PRELOGGING

in the

DOUGLAS FIR REGION
A Typical Prelogged Area
PRELOGGING IN THE DOUGLAS FIR REGION

by

Floyd J. Lyne

A Thesis
Presented to the Faculty
of the
School of Forestry
Oregon State College

In Partial Fulfillment
of the Requirements for the Degree
Bachelor of Science
April 1948

Approved:

[Signature]
Professor of Forestry
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Definition of prelogging</td>
<td>1</td>
</tr>
<tr>
<td>Object and scope of thesis</td>
<td>1</td>
</tr>
<tr>
<td>Importance of prelogging</td>
<td>1</td>
</tr>
<tr>
<td>Sources of data</td>
<td>1</td>
</tr>
<tr>
<td>Summary</td>
<td>2</td>
</tr>
<tr>
<td>Development of prelogging</td>
<td>2</td>
</tr>
<tr>
<td>Problems encountered</td>
<td>2</td>
</tr>
<tr>
<td>Products harvested</td>
<td>2</td>
</tr>
<tr>
<td>Methods and equipment</td>
<td>2</td>
</tr>
<tr>
<td>Development of prelogging</td>
<td>3</td>
</tr>
<tr>
<td>Prior to World War II</td>
<td>3</td>
</tr>
<tr>
<td>European forestry</td>
<td>3</td>
</tr>
<tr>
<td>American forestry</td>
<td>3</td>
</tr>
<tr>
<td>During and after World War II</td>
<td>4</td>
</tr>
<tr>
<td>Problems encountered in prelogging</td>
<td>4</td>
</tr>
<tr>
<td>Market conditions</td>
<td>4</td>
</tr>
<tr>
<td>Material harvested</td>
<td>5</td>
</tr>
<tr>
<td>Scaling methods</td>
<td>5</td>
</tr>
<tr>
<td>Storage</td>
<td>5</td>
</tr>
<tr>
<td>Road investment</td>
<td>6</td>
</tr>
<tr>
<td>Products harvested in prelogging</td>
<td>6</td>
</tr>
<tr>
<td>For salvage purposes</td>
<td>6</td>
</tr>
<tr>
<td>For silvicultural reasons</td>
<td>7</td>
</tr>
<tr>
<td>Thinning</td>
<td>7</td>
</tr>
</tbody>
</table>
Sanitation

Methods and equipment

Logging

"Bunching" tractor

"Peanut picker"

Tractor-mounted tower

Portable spar

A-frame sled

Tower mounted on arch tracks

Loading

Standard loading equipment

Conveyor loader

Wheel-mounted loaders

Pre-loader

Transportation

Standard log trucks and trailers

Truck, railroad, and water

Conclusions

Bibliography

Figures

1. "Bunching" Tractor

2. "Peanut Picker"

3. Tractor-Mounted Tower

4. Portable Spar

5. A-frame Sled
<table>
<thead>
<tr>
<th>Figures</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Tower Mounted On Arch Tracks</td>
<td>13</td>
</tr>
<tr>
<td>7. Shovel Loader</td>
<td>15</td>
</tr>
<tr>
<td>8. Converted Lima Shovel</td>
<td>16</td>
</tr>
<tr>
<td>9. Pre-loader</td>
<td>17</td>
</tr>
<tr>
<td>10. High Stakes</td>
<td>18</td>
</tr>
<tr>
<td>11. Unloader</td>
<td>19</td>
</tr>
<tr>
<td>12. Steel-Strapped Hemlock On Railroad Car</td>
<td>20</td>
</tr>
<tr>
<td>13. Packaged Hemlock In The Water</td>
<td>21</td>
</tr>
</tbody>
</table>
INTRODUCTION

Definition of prelogging

Prelogging consists of the advanced harvest of the dead, dying, deformed, and suppressed trees for salvage purposes and the cutting of poles, piling, and saplings in overstocked areas in order to get accelerated growth on the remaining trees. 8

Object and scope of thesis

This paper, an informative report, discusses the development, problems encountered, products harvested, and methods and equipment used in prelogging.

Importance of prelogging

Prelogging is another step towards that final achievement, the closest possible utilization of our forests, and as such deserves recognition of its importance in the over-all picture of forestry. As the remaining old-growth forests are cut and cutting becomes more prevalent in our second-growth forests, prelogging will play an important part in bringing to market large quantities of material that would otherwise be left in the woods and lost. This will mean closer utilization and more profit to those companies and individuals practicing forestry--profit, not only in immediate remuneration for their labors, but in an increased yield of the final harvest of their timber crop.

Sources of data

The information contained in this report was obtained
from various trade journals relating to forestry and through correspondence with the logging superintendents of several logging companies.

**SUMMARY**

**Development of prelogging**

Prelogging had its earliest beginnings in European forestry, but it wasn't until World War II that it became important in this country. During this war, government restrictions in this country forced pulp companies, to which goes the major portion of the yield, to subsist on smaller sized material; and prelogging, being designed to handle small material, came into prominence.

**Problems encountered**

Market conditions, special equipment for handling small material, scaling methods, storage, and road construction are the chief problems encountered in prelogging, but with adequate planning and ingenuity in devising machinery, these obstacles can be overcome.

**Products harvested**

The products harvested fall into two groups, for salvage purposes and for silvicultural reasons. All material, economically feasible to remove, that will be damaged or destroyed is harvested under the title of salvage and all material which will die before the main harvest or which will benefit the stand by removal comes under the heading of silviculture.

**Methods and equipment**

The methods and equipment used in prelogging are the
same as those used in regular logging. The difference being that the equipment is lighter and has incorporated into the design some special innovations peculiar to this type of logging.

DEVELOPMENT OF PRELOGGING

Prior to World War II

European forestry. European forestry before the war had attained a high degree of perfection. The most favorable factor was the shortage of coal, oil, and gas for fuel in Europe which made it imperative for the inhabitants of the nearby villages to go to the forests for the necessary fuel and lumber products essential to their frugal standard of living. These conditions prevailed for hundreds of years with the result that an intensive road system, supplemented by flumes and aerial tramways, were built and gave ready access to all timbered areas. No tree was permitted to die and waste in the forest but was always taken out for the highest degree of utilization possible.

American forestry. In America there has been an abundant supply of fuels in forms that were more readily usable with a minimum amount of labor and at costs that made it uneconomical to bring out low grade forest materials for fuels. One of the greatest handicaps has been the long distances from the forests to the consuming markets and, in many instances, vast forest areas were inaccessible and were not tapped by roads. Another handicap has been that the machinery used in logging was
designed for handling large logs not small ones. 14

During and after World War II

Large hemlock logs which previously were used for pulp skyrocketed in value as select aircraft stock. With federal regulations governing the use of such logs, the pulp mills couldn't touch them. As a result they became scavengers and subsisted on large chunks, smaller sized trees, and logging leftovers. Aside from the physical problem of digesting this mess of odd sizes--picking them up in the field and bringing them to the mills--the pulp mills discovered that they could still survive and produce the same end product, good wood pulp. Thus, in peacetime years, it became profitable to use smaller trees. More wood utilized in the original stand through better logging also meant that the timber supply would last longer. Logging engineers joined in the strategy and began to devise lighter machinery and new methods for profitably harvesting smaller trees. Finally, the idea was conceived of logging an area three times: first, an initial prelogging harvest of the standing small trees of commercial value; second, the major harvest; and third, a final relogging harvest of logging debris--the chunks and pieces that in prewar years remained as slash. 14

PROBLEMS ENCOUNTERED IN PRELOGGING

Market conditions

First, there must be a market for the material to be harvested; and second, prices and the markets must be within reach of economical transportation. 8 The war and
the ever encroaching thought of the scarcity of timber has taken care of the marketability of the material harvested, and at the writing of this paper, prices are still high and consequently the markets are within reach of economical transportation, however, how long this will continue is pure speculation.

Material harvested

The material to be harvested varies considerably in size, species, and volumes per acre, and require special handling methods and equipment. With engineers designing new equipment for handling these odd sized trees, this problem is slowly being eliminated.

Scaling methods

The adoption of the Sorenson scale for the measurement of pulp logs 13 inches or less in diameter, and the general use of cordwood measure for 8-foot logs has greatly encouraged the production of a great deal of salvage material, as the overall combination has been an inducement to contractors.

The formula for the Sorenson scale is as follows:

\[ V = 0.00545154 \left( \frac{d}{20} \right)^2 \times L \]

Where \( V \) = volume; \( d \) = diameter, small end; \( L \) = length

Storage

The matter of storage has presented quite a problem. If the storage is made in the water, then the small logs have to be bundled in order to minimize the chance of sinking. If the storage is made on dry land, it naturally takes a large area on which to store any substantial
volume of logs. However, it has proven economical to bundle the logs, and most of the mills are using water as a storage medium.

Road investment

According to E. P. Stamm of the Crown Zellerbach Corporation, the road investment for prelogging is a consideration that must be given a great deal of thought, as the investment would necessarily be quite large, and, based on a 20-25% thinning cut, would take a good many years to liquidate.

In reality, the road investment to be borne by pre-logging will be slight. The primary logging roads extending into the timber stands will serve a quadruple function, principally as arterials for hauling out the big logs, but also as yarding and loading thoroughfares for prelogging and relogging operations, and for fire protection. The cost, therefore, can be charged to those four items: prelogging, mainlogging, relogging, and fire protection.

PRODUCTS HARVESTED IN PRELOGGING

For salvage purposes

The main item to be harvested in prelogging is small hemlock, that would otherwise be destroyed during the main logging operation, for pulpwood. Cedar bolts and logs, and small sawlogs are also taken out, if available. Any miscellaneous items, such as, Christmas trees, ferns, maple, alder, burls, and cascara are also harvested where economically feasible.
For silvicultural reasons

**Thinning.** The thinning of timber stands apply to second growth only. The products to be taken out are small sawlogs, pulpwood, and poles and piling. They are taken out so as to utilize their growth and to enable the remaining stand to put on more growth, thereby increasing the total yield. ⁸

**Sanitation.** Sanitation cutting applies primarily to diseased trees or those trees infected with insects, however, the maximum benefits can be be obtained from prelogging by taking out very large, overmature, dead and decadent trees as quickly as possible where large losses would otherwise be incurred if the logging of these trees was delayed until the main logging was done in the routine manner. ⁸

**METHODS AND EQUIPMENT**

In general, methods in salvage logging have followed those of regular logging, but with lighter equipment and smaller crews. However, prelogging is still in the experimental stage, and several companies are testing specialized equipment. Since equipment and methods which represent a departure from conventional practice will be of greatest interest, only these will be describe in detail.

**Logging**

"Bunching" tractor. A "bunching" tractor has been devised by the Crown Zellerbach Corporation. This unit consists of a 75 caterpillar tractor with a twenty-one
foot frame attached to the rear end. A single 5/8-inch yarding line with a flat-hook on the end is carried on the free-spooling haulback drum, and the line is pulled out by hand.

Figure 1
"Bunching" Tractor

With an average yarding distance of 100 feet a four-man crew has bunched as high as 80,000 fbm of logs per day. The rig is particularly valuable in bunching turns, thereby increasing the efficiency of the operation as a whole.11

"Peanut picker". One of the first yarding units developed especially for yarding logging waste was the "peanut picker" developed by the Comox Logging and Railway Company, Limited, at Ladysmith, British Columbia. This unit consists of a 28-foot A-frame, drums and engine mounted on an old 5-ton truck. A 9/16-inch mainline and a 7/16-inch haulback line were used to facilitate the
yarding of the small scattered logs.

![Image of yarding equipment]

Figure 2
"Peanut Picker"

Average yarding distance was 260 feet. Man-day production with this unit and three-man crew averaged 3.1 cords during periods of relatively high efficiency.¹¹

Tractor-mounted tower. The Crown Zellerbach Corporation is employing a tractor-mounted steel tower for cold decking salvage wood in its Clatsop County, Oregon, operations. Over-all height of the tower is 55 feet with maximum yarding distances ranging from 500-600 feet. Because of its flexibility, yarding distances are usually held down to 300-400 feet.

The rig is readily moved over tractor roads and has self-tightening guy lines, enabling it to be moved and re-rigged in one to two hours. Each guy line is attached
to a separate drum near the base of the tower and power is supplied to any drum from an auxiliary gasoline engine mounted at the base of the tower.

Figure 3
Tractor-Mounted Tower

A 7/8-inch mainline, 5/8-inch haulback, and 3/4-inch chokers facilitate the choking of small logs while the light lines facilitate rigging up, road changing, and
Yarding. A five-man crew is required for the highest efficiency. Two choker setters, machine operator, and chaser perform their usual duties. The rigging slinger chooses new settings to co-ordinate decking and swinging and supervises the selection of material. Production varies from 40-50,000 fbm per day, depending on the size of the material.11

Portable spar. A 50-foot portable spar built by the Isaacson Iron Works, has been use by the Soundview Pulp Company of Everett, Washington, which works out satisfactorily for yarding small logs.

Figure 4
Portable Spar

The spar is made of 12-inch tubular steel and the main line passes through the inside of the tube to a sheave at the top. On top there is a swivel ring for attaching guy lines. The spar is swiveled at the base
and mounted on four armoured wheels. In moving, the spar is lowered and a fifth wheel is attached near the top. Light rigging is used. Yarding distance is about 600 feet. A 3-man crew can yard 15 to 18 cords per day.11

**A-frame sled.** At Shelton, Washington, the Simpson Logging Company has developed an A-frame on a sled which is being tried out for salvaging larger logs.

![A-frame Sled Image](image)

**Figure 5**

**A-frame Sled**

The sled is 60 feet in length and the A-frame is 55 feet long. A 75 caterpillar tractor with triple drums furnishes the power. In moving, the A-frame is lowered and the tractor moved off the sled and used to pull it to the next setting. When operating, the A-frame is held by five guy lines. The unit is equipped with a
7/8-inch mainline and a 1/2-inch haulback line. Maximum yarding distance is 600 feet.¹¹

Tower mounted on arch tracks. At the Vail, Washington, operations of the Weyerhaeuser Timber Company, yarding to the roadside is done with a tractor and a portable 40-foot steel tower mounted on an old set of logging arch tracks.

Figure 6
Tower Mounted On Arch Tracks

The tower is a discarded shovel boom, which can be lowered when the yarding unit is moved to another setting. The tower is rigged with a double set of blocks, one on each side, and four guy lines which hold it in position during the yarding operation. Yarding lines are run out
about 400 feet at each setting. Power is supplied through a triple drum takeoff on the rear of a D-8 caterpillar tractor. The tractor is backed off a short distance from the tower to provide full clearance for the main line and haulback, and is free to maneuver around for the best power direction. Two men work at the landing.9

Loading

Standard loading equipment. Nearly every type of standard loading equipment has been tried in an attempt to determine the most economical system of loading salvaged wood. Loading time and loading costs are generally high due to the small size of some of the material, the variations in lengths, the low net volume, and the small volume loaded at each landing.

Where salvage wood is in large sizes, standard loading systems such as crotch lines, McLean boom, or shovel-type loaders have been the most popular because of their flexibility, but the original costs are high for the small concern.11

Conveyor loader. The Comox Logging and Railway Company tested a conveyor loader on the Ladysmith experiment, but they were not completely satisfied with the results. However, where much of the salvage material is small, flexible loading equipment is indicated.11

Wheel-mounted loaders. Wheel-mounted cranes or shovels, equipped with heel booms may well prove to be the best type of loading equipment for prelogging operations,
but even here some alterations are needed to speed the loading of small logs and chunks.

Figure 7
Shovel Loader

One logging superintendent suggested a shovel on which the boom can be lowered or raised as it swings. This would avoid the time lost when the boom must be swung over the log and then lowered almost to the ground to pick up a short log or chunk. Another man familiar with prelogging problems has suggested a heel-boom shovel equipped with jaws rather than tongs. Here again, attention should be given to a provision for lowering and raising the boom readily.11

The Weyerhaeuser Timber Company, in its Vail, Washington operations, uses a converted 3/4-yard Lima shovel,
with a single tong hook, in their loading operations. Three men perform the loading.

Figure 8
Converted Lima Shovel

Pre-loader. At its Neah Bay, Washington, operations, the Crown Zellerbach Corporation has devised a special pre-loader to handle small logs. This unit consists of a steel bed on which are mounted two sets of cradle-like semi-circular jaws in upright position. The logs are loaded into the open jaws which form them into a bundle. Steel straps are then placed around the load. The jaws are opened and a crane picks up the bundled logs for loading on a truck.
While the method of bundling is quite satisfactory, there appears to be too many rehandlings. First, the trucks are unloaded onto a cold deck. A crane picks up the logs from the cold deck, places them into the pre-loader. The crane must again pick the bundles out of the loader, place them on a bundle stack. From this stack they are again loaded on trucks, four to a load.

The Crown people are working on a modification of this process to reduce the number of handlings, whereby the hauler will dump his logs into the pre-loader and steel strap them. The jaws will then be opened and the bundles kicked out onto a gravity landing below. Changes in the pre-loader itself will be necessary for this system of handling.
Other ideas have been expressed to reduce loading costs, such as false bunks, cradles, and extra trailers to avoid lost time. Since it frequently requires an hour to build up a load of salvaged logs, pre-loading offers greater savings in handling salvage than in the handling of ordinary logs.\textsuperscript{11}

Transportation

*Standard log trucks and trailers.* So far salvaged logs have been transported almost entirely on standard log trucks and trailers. The exception has been where portable mills were set up in the woods so that only lumber or cants were trucked out.

**Figure 10**

High Stakes

The addition of stakes has been the only adaptation
which has been made to standard trucking equipment to facilitate the loading of small diameter pieces and random lengths. Stakes are used on both truck and trailer bunks and result in a marked reduction in loading time.

Where salvage logs are to be transported by water, it has been customary to bundle the truck loads with heavy steel wire or straps before the load is dumped. Dumping the loads by means of a bridge crane and by use of a stationary or movable A-frame have been used successfully.11

Figure 11
Unloader
Truck, railroad, and water. Weyerhaeuser in its Vail, Washington, operations uses all three means of transportation--truck, railroad, and water.

Figure 12
Steel-Strapped Hemlock On Railroad Car

The truckload of logs shuttles to the nearby railroad reload station; the load is bound with three wide steel straps and lifted off as a packaged bundle. The same reload station is used for unloading the huge sawlogs that keep the reload machinery busy. The railroad daily transports the long strings of log cars to the South Bay Dump, located on Puget Sound at Olympia, Washington. There the log bundles are kicked off, fabricated into
rafts, and towed by water to the Everett Pulp Mill.14

Figure 13
Packaged Hemlock In The Water

CONCLUSIONS

1. There are vast quantities of wood which can be harvested by prelogging and should not be allowed to go to waste.8

2. All large areas of timber as yet untapped by roads should be made accessible as soon as it is economically feasible in order to minimize losses.8

3. Thinning will increase the amount of usable wood obtained in the long-run timber crop.1

4. Loading time and loading costs are generally
high due to the small size of some of the material, the variation in lengths, the low net volume, and the small volume loaded at each landing.\textsuperscript{11}

5. There have been more developments in the specialized high lead yarding equipment than in any other phase of the salvage operations, all of them designed for increased mobility. Most of these machines have been converted loaders powered by 85-hp to 100-hp gasoline engines. Ordinarily the original spar trees have been used and yarding distances have ranged up to 1200 feet. The consensus of opinion is, however, that yarding range should be limited to distances of 500 to 600 feet.\textsuperscript{11}

6. The addition of stakes on both truck and trailer bunks result in a marked reduction in loading time.\textsuperscript{11}
BIBLIOGRAPHY


6. Correspondence with Floyd H. Blackburn, Logging Superintendent, Mollala Logging Company, Mollala, Oregon.


