SOME MEDITERRANEAN FORESTS

I. The Forest of Bugeaud.

By A. P. THOMSON.

Introduction.

The Forest of Bugeaud, or more properly the Parc National de Sainte Croix de l'Edough, was the site of the 14th New Zealand Forestry Company's operations from September, 1943, to February, 1944. The forest is named from the nearby village of Bugeaud, a hill resort some 15 miles from the Algerian port of Bone. It forms part of the semi-continuous belt which clothes the upper slopes of the coastal ranges between Tunis and Algiers. The topography of these hills is generally steep and the altitudes go up to over 3,000 feet. The climate, typically Mediterranean, is characterised by prolonged dry summers and wet winters. On account of the high altitudes, the winters are relatively severe and heavy falls of snow are not uncommon. The annual rainfall varies from 25 to 40 inches and the humidity generally is high.

This coastal rainfall belt represents the optimum site for cork oak (*Qercus suber*) and most of the forests consist of pure stands of this species. Two other main types occur, maritime pine and *Chene Zeen* (*Quercus mirbeckii*). The former species covers quite extensive areas, particularly in the regions of Phillipeville aud Collo ; the latter is more localised and is to be found only in comparatively small pockets. The forest of Bugeaud was particularly interesting in that all three types were there represented in a relatively small area.

Cork Oak.

At Bugeaud the cork oak occurred in pure stands on the higher ridges and the higher southerly and south-easterly slopes. *Quercus suber* is typically associated with various shrub species and, on account of the open nature of the association, these tend to be well developed. Dominant amongst them were two species of heath (*Erica arborea* and *Erica scoparia*), the strawberry-tree (*Arbutus unedo*), two brooms (*Genista cardicans* and *Cytisus triflorus*), and a shrub olive (*Phillyrea* sp.). Other species which occurred were bracken (*Pteris aquilinum*), a buckthorn (*Rhamnus sp.*), the mastic tree (*Pistacea* sp.) and laurel (*Laurus nobilis*). In places there was a rank growth of *Diss* grass (*Ampelodesma mauritanica*). Wild violets and crocuses were not uncommon and there was a multiplicity of fungi, over 100 species being represented. Of the shrubs the most interesting undoubtedly was the tree heath, known to the French as *bruyere.* This is the briar of pipe fame and the forest of Bugeaud was one of the important sources of briar roots. The roots were gathered, boiled for 24 hours, cut into rough blocks called *ebouchons,* and exported in this form.

The village of Bugeaud had a small but very lucrative *ebouchons* industry. During their stay, the Forestry Company personnel were good customers.

In appearance the cork oak forests look something like a forester's bad dream. The trees are all short (30 feet high) and they are typically gnarled and misshapen. The general aspect is more of a collection of wolf trees than of a managed forest. Appearances, however, are deceptive, for cork oak represents one of the most profitable types of forest cover known and its exploitation is the major forest industry of Algeria.

Chene Zeen.

Quercus mirbeckii was a well-formed forest tree, 90-100 feet in height and with often 50 to 60 feet of clean round bole. Diameters averaged about 24 inches and went up to 40 inches. It is one of the "red oaks" and is notable mainly for the large size of the leaves, the shade forms of which were over 12 inches in length. The timber is strong and very heavy but is difficult to season.

Chene Zeen at Bugeaud occurred on the moister northern and eastern slopes. Generally pure, it was sometimes found in mixture with cork oak. There was a scattering of wild cherries (*Cerasus avium*) and in the gullies there were some alder (*Alnus glutinosa*) and laurel (*Laurus nobilis*). A few sweet chestnuts occurred, a fact which made the forest famous locally, for they represent one of the two known natural occurrences in Africa.

More gregarious than cork oak, Chene Zene produces a closed canopy, with little or no undergrowth. Bracken and the briars were sparsely developed and one or two species not associated with cork oak were to be seen, notably holly, ivy, a *Smilax* species and an Osmond fern. Diss grass also occurred. Generally, however, the shrub layer was absent and the forest floor was covered with a thick carpet of dead leaves. Because of this and the fact that the species is strongly light-demanding, there was a complete absence of regeneration, and of saplings and small poles.

Chene Zeen was reputed to displace cork oak after a fire, but no evidence of this was seen. On the contrary, cork oak showed great powers of vegetative recuperation following a very hot fire which occurred soon after the arrival of the Forestry Company.

Maritime Pine.

Pinus pinaster at Bugeaud was at the extreme southern limit of its range. Belying its name, it was there a montane species, although it occurred at lower levels than the two oaks. The stands were poor and very open. The trees averaged 15 inches in diameter, with a total height of under 50 feet. The length of merchantable bole was generally 20-25 feet, to a 6 inch top. The form was bad and the taper extreme. (There was possibly an historical reason for this as much taller stands with trees of quite normal form were seen in

other parts of Algeria). The undergrowth was very dense and was dominated by *Arbutus* and the *Phillyrea* spp. The heaths were not as strongly developed as in the cork oak association.

A small area was covered by a much younger age-class resulting from a fire in 1921. It consisted of a very dense stand of saplings some fifteen feet high and 1 inch in diameter. It was extremely overstocked, averaging more than 20,000 per acre. No thinnings had taken place, nor were contemplated. It was difficult to visualise how this regeneration could develop into any of the types of mature stands which were seen. In actual fact, the particular area in question did not get a chance as it was wiped out by the fire already mentioned.

Aleppo pine (*P. halepensis*), the characteristic species of inland Algerian forests, did not occur at Bugeaud.

History and Treatment.

The forest was created a National Park in 1931 and exploitation for sawn timber ceased from that date. This did not mean that it was left to stagnate or that it became sacred and inviolable. In fact, an intelligent management was prosecuted, particularly for minor forest products. Cork oak harvesting continued, as did light thinnings in the Chene Zeen stands, the thinnings yielding a useful supply of railway sleepers. On the other hand, protection measures were not adequate and periodic fires took their toll of the maritime pine areas. These would be followed by local Arab charcoal industries and it was therefore not surprising that the Arabs were sometimes accused of initiating the process. On private forests outside the National Park boundaries, some exploitation of maritime pine took place. The methods were primitive, using pit-saws for immediate conversion and bullocks for extraction of the sawn product. A few short logs also came out by bullocks.

The operations of the Forestry Company necessarily brought about many changes. In the small maritime pine stands a heavy selection was made and all trees large enough to be milled were taken. A light stand of trees mainly under 10 inches D.B.H. remained. It was hoped that these would be sufficient to restock the area and some eradication of the shrub layer was contemplated in order to make regeneration possible. The local Inspecteur, however, quite obviously did not expect to be able to prevent Arab fires, and knew well that after burning he would have no regeneration problem. The Chene Zeen forests were a more difficult proposition, since the marking had been determined by milling and not silvicultural considerations. The 48 inch breakdown saws of the portable mills meant that logs over 21 inch diameter could not be handled. The result was a forest in which all the poles and young mature trees had been removed, leaving a residual stand of mature trees insufficiently dense to form a canopy and unlikely to develop one. An early inducement of regeneration was thus a prime necessity. Regeneration, however, was not easy to get for two seasons. Firstly,

good seed years were very infrequent; secondly, as the slopes were so steep and the first winter rains so heavy, almost the whole of the acorn crop would be washed down into the cork oak and maritime pine belts below. The solution, as envisaged by the French foresters, consisted of this plan :—

(1) To graze heavily for 5—6 years, thus keeping the development of undergrowth to a minimum.

(2) Then to restrict domestic grazing and to shoot out the wild boar.

(3) To dig contour ditches at height intervals of 20 feet in order to impede the downward flow of water-borne acorns.

This plan obviously would have to be geared to a seed year. It was complicated by the fact that the periodicity was not known.

The royalties paid for the two species milled are interesting to note. Chene Zeen fetched 500 francs per metre cube, or about 25/- per 100 board feet at the current rate of exchange. Maritime pine was worth 150 francs per metre cube, or about 7/6 per 100 feet; while a stand of recently burnt pine was priced at only 86 francs or about 4/- per 100.

The Forestry Company cut 800,000 board feet during their stay, more than half of which was Chene Zeen.

Minor Benefits.

Perhaps the most interesting feature of the forest was the highly developed utilisation of all minor forest products. With the exception of about 20 species of inedible fungi, it appeared that all plant growth in the forest was used in one way or another to fulfil the needs of the Arab and French communities. The following list shows products which were collected and marketed during the time the Forestry Company was there :—

1. Sleepers from Chene Zeen.

2. Pip props, from the branches of both maritime pine and Chene Zeen. They were used in the phosphate and lead mines in the interior.

3. Firewood from the lop and top of any species and from pine cones.

4. Charcoal from lopped cork oak and maritime pine and, for particular purposes, from *Arbutus*, *Phillyrea* and *Pistacea*.

5. Pipe blocks from the roots of *Erica arborea*.

6. *Arbutus* berries for jam-making.

7. Edible fungi.

8. Wild flowers.

9. Brush from heaths and brooms for frost-prevention fires in the vineyards.

10. Acorns for domestic pig feed.

The major forest products, of course, were cork oak bark and (in war-time) sawn timber from Chene Zeen and maritime pine. The forest as well performed an important grazing function, supplying forage for both goats and cattle. It also supported a good population of wild boar and hence, in times of food shortages, a thriving black market. Added to all this were the very important indirect functions of erosion control and water conservation. Finally, as a scenic reserve it was widely used and appreciated by the townspeople of Bone. All in all, therefore, it was an excellent example of the integration of diverse forest benefits with the needs of a human community. Perhaps American foresters had it in mind when they coined the term "Multiple Use"; they could scarcely have found a better example.

SILVICULTURAL OBSERVATIONS ON A CENTRAL NORTH ISLAND BEECH FOREST.

By G. H. HOCKING and C. A. B. KENDERDINE.

The management of indigenous beech (*Nothofagus*) forests is assuming increasing importance and has already been discussed on several occasions in the pages of this Journal—see references at the end of this article. While there are silvical characteristics common to all *Nothofagus* forests, conditions vary and necessitate local modifications of silvicultural practices. It is not suggested that the following description of the Rangataua State Forest in the Ohakune District will closely resemble beech forests in other districts or that the treatments suggested will necessarily be applicable elsewhere.

General Description.

The Rangataua State Forest has a present area of 17,560 acres which may be increased to about 20,000 acres. It lies on the southern slopes of Mt. Ruapehu with an altitudinal range from 2,100 ft. to slightly over 4,000 ft. and is bounded on the north by Tongariro National Park, on the east by Karioi Forest of exotic conifers established on former tussock grassland, on the south by the Main Trunk Railway and on the west by farm land.

The bulk of the forest lies on the Rangataua Plain which extends eastwards to a belt of broken country up to 2 miles wide running south-east from the mountain; east and south of this broken country lies the Karioi Plain on which is some 2,500 acres of the north-east of the forest. Both plains consist in the main of continuous easy