IV THE ENVIRONMENT

The traditional territories of the Tahltan people, as outlined above, are located within two natural physiographic regions, the Stikine Plateau and the Skeena Mountains (as shown in Figure 4). The complex interaction of geologic processes, topography, climate, soils, and vegetation contribute to the nature, abundance, and distribution of resources available for human exploitation. This section summarizes the environmental factors which have influenced human occupation of the area.

Physiographic Areas

The Stikine Plateau is generally characterized by flat and gently sloping upland surfaces which represent remnants of late Tertiary erosional surfaces, uplifted during the Pliocene. It also includes areas modified by extensive Pleistocene volcanic activity and glaciation. The Stikine Plateau is differentially dissected by several major river valleys, and is subdivided into several units each with its own distinct geographical and geological characteristics (Holland 1976:49-55).

The Tahltan highland, running from northwest to southeast, is a transitional zone between the Boundary Range of the Coastal Mountains and the plateau areas to the east. The Mount Edziza Complex and the Spectrum Range dominate the eastern edge of the highlands. Mt. Edziza is a composite volcano rising to a height of 2700 metres (9000 feet) with an ice covered peak. The first Edziza flow, dated to six million years ago by radiometric assay (Souther 1973:16), was followed by many similar flows forming a basal shield volcano with a radial system of canyons. During the late Pleistocene, until about 10,000 years ago, activity in the central conduit built up the central dome and summit crater with lava flowing down the radial valleys.

Since 10,000 years ago, 30 to 40 eruptions from small pyroclastic cones have produced mobile flows of blocky olivine basalt. One of these on the north slope of Edziza has been dated to 1340 ± 130 B.P. with even younger material overlying it (Souther 1970:63). Edziza derives its name from the Tahltan term 'edzi0a' meaning 'volcano ash and sand mountain,' and oral traditions describe eruptions which have forced people to move their camps quickly. The base of the dome provides sources of good quality obsidian for stone tool technologies. Most of the obsidian is black whose thinned edges sometimes show black lines and specks. Opaque green, grey, and blue varieties are less common while mottled, striped or speckled varieties are rare. These good quality obsidians were formed about 0.9 to 1.1 million years ago, according to fission track and potassium argon dating, and have an abnormally high uranium content (Souther 1970:63).

The blocky alkali olivine basalt flows from the younger cone volcanos do not produce a workable glass suitable for making stone tools. However, the scattered eruptions of these cones have caused sudden changes in drainage patterns. Well defined lacustrine terraces on Mess Creek and Klastline River mark the former extent of now dry lava dammed lakes that persisted for hundreds of years and may have influenced the location of early campsites. The effect of lava dams on salmon migrations may also have had important repercussions on early human populations. The absence of salmon in upper Iskut River may be attributed to an impassable barrier of recent lava from a cinder cone near the mouth of Forest Kerr Creek (Souther 1970:55).

The plateau areas, including Nahlin, Kawdy, Tanzilla, Spatsizi, and Klastline Plateaus, have gently rolling upland surfaces of low relief, lying mainly above timberline at 1500 metres (5000 feet). These areas support a wide range of subalpine and alpine vegetation including grassland communities, low lying shrubs, mosses, and lichens. Within the Spatsizi Plateau, Pojar (1976) has identified more than 370 species of vascular plants and over 200 species of mosses and lichens. These rich habitats support large populations of larger game such as caribou, sheep, and goats as well as small animals such as marmots.

The Skeena Mountains extend south from the Spatsizi and Klastline plateau areas. The transition between the plateau areas and the mountains is represented by gently sloping upland areas which are remnants of dissected late Tertiary erosional surfaces. Drained by the Stikine, Nass, and Skeena Rivers, the Skeena Mountains consist of a series of ranges divided by prominent northwesterly trending valleys. The valley bottoms lie at 2,500 to 4,000 feet (750 to 1200 m) in elevation and are wide and drift filled (Holland 1976:55).

Climate

Most of the study area has a climate which is in direct contrast to that of the Coastal Mountains. Situated within the rainshadow of the Coast Mountains, the Stikine Plateau has low precipitation, averaging 12 to 23 inches (30-58 cm) annually. Precipitation is particularly low in the Tahltan highlands adjacent to the mountains and increases eastward towards the Cassiar Mountains. The area also experiences extremes in temperature, although it is characterized by long cold winters and short cool summers, due to the combined factors of high northern latitude and high elevation of most of the area.

The amount of direct sunlight received within the study area varies greatly from summer to winter as shown in Table 2. The long hours of daylight during summer contribute to high plant productivity of more hardy frost resistant species. Low rainfall, combined with short frost free summers in the Stikine Plateau, prohibits extensive horticulture or agricultural activities except in a very restricted portion of the Middle Stikine Valley in the vicinity of Telegraph Creek.

Table 2 Hours of Direct Sunlight

Latitude	December 21	June 21
56°	6 hr 57 min	17 hr 37 min
57°	6 hr 41 min	17 hr 56 min
58°	6 hr 24 min	18 hr 15 min
59°	6 hr 08 min	18 hr 34 min
60°	5 hr 52 min	18 hr 53 min

(Kendrew and Kerr 1956:156)

The major rivers freeze over by the end of November and are closed to navigation by boat until late April. At higher elevations, lakes start to freeze over in October and do not open again until late May or June.

Within the study area marked differences in topography, climate, soils, and vegetation are related to elevational zonation in local land forms. These differences are presented according to the biogeoclimatic classification system developed by Dr. V.J. Krajina (1965, 1969).

Biogeoclimatic Zones

Alpine Tundra Zone

The Alpine Tundra zone consists of treeless meadows, slopes, rocky ridges, snowfields, and icefields at high elevations in mountainous as well as plateau areas. Within the study area alpine tundra occurs above 1500 to 1800 metres (5,000 to 6,000 feet) (Valentine et al. 1978:154). The harsh climate of the alpine environment is the result of both increasing elevation and latitude. The climate is described as subarctic (Dfc after Koppen) with less than 25 frost free days. Frost may occur, however, any day of the year at higher elevations. Absolute temperatures range from 28° C to -45° C (83° to -49° F) while the average temperature of the warmest month is less than 10° C (50° F). Average annual precipitation is 72 cm (29 in.) with approximately 75% as snowfall (Krajina 1965, 1969).

Factors such as high elevation, very cold subarctic climate, lack of moisture, and rugged or often rocky terrain, all tend to restrict soil formation processes in the Alpine Tundra zone. Periglacial activity such as cryoturbation is very active in this zone resulting in churning of soil materials, patterned ground features, and poor horizon differentiation. Regosol landscapes are most common under these conditions (Valentine et al. 1978:155).

Alpine meadows occur under moist conditions on flat or gently sloping topography where snow cover lasts longer. They have a short but colourful vegetative season and produce such species as grasses, sedges, lupines, anemones, Indian paintbrush, and arnicas. A wide variety of mosses, lichens, and mountain heathers grow in the alpine tundra zone. Subalpine fir and scrub birch may occur in Krummholz, or dwarf, form in especially protected habitats with moderate snow cover (Valentine et al. 1978:38).

Spruce - Willow - Birch Zone

The subalpine Spruce - Willow - Birch zone occurs in the Stikine Plateau area between 900 and 1800 metres (3,000 to 6,000 feet). It is characterized by a cold continental climate (Dfc after Koppen) with short cool summers, and severe winters. Only tress which tolerate extended periods of frozen ground grow successfully in this zone. These include subalpine fir (Abies lasiocarpa), white and black spruce (Picea glauca and mariana), Sitka alder (Alnus sinuata), willows (Salix spp.), and shrub birch (Betula occidentalis).

Within the subalpine zone, Humo-Ferric Podzols are the most common soils throughout. On moderate to well drained sites on colluvial and morainal parent materials white spruce and subalpine fir often grow in colonies or pure stands with a resulting thin acidic litter mat. On the dry exposed plateau areas, such as the Spatsizi, shrub willows and birch predominate, along with grassland communities. In some valleys subject to cold air drainage from adjacent mountains, shrub willows and birch, along with alpine species, occupy the valley floor as well as upper elevations (Valentine et al. 1979: 154:55). Turbic Cryosol soils occur at higher elevations where solifluction and nivation become active in moist areas between clumps of krummholz, or dwarf, tree forms. Although the Stikine Plateau lies south of the limit of discontinuous permafrost, permafrost occurs sporadically at higher elevations in the subalpine and alpine tundra zones, particularly in the mountainous areas of the region.

Boreal White and Black Spruce Zone

This boreal forest zone occurs at lower elevations in the major river valleys of the Stikine Plateau from 150 to 900 metres (500 to 3000 feet). This zone is characterized by a humid continental climate (Dfc - Dsb after Koppen), with cool summers and fairly evenly distributed precipitation over the year. Mean annual temperatures range from -3° to 3° C (27° to 37° F). The number of frost free days varies from 20 to 150 (Krajina 1965, 1969).

The major tree species in this zone are

white and black spruce (*Picea glauca* and *mariana*), lodgepole pine (*Pinus contorta*), subalpine fir (*Abies lasiocarpa*), trembling aspen (*Populus tremuloides*), cottonwood (*Populus trichocarpa*), alders (*Alnus sinuata* and *tenuifolia*), and paper birch (*Betula papyfera*). Within the broad valleys of this zone, extensive fluvioglacial deposits are common. These coarse textured soils of the Dystric and Eutric Brunisolic type are characterized by rapid percolation and iron accumulation, especially on acidic parent materials. Dystric Brunisols occur on dry acidic sites, where forest fires are common and lodgepole pine dominates the forest growth which is kept in a constant early successional stage. Black spruce, which is the most shade tolerant tree growing in this zone, often grows with moss communities on imperfectly drained habitats with acid soils (Valentine *et al.* 1979:153).

The penetration of warm westerly winds up the Stikine River valley produces a small warmer and drier microclimate in the middle section of the Stikine valley. Annual total precipitation in this area is 12 to 15 inches (30 to 37 cm). Absolute temperatures range from 35° to -50° C (95° to -60° F). Eutric Brunisol soils occur on the dry, south facing terraces in this area where grassland communities dominate. The surface soil horizons (Bm) are reddish yellow or yellowish brown, with an average depth of 20 cm having occasional leached (Ae) surfaces. Soil pH ranges from 6 to 7 in value with surface soil horizons slightly more acidic than underlying deposits (Epp and Fenger 1978:8). The soils in this area are closer to neutral than most areas of the Stikine Plateau and thus more likely to yield preserved faunal remains.

Figure 5 compares the yearly distribution of precipitation and temperatures at Telegraph Creek at 165m within the Boreal Forest Zone and at Cold Fish Lake at 1200 m in the Subalpine Zone.

The large valley of the Nass River allows westerly winds to penetrate the Coast Mountain barrier, resulting in increased precipitation locally in the Skeena Mountains and deep snow accumulations. The higher peaks also

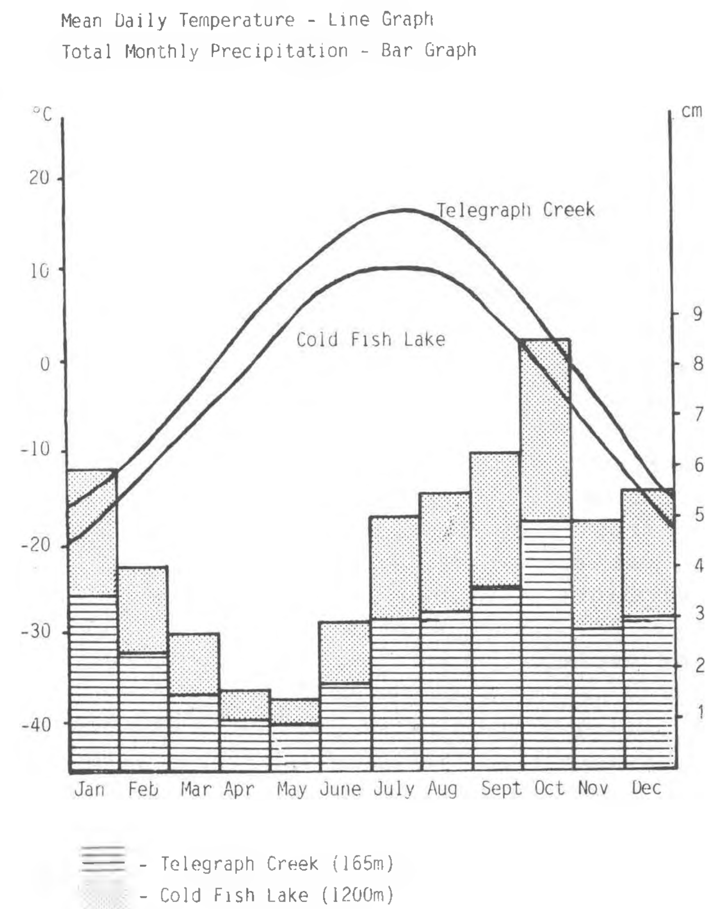

Figure 5. Comparisons of temperatures and precipitation at Telegraph Creek and Cold Fish Lake (data from Canada, Department of Transport 1967 and Pojar 1976)

block out cold arctic air from the north moderating winter temperatures in this region.

Due to warmer temperatures and increased precipitation, the Boreal White and Black Spruce Zone of the Stikine Plateau is replaced by the Sub-Boreal Spruce zone at elevations of 300 to 900 metres (1000 to 3000 ft.) in the Skeena Mountains. Although the major tree species are the same in both zones their productivity is greatly increased within the Sub-Boreal Zone. Within the subalpine zone climatic modifications are also felt, so that the Spruce - Willow - Birch Zone north of 57° latitude is replaced by the Subalpine Fir Zone at 900 to 1500 metres (3000 to 5000 ft.) in the Skeena Mountains (Krajina 1965, 1969, Valentine *et al.* 1978:159).

Paleoclimate

Post glacial paleoclimatic data for northern British Columbia are only available from the Atlin region where palynological profiles have been dated (Anderson 1970). Since the Atlin region, located within the Yukon Plateau area, has a very similar climate at present, in terms of temperatures and precipitation, to that of the Stikine Plateau, it would seem logical to assume that the paleoclimates of the two neighbouring areas were also similar.

Within the northwestern corner of British Columbia, deglaciation proceeded in an irregular fashion. The palynological profile from Atlin indicates that tundra shrubs were established by 11,000 years ago. The existence of a late glacial lake in the area of the middle Stikine and its three northern tributaries, the Tahltan, Tuya, and Tanzilla Rivers (Valentine _et al_. 1978: Figure 1.3.2) and the presence of drumlin-like features in the topography of the plateau areas marking the northward retreat of glacial ice (Holland 1976:48-54) suggest that the middle Stikine area was ice free earlier than the Atlin region. The geothermal potential of volcanic activity in the area during the late Pleistocene may possibly have stimulated early deglaciation in the Stikine area.

The Atlin pollen profile indicates that during early post glacial times the climate of the region was two to three degrees Centigrade cooler and somewhat drier than at present. By 8,000 years ago the climate was similar to that of today. A postglacial maximum has been proposed for the region between 8,000 and 2,500 years ago with mean July temperatures up to one degree higher than present and precipitation at the same level as today or somewhat higher. Climatic fluctuations in the Atlin region appear to have differed from other areas of the province in terms of moisture regime, being moister when other areas were drier during the postglacial thermal maximum (Clague 1981:23).

While in southern British Columbia the late postglacial climate became cooler and wetter than earlier periods, late postglacial cooling in the Atlin region was marked by reduced precipitation. A cool dry period occurred between 2,500 and 750 years ago while alpine glaciers in the nearby Boundary Ranges of the Coastal Mountains were expanding. Within the last 750 years precipitation and temperatures have increased to values comparable to those prior to 2,500 years ago (Clague 1981:25). The latest advance of alpine glaciers in the Mt. Edziza complex in the Tahltan Highland, occurring prior to 1340 ± 130 radiocarbon years ago, extended no more than one to two kilometres (J. Souther: personal communication) from their present position.