SALVAGE OF A WINDTHROWN FOREST

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SYNOPSIS

During March, 1964, exceptionally violent north-west gales wrought havoc at Eyrewell State Forest on the Canterbury Plains. A forest geared to produce 2 million cu. ft a year was confronted overnight with the salvage of 40 million cu. ft of windthrown timber, mostly Pinus radiata between 32 years and 36 years old. Sales and production had immediately to be organized on a large scale to uplift as much timber as possible before it deteriorated.

INTRODUCTION

A description of Eyrewell Forest, together with its history and future possibilities, has been given by Wendelken (1966).

Until March, 1964, twenty men were employed in the bush at Eyrewell Forest. Logs were cut at the stump into lengths ready for sawmilling. The logs, in lengths between 10 and 20 ft, were then hauled to tracks prepared to give access for logging trucks. Wheeled tractors (20 to 50 drawbar horsepower) were used for hauling logs and these tractors fulfilled the requirements of handling small pieces (8 cu. ft) for short distances (1½ chains) over flat ground with a firm gravel base. Logs were left alongside the forest ride where they were uplifted by trucks fitted with their own log-loading device operated by a power take-off from the truck motor. One and a half million cubic feet of sawlogs a year were being produced in this manner and sold to 18 sawmillers on a "cash and carry" basis. These sawmills were not committed by agreement to purchase logs from Eyrewell. Half a million cubic feet of roundwood was also sold annually from the forest.

When 10,000 acres of forest were flattened by wind in March, 1964, production had to be increased drastically to salvage as much as possible of the 40,000,000 cu. ft involved. By September, 1964, sales and production had been boosted to a level of 14½ million cu. ft a year. At this stage, 280 men were employed in 62 bush gangs; almost half of the production was in lengths over 20 ft and crawler tractors had replaced wheel tractors as the main workhorse. This paper describes the problems concerned in salvage and the methods used to overcome them.

STARTING SALVAGE LOGGING

The first essential was to clear the 60 miles of forest roads and 30 miles of water-race that were blocked. The existing bush gangs, with their wheeled tractors, waded into the tangle covering the roads, and, because they did not have to cope with the uprooted

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stumps but merely with boles which had fallen across the roadway, they made good progress. The wheeled tractors were also able to work the fringes of the compartments. Labour and equipment were increased at this stage and, coupled with the benefits of working along roadways, this resulted in a rapid rise in production, which reached a level of 4 million cu.ft a year by 19 April 1964.

ORGANIZATION OF SALES

It was axiomatic that the speed of salvage would be governed by sales of produce. The outlook had continually to be to accept all sales however difficult the task of fulfilment might appear. This at least served to define a target. Because of the urgency of uplifting as much as possible in the shortest time, commitments rather frightening in magnitude were accepted. However, this was beneficial to the extent that it allowed no room for a pessimistic, dilatory, or unduly cautious approach.

Sales to Canterbury Sawmillers

An appeal was made to sawmillers, and those supplying sawmills with logs, to co-operate with the N.Z. Forest Service in ensuring that all efforts were concentrated on salvage. This meant that standing timber in Canterbury, irrespective of ownership, should not be felled so long as windthrown timber remained sound. The response of the timber industry and forest owners was wholehearted. The entire industry agreed to mill Eyrewell logs. The only exceptions were one or two sawmills already clearing windthrown timber from privately-owned forests that had suffered a fate similar to that of Eyrewell Forest, but on a smaller scale.

The response of the industry brought with it a complete re-organization of log supply to 43 sawmills throughout Canterbury. It was inevitable that such a major change brought problems frowning in its wake. Some sawmillers owned forests and employed bushmen. In other instances, logging contractors owned tracts of forest which they worked to supply several small sawmills. Yet again, farmers supplied logs, sometimes directly to a sawmiller but frequently to a logging contractor who then made his own arrangements to distribute the logs to one or more sawmills.

The physical requirements of satisfying, from Eyrewell, the needs of 43 sawmills between Kaikoura in the north and Waimate in the south were large enough. However, this also brought associated problems. Sawmillers in South Canterbury accustomed to road delivery would now have logs railed to the nearest siding. Bushmen, logging contractors and cartage contractors were now losing their customers. There was an obligation to see that such people were placed to best advantage in the team at Eyrewell, until normal work resumed. The solution of each of the physical problems had to take full cognizance of the associated and intricate financial pattern. A forest owner who desisted from cutting standing trees lost income; a logging contractor or a cartage contractor would have a similar plaint if his income dropped through any valid reason connected with the salvage operation; at the same time, care had to be taken to reject specious argument.

It is no wonder a number of financial posers were aired — they were to be expected. Throughout the numerous negotiations, forth-
rightness was usual, acrimony rare. It is to the credit of sawmillers, timber merchants, logging contractors, cartage contractors and forest owners in Canterbury, that good business relationships enabled obstacles to be removed so they did not hinder the progress of salvage and invariably made for speedy action.

The outcome is that Canterbury sawmillers and timber-treating plants have been able to accept produce from Eyrewell at the rate of 8 million cu. ft a year.

**Overseas Sales**

The volume of windthrown timber was such that even the impact of the concerted efforts of sawmillers throughout Canterbury was, in itself, insufficient. The possibilities of exporting sawlogs were explored with several overseas countries. After strenuous negotiations, both in New Zealand and overseas, a sale of Eyrewell sawlogs
to Japan was agreed. This sale, at a level of 4¼ million cu. ft a year, was a major contribution to the salvage.

The successful ventures into the log-exporting business had been hard won. The history of this trade listed a number of erstwhile exporters to testify that log exporting was a demanding business and one in which a multitude of influences could cause costs to soar beyond predictions. With this background, the problems associated with launching a trade, especially through a port not already engaged in this business, were not underestimated.

Exporting logs through Lyttelton proved impracticable at the time (July, 1964) and the logs sold to Japan were handled through the port of Timaru where excellent facilities were available.

Expert knowledge was obtained through a firm well experienced in the shipping of logs. This, together with the co-operation of the many organizations associated with the port of Timaru, was vital in ensuring that the log trade was not only successfully launched but that it continued to have a smooth passage to the satisfaction of the Japanese buyers and the Japanese shipowners.

Sales to Conical Hill Sawmill

The efforts of Canterbury sawmillers together with overseas sales enabled salvage to proceed at a rate of 12¾ million cu. ft a year. As a further boost, it was decided to supply logs to the Forest Service sawmill at Conical Hill in Southland. Each day 6,500 cu. ft of logs were taken by road to the railway at Kaiapoi and then transferred to railway wagons for the 328-mile journey to the sawmill. The contribution of Conical Hill Sawmill raised the level of salvage a further 1½ million cu. ft a year, making a total sale of 14¼ million cu. ft a year.

Fig. 2: The problem confronting logging gangs.
BUSH PRODUCTION

Loggers were confronted with a barrier of horizontal trees and upturned roots 8 to 10 ft high. Although wind damage had occurred on three different occasions, each a few days apart, trees were all lying in the one direction pointing away from the north-west. Trees had been uprooted, not broken, and the root plates were standing on edge, roots on the lower side retaining their place in the ground. Once the trunks were cut free at the stump, the root plates often toppled back into their former positions.

While it was obvious that larger tractors must supersede the small wheeled tractors, there was no unanimity among expert loggers regarding the most efficient equipment to meet the unusual conditions of working large-scale windthrown forest. In retrospect, it seems that lack of dogma regarding equipment and method of bush working was beneficial; it allowed even fanciful ideas to be put to the test. Collectively, contractors had a wealth of experience gained under widely-differing conditions; they also owned a miscellaneous collection of equipment of varying usefulness. Irrespective of previous experience or competence, it took several weeks to obtain efficiency in the peculiarities of logging windthrown forest.

With each contractor anxious to prove the utility (and sometimes the futility) of his own ideas, it was not long before the most efficient method of working windthrown forest became apparent to an unbiased and discerning eye. Once proven in practice, this pattern was universally adopted, although some contractors were more tardy than others in discarding their pet theories.

Method of Logging

The following method of work was proven and applied during the extraction of 21 million cu. ft of produce so far salvaged. For windthrown bush on flat country with firm gravel near the surface and a cheap supply of clean metal for roading the most efficient method is as follows:

1. Logging proceeds in the direction in which the trees have fallen, logs being hauled by the butt.

2. Access roads, usually 3 chains apart, are formed into the areas concurrently with logging. These roads are cleared to a width of 14 ft.

3. Bays for stockpiling and subsequent loading are cleared along the access road. The distance between bays varies from 5 to 10 chains. In some instances, a continuous clearing 50 yards wide is used instead of separate bays.

4. The formation of roads and landings to a suitable standard is included as part of each logger’s contract.

5. Necessary roads and landings are metallled at the expense of the forest owner.

6. A saw cut is made near the upturned root to sever the bole. Tension in the trunks of the uprooted trees necessitates undercutting to prevent splits running up the log.

7. Logs are hauled in tree lengths an average distance of 5 chains to the landings. This enable tops and debris, as well as saw-logs, to be continually cleared from the working face.
Fig. 3: The tangle through which new logging roads and landings had to be formed.
(8) Ninety-five cubic feet form an average load which is hauled by a class 2 (41 to 60 draw-bar horsepower) crawler tractor fitted with a blade, logging winch and, where available, a logging arch.

(9) Tree lengths are cut into logs and trimmed at the landing preparatory to being "fleeted" into stacks when the tractor returns with its next haul.

(10) Discarded tops are pushed into a heap alongside the log landing; posts and chipwood are frequently retrieved from the accumulation of these tops.

The cost of a typical operation as described is 6.1 pence per cubic foot for logs placed in heaps at the landing. This includes payment for forming the roads and landings.

A few contractors tried hauling with winches, using a high lead, but these were not as efficient as tractors for Eyrewell conditions. Although crawler tractors were the ones most commonly used, it is worth recording that a rubber-tyred unit specifically designed for logging performed exceptionally well at Eyrewell. The machine was a Garrett Tree Farmer which relished the flat ground and firm footing. This unit regularly hauled 2,000 cu. ft in an 8-hour day.

The early qualms of having to rely upon a large number (52) of comparatively small, independent contractors to meet the heavy commitment of 14 3/4 million cubic feet a year proved unfounded. A lesson has been learnt in how effective a group of small contractors can be in collectively meeting work programmes at a realistic cost. Capital investment and overheads are kept to a minimum and surprisingly consistent outputs result from equipment being handled by operators with a financial interest in the mechanical plant being used.

Quality Control

Contractors were given written specifications with which the particular type of produce had to comply. Every contractor had an identifying sign and it was his responsibility to ensure that this was marked on every sawlog. Logs were not tallied unless this had been done. To ensure that produce was prepared in the bush to as high a standard as possible, staff who were log scaling were trained to closely examine all material before it was measured for contract payments. Whenever quality was in doubt, the material was not tallied until it had been inspected by a more senior officer. If the produce was unacceptable, the contractor was shown why; tally and payment were then deferred till the faults had been corrected. This action was essential not only to ensure that the standards were up to those expected, but also to ensure that the efficient contractor did not become disgruntled at the increasing earnings of a slipshod neighbour. Every contractor knew the conditions of work of other contractors and all were alert to ensure any advantage gained by one was extended to themselves. Any concession to one contractor, albeit inadvertent, created the potential for a rapid spread of discord. This in no way maligns the contractors, as one who did not zealously safeguard his own rights in relation to his competitors would not be long in the contracting business.
Fig. 4: The pattern of logging showing extraction tracks following the direction in which the trees have been thrown.
If ever there was a situation where harmony depended upon justice not only being done, but also being seen to be done, this was it.

**Log Loading**

A scarcity of good loaders resulted in many ingenious adaptations especially in the early stages of salvage. The methods tried for loading logging trucks consisted of:

1. Jib-type loaders with rope and log scissors.
2. Jib-type loaders with log tongs, operated by compressed air.
3. Jib-type loader fitted with a log grapple.
4. Jib-type loader with a "heel boom" and single log scissor.
5. Front-end loaders (rubber-tyred) fitted with a hydraulic log unit.
6. Jib units mounted on the truck and using single log scissors—operated by a power take-off from the truck motor.

For handling short-length logs (up to 20 ft), the loaders mounted on the truck were the most versatile and suitable for the small loads carried. It was possible to load 240 cu.ft, a truckload, in 20 minutes working from one stack. For handling long-length logs (up to 40 ft), front-end loaders with rubber tyres enjoyed the flat, firm terrain at Eyrewell. The greatest advantage of these units was their mobility, coupled with the fact that they commenced loading as soon as they arrived at the landing—there was no time lost preparing for work. These machines loaded 20,000 cu.ft in a 10-hour day from five different compartments with an average distance of one mile between compartments. A truckload of 850 cu.ft was frequently completed in 10 minutes. Identical front-end loaders were used at Timaru. Here, as well as unloading every road truck and railway wagon, they carried logs from stockpile to the ship's side.

**Safety to Workers**

The safety of workmen employed by contractors was legally the responsibility of the respective employers, not the Forest Service. However, there was a heavy moral responsibility on the Forest Service to ensure that safe working practices were adopted, especially on this unusual work. As the Forest Service was without legal liability, it lacked legal authority, the Department of Labour being the authority that inspects and controls the safety of the bush work of private contractors. The Department of Labour gave valuable assistance at Eyrewell. Nevertheless, as "Johnny on the spot", it behoved the Forest Service to keep an eagle eye on bush safety. Forest Service staff gave continual verbal advice to both contractors and their workmen regarding safety. This became a normal and accepted function of supervising operations. The most common accident was that associated with the rapid movement of tree lengths when suddenly released from tension. Even with experience, this remained the greatest single risk because the direction of movement among the tangle of fallen trees was unpredictable.
Work Study and Contract Prices

The role of work study is well known. This function was put to excellent use in studying methods and determining contract prices for the multiplicity of operations at Eyrewell (King, 1964).

(1) Sawlogs were cut to sawmill lengths (from 10 ft to 20 ft) in the bush.

(2) Export logs were cut in 13 ft, 20 ft, 26 ft and 39 ft lengths.

(3) Sawlogs for Conical Hill Sawmill were cut in 16 ft, 18 ft, 32 ft and 36 ft lengths.

(4) Poles in 18 ft, 20 ft, 26 ft and 28 ft lengths were cut in accordance with the rigid specifications of the N.Z. Post Office.

(5) Logs suitable for peeling were cut to length and segregated in the bush.

(6) A particleboard factory relied upon Eyrewell for its entire supply (30 cords a day) of raw material.

(7) Posts and stockyard rails were cut for timber-treating plants.

Soundly based contract prices were prepared for all operations. These prices, besides having to allow for the variety of material being cut, had to make additional allowance for the size and volume of available material, which varied from one area to another.

The aim of the Forest Service was to set contract rates that were fair to both the contractor and the Department. As proof of this intention, the detailed work-study calculations on which rates were determined were available to contractors. If any contractor thought his earning capacity was lower than expected, the work-study information was analysed with him to pinpoint the reason. Accurate work study also ensured fair relativity between the earning potential of contractors on different operations. This prevented the balance of production being upset by an ungainly scramble for work of a particular type; it also ensured that contractors would willingly change from one job to another as required.

LOG TRANSPORT

If cutting the produce in the bush was one problem, moving more than ¼ million cubic feet a week was another. Again, the difficulty was aggravated by the diversity of produce and the many destinations, together with the fact that both road and rail transport were being used. Small wonder that 36-ft logs being railed to Conical Hill Sawmill caused caustic comments regarding incorrectly cut lengths when they inadvertently arrived amongst a group of 39 ft export logs at Timaru wharf! Likewise, the remarks of an operator of a timber-treating plant regarding the poor quality of posts hardly bear repeating — the cartage contractor had mistakenly delivered a load of chipwood!

The only way in which the required volume could be moved was by the services of numerous local cartage contractors. With cartage, as with bush production, the complication of dealing with, and the qualms of relying upon, many (24) independent contractors had to be accepted. Again, however, there was the benefit that capital
investment and overheads were kept to a minimum. Collectively, Canterbury cartage contractors combined to meet a demand which at one time appeared far beyond their united capabilities—and they did this at a realistic price. For instance, the cost of cartage to Timaru was 1s. 1d. a cubic foot, for a round-trip distance of 260 miles. The route was certainly ideal for haulage, being class I and flat.

Canterbury sawmillers have traditionally been supplied with logs cut in the bush to meet the length requirements of the sawmill, the requests for specified lengths varying in accordance with timber orders. This had to continue. Further, most Canterbury sawmills have only a small space for holding logs, their capacity frequently being no more than the equivalent of one day's cut. Therefore, although the volumes to be supplied to individual sawmills were not frightening, the maintenance of a regular delivery was; it was even more imperative than is the case when feeding larger mills that have comparatively better storage space for logs. Up till now (December, 1965) no sawmills have run out of log supplies, although some have come uncomfortably close to doing so on occasions.

Life at Kaiapoi Railway Station was violently disrupted when road trucks started arriving from Eyrewell with 20,000 cu.ft of logs each day for onward transmission by rail. The yard had never been designed to handle logs, let alone 20,000 cu.ft a day. The sidings became congested as logs were loaded at sidings which were also being used by coal merchants, freezing works and those handling general cargo. Space was only one of the facilities at a premium. Different lengths of logs required different types of railway wagons. Frequently wagon requirements could not be fulfilled, and when they were there remained the problem of restricted manoeuvrability through inadequate railway marshalling service. These inherent problems caused the flow of logs by rail to falter in the initial stages. However, the New Zealand Railways improved facilities by laying an additional marshalling track, providing a diesel shunting engine and increasing staff, with the result that 20,000 cu.ft of logs were soon passing through Kaiapoi every day in an uninterrupted flow—something that had hitherto seemed impossible.

The transfer from road to rail was in no way eased by the use of railway wagons which were equipped with wooden side stanchions never designed for the speedy loading of logs. The temporary nature of the salvage precluded obtaining more suitable wagons. Loading railway wagons had therefore to be much more precise and delicate than the customary handling of logs, especially as these wagons had to be loaded in accordance with the understandably rigid safety specifications for travelling at speed along the South Island Main Trunk Line. Loading was therefore slower than might otherwise be expected.

Short logs (up to 20 ft) were loaded one at a time by an overhead gantry. Long logs (up to 40 ft) were loaded by air tongs or a jib-type loader with log scissors. On occasion, a loader breakdown at Kaiapoi resulted in front-end loaders travelling from Eyrewell to load railway wagons, which they managed to do quite successfully. The cost of unloading logs from road trucks into stockpile and reloading on to railway wagons was one penny per cubic foot.
MAINTAINING BALANCE BETWEEN PRODUCTION
AND SALES

Initial Planning — Build-up Period

For salvage of the magnitude of that at Eyrewell, a large-scale operation has to be organized on a temporary basis, and without the advantages of a planned increase in tempo to meet clearly defined objectives. The cart is before the horse in that salvage is already under way, while sales, which determine objectives, have still to be negotiated. Bush production must not exceed sales, yet there is the ever-present possibility that an additional sale may call for a sudden increase in production. As an example, the sale of logs to Japan was agreed to during the second half of June. The first shipment was scheduled for July, and by September this trade had to be proceeding at a level of 4½ million cubic feet a year. Similarly in June there were no telegraph poles being cut, but once contracts had been let by the N.Z. Post Office, there were orders for 13,000 poles. These had to be supplied before the end of December. Such fluctuations, coupled with the lack of permanence of the entire operation, rendered it impossible to give contractors assurances regarding either quantity or duration of work. In turn, this meant that contractors could not be expected to place themselves under any obligation regarding output or duration of their stay at Eyrewell. It was natural for contractors to be more content if they had an abundance rather than a shortage of work. For this reason, a calculated risk had always to be taken regarding the number to be engaged during the build-up period, and this always erred on the conservative side. At times, this approach resulted in inordinately heavy demands being made on the capacity of contractors already at Eyrewell, who, nevertheless, responded by working long hours and on occasions for seven days a week.

Maintaining a Balance

Once the sales possibilities had been exhausted and the necessary level of bush production established, the emphasis moved to one of maintaining a balance between the many different items for which the individual demands changed from time to time. The demands of the 40-odd local sawmillers fluctuated in both volume and the lengths of logs to be cut; shipping for export was at variance with schedules; preservative plants, the plywood factory and the plywoodboard factory all had whimsical requests. Production, which itself suffered involuntary fluctuations because of weather and mechanical breakdowns, had to be continually attuned to the changing demands of the customers.

The export trade presented its own peculiarities. The actual arrival time of ships frequently differed from that planned, some ships being two weeks ahead while others were a similar time behind schedule. While this upset the uniform flow of logs, even greater surges were caused by the last minute demands of a particular ship for an unexpected volume of one of the four length-classes of logs. Ships loading at Timaru were mostly strangers to the New Zealand coast, which meant that estimates for the volume required in each length-class of log were based solely on drawings. When a ship arrived in port, inspection of its layout often meant an
appreciable and immediate change in the volumes of logs of each length-class required for good stowage. It was imperative to have bush work and transport geared to meet these sudden changes, especially when confronted with the possibility of paying for dead freight to Japan or demurrage at £350 a day, if the right length of log was not at the right place, the ship's side, at the right time.

Therefore there had to be sufficient flexibility to divert contractors from one line of production to another as the emphasis changed. In anticipation of this, the work-study section were asked to prepare contract prices for alternative lines of produce from the one area of windthrow. The results of this work study enabled a smooth changeover, with detailed prices and specifications already prepared for the contractor. Flexibility was further improved by having a stockpile of the various items. The objective was to have the equivalent of one week’s production on hand at all times. Produce that ran the risk of being left in stockpile longer than a week was sprayed with anti-sapstain solution soon after the logs were cut. This applied in particular to logs for export.

Only by ensuring sufficient flexibility was there any hope, on the one hand, of meeting the various commitments, while, on the other hand, avoiding over-production and consequent waste.

STAFF ORGANIZATION

Soon after salvage started it became apparent that production was outstripping ability to measure all the material. The contract therefore stipulated that bush gangs measure their own produce and mark the dimensions on each piece. This log scaling was subsequently checked by Forest Service staff before the material was tallied for payment. Cartage contractors, sawmills, and the Japanese buyers also checked the accuracy of measurements in their own interest, so that mistakes had little chance of escaping detection.

Even with this streamlined log scaling it would have been a luxury, in the circumstances, to have staff whose sole activity was measuring logs. Therefore, as mentioned, staff were trained to be capable not only of measuring the size but also of assessing whether the quality of produce was according to specifications.

This dual function was necessary for all facets of the operation but particularly for the production of roundwood where the assortment of small pieces involved much detailed work. The dimensions varied for different classes of posts, strainers, stays, rails and poles, as did the orders for each item.

The only way by which the efforts of available staff could be stretched to cover the two time-consuming but vital tasks of keeping check on both the volume and quality of produce was by combining the work. Although this system evolved through necessity it has been beneficial, not only in making the best use of staff, but also in giving them a more responsible job with a wider interest than is possible if their activity is confined to the mechanics of measuring logs. The log scalers also handled the daily detail of organizing and directing logging trucks and loaders within their own sphere of responsibility.

This allocation of duties enabled the entire production to be effectively controlled by the following staff.
(1) Sawlogs for Canterbury

Seven million cubic feet a year, produced by 26 bush gangs, in lengths ready for sawmilling; dispersal to 43 sawmills.
Control—One forest ranger and four assistants.

(2) Logs for Export

Four and three-quarter million cubic feet a year, produced by 13 bush gangs; sent by both rail and road to the port of Timaru.
Control—One forest ranger and three assistants.

(3) Smallwood

One million cubic feet a year, produced by 20 bush gangs, in small piece sizes, to a variety of specifications.
Control—One forest ranger and two assistants.

(4) Conical Hill Supply

One and a half million cubic feet a year, produced by three bush gangs; delivered by rail.
Control—One forest ranger.

TIMBER QUALITY

As a result of the salvage, almost every piece of sawn radiata pine coming on to the Canterbury market originated from Eyrewell logs; the building industry was thus presented with a uniform product. It would be no mis-statement to say that one of the bugbears previously restraining the use of radiata pine in Canterbury had been the variability of sawn timber. The raw material had been gathered from many sources of widely-differing quality and timber grading, which could have ensured that builders received an article of consistent quality, had been lax and in many instances absent.

Timber grades cut from Eyrewell logs were: Factory, 1.2%; Dressing, 6.2%; Merchantable, 25.9%; No. 1 framing, 35.9%; No. 2 framing, 3.5%; Box, 11.8%; Miscellaneous, 15.5% (e.g., railway sleepers and special orders. At least half of this would have been suitable for No. 1 framing). (Results based on the grading of 8,450,000 bd. ft.)

The inherent quality of the logs, especially for framing, helped create a favourable climate for increased demand, and coinciding as it did with a mild building boom, resulted in a sharp increase in the amount of sawn radiata pine coming on to the Canterbury market. The Canterbury acceptance of radiata pine, which was at a level of 34 million board feet a year immediately before the windthrow, rose to a level of 44 million board feet a year during the first six months of the salvage and continued at this, or even a slightly higher rate.

While the quality of Eyrewell logs was beneficial to both the industry and, in turn, the speed of salvage, there were also drawbacks. Some of the more attractive shelterbelts had supplied a percentage of wide boards of high grade, sufficient for specialized uses such as glue lamination. Such boards were not available from
Eyrewell logs. Similarly, the lack of really large logs from Eyrewell complicated the production of railway sleepers, a commitment that had been accepted by sawmillers before the windthrow.

In spite of 1964 being the driest of the last 49 years (19.63" in. of rain at Eyrewell compared with an annual average of 36 in.), windthrown trees with some of their roots still in the ground stayed alive. About 85% of the trees were in this category, the roots of the other 15% having parted from the ground when blown over. Apart from minor incidences of sapstain, all timber remained sound until the spring of 1965 when sapstain increased and became a matter for concern. The trees most affected comprised the 15% where contact between roots and soil had been severed. Therefore, a “filter” was introduced whereby logging gangs scrutinized all logs, discarding in the bush any that were sapstained. Inevitably, a few sapstained logs escaped detection and arrived at sawmills, where the resultant timber had to be culled. Sometimes this timber was relegated to a lowly and suitable use while in other instances it was destroyed.

Throughout the salvage, care has been taken to ensure that unsound timber was not marketed, to avoid jeopardizing the future of the radiata pine trade in Canterbury.

AMOUNT SALVAGED

Of the 10,000 acres windthrown, stands covering 7,000 acres were flattened, while 3,000 acres comprised partial damage scattered amongst stands where a preponderance of trees remained standing. The assessed volume windthrown was 40 million cubic feet to a 6-in. top, of which 28 million cubic feet was contained in the 7,000 acres that were flattened. This 28 million cubic feet to a 6-in. top contained 24 million cubic feet to an 8-in. top. During the salvage, sawlogs were cut to an 8-in. small-end diameter. As 21 million cubic feet have already been salvaged (December, 1965), only 4 million cubic feet to an 8-in. top remain to be uplifted from the 7,000 acres that were flattened. Work will then move to the partially-damaged stands where sound windthrown trees will continue to be salvaged in conjunction with the felling and logging of standing trees.

CONCLUSION

Increasing bush production in a matter of 20 weeks from a level of 2 million cubic feet a year to a level of 14½ million cubic feet a year is no small task, even under normal conditions. The task is magnified when there is no warning and when it must be accomplished under the exceptional conditions of logging a windthrown area of forest with whatever equipment can be gathered at short notice.

Little could have been achieved without the combined support of sawmillers, contractors, shipping interests, local bodies, and other government departments. Such an assembly brought together strange bedfellows. Of the many organizations and firms involved, there were naturally some with an existing background of business rivalry, at times approaching conflict. At the same time, there was an array of knowledgeable talent to be tapped. Indeed, once early discord had been removed, a concerted attack could be directed at the problems of salvage, and it was thanks to this onslaught.
that technical difficulties, which at first sight appeared insurmountable, were overcome.

This harmonious co-operation was a highlight of the salvage. Without it, much of the time and energy of all concerned could so easily have been dissipated in the negative occupation of arguing, rather than in the positive occupation of making better progress with the salvage, on a job where time was truly "of the essence".

The outcome is that 21 million cubic feet of windthrown timber has now been salvaged (December, 1965), with payments for the sale of this produce amounting to almost £1,250,000.

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REFERENCES


APPENDIX

Analysis of a Typical Logging Operation

To Produce:

Logs in 16, 18, 32 and 36 ft lengths with a minimum small-end diameter of 8 in., for Conical Hill Sawmill, Southland.

From:

Eyrewell State Forest Compartment 44, averaging 143 merchantable windthrown stems per acre yielding 3,960 cu. ft of sawlogs.

Gang Size:

Four men.

Equipment:

Caterpillar D4 crawler tractor (or equivalent) extracting 95 cu. ft each haul, an average distance of 5 chains.

Load:

An average per haul of 3.34 tree-lengths, each containing an average merchantable volume of 27.7 cu. ft.

Average Cycle Time:

19.21 minutes at 100 performance rating.

Daily Output:

2,380 cu. ft at 100 performance; 2,080 cu. ft at 87.5 performance.

Roads:

Form access roads to a width of 14 ft and clear log landings with adequate space for loading trucks.

Log Measurement:

Measure and mark the length and small-end diameter on every log, together with the identification sign of the contractor.

Payment:

6.1 pence per cubic foot for logs placed in stacks at the landings.