The Oregon Forest Products Laboratory

By
William J. Baker

OREGON FOREST PRODUCTS LABORATORY
State Board of Forestry and School of Forestry,
Oregon State College Cooperating
Corvallis
THE OREGON FOREST PRODUCTS LABORATORY was established by legislative action in 1941 as a result of active interest of the lumber industry and forestry-minded citizens. It is associated with the State Board of Forestry and the School of Forestry at Oregon State College. The Dean of the School of Forestry is its Director.

An Advisory Committee composed of men from representative interests determines Laboratory policy and guides the research program that is directly pointed toward the fuller utilization of Oregon's forest resources. The following men constitute the present membership of the Advisory Committee:

JOHN H. HALL, Governor . . Chairman
H. J. Cox . . West Coast Lumbermen's Association
PAUL M. DUNN . . School of Forestry
CHARLES W. FOX . . Oregon Plywood Interests
J. ALFRED HALL . . Pacific Northwest Forest and Range Experiment Station
ORVILLE R. MILLER . . Willamette Valley Lumbermen's Association
CARL A. RASMUSSEN . . Western Pine Association
N. S. ROGERS, State Forester . . Secretary
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The Oregon Forest Products Laboratory

The Oregon Forest Products Laboratory is a tax-supported research agency maintained by the state at Corvallis, the State Board of Forestry and the School of Forestry, Oregon State College, cooperating. Its functions, briefly, are to obtain and to disseminate technical information in efforts to attain the fullest utilization of our total forest crop, to improve the serviceability of present products, to develop new products, to preserve and extend appropriate markets for all Oregon forest products, and to assist users in the application of technical knowledge that will enable them to obtain the inherent satisfaction and serviceability of forest products.

Authorization for the Laboratory

The Laboratory was created in 1941 by an Act of the State Legislature that authorized the State Board of Forestry, in cooperation with the School of Forestry at Oregon State College, to institute and carry on research in the fields of utilization, fabrication, and manufacture of forest products for the purpose of furthering the interests of forestry and forest products industries within the state. This law and subsequent amendments provided for:

1. Initiation of research to improve the utilization of unused residues resulting from the harvesting of forest crops and from the manufacture of lumber and other wood products.

2. Establishment of a Forest Products Laboratory at Oregon State College, such laboratory to be under the direction of the Dean of the School of Forestry. The Director is responsible (a) for cooperating with individuals, corporations, associations, and public agencies, and (b) for hiring personnel and purchasing materials and equipment to do or cause to be done all things necessary to the research program or other projects, objects, and purposes of the Act.

3. Creation of an Advisory Committee of eight members, six of whom are appointed by the Governor of the state. Each of the following recommends a member for appointment: Oregon Plywood Interests, Pacific Northwest Forest and Range Experiment Station, School of Forestry at the State College, West Coast Lumbermen's Association, Western Pine Association, and the Willamette Valley Lumbermen's Association. The Governor, an ex-officio member of the Advisory Committee, is its Chairman, and the State Forester is its Secretary.
4 Financing of the program at first by direct legislative appropriations, which later were supplemented by the establishment of a privilege tax on all timber in excess of 25,000 board feet harvested by each operator in the state. After deducting costs of collection, 60 per cent of the remainder of the privilege tax of five cents per thousand feet (log scale) is allotted to research at the Oregon Forest Products Laboratory; the other 40 per cent is allocated to the State Board of Forestry for forest management research. This privilege tax was effective July 1, 1947 and is to terminate June 30, 1953; it is intended primarily to provide funds for the establishment of adequate research facilities.

5 Granting and vesting the State Board of Forestry with authority to accept gifts or donations that may come from any source and are intended to further the objectives of the law. The State Board of Forestry is also authorized to enter into contracts and agreements with the United States of America or any of its agencies provided that such contracts or agreements are necessary, proper, and convenient to the attainment of the objectives of the program and provided that they are not contrary to the laws of the State of Oregon.

Figure 1. Industrial Building, Oregon State College.
Functions of Advisory Committee

Members of the Advisory Committee receive no compensation for their services, but they are reimbursed for actual travel expenses incurred when attending Committee meetings and for the performance of other official services. By law, the functions of the Advisory Committee are:

1 To survey the entire field of research in wood utilization for the purpose of assembling definite information covering current research projects as well as past accomplishments and rendering practical counsel in the field of economic forest utilization.

2 To explore new fields for the utilization of forest products and to encourage the establishment of new industries of this type within the state.

3 To guide and approve all research activities undertaken by the Forest Products Laboratory.

4 To suggest, as a result of contacts with wood-using industries, promising wood utilization projects to other research organizations.

5 To recommend the compilation of and release to industry and to the general public all research information and data.

Need for the program

The State of Oregon has about 26½ million acres of land that are unsuited for uses more profitable than the production of commercial forests. This land will either produce wealth or it will not, according to its management and use, but the extent to which it will return wealth depends in large measure on the utility values of the forest crop it yields. Although the state, its counties, and municipalities own but 4 per cent of this land, in contrast to the 58 per cent in federal and 38 per cent in private ownership, the state is justified in applying tax money to forest products research.

Better adaptation of wood, the principal product of the forest crop, is of direct concern to consumers whose proper housing and standards of living are closely associated with the satisfactory use of wood products. Greater utility of wood is vital to workers who need the millions of dollars of wages furnished by stable employment in forests, sawmills, pulp mills, and all other industries that use wood in manufacture and construction. Full utilization of products is essential if owners of forest land, public and private, are to realize the maximum value of the tree crop. Local communities, counties,
the state, and the Nation at large have a basic interest in obtaining
taxes continuously from owners of productive forest land and suc-
cessful forest industries.

Forest products research must aid in solving many difficult
problems, such as:
1 How to utilize more efficiently the small-sized and second-
growth trees that will form the bulk of our future forests.
2 How to obtain utilitarian products from tree species that are
now unused or little used.
3 How to create values for the residues that develop in the
conversion of trees into articles of commerce.
4 How to increase the serviceability and economic advantages
of wood by proper use, by selection of suitable material, by
modification of properties, by improved treating processes,
and by the development of better or entirely new methods
of wood conversion and fabrication.

Research findings must be applied to be beneficial

Research merely for extension of knowledge may have potential
value, but application of research results can benefit everyone (a) be-
cause the use of forest products is so universal and so much a part
of the daily life of every individual, (b) because the conversion and
processing of the forest crop constitute the largest manufacturing
industry within the state, and (c) because our forest products are
shipped into every other state in the Union. Specifically, application
of fruitful research achievements will be profitable to:
1 Producers of forest crops, including the general public as
owners of community, country, state, and national forests; the
farm woodland owner; the commercial forest owner; and the people engaged in growing, managing, and protect-
ing forest crops.
2 Processors and handlers of forest products, consisting of all
individuals and organizations engaged in harvesting, con-
verting, processing, transporting, distributing, and selling
forest products. This group provides the greatest amount
of employment for labor, and it is the group that can make
the greatest contribution to the stability of forestry com-
munities.
3 Consumers of forest products, comprising virtually the entire
population of the Nation, particularly labor, farmers, home
owners, industrial organizations, and public agencies, all of
whom use vast quantities of forest products.
Figure 2. Rotary, 17-inch by 20-foot, internally-heated, wood-carbonizing retort (above left) and calcining oven (below right).

4 Governmental units, municipal, county, state, and federal, all of whom, because of the broader tax base resulting from the creation of values where none had existed heretofore, may render greater service to the general public without increasing rates of taxation.

The Oregon Forest Products Laboratory, within the limitations of its staff, will assist manufacturers, users, and others in applying technical knowledge that will enable them to utilize the forest crop more fully and to obtain greater satisfaction and serviceability from forest products.

Forestry Research Foundation

The Forestry Research Foundation, Salem, Oregon, a nonprofit, perpetual, Oregon incorporation, was established in 1945 to stimulate and facilitate research in all branches of forestry and related fields by the Oregon Forest Products Laboratory, Oregon State College, and others who collaborate with the Laboratory and the College, especially for the benefit of the forestry and related industries of the Pacific Northwest. Not only does the Foundation pro-
mote basic research, but it also provides and assists in providing means for developing research results for application in the forestry and related industries. To attain these objectives, the Foundation solicits donations, gifts, grants, bequests, assignments of patent rights, and similar considerations of value.

Laboratory staff and organization

Aside from the Dean of the School of Forestry, who officially is Director of the Laboratory, the full-time professional staff now consists of nine men: a Technical Director, a Chemical Engineer, a Wood Chemist, two Forest Products Technologists, and four Wood Technologists. The full-time employment of another Chemist is planned. Several part-time specialists and graduate assistants work under the supervision of regular professional staff members. In addition to full-time clerical workers and mechanics, several part-time people, usually students, are employed when extra work demands arise.

The working organization is headed by the Technical Director, who has charge of the research program and the internal administration of the Laboratory. For purposes of administration, the present work of the Laboratory is divided into sections, each of which has or will have one man in charge. These section heads work under and are responsible to the Technical Director. On the basis of the current research program, the Chemical Utilization, Industrial Service, and Wood Technology Sections are now operative.

Physical facilities of the Laboratory

The Laboratory is housed in a structure, known as the Industrial Building, provided by the State Board of Higher Education in July 1947 in response to state-wide interest in industrial research. This building is a modern, two-story, wood-steel-tile-concrete structure having ground-floor dimensions of 60 by 300 feet. The Forest Products Laboratory shares the Industrial Building with the Department of Chemical Engineering of the State College; the Laboratory occupies two floors of about one-half of the building. Space is allocated to chemical utilization, dry kiln, fiberboard, plywood, timber testing, wood preservation, wood technology, and physical laboratory equipment; a machine shop; four controlled temperature-humidity rooms; two storage rooms; two offices; and a library. Wood carbonization and charcoal briquetting equipment is housed in an adjacent small, frame building.

Much new equipment has been purchased, some has been procured from war surplus, many items are on order, and some apparatus must be designed and assembled at the Laboratory. It is planned
eventually to have enough essential equipment to permit research on virtually any chemical or physical aspect of forest products utilization. Full use will also be made of available laboratory equipment of cooperating agencies and facilities, and it is highly probable that some research projects will be conducted at industrial plants located throughout the state.

Scope of research program

Because the original 1941 law provided for the initiation of research to improve the utilization of residues arising from the harvesting of forest crops and from the manufacture of lumber and other forest products, it was appropriate that first research efforts

Figure 3. Unit for extracting wax from wood-sugar lignin residue.
should be directed toward determining the quantities of sawmill residues available and possible uses for these materials. Since sawdust, slabs, and edgings constitute the bulk of unused wood, the costs of converting these materials into fuel and transporting the fuel by various methods to large consuming centers were studied.

Other projects undertaken included investigations on (a) the use of sawdust and hocked wood for fiberboard manufacture, (b) the use of Douglas-fir bark, (c) the carbonization of wood residues, (d) the possible uses of the tars accumulated from the wood carbonization process, (e) the effects of storage on hocked wood, (f) the utilization of the lignin residue, calcium sulphate, and waste liquor from the wood-sugar alcohol process (g) the utilization of lodgepole pine and native hardwoods, and (h) the possibilities of relogg and salvage operations on previously logged land.

The current scope of the Laboratory's research program is indicated in the following outline:

1. Chemical Utilization Section
   - Wood chemistry
     a. Wax recovery from lignin residue of wood-sugar alcohol manufacture.
     b. Tannin production from Douglas-fir bark.
     d. Chemical analysis of ponderosa pine bark, in cooperation with the Western Pine Association.
     e. Chemical analysis of Douglas-fir wood extractives.
     f. Chemical analysis of western woods, in cooperation with the Department of Chemistry, Oregon State College.
     g. Chemical analysis of decayed wood.
   - Wood carbonization
     a. Production of 5-ton sample of Douglas-fir sawdust charcoal for commercial test by the abrasives industry.
     b. Design of a one-ton per day charcoal plant.
     c. Analysis of tars from wood carbonization.

2. Wood Technology Section
   - Fiberboard and related products
     a. Study of factors in fiberboard production.
     b. Study of essential properties and ultimate production of wood-fiber specialty items.
     c. Special surface treatments for hard-pressed fiberboard.
d. Utilization of wood containing decay for fiberboard.
e. Production of containers for agricultural products.
f. Utilization of shingle tow for specialty board.

Plywood and laminated products
a. Utilization of No. 3 Douglas-fir lumber in prefabricated panels, in cooperation with West Coast Lumbermen's Association.
b. Development of molded products.
c. Development of veneered wood-waste core panel.
d. Utilization of decayed and defective wood for laminated core stock.
e. Study of gluing characteristics of Oregon hardwoods.
f. Study of operating factors in high frequency gluing.
g. Study of adhesives.

Seasoning
a. Development of dry kiln schedules for Oregon hardwoods.
b. Improvements in kiln design, especially small units.
c. Comprehensive study of drying factors of wood.
d. Testing of end sealers, in cooperation with the West Coast Lumbermen's Association.
e. Study of solvent seasoning, by arrangement with the Western Pine Association.

► Wood preservation
a. Serviceability of native Oregon woods as crossties, in cooperation with the Southern Pacific Company.
b. Continuation of fence post durability experiments.
c. Design of experimental treating plant.
d. Study of resin-coated nails for use with resistance-type electric moisture meters in determining moisture content of thick lumber.
e. Screening of chemical compounds for fungicidal value, in cooperation with the Prevention of Deterioration Center, National Research Council, Washington, D. C.
f. Development of accelerated testing methods for evaluating treated wood, in cooperation with several agencies.

► Timber testing
a. Determination of mechanical properties of little-used Oregon species, especially hardwoods.

► Miscellaneous
a. Cooperation with the Wooden Box Institute in research on white fir box ends.
b. Evaluation of wood-sugar molasses and yeast as livestock food supplements, in cooperation with the U. S. Forest Service and the Oregon Agricultural Experiment Station.
c. Comprehensive study of amount, kind, and rate of decay in old-growth Douglas-fir, in cooperation with several companies and agencies.

3. Industrial Service Section
► Information
a. Editing, publication, and dissemination of research data.
b. Consultations on wood utilization problems.

► Investigations
a. Wood utilization and sawmill surveys.
b. Utilization of No. 3 Douglas-fir lumber, in cooperation with the West Coast Lumbermen's Association.
c. Grade and mill studies in connection with the Douglas-fir decay project.
d. Visits to wood-using facilities throughout the state.

How you can use the Laboratory

Merely by writing to or calling at the Oregon Forest Products Laboratory, 17th and May streets, Corvallis, and subject only to the limitations of Laboratory personnel and available data, a resident of Oregon may, without charge, obtain advice, information, and assist-

Figure 5. Double-disk, 24-inch diameter refiner for reducing treated chips to fiber.
ance on any forest products utilization problem. Many final and progress reports on Laboratory research projects have been published as bulletins, circulars, or trade journal articles. Copies of most of these reports are available to interested persons. If the data necessary to solve a given forest products utilization problem

Figure 6. Hot press having 24- by 24-inch platens and 155-ton capacity.
are not in Laboratory files, but are known to be available elsewhere, reasonable attempts will be made to obtain such data in order to save the time, effort, and money that might otherwise be expended in duplicate research activities.

Since the major objective of the program is to obtain complete utilization of the forest crop, it is the policy of the Advisory Committee and the Laboratory to cooperate fully with individuals, industry, and public agencies in a sincere effort to attain that objective.

The Laboratory welcomes suggestions for research projects that will further the maximum utilization of our forest crop. All suggestions will be given careful consideration, and the ones showing promise of wide application will be incorporated into the research program at the earliest time, consistent with personnel and facilities available and the priorities assigned to active research projects.

**List of Publications**

**Bulletins—**


**Circulars—**

Saving Fuel in Oregon Homes, by E. C. Willey. Oregon State Engineering Experiment Station Circular Series, No. 7. 1942.

**Information Circulars—**


The Oregon Forest Products Laboratory, by William J. Baker. Oregon Forest Products Laboratory Information Circular 3. 1948.

**Research Leaflets—**


The Essentials of Kiln Drying Oregon Hardwood Lumber, by Glenn Voorhies. Oregon Forest Products Laboratory Research Leaflet No. 2. 1944.

The Effect of Storage on Douglas-Fir Hugged Wood and Sawdust, by Leo Friedman, Eugene Tower, and R. B. Boals. Oregon Forest Products Laboratory Research Leaflet No. 3. 1945.
Published articles—


