treeline remained at higher limits until approximately 5000 to 6000 BP.

The analysis of alpine palaeosols from the Crownest Pass region provides additional information on alpine and Subalpine Forest-Grassland treeline fluctuations in the Canadian Rocky Mountains (Figure 11). Reeves and Dornar (1972) identified a buried Degraded Alpine Entric Brunisol characteristic of open alpine vegetation in a region which supports a dense forest today. Radiocarbon dates of 9520 ± 240 BP (GSC-956) and 8000 ± 150 BP (GSC-1158) were obtained for the soil from charcoal. An Orthic Regosol with a thick Ah horizon overlies this Degraded Entric Brunisol and a layer of Mazama Ash (6600 BP). Analysis of the humic acids from this Ah horizon indicate that it was developed in a grassland setting. A radiocarbon date of 6060 ± 140 BP (GSC-1255) is available for this Orthic Regosol soil. Reeves and Dornar (1972) interpret these palaeosols as reflecting a significant depression of treeline at 8000 to 9000 BP followed by an upward displacement of the Subalpine Forest-Grassland treeline at 8000 to 6000 BP. However, this treeline reconstruction is not supported by recent palynological work in the Crownest Pass region (L.V. Hills, pers. comm.).

Clearly, additional work will be required to tighten up the chronology of treeline advances and retreats and to account for valley to valley variation in treeline history.

Return to the bus and proceed to the Kananaskis Road. Turn north.

30.3 STOP 2 WELLHEAD BELOW JANUARY CAVE (e1 1905 m)

Extant Vegetation (R.D. Revel)

This stop affords a close examination of typical Picea engelmannii/Abies lasiocarpa Subalpine communities which constitute the
climatic climax vegetation of the area. In the lower Subalpine areas Picea engelmannii dominates the over-story with occasional Abies lasiocarpa codominants while in the upper Subalpine Abies lasiocarpa becomes dominant and Picea engelmannii becomes less well represented.

Abies lasiocarpa is very shade-tolerant and constitutes a major element in the understory. On well-drained soils Pinus contorta may dominate after forest fires where it frequently forms stands with over 8,000 stems per acre (approximately 20,000 per hectare).

Some plants typical of the area include: Abies lasiocarpa,
Achillea millefolium, Anemone parviflora, Arctostaphylos uva-ursi,
Artemisia cordifolia, A. lasiocarpa, Equisetum arvense, E. scopoides, E.
sylvaticum, Garrya oblongifolia, Heracleum lanatum, Juniperus communis, Menispermum canadense, Picea engelmannii, Pinus albicaulis,
Pinus contorta, Rhododendron albofasciculatum, Salix spp., Senecio triangularis,
Stellaria longipes, Vaccinium membranaceum, V. scoparium, and Veratrum viride.

Looking toward the summit of Plateau Mountain, Larix lyallii forms the upper limit of the tree line.

January Cave: Vertebrate Paleontology (J.A. Burns)

January Cave (2040 m elevation) is a solution cavity in Mississippian Limestone; it has an overhang shelter at its mouth. Sedimentary deposits from the cave are massive, poorly sorted and contain fossil bone and pollen. Three radiocarbon dates on bone collagen present a problem. An 14C date of 23,100 ± 860 BP (GaK-4538) was obtained near the base of the sedimentary sequence. However, two radiocarbon dates on material stratigraphically higher in the deposit provided significantly older ages of 31,900 ± 1,400 BP (QL-1738) and

<table>
<thead>
<tr>
<th>TABLE 1 - IDENTIFIED VERTEBRATE TAXA FROM JANUARY CAVE, ALBERTA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MAMMALS</strong></td>
</tr>
<tr>
<td><em>Sorex cinereus</em>, Masked Shrew</td>
</tr>
<tr>
<td><em>S. monticolus</em>, Dusky Shrew</td>
</tr>
<tr>
<td><em>S. arcticus</em>, Arctic Shrew</td>
</tr>
<tr>
<td><em>S. hoyi</em>, Pygmy Shrew</td>
</tr>
<tr>
<td>Ochotona princeps, Pika</td>
</tr>
<tr>
<td>Lepus cf. americanus, Snowshoe Hare</td>
</tr>
<tr>
<td>Eutamias sp., Chipmunk</td>
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<tr>
<td>Harmanus caligatus, Hoary Hare</td>
</tr>
<tr>
<td>Ermineus vulpecula, Red Squirrel</td>
</tr>
<tr>
<td>Eutamias albicaudatus, Ground Squirrel</td>
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<tr>
<td>Cynomys cf. leucurus, White-tailed Prairie Dog</td>
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<tr>
<td><em>C. griseus</em>, Badger</td>
</tr>
<tr>
<td>Tamiasciurus hudsonicus, Red Squirrel</td>
</tr>
<tr>
<td><em>T. minimus</em>, Red Squirrel</td>
</tr>
<tr>
<td>Thomomys talpoides, Northern Pocket Gopher</td>
</tr>
<tr>
<td><em>T. talpoides</em>, Gopher</td>
</tr>
<tr>
<td>Nesotoma cinerea, Wood Rat</td>
</tr>
<tr>
<td>Cleatheromys gapperi, Red-backed Vole</td>
</tr>
<tr>
<td>Urocitellus townsendii, Deer Mouse</td>
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<tr>
<td>Neotoma montana, Brown Lemming</td>
</tr>
<tr>
<td>Apodemus speciosus, Redbacked Vole</td>
</tr>
<tr>
<td>Synaptomys borreli, Northern Bog Vole</td>
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</tbody>
</table>
from the alpine tundra on the summit of Plateau Mountain (2590 m elevation) above the cave.

Analyses were done on a 190 cm thick section (Figure 14). Thermal analyses (loss-on-ignition) show that the cave soil is low in organic matter and, relative to the limestone bedrock, is low in CaCO$_3$ and high in residue, probably silicates. This suggests that the parent material was partly leached before bones were mixed with it.

Fossil pollen and spores in the soil are reasonably abundant (33,000-106,000 per g dry weight) but less than half can be identified because of poor preservation. The assemblage is dominated by herbs that, except for Gramineae, are entomophilous. Plants that could produce such an assemblage today mostly grow in the local alpine tundra. An exception is Phlox; Alberta species today only grow at elevations below the cave in the Foothills and Grassland. Perhaps the species represented by the pollen is Phlox sibirica, an arctic-alpine species of the Yukon but with alpine disjuncts in Colorado.

In contrast, the Holocene midden and polster samples are dominated by tree pollen that reflect the regional conifer-dominated forest and emphasize the treeless, arctic-alpine vegetation of the time when the cave earth was deposited.

A problem arises as to how the cave soil was deposited. A lack of stratification rules out water deposition, and the presence of bedrock clasts indicates at least some colluvial activity. The silty matrix suggests loess could be a partial source. Pollen could have been blown into the cave but the abundant entomophilous pollen suggests mass movement.

The pollen assemblage could represent the nesting activities of
pollen-gathering insects but no fossil insects or their burrows have
been found. Another possibility is that the pollen represents transport
by vertebrates, either in nesting material or in rodent guts after the
rodents have been brought to the cave as meals of birds of prey.
However, I favour deposition with leached alluvium derived from the soil
surface above the cave. A hole visible in the roof of the cave may
represent the lower end of a now plugged chute. Whatever the source of
the bones and pollen, the January Cave soil represents a mid-Wisconsin
interval of treeless landscape occupied by arctic-alpine animals and
plants.

Proceed west on Kananaskis Road. Turn north on access Road to Plateau
Mountain.

36.8

STOP 3. SUMMIT OF PLATEAU MOUNTAIN (el. 2320 m)

Geologic Setting (L.E. Jackson, Jr.)

The summit of Plateau Mountain is marked by sorted scree cones,
rock stripes and solifluction lobes and other indications of periglacial
processes. Harris and Brown (1978) drilled twelve boreholes ranging
from 15 m to 31 m in depth between 2290 m and the summit at 2319 m.
Seven of these boreholes encountered permafrost. Earst caverns which
intersect the surface along the northern end of the mountain at about
2244 m intersect permafrost. Harris and Brown concluded that
permafrost, down to 30 m depth, is primarily controlled by the present
climate while the deeper permafrost intersected by the caverns is
relict. The maximum depth of permafrost beneath the mountain was not
determined.