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THE BALANCE WHEEL OF INDUSTRIAL FORESTRY IN THE DOUGLAS FIR REGION¹

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INDUSTRIAL forestry is the growing, protecting, harvesting, manufacturing, and marketing of forest crops. As such, it is a business conducted along orderly lines in the biological, engineering and economic sciences. Its objective is continuity with maximum returns from each of these five forestry functions.

In the Douglas fir region, just as in all other virgin forest areas, forestry begins with logging. Before logging can commence, however, a chain of events must occur which sets the economic wheels in motion. Those events begin when Farmer MacDonald, near Center City, Iowa, decides that his hog house will have to be repaired before winter sets in and that he will renew that wood structure with like material. He places his order, for the required lumber items, with Manager Jones of the Center City Retail Lumber Yard who, in turn, places a similar order with his wholesale or brokerage connection in Council Bluffs. The wholesaler at Council Bluffs gets in touch with one or more of the manufacturers he represents. They either secure the type of logs required from their own logging operation or from the open log markets and get to sawing on the order. And so it goes, on back to the bull-buck and his cutting crew up in the woods.

This process of demand, reacting through the agencies of distribution and manufacturing to the sources of supply, is the prime mover in forestry, just as it is in any other commodity business.

These basic conceptions of economics, it should be noted, do not function naturally and undisturbed in these times of heavy Government purchases of forest products.

A brief discussion of the pressure which the war is exerting upon the industry in Washington and Oregon is necessary for an appreciation of the present forestry situation.

Faced with an appalling shortage of experienced workmen, distressing difficulties in obtaining replacements of and parts for machinery of all kinds, the West Coast lumber industry has an unprecedented order file. Despite this unbalanced condition, until July 1, 1942 production had been pushed to a level 2.6 per cent higher than for the similar six months' period in 1941. Ceiling prices on logs and lumber, allocation to the mills of the logs of certain

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critical species and the excessive demand for high-grade items, coupled with the virtual disappearance of water transportation and frequent local shortages of railroad cars, further complicate the situation; to say nothing of the heavy increase in income and excess profit taxes, which work an especial hardship on any industry with a depletable supply of currently available raw materials. One wonders if management has time even to think of perpetuating its supplies of timber.

One often hears or sees in the press these days the alarmist stories that the war pressure for production has caused most of the industry to discard its progressive forest practices and that this is going to have permanent deleterious effects upon the productiveness of its lands.

Just what are the facts in regard to this allegation? Have the difficult business barriers outlined above forced the industry to abandon its work in the woods in fire protection and silviculture, or to abandon its work in the conversion plants for improved processing methods and new uses? It is not thought that they have and, to demonstrate that belief, your speaker should like permission to relate to you; first, just what the status of the present forest practices within the industry are; second, what is new in utilization refinements and research; and, third, to conclude by attempting to show the interrelation of silviculture and utilization as unified in the balance wheel of industrial forestry.

Let's start out for the woods and see for ourselves what is actually going on. If forestry begins with logging, then it follows that logging begins with cutting. Cutting of the forest is a silvicultural process, and a system when used for a given timber type with regeneration as its primary aim. The silvical requirements of the species handled usually indicate the necessary system.

Thus the basic silvical fact which indicates clear cutting as good silviculture for most Douglas fir areas is the degree of tolerance of Douglas fir itself. Being an intolerant species, it will not reproduce well in shade.

If we are in agreement on that point, it is safe to dare generalize that in the majority of cases clear cutting should be the approved silvicultural system, provided the object of management is to grow Douglas fir. There are several areas in the region where a two-aged condition is present by reason of a decadent Douglas fir forest which is being succeeded by the climax forest of Western hemlock and silver fir. Such a condition lends itself admirably to a sort of installment cutting method, which first removes the overstory of Douglas fir and waits twenty or more years before going back to remove some of the understory which has been adding quality increment. This system, which is being used on several operations and has been erroneously termed "selective logging," is not to be construed as a true selection system. It is good forestry, however.

But what has this silvicultural sermon to do with what is actually going on in the woods in the way of satisfactory forest practice? Just this! Despite the fact that many operators can't possibly stay in business, either because of insufficient area, inadequate financing, operating on other people's

lands, or just don't give a continental, we are getting restocking resulting from their cuttings. Why? For four simple reasons: (1) involuntarily they cut slowly enough in the majority of cases, either because they are small or are seasonal, so that a seed source is present long enough to render its silvicultural service; (2) their areas are intermingled with other ownerships which are not being operated at the same time; (3) there happens to be sufficient defective over-mature trees or patches of seed-bearing immature trees; or, (4) they are purposely reserving positive stumpage values on their operating areas to act as seed sources.

An example of the latter can be cited in Mason County, Washington, where an operator cutting only 2 to 3 million board feet per year leaves merchantable trees on his cut-overs until they are restocked.

How about the industrial forest ownerships? Are their practices progressive or are they just logging?

Practices vary among large companies, just as much as in the case of the smaller ones. Some are still clinging to the old order of forest liquidation, either because they have insufficient merchantable timber to carry them over the period necessary to bring their second growth along to marketability or the management doesn't hold faith in the future value of forest products and is thus dedicated to a definite liquidation policy. The latter alternative doesn't preclude, however, the fact that many such properties are left with restocked cut-overs.

One such property in Thurston and Gray's Harbor Counties, Washington, aggregating 100,000 acres was turned over intact to the State of Washington for a State Forest at a nominal sum. In the last 45,000 acres deeded to the State, field examination has shown that slightly less than 5,000 acres are in need of planting. The remaining 90 per cent is fully stocked with coniferous reproduction. Did all of this result from involuntary forestry and good fortune in fire protection? It did not! This particular company began to leave seed sources in strips and blocks in 1928 and burned its slash currently each fall.

On large properties it was customary in the past to turn over anywhere from twenty to a hundred thousand acres of cut-over land in all stages of restocking and nonrestocking to the industrial forester and challenge him to grow trees on those acres economically. In some cases there were considerable areas nonstocked, with little hope of getting any natural reproduction in a reasonable length of time because of the great distance to the nearest seed source, if any. And there was no source of seedling stock to plant up the idle land, because every public forest tree nursery was obliged by law either to use its stock for planting on public lands or to sell it to farmers for their use.

This was an embarrassing and pathetic position in which the young forester found himself. A solution dawned on the horizon when several private foresters put their heads together and determined that to reduce this malady they would have to sell a bill of forest economics to their employer.

This was done by drawing up a simple table showing the value of reproduction of different ages, with various densities of stocking and carrying

charges as reflected by the replacement cost. Another tabulation, employing the available normal yield tables reduced for stocking and for estimated fire losses, was presented as a basis for calculating the cost of growing timber on different sites for different rotations

These tables drove a cold financial shaft home to the thinking processes of management. They proved beyond doubt that it is costly to plant cut-over land. They proved beyond doubt that companies holding cut-over land could not afford to risk losing natural reproduction by failing to supply adequate fire protection. They proved beyond a doubt that industrial foresters should be given authority to plan the logging in advance of felling, so that as much natural restocking as possible could be gained. The net result of these proven facts has been the setting during the past two years by several companies of the Douglas fir region, of the heartening precedent which gives their foresters authority: (1) to plan cutting in virgin timber; (2) to organize a system of modern mechanized fire protection; and, (3) to supplement natural restocking where necessary by planting. This marks a very important milestone in the forest history of industrial ownership.

There are now twenty Washington and Oregon forest properties with an area of nearly 1,900,000 acres, half of which is old-growth timber, where commercial forestry is being practiced under the control of thirty-eight technically-trained foresters. Under their guidance systematic inventories and surveys have been made on over a million of these acres to determine timber types, fire hazards, restocking, site quality and other items pertinent to the institution of industrial forest management with its integrals of intensive fire protection, planting, and cutting practices. Surveys are in progress on the balance of the area of this large private forestry enterprise. It is timely to relate the present status of these integrals of industrial forest management.

Every forester knows full well that fire is the major impediment to obtaining restocking in this region. He knows in addition that continuous headway has been made in forest protection by all agencies but that the desired objective of a minimum acreage burned over annually has not been attained on a region-wide basis. Intensive protection as an aid to the attainment of the objective of fire control has been exemplified during the past two years on some of these progressive properties. It consists primarily in the development of a supplemental organization to augment the existing private and public organizations charged with the responsibility of protecting private land. In a sense, these supplemental organizations are a form of private patrol whose principal activities are building and maintaining private look-outs, constructing and maintaining fire protection roads, and developing water facilities for use in attack on fires.

Adopting water as their best facility, most of the operations are equipped with tank trucks, having power pumps and other fire-fighting tools, for motorized attack on fires. These trucks, using well-graded truck roads constructed for protection and harvesting either as new roads or as converted railroad grades, can reach critical areas rapidly after detection of fires. The supplemental protection forces are contributing greatly toward keeping the burned-

over acreage small because the constant presence of men on critical areas has stimulated fire prevention.

Short-wave radio has made its appearance in the private supplemental protection organizations and is proving its worth in keeping detection and suppression units in constant communication with one another. This allows standby suppression crews to be engaged during fire weather in important field work, such as hazard reduction, truck trail construction, water development or other work incidental to fire-proofing a property, and still be instantly available in case of fire.

One conservative estimate as to the cost of instituting intensive protection, based on the volume produced for a fifty-year rotation, indicates that the cost per thousand board feet log scale is only 35 cents. This is most reasonable fire insurance to fortify the long-term investor who awaits a timber crop a rotation hence when man-grown timber will not be obliged to compete with higher grade old growth.

When land examination shows that natural restocking has not occurred or is not likely to occur within a reasonable period of time, tree planting must be used to put such lands into production. The West Coast Lumbermen's Association established a co-operative forest tree nursery in 1941 for the express purpose of making seedling stock available, to co-operators in the industry's commercial forestry program, at cost. The present annual capacity of this nursery is five million conifers and the first seedlings being lifted for shipment are being packaged as this address is being prepared. The output of this nursery will put from eight to ten thousand acres annually into new forest production. This planting program, which is the largest industrial venture of its kind ever underwritten by American forest owners, has for its principal objective the rectification of non-productiveness wherever found on the participants' lands.

What is new in cutting practices? Clear cutting is still adhered to by most Douglas fir operators. Most silviculturists agree that it is the best practice if we are to perpetuate the species upon which the industry was founded. Clear cutting is modified, however, by the staggering of settings. In this modification the residual settings are reserved until the seed source has functioned. This may be three to ten years, depending upon the periodicity of seed crops, weather during slash burning season and conditions for survival and establishment of reproduction.

The speaker knows of a 160-acre skidder setting, surrounded on three sides, including the windward, by residual settings, which, after three heavy seed crops, still fails to reveal to the forester more than a ten per cent density of stocking. It so happens that conditions have never been satisfactory for survival or establishment in spite of an abundance of viable seed. On the other hand, there are some where the nearest seed source is two miles away and hard northerly and easterly winds have restocked the cut-over areas bountifully.

If silviculture and utilization are the two vital juices of the forestry fluid,

as has been previously proposed, then what is the industry in Washington and Oregon doing toward improving utilization methods and practices?

Western hemlock, former step-child and by-product of the Douglas fir logging industry, is now standing with its associates as a full-blood relative. Long prejudice against this species because of the association of the name "hemlock" with the inferior quality of its Eastern cousin has been largely overcome. This has occurred because the industry has investigated thoroughly the properties of Western hemlock and found that, for many purposes, it is an ideal wood when properly manufactured, seasoned and fabricated. It is now being used for veneer, with one plant on Puget Sound peeling several hundred thousand board feet of choice logs each month. The difficulties in securing sufficient quantities of aircraft lumber have been alleviated somewhat by the successful production of high-grade hemlock clears. Ladder stock and packaging material are now manufactured from Western hemlock. And, if you haven't seen vertical grain hemlock flooring or paneling, you who love beautiful wood have a delightful experience in store.

Hemlock is an old story in the pulp business but it is interesting to relate the history of the development of its present position. One large pulp company began operating some forty years ago with Northern black cottonwood as its raw material and planted cottonwood cuttings on its lands to perpetuate the supply. By the time the cottonwood was merchantable the company had discontinued using that species, had used principally Sitka spruce for a number of years, and was discarding the latter for the bulk of its production in favor of the superior Western hemlock. The higher value cottonwood which resulted from the cuttings was used for a higher value product, veneer. And the trend now for some types of pulp is for the greater use of true firs, particularly Silver fir, in the place of hemlock.

The war has added products of the bark of both Western hemlock and Douglas fir to the list of critical materials.

The bark of Western hemlock has been long regarded as an important potential source of vegetable tannin. There was an unsuccessful attempt as early as 1892 in Clallam County, Washington, to use it for this purpose. Many investigations have been made through the intervening years but no commercial operations have resulted. With the rapid passing of American chestnut and restricted imports of Quebracho extract from the Argentine and Paraguay because of a shortage of bottoms, Western hemlock bark now becomes an important domestic source. A plant in Washington will shortly be supplying some of the tannin so essential in this world of marching men.

With imports of Mediterranean cork becoming progressively restricted, the most likely domestic substitute is found in the bark of Douglas fir. This also has been long known and a patent covering a method for its extraction was granted in the United States in 1922. The College of Forestry at the University of Washington, under a grant from the Washington State Planning Council, has been investigating the possibilities of utilizing Douglas fir cork commercially during the past few months. In the course of this study the investigators developed processes industrially practicable for extracting the cork mechanically and refining it chemically so that a raw material suit-

able for the manufacture of bottle cap liners, linoleum, and insulating board was produced. A co-operative survey conducted by the College of Forestry and the West Coast Lumbermen's Association has shown that there is a potential annual productive capacity of 100,000 tons of granulated Douglas fir cork in western Washington alone. This is one-half of the national annual consumption of Mediterranean cork for all purposes. Commercial production, while not under way at present, should soon be an accomplished fact.

The industry has always had a notorious reputation for incomplete utilization of its raw forest materials. It is commonly said that one-third of the gross merchantable volume of a tree is left behind by the logger and another third is unused by the manufacturer. The effect of this has been to decrease the stumpage realization of old-growth timber and to act as one of the chief obstacles in foresters' attempts to interest management in timber growing. There have been a number of investigations made to determine workable solutions to this problem and most of them have concluded that an integration of utilization is necessary.

Integrated utilization can be best explained by citing an example. A logging operator in Lewis County, Washington, owned an area of 480 acres, of which 80 acres was old-growth fir with considerable windfall and the balance 130-year old fir stand with an understory of cedar. The first operation in the old-growth area was the riving of shakes from down cedar and the bucking and yarding of all fir windfalls. Following this, the old growth was logged for saw logs, with peelable logs being sold to a plywood plant. Before the slash was burned, all the utilizable tops, breaks, snags, and long butts were worked into fuel wood for local consumption. In the 130-year old stand, cedar poles were pre-logged, fir piling was then removed and, finally, the balance of the stand was logged and manufactured into cross ties, timbers and boards by two semi-portable mills in the woods. Following the sawing of the logs in this last operation, the slabs which could not be cut into 2x4's or 1" boards were sold locally for fuel wood. The whole operation was conducted in such a way as to realize all the values, because breakage was held to a minimum, each type of material was utilized for the highest value products it would make and there was practically no sound material left on the ground. This experience should certainly indicate that careful utilization planning is a professional function, yes, even an obligation, of a forester engaged in the management of an industrial property.

The industry has made considerable progress in research in the manufacturing phases. It has been constantly augmenting its research facilities by the addition of new laboratories and the expansion of established ones. Forward-looking improvements in the kiln drying of lumber and the chemical seasoning of timbers have been accomplished. Plywood has increased its construction value many fold by the use of practically waterproof bonding agents. Waste pulp liquor, that abundant potential source of plastics, chemicals and synthetics, is being thoroughly investigated and new uses for wood pulp are being discovered right along. Forest products research has as its aim the taking of the product of the saw, the lathe or the digester, and im-

proving it so as to furnish the consumer with a commodity which satisfies the requirements of utility and economy. This objective, in turn, makes industrial silviculture practicable.

Timber engineers are now showing architects how to use wood to advantage in their designs. They are showing builders how to improve wood structures by the use of modern timber connectors and laminated trusses. Retail lumber dealers are furnishing home builders with carefully prepared plans for comfortable modern dwellings. They are providing farmers with plans for silos, corn cribs, and other farm structures. These forest marketing activities place wood in a competitive position with other building materials. Applied silviculture in the forests of the Pacific Northwest is made possible by successful trade promotion and extension in the trade areas of the Middle West.

It has been held that industrial forestry may be considered as a balance wheel with each mutually dependent spoke of growing, protecting, harvesting, manufacturing, and marketing required to furnish its part of the drive necessary to overcome inertia. In theory it rotates perpetually provided there is always a demand for forest products and an adequate supply. Actually, with periodic fluctuations of demand and lopsided distribution of age classes, the Douglas fir region balance wheel has not always revolved effectively. The day is no longer with us when the public can be allowed to confound forestry with tree planting. The day has also passed when the public can be allowed to think of foresters only as tree planters and fire wardens. Nor do foresters have the right to think of their profession in light of their own special interest for, if the dirt forester would grow trees, his lumber salesman colleague must be able to market their products