

SUCCESSIONS IN THE ALPINE REGION OF
BRITISH COLUMBIA

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One of the mountains that border the northern side of the Bella Coola valley in the coast mountains in British Columbia is Canoe Crossing Mountain. Dr. Dolmage, in his 1925 geologic report, says that this mountain is somewhat over 6,000 feet above sea level. I have been up this mountain twice and have measured it both times with an aneroid barometer. I found it somewhat less than 6,000 feet. I found that the alpine region begins at 4,500 feet above the floor of the Bella Coola valley.

In this study I have considered the different types of places where pioneer vegetation may start, and I have observed the succession of vegetation that follows each kind of pioneer vegetation.

The vegetation on the snow banks that do not melt away during the summer is of a distinct type. On these snow fields the red snow is very common. The snow is dimpled on the surface, as snow gets when it is exposed to wind and sun. In the dimples the red snow is much thicker than it is on the little ridges between the dimples. The red alga penetrates deeply into the snow. On the northern exposure the red snow is much better developed than it is on the other exposures. This may be due to the effect of the sunlight or to the more rapid melting of the snow on the other exposures. I was unable to follow any succession on the snow.

At the top there is a good deal of live rock that is greatly exposed to the wind and light and cold. Live rock that is more or less vertical and well drained has on it three crustose lichens as pioneers. They are *Rhizocarpon geographicum* and *Acaraspora* sp. and a third that has not been identified. Dr. Plitt has identified the lichens.

The crustose lichens may be overshadowed by one of two lichens. A very small black fruticose lichen, *Alectoria divergens*, grows closely over the crustose lichens. *Gyrophora erosa* is a larger black foliose lichen which sometimes follows the crustose lichens and which sometimes follows *Alectoria*. In the most exposed parts of the live rock there is no further stage in the succession.

In the crevices of the live rock *Silene acaulis* is the one plant that I found.

Near the top of the mountain the live rock may be hollowed out by ice, and in the hollows the snow lies until late in the growing season. Here lichens are not the pioneers, but dark colored moss that has not been identified. The first flowering plant that gets started in the mats of moss is *Saxifraga tolmiei*. Where the moss is not so wet there is a sorediose lichen, *Crocynia* sp., which spreads over the moss. *Saxifraga* is followed by *Carex* sp., and it in turn is followed by a *Juncoides* and another *Carex*.

In most places the next association is one of *Spiraea pectinata*, which is followed by the green-flowered heather, *Phyllodoce glandulosa*. It is followed by the moss heather, *Cassiope mertensiana*. Then comes the climax for the alpine region, namely, the red-flowered heather, *Phyllodoce empetrifomis*. In some of the uppermost basined areas the successions went no further than *Cassiope*.

Where the subalpine merges into the alpine on exposed areas of live rock, the heather was followed by a poor growth of low wind timber, *Abies lasiocarpa*, *Juniperus communis*, and a very little white-barked pine.

By far the most of the side of the mountain is made up of talus. Down the side of the mountain in the talus there may be streams. In other places the water may spread out and make shallow ponds. In still other places the talus may be comparatively dry. It will be wet in the early part of the season but soon becomes drier because all the snow melts away. In still other parts of the alpine the talus may be kept very wet throughout the summer because of very large fields of snow that continue to melt all summer. I studied the successions in these four types of places on the talus.

Along the edge of streams there are two pioneers, namely, *Caltha leptasepala* and *Trollius laxus*. Behind these are *Saxifraga bongardii* and *Cardamine kamtschatiea*. On the higher ground there are the *Spiraea* and the three heathers in the same order as mentioned above, with *Phyllodoce empetrifomis* as the climax.

Around ponds the mats of moss soon have growing in them *Saxifraga tolmiei*, which is followed by *Spiraea pectinata* on higher ground. This is followed by the heathers. Always *Phyllodoce empetrifomis*, the red-flowered heather, is the climax.

Where a thin sheet of water spreads out over the gravel so as to form a kind of quick gravel, two vine-like willows are pioneers. On the edge of the water *Caltha leptisepala* grows, and further out on the higher land is *Spiraea pectinata*, and then the three heathers.

On the comparatively dry talus slope, vegetation starts under conditions of moisture in the early part of the season, but as the season advances the slope becomes better drained because most of the snow has melted and drained away. On such talus slopes the pieces of rocks that make up the talus carry as an inheritance the five lichens that were discussed above. Early on the talus there come two kinds of moss. As the moss dries out it may be covered by a lichen, *Crocynia*, which is sorediose, or by two other larger lichens, *Cetraria islandica* and *Cladonia pyxidata*. Sometimes one of the reindeer lichens is found also. A lichen, *Solorina arctica*, and another large green foliose lichen overwhelm the smaller lichens and the moss. Usually the lichen series is ended with a dense growth of fruticose lichens, among which may be mentioned *Stereocaulon tomentosum* and a reindeer *Cladonia*.

The moss and the lichens are followed by flowering plants, such as *Saxafraga tolmiei* and *Gentiana propinqua*. In other places the following flowers help to make a colorful mat rooted in the moss: *Sibbaldia procumbens*, *Saxifraga bronchialis*, *Pentstemon diffusus*, *Pedicularis scopulorum*, *Senecio pauciflorus*, *Oxyria digyna*, *Saxafraga lyalli*, and many others. A pioneer that grows around large stones that are imbedded in the talus is the mountain form of *Campanula rotundifolia*. *Silene acaulis* may also be a pioneer where the pieces of talus are close enough together.

Back from the herbaceous association there is found the same succession that I have already discussed, namely, *Spiraea pectinata* and the three heathers. *Phyllodoce empetriformis* is, therefore, the climax on the talus slopes that are well drained.

The last type of talus association that I wish to discuss is developed on very wet talus. In these places the melting snow keeps the slope wet during the entire summer. The water is below the surface of the talus and is moving downward all the while. On such places one finds the best development of the lupine fields of the arctic region. With the lupines and in the wetter places are quantities of *Trollius*. Several colors of Indian paint cup are found, too. Where it is very wet there are creeping willows. Back from such wet meadows where the talus is drier, one always finds

the regular succession of *Spiraea pectinata* and the three heathers. With the heathers there is a *Lycopodium* that is prominent.

We may say that no matter where the pioneers take hold and no matter what the pioneers may be the succession in the alpine is usually terminated by the three heathers of which *Phyllodoce empetrifolia* is the climax. Lower down the mountain, where the subalpine merges into the alpine, wind timber becomes the climax, and down in the subalpine the heathers are followed by *Rhododendron albiflorum* and *Veratrum viride*, and this association is followed by the alpine fir, mountain hemlock, and juniper.