the ground of one whorl at a height of 18–20 feet to allow the double ladder to be erected. Each pair of workers treats an average of 50 trees daily, and sometimes, where terrain is level and with little debris and slash, up to 80.

**Profitability**

What profit each tree or acre will return, through this treatment, is a source for argument and conjecture, and will probably remain so.

It would seem however that 40 or so of the trees treated will remain part of the final crop. On a rotation of 45 years each of these trees could yield additional clear timber as contained in a log 16 ft long of estimated 21 in. mid-diameter, with a knotty core averaging 10 in. The value of this timber as compared with that of an unpruned length containing bark-encased knots and cone-stem holes is likely to make the 3s. pruning cost a very paltry sum.

### NOTES

**HURRICANE DAMAGE IN NORTHLAND**

M. J. CONWAY*

An extract from the N.Z. Gazette 1959, No. 23, page 535 reads as follows:

A tropical cyclone which passed close to North Cape on the evening of 14 March 1959 caused widespread damage over the northern half of Northland. At Cape Reinga lighthouse the barometer fell to 963 millibars—the lowest ever recorded in the North Island. Winds from the north-east reached hurricane force, and a gust of 110 mile/h was recorded at Kaitaia aerodrome. Many buildings, including five churches and three halls, were destroyed by the wind, and power and telephone services were completely disrupted over a wide area. In the Kerikeri district much of the tree-tomato and citrus crop was destroyed.

The highest wind ever recorded in New Zealand was one of 126 mile/h. Fortunately the cyclone of 14 March passed west of the coast and wind strengths decreased to the south and east where the forests are located. Synoptic observations (namely, average of readings over a ten-minute period, in knots) show this general pattern:

<table>
<thead>
<tr>
<th></th>
<th>1200 hours</th>
<th>1500 hours</th>
<th>1800 hours</th>
<th>Midnight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cape Reinga</td>
<td>40</td>
<td>40</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>Kaitaia</td>
<td>30</td>
<td>35</td>
<td>35</td>
<td>—</td>
</tr>
<tr>
<td>Dargaville</td>
<td>30</td>
<td>35</td>
<td>35</td>
<td>—</td>
</tr>
<tr>
<td>Whangarei</td>
<td>20</td>
<td>25</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

*Forester, N.Z. Forest Service, Auckland.
**Exotic Forests**

Waipapakauri Forest, seven miles north-west of Kaitaia and the most northerly exotic forest in the country, suffered severely, approximately half of the millable radiata pine stand of 100 acres being affected. Swathes were cut through the forest, trees being broken off rather than uprooted.

Exotic stands in Waipoua Forest were virtually untouched, while at Omahuta only four acres were damaged. On the eastern coast Gleng bervie Forest was unaffected; but 40-year-old radiata pine on an exposed plateau at Puhupuhi Forest received the full force of the gale and 30,000 cubic feet of wind-thrown timber has been salvaged. Southern pines at Waitangi Endowment withstood the gale better than was expected, the main damage being to malformed stems, while the crops generally lost considerable foliage due to whipping. Losses of 1,000 cubic feet per acre—an insufficient quantity for economical salvage—were sustained in one or two compartments.

Owing to its position at the head of a gully a permanent sample plot in 17-year-old radiata pine was completely destroyed. Of more consequence was the harm done to 200 acres of 1955–58 plantings, as most of the trees were leaning and had to be straightened. Prompt action has probably reduced permanent damage.

**Indigenous Forests**

The full extent of wind throw in the indigenous forests has not been fully assessed, but interim reports indicate considerable local damage. Waipoua Forest, including the Sanctuary, was fortunately not affected, and only a few mature kauri were lost at Trounson Park. The well known Manginangina Scenic Reserve adjoining Puketi Forest was, however, hard hit, 50 mature kauri being uprooted and many others damaged.

Within Puketi Forest itself at least 90 kauri trees were blown down and a closer inspection will probably reveal further damage. Warawara and Herekino Forests suffered very little, but Omahuta Forest, including the Sanctuary, fared badly, with 280 kauris uprooted, mostly in stands logged 20 years ago. A feature of these windthrows is that many are unsound, with hollow butts.

It is estimated that throughout Northland, in the major forests and scenic reserves, nearly 600,000 board feet of kauri was blown down, but reports still coming to hand indicate that the quantity wind thrown or severely damaged will probably amount to 1,000,000 board feet, which is the current annual production of kauri from all sources. Unfortunately less than half of the timber affected can be salvaged at reasonable cost.

A feature of the damage to the indigenous forests was the much greater destruction of kauri compared with other indigenous species, the known volume of uprooted rimu, miro, and totara being only 30,000 board feet. Losses in kauri may be attributed to the emergent character of the species and to the driving effect of falling dominants.