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## 2. Description and general characteristics of the area

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### 2.1 Description and management of the area

Guberwald (near Schwarzenberg) lies on the north side of the Mt. Pilatus (2010m) in the cantone Lucerne. It ranges between 866 and 1006m elevation. It occupies 44 hectares area of the forest belonging to "Holzkorporation Malters-Schwarzenberg". Topographically, it ranges from plateau to steep slope.

All of the easily accessible forests in this area have since long been managed and timber is removed periodically. Hence their natural trend has been altered. But the forests on steep slopes have been retained as a natural measure against soil erosion. In 1895, forests belonging to the communities of Malters and Schwarzenberg were put under the administration of "Holzkorporation Malters-Schwarzenberg". Since then this corporation has been responsible for the management of these forests. In the late 19th century beech was not supposed to be a good forest tree. Therefore, foresters of the area cut beech trees and weeded out seedlings and saplings. Special efforts were made to plant spruce as it has more demand on the market.

Because of understanding of the disadvantages of a monoculture of spruce and of the beneficial effect of broad leaved trees in coniferous forests, the practice of cutting the old beech trees and weeding out seedlings and saplings was abandoned. On the contrary, attention was now being paid to further beech regeneration particularly in the coniferous stands. Therefore, young saplings were transplanted from the nurseries. Light conditions were improved in the crowded stands. As a result, percentage of broad leaved trees particularly that of beech increased from 1932 ( fig. 2 )

The present management of the Guberwald is based on the "management plan" worked out by LEIBUNDGUT et al. of the Institute of Silviculture ETHZ.

( For further details consult management plan of "Holzkorporation Malters-Schwarzenberg" 1962.)

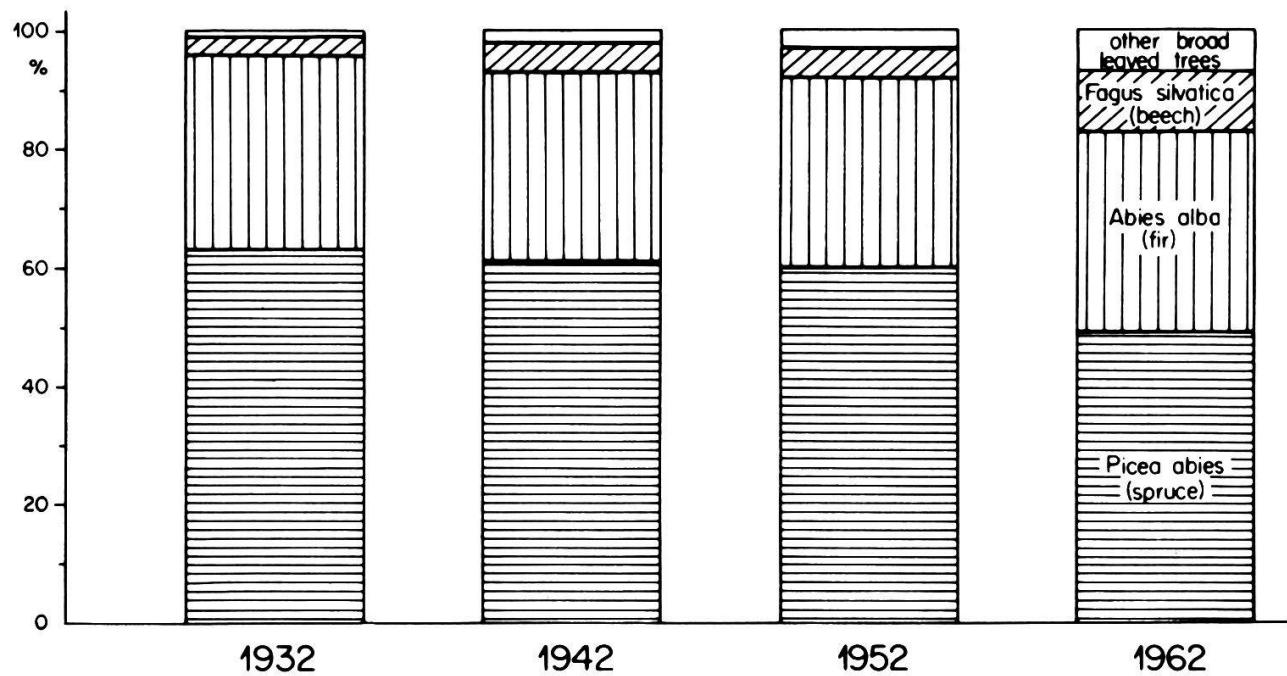


Fig. 2, Percentage of main trees in the Guberwald in different years. (From the management plan of the "Holzorporation Malters - Schwarzenberg 1962")

## 2.2 Climate and Geology:

### 2.2.1 Climate:

As a result of the wall effect of Mt. Pilatus the Guberwald area receives heavy precipitation during the whole year. Yearly mean rainfall amounts to 1800 mm of which 62 % falls in summer and autumn. Thus rainfall is well distributed throughout the growth period. Yearly mean temperature is  $5^{\circ} C$ , but extremes as low as  $-25^{\circ} C$  can occur in the month of February. Mean relative humidity remains in the range of 70 - 80 %.

The climate diagramme from Engelberg, which is at the same elevation and has nearly similar geographical location, is produced below (fig. 3) along with those from Lucerne and Mt. Pilatus.

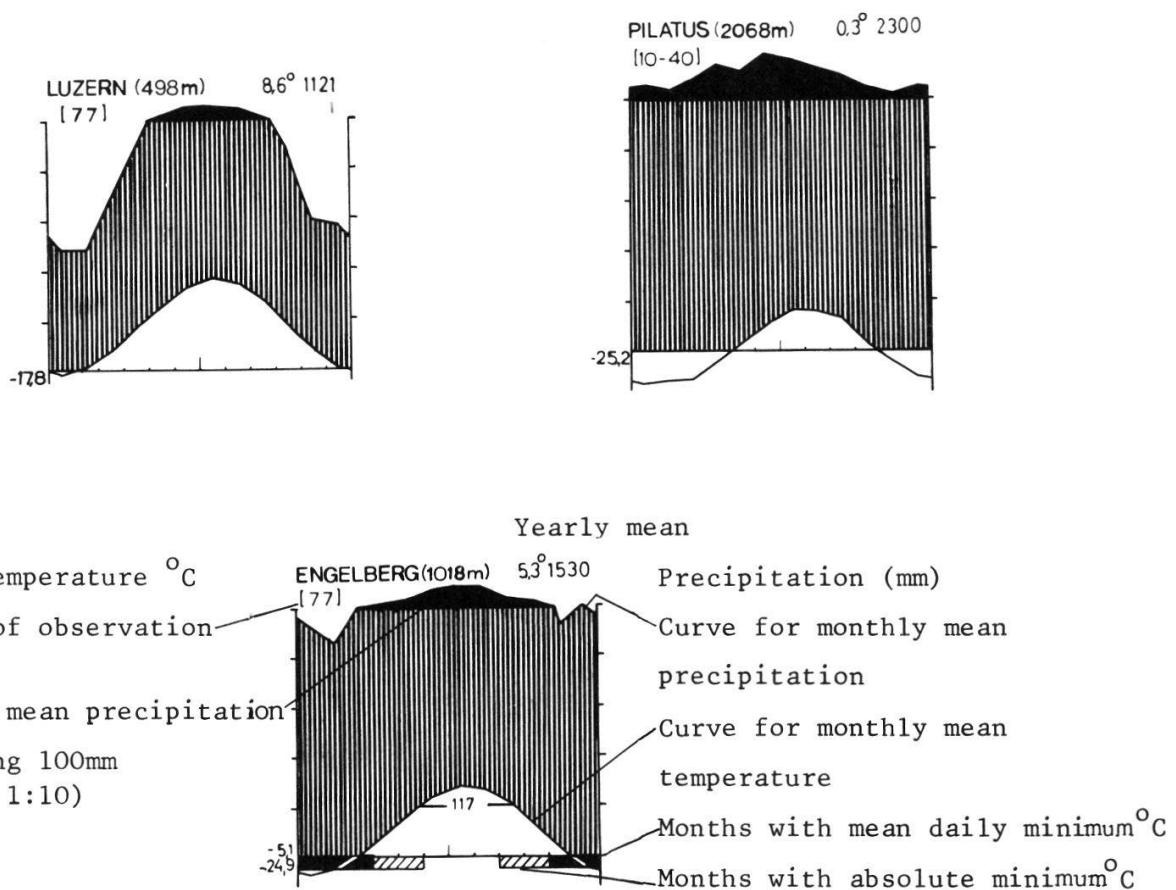


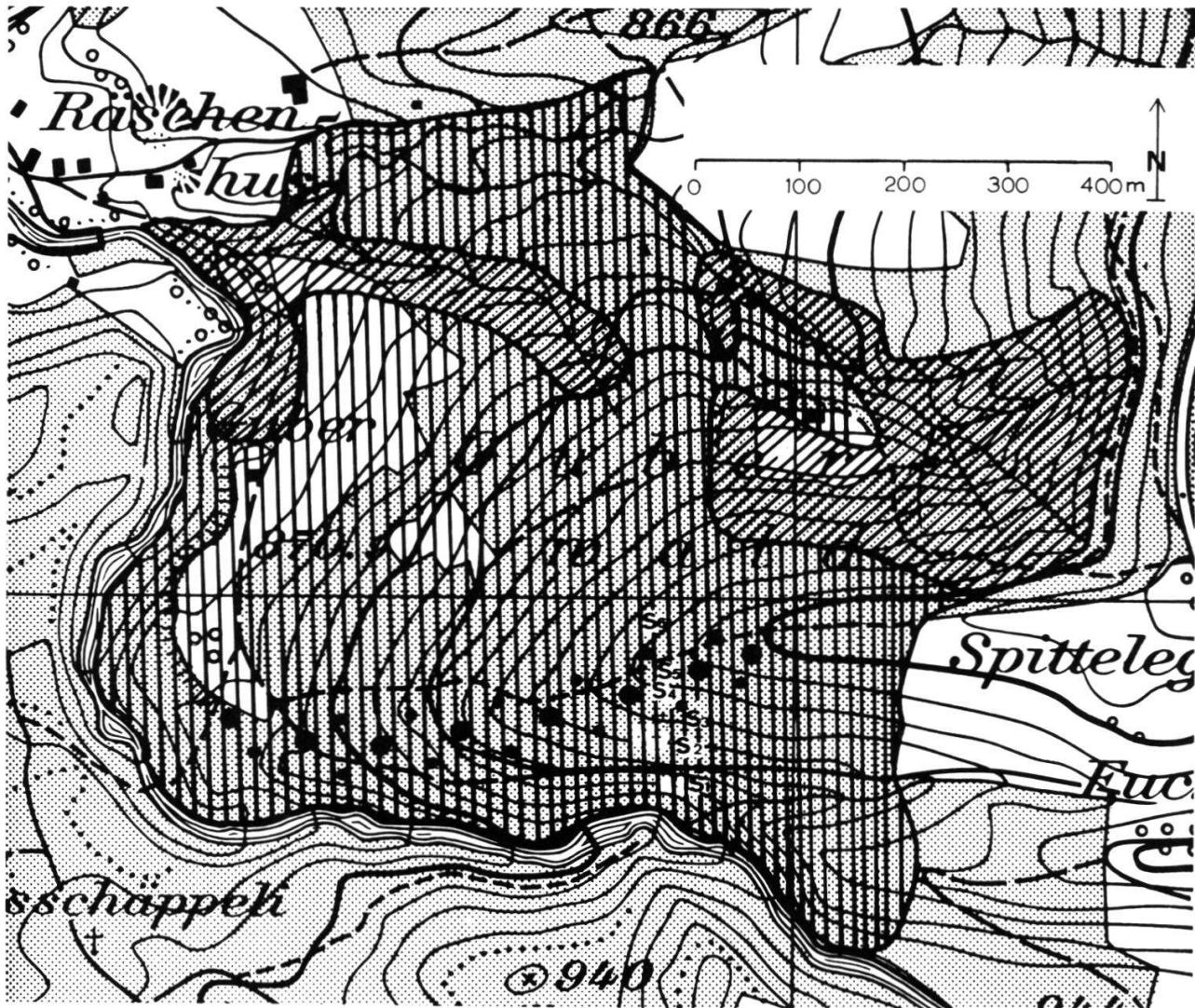
Fig. 3 , Climate diagrammes for Lucerne, Engelberg and Mt. Pilatus (from WALTER and LEITH 1960- 67).

## 2.2.2 Geology:

According to KOPP, BENDEL and BUXTORF (1955) the Guberwald area is composed of "Lower Süsswasser Molasse" (Aquitaniens), petrographically it is sandstone and gray or multi coloured marl ("Mergel").

During the glaciation period, the Reuss glacier and the Brünig branch of the Aare glacier surrounded Mt. Pilatus. Another glacier, the Eigenthal glacier started from Pilatus itself and was drained by the Rümlig river. These glaciers deposited their material in the area.

On most places the underground "Molasse" material is not visible except in the middle of the Guberwald where streamlets have eroded the surface material. Gray marl is the parent material of soil formation. In Hinterguberwald on the southern slope, the parent material is composed of non-calcareous sandstone while at the same slope, along the river Rümlig it is composed of a mixture of calcareous and non-calcareous sandstone. The ridge running down from Spitelegg into the Guberwald forms a morainic wall. (Fig. 4 )



S - Tensiometer station

|||||| " Wuerm moränen " from glaciers coming from the north side of the Mt. Pilatus.

■■■■■ " Untere Suesswasser Molasse ( Aquitanien ) " Granite sandstone or multicoloured marne.

●●● Morainic wall.

——— Erosion bank.

↙ Limits of Guberwald.

████████ Forest.

Fig. 4, Geological map of Guberwald (KOPP, BENDEL and BUXTORF 1955) also showing the locations of experimental stations.

### 2.3. Description of the experimental plots:

A general survey of the area revealed that the southern slope of a hill exhibits a variety of soils and plant communities. Therefore, this slope was chosen for detailed investigations. Suitable places were chosen for tensiometer installation as follows:

Tensiometer station 1 (Fig 4, 5): On the steep slope of the hill below the, brown-earth where beech dominates.

Tensiometer station 2: Above the station 1 on the slope, podsol where fir dominates.

Tensiometer station 3: Above station 2, on the slope, podsol where fir dominates

Tensiometer station 4: Above station 3, transition from podsol to  $A_1$ -pseudogley where fir dominates but beech also occurs.

Tensiometer station 5: Above station 4,  $A_1$ -pseudogley where fir dominates.

Tensiometer station 6: Below station 5, on slope,  $A_1/B_{v,g}$ -pseudogley where spruce dominates (plantation of spruce).

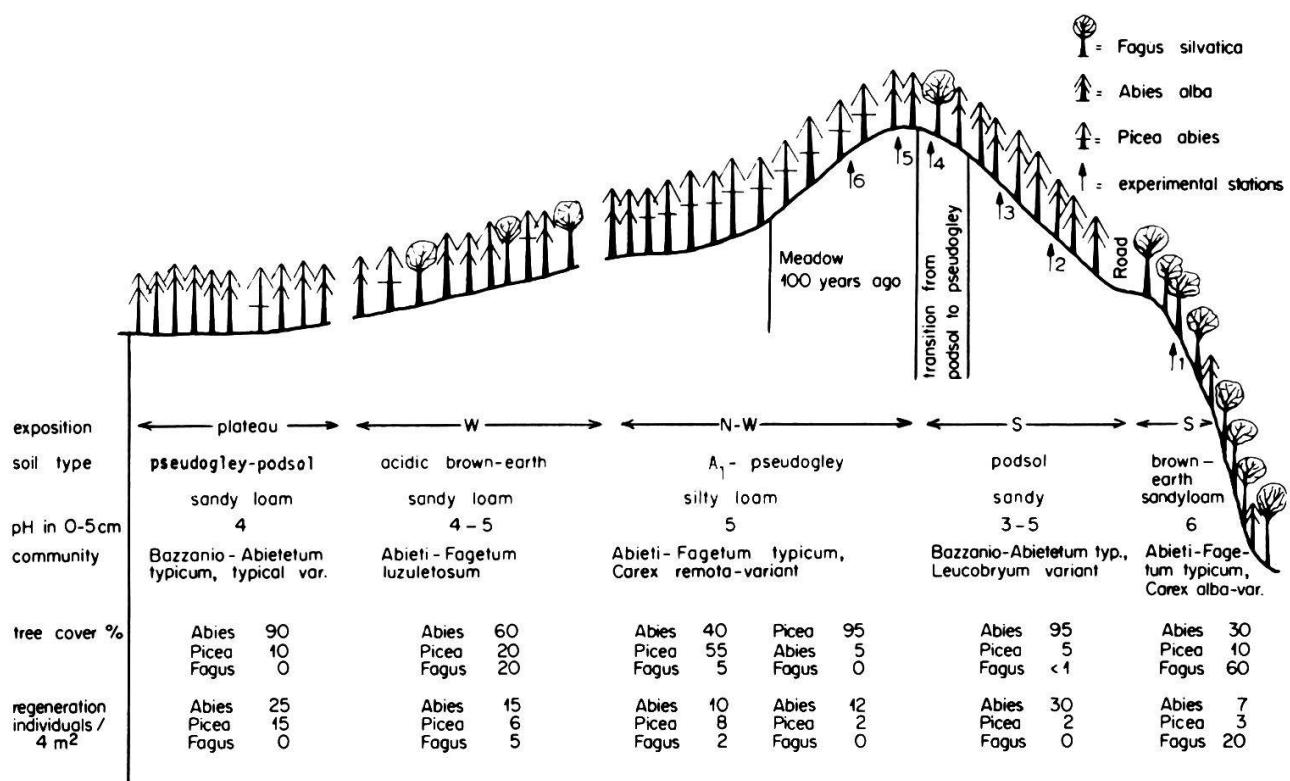


Fig. 5, Ecological conditions in Guberwald.