

Timber Cruising On A Private Operation in The Pacific Northwest

By Neil Welden C. E. '23

Porteous and Company have evolved a new system of cruising which seems to be gaining favor in the western states. It is a comparatively new system being first tried out experimentally during the fall of 1919 on a job which the Porteous Company had secured in the Gray's Harbor District mapping and cruising sections. As stated the work was to a great extent experimental and consisted in working out Mr. Porteous' theory which was an improvement and simplification of the Lacey system. As finally worked out, the cruising system used by Porteous and Company which I shall call the Porteous system, is a three run strip system. That is, there are three cruise lines through each forty, and all the trees on a strip a chain wide are tallied. This is in contrast to the block system, in which the trees on a block of an acre are counted every ten chains. The strip system gives a better average, and the timber is more easily and accurately divided into types.

The cruising is done from a base line, which is usually run through the center of a chain of sections. This may be simply a straight line, run directly down the center line, or it may be the preliminary survey for a logging railroad. The only requirement is that it run from one side of the section to the opposite. It is run accurately, either by transit and chain or stadia, and blazed thoroughly, so that it can be easily picked up. Levels are run over this line with the transit and the traverse plotted by latitudes and departures. From these latitudes and departures, the starting points of the cruise lines, which are four hundred and forty feet apart are figured, and marked on the ground.

The section lines parallel to the base line are then run with a compass, Abney level, and chain and reblazed and stationed to correspond to the stationing of the base line. These lines are called secondary control lines. The elevations taken on these lines are checked in to the base line wherever possible—at least every two miles. It is quite possible for an experienced crew to run an Abney level with an error of less than two feet in elevation to the mile.

After these lines are finished, cruising proper starts. Each cruiser carries a note book, a box compass, a barometer, a diameter tape, and a pace tally. The left hand page of the note book is divided into five columns, the first three of which

are headed "Fir" (Douglas Fir), "Cedar" (Western Red Cedar), and "Hemlock" (Western Hemlock). The heading of the other two columns varies with the locality, but in Western Washington they are usually headed "Spruce" (Sitka Spruce) and "Pine" (Western White Pine). The right hand sheet is cross sectioned ten by ten squares to the inch, with a red line down the center. The right hand column of squares is used for barometer readings.

All trees are divided into diameter classes, as follows—class "A"—10" to 16": Class "B"—17" to 22": class "C"—23"—26": class "D"—27" to 30": two unit—31" to 35": three unit—35" to 39": four unit—40" to 43": etc.

The cruiser, starting for example from station 1, first checks in his barometer by taking a reading on the station. He then takes a compass shot in the direction of station 1 on the secondary control line. He starts out toward his sighting point, counting paces on his daily register, and counting trees and classifying them. When he has as many trees as he can conveniently remember, he stops and records them in his note book. These notes are made at a distance from the foot of the page corresponding to the distance from the start, figuring a tenth of an inch to ten paces. All trees which come under the unit classification are grouped—for instance, in any problem, 3/11-4-6-2-0 would indicate that, since the last stop, there had been found of that species, three trees with a total of eleven units, possibly two four unit and a three, four trees in class "D," six in class "C," two in class "B," and no "A"s. At every break in grade and every stream crossing, barometer readings are taken and recorded in the proper place. Topography is sketched in along the red line in the center of the right hand sheet. This shows the general slope of the ground, width and direction of flow of streams crossed, rock outcrops, swamps, etc.

On reaching the section line, the cruiser records the distance and direction of the point where he cut the line, from station 1 on this line, and takes a barometer reading on the station. He then proceeds to station 2 on the secondary line, and starts back to station 2 on the base line, using the same method. When he reaches the base line he notes and corrects his error in alignment, and runs to station 2 on the other secondary control line. On reaching this line, he sets over to station 1, and returns to the point on the base line from which he originally started. This makes a total of two miles of cruise line, which is considered a day's work.

That evening, in camp, the cruiser figures the average number of paces taken to the chain, and divides the notes

into types. This last is easily done, as any change in the type sows distinctly in the notes. The next day he does the same thing over again on a different line.

When the total area has been cruised in this manner, the cruisers go to the nearest logging operation, and scale about two hundred trees which have been felled and bucked, but not yarded. Under these conditions it is easy to determine the total volume of any tree in board feet, since the trees are laying as they fell, except for being bucked. This information



Packing in canoe used on Thurlow Island lakes.

is used to determine the average number of board feet to a unit. In Douglas Fir this will be about nine hundred board feet.

This concludes the field work. In the office the area is laid out on a scale of sixteen inches to the mile, and the primary and secondary control plotted on this map, with the elevations marked. Then, taking from the notes the starting and finishing point of each cruise line, they are plotted and elevations corrected from the barometer notes in the note books, plotted on them in the proper position. The topography is worked up from this skeleton.

In the meantime the notes in the note books have been divided into forties. This is possible, as the timber is arranged in its proper relative position. The notes for each section are collected on a large sheet, each forty being listed separately. Then using the figures obtained by measuring the felled timber, the volume on the tree cruise lines in each

forty is figured. This amount multiplied by six and two-thirds gives the total volume on the forty. From these notes, the percentage of each species on a forty, and the average volume of each tree is figured. Next the type boundaries are placed on the map, and the stand per acre of each type figured. This data is placed in the form of a table in the corner of the forty it refers to, and the map is traced on a tracing cloth. Prints are made by a black line process on linen. The volume per acre of the various types is indicated by coloring the types with oil colors, red indicating more than one hundred thousand feet to the acre, green, sixty to one hundred thousand, and so forth. The cruise map is now complete, showing the amount of timber on every forty, the distribution of timber in the forty, and the topography of the area.

The application of this system in this form, with a few minor differences was worked out at the Elma job. On this job the crew ran from three to five, not including the cook. It was an excellent location for a tryout of the system, as the ground was rough, and the timber variable. The average was about forty five thousand feet to the acre, but the maximum was a hundred thousand, and the minimum zero. We spent about five weeks on this job, making three camps.

The next place the system was tried was near Eatonville. The advantage of the system is that the office work need not be done by cruisers, as the notes, if properly taken can be read by anyone. Thus when a new job is secured the cruisers can leave their notes and have them drawn up by a draftsman.

At Eatonville seven sections were to be mapped. It was nearly an ideal stand of timber, the trees running of even size, and the distribution uniform. The country was rolling, but not steep, and there was very little underbrush. On this whole area, the timber averaged sixty five thousand to the acre. The only bad feature was that a few trees, in one corner of the area were conky.

The cruising was working in good share by this time, and the crew of three men completed this area in about four weeks.

In Clallan County a check cruise of two sections was made in the settlement of a dispute. Two separate companies made the cruise working in co-operation. No topography was taken, but every tree on the cruise line was measured with the diameter tape and cruise lines were run five chains apart, to insure the highest possible degree of accuracy. The work was done

by one of Porteous' cruisers and one of Clark and Lyford's, working together. This work consumed about two weeks.

Upon completing the above work, a cruise was made at Rock Bay, B. C. The course covered seven or eight limits. In British Columbia, a timber claim, which includes six hundred forty acres, is called a limit. This area was scattered,



Cedar on old logging road. Timber partially cleared; Thurlow Island.

no block containing more than two limits. Moreover, two of the limits were on a lake, and accessible only by boat. A stadia traverse of the lake was made and this was used as a base line for the cruising of these limits. On this job, also, some of the limits ran up to the bare rock above timber line, which occurred as low as two thousand feet in some places. This made hard cruising, particularly when as hap-

pened several times, there was a fall of snow. However, in that country, the winter is not severe, and the snow soon disappeared. The field work was completed about the twentieth of February. Before we had completed this, Mr. Portecus took a contract for the cruising and mapping of twelve limits on Slate Creek, about a hundred and fifty miles north of Vancouver, B. C. On this job, as an experiment, a crew of eight men were employed including an instrument man, five cruisers, a cook and a packer. This proved to be less economical than a crew of three cruisers and a cook. It was decided that if greater speed was necessary than could be obtained with one crew of four men, it would be cheaper and more efficient to place two or more such crews in the field, working separately.

The Slate Creek tract lay in a valley which ran back for a distance of about six miles from the ocean, and varied in width from two miles to about three quarters of a mile from timber line on one side to timber line on the other. The timber was an excellent stand of Fir-Cedar-Hemlock in the valleys, running out to Hemlock scrub on the side hill near timber line. The upper end of the valley was cedar swamp, but the timber was small and crooked. The average for the total timbered area was about forty thousand, but in spots the stand would go as high as one hundred thousand.

On this job, a railroad preliminary was required, and this was run in and used as a base line. It was practically impossible to run a control line at timber line, owing to the roughness of the country. To obtain accurate control therefore, the cruisers worked in pairs, running with clinometer and chain from a control station on the base line to the cliff on the side of the valley, then separating and running back, one on each side of the chained line, to the base line in the valley. This return trip was made with paced distances and barometer elevation, the chained line being accented as control, both for alignment and elevation. Remarkably accurate work was done in this way, considering the steepness and roughness of the country. Otherwise there were no remarkable features on the job, the same system being used in taking and working up notes as on the preceding jobs.

Mr. Portecus took another contract for cruising on Deserted River, which was only about two miles by water from Slate Creek. The topography here was of the same type as that of Slate Creek, that is, a comparatively narrow valley running back from the ocean, but in this case the valley was

branched and much more nearly level than the valley of Slate Creek.

One peculiar point was the fact that the valley ran back nearly a mile with a rise of only about twenty feet. At this point the valley narrowed, closing in on the river. Apparently the ledge ran clear across the stream, causing a falls about fifty feet high, above which the valley opened out again. The same condition was repeated about a mile further up stream, where there was another fall of about the same height, and above it another valley. These conditions made cruising a little more difficult. It was necessary in some cases to run the cruise lines parallel to the main drainage instead of perpendicular to it, as is usual. Moreover, auxiliary base lines had to be run to control these cruise lines. This, of course, increased the overhead.

The timber on Deserted River was neither as heavy nor as high grade as that on Slate Creek. The lower valley, for



a distance of half a mile each side of the river, consisted of a vine maple and devil's club swamp, which was almost impenetrable. There was some fair timber in the second valley, but for the most part, the timber was scrubby, and the whole area would scarcely average thirty thousand feet.

The next conditions on which this system was tried was on land owned by the Milwaukee Land Company which had suffered from the wind storm which devastated parts of the Olympic Peninsula during January, 1921. This work was much different from ordinary cruising. Only one line was run through each forty, and instead of taking the standing timber,

the amount of damage was estimated in percentage of the total original stand, and the percentage of each species making up the down timber.

It was practically impossible to salvage this timber, or any large part of it, owing to the inaccessibility. On one stretch of road a mile long, it was necessary to cut nearly five thousand trees to clear the road, which will give some idea of the devastation. In several places, going across the country, it was possible to travel for as far as a half mile on the down timber without touching the ground.

The timber was rather low grade, being generally a Hemlock-Cedar-Spruce type, running about thirty to thirty-five thousand feet to the acre. This contract covered about fifty thousand acres. This took seven weeks and required six camps. Some time was lost on account of rain, which was almost continuous.

The system has been tried under varying conditions and has made a decided success of itself. As Mr. Porteous claims, it is simple and rapid. Another thing in its favor is its flexibility enabling its use in all conditions and in all parts of the country. As to its general adoption, time will reveal that phase. So far it has been a success wherever it was tried.