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ORDERLY HARVEST OF OLD GROWTH?

A Practical Experiment in Forestry-Logging to Determine Methods and Costs

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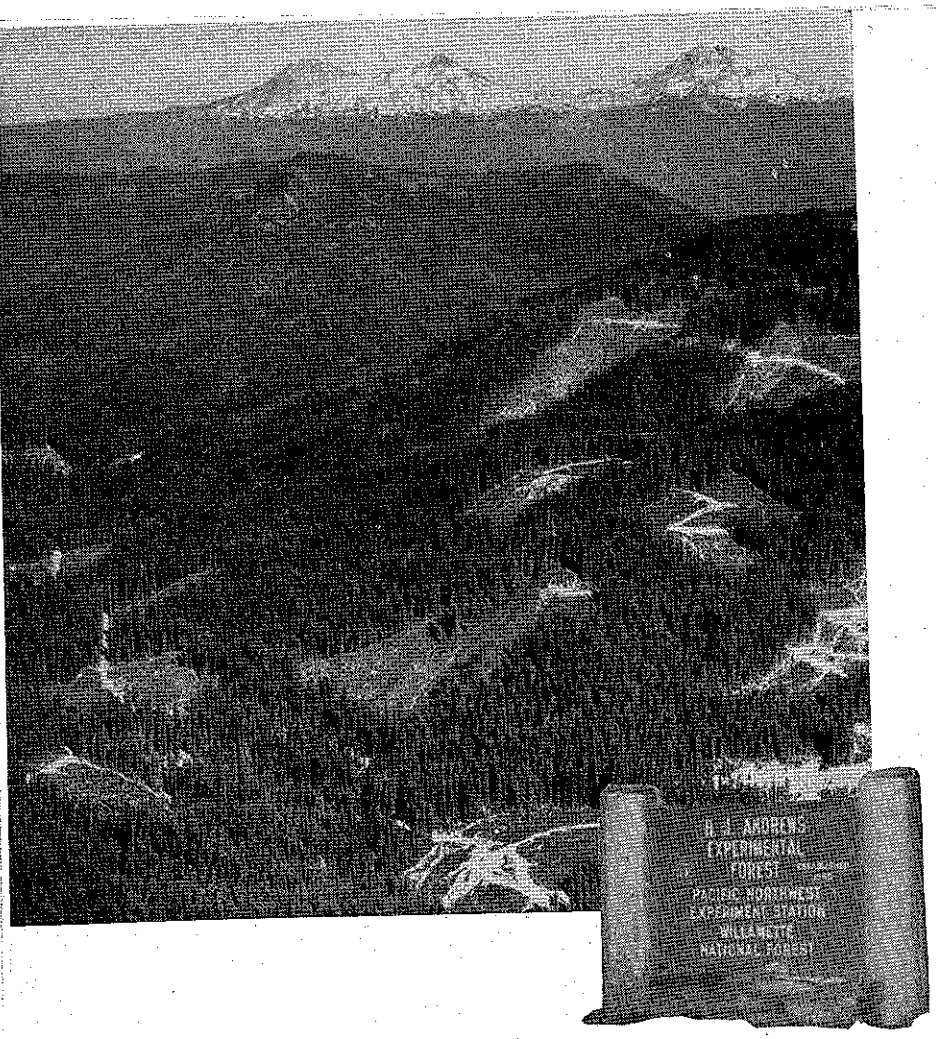


Can there be

Orderly Harvest of Old Growth?

A Practical Experiment In Forestry-Logging To Determine Methods and Costs

Federal foresters have computed that old growth Douglas fir will be cut in the Cascades and other west side forests of the Pacific Northwest for more than 50 years before the region will be entirely converted to a second growth economy. The high value of these old growth, maximum quality trees makes the investment in growing stock reach fabulous sums. And, although second growth timber is perhaps suitable to more intensive management than the old growth, it is a necessity that some answers be found upon which to base the next half century of cutting practices in these untouched forests.

The orderly harvesting of the Pacific Northwest's virgin old-growth trees, regeneration and conversion of the land to second-growth management, is something that requires concrete information upon which to base planning. The H. J. Andrews experimental forest and its research staff are principal sources for this information which is becoming of increasing value.

The Forest: What It Is—Where It Is—Why It is . . .

THIS is no theoretical experiment laboratory. It is a 15,000-acre virgin timberland with a 20 million foot annual cutting allowed during the initial opening-up period. A total of 92 million board feet have been cut so far since the forest was established in 1948. Practical forest management and logging engineering are combined and applied here. Studies made through tests and sample plots set up and applied during and after logging.

The forest embraces the entire watershed of Lookout Creek, a main tributary of Blue River in the McKenzie River drainage 50 miles east of Eugene, Ore. The topography is typical of the Oregon Cascade range with most of the area fairly steep and rough with some gentler slopes near the creek bottoms. Elevations range from 1500 feet to over 5000 feet.

More than three-fourths of the forest is of a Douglas fir 400 plus age class. This stand was established during the mid-1500s following a huge forest fire of Tillamook Burn proportions. Although other age classes range from seedlings upward, most of the balance of the timber is second-growth which started following a widespread fire about 1835. Other species on the area include Western hemlock, Western red cedar, mountain hemlock, Pacific silver fir, Noble fir and Western white pine.

Administratively, the Andrews forest is within the McKenzie Bridge ranger district of the Willamette National Forest. Edward Anderson is district ranger and Henry DeBruin is timber sales assistant.

Research activities are planned and conducted by the Pacific Northwest Forest and Range Experiment Station through the Willamette Research Center in Corvallis, Ore. This center is headed by Robert Ruth who has direct charge of the forest's experiments. His staffmen co-ordinate the experiments with the district ranger who actually administers the sales and handles protection work on the forest.

The area was originally designated the Blue River Experimental Forest, but was later named in honor of H. J. Andrews. Andrews was Pacific Northwest regional forester from 1943 until his death in 1951.

Assigned objective at the time of the forest's establishment was to learn and demonstrate approved methods of multiple use management for old growth Douglas fir forests on mountain watersheds. This included harvesting, reproduction establishment and managing the second growth stand. The study of water quality and yield was later given more emphasis as were cooperative studies in fish and game management.

Advance Planning of the Road System Shows Savings . . .

At the time of the forest's designation, the system of staggered settings on national forest land was well established. In this cutting method, units of from 15 to 60 acres are set up with uncut areas at least that large, separating the cutting units. The logic was that cut areas would have been re-established with trees by the time the adjoining areas were cut.

This system was, and is, quite practical and effective, but one point missed in the original planning was most important—the future. Logical units for the first cutting were set up, but with no thought for the successive cuts. It was assumed that the next round of units could be established at that time.

This system of planning left the succeeding units strictly to chance. An over-all forestry-logging plan was the goal of the Andrews forest staff and this same plan is becoming more and more part of management plans of other national and private forests. Both leave settings and cut settings are established at the same time to take advantage of terrain and timber type features. This permitted logging in natural and logical units.

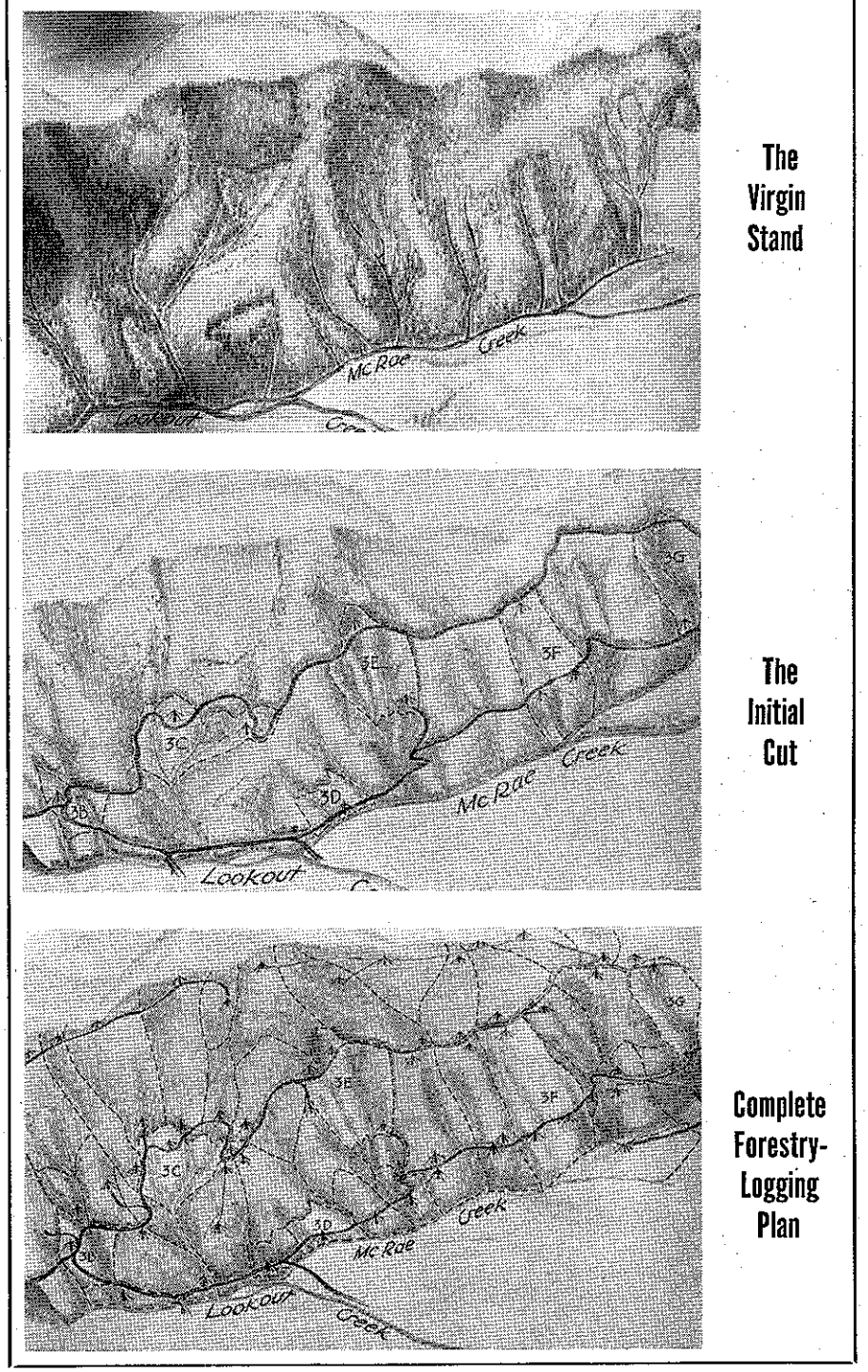
Planning is based upon cutting the high risk settings first — those which would be most likely to deteriorate before the next cutting cycle would be reached.

Planning the entire management before any work was done, also allowed for a permanent effective road system to take care of the future requirements as well as those of the present. It was found that often through prior planning and a slight increase, or sometimes no additional expenditure, a road location resulted which would serve the long range program.

Acreage Removed from Production

A study made after some road construction was completed revealed the acreage removed from production by roads as well as the consequent cuts and fills, came to roughly 2.9% of the total forest land. Another 1.2% was tied up in landings for a 4.1% total removed. Short spurs and tractor skid roads were not included, because they will be considered to reseed. Although this is a small percentage of the total, this land must still be considered in computing allowable cuts.

During their road study, research foresters, Roy R. Silen and Henry J. Gratkowski discovered that more than 12% of the ground within the cutting units was disturbed by landing or road construction. Actual logging operations were not considered in this study.



The Virgin Stand

The Initial Cut

Complete Forestry-Logging Plan

Road density was unusually heavy as these were the first roads opening up the area. A large proportion of the climbing roads to reach the higher country were included. In the initial development plan the density was 7.42 miles per-square-mile of country served as compared to 5.19 miles per-square-mile for the entire 8800 acres.

The road system for the planned area includes 71.6 miles of which the 30 miles have already been built. More than 40 additional miles have been located on the ground to and through the reserve settings.

As reported in, "More Efficient Road Patterns for a Douglas Fir Drainage" by Mr. Silen in the April, 1955 issue of The Timberman, road planning in the Andrews forest has worked into a systematic method. The method reduces the number of roads climbing between levels and increases the proportion of the drainage served by road levels spaced at the economic level.

EXPERIMENTAL seed bed. White sand used to determine survival on cool sites.

CHECKING test plot for regneration in logged over area. Sticks mark test sites.

dence that the surface temperature had exceeded the pellet's melting point.

Permanent check plots are established in all cut areas the second spring after the slash has been burned. These plots are then checked every two years to follow the trend of regeneration in relation to herbacious plants and brush in the seed bed. Mil-acre plots are charted, with reproduction species listed. Other information noted includes the status of the burn, aspect and slope, slash remaining, hours of shade, and whether or not the plot is located in a skid road.

Two forestry school seniors, Bill Scheuner, Oregon State College and Ray Gruber, University of Washington, have worked on this project seasonally.

Heat as a Major Cause of Regeneration Failure . . .

Regeneration studies are among the most important projects underway on the Andrews forest. Establishment of the succeeding stand, ranks in importance with the methods of harvesting the present one.

The first question in the studies was determining whether regeneration occurs patternwise or completely at random. It was learned that there are definite usable patterns:

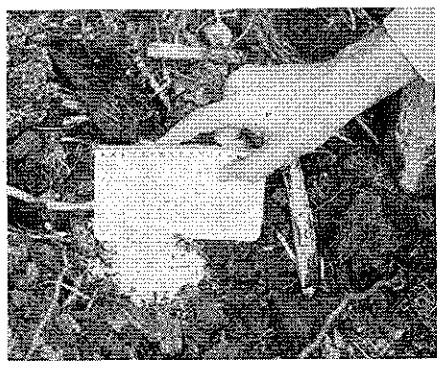
- Disturbed areas such as skidroads and fills, regenerated better than undisturbed areas.
- The amount of slash adversely affected regeneration.
- Burned seed beds were slower to regenerate than unburned seed beds.
- Nearly 90% of the surviving seedlings had permanent shade for the first quarter inch of their stems.
- The heaviest stocking on the clearcuts was on the south edge where the seedlings had shade from the stand's edge.
- Regeneration was very poor on exposed south slopes.

All this seemed to indicate high soil surface temperatures as a principal cause of stocking failure.

Measuring Soil Temperatures

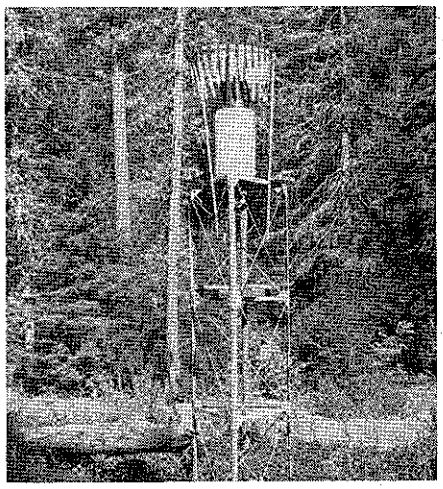
Silén, who was in charge of the experimental forest during this period, developed a technique of measuring maximum soil temperatures through the use of temperature pellets sold by the Tempil Corp., New York City. These pellets are 7/16 x 1/8-inch and are inexpensive, accurate and distinctively colored. They are generally waterproof for at least a year and easily fragmented to any desired size. The pellets melt at the critical temperature.

On this project, melting temperatures of 125, 138 and 150 degrees are used. It was found that the melting of the 138 degree pellets most closely corresponded with seedling mortality. A sampling of eight clearcut areas showed that 61% of the surface area on some south slopes reached this temperature by July 1, compared to only 28% on the north slopes. This substantiated the theory that heat kill was a major cause of stocking failure. It led to a series of seedbed experiments set up to determine soil temperatures, even more accurately, using a white sand artificial soil-cover to reduce soil temperatures. Staked seedlings with temperature pellets are also being studied under varied conditions.



YEAR old seedling. Dark spots are pellets on white sand for measuring temperatures.

In placing the pellet fragment, the spots are prepared by probing a pencil point about a half-inch into the soil to form a small conical hole. The fragment is then inserted with tweezers, point first, so that only a third or less shows above ground. This is to eliminate the danger of the pellet becoming lost. Also, the unmelted portion below the ground gives positive evi-

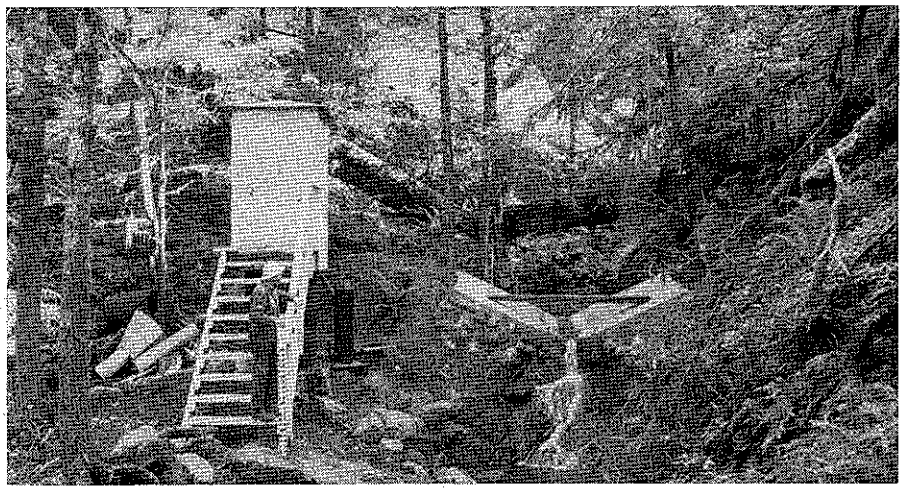


RAIN and snow gauge has Stevens recorder. Results help determine the stream flow.

Looking for: Logging Effect On Soil and Water

Protection and maintenance of water sources and the soil on watersheds are among the added functions of producing forest lands of Pacific Coast forests, and these functions are included in the testing of the experimental forest's reaction to management.

A gauging station was installed on Blue River, the main drainage, at the time of the forest's establishment. Additional gauge installations were made on three small tributaries to Blue River in 1952. These three watersheds were chosen because of their similarity. Each one drains a virgin old growth Douglas fir area of about 225 acres. In summer the streams run about one half inch deep and nine inches wide with a peak winter flow about one inch deep and 24 inches wide. These streams are typical of feeder streams of many small city and country watersheds and are being studied with the hope of finding information applicable to a wider area.



RECORDER house and weir where streamflow is measured before logging. Water measured to 1/1000-inch. Results will enable measure of logging effects on the watershed.

Stream Flow and Sedimentation Studies Are Essential . . .

The four year calibration period on the streams has permitted observation of stream reaction and the determining of seasonal distribution of flow, peak and total flow. This will permit accurate determination of the normal sediment level so that after logging begins they will be able to measure how much additional sediment is caused by logging. In addition to studying suspended sediment, debris basins behind small dams will allow the major part of the bed load to settle out and be calculated. The bedload consists of the small rocks carried along the bottom by the current. This volume is found by cross-sectioning the basins at intervals.

To determine stream levels, concrete weirs have been established on each of the three streams. Leopold & Stevens Type A-35 water level recorders are in use. These will record up to a two-month period without attention, although they are generally read at much shorter intervals.

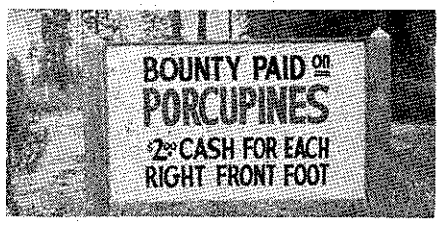
A velocity head rod is used to gauge water velocity over the weir to determine volume of flow. A Stevens recording rain and snow gauge is also in use to determine typical precipitation on the area to compare with the stream records. Antifreeze and oil solutions are added to the catch-tube. The antifreeze is used to melt the snow for conversion to water readings and the oil coating prevents the water from evaporating before the level is checked.

Presently the station plans to have two of the drainages clear-cut over the next several years. The third drainage will be left as a control unit. It is planned to designate one watershed for logging with a skyline system such as the Wyssen system, with the other area being high-leaded. This will, in addition, compare the effects of two logging systems. Supplemental studies will be made to determine erosion effects from both yarding and road building. This will be through established plots on the ground.

How Does Logging Actually Affect Wildlife?

Wildlife research is included in the studies underway on the Andrews forest with both State of Oregon and federal fish and wildlife personnel participating in study and experiments.

The study of the relationship between logging, wildlife and fish production is being recorded by two Oregon State College fish and game graduate students, working on the project year-round. An additional study being made by this pair includes the protein content of deer browse species. More and more deer are moving into the area



as it is being changed from its virgin forest condition. The clear-cut settings open up browse for the deer in the virgin Douglas fir forest.

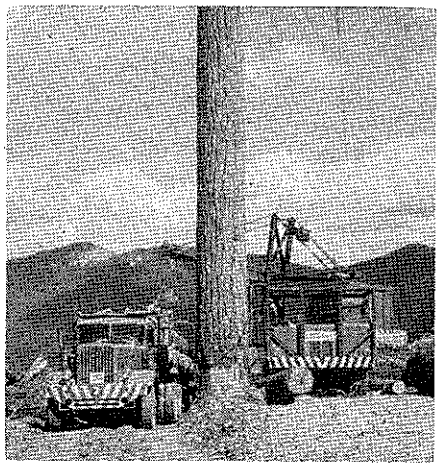
Results already obtained from these studies have been of aid to further planning on the forest. These include road locations and crossings to minimize stream sedimentation to the detriment of fish life. Some of the first sales showed complete extinction of fish from sedimentation from road building or accidental logging down the streambed.

Jay Gashwiler of the United States Fish and Wildlife Service is studying the relationships between small forest mammals on virgin and cutover forest land and also the relationship of the small mammals and birds and the forest seed crop. The seed study will be of use in both natural and artificial regeneration.

Logging Methods Under Controlled Conditions . . .

Elevations of up to 5000 feet are being logged on the Andrews and snow is a problem. They expect snow anytime after November 1 each year. Bulldozers had to be used on May 15 last season to open the logging roads at the 4100-foot level.

The high elevation and severe weather conditions have contributed to form a rather low quality stand on the higher portion of the forest. Snow breakage and rot and a combination of the two have combined to degrade. A total of but 10 to 15% of the logs on the present sale are graded peelers.



LINK-BELT Speeder used to load Autocar truck. Caterpillar D8 with drum yards.

Of the 92 million feet sold so far on the Andrews forest, nearly all the cutting has been done by Mike Savelich and his Savelich Logging Co., Springfield, Ore. Six sales have been logged, the seventh appraised, ready for sale.

He is contract logging for the Associated Division, United States Plywood Corp., Eugene, Ore., with his sawlogs going to Mt. June Lumber Co., Springfield.

Two sides are operated in the summer, cutting about 150,000 feet a day with a single side cutting 80,000 feet daily during the winter season.

Experimental Forest

Principal equipment includes a Skagit BU-200 yarder, a BU-35 loader, a Washington 2-speed yarder powered by a 200 Cummins diesel unit, a Link-Belt HC-98 shovel loader with Hendricks undercarriage, three Caterpillar D8 tractors and an International TD-24 tractor.

A Hyster triple drum unit is mounted on one of the D8s. This makes a highly mobile yarder capable of logging some of the rougher settings. Occasionally the lower end of a difficult setting is logged with the triple drum in conjunction with a skyline rigged to swing the logs up to an upper tree and the truck landing.

Eight saws, mostly Homelite, are used by the cutting crew with a marker working with each crew. Payment to the fallers and buckers is on a contract basis.

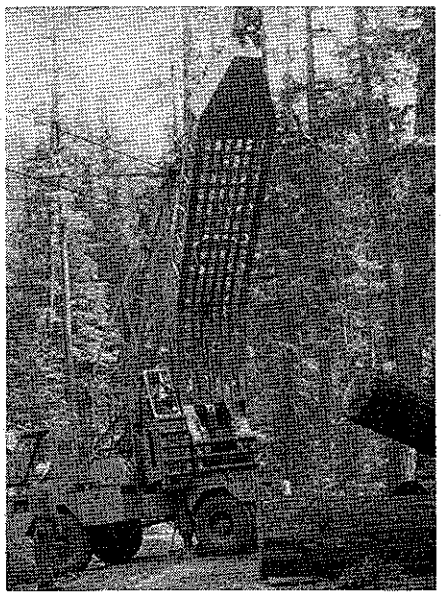
Seventy-five men are used by Savelich on his entire operation with complete maintenance facilities at his Springfield shops supervised by truck foreman, Theron Savelich. He operates five Autocar diesel trucks with four Page and one Peerless trailers. About seven trucks are also hired during the mid-summer operational peak. Savelich's annual production is about 25 million feet of logs. Tony Correia is logging superintendent and Tom Savelich is bull-buck and check-scaler.

Roads on the forest are principally operator-built by Savelich. The main exception is the original Blue River access road which was contracted by the forest service through the federal Bureau of Public Roads.

A Bucyrus Erie 22B rock shovel, Ford and Dodge 10-yard dump trucks, a Leroi tractor drill and a Caterpillar #12 grader are used for construction and maintenance. A Chevrolet crew truck and White school bus are used for crew transportation.

He takes a personal interest in the experiments being conducted. Savelich says, "In this type of experimental work its' hard to get a crew educated, but now they're oriented and we're trying to do the best job possible." Some of his men have been with him for nearly 20 years.

Stopwatch Salvage Logging to Learn Important Facts . . .



SALVAGE logger on forest uses a Skagit SJ-4 yarder-loader on 285-acre salvage.

The uncut reserve units present a management problem while being held for the cutting cycle. Because of the difficulty of access without damaging the other trees, salvaging the mortality in these stands is more of a problem than windfall and other mortality surrounding clearcut settings.

Salvage logging in flatter country is quite common, but the steep terrain typical of the Pacific Coast national forests is a problem in itself, with the Andrews experiments being closely watched for techniques.

The initial road system has rock roads roughly 1400 feet apart. This is too great a spacing to reach out with any sort of cable system to pick up salvage, and experiment station personnel feel that repeated tractor logging would damage the residual stand through both root damage and repeated barking of the trees.

The Andrews salvage plan was expedited by locating low-standard dirt roads between the rocked roads with the general standard of trying to have some sort of road within 500 feet of every tree in the stand. The locations of yet-to-be constructed permanent roads are used wherever possible for these salvage roads. In this case the dirt grade is so located that the cut of the final road location from the upper cut stakes, will not be duplicated when the final rock road is built.

The 500-foot reach was planned as a practical distance to reach any tree through the use of rubber tired yarders.

Testing of this system is presently underway by the Tuff Luck Logging Co. owned by Robert W. Kenady who is operating a Skagit SJ-4 yarder-loader. He uses a tailblock and haulback with the unit. Mr. Kenady's sale was estimated at 975,000 board feet on a 285-acre area. This type of volume is difficult to estimate, however, and his actual cut is exceeding this. He is taking the dead and down material and some high-risk trees as marked by the forest service. Mr. Kenady is careful in his logging to protect the remaining stand. Yew slats are used to protect guy-trees and block-anchors.

Cost data is needed to properly plan sales of this type. The operation has been made a subject of an intensive "stopwatch yarding" time study to determine accurate costs. This study includes yarding distances, log volumes and steepness of slope being logged. The operator also keeps accurate time checks of his crew's activities. The checks are being studied by the forest service and are a requirement.

Ruth says this system of salvaging the leave settings at intervals before the clearcut has so far been found to be practical.

Smallest Salvage Unit

The smallest salvage operation on the forest is the Starvation Gulch Shake & Cedar Products Co., owned by C. L. Cowan. With a $1500 investment and a maximum of an 8-man crew, 15 squares a day of tapered shakes are produced. Using a horse for yarding and a 5-hp McCulloch saw cutting dead and down material, 25-inch shake bolts are cut for Cowan's horizontal shingle saw at McKenzie Bridge, Ore. These shakes are split by hand on one side and sawed on the other for taper.

SMALLEST logger of salvage material cuts cedar bolts. Uses horses for power.