Continuous
NW 03	Low Subarctic	Norman Range LS[a]	Continuous
NW 04	Low Subarctic	Norman Range LS[a]	Extensive Discontinuous
NW IPY	Low Subarctic	North Mackenzie Plain LS[a]	Extensive Discontinuous
WR 01	High Boreal	Central Mackenzie Valley HBb[b]	Extensive Discontinuous
WR 02	High Boreal	Ebbutt Upland HB[a]	Extensive Discontinuous
WR 03	High Boreal	Ebbutt Upland HB[a]	Extensive Discontinuous
WR 04	High Boreal	Central Mackenzie Valley HBb[b]	Extensive Discontinuous
WR 05	High Boreal	Ebbutt Upland HB[a]	Extensive Discontinuous
WR 06	High Boreal	Horn Plain HB[a]	Extensive Discontinuous
WR 07	High Boreal	Horn Plain HB[a]	Extensive Discontinuous
FS 02	Mid-Boreal	South Mackenzie Plain MB[a]	Extensive Discontinuous
FS 03	Mid-Boreal	Tathlina Plain MB[a]	Sporadic Discontinuous
FS 04	Mid-Boreal	Tathlina Plain MB[a]	Sporadic Discontinuous
FS 05	High Boreal	Trout Upland HB[a]	Sporadic Discontinuous
FS 06	High Boreal	Trout Upland HB[a]	Sporadic Discontinuous
FS 07	High Boreal	Trout Upland HB[a]	Sporadic Discontinuous
FS IPY	Mid-Boreal	South Mackenzie Plain MB[a]	Extensive Discontinuous
AN IPY	Mid-Boreal	Mid-Boreal Mixedwood[c]	Isolated Patches

[a] Following ecological regions of the Northwest Territories Taiga Plains (Ecosystem Classification Group 2007).
[b] Following ecological regions of the Northwest Territories Cordillera (Ecosystem Classification Group 2010).
[c] Following ecoregions and ecodistricts of Alberta (Strong 1992).

USING THIS REPORT

The main body of this report consists of two sections. The first describes the information provided for each site and plot, along with the methods and resources used to collect the data. The second section provides detailed information specific to each site and plot with a site information page for each site followed by a plot information page containing more detailed information about each plot within that site. Site and plot information pages are organized by site code within four geographic regions ordered from north to south. Site information pages (Fig. 15) describe overall site characteristics and detail the individual plot locations, as well as providing directions on how to relocate the plots from features identifiable from access roads or from the air (in cases of helicopter-accessed sites). Ideally, sites will be best accessed using a handheld GPS device in conjunction with a compass and air photographs or other aerial imagery. A plot information page, which details all plots within a site (Fig. 16), follows each site information page.

In this report, the following terminology is used precisely to designate specific components of the sampling hierarchy:

Site

Plot

Subplot

Sub-transect

The term site is used exclusively to refer to a set of 2–3 plots and a sub-transect, generally located within 1 km of each other and established along a topographic sequence encompassing upland forest, peat plateau, and collapse scar ecotopes. Each plot is a fixed area, usually 20 m x 20 m, laid out within a site to represent one of the three target ecotopes. The term subplot refers to any smaller, fixed-area unit established within the context of either the plot or sub-transect. The term sub-transect refers to a contiguous sequence of 1-m x 1-m subplots established across, and perpendicular to, the peat plateau–collapse scar boundary, or a polygonal trench.

The following information describes the fields listed for each site on the site information pages (Fig. 15) and on the plot information pages (Fig. 16).

Site Information

Site Code

The site code consists of two parts, with the first part consisting of a two-letter code indicating the general geographic location of the site with the following abbreviations:

IN Inuvik

NW Norman Wells

WR Wrigley

FS Fort Simpson

AN Anzac

The second portion of the site code is simply a two- or three-digit code unique to each site within a geographic region. Most sites are identified with a two-digit numeric code, with the only exceptions being sites identified by the three-letter code of IPY. These 'IPY' designations represent sites examined in more detail for carbon cycling and greenhouse gas dynamics (see, for example, Startsev et al. 2016).

Network ID

The network ID is a three-part code, consisting of the site code preceded by two digits denoting the year of site establishment. For example, a plot established in 2007 would begin with the code 07. In most cases, all plots in a site were established in the same year. Where plots in a single site were established over the course of multiple years, the site code reflects the first year a plot was established in the site.

Permafrost Zone

The permafrost zone indicates the regional prevalence of permafrost according to the Canadian permafrost classification (Heginbottom et. al. 1995). In terms of permafrost extent, three zones are delineated within the terrestrial Northwest Territories and one additional zone in northern Alberta:

Continuous (90–100% of land area underlain by permafrost), Extensive Discontinuous (50–90% of land area underlain by permafrost), Sporadic Discontinuous (10–50% of land area underlain by permafrost), and Isolated Patches (0–10% of land area underlain by permafrost).

In this publication, sites are identified according to their location within one of the above zones as delineated by Heginbottom et al. (1995), except for those sites in the Mackenzie Delta region, near Inuvik, now all described as part of the Continuous permafrost zone, reflecting recent investigations of Nguyen et al. (2009).

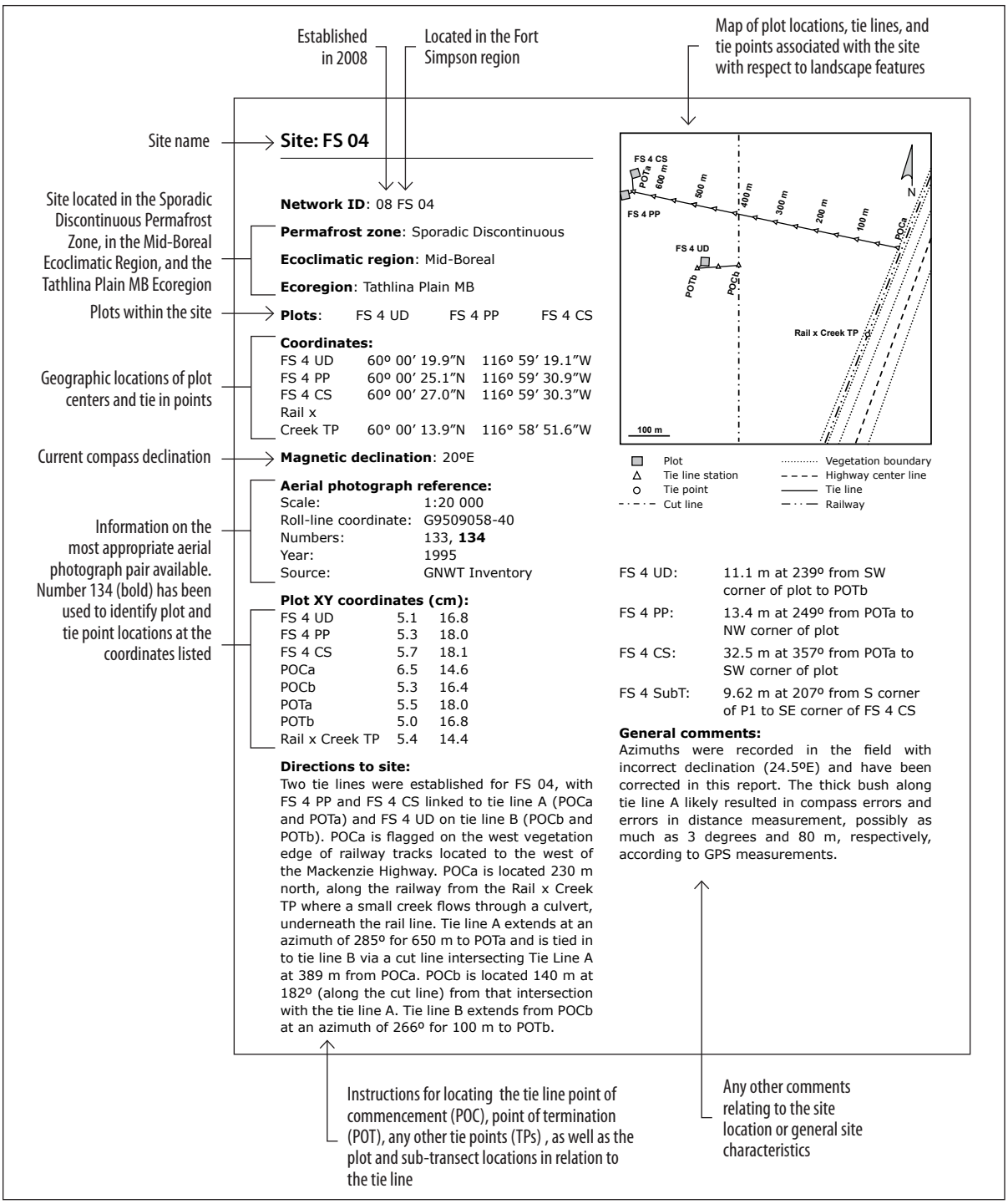


Figure 15. Example page layout of site information.

Ecoclimatic Region

The regional ecoclimate describes broad areas on the earth's surface characterized by distinctive ecological responses to climate, as expressed by vegetation and reflected in soils, wildlife, and water (Ecoregions Working Group 1989). These ecoclimatic regions are characterized by regional climatic differences at an approximate scale of 1:2 000 000–1:10 000 000 (Ecosystem Classification Group 2010). The ecoclimatic classification reflected in this publication is based on that of the Ecoregions Working Group (1989) as updated for the Northwest Territories as level III ecoregions (Ecosystem Classification Group 2010). Each site is identified according to its location within one of four ecoclimatic regions:

High Subarctic

Low Subarctic

High Boreal

Mid-Boreal

Ecoregion

Ecoregions identify broad recurring vegetation and landform patterns within the regional

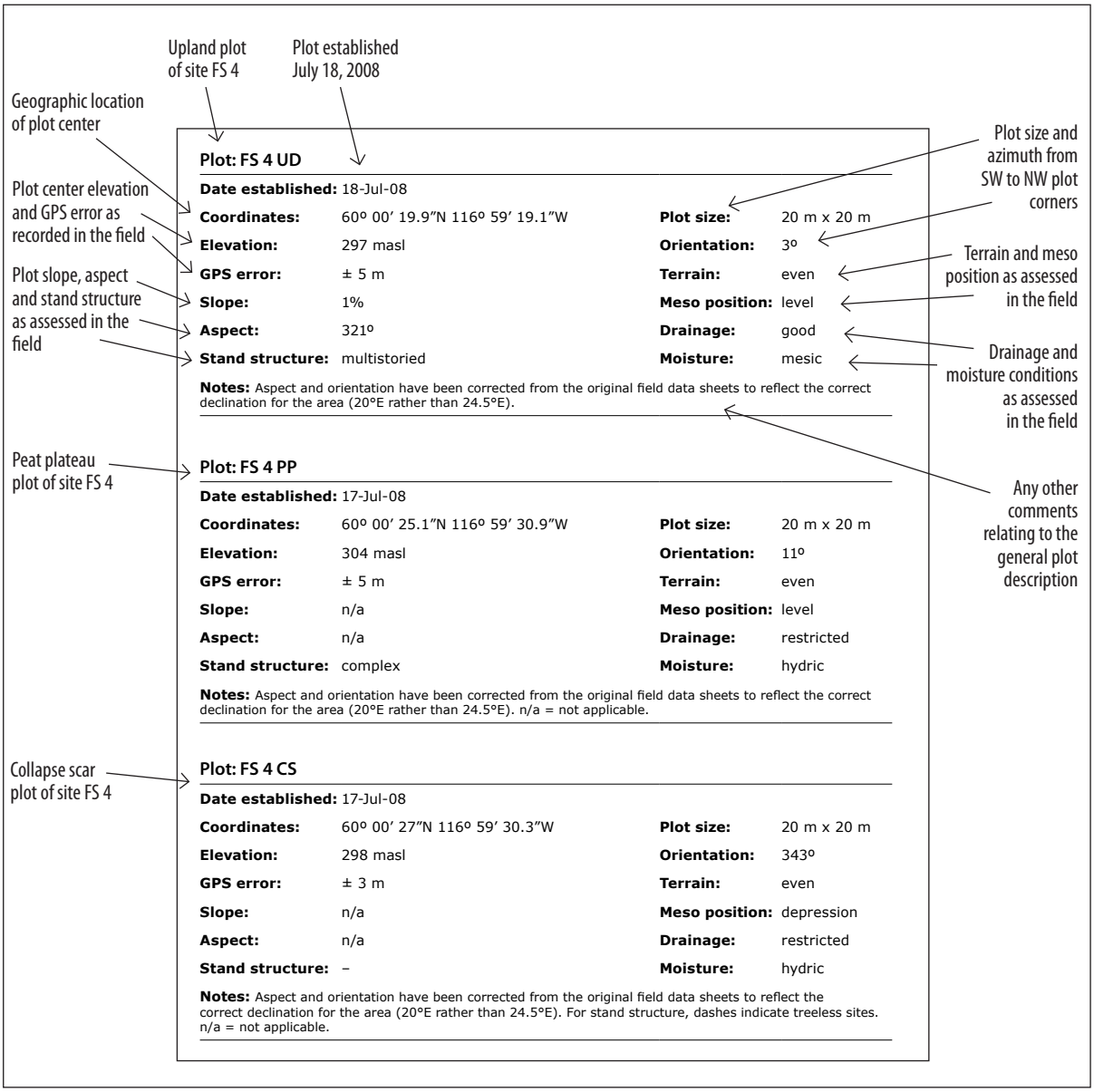


Figure 16. Example page layout of plot information.

ecoclimatic framework (Ecosystem Classification Group 2010). As defined for the Northwest Territories, ecoregions (level IV Ecoregion in Ecosystem Classification Group 2007; 2010) are subdivided from the ecoclimatic regions based on physiographic and geographic features at a scale of 1:250 000–1:1 500 000 (Ecosystem Classification Group 2010). Each site in the Northwest Territories is identified according to its location within one of eleven ecoregions:

Sitidgi Plain HS

Travaillant Upland HS

Arctic Red Plain HS

Norman Range LS

North Mackenzie Plain LS

Central Mackenzie Valley HBb

Ebbutt Upland HB

Horn Plain HB

Trout Upland HB

South Mackenzie Plain MB

Tathlina Plain MB

Plots

This field lists the names of all plots occurring within a single site. Each plot name is a three-part code, consisting of the site code (two parts) followed by a two-letter code identifying the landscape feature represented by the plot. Typically, each site will consist of three plots, each with one of the following landscape codes:

UD upland forest

PP peat plateau

CS collapse scar

Within the northern continuous permafrost zone, near Inuvik, collapse scar features have not developed on the landscape, and sites consist of only two plots, representative of the upland forest and peat plateau features. In the most southerly site, near Anzac, internal lawns (IL) represent the collapse of permafrost on the landscape and lie within bog (BG) environments that are free of permafrost.

Coordinates

Geographic latitude and longitude coordinates of all plot center points as well as navigational tie points are provided in degree, minute, second format, using the WGS 84 datum. All coordinates are shown on the inset map and were recorded in the field using a handheld Garmin GPSmap 60Cx unit. Photo tie points (TP) are commonly listed and identify where a GPS location was recorded to link on-the-ground compass navigation to a feature visible on aerial photography or satellite imagery. Point of commencement (POC) and point of termination (POT) locations were also frequently recorded, documenting the start (POC) and end (POT) points of tie lines laid out in the field.

Magnetic Declination

The compass declination in degrees from true north defines the offset used to correct for the difference between true north and magnetic north. This value was determined to the nearest half degree before site layout, using the approximate site location and date of layout in an online magnetic declination calculator produced by the Geologic Survey of Canada (Geomagnetism Canada 2017). In a few cases, last minute changes to site location resulted in incorrect compass declinations being used in the field. In such cases, the corrected declination is recorded as the magnetic declination and all site layout azimuths have been corrected to the proper declination, with the inset location map representing an accurate relationship to true north. Any post hoc adjustments such as this declination adjustment have been clearly documented in the General Comments field.

Aerial Photograph Reference

Details of aerial photographic coverage for each site are provided in a series of five fields documenting the scale of the photograph, the film roll and or flight line number, the photograph numbers, the year the photograph was taken, and the source from which the photographs were obtained. As provided, photograph scales are nominal, with exact scales dependant on the precise altitude and are usually not constant, even within a single photograph. Multiple photograph numbers are provided to indicate stereo pairs, with the single, bold number indicating the photograph used to locate the plots and other tie points in the plot XY coordinates field.

Three sources of aerial photographs, in scales ranging from 1:15 000 to 1:40 000, were used:

GNWT inventory

Government of the Northwest Territories
Forest Vegetation Management Inventory

In target areas of the Northwest Territories, as part of a series of forest management inventories aerial photographic coverage was available for many of the sites in the Dehcho (Wrigley and Fort Simpson) Region. Although not available for public purchase or use, a copy of these photographs is stored with the GNWT Forest Management Division:

Forest Resources
Department of Environment
and Natural Resources
Government of the Northwest Territories
P.O. Box 4354
Hay River, NT
X0E 1G3

Phone: 867-874-2009
Fax: 867-874-6236

To purchase contact prints, contact the National Air Photo Library (information below).

MVAPP

Mackenzie Valley Air Photo Project

As part of the Mackenzie Mapping Program for Northern Oil & Gas Development, a series of 1:30 000 aerial photographs was taken in 2004 for the Mackenzie Delta and along the Mackenzie Valley following the proposed route of the Mackenzie Gas Pipeline. Photographs can be obtained by contacting the Department of Lands:

Evangelos (Van) Kirizopoulos
Geomatics Data Coordinator
NWT Centre for Geomatics
Informatics Division
Department of Lands
Government of the Northwest Territories
2nd Floor, Gallery Building
PO Box 1320
4923 – 52nd Street
Yellowknife, NT
X1A 3Z4

Telephone: 867-767-9186 ext. 24166
Fax: 867-765-0144
Email: evangelos_kirizopoulos@gov.nt.ca
www.geomatics.gov.nt.ca

NAPL

Government of Canada,
National Air Photo Library

For sites not covered by either of the above sources, aerial photographs were obtained from the National Air Photo Library in Ottawa:

National Air Photo Library
Centre for Topographic Information
Natural Resources Canada
615 Booth Street, Room 190
Ottawa, Ontario, Canada
K1A 0E9

Telephone: 613-995-4560 or
1-800-230-6275
Fax: 613-995-4568 or 1-800-661-6277
Email: NAPL@NRCan.gc.ca

For four sites, the most recent available photography at an acceptable scale was from 1950 and, as such, can be relied on only as a general guide to local landforms, particularly in regions of active permafrost collapse (i.e., in the Fort Simpson and Wrigley Regions).

Plot XY Coordinates

Plot coordinates indicate pairs of distances (in centimeters) from the fiducial mark in the lower left-hand corner of the aerial photograph indicated by bold font in the numbers field of the aerial photograph reference. The first number of each distance pair provides the horizontal distance (x coordinate) and the second number provides the vertical distance (y coordinate). Figure 17 shows a portion of the aerial photograph for site FS 07 and provides an example of the fiducial mark and the location of individual plots and tie-in points.

Plot and tie-in point locations were determined in a number of ways, depending on the resources available for each site. In most cases, general site locations were determined beforehand and potential photo tie points were identified on Google Earth (Google Inc. 2005–2008) imagery before layout in the field. In the field, photo tie points were precisely marked on printed copies of Google Earth images and distances and azimuths from tie-in points to plots were recorded. The GPS tracking feature was also used to record access routes and plot boundaries. Field measured distances and directions from photo tie points were used to spatially orient plots, and these locations were confirmed through the overlay of recorded GPS points and tracks on Google Earth.

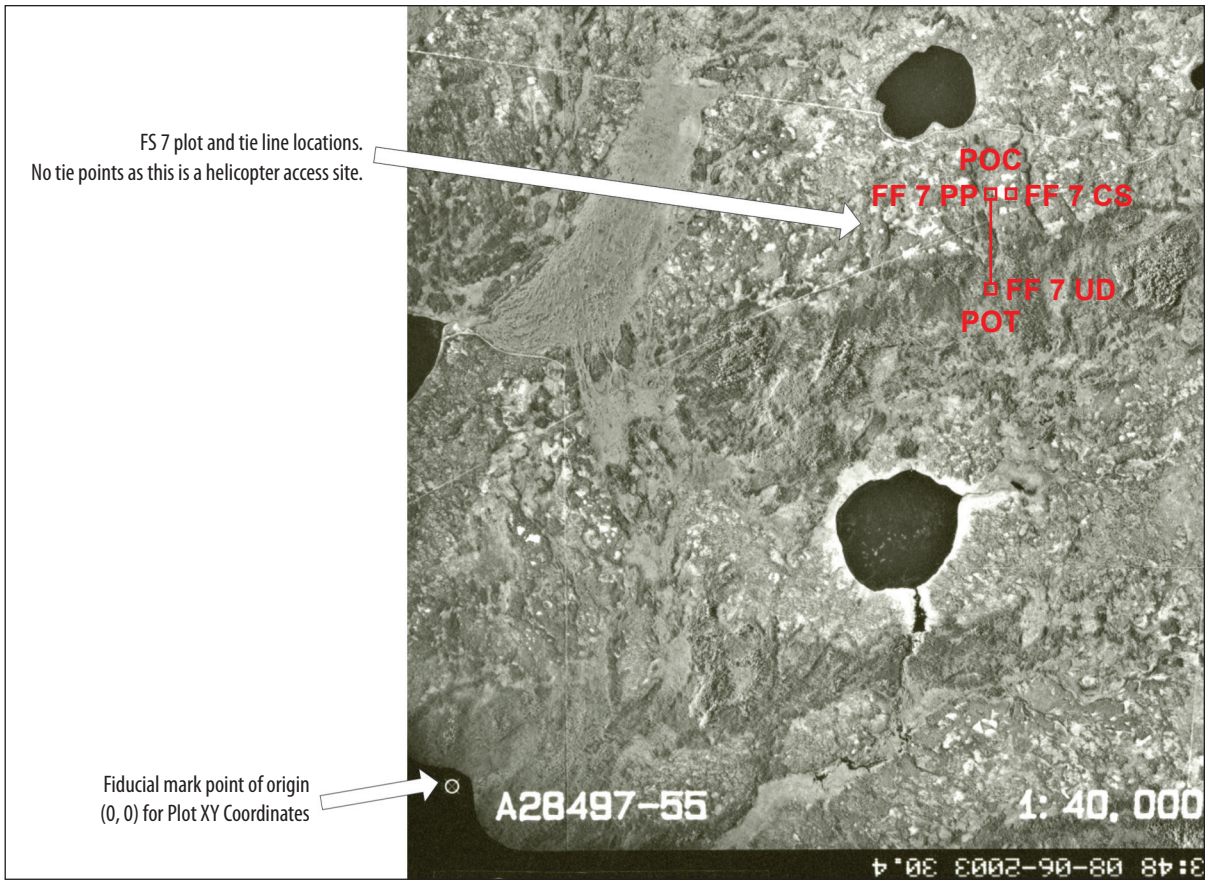


Figure 17. A portion of the aerial photograph for site FS 07, providing an example of the fiducial mark and the location of individual plots and tie-in points.

Site Map

The site location map, in the upper right-hand corner of each page, provides a sketch map of the site, which, coupled with the more specific written directions, is designed to assist with plot relocation. These maps are based on field notes (recording distances and directions) and are all tied to aerial imagery, either via photo-tie points or vegetation boundaries, through a combination of field notes and GPS overlay on Google Earth and/or aerial photographs. Sites accessible from roads are tied to photo tie points visible from the road, and helicopter access sites are depicted relative to vegetation boundaries visible from the air. Specifically, peat plateau, collapse scar, and lagg boundaries are those most commonly delimited. Lagg is a term used to define the depressed, wetter area surrounding domed peatlands, which separates the peatland proper from the mineral edge of the basin (National Wetlands Working Group 1988; Moore and Bellamy 1974). This zone has thinner peat and is subject to ground water flow and often flooding.

Directions to Site

A written description of site access is provided; it describes how plots and tie lines can be located from photo tie points along access roads or between plots at a helicopter access site. This section provides distances and compass settings for precise navigation to each plot. All azimuths are provided in degrees from true north. Declination adjustment, as provided in the magnetic declination field, is required for accurate field navigation.

General Comments

The general comments section provides miscellaneous information about the site. Typically, this field contains information documenting discrepancies between field records and those presented in this report. For example, if a declination was incorrectly set in the field, or the distance between a plot center and the tie line was not recorded, this section describes how these errors have been corrected in the report. Any unusual site information (such

as installation of boardwalks in IPY sites) would also be recorded here.

Plot Information

Plot

This field lists the plot name. As described for the site information sheet, each plot name is a three-part code, consisting of the site code (two parts) followed by a two-letter code identifying the landscape feature represented by the plot. Typically each site will consist of three plots, each with one of the following landscape codes:

- UD upland forest
- PP peat plateau
- CS collapse scar

Within the northern continuous permafrost zone near Inuvik, collapse scar features did not occur on the landscape; thus, sites consist of only two plots, representative of the upland forest and peat plateau features. In the most southerly site, internal lawns (IL) represent the collapse of permafrost on the landscape and lie within bog (BG) environments that are free of permafrost.

Date Established

This field indicates the date of plot establishment in day-month-year format. If plot data were collected on multiple dates, this is indicated in the notes section.

Coordinates

Geographic latitude and longitude coordinates of the plot center are provided in degree, minute, second format, using the WGS 84 datum. All coordinates were recorded in the field using a handheld Garmin GPSmap 60Cx unit.

Elevation

This field reports elevation, in meters above sea level (masl), as recorded for the plot center point in the field, using a handheld Garmin GPSmap 60Cx unit.

GPS Error

This field reports the error term displayed by the handheld Garmin GPSmap 60Cx unit as the plot center point location was recorded in the field. This error term only reflects a dilution of precision error caused by satellite configuration and is not indicative of other errors such as atmospheric or multipath effects (Customer Care for Garmin International personal communication via email). This term does not reflect the true error of the position but does provide a relative level of confidence.

Slope

This field reports the overall slope of the plot as measured in the field using handheld Suunto brand clinometers. Slope was measured along the direction of the steepest slope in the plot and recorded as a percentage. If the slope was determined to be negligible in the field, it was recorded as n/a (not applicable); when the slope was actually recorded to be zero, it was entered as such (0).

Aspect

The plot aspect reflects the direction the overall slope faces for each plot. Aspect was recorded in the field as an azimuth, pointing downhill in the direction of steepest slope. Not applicable (n/a) was recorded if no slope was detected for the plot.

Plot Size

Plot size is recorded as plot length x width in meters. Although a standard plot size of 20 m x 20 m was used throughout this project, occasionally it was necessary to modify the plot size to account for irregularly shaped vegetation types such as long, narrow collapse scar features.

Orientation

The orientation records the azimuth of one side of the square plot. Although plots are rarely oriented directly north–south, this azimuth records the direction from the southeasternmost plot corner, towards the northeasternmost plot corner.

Terrain

Plot terrain was classified as one of four options: even, rolling, gullied, or broken, as indicated, but not defined, in the NWT Inventory Field Sampling Manual (ENR 2006). For the purposes of this study, these terrain types are defined as follows:

Even terrain is, quite simplistically, a category for anything that does not qualify as rolling, gullied, or otherwise broken terrain. Generally, even terrain will have a level, or unidirectional sloping surface or, at the very least, no abrupt slope breaks. This category includes surface expression criteria such as level, inclined, steep, undulating, and hummocky as defined by the Canadian System of Soil Classification (Soil Classification Working Group 1998).

Rolling terrain is defined by the Canadian System of Soil Classification (Soil Classification Working Group 1998) as, "A very regular sequence of moderate slopes extending from rounded, sometimes confined concave depressions to broad, rounded convexities producing a wavelike pattern of moderate relief. Slope length is often 1.6 km or greater and gradients are greater than 5%."

Gullied terrain is defined by the Canadian System of Soil Classification (Soil Classification Working Group 1998) as a surface "modified by fluvial erosion resulting in the development of parallel and sub-parallel, steep-sided, and narrow ravines in both consolidated and unconsolidated materials."

Broken terrain is a general category including any terrain with abrupt slope breaks. Often terrain will be broken by erosional processes and gullied terrain is actually a specific type of broken terrain. This category includes surface expression criteria such as ridged or terraced, as well as terrain modified by processes resulting in such features as beveled, channeled, failing, kettled, or karst modified terrain as described by the Canadian System of Soil Classification (Soil Classification Working Group 1998).

Meso Position

Meso slope position identifies the relative location of the plot on a landscape scale. Seven categories are possible, representing landscape positions from the slope crest to level or depressional terrain at the base of a slope. Meso positions include the following categories (ENR 2006):

Crest
: Generally convex in all directions with no distinct aspect

Upper slope
: Convex surface profile with a specific aspect

Mid-slope
: Slope profile is neither concave nor convex, having a generally straight surface profile with a specific aspect

Lower slope
: An area toward the base of a hill with a generally concave surface profile and a specific aspect

Toe
: A low slope, clearly separated by an abrupt decrease in slope

Depression
: Concave in all directions

Level
: Horizontal surface profile with no significant aspect

Drainage

Plot drainage reflects the speed at which water is removed from the soil surface and absorbed into the groundwater. At the soil level, this can be considered as the frequency and duration of periods when the soil is free from saturation with water (Brady and Weil 1996). Drainage is estimated by looking at the permeability and porosity of the soil (ENR 2006), incorporating observations of soil texture, mottling, and coarse fragment content. This section is dependant on observations from the soil pits. The three drainage categories are excessive, good, and restricted. These categories are defined in accordance with the NWT Inventory Field Sampling Manual (ENR 2006):

Excessive
: Soils are normally very dry due to the rapid percolation of water through the soil solum. Usually, this condition is associated with coarse-textured soils, e.g., sands and gravels.

Good

Soils are somewhat dry to moist. Mottles may be present in the A, B, and C horizons.

Restricted

These soils are usually associated with organic soils, and drainage is poor to absent. Soils may be wet to the touch or have free water at the surface for part of the year.

Moisture

Moisture refers to the soil moisture regime, and describes the relative amount of water available annually for plant growth (ENR 2006). The nine possible categories, as described in the NWT Inventory Field Sampling Manual (ENR 2006), are listed below:

Very xeric

Water removed extremely rapidly in relation to supply

Soil remains moist for a negligible time after precipitation

Primary water source is precipitation

Texture: very coarse; abundant coarse fragments

Xeric

Water removed very rapidly in relation to supply

Soil remains moist for a brief period of time after precipitation

Primary water source is precipitation

Texture: coarse fragments

Sub-xeric

Water removed rapidly in relation to supply

Soil remains moist for short periods of time after precipitation

Primary water source is precipitation

Texture: coarse to moderately coarse fragments

Sub-mesic

Water removed readily in relation to supply

Water available for moderately short time periods after precipitation

Primary water source is precipitation

Texture: moderately coarse

Mesic

Water removed somewhat slowly in relation to supply

Soil may remain moist for a significant, but sometimes short, time period after precipitation

Primary water source is precipitation; however, it may be from limited seepage in coarser textured soils

Texture: moderate to fine; few coarse fragments

Sub-hygric

Water removed slowly enough to keep the soil wet for a significant part of the growing season

Some temporary seepage and possible mottling below 20 cm

Primary water sources are precipitation and seepage

Texture: variable, depending on seepage

Hygric

Water removed slowly enough to keep the soil wet for most of the growing season

Permanent seepage and mottling present; possibly weak gleying

Primary water source is seepage

Texture: variable, depending on seepage

Sub-hydric

Water removed slowly enough to keep the water table at or near the surface for most of the year

Permanent seepage ≤ 30 cm[1] from surface; gleyed soils

Primary water sources are seepage or permanent water table

Texture: variable, depending on seepage

[1]After consulting other sources (e.g., Beckingham and Archibald 1995), it became clear that the value in the Inventory Field Sampling Manual (ENR 2006) is erroneously reported as ≥ 30 cm. For this report, we are defining Sub-hydric as permanent seepage ≤ 30 cm. This may have led to some confusion in determining moisture regimes because the original ENR description (≥30 cm) was used for field classification.

Hydric

Water table at or above the soil surface all year

Gleyed/mottled soils

Primary water source is the water table

Texture: not defined

Stand Structure

Stand structure identifies the structural characteristics of the stand of trees in which each plot is located. Stand structure is characterized by recognizable height differences of different stories, or layers, in the stand. Stands can be described as single storied, multistoried, or complex:

Single storied stands are those with consistent tree heights and ages, such that the forest has only one main canopy layer (ENR 2006).

Multistoried stands are those where two or three canopy layers exist. Each canopy layer, or story, must be clearly observable, evenly distributed, and have a distinct height difference (ENR 2006).

Complex stands are, as the name suggests, complex, and composed of trees with varying heights. The canopy does not have distinct layers, and height variation is often due to micro-relief of the ground surface (ENR 2006).

If there were no trees in the stand greater than 1.3-m tall, stand structure was considered to be an inappropriate characterization, and not applicable; consequently, a dash (–) was recorded in this field.

Notes

The notes section provides miscellaneous information about the plot. Typically, this field contains information documenting discrepancies between field records and those presented in this report. For example, if a declination was incorrectly set in the field, or the plot orientation was not recorded, this section describes how these errors have been corrected in the report. This section will also note if the plot was established over a period of time, and not just in a single day.

INUVIK AREA SITES

Site: IN IPY

Network ID: 07 IN IPY

Permafrost zone: Continuous

Ecoclimatic region: High Subarctic

Ecoregion: Sitidgi Plain HS

Plots: IN IPY UD IN IPY PP

Coordinates:

IN IPY UD	68º 18′ 49.5″N	133º 25′ 56.2″W
IN IPY PP	68º 18′ 54.9″N	133º 25′ 56.7″W

Magnetic declination: 29ºE

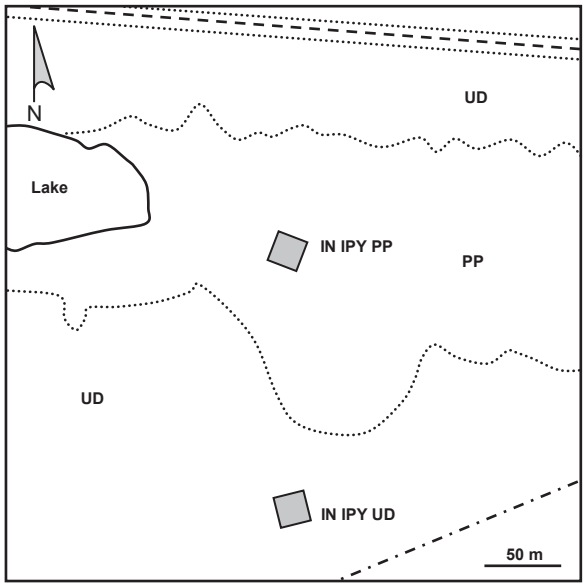
Aerial photograph reference:

Scale:	1:30 000
Roll-line coordinate:	A31873
Numbers:	**80**, 81
Year:	2004
Source:	MVAPP

Plot XY coordinates (cm):

IN IPY UD	17.6	7.1
IN IPY PP	17.5	7.6

Directions to site:
IN IPY is located south of the Dempster Highway, approximately 3.4 km east of the junction with Airport Road. IN IPY PP lies within the polygonal peat plateau area to the east of a small lake, approximately 142 m south of the southern vegetation edge of the Dempster Highway. The IN IPY UD plot center is located approximately 168 m at 178º from the IN IPY PP plot center. Short, cut trails exist from the highway to the peat plateau, and from the peat plateau to IN IPY UD.



General comments:
Plot coordinates were recorded in the field and all distances and directions to the plots have been estimated from GPS overlays on Google Earth imagery.

Boardwalks were established in all plots at this site as part of an intensive International Polar Year project to study greenhouse gas emissions and dynamics. Vegetation subplots were established in nonstandard locations, because of the boardwalks and instruments, and presence of the boardwalk could have influenced the plot ecology such that plots may not be suitable for remeasurement at future dates.

Plot: IN IPY UD

Date established:	22-Jul-07		
Coordinates:	68º 18’ 49.5”N 133º 25’ 56.2”W	**Plot size:**	20 m x 20 m
Elevation:	90 masl	**Orientation:**	346º
GPS error:	± 2 m	**Terrain:**	even
Slope:	1.5%	**Meso position:**	crest
Aspect:	81º	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hydric

Notes: Plot was established from 22-Jul-07 to 24-Jul-07 by one crew with soil and mensuration data collected at that time. Plot characteristics and vegetation were recorded later (31-Jul-07) by a second crew.

Plot: IN IPY PP

Date established:	22-Jul-07		
Coordinates:	68º 18’ 54.9”N 133º 25’ 56.7”W	**Plot size:**	20 m x 20 m
Elevation:	90 masl	**Orientation:**	21º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: Plot was established from 22-Jul-07 to 24-Jul-07 by one crew; soil and mensuration data were collected at that time. Plot characteristics and vegetation were recorded later (31-Jul-07) by a second crew. The plot is located within a polygonal peat plateau. For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: IN 01

Network ID: 07 IN 01

Permafrost zone: Continuous

Ecoclimatic region: High Subarctic

Ecoregion: Sitidgi Plain HS

Plots: IN 1 UD IN 1 PP

Coordinates:

IN 1 UD	68º 18′ 39.9″N	133º 22′ 59.4″W
IN 1 PP	68º 18′ 47.8″N	133º 23′ 00.1″W

Magnetic declination: 29ºE

Aerial photograph reference:

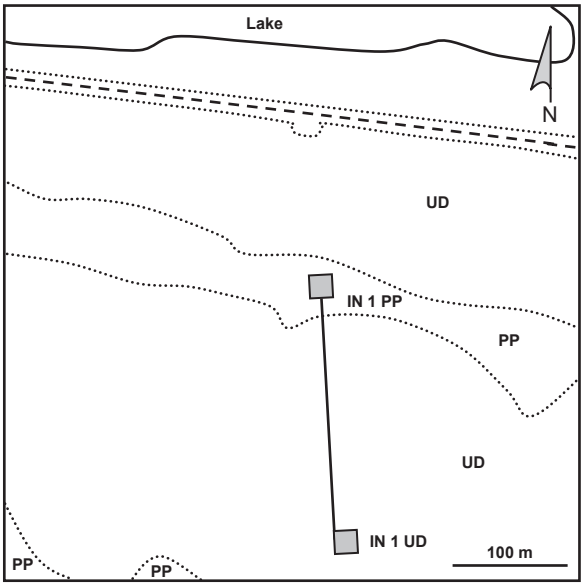
Scale:	1:30 000
Roll-line coordinate:	A31873
Numbers:	81, **82**
Year:	2004
Source:	MVAPP

Plot XY coordinates (cm):

IN 1 UD	5.9	5.9
IN 1 PP	5.9	6.6

Directions to site:
IN 1 is located on the south side of the Dempster Highway and is accessed from a small pullout on the south side of the highway, approximately 5.4 km east of the junction with Airport Road. Although no trail or tie line is established, the IN 1 PP plot is located on a polygonal peat plateau approximately 130 m at 176º downhill from the SE corner of the pullout. IN 1 UD is tied to IN 1 PP through a 210-m tie line beginning at the midpoint of the south side of IN 1 PP and ending at the northwest corner of IN 1 UD.

IN 1 UD:	210 m at 357º from NW corner to center of the south side edge of IN 1 PP
IN 1 PP:	Approximately 174 m from Highway 8 to NW corner of plot
IN 1 SubT:	14.3 m at 298º from NW corner of P1 to the E side midpoint of IN 1 PP



Plot
Lake
Vegetation boundary
Highway center line

General comments:
In 2017, this site was revisited and the location of IN 1 SubT determined as 14.3 m at 298º from the NW corner of P1 to the midpoint of the E side of IN 1 PP. In 2007, the location of IN 1 SubT was recorded without an azimuth to be 23.76 m from the SE corner of P1 to the IN 1 PP plot center. The location was re-surveyed in 2017 and is included in the Directions to site section.

Plot coordinates and tie line information were recorded in the field; other distances and directions to the plots have been estimated from GPS overlays on Google Earth imagery.

Plot: IN 1 UD

Date established:	20-Jul-07		
Coordinates:	68º 18′ 39.9″N 133º 22′ 59.4″W	**Plot size:**	20 m x 20 m
Elevation:	90 masl	**Orientation:**	357º
GPS error:	± 3 m	**Terrain:**	even
Slope:	2%	**Meso position:**	upper slope
Aspect:	334º	**Drainage:**	good
Stand structure:	complex	**Moisture:**	subhydric

Notes: Orientation is missing on original field data sheets and notes, but field diagrams and GPS appear to match tie line orientation.

Plot: IN 1 PP

Date established:	19-Jul-07		
Coordinates:	68º 18′ 47.8″N 133º 23′ 00.1″W	**Plot size:**	20 m x 20 m
Elevation:	94 masl	**Orientation:**	357º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	subhydric

Notes: The plot is located within a polygonal peat plateau. For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: IN 02

Network ID: 07 IN 02

Permafrost zone: Continuous

Ecoclimatic region: High Subarctic

Ecoregion: Travaillant Upland HS

Plots: IN 2 UD IN 2 PP

Coordinates:

IN 2 UD	68º 11′ 48.7″N	133º 23′ 26.1″W
IN 2 PP	68º 11′ 46.5″N	133º 23′ 14.1″W
POC	68° 12′ 03.3″N	133° 24′ 25.7″W

Magnetic declination: 29ºE

Aerial photograph reference:

Scale:	1:30 000
Roll-line coordinate:	A31865
Numbers:	20, **21**
Year:	2004
Source:	MVAPP

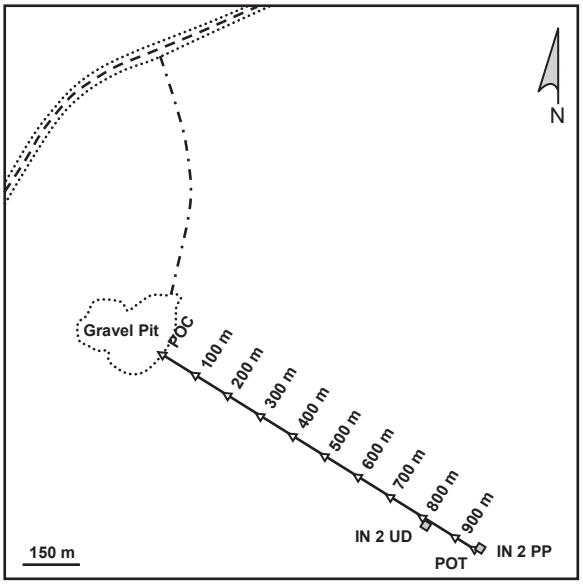
Plot XY coordinates (cm):

IN 2 UD	12.5	12.7
IN2 PP	12.0	12.9
POC	14.8	11.4
POT	12.1	12.9

Directions to site:
The POC is located along the southeast edge of a gravel pit accessed by a short (approximately 850 m) access road from the Dempster Highway. The tie line extends at an azimuth of 122º for 960 m to the POT.

IN 2 UD: NW plot corner is located at 806 m along the tie line and is tied to the 800 m station

IN 2 PP: SW corner of the plot located at the POT (960 m station)



Plot
Tie line station
Access road
Vegetation boundary
Highway center line
Tie line

General comments:
Data are missing relating IN 2 UD to the tie line. GPS records are used to tie the plot corner closest to the 800 m station to the tie line on the site map and Direction to site.

Plot: IN 2 UD

Date established:	22-Jul-07		
Coordinates:	68º 11’ 48.7”N 133º 23’ 26.1”W	**Plot size:**	20 m x 20 m
Elevation:	133 masl	**Orientation:**	32º
GPS error:	± 3 m	**Terrain:**	even
Slope:	3%	**Meso position:**	upper slope
Aspect:	250º	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: No notes for this section.

Plot: IN 2 PP

Date established:	21-Jul-07		
Coordinates:	68º 11’ 46.5”N 133º 23’ 14.1”W	**Plot size:**	20 m x 20 m
Elevation:	129 masl	**Orientation:**	32º
GPS error:	± 4 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	single-storied	**Moisture:**	subhydric

Notes: n/a = not applicable.

Site: IN 03

Network ID: 07 IN 03

Permafrost zone: Continuous

Ecoclimatic region: High Subarctic

Ecoregion: Arctic Red Plain HS

Plots: IN 3 UD IN 3 PP

Coordinates:

IN 3 UD	67º 55′ 24.7″N	133º 30′ 30.4″W
IN 3 PP	67º 55′ 25.3″N	133º 30′ 54.5″W
POC	67° 55′ 44.4″N	133° 32′ 10.7″W
IN 3 TP	67° 52′ 02.5″N	133° 39′ 01.2″W

Magnetic declination: 29ºE

Aerial photograph reference:

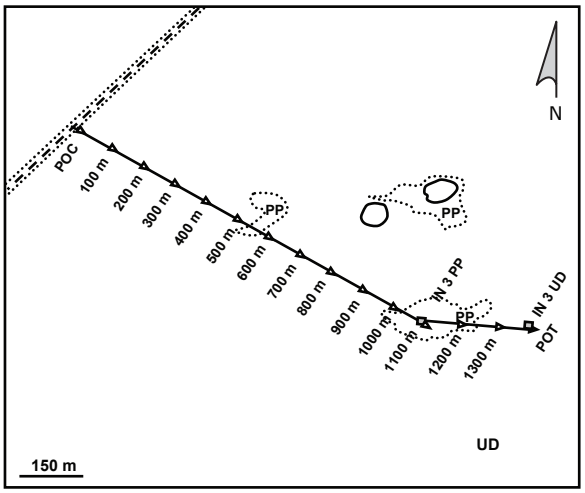
Scale:	1:30 000	1:15 000
Roll-line coordinate:	A31869	A22963
Numbers:	140, **141**	196, 197
Year:	2004	1972
Source:	MVAPP	NAPL

Plot XY coordinates (cm):

IN 3 UD	3.8	3.8
IN 3 PP	4.7	3.7
POC	7.7	2.0
POT	3.8	3.8

Directions to site:
The POC is located on the southeast vegetation edge of the Dempster Highway, approximately 8.38 km northeast of IN 3 TP, which is located at the intersection of an old gravel pit access road to the east of the highway. The tie line extends from the POC at an azimuth of 124º for 1100 m to the midpoint of the south side of IN 3 PP, then resumes from the midpoint of the east side of IN 3 PP at an azimuth of 95º for 280 m to the POT located at the SE corner of IN 3 UD.

IN 3 UD:	280 m at 95º from the midpoint of the east side of IN 3 PP to the SE corner of IN 3 UD
IN 3 PP:	1100 m from the POC to the midpoint of the south side of IN 3 PP



Plot
Tie line station
Lake
Vegetation boundary
Highway center line
Tie line

General comments:
Distance from the POC to IN 3 TP was not recorded in the field and has been estimated from the GPS data collected in the field. IN 3 TP is not shown on the inset map due to scaling issues.

Plot: IN 3 UD

Date established:	25-Jul-07		
Coordinates:	67º 55′ 24.7″N 133º 30′ 30.4″W	**Plot size:**	20 m x 20 m
Elevation:	88 masl	**Orientation:**	5º
GPS error:	± 3 m	**Terrain:**	even
Slope:	2%	**Meso position:**	mid-slope
Aspect:	252º	**Drainage:**	restricted
Stand structure:	multistoried	**Moisture:**	subhydric

Notes: This plot was established over two days (July 25 and 26, 2007).

Plot: IN 3 PP

Date established:	24-Jul-07		
Coordinates:	67º 55′ 25.3″N 133º 30′ 54.5″W	**Plot size:**	20 m x 20 m
Elevation:	84 masl	**Orientation:**	5º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	upper slope
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	subhydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: IN 04

Network ID: 07 IN 04

Permafrost zone: Continuous

Ecoclimatic region: High Subarctic

Ecoregion: Arctic Red Plain HS

Plots: IN 4 UD IN 4 PP

Coordinates:

IN 4 UD	67º 48′ 35.2″N	133º 45′ 15.4″W
IN 4 PP	67º 48′ 41.5″N	133º 45′ 43.2″W
POC	67° 48′ 36.7″N	133° 45′ 21.3″W

Magnetic declination: 29ºE

Aerial photograph reference:

Scale:	1:30 000
Roll-line coordinate:	A31869
Numbers:	149, **150**
Year:	2004
Source:	MVAPP

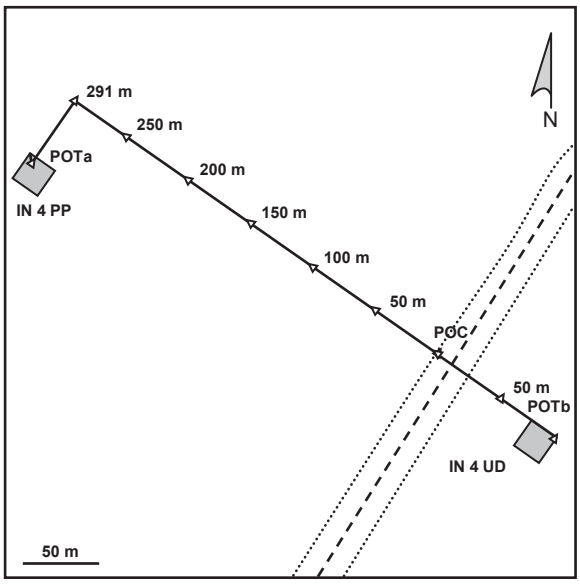
Plot XY coordinates (cm):

IN 4 UD	9.0	9.3
IN 4 PP	7.9	9.7
POC	8.8	9.5
POTa	7.9	9.7
POTb	9.0	9.3

Directions to site:
The POC is located at the northwest vegetation edge of the Dempster Highway. The tie line extends at an azimuth of 125º for 94 m to POTb and at an azimuth of 305º for 291 m, then turning to an azimuth of 215º for 50 m to POTa.

IN 4 UD: 1 m at 305º from NE corner of plot to POTb

IN 4 PP: 7.17 m at 174º to POTa from the NW corner of the plot



General comments:
No additional comments

Plot: IN 4 UD

Date established:	29-Jul-07		
Coordinates:	67º 48′ 35.2″N 133º 45′ 15.4″W	**Plot size:**	20 m x 20 m
Elevation:	86 masl	**Orientation:**	35º
GPS error:	± 4 m	**Terrain:**	even/broken
Slope:	n/a	**Meso position:**	mid-slope
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hydric

Notes: The UD designation of this plot is somewhat suspect due to a shallow active layer. Soils may be transitional to a shallow peatland. n/a = not applicable.

Plot: IN 4 PP

Date established:	28-Jul-07		
Coordinates:	67º 48′ 41.5″N 133º 45′ 43.2″W	**Plot size:**	20 m x 20 m
Elevation:	84 masl	**Orientation:**	35º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hydric

Notes: n/a = not applicable.

Site: IN 05

Network ID: 07 IN 05

Permafrost zone: Continuous

Ecoclimatic region: High Subarctic

Ecoregion: Travaillant Upland HS

Plots: IN 5 UD IN 5 PP

Coordinates:

IN 5 UD	67º 57′ 38.6″N	133º 27′ 59.7″W
IN 5 PP	67º 57′ 42.6″N	133º 28′ 27.1″W
POCb	67º 57′ 42.6″N	133º 28′ 27.1″W
POCc	67° 57′ 39.6″N	133° 27′ 56.6″W
POTc	67° 57′ 39.0″N	133° 28′ 00.4″W
IN 5 TP	67° 57′ 45.8″N	133° 28′ 29.4″W

Magnetic declination: 29ºE/28ºE

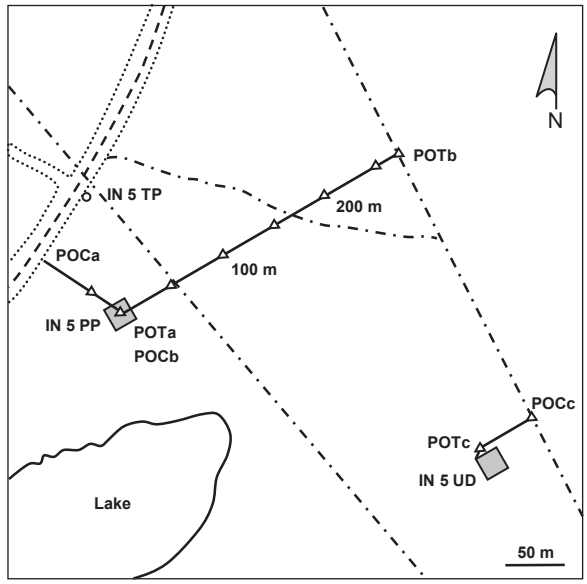
Aerial photograph reference:

Scale:	1:30 000
Roll-line coordinate:	A31875
Numbers:	15, **16**
Year:	2004
Source:	MVAPP

Plot XY coordinates (cm):

IN 5 UD	7.5	5.6
IN 5 PP	8.4	5.3
POCb	8.4	5.3
POCc	7.3	5.5
POTb	7.7	4.8
POTc	7.5	5.6
IN 5 TP	8.5	4.9

Directions to site:
POCa is located 65 m south along the Dempster Highway from IN 5 TP, which represents the southeast vegetation edge of a cut line intersection and is opposite a small pullout suitable for parking. Tie line A extends at an azimuth of 131º for 75 m from POCa to POTa (plot center of IN 5 PP). POCb is also located at the center of IN 5 PP and tie line B extends at an azimuth of 60º for 279 m to end on a cutline at POTb. POCc is located 250 m along the cutline at 156º. Tie line C extends at an azimuth of 240º for 50 m from POCc to POTc. POTc is located 11 m at 25º from the NW corner of IN 5 UD.



Plot
Tie line station
Tie point
Cut line
Vegetation boundary
Highway center line
Tie line

General comments:
IN 5 PP and tie line A were established in 2007 using a declination of 29ºE while IN 5 UD, and tie lines B and C, were established in 2008 using a declination of 28ºE.

Distances and azimuths recorded in the field do not agree with GPS points and tracks. In the directions to the site, distances and azimuths are maintained as recorded but in the inset map, a number of adjustments were made to better orient the site layout to agree with GPS data and its projection in Google Earth. For the inset map, the angle from POTb to POCc (cut line) was adjusted by -3 degrees to 153º, the angle from POCa to POCb/POTa (tie line A) was adjusted by -6 degrees to 125º, the distance between POCb and POTb (tie line B) was shortened by 8.39 m, which may, in part, correct the recorded slope distance to horizontal distance. POTa and POCb are both located at the center of IN 5 PP but plot at slightly different locations. On the inset map, 2007 and 2008 data were plotted independantly such that POTa is at IN 5 PP plot center and POCb is offset, allowing the 2008 GPS data to align with trails and cut lines when projected in Google Earth.

Plot: IN 5 UD

Date established:	07-Sep-08		
Coordinates:	67º 57′ 38.6″N 133º 27′ 59.7″W	**Plot size:**	20 m x 20 m
Elevation:	98 masl	**Orientation:**	330º
GPS error:	± 3 m	**Terrain:**	even
Slope:	4%	**Meso position:**	upper/mid-slope
Aspect:	280º	**Drainage:**	restricted
Stand structure:	single storied	**Moisture:**	subhydric

Notes: No notes for this section.

Plot: IN 5 PP

Date established:	30-Jul-07		
Coordinates:	67º 57′ 42.6″N 133º 28′ 27.1″W	**Plot size:**	20 m x 20 m
Elevation:	89 masl	**Orientation:**	60º
GPS error:	± 4 m	**Terrain:**	even
Slope:	0%	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	subhydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

NORMAN WELLS AREA SITES

Site: NW IPY

Network ID: 07 NW IPY

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: Low Subarctic

Ecoregion: North Mackenzie Plain LS

Plots: NW IPY UD NW IPY PP NW IPY CS

Coordinates:

NW IPY UD	65º 12′ 34.6″N	127º 01′ 01.2″W
NW IPY PP	65º 12′ 36.3″N	127º 00′ 52.0″W
NW IPY CS	65º 12′ 36.5″N	127º 00′ 50.1″W

Magnetic declination: 26ºE

Aerial photograph reference:

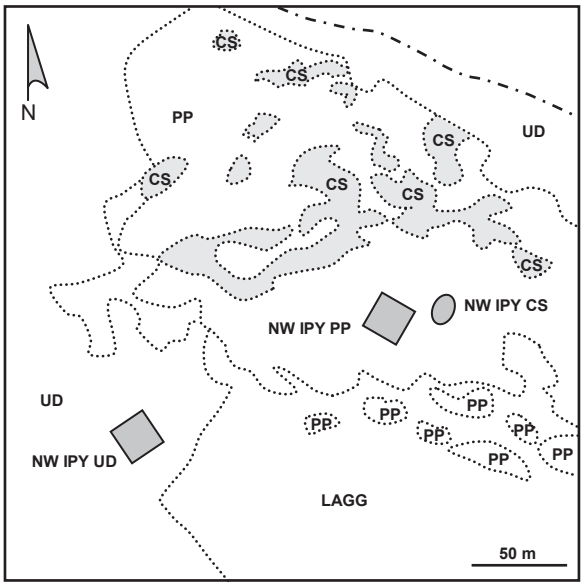
Scale:	1:15 000
Roll-line coordinate:	A27931
Numbers:	**151**, 152
Year:	1993
Source:	NAPL

Plot XY coordinates (cm):

NW IPY UD	8.8	11.6
NW IPY PP	8.3	10.8
NW IPY CS	8.0	10.7

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. No tie line was established at this site, but a cut trail does exist between NW IPY PP and NW IPY UD.

NW IPY UD:	approximately 127 m SW of NW IPY PP
NW IPY PP:	approximately 15 m W of NW IPY CS
NW IPY CS:	approximately 219 m at 82º to the junction of two cutlines (W of inset map)



Plot
Collapse scar
Irregular shaped plot
Vegetation boundary
Cut line

General comments:
Although plot coordinates were recorded in the field, all distances and directions to the plots have been estimated from GPS overlays on Google Earth imagery.

Boardwalks were established in all plots at this site as part of an intensive International Polar Year project to study greenhouse gas emissions and dynamics. Vegetation subplots were established in non-standard locations, because of the boardwalks and instruments, and presence of the boardwalk could have influenced the plot ecology such that plots may not be suitable for remeasurement at future dates.

Plot: NW IPY UD

Date established:	25-Jul-07		
Coordinates:	65º 12’ 34.6”N 127º 01’ 01.2”W	**Plot size:**	20 m x 20 m
Elevation:	130 masl	**Orientation:**	326º
GPS error:	± 3 m	**Terrain:**	even
Slope:	2%	**Meso position:**	lower slope
Aspect:	325º	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: Plot was established from 25-Jul-07 to 29-July-07 by one crew; mensuration and soils data were collected at that time. Plot characteristics and vegetation were recorded later (20-Aug-07) by a second crew.

Plot: NW IPY PP

Date established:	25-Jul-07		
Coordinates:	65º 12’ 36.3”N 127º 00’ 52.0”W	**Plot size:**	20 m x 20 m
Elevation:	131 masl	**Orientation:**	300º
GPS error:	± 4 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	subhydric

Notes: Plot was established from 25-Jul-07 to 29-July-07 by one crew; mensuration and soils data were collected at that time. Plot characteristics and vegetation were recorded later (19-Aug-07) by a second crew. For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Plot: NW IPY CS

Date established:	25-Jul-07		
Coordinates:	65º 12’ 36.5”N 127º 00’ 50.1”W	**Plot size:**	18.25 m x 8.97 m
Elevation:	130 masl	**Orientation:**	280º
GPS error:	± 4 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: Plot was established from 25-Jul-07 to 29-July-07 by one crew; mensuration and soils data were collected at that time. Plot characteristics and vegetation were recorded later (20-Aug-07) by a second crew. Due to the small and irregular plot size and shape, only six vegetation subplots were established rather than the usual eight. Plot has an irregular shape, following the collapse scar boundary. Plot dimensions reflect those of the broadwalk arms, approximately NE to SW by NW to SE. For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: NW 01

Network ID: 07 NW 01

Permafrost zone: Continuous

Ecoclimatic region: Low Subarctic

Ecoregion: North Mackenzie Plain LS

Plots: NW 1 UD NW 1 PP NW 1 CS

Coordinates:

NW 1 UD	66º 05′ 33.0″N	128º 20′ 12.5″W
NW 1 PP	66º 05′ 43.7″N	128º 20′ 39.1″W
NW 1 CS	66º 05′ 46.7″N	128º 20′ 47.2″W
POC	66º 05′ 46.7″N	128º 20′ 47.2″W
POT	66º 05′ 33.0″N	128º 20′ 12.5″W

Magnetic declination: 26ºE

Aerial photograph reference:

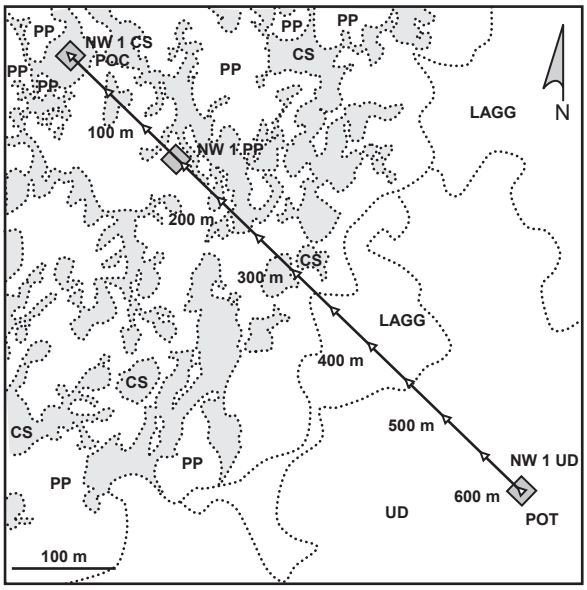
Scale:	1:30 000
Roll-line coordinate:	A31877
Numbers:	208, **209**
Year:	2004
Source:	MVAPP

Plot XY coordinates (cm):

NW 1 UD	6.4	2.0
NW 1 PP	7.9	2.5
NW 1 CS	8.3	2.7
POC	8.3	2.7
POT	6.4	2.0

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. The tie line POC is located at the center of NW 1 CS and extends at an azimuth of 134º for 600 m to the POT.

NW 1 UD:	Plot center located at POT
NW 1 PP:	Plot center located on the tie line, at a distance of 140 m from the POC
NW 1 CS:	Plot center located at POC



Plot
Tie line station
Tie point
Vegetation boundary
Tie line
Collapse scar

General comments:
NW 1 CS, NW 1 PP, and the tie line from the POC to the 350 m station were all established in 2006 as part of a scouting exercise. Plots were remeasured in 2007 using finalized methods.

Plot: NW 1 UD

Date established: 10-Aug-07

Coordinates:	66º 05’ 33.0”N 128º 20’ 12.5”W	**Plot size:**	20 m x 20 m
Elevation:	172 masl	**Orientation:**	314º
GPS error:	± 3 m	**Terrain:**	even
Slope:	1%	**Meso position:**	level
Aspect:	165º	**Drainage:**	good
Stand structure:	complex	**Moisture:**	hygric

Notes: No notes for this section.

Plot: NW 1 PP

Date established: 20-Jul-06

Coordinates:	66º 05’ 43.7”N 128º 20’ 39.1”W	**Plot size:**	20 m x 20 m
Elevation:	178 masl	**Orientation:**	314º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	toe
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: NW 1 PP was established on 20-Jul-06 as part of a scouting exercise, and all measurements were recorded on 11-Aug-07 using finalized methods. n/a = not applicable.

Plot: NW 1 CS

Date established: 20-Jul-06

Coordinates:	66º 05’ 46.7”N 128º 20’ 47.2”W	**Plot size:**	20 m x 20 m
Elevation:	176 masl	**Orientation:**	314º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: NW 1 PP was established on 20-Jul-06 as part of a scouting exercise, and all measurements were recorded on 12-Aug-07 using finalized methods. For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: NW 02

Network ID: 07 NW 02

Permafrost zone: Continuous

Ecoclimatic region: Low Subarctic

Ecoregion: Norman Range LS

Plots: NW 2 UD NW 2 PP NW 2 CS

Coordinates:

NW 2 UD	65º 52′ 20.2″N	126º 40′ 45.7″W
NW 2 PP	65º 52′ 32.0″N	126º 40′ 42.0″W
NW 2 CS	65º 52′ 30.2″N	126º 40′ 34.8″W

Magnetic declination: 26ºE

Aerial photograph reference:

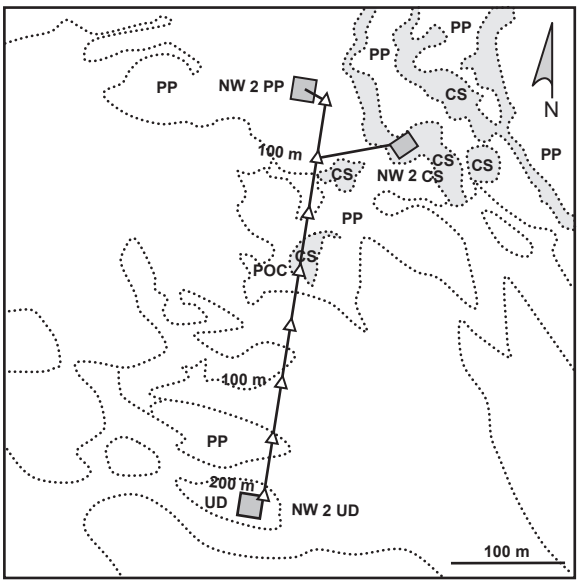
Scale:	1:40 000
Roll-line coordinate:	A12575
Numbers:	271, **272**
Year:	1950
Source:	NAPL

Plot XY coordinates (cm):

NW 2 UD	11.4	5.3
NW 2 PP	12.4	5.15
NW 2 CS	12.2	4.9
POC	11.9	5.2

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. The tie line extends northward from the POC at an azimuth of 8º for 150 m towards NW 2 PP and extends southward at an azimuth 188º for 200 m towards NW 2 UD.

NW 2 UD:	2.89 m at 290º from the NE plot corner to the 200 m station
NW 2 PP:	21 m at 120º from the plot center to the northern 150 m station
NW 2 CS:	66 m at 259º from the NW plot corner to the northern 100 m station
NW 2 SubT:	36.4 m at 269º from the E corner of P1 to the northern 100 m station



General comments:
Distances and bearings as recorded in the field are maintained in the directions to the site; however, slight changes (including adjustment of the tie line to 9º) were made on the inset map to facilitate alignment with recorded GPS data and its projection in Google Earth.

Plot: NW 2 UD

Date established:	14-Aug-07		
Coordinates:	65º 52′ 20.2″N 126º 40′ 45.7″W	**Plot size:**	20 m x 20 m
Elevation:	287 masl	**Orientation:**	8º
GPS error:	± 3 m	**Terrain:**	even
Slope:	3%	**Meso position:**	upper/mid-slope
Aspect:	153º	**Drainage:**	good
Stand structure:	complex	**Moisture:**	subhygric

Notes: No notes for this section.

Plot: NW 2 PP

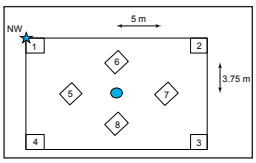
Date established:	13-Aug-07		
Coordinates:	65º 52′ 32.0″N 126º 40′ 42.0″W	**Plot size:**	20 m x 20 m
Elevation:	316 masl	**Orientation:**	8º
GPS error:	± 3 m	**Terrain:**	even
Slope:	0%	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: n/a = not applicable.

Plot: NW 2 CS

Date established:	15-Aug-07		
Coordinates:	65º 52′ 30.2″N 126º 40′ 34.8″W	**Plot size:**	15 m x 20 m
Elevation:	313 masl	**Orientation:**	145º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: Plot size was modified to fit within the boundary of the collapse scar feature. Quadrat location was also adjusted, such that central quadrats were no longer located along the diagonals, but half way between the plot center and the side midpoints. For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.



Site: NW 03

Network ID: 07 NW 03

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: Low Subarctic

Ecoregion: Norman Range LS

Plots: NW 3 UD NW 3 PP NW 3 CS

Coordinates:

NW 3 UD	65º 48′ 55.8″N	126º 44′ 52.0″W
NW 3 PP	65º 49′ 02.3″N	126º 45′ 08.8″W
NW 3 CS	65º 49′ 02.2″N	126º 45′ 05.7″W
POC	65º 49′ 02.2″N	126º 45′ 05.7″W

Magnetic declination: 26ºE

Aerial photograph reference:

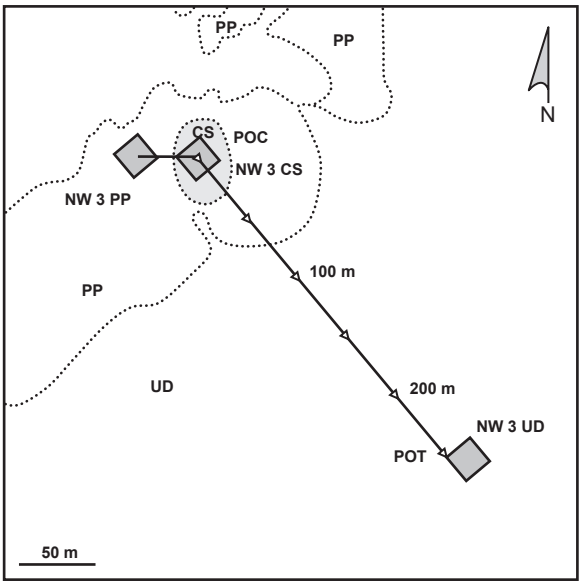
Scale:	1:40 000
Roll-line coordinate:	A12575
Numbers:	273, **274**
Year:	1950
Source:	NAPL

Plot XY coordinates (cm):

NW 3 UD	13.1	13.8
NW 3 PP	13.7	14.4
NW 3 CS	13.7	14.2
POC	13.7	14.2
POT	13.1	13.8

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. The tie line POC is located at the center of NW 3 CS and extends at an azimuth of 140º for 250 m to the POT.

NW 3 UD:	2 m at 140º from the POT (250 m station) to the NW plot corner
NW 3 PP:	40.5 m at 91º from the center of NW 3 PP to the center of NW 3 CS
NW 3 CS:	Plot center located at the tie line POC
NW 3 SubT:	32.8 m at 159º from the center of NW 3 CS to the E corner of P1



Plot
Tie line station
Collapse scar
Vegetation boundary
Tie line

General comments:
No additional comments

Plot: NW 3 UD

Date established:	16-Aug-07		
Coordinates:	65º 48′ 55.8″N 126º 44′ 52.0″W	**Plot size:**	20 m x 20 m
Elevation:	287 masl	**Orientation:**	320º
GPS error:	± 4 m	**Terrain:**	even
Slope:	1.5%	**Meso position:**	mid-slope
Aspect:	177º	**Drainage:**	good
Stand structure:	complex	**Moisture:**	mesic

Notes: No notes for this section.

Plot: NW 3 PP

Date established:	17-Aug-07		
Coordinates:	65º 49′ 2.3″N 126º 45′ 8.8″W	**Plot size:**	20 m x 20 m
Elevation:	289 masl	**Orientation:**	320º
GPS error:	± 4 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	single storied	**Moisture:**	subhydric

Notes: n/a = not applicable.

Plot: NW 3 CS

Date established:	18-Aug-07		
Coordinates:	65º 49′ 2.2″N 126º 45′ 5.7″W	**Plot size:**	20 m x 20 m
Elevation:	284 masl	**Orientation:**	320º
GPS error:	± 4 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: NW 04

Network ID: 07 NW 04

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: Low Subarctic

Ecoregion: Norman Range LS

Plots: NW 4 UD NW 4 PP NW 4 CS

Coordinates:

NW 4 UD	65º 51′ 39.6″N	127º 22′ 33.4″W
NW 4 PP	65º 51′ 10.7″N	127º 22′ 43.8″W
NW 4 CS	65º 51′ 10.0″N	127º 22′ 39.3″W
POC	65º 51′ 10.7″N	127º 22′ 43.8″W
POT	65° 51′ 40.6″N	127° 22′ 32.2″W

Magnetic declination: 25ºE

Aerial photograph reference:

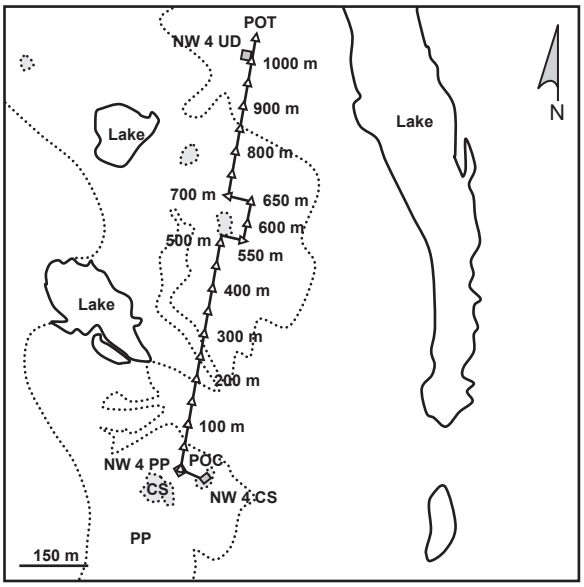
Scale:	1:40 000
Roll-line coordinate:	A12602
Numbers:	93, **94**
Year:	1950
Source:	NAPL

Plot XY coordinates (cm):

NW 4 UD	15.6	5.4
NW 4 PP	18.1	5.0
NW 4 CS	18.1	5.2
POC	18.1	5.0
POT	15.5	5.4

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. The tie line POC is located at the center of NW 4 PP and extends at an azimuth of 10º for 518 m before detouring to avoid an uncrossable collapse scar. The detour at 518 m consisted of a change in azimuth to 100º for 50 m, 10º for 82 m, 280º for 50 m, and finally back to the original line with an azimuth of 10º for 350 m more, ending at the POT after a total length of 1050 m.

NW 4 UD:	3 m at 126º from the SE plot corner to 1000 m station
NW 4 PP:	Plot center located at the POC
NW 4 CS:	60.6 m at 290º from the NW plot corner to the NW corner of NW 4 PP
NW 4 SubT:	11.3 m at 281º from the SW corner of NW 4 CS to N corner of P7



Plot
Tie line station
Lake
Vegetation boundary
Tie line
Collapse scar

General comments:
NW 4 CS and NW 4 PP were established in 2007; the tie line and NW 4 UD were established in 2008.

Plot: NW 4 UD

Date established: 03-Sep-08

Coordinates:	65º 51′ 39.6″N 127º 22′ 33.4″W	**Plot size:**	20 m x 20 m
Elevation:	238 masl	**Orientation:**	10º
GPS error:	± 2 m	**Terrain:**	even
Slope:	4%	**Meso position:**	lower slope
Aspect:	257º	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric/hydric

Notes: No notes for this section.

Plot: NW 4 PP

Date established: 21-Aug-07

Coordinates:	65º 51′ 10.7″N 127º 22′ 43.8″W	**Plot size:**	20 m x 20 m
Elevation:	244 masl	**Orientation:**	320º
GPS error:	± 4 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	mid-slope
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	subhydric

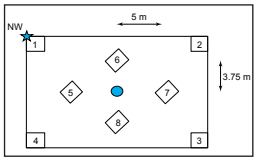
Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Plot: NW 4 CS

Date established: 22-Aug-07

Coordinates:	65º 51′ 10.0″N 127º 22′ 39.3″W	**Plot size:**	20 m x 15 m
Elevation:	238 masl	**Orientation:**	322º
GPS error:	± 4 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: Plot size was modified to fit within the boundary of the collapse scar feature. Quadrat locations were also adjusted with central quadrats located half way between the plot center and the side midpoints (instead of being located along the diagonals). For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.



WRIGLEY AREA SITES

Site: WR 01

Network ID: 07 WR 01

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Central Mackenzie Valley HBb

Plots: WR 1 UD WR 1 PP WR 1 CS

Coordinates:

WR 1 UD	63º 00′ 36.6″N	123º 12′ 37.9″W
WR 1 PP	63º 00′ 38.7″N	123º 12′ 27.5″W
WR 1 CS	63º 00′ 38.6″N	123º 12′ 32.3″W
POC	63° 00′ 32.5″N	123° 12′ 55.6″W
WR 1 TP	63° 00′ 29.4″N	123° 13′ 02.2″W

Magnetic declination: 24.5ºE

Aerial photograph reference:

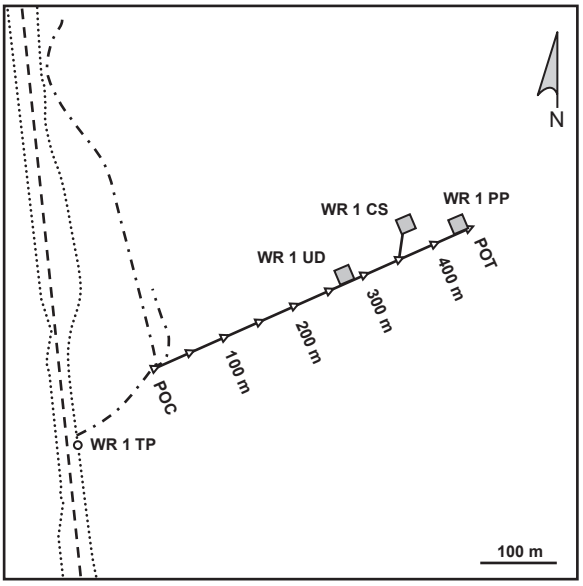
Scale:	1:30 000
Roll-line coordinate:	A31884
Numbers:	**189**
Year:	2004
Source:	MVAPP

Plot XY Coordinates (cm):

WR 1 UD	1.8	12.0
WR 1 PP	1.6	12.6
WR 1 CS	1.7	12.3
POC	2.0	11.1
POT	1.6	12.6
WR 1 TP	2.3	10.8

Directions to site:
WR 1 TP is located on the southeastern vegetation edge of a junction between a cut line and the Mackenzie Highway. The POC is located approximately 147 m along the cutline from WR 1 TP, at the juction of two cut lines. WR 1 tie line extends at an azimuth of 67º for 450 m from the POC to the POT.

WR 1 UD:	SE corner of plot located at 290 m along the tie line and is tied to the 300 m station
WR 1 PP:	SE corner of plot located at the POT
WR 1 CS:	34 m at 9º from tie line 350 m station to SW corner of plot
WR 1 SubT:	22.3 m at 310º from W Corner of P1 to WR 1 CS plot center



Plot
Tie line station
Tie point
Vegetation boundary
Highway center line
Tie line
Cut line

General comments:
Insufficient data were recorded on the original field data sheets and notes. Consequently, all azimuths and distances recorded in the "Directions to site" section were estimated in the office from GPS tracks recorded in the field. The only exception is the information tieing WR 1 SubT to WR 1 CS, which was recorded in the field.

Plot: WR 1 UD

Date established: 06-Jul-07

Coordinates:	63º 00’ 36.6”N 123º 12’ 37.9”W	**Plot size:**	20 m x 20 m
Elevation:	266 masl	**Orientation:**	337º
GPS error:	± 4 m	**Terrain:**	even
Slope:	not recorded	**Meso position:**	crest/upper slope
Aspect:	247º	**Drainage:**	even
Stand structure:	complex	**Moisture:**	submesic

Notes: No notes for this section.

Plot: WR 1 PP

Date established: 04-Jul-07

Coordinates:	63º 00’ 38.7”N 123º 12’ 27.5”W	**Plot size:**	20 m x 20 m
Elevation:	268 masl	**Orientation:**	337º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hydric

Notes: n/a = not applicable.

Plot: WR 1 CS

Date established: 05-Jul-07

Coordinates:	63º 00’ 38.6”N 123º 12’ 32.3”W	**Plot size:**	20 m x 20 m
Elevation:	266 masl	**Orientation:**	337º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: WR 02

Network ID: 08 WR 02

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Ebbutt Upland HB

Plots: WR 2 UD WR 2 PP WR 2 CS

Coordinates:

WR 2 UD	62º 14′ 37.2″N	122º 34′ 42.0″W
WR 2 PP	62º 14′ 43.7″N	122º 34′ 20.4″W
WR 2 CS	62º 14′ 44.1″N	122º 34′ 16.7″W
Cut Line TP	62° 14′ 47.5″N	122° 33′ 51.9″W

Magnetic declination: 24.5ºE

Aerial photograph reference:

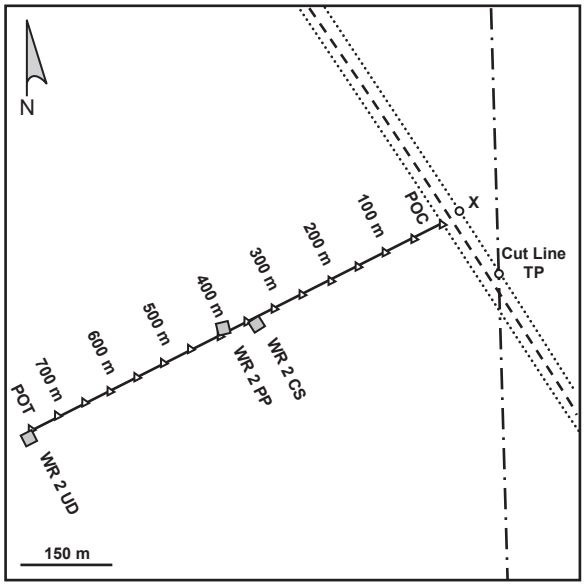
Scale:	1:20 000
Roll-line coordinate:	A28091
Numbers:	241, **242**, 243
Year:	1994
Source:	GNWT inventory

Plot XY coordinates (cm):

WR 2 UD	10.9	7.1
WR 2 PP	11.8	5.3
WR 2 CS	11.9	5.0
POC	12.6	3.7
POT	10.9	7.1
X	12.7	3.6
Cut Line TP	12.4	3.3

Directions to site:
Tie line POC is flagged on the vegetation edge, southwest of the Mackenzie Highway, and extends at an azimuth of 243º for 750 m to the POT. The POC is tied to the cutline TP, which records the intersection of a nearby cutline with the northeast vegetation edge of the Mackenzie Highway. From the Cutline TP, point X is located 100 m NW (337º) along the highway, whereupon the POC is located on the opposite side of the highway 25 m at 243º from X.

WR 2 UD:	NE corner of plot located at the tie line POT
WR 2 PP:	SW corner of plot located at the tie line 400 m station
WR 2 CS:	SW corner of plot located at the tie line 350 m station
WR 2 SubT:	83 m at 267º from W corner of P1 to NW corner of WR 2 PP



Plot
Tie line station
Tie point
Vegetation boundary
Highway center line
Tie line
Cut line

General comments:
Field notes record a change in the tie line angle from 243º to 248º at 675 m in the transition from peat plateau to upland. This is treated as a recording error and the inset site map uses 243º for the entire tie line, which agrees with GPS tracks recorded in the field.

Location of WR 2 SubT, as recorded in the Directions to Site section are taken from original field data sheets and notes, but do not make sense when considered in terms of the GPS tracks of the tie line and plot locations as recorded in the field. It is more likely that the WR 2 SubT is located 83 m at 87º from E corner of P9 to the NW corner of WR 2 PP.

Plot: WR 2 UD

Date established: 06-Jul-08

Coordinates:	62º 14′ 37.2″N 122º 34′ 42.0″W	**Plot size:**	20 m x 20.5 m
Elevation:	260 masl	**Orientation:**	333º
GPS error:	± 4 m	**Terrain:**	even
Slope:	3%	**Meso position:**	mid-slope
Aspect:	168º	**Drainage:**	good
Stand structure:	single storied	**Moisture:**	subhydric

Notes: No notes for this section.

Plot: WR 2 PP

Date established: 05-Jul-08

Coordinates:	62º 14′ 43.7″N 122º 34′ 20.4″W	**Plot size:**	20 m x 20 m
Elevation:	258 masl	**Orientation:**	75º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	toe
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hydric

Notes: n/a = not applicable.

Plot: WR 2 CS

Date established: 04-Jul-08

Coordinates:	62º 14′ 44.1″N 122º 34′ 16.7″W	**Plot size:**	20 m x 20 m
Elevation:	255 masl	**Orientation:**	58º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: WR 03

Network ID: 08 WR 03

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Ebbutt Upland HB

Plots: WR 3 UD WR 3 PP WR 3 CS

Coordinates:

WR 3 UD	62º 30′ 35.4″N	123º 00′ 58.1″W
WR 3 PP	62º 30′ 32.4″N	123º 01′ 59.7″W
WR 3 CS	62º 30′ 32.0″N	123º 02′ 09.1″W
POC	62° 30′ 35.9″N	123° 00′ 48.7″W
Creek TP	62° 30′ 34.0″N	123° 00′ 47.5″W

Magnetic declination: 24.5ºE

Aerial photograph reference:

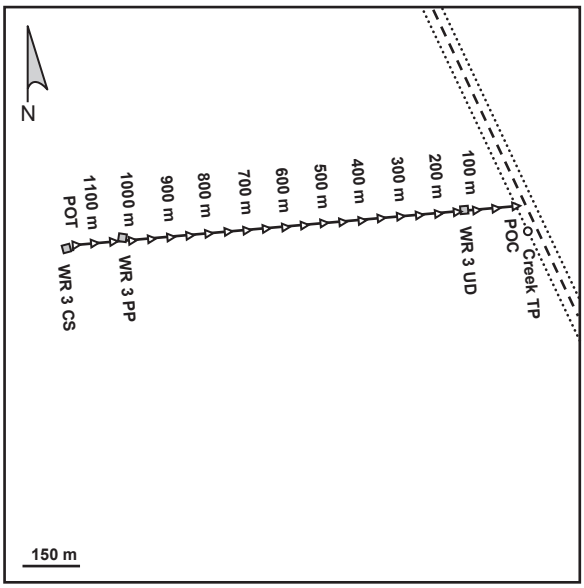
Scale:	1:20 000
Roll-line coordinate:	A28095
Numbers:	**194**, 195
Year:	1994
Source:	GNWT Inventory

Plot XY coordinates (cm):

WR 3 UD	13.5	13.3
WR 3 PP	13.9	9.0
WR 3 CS	13.9	8.4
POC	13.4	13.9
POT	13.9	8.4
Creek TP	13.7	14.1

Directions to site:
Tie line POC is flagged on the southwest vegetation edge of the Mackenzie Highway and extends at an azimuth of 265º for 1150 m to the POT. A creek crosses the highway at Creek TP, located 60 m at 160º along the highway from the POC.

WR 3 UD:	7.7 m at 112º from the tie line 150 m station to the SW plot corner
WR 3 PP:	10.38 m at 276º from the SW plot corner to the tie line 1050 m station
WR 3 CS:	10.88 m at 192º from tie line POT (1150 m station) to the SE plot corner
WR 3 SubT:	6 m at 110º from the NE plot corner of WR 3 CS to the W corner of P1



Plot
Tie line station
Tie point
Vegetation boundary
Highway center line
Tie line

General comments:
No additional comments

Plot: WR 3 UD

Date established:	09-Jul-08		
Coordinates:	62º 30’ 35.4”N 123º 00’ 58.1”W	**Plot size:**	20 m x 20 m
Elevation:	173 masl	**Orientation:**	355º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	good
Stand structure:	complex	**Moisture:**	mesic

Notes: n/a = not applicable.

Plot: WR 3 PP

Date established:	08-Jul-08		
Coordinates:	62º 30’ 32.4”N 123º 01’ 59.7”W	**Plot size:**	20 m x 20 m
Elevation:	160 masl	**Orientation:**	8º
GPS error:	± 2 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: n/a = not applicable.

Plot: WR 3 CS

Date established:	07-Jul-08		
Coordinates:	62º 30’ 32.0”N 123º 02’ 09.1”W	**Plot size:**	20 m x 20 m
Elevation:	164 masl	**Orientation:**	345º
GPS error:	± 2 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: WR 04

Network ID: 08 WR 04

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Central Mackenzie Valley HBb

Plots: WR 4 UD WR 4 PP WR 4 CS

Coordinates:

WR 4 UD	62º 59′ 37.3″N	123º 12′ 09.7″W
WR 4 PP	62º 59′ 42.2″N	123º 11′ 35.0″W
WR 4 CS	62º 59′ 41.7″N	123º 11′ 38.5″W
Culvert TP	62º 59′ 31.2″N	123º 12′ 31.9″W

Magnetic declination: 24.5ºE

Aerial photograph reference:

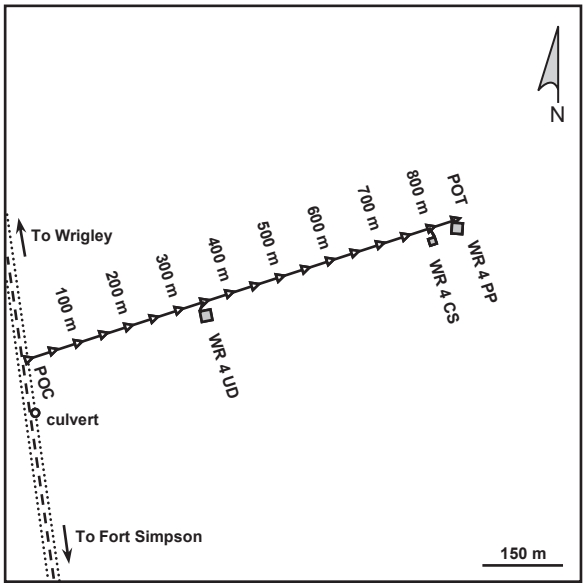
Scale:	1:30 000
Roll-line coordinate:	A31884
Numbers:	**189**
Year:	2004
Source:	MVAPP

Plot XY coordinates (cm):

WR 4 UD	7.8	11.9
WR 4 PP	7.7	13.6
WR 4 CS	7.7	13.4
POC	7.9	10.9
POT	7.7	13.6
Culvert TP	8.2	10.9

Directions to site:
The POC of WR 04 tie line is situated on the NE vegetation edge of the Mackenzie Highway, with the tie line extending at an azimuth of 72º for 850 m to the POT. The POC is located 100 m north along the highway from a culvert crossing (culvert TP).

WR 4 UD:	21 m at 25º from the NW plot corner to the 350 m tie line station
WR 4 PP:	6.6 m at 49º from the NW plot corner to the POT (850 m station)
WR 4 CS:	19 m at 330º from the NE plot corner to the 800 m tie line station
WR 4 SubT:	5.3 m at 10º from the SE plot corner of WR 4 CS to the SW corner of P1



Plot
Tie line station
Tie point
Vegetation boundary
Highway center line
Tie line

General Comments:
No additional comments

Plot: WR 4 UD

Date established: 12-Jul-08

Coordinates:	62º 59’ 37.3”N 123º 12’ 9.7”W	**Plot size:**	20 m x 20 m
Elevation:	221 masl	**Orientation:**	349º
GPS error:	± 4 m	**Terrain:**	rolling
Slope:	5%	**Meso position:**	upper slope
Aspect:	260º	**Drainage:**	good
Stand structure:	single storied	**Moisture:**	mesic

Notes: No notes for this section.

Plot: WR 4 PP

Date established: 10-Jul-08

Coordinates:	62º 59’ 42.2”N 123º 11’ 35.0”W	**Plot size:**	20 m x 20 m
Elevation:	255 masl	**Orientation:**	4º
GPS error:	± 3 m	**Terrain:**	rolling
Slope:	n/a	**Meso position:**	toe
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: This plot was established over two days: July 10 and 11, 2008. n/a = not applicable.

Plot: WR 4 CS

Date established: 11-Jul-08

Coordinates:	62º 59’ 41.7”N 123º 11’ 38.5”W	**Plot size:**	14 m x 14 m
Elevation:	252 masl	**Orientation:**	342º
GPS error:	± 3 m	**Terrain:**	rolling
Slope:	2%	**Meso position:**	depression
Aspect:	108º	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: Plot size was restricted to fit within the collapse scar feature. Quadrat locations were scaled according to the plot size and remained in the standard configuration with central quadrats located at the midpoints of the diagonals from the plot center to the corners. For stand structure, dashes indicate sites with no trees taller than 1.3 m.

Site: WR 05

Network ID: 08 WR 05

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Ebbutt Upland HB

Plots: WR 5 UD WR 5 PP WR 5 CS

Coordinates:

WR 5 UD	62º 15′ 26.6″N	122º 35′ 11.0″W
WR 5 PP	62º 15′ 12.8″N	122º 35′ 59.6″W
WR 5 CS	62º 15′ 11.1″N	122º 35′ 58.3″W
POC	62º 15′ 27.6″N	122º 35′ 05.9″W
POT	62º 15′ 12.5″N	122º 35′ 58.6″W
Creek TP	62º 15′ 28.0″N	122º 35′ 03.8″W

Magnetic declination: 23.5ºE

Aerial photograph reference:

Scale:	1:20 000
Roll-line coordinate:	A28091
Numbers:	**242**, 243
Year:	1994
Source:	GNWT inventory

Plot XY coordinates (cm):

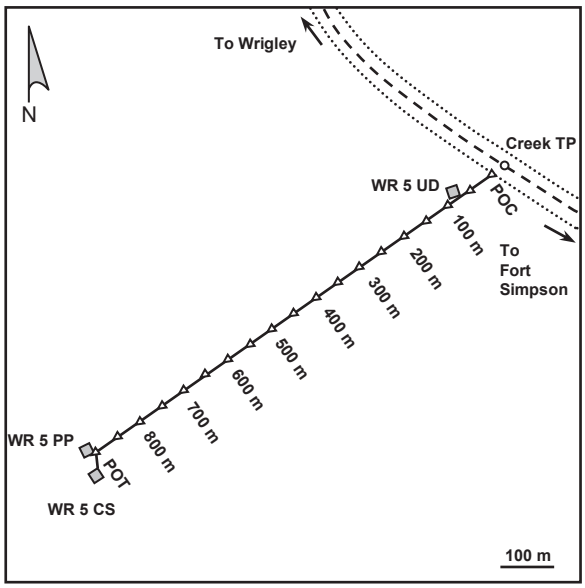
WR 5 UD	18.2	8.6
WR 5 PP	15.6	12.3
WR 5 CS	15.4	12.2
POC	18.3	8.4
POT	15.6	12.3
Creek TP	18.4	8.3

Directions to site:
The POC is located on the southwest vegetation edge of the Mackenzie Highway, and the tie line extends at an azimuth of 235º for 900 m to the POT. The POC can be tied to a small creek crossing the highway (Creek TP). Creek TP is located on the highway center line 35 m at 55º from the POC.

WR 5 UD: 21.7 m at 245º from the 50 m tie line station to the SE plot corner

WR 5 PP: 3.6 m at 222º from the POT (900 m station) to the SE plot corner

WR 5 CS: 30.9 m at 175º from the POT (900 m station) to the NE plot corner



Plot
Tie line station
Tie point
Vegetation boundary
Highway center line
Tie line

WR 5 SubT: 15.75 m at 22º from the NE corner of WR 5 CS to the W corner of P1

General comments:
GPS tracks recorded in the field indicate an azimuth of 239º for the tie line, in contrast to the 235º recorded in the field notes. Although this may indicate an error in field compassing, or a recording error, all azimuths were maintained as recorded in the field.

Plot: WR 5 UD

Date established: 07-Aug-08

Coordinates:	62º 15’ 26.6”N 122º 35’ 11.0”W	**Plot size:**	20 m x 20 m
Elevation:	263 masl	**Orientation:**	341º
GPS error:	± 4 m	**Terrain:**	even
Slope:	4%	**Meso position:**	lower slope
Aspect:	191º	**Drainage:**	good
Stand structure:	complex	**Moisture:**	mesic

Notes: No notes for this section.

Plot: WR 5 PP

Date established: 05-Aug-08

Coordinates:	62º 15’ 12.8”N 122º 35’ 59.6”W	**Plot size:**	20 m x 20 m
Elevation:	258 masl	**Orientation:**	64º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hygric

Notes: n/a = not applicable.

Plot: WR 5 CS

Date established: 06-Aug-08

Coordinates:	62º 15’ 11.1”N 122º 35’ 58.3”W	**Plot size:**	20 m x 20 m
Elevation:	258 masl	**Orientation:**	327º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: WR 06

Network ID: 08 WR 06

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Horn Plain HB

Plots: WR 6 UD WR 6 PP WR 6 CS

Coordinates:

WR 6 UD	62º 04′ 11.0″N	121º 21′ 14.3″W
WR 6 PP	62º 04′ 30.1″N	121º 21′ 20.3″W
WR 6 CS	62º 04′ 37.1″N	121º 21′ 22.1″W
POC	62° 04′ 36.8″N	121° 21′ 23.8″W
POT	62° 04′ 11.4″N	121° 21′ 14.1″W

Magnetic declination: 23ºE

Aerial photograph reference:

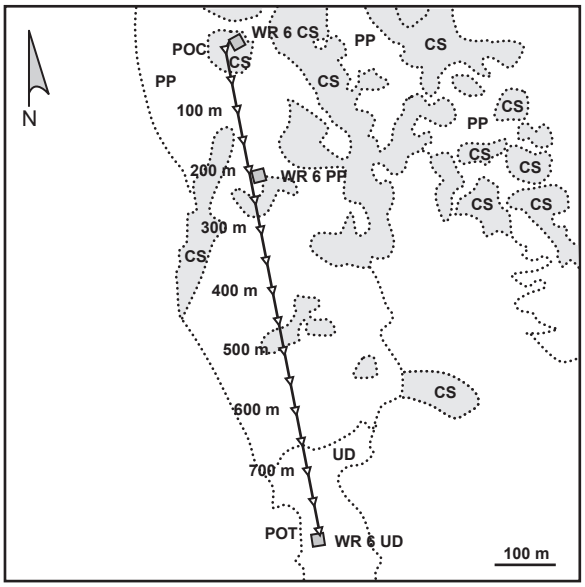
Scale:	1:20 000	
Roll-line coordinate:	G9608083-24	G9608082-23
Numbers:	**163**, 164	246, 247
Year:	1996	
Source:	GNWT inventory	

Plot XY coordinates (cm):

WR 6 UD	14.5	4.6
WR 6 PP	14.0	7.5
WR 6 CS	14.0	8.6
POC	13.8	8.6
POT	14.5	4.6

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. The tie line POC is located 1.71 m at 209º from the northwest corner of WR 6 CS and extends at an azimuth of 169º for 800 m to the POT.

WR 6 UD:	6.7 m at 116º from the POT (800 m station) to the NE plot corner
WR 6 PP:	3.8 m at 164º from the 200 m station to the NW plot corner
WR 6 CS:	1.71 m at 29º from the POC to the NW plot corner
WR 6 SubT:	5.75 m at 30º from the SE corner of WR 6 CS to the S corner of P8



Plot
Tie line station
Collapse scar
Vegetation boundary
Tie line

General comments:
No additional comments

Plot: WR 6 UD

Date established: 14-Aug-08

Coordinates:	62º 04’ 11.0”N 121º 21’ 14.3”W	**Plot size:**	20 m x 20 m
Elevation:	226 masl	**Orientation:**	349º
GPS error:	± 4 m	**Terrain:**	even
Slope:	2%	**Meso position:**	level
Aspect:	144º	**Drainage:**	good
Stand structure:	multistoried	**Moisture:**	subhygric

Notes: No notes for this section.

Plot: WR 6 PP

Date established: 15-Aug-08

Coordinates:	62º 04’ 30.1”N 121º 21’ 20.3”W	**Plot size:**	20 m x 20 m
Elevation:	231 masl	**Orientation:**	346º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hydric

Notes: n/a = not applicable.

Plot: WR 6 CS

Date established: 16-Aug-08

Coordinates:	62º 04’ 37.1”N 121º 21’ 22.1”W	**Plot size:**	20 m x 20 m
Elevation:	222 masl	**Orientation:**	331º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: WR 07

Network ID: 08 WR 07

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Horn Plain HB

Plots: WR 7 UD WR 7 PP WR 7 CS

Coordinates:

WR 7 UD	62º 01′ 39.1″N	121º 21′ 26.9″W
WR 7 PP	62º 01′ 50.9″N	121º 21′ 26.8″W
WR 7 CS	62º 01′ 54.2″N	121º 21′ 25.9″W
POC	62º 01′ 54.2″N	121º 21′ 25.9″W
POT	62° 01′ 38.1″N	121° 21′ 25.9″W

Magnetic declination: 23ºE

Aerial photograph reference:

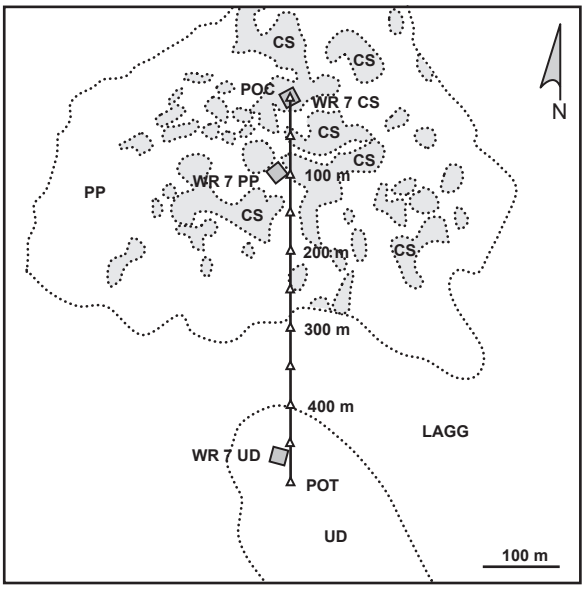
Scale:	1:30 000
Roll-line coordinate:	A24752
Numbers:	**94**, 95
Year:	1977
Source:	NAPL

Plot XY coordinates (cm):

WR 7 UD	10.6	17.5
WR 7 PP	10.6	18.8
WR 7 CS	10.6	19.1
POC	10.6	19.1
POT	10.8	17.4

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. The tie line POC is located at the center of WR 7 CS and extends at an azimuth of 180º for 500 m to the POT.

WR 7 UD:	10.14 m at 14º from NE corner of plot to tie line 450 m station
WR 7 PP:	3.88 m at 333º from tie line 100 m station to SE corner of plot
WR 7 CS:	Plot center located at the tie line POC
WR 7 SubT:	25.35 m at 57º from SE corner of WR 7 CS to W corner of P1



Plot
Tie line station
Collapse scar
Vegetation boundary
Tie line

General comments:
No additional comments

Plot: WR 7 UD

Date established:	18-Aug-08		
Coordinates:	62º 01’ 39.1”N 121º 21’ 26.9”W	**Plot size:**	20 m x 20 m
Elevation:	205 masl	**Orientation:**	15º
GPS error:	± 3 m	**Terrain:**	even
Slope:	2%	**Meso position:**	upper slope
Aspect:	308º	**Drainage:**	good
Stand structure:	single storied	**Moisture:**	mesic

Notes: No notes for this section.

Plot: WR 7 PP

Date established:	17-Aug-08		
Coordinates:	62º 01’ 50.9”N 121º 21’ 26.8”W	**Plot size:**	20 m x 20 m
Elevation:	207 masl	**Orientation:**	321º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: n/a = not applicable.

Plot: WR 7 CS

Date established:	17-Aug-08		
Coordinates:	62º 01’ 54.2”N 121º 21’ 25.9”W	**Plot size:**	20 m x 20 m
Elevation:	210 masl	**Orientation:**	330º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

FORT SIMPSON AREA SITES

Site: FS IPY

Network ID: 07 FS IPY

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: Mid-Boreal

Ecoregion: South Mackenzie Plain MB

Plots: FS IPY UD FS IPY PP FS IPY CS

Coordinates:

FS IPY UD	61º 38′ 15.1″N	121º 23′ 51.2″W
FS IPY PP	61º 38′ 13.2″N	121º 23′ 51.0″W
FS IPY CS	61º 38′ 10.4″N	121º 23′ 51.7″W
FS IPY TP	61º 38′ 17.9″N	121º 23′ 58.0″W
Culvert	61° 38′ 18.9″N	121° 23′ 37.4″W

Magnetic declination: 23ºE

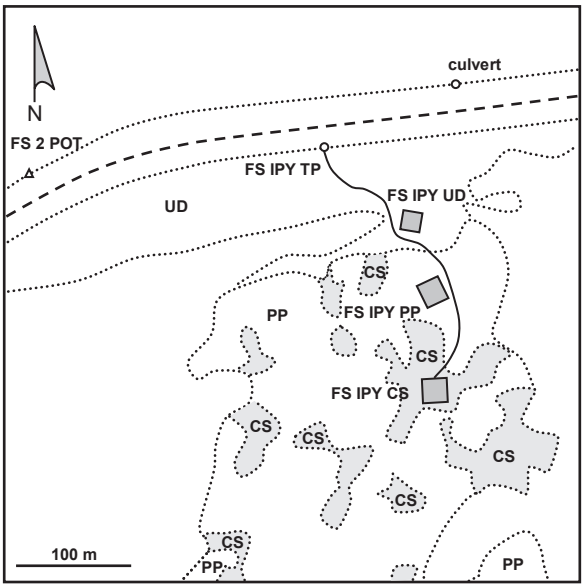
Aerial photograph reference:

Scale:	1:20 000
Roll-line coordinate:	G9608080-9
Numbers:	89, **90**
Year:	1996
Source:	GNWT inventory

Plot XY coordinates (cm):

FS IPY UD	12.4	9.0
FS IPY PP	12.4	8.7
FS IPY CS	12.4	8.3
FS IPY TP	11.9	9.3
Culvert	13.3	9.6

Directions to site:
Plots are connected by an access trail beginning at FS IPY TP on the south side of Highway 1. This tie point is located approximately 160 m east of km post 438 and 200 m east of FS 2 POT. The trail winds southeast through an upland forest that was avoided during site layout due to evidence of selective harvesting. In approximately 100 m, the trail continues into a dense *Picea mariana* stand in which the FS IPY UD is located on the north side of the access trail. Past FS IPY UD, the trail veers south into a peat plateau and FS IPY PP is located approximately 60 m past the peat plateau margin to the west of the access trail. The trail terminates at FS IPY CS, approximately 100 m past FS IPY PP.



Plot
Tie line station
Tie point
Collapse scar
Vegetation boundary
Highway center line
Cut trail linking plots

General comments:
FS IPY CS and FS IPY PP were recorded as FS 1 CS and FS 1 PP, respectively, on original field data sheets and notes.

Boardwalks were establised in all plots at this site as part of an intensive International Polar Year project to study greenhouse gas emissions and dynamics. Vegetation subplots were established in non-standard locations, because of the boardwalks and instruments, and presence of the boardwalk could have influenced the plot ecology such that plots may not be suitable for remeasurement at future dates.

Plot: FS IPY UD

Date established:	29-Jun-07		
Coordinates:	61º 38′ 15.1″N 121º 23′ 51.2″W	**Plot size:**	17 m x 17 m
Elevation:	198 masl	**Orientation:**	22º
GPS error:	not recorded	**Terrain:**	even
Slope:	4%	**Meso position:**	lower
Aspect:	5º	**Drainage:**	restricted
Stand structure:	single storied	**Moisture:**	hygric

Notes: Plot was established from 29-Jun-07 to 04-Jul-07 by one crew; plot characteristics and vegetation were recorded later (22-Sept-07) by a second crew. Mensuration data and soil samples were collected on 07-Aug-08 and 06-Aug-08, respectively, by a third crew.

Plot: FS IPY PP

Date established:	29-Jun-07		
Coordinates:	61º 38′ 13.2″N 121º 23′ 51.0″W	**Plot size:**	20 m x 20 m
Elevation:	194 masl	**Orientation:**	155º
GPS error:	± 4 m	**Terrain:**	even
Slope:	2%	**Meso position:**	level
Aspect:	107º	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: Plot was established from 29-Jun-07 to 04-Jul-07 by one crew; plot characteristics and vegetation were recorded later (22-Sept-07) by a second crew. Mensuration data and soil samples were collected on 07-Aug-08 and 06-Aug-08, respectively, by a third crew.

Plot: FS IPY CS

Date established:	29-Jun-07		
Coordinates:	61º 38′ 10.4″N 121º 23′ 51.7″W	**Plot size:**	20 m x 20 m
Elevation:	190 masl	**Orientation:**	356º
GPS error:	± 3 m	**Terrain:**	even
Slope:	1.5%	**Meso position:**	depression
Aspect:	301º	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: Plot was established from 29-Jun-07 to 04-Jul-07 by one crew; plot characteristics and vegetation were recorded later (22-Sept-07) by a second crew. Mensuration data and soil samples were collected on 07-Aug-08 and 06-Aug-08, respectively, by a third crew. For stand structure, dashes indicate sites with no trees taller than 1.3 m.

Site: FS 02

Network ID: 07 FS 02

Permafrost zone: Extensive Discontinuous

Ecoclimatic region: Mid-Boreal

Ecoregion: South Mackenzie Plain MB

Plots: FS 2 UD FS 2 PP FS 2 CS

Coordinates:

FS 2 UD	61º 38′ 22.3″N	121º 24′ 20.2″W
FS 2 PP	61º 38′ 29.1″N	121º 24′ 23.3″W
FS 2 CS	61º 38′ 32.1″N	121º 24′ 24.2″W
POC	61º 38′ 32.2″N	121º 24′ 25.2″W
POT	61º 38′ 16.4″N	121º 24′ 15.5″W
Culvert	61° 38′ 18.9″N	121° 23′ 37.4″W

Magnetic declination: 23ºE

Aerial photograph reference:

Scale:	1:20 000
Roll-line coordinate:	G9608080-9
Numbers:	89, **90**
Year:	1996
Source:	GNWT inventory

Plot XY coordinates (cm):

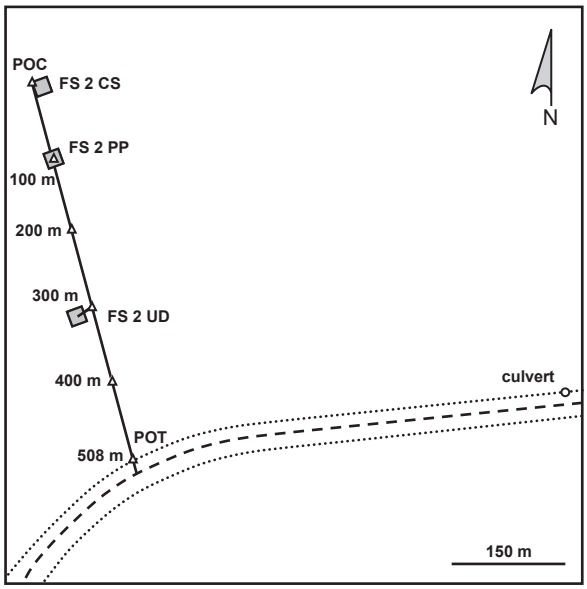
FS 2 UD	10.1	9.9
FS 2 PP	10.0	11.0
FS 2 CS	9.8	11.5
POC	9.8	11.5
POT	10.4	9.0
Culvert	13.3	9.6

Directions to site:
Tie line begins (POC) at the northwest corner of FS 2 CS and extends at an azimuth of 165º for 525 m to the center line of Highway 1. The POT is flagged at the vegetation edge, to the NW of Highway 1 at a distance of 508 m from the POC. The POT can be tied to kilometer post number 438, located 100 m east along the highway from the tie line and a culvert, 512 m east along the highway from the tie line.

FS 2 UD: 22.21 m at 236º from tie line station 300 m to plot center

FS 2 PP: Plot center located at the tie line 100 m station

FS 2 CS: Tie line POC located at NW corner of plot



Plot
Tie line station
Tie point
Vegetation boundary
Highway center line
Tie line

FS 2 SubT: 19.3 m at 359º from W corner of P5 to FS 2 CS plot center

General comments:
No additional comments

Plot: FS 2 UD

Date established: 01-Jul-07

Coordinates:	61º 38’ 22.3”N 121º 24’ 20.2”W	**Plot size:**	20 m x 20 m
Elevation:	190 masl	**Orientation:**	340º
GPS error:	± 5 m	**Terrain:**	even
Slope:	5.5%	**Meso position:**	lower slope
Aspect:	5º	**Drainage:**	restricted
Stand structure:	single storied	**Moisture:**	subhydric

Notes: No notes for this section.

Plot: FS 2 PP

Date established: 28-Jun-07

Coordinates:	61º 38’ 29.1”N 121º 24’ 23.3”W	**Plot size:**	20 m x 20 m
Elevation:	185 masl	**Orientation:**	340º
GPS error:	± 4 m	**Terrain:**	even
Slope:	2%	**Meso position:**	depression
Aspect:	140º	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: No notes for this section.

Plot: FS 2 CS

Date established: 24-Jun-07

Coordinates:	61º 38’ 32.1”N 121º 24’ 24.2”W	**Plot size:**	20 m x 20 m
Elevation:	187 masl	**Orientation:**	340º
GPS error:	± 3 m	**Terrain:**	even
Slope:	0%	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	single storied	**Moisture:**	hydric

Notes: n/a = not applicable.

Site: FS 03

Network ID: 08 FS 03

Permafrost zone: Sporadic Discontinuous

Ecoclimatic region: Mid-Boreal

Ecoregion: Tathlina Plain MB

Plots: FS 3 UD FS 3 PP FS 3 CS

Coordinates:

FS 3 UD	60º 56′ 28.4″N	117º 22′ 59.3″W
FS 3 PP	60º 56′ 26.0″N	117º 21′ 52.7″W
FS 3 CS	60º 56′ 26.2″N	117º 21′ 48.8″W
POC	60° 56′ 28.6″N	117° 23′ 05.9″W

Magnetic declination: 20.5ºE

Aerial photograph reference:

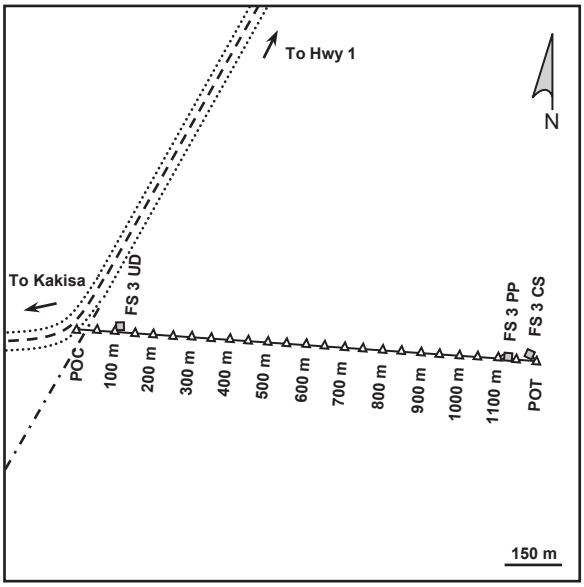
Scale:	1:20 000
Roll-line coordinate:	A28087
Numbers:	**41**, 42
Year:	1994
Source:	GNWT Inventory

Plot XY coordinates (cm):

FS 3 UD	15.3	14.7
FS 3 PP	15.4	19.8
FS 3 CS	15.4	20.2
POC	15.3	14.3
POT	15.4	20.3

Directions to site:
Tie line POC is flagged to the southeast of Kakisa road, at the vegetation edge between the cut line and the road. The tie line extends from the POC at an azimuth of 90º for 1200 m to the POT.

FS 3 UD:	8.8 m at 222º from SW corner of plot to tie line station 100 m.
FS 3 PP:	22 m at 236º from NW corner of plot to tie line station 1100 m.
FS 3 CS:	15.3 m at 289º from the POT to SE corner of plot.
FS 3 SubT:	15.1 m at 359º from N corner of P9 to SW corner of FS 3 CS.



Plot
Tie line station
Cut line
Vegetation boundary
Highway center line
Tie line

General comments:
Azimuths were recorded in the field with an incorrect declination (24.5ºE) and have been corrected in this report. On the site location inset map only, uncorrected azimuths have been preserved because they represent a better fit to the GPS data and its overlay on Google Earth imagery.

Plot: FS 3 UD

Date established:	15-Jul-08		
Coordinates:	60º 56’ 28.4”N 117º 22’ 59.3”W	**Plot size:**	20 m x 20 m
Elevation:	239 masl	**Orientation:**	355º
GPS error:	± 4 m	**Terrain:**	even
Slope:	2%	**Meso position:**	toe
Aspect:	123º	**Drainage:**	good
Stand structure:	complex	**Moisture:**	subhygric

Notes: Aspect and orientation have been corrected from the original field data sheets to reflect the correct declination for the area (20.5°E rather than 24.5°E).

Plot: FS 3 PP

Date established:	14-Jul-08		
Coordinates:	60º 56’ 26”N 117º 21’ 52.7”W	**Plot size:**	20 m x 20 m
Elevation:	232 masl	**Orientation:**	1º
GPS error:	± 4 m	**Terrain:**	even
Slope:	1%	**Meso position:**	level
Aspect:	85º	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: Aspect and orientation have been corrected from the original field data sheets to reflect the correct declination for the area (20.5°E rather than 24.5°E).

Plot: FS 3 CS

Date established:	13-Jul-08		
Coordinates:	60º 56’ 26.2”N 117º 21’ 48.8”W	**Plot size:**	20 m x 20 m
Elevation:	236 masl	**Orientation:**	19º
GPS error:	± 3 m	**Terrain:**	even
Slope:	1%	**Meso position:**	depression
Aspect:	274º	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: Aspect and orientation have been corrected from the original field data sheets to reflect the correct declination for the area (20.5°E rather than 24.5°E). For stand structure, dashes indicate sites with no trees taller than 1.3 m.

Site: FS 04

Network ID: 08 FS 04

Permafrost zone: Sporadic Discontinuous

Ecoclimatic region: Mid-Boreal

Ecoregion: Tathlina Plain MB

Plots: FS 4 UD FS 4 PP FS 4 CS

Coordinates:

FS 4 UD	60º 00′ 19.9″N	116º 59′ 19.1″W
FS 4 PP	60º 00′ 25.1″N	116º 59′ 30.9″W
FS 4 CS	60º 00′ 27.0″N	116º 59′ 30.3″W
Rail x Creek TP	60° 00′ 13.9″N	116° 58′ 51.6″W

Magnetic declination: 20ºE

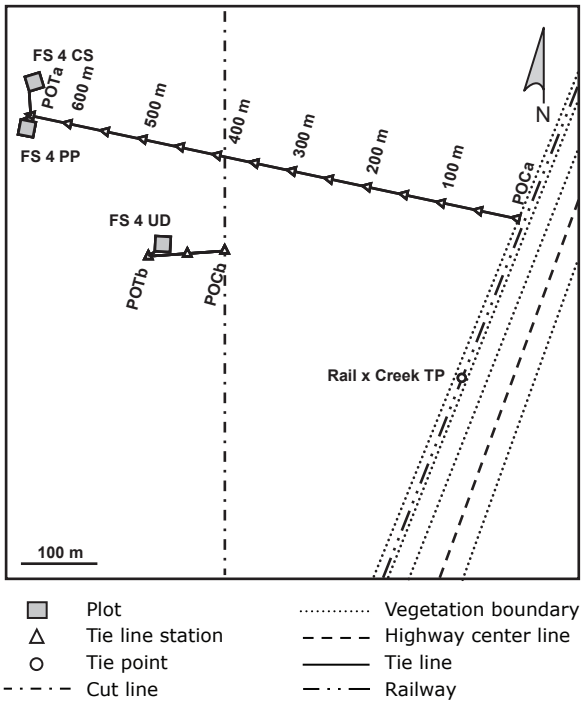
Aerial photograph reference:

Scale:	1:20 000
Roll-line coordinate:	G9509058-40
Numbers:	133, **134**
Year:	1995
Source:	GNWT Inventory

Plot XY coordinates (cm):

FS 4 UD	5.1	16.8
FS 4 PP	5.3	18.0
FS 4 CS	5.7	18.1
POCa	6.5	14.6
POCb	5.3	16.4
POTa	5.5	18.0
POTb	5.0	16.8
Rail x Creek TP	5.4	14.4

Directions to site:
Two tie lines were established for FS 04, with FS 4 PP and FS 4 CS linked to tie line A (POCa and POTa) and FS 4 UD on tie line B (POCb and POTb). POCa is flagged on the west vegetation edge of railway tracks located to the west of the Mackenzie Highway. POCa is located 230 m north, along the railway from the Rail x Creek TP where a small creek flows through a culvert, underneath the rail line. Tie line A extends at an azimuth of 285º for 650 m to POTa and is tied in to tie line B via a cut line intersecting Tie Line A at 389 m from POCa. POCb is located 140 m at 182º (along the cut line) from that intersection with the tie line A. Tie line B extends from POCb at an azimuth of 266º for 100 m to POTb.



FS 4 UD:	11.1 m at 239º from SW corner of plot to POTb
FS 4 PP:	13.4 m at 249º from POTa to NW corner of plot
FS 4 CS:	32.5 m at 357º from POTa to SW corner of plot
FS 4 SubT:	9.62 m at 207º from S corner of P1 to SE corner of FS 4 CS

General comments:
Azimuths were recorded in the field with incorrect declination (24.5ºE) and have been corrected in this report. The thick bush along tie line A likely resulted in compass errors and errors in distance measurement, possibly as much as 3 degrees and 80 m, respectively, according to GPS measurements.

Plot: FS 4 UD

Date established: 18-Jul-08

Coordinates:	60º 00’ 19.9”N 116º 59’ 19.1”W	**Plot size:**	20 m x 20 m
Elevation:	297 masl	**Orientation:**	3º
GPS error:	± 5 m	**Terrain:**	even
Slope:	1%	**Meso position:**	level
Aspect:	321º	**Drainage:**	good
Stand structure:	multistoried	**Moisture:**	mesic

Notes: Aspect and orientation have been corrected from the original field data sheets to reflect the correct declination for the area (20°E rather than 24.5°E).

Plot: FS 4 PP

Date established: 17-Jul-08

Coordinates:	60º 00’ 25.1”N 116º 59’ 30.9”W	**Plot size:**	20 m x 20 m
Elevation:	304 masl	**Orientation:**	11º
GPS error:	± 5 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hydric

Notes: Aspect and orientation have been corrected from the original field data sheets to reflect the correct declination for the area (20°E rather than 24.5°E). n/a = not applicable.

Plot: FS 4 CS

Date established: 17-Jul-08

Coordinates:	60º 00’ 27”N 116º 59’ 30.3”W	**Plot size:**	20 m x 20 m
Elevation:	298 masl	**Orientation:**	343º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: Aspect and orientation have been corrected from the original field data sheets to reflect the correct declination for the area (20°E rather than 24.5°E). For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: FS 05

Network ID: 08 FS 05

Permafrost zone: Sporadic Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Trout Upland HB

Plots: FS 5 UD FS 5 PP FS 5 CS

Coordinates:

FS 5 UD	60º 21′ 22.4″N	120º 28′ 22.1″W
FS 5 PP	60º 20′ 54.3″N	120º 28′ 14.6″W
FS 5 CS	60º 21′ 03.5″N	120º 28′ 24.5″W
POC	60º 20′ 54.1″N	120º 28′ 15.5″W

Magnetic declination: 22.5ºE

Aerial photograph reference:

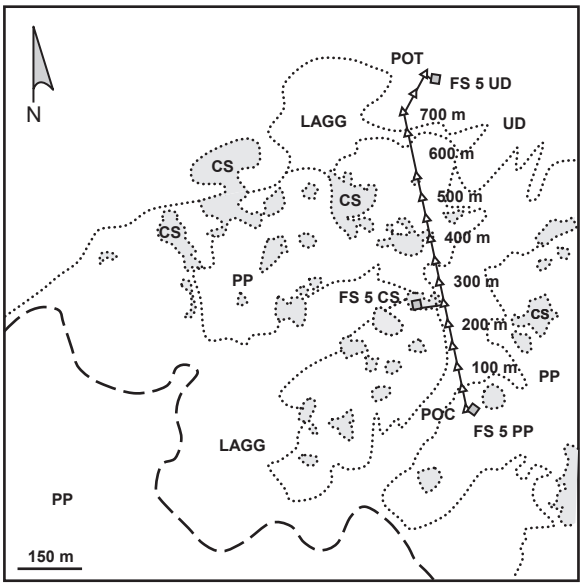
Scale:	1:40 000
Roll-line coordinate:	A12544
Numbers:	77, **78**
Year:	1950
Source:	NAPL

Plot XY Coordinates (cm):

FS 5 UD	12.6	8.4
FS 5 PP	12.3	10.6
FS 5 CS	12.7	9.9
POC	12.3	10.6
POT	12.8	8.3

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. The tie line POC is located at the southwest corner of FS 5 PP and extends at an azimuth of 348º for 700 m, then changes to an azimuth of 29º for 100 m to the POT.

FS 5 UD:	22.1 m at 143º from tie line POT (800 m station) to SW corner of plot
FS 5 PP:	SW corner of plot located at tie line POC
FS 5 CS:	53 m at 263º from tie line 250 m station to SE corner of plot
FS 5 SubT:	14.27 m at 56º from NE corner of FS 5 CS to W corner of P1



Plot
Tie line station
Creek
Tie line
Collapse scar

General comments:
The tie line was recorded in the field to be 1000 m long, but after confirming agreement with GPS data, the tie line on this map is shortened to 800 m. FS 5 UD is tied to the POT, which has been corrected from 1000 m to 800 m.

Plot: FS 5 UD

Date established: 02-Aug-08

Coordinates:	60º 21’ 22.4”N 120º 28’ 22.1”W	**Plot size:**	20 m x 20 m
Elevation:	593 masl	**Orientation:**	9º
GPS error:	± 3 m	**Terrain:**	even
Slope:	4%	**Meso position:**	lower slope
Aspect:	82º	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: No notes for this section.

Plot: FS 5 PP

Date established: 01-Aug-08

Coordinates:	60º 20’ 54.3”N 120º 28’ 14.6”W	**Plot size:**	20 m x 20 m
Elevation:	584 masl	**Orientation:**	34º
GPS error:	± 3 m	**Terrain:**	even
Slope:	2%	**Meso position:**	level
Aspect:	284º	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhygric

Notes: No notes for this section.

Plot: FS 5 CS

Date established: 03-Aug-08

Coordinates:	60º 21’ 3.5”N 120º 28’ 24.5”W	**Plot size:**	20 m x 20 m
Elevation:	586 masl	**Orientation:**	350º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: FS 06

Network ID: 08 FS 06

Permafrost zone: Sporadic Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Trout Upland HB

Plots: FS 6 UD FS 6 PP FS 6 CS

Coordinates:

FS 6 UD	60º 37′ 05.2″N	121º 53′ 57.7″W
FS 6 PP	60º 37′ 22.0″N	121º 54′ 02.1″W
FS 6 CS	60º 37′ 21.0″N	121º 54′ 04.9″W
POC	60º 37′ 21.6″N	121º 54′ 02.0″W
POT	60º 37′ 05.8″N	121º 53′ 57.5″W

Magnetic declination: 22.5ºE

Aerial photograph reference:

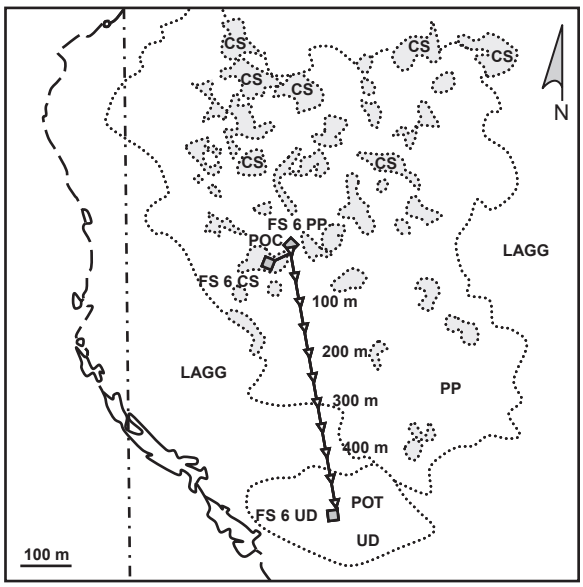
Scale:	1:25 000
Roll-line coordinate:	A24112
Numbers:	**29**, 30
Year:	1975
Source:	NAPL

Plot XY coordinates (cm):

FS 6 UD	5.6	-4.3
FS 6 PP	5.2	-2.1
FS 6 CS	5.0	-2.25
POC	5.2	-2.1
POT	5.6	-4.3

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. The tie line POC is located at the southwest corner of FS 6 PP and extends at an azimuth of 170º for 500 m to the POT.

FS 6 UD:	10.5 m at 163º from tie line POT (500 m station) to NE corner of plot
FS 6 PP:	SW corner of the plot is located at the tie line POC
FS 6 CS:	35.5 m at 246º from tie line POC to NE corner of plot
FS 6 SubT:	28.5 m at 181º from S corner of P6 to tie line POC station



Plot
Tie line station
Collapse scar
Tie line
Cut line
Creek

General comments:
Plot XY coordinates are measured from the fiducial mark in the center of the air photo.

Plot: FS 6 UD

Date established:	09-Aug-08		
Coordinates:	60º 37’ 5.2”N 121º 53’ 57.7”W	**Plot size:**	20 m x 20 m
Elevation:	648 masl	**Orientation:**	353º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	good
Stand structure:	multistoried	**Moisture:**	mesic

Notes: Measurement of plot orientation is missing from the original field datasheets and notes. Plot orientation recorded here was measured in the office using the GPS track of the plot boundary recorded in the field. n/a = not applicable.

Plot: FS 6 PP

Date established:	08-Aug-08		
Coordinates:	60º 37’ 22.0”N 121º 54’ 2.1”W	**Plot size:**	20 m x 20 m
Elevation:	655 masl	**Orientation:**	314º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: n/a = not applicable.

Plot: FS 6 CS

Date established:	10-Aug-08		
Coordinates:	60º 37’ 21.0”N 121º 54’ 4.9”W	**Plot size:**	20 m x 20 m
Elevation:	655 masl	**Orientation:**	22º
GPS error:	± 2 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

Site: FS 07

Network ID: 08 FS 07

Permafrost zone: Sporadic Discontinuous

Ecoclimatic region: High Boreal

Ecoregion: Trout Upland HB

Plots: FS 7 UD FS 7 PP FS 7 CS

Coordinates:

FS 7 UD	61º 06′ 28.8″N	120º 58′ 24.3″W
FS 7 PP	61º 06′ 11.7″N	120º 58′ 24.2″W
FS 7 CS	61º 06′ 12.0″N	120º 58′ 29.1″W
POC	61° 06′ 12.0″N	120° 58′ 25.2″W

Magnetic declination: 22.5ºE

Aerial photograph reference:

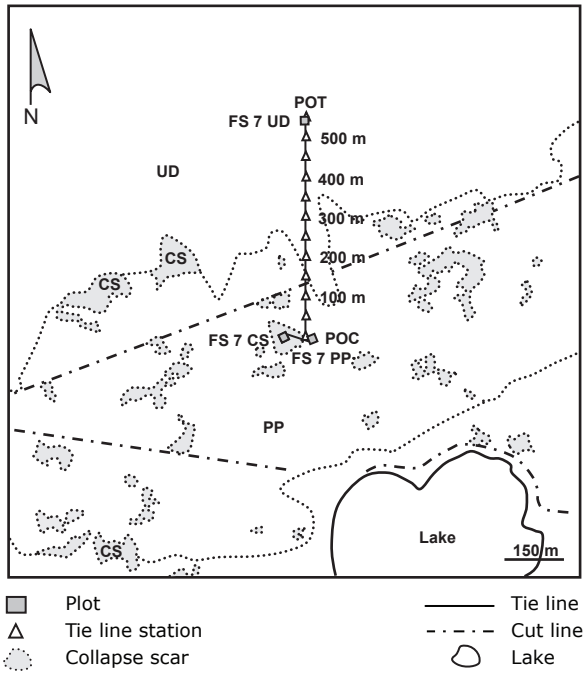
Scale:	1:40 000
Roll-line coordinate:	A28497
Numbers:	54, **55**
Year:	2003
Source:	GNWT inventory

Plot XY coordinates (cm):

FS 7 UD	7.0	6.4
FS 7 PP	7.0	7.7
FS 7 CS	7.2	7.7
POC	7.0	7.7
POT	7.0	6.4

Directions to site:
This site was accessed by helicopter and does not tie to a single specific photo tie point. The tie line POC is located at the northwest corner of FS 7 PP and extends at an azimuth of 360º for 550 m to the POT.

FS 7 UD:	8.4 m at 296º from NE corner of plot to tie line POT (550 m station)
FS 7 PP:	NW corner of plot located at the tie line POC
FS 7 CS:	67 m at 117º from NE corner of plot to SW corner of FS 7 PP
FS 7 SubT:	6.8 m at 226º from SW corner of FS 7 CS to N corner of P1



General comments:
No additional comments

Plot: FS 7 UD

Date established: 12-Aug-08

Coordinates:	61º 06’ 28.8”N 120º 58’ 24.3”W	**Plot size:**	20 m x 20 m
Elevation:	363 masl	**Orientation:**	359º
GPS error:	± 3 m	**Terrain:**	even
Slope:	2%	**Meso position:**	level
Aspect:	359º	**Drainage:**	restricted
Stand structure:	multistoried	**Moisture:**	hydric

Notes: No notes for this section.

Plot: FS 7 PP

Date established: 11-Aug-08

Coordinates:	61º 06’ 11.7”N 120º 58’ 24.2”W	**Plot size:**	20 m x 20 m
Elevation:	367 masl	**Orientation:**	338º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hydric

Notes: n/a = not applicable.

Plot: FS 7 CS

Date established: 13-Aug-08

Coordinates:	61º 06’ 12.0”N 120º 58’ 29.1”W	**Plot size:**	20 m x 20 m
Elevation:	369 masl	**Orientation:**	334º
GPS error:	± 3 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	depression
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	–	**Moisture:**	hydric

Notes: For stand structure, dashes indicate sites with no trees taller than 1.3 m. n/a = not applicable.

ANZAC AREA SITES

Site: AN IPY

Network ID: 07 AN IPY

Permafrost zone: Isolated Patches

Ecoclimatic region: Mid-Boreal

Ecoregion:Mid-Boreal Mixedwood (follows Strong [1992] for Ecoregions of Alberta)

Plots: AN IPY UD AN IPY BG AN IPY IL

Coordinates:

AN IPY UD	56º 23′ 55.8″N	111º 02′ 02.6″W
AN IPY BG	56º 24′ 00.6″N	111º 01′ 52.6″W
AN IPY IL	56º 23′ 58.9″N	111º 01′ 52.5″W

Magnetic declination: 16ºE

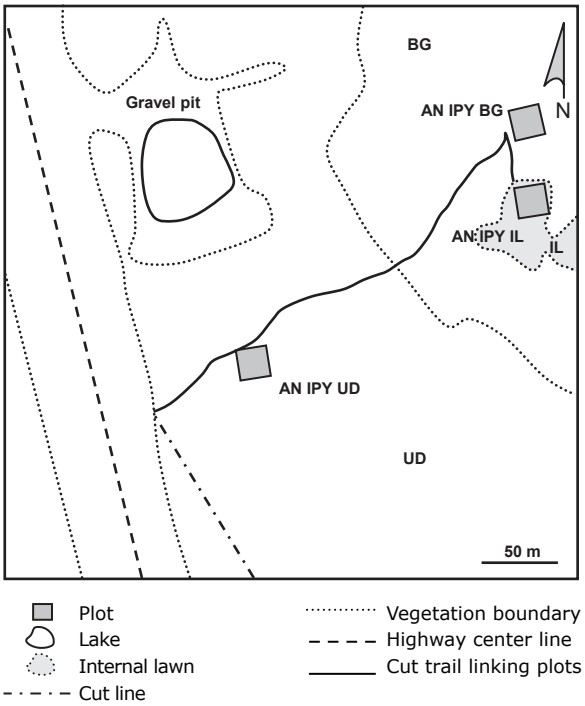
Aerial photograph reference:

Scale:	1:15 000
Roll-line coordinate:	AS5091
Numbers:	**95**, 96
Year:	1999
Source:	NAPL

Plot XY coordinates (cm):

AN IPY UD	12.7	18.3
AN IPY BG	13.9	19.1
AN IPY IL	13.9	18.7

Directions to site:
Plots are connected by an access trail beginning at the vegetation edge and cut line junction on the east side of Highway 881. The trail winds northeast through an upland forest for approximately 62 m from the vegetation edge to where AN IPY UD is located on the south side of the access trail. The trail continues northeast into a bog and AN IPY BG is located approximately 112 m past the bog margin to the east of the access trail. Past AN IPY BG, the trail veers south for approximately 38 m and terminates in an internal lawn, at AN IPY IL.



General comments:
Plot coordinates were recorded in the field; no tie line was established, and all distances and directions to the plots have been estimated from GPS tracks collected on site.

Boardwalks were established in all plots at this site as part of an intensive International Polar Year project to study greenhouse gas emissions and dynamics. Vegetation subplots were established in nonstandard locations because of the boardwalks and instruments, and presence of the boardwalk could have influenced the plot ecology such that plots may not be suitable for remeasurement at future dates.

Plot: AN IPY UD

Date established:	25-Jun-07		
Coordinates:	56º 23’ 55.8”N 111º 02’ 02.6”W	**Plot size:**	20 m x 20 m
Elevation:	582 masl	**Orientation:**	351º
GPS error:	± 3 m	**Terrain:**	even
Slope:	3%	**Meso position:**	level
Aspect:	214º	**Drainage:**	good to restricted
Stand structure:	multistoried	**Moisture:**	not available

Notes: Plot was established from 25-Jun-07 to 28-Jun-07 by one crew; plot characteristics and vegetation were recorded later (10-Sep-07) by a second crew. Soil samples were collected on 13-Sep-07 while mensuration data were recorded on both 10-Aug-07 and 13-Sep-07.

Plot: AN IPY BG

Date established:	25-Jun-07		
Coordinates:	56º 24’ 00.6”N 111º 01’ 52.6”W	**Plot size:**	20 m x 20 m
Elevation:	472 masl	**Orientation:**	347º
GPS error:	± 2 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	subhydric

Notes: Plot was established from 25-Jun-07 to 28-Jun-07 by one crew; plot characteristics and vegetation were recorded later (10-Sep-07) by a second crew. Soil samples and mensuration data were collected on 13-Sep-07. n/a = not applicable.

Plot: AN IPY IL

Date established:	25-Jun-07		
Coordinates:	56º 23’ 58.9”N 111º 01’ 52.5”W	**Plot size:**	20 m x 20 m
Elevation:	474 masl	**Orientation:**	351º
GPS error:	± 2 m	**Terrain:**	even
Slope:	n/a	**Meso position:**	level
Aspect:	n/a	**Drainage:**	restricted
Stand structure:	complex	**Moisture:**	hydric

Notes: Plot was established from 25-Jun-07 to 28-Jun-07 by one crew; plot characteristics and vegetation were recorded later (10-Sep-07) by a second crew. Soil samples and mensuration data were collected on 13-Sep-07. Azimuth of AN IPY IL is missing on original field data sheets and notes. The plot orientation of 351º was estimated from GPS. n/a = not applicable.

CONCLUDING REMARKS

This report details plot layout and access for 69 permanent monitoring plots established in the Mackenzie Valley region of the Northwest Territories and three associated plots in northern Alberta. Although plots were established in 2007 and 2008, this first report is only now being published in 2017, following a 10-year remeasurement of half of the plots. Despite this delay in publishing, it is still our intent that this be the first in a three-part series; the second report will present the baseline (2007–2008) mensuration data, and the third report will include the plant community, soil, and water chemistry data.

Having now revisited many of the plots, it is evident which features held up over time, and which features are not reliable for plot relocation and remeasurement. The GPS coordinates were most reliable and consistent for plot relocation, although in some cases the flagged tie line was still clearly visible and could be used without aid of the GPS. In many cases, however, the flagging could not be relocated easily and in no case was information previously written on the flagging, such as tie line distance, still visible after 10 years. Most plot signs were still standing and were critical to orienting the plots and relocating subplots. Pigtails were also largely still present and, when not, enough were still present to fairly easily replace those missing. The exception was in some collapse scars where the wet, unstable nature of a floating vegetation mat resulted in a much higher incidence of missing pigtails, presumably due to the pigtails sinking into or being overgrown by the peat. The standard layout of plots made it much easier to relocate or re-establish plot markers, and it was only in the IPY plots, where boardwalks made for a nonstandard layout, that we were not always able to confidently resample the same locations as initially measured.

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