

## Subarctic Alpine Tundra



### General Description

The *Subarctic Alpine Tundra* zone covers an area of approximately 88,000 km<sup>2</sup> near and above elevational treeline in the mountains of central and northern Yukon and western Northwest Territories (NWT). In the northern Richardson Mountains, this zone meets the *Low Arctic Shrub Tundra* zone as elevational and latitudinal treelines merge. The climate is characterized by very cold temperatures and wind. Landcover is a mosaic of patchy to continuous low vegetation, exposed soil and rock, and snow or ice. Continuous permafrost actively modifies the surface expression of the landscape and significantly influences vegetation distribution.

### Vegetation

Vegetation is distributed according to micro-environmental conditions; cover can be sparse in harsh environments, grading to continuous on favourable sites. It is characterized by a mixture of low and dwarf shrubs, graminoids, forbs, bryophytes and lichens. In the alpine, shrub height rarely exceeds 25 cm, but subalpine shrublands are taller. Bedrock and surficial geology, as well as permafrost action, affect vegetation distribution and species composition.

Entire-leaved mountain avens (*Dryas integrifolia*) and/or Alaska mountain avens (*D. alaskana*) often dominate. Other common species include moss campion (*Silene acaulis*), blackish locoweed (*Oxytropis nigrescens*), alpine bistort (*Bistorta*

*vivipara*), net-veined willow (*Salix reticulata*), skeleton-leaved willow (*S. phlebophylla*) and purple mountain saxifrage (*Saxifraga oppositifolia*). Common lichens are crinkled snow lichen (*Flavocetraria nivalis*), curled snow lichen (*Flavocetraria cucullata*), limestone sunshine lichen (*Vulpicida tilesii*), arctic butterfingers lichen (*Dactylina arctica*) and awl-shaped whiteworm lichen (*Thamnolia subuliformis*). Northern rough fescue (*Festuca altaica*) is sometimes abundant. Graceful mountain sedge (*Carex podocarpa*) is common on moist sites.

Heath vegetation dominated by four-angled mountain heather (*Cassiope tetragona*) occupies sites with late-melting snowbeds, often with entire-leaved mountain avens, black crowberry (*Empetrum nigrum*), bog bilberry (*Vaccinium uliginosum*), bryophytes and clad lichens (*Cladonia* spp.).

Where rock surfaces are the predominant substrate (e.g., talus, boulder colluvium, bedrock, frost-shattered rock), lichens dominate the vegetation. Species include netted rocktripe lichen (*Umbilicaria proboscidea*), sandpaper rocktripe lichen (*U. rigida*), yellow map lichen (*Rhizocarpon geographicum*), superficial map lichen (*R. superficiale*), sporastatia lichen (*Sporastatia testudinea*), curled snow lichen, crinkled snow lichen, green witch's hair lichen (*Alectoria ochroleuca*), arctic butterfingers lichen and limestone sunshine lichen. Hoary rock moss (*Racomitrium lanuginosum*) or curly heron's-bill moss (*Dicranum fuscescens*) may also be present.

In the northern Ogilvie Mountains, several species associated with Beringia (an area that escaped late Pleistocene glaciation) are endemic. Examples include Yukon podistera (*Podistera yukonensis*), arctic-alpine forget-me-not (*Eritrichium aretioides*), Ogilvie Mountains draba (*Draba ogilviensis*), Jurtzev's smelowskia (*Smelowskia porsildii*) and Walpole's poppy (*Papaver walpolei*).

Wetlands are associated with late-melting snowbeds and seepage areas. Sedges dominate these communities, including tussock cottongrass (*Eriophorum vaginatum*), beautiful cottongrass (*E. callitrix*), narrow-leaved cottongrass (*E. angustifolium*) and spruce muskeg sedge (*Carex bigelowii* ssp. *lugens*). Peat mosses (*Sphagnum* spp.), golden fuzzy fen moss (*Tomentypnum nitens*), acutetip groove moss (*Aulacomnium acuminatum*), intermediate hook-moss (*Scorpidium cossonii*) and stairstep moss (*Hylocomium splendens*) are also present.

Shrublands, together with patches of stunted trees, dominate at lower elevations in the transition to subarctic woodlands. Arctic dwarf birch (*Betula nana*) and glandular birch (*B. glandulosa*) are the main species, often in association with bog bilberry (*Vaccinium uliginosum*), northern Labrador tea (*Rhododendron tomentosum*) and various willows (e.g., Alaska willow [*Salix alaxensis*], Barclay's willow [*S. barclayi*], grey-leaved willow [*S. glauca*], low blueberry willow [*S. myrtillofolia*], Richardson's willow [*S. richardsonii*]). Tree species include white spruce (*Picea glauca*) and black spruce (*P. mariana*).

## Climate

Overall, the high elevation – high latitude climate has short, cool summers and very long, cold winters. Mean annual temperatures vary from approximately -9°C to -5°C. The growing season is very short, and frost can occur at any time. Precipitation is generally low and snowpacks are light. Mean annual precipitation varies between approximately 400 and 1000 mm, with the driest areas occurring in the NWT. Over half of total precipitation falls as snow.

The alpine environment is windy, and snow is significantly re-distributed from exposed locations. Snow cover protects vegetation from extreme winter cold and abrasion by wind-driven ice

particles, and snowmelt provides moisture into the growing season. Slope, aspect and wind exposure control site-scale patterns of insolation, snow deposition and melting. Southerly and westerly aspects are warmer; snowmelt on these sites occurs earlier in the spring. Northerly and easterly aspects are cooler; wind deposition of snow is often greater and snowmelt occurs later, delaying the onset of the growing season. Consequently, there is considerable variation in the temperature, moisture and growing season length at the scale of microsites.

## Physiography, Geology, Topography, Soils and Land Cover

The *Subarctic Alpine Tundra* zone occurs in northern portions of the Cordilleran physiographic region in Yukon and NWT, including the British, Richardson, MacKenzie and Franklin Mountains, the North Ogilvie region, and also the Old Crow Range. The lower elevation of the zone lies between 800 and 1200 mASL in the south, and 600 mASL in the Richardson Mountains at the northern limit.

Geology and topography are diverse. The geology is primarily of sedimentary origin, although igneous intrusions are present in some areas. The terrain is a complex of high plateaux and mountains (up to 2800 mASL). Karst features are common in limestone areas, including sinkholes, caves and deep canyons.

Much of the eastern portion of the zone was glaciated during the most recent Pleistocene ice age, either by continental or alpine ice sheets. However, there are significant areas that remained unglaciated during this period (Beringia), especially in west-central Yukon, the British and western Richardson Mountains, and portions of the southern and north-central Mackenzie Mountains.

High mountain terrain is generally steep and rugged; rock, ice and snow dominate much of the landscape. Steep slopes can result in mass substrate movement, such as landslides or talus deposition; debris flows are exacerbated by melting permafrost. The cold climate results in frequent freeze-thaw cycles, causing rocks to fracture. Rock fragments, bouldery colluvium and talus are common, especially in areas of limestone and sandstone. Shale breaks down to fine-textured substrates that supply nutrients and

hold moisture, supporting more continuous vegetation cover.

In glaciated areas, surficial materials are mostly shallow stony tills, often modified by colluvium, slope movement or permafrost action. Continuous permafrost occurs in most parts of the zone, creating variable patterns within the surface mineral and organic substrates. Permafrost features are common, especially sorted and non-sorted circles and stripes. Solifluction occurs where surface permafrost melts during the summer and slowly moves downslope. Soils are mostly Cryosols, with

Brunisols and Regosols on well-drained, coarse-textured sites.

### Notes

The *Subarctic Alpine Tundra* zone is mainly bounded at lower elevations by the *Northern Boreal Woodland*. To the north, it shares a short boundary with the *Low Arctic Shrub Tundra*, where latitudinal and elevational treelines merge. At alpine elevations, it abuts the *Western Boreal Alpine Tundra* zone to the south. To the west, it continues into Alaska.

DRAFT