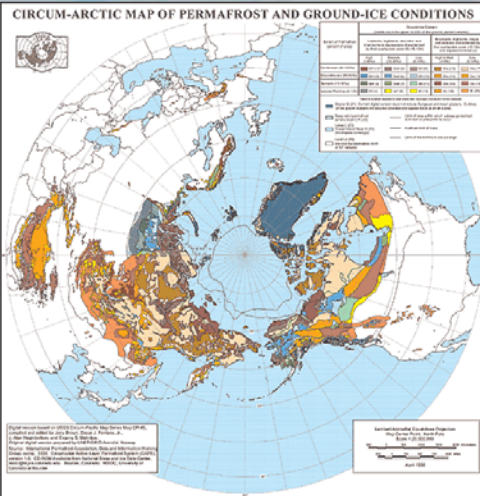


The Relationship between Permafrost Characteristics and the Distribution of Arctic Vegetation Types

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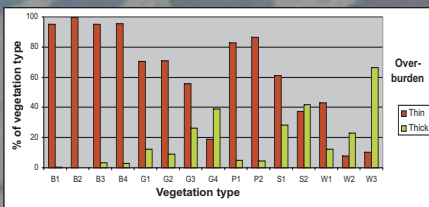
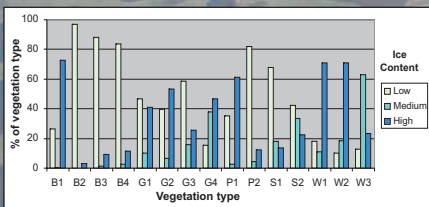
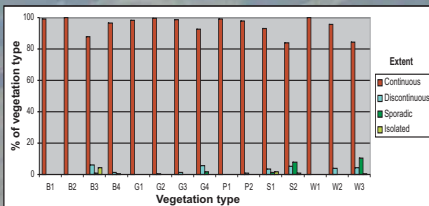
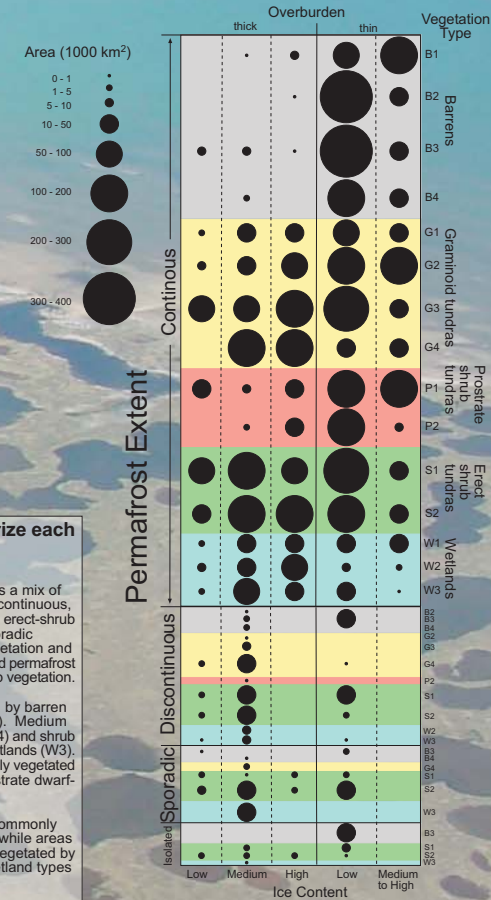


Introduction

The permafrost map: The extent, ground ice content and depth of overburden of circum-polar permafrost were mapped by Brown et al. (1997). Permafrost extent was mapped as continuous, discontinuous, sporadic or isolated. Ground-ice content was divided into low, medium and high categories. Lowland, highlands and intra- and intermontane depressions characterized by thick overburden cover (>5-10 m) were mapped separately from mountains, highlands, ridge and plateaus characterized by thin overburden cover (<5-10 m) and exposed bedrock.

The vegetation map: The distribution of arctic vegetation types was mapped by the Circumpolar Arctic Vegetation Map (CAVM Team, 2003). The integrated vegetation mapping approach used to create the vegetation map was based on the principle that a combination of environmental characteristics controls the distribution of vegetation. Vegetation type boundaries were drawn based on AVHRR false-color infrared imagery, bioclimate subzones, floristic regions, landscape categories, elevation, percent lake cover, substrate chemistry, and surficial and bedrock geology.

A comparison: An additional factor which strongly influences arctic vegetation distribution is permafrost and its characteristics. This poster presents a comparison of the two maps, investigating the relationship between the permafrost and vegetation characteristics.

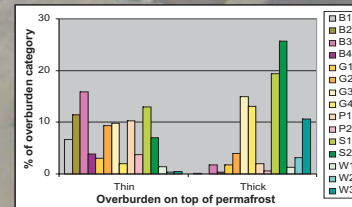
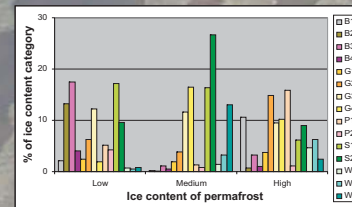
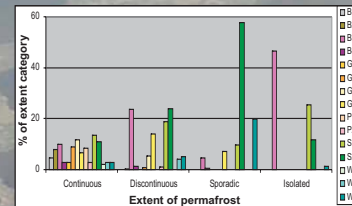


Types of permafrost that characterize vegetation types

Most of the Arctic, the area north of treeline characterized by an arctic climate, arctic flora and tundra vegetation, has continuous permafrost. Areas without continuous permafrost include southern Greenland, Western Siberia, the Seward Peninsula, and southern parts of the Kuskokwim Delta. Only three vegetation types have < 90 % continuous permafrost: non-carbonate mountain complex (B3); low shrub tundra (S2); and sedge, moss, low-shrub wetland (W3). The non-carbonate mountain complex has over 4% isolated patches, and 6% discontinuous and sporadic permafrost. The second two types are found in the warmest parts of the Arctic, and have up to 15% discontinuous and sporadic permafrost.

High ice-content permafrost is found in the western Canadian Arctic Islands, the lowlands of Yakutia and Western Siberia, and the Alaska Coastal Plain. Low-ice content permafrost occurs in mountainous areas of Baffin, Greenland, Taimyr Peninsula, Chukotka, the Brooks Range and the eastern portions of the Canadian Shield. The cryptogam barren complex (B2) and erect dwarf-shrub tundra (S1) characteristic of the Canadian Shield grows mostly on low ice-content permafrost. Similarly, the hemiprote dwarf shrub tundra (P2) characteristic of Baffin Island and the mountain vegetation complexes (B3, B4) also occur mostly on low ice-content permafrost. The cryptogam herb barrens (B1) characteristic of the High Arctic, and wetland vegetation types (W1, W2) grow mostly on high ice-content permafrost. The wetland vegetation type found in the warmest areas (W3), occurs mostly on medium ice-content permafrost.

Thin overburden occurs on mountains, ridges and plateaus, while thick overburden occurs at lower elevations and in depressions where sediments can accumulate. Most arctic vegetation types grow on areas of thin overburden on permafrost. Tussock sedge, dwarf-shrub, moss tundra (G4), low shrub tundra (S2), and warmer wetlands (W2, W3) occur more commonly on areas with thick overburden on permafrost.



Vegetation types that characterize each type of permafrost

Continuous permafrost in the Arctic supports a mix of vegetation types. Where permafrost is not continuous, non-carbonate mountain complexes (B3) and erect-shrub vegetation types are common (S1, S2). Sporadic permafrost mostly supports erect-shrub vegetation and sedge, moss, low-shrub wetland (W3). Isolated permafrost is vegetated almost exclusively by erect-shrub vegetation.

Low ice-content permafrost is characterized by barren types (B2, B3, B4) and shrub types (S1, S2). Medium ice-content permafrost has graminoid (G3, G4) and shrub (S1, S2) dominated vegetation, as well as wetlands (W3). High ice-content permafrost is most commonly vegetated with graminoid types (G2, G3, G4) and prostrate dwarf-shrub (P1).

Areas with thin overburden on permafrost commonly have barren vegetation types (B1, B2, B3), while areas with thick overburden are more commonly vegetated by graminoid (G3, G4), shrub (S1, S2) and wetland types (W3).

Summary

Barren vegetation types, including cryptogam herb barrens common in the far north (B1), the cryptogam barren complex of the Canadian Shield (B2), and the mountain complexes (B3, B4) occur almost exclusively on thin overburden. Only B1 grows predominantly on high ground-ice content permafrost.

The graminoid tundras found in colder areas (G1, G2) occur predominantly on thin overburden. Nontussock sedge, dwarf-shrub tundra (G3) is most common on thin overburden, low ice-content permafrost, while tussock-sedge, dwarf-shrub tundra occurs mostly on

thick overburden with high ice-content.

Prostrate shrub tundras (P1, P2) occur mostly on areas of thin overburden, and the type that occurs farther south (P2) occurs almost exclusively on low-ice content permafrost. Erect shrub tundras (S1, S2) occur on low ice-content permafrost on thin overburden, but more commonly on medium to high ice-content permafrost on thick overburden.

Wetlands occur predominantly on thick overburden with medium to high ice-content permafrost.

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