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The forests, Baltimore
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MARYLAND STATE BOARD OF FORESTRY

F. W. BESLEY, State Forester.

THE FORESTS

—OF—

BALTIMORE COUNTY

BY

F. W. BESLEY State Forester

BALTIMORE, MARYLAND
AUGUST, 1921

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STATE FORESTER'S OFFICE

815 CALVERT BUILDING

BALTIMORE

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The Forests Of Baltimore County.

INTRODUCTION.

A forest survey of Baltimore County, made by the State Board of Forestry a few years ago, resulted in detailed information concerning the character and composition of the forests, the stand of timber, the different wood uses, the amount of timber being cut, and the damage by fire and other destructive agencies, and forms the basis for this report. The large forest map, found on the inside back cover of the report, greatly supplements the information herein contained.

Baltimore County, the third largest in the State, has important forest resources. It ranks third in the value of its forest products and ninth in total wooded area. It ranks second in area of improved farm land and has the largest assessed value of any county in the State. Its proximity to Baltimore City, with its rapidly expanding industrial developments, gives it an excellent market for all classes of forest products.

The County lies in two physiographic divisions, the Piedmont and the Coastal Plain. Since only about one tenth of the land area embracing the southeastern section lies in the Coastal Plain, the surface is distinctly characteristic of the Piedmont with its rolling hills interspersed with a few valleys.

The County is traversed by five lines of railroad, covering 120 miles, and by 900 miles of improved highway, rendering all parts accessible.

LAND CLASSIFICATION.

Improved Farmland	230,471	acres	58%
Wooded Area	103,515	"	24%
Waste Land	65,739	"	17%
Salt Marsh Land	3,456	"	1%
	403,181	"	100%

DISTRIBUTION OF THE FORESTS.

Outside of the suburban development in the vicinity of Baltimore, there is little clearing of land, and comparatively little cleared land is reverting to forest. It appears that one will about off-set the other, so that a "status quo" is maintained. It is not likely that there will be any decided change in forest distribution for many years to come.

Twenty-four per cent. of the land area of the County is in forests. This is distinctively an agricultural county and the forest areas are, generally, distributed in woodlots of varying sizes from ten to a hundred acres, interspersed with cleared lands, the exception being in the southheastern part in the Coastal Plain, where there are a few large areas of continuous forests. This is true to a limited extent in the northern part of the County around Parkton, and also in the central part between Cockeysville and Owings Mills.

The forests are largely confined to rocky ridges, steep slopes, and flats along streams. It is a county of high agricultural development where arable land and forest land are sharply divided.

The fifteenth district contains the largest acreage of woodland and also the highest percentage, sixty-nine, while the twelfth district contains the smallest acreage of woodland, and also the smallest percentage of wooded area, amounting to 11%. The eleventh district contains timber of the highest stumpage value. Only eight of the districts of the County contain any pine of merchantable size, and of this, seventy-five per cent. is in the fifteenth district.

Table I shows the area, stand, and value of saw timber by election districts. Distribution and character of the forests are graphically shown on the map at the end of the report.

DESCRIPTION OF THE FORESTS.

The forests of the County are almost entirely of the hardwood type. In the stand of timber, the hardwoods constitute ninety-six per cent., while the pine constitutes only four per cent. Twenty-four per cent. of the land area is in forest, which is about the right proportion for the best economical development.

Rolling hills with ridges, slopes, and valleys produce three forest types,—notably, the ridge type consisting of chestnut, chestnut oak, and scarlet oak, as the prevailing tree species; the slope type in which

STANDARD VALUE OF SAW TIMBER BY ELECTION DISTRICTS, TABLE I.

Dist. No.	Total Land Area.	Wooded Area.	% Wooded	Stand of Saw Timber in Board Feet (Doyle Log Rule). All Trees More Than Nine Inches in Diameter.				Stumpage Value.	
	Acres.	Acres.	%	Hardwood M. Bd. Ft.	Pine M. Bd. Ft.	Total M. Bd. Ft.	Hardwood $8.00 per M.	Pine $8.00 Per M.	Total $
1	17,460	5,164	30	8,529	24	8,553	68,232	$192	$68,424
2	28,750	8,744	29	18,497	..	18,497	147,976	...	147,976
3	20,820	4,820	23	11,241	36	11,277	89,928	288	90,216
4	37,580	8,624	23	20,841	155	20,996	166,728	1,240	167,968
5	28,290	4,487	16	10,145	396	10,541	81,160	3,168	84,328
6	22,870	7,089	31	8,475	..	8,475	67,800	...	67,800
7	52,670	8,142	15	10,485	56	10,541	83,880	448	84,328
8	41,273	9,207	22	24,330	..	24,330	194,640	...	194,640
9	23,370	5,160	22	14,333	..	14,333	114,664	...	114,664
10	30,980	6,120	20	14,325	..	14,325	114,600	...	114,600
11	42,930	14,413	34	30,427	1,152	31,579	243,416	9,216	252,632
12	8,180	873	11	668	..	668	5,344	...	5,344
13	9,178	1,186	13	1,525	..	1,525	12,200	...	12,200
14	14,180	3,087	27	4,696	102	4,798	37,568	816	38,384
15	23,650	16,399	69	22,835	6,070	28,905	182,680	48,560	231,240
Co.	403,181	103,515	24	201,352	7,991	209,343	1,610,816	$63,928	$1,674,744

the chestnut, scarlet oak, black oak, and white oak of the upper slopes give way to red oak, tulip, and hickory on the lower slope; and the bottom type found along streams or low flat lands, consisting principally of red maple, ash, elm, birch, and sycamore.

Ridge Type.—This type of forest, occupying as it does the rocky ridges with thin soil of poor quality, has the least valuable forest growth. On the other hand, this land is not suitable for any other purpose, and is better adapted to the growing of forests than for any other use.

Slope Type.—The slope type contains deeper soils with a greater amount of moisture, therefore, producing a correspondingly heavy stand of timber. It is also noted that the trees are taller and better developed on this type than on the ridge type.

Bottom Type.—The bottom type is found on the deeper, moister soils and where there is not excessive moisture, the stands are heavy and well developed. Frequently, however, forests of this type are on wet, or poorly drained, soil, which retards growth and produces a poorer quality of timber.

Practically all of the forests have been cut over one or more times. Since the more valuable species have been cut the heaviest, constant culling has changed the relative proportion of the different species and caused considerable deterioration of the stand. The chestnut has nearly all been killed by the chestnut blight and is now being replaced by a natural growth of oaks, poplar, and hickory. In the mean time, there has been a tremendous waste caused by the failure to utilize the chestnut before it became worthless.

The use of the forest and the intensity of cutting has varied inversely with the distance from the railroad, or the difficulty of logging. Some of the best timber is now found in inaccessible places, such as steep slopes or along ravines of difficult access.

COMMERCIAL TYPES.

In the forest survey of the county, the forests were divided into three general classes,—hardwoods, pines, and mixed hardwood and pines. The hardwoods were divided into two classes,—the merchantable and the culled forests, the merchantable indicated on the map by the letter "M" and divided into two sub-divisions, depending upon the stand of timber per acre, while the culled forests, indicated by

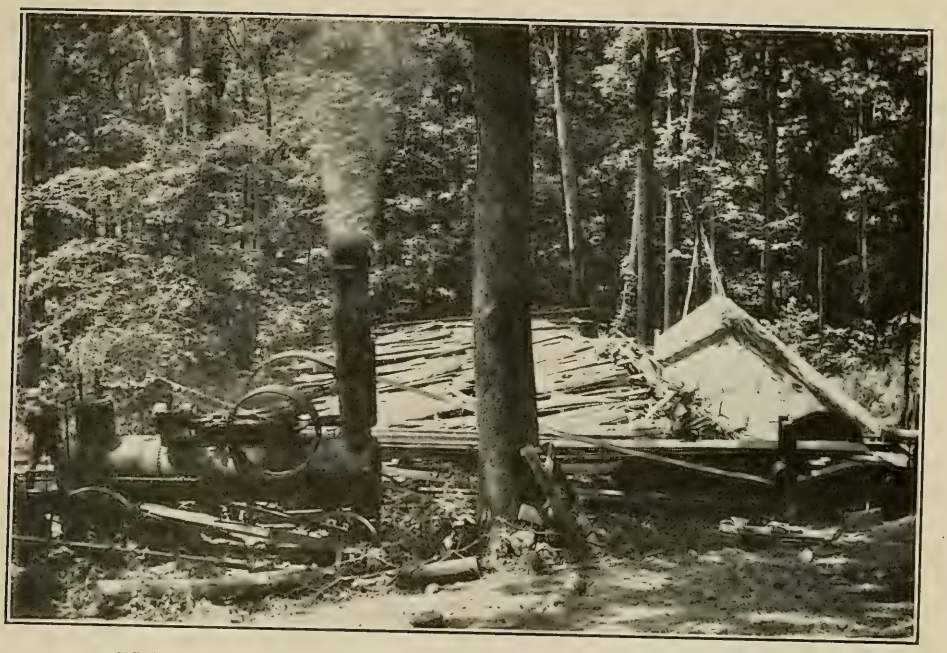

PLATE I. FIG. 1.—PORTABLE SAW-MILL, NEAR ILCHESTER.
There are about 49 operating in the County.

PLATE I. FIG. 2.—THE PRODUCT OF A PORTABLE SAW-MILL.
An operation in a 30-acre timber tract. The annual output of the saw-mills is 7,585,000 board feet, and 101,150 sawed railroad ties.

the symbol "C" are divided into three sub-divisions, according to the stand of timber per acre. The merchantable forests indicate stands in which there is a sufficient amount of timber to justify logging operations, while the culled forests are usually those of immature growth, where the stand of timber is not sufficient to warrant logging operations. The pine forests, which are found sparingly, except in the southeastern section of the County, and practically all consisting of scrub pine, are indicated by the symbol "S," and are, likewise, sub-divided into three classes on a basis of stand of timber. The bulk of the pine, however, is found in mixed stands with hardwood, indicated by a combined symbol "C" and "S", showing a culled hardwood and pine class. Of this type, there are three classes, depending upon the proportion and size of the pine and of the hardwood in mixture.

By referring to the map in the back of this report, the different types and their arrangement will be clearly demonstrated.

Hardwood Type.—This is the prevailing type throughout the County and comprises more than 95 per cent. of the total forested area. The three main sub-types under this are merchantable hardwoods, culled hardwoods, and hardwood seedlings. The former represents areas containing sufficient trees of mature size to make logging operations profitable. This type is sub-divided into two classes according to the stand of timber per acre.

The culled hardwood class represents areas that have been more or less cut over, and where the stand of timber is not considered heavy enough to make the lumber operations entirely practicable. Many of these stands contain scattered trees of large size and considerable value, but in most cases, they represent young stands not yet mature. The culled hardwoods are further sub-divided into three classes, according to the relative stand of timber per acre.

The third class of hardwoods, the hardwood seedlings, represents young stands, usually under twenty feet in height, that contain nothing of sufficient size to be of merchantable value.

The Pine Type.—The pine type, the smallest of the three mentioned, occupies very limited areas in different parts of the County. The bulk of it is found in the Middle River section, in the southeastern part of the County, and consists of scrub pine. This type is sub-divided into three sub-classes, differing according to the stand of timber.

Mixed Type.—The third general type, consisting of a mixture of hardwood and pine, occupies limited areas in the County,—the larger portion being in the southeastern section. The total amount comprises a very small percentage of the forested area. This type consists of stands of varying mixtures of hardwood and pine of varying sizes, as indicated by the letters and symbols on the map.

NATIVE FOREST TREES.

The native forest trees found in the County comprise an extensive list of 79 species. A large part of them are of commercial importance, while others are found only sparingly. The list below contains species native to the County which reach tree size.

EVERGREEN OR NEEDLE-LEAVED TREES.

Common Name.	*Botanical Name.*
Scrub Pine	Pinus virginiana
Pitch Pine	Pinus rigida
White Pine	Pinus strobus
Short Leaf Pine	Pinus echinata
Red Cedar	Juniperus virginiana
Hemlock	Tsuga canandensis

DECIDUOUS OR BROAD-LEAVEVD TREES.

Common Name.	*Botanical Name.*
White Oak	Quercus alba
Chestnut Oak	Quercus prinus
Post Oak	Quercus minor
Swamp White Oak	Quercus platanoides
Burr Oak	Quercus macrocarpa
Red Oak	Quercus rubra
Black Oak	Quercus velutina
Scarlet Oak	Quercus coccinea
Spanish Oak	Quercus digitata
Pin Oak	Quercus palustris
Willow Oak	Quercus phellos
Black Jack Oak	Quercus marilandica
Shingle Oak	Quercus imbricaria
Scrub Oak	Quercus ilicifolia
Chestnut	Castanea dentata

Common Name.	*Botanical Name.*
Tulip Poplar	Liriodendron tulipifera
Mockernut Hickory	Carya alba
Pignut Hickory	Carya glabra
Shellbark Hickory	Carya evata
Small Pignut	Carya microcarpa
Bitternut Hickory	Carya minima
Big Shellbark Hickory	Carya laciniosa
Black Walnut	Juglans nigra
Butternut	Juglans cinerea
Black Locust	Robinia pseudacacia
Red Maple	Acer rubrum
Silver Maple	Acer saccharinum
Sugar Maple	Acer saccharum
Ash Leaved Maple	Acer negundo
Black Maple	Acer nigrum
Beech	Fagus americana
Red Gum	Liquidambar styraciflua
Sour Gum	Nyssa sylvatica
Wild Black Cherry	Prunus serotina
Fire Cherry	Prunus pennsylvanica
Bird Cherry	Prunus avium
White Elm	Ulmus americana
Slippery Elm	Ulmus pubescens
Sycamore	Platanus occidentalis
Sassafras	Sassafras sassafras
Persimmon	Diospyros virginiana
Basswood	Tilia americana
Hackberry	Celtis occidentalis
Holly	Ilex opaca
White Willow	Salix alba
Pussy Willow	Salix discolor
Black Willow	Salix nigra
Red Bud	Cercis canadensis
Dogwood	Cornus florida
Blue Beech	Carpinus caroliniana
Shad Bush	Amelanchier canadensis
Trembling Aspen	Populus tremuloides
Big Toothed Aspen	Populus grandidentata

Common Name.	*Botanical Name.*
Balsam Poplar	Populus balsamifera
Hop Hornbeam	Ostrya virginiana
Red Mulberry	Morus rubra
Paw Paw	Asimina triloba
Witch Hazel	Hamamelis virginiana
Swamp Magnolia	Magnolia glauca
Umbrella Tree	Magnolia tripetala
Cockspur Thorn	Crataegus crus-galli
Red Birch	Betula nigra
Black Birch	Betula lenta
White Ash	Fraxinus americana
Black Ash	Fraxinus nigra
Red Ash	Fraxinus pennsylvanica
Fringe Tree	Chionanthus virginica
Hercules Club	Aralia spinosa
Staghorn Sumach	Rhus hirta

INTRODUCED TREES THAT HAVE BECOME COMMON IN THE FOREST.

Common Name.	*Botanical Name.*
Honey Locust	Gleditsia tricanthos
Catalpa	Catalpa speciosa
Ailanthus	Ailanthus glandulosa
Empress Tree	Paulownia imperialis
Osage Orange	Maclura pomifera

IMPORTANT TIMBER TREES AND THEIR CHIEF USES.

Nearly all of the tree species found in the County are used to some extent, but taking only those which, by reason of their abundance and good qualities, have an extensive use, the list may be reduced to comparitively few well recognized species.

Oaks.—At the head of the list naturally stand the oaks which furnish 60 per cent. of the timber cut of the County. There is no class of wood that possesses strength and durability to such a marked extent as oak. The oaks may be divided commercially into two groups-the white oaks and the red oaks.

White Oaks.—This group includes a number of different species classed by timber operators under the general name of white oak. The wood of the different species is very similar and difficult to recognize, except by experts. For all practical purposes, the wood of one species is as good as another. The principal species included in this group are the true white oak, chestnut oak, post oak, and swamp white oak. The true white oak furnishes about 80 per cent. of what is cut and sold as white oak, the chestnut oak about 12 per cent., and post oak and swamp white oak, the remainder.

The wood of the white oak is especially tough and strong, and since it is so widely distributed over the County and constitutes so large a percentage of the merchantable timber, it is the most important of all of the tree species. It is used locally for general construction purposes, and is extensively exported from the County for car construction, framing, bridge plank, furniture wood, cooperage stock, railroad ties, piling, and a variety of other uses requiring high grade wood.

Red Oaks.—A number of different species of oak are sold as red oak, including black oak, red oak, scarlet oak, Spanish oak, pin oak, and willow oak. Sometimes, the last two mentioned are classed as water oaks, and sold at a somewhat lower price. Red oak is less durable than white oak, and for most purposes does not command so high a price. Like white oak, it is heavy, hard, strong, tough, but not so durable on exposure.

For interior uses, such as furniture, finish, etc., it is the equal of white oak, and sells for about the same price. Its chief uses are for general construction, car stock, railroad ties, planking, furniture, and interior finish. The greatest increase in use has been for railroad ties which take a large percentage of the cut. The wood of the red oak possesses all the requisite qualities for first class railroad ties, except its durability in contact with the soil. By treating the wood with a preservative, such as is in practice by all railroad companies, this obstacle is overcome, consequently red oak ties are now universally used.

Chestnut.—Chestnut was formerly the most abundant tree species in the County, but due to the ravages of the chestnut blight,—a fungus disease which has been destroying chestnut timber for more than ten years, its status as a commercial species seems doomed. The cut

at the present time, however, constitutes a very important item of timber production, constituting about 20 per cent. of the total. It is more abundant in the northern half of the County, and because of its durability in contact with soil, and its excellent stem development, it is much in demand for telephone, telegraph, and electric light poles, railroad ties, and general construction purposes. The wood is fairly light, soft, liable to warp and check in seasoning, easily split, coarse and brittle, but durable under exposure. There has been a great increase in the cutting of chestnut in the last few years, in the nature of salvage of timber affected by the blight. The cut, however, in the next few years, will rapidly fall off, due to exhaustion of supplies.

Tulip Poplar.—This species, commonly known as yellow poplar, is a tree found scattered singly or in small groups in the forest, and is rarely found in anything like pure stands. The wood is of fine texture, light, soft, easily worked, takes paint readily, and holds its shape well, making it a favorite among wood users. It attains a larger size than any other tree in the County, and is found in the deep, moist soils of ravines and lower slopes. It is used locally for weather boarding, sheathing, and general construction. The better grades are exported for furniture stock and interior finish, cigar boxes, wagon bodies, etc. The smaller and medium sized trees are cut extensively for pulpwood.

Hickory.—Several species of hickory occur in the County and are used indiscriminately. The principal species are mockernut and pignut hickory. The wood has a highly specialized use for spoke timber and tool handles, for which it is fitted by its distinctive qualities of hardwood, strength, toughness, and flexibility. It is a tree found sparingly in the forest and associated with the oaks, tulip, poplar and chestnut. While the wood is very valuable, usually only a small percentage of the tree is sufficiently clear straight grained to be acceptable for its special uses, hence it is not considered as a desirable tree to encourage in the forest. As a fuel wood, it ranks very high.

Locust.—This tree is abundant throughout the County, found on a variety of soils, and is the chief dependence for fence posts. It is a rapid growing tree of quick maturity, furnishing a valuable product, and is highly desirable for forest planting. In addition

to its local use for fence posts, the wood is specially used for insulator pine, and was used extensively during the War for tree nails in the construction of wooden ships.

Ash.—Although five species of ash are recognized in the County, it is probably that white ash constitutes more than 90 per cent. of the cut. It is a tree growing in mixture with other species in the forest, and is found on the moister soils along water courses. The wood is very heavy, strong, straight grained, tough and elastic, and is used for car construction, furniture, vehicle manufacture, agricultural implements, tool handles, sporting goods, etc. The amount cut in the County is, relatively, small, and it is usually thrown in with other species, being cut for lumber and rairoad ties, although occasionally selected logs are shipped for use in special wood using industries.

Black Walnut.—Walnut brings a higher price per thousand feet than any other wood, and during the War, immense quantities were cut and shipped out of the County for the manufacture of gun stocks and aeroplane propellers. It is a tree found along the edges of fields and ravines on the farm, rather than in the forest. Where it grows, it is a short stemmed, wide branching tree having a low percentage of merchantable content, so that the values received are not high as compared with the length of time required to grow the tree to commercial size, and the amount of space that it occupies. The wood is fine grained, hard, strong, durable, and easily worked. It is highly prized as a cabinet and furniture wood.

THE LUMBER AND TIMBER CUT.

There were forty-nine saw-mills operating in Baltimore County in 1920, which produced 7,585,000 feet board measure of lumber, together with 101,150 sawed railroad ties and other timber and wood products. In addition to the saw-mill operators, many of whom got out other timber products than lumber and railroad ties, there were at least ten others not operating saw-mills who produced poles, piling, veneer logs, or cordwood exclusively.

The lumber and timber cut of the County has fallen off considerably in the last six years, the lumber production for 1920, being below that of 1914 by nearly two and a half million feet, or a falling off of more than 28 per cent. In the same time, tie production has

fallen off 28 per cent., piling 40 per cent., and cordwood 60 per cent. The reduced output of lumber and timber products is due mainly to the depleted timber supplies. In the same time, however, timber values have greatly increased so that the value at the shipping points for lumber and timber production in 1920 was 88 per cent. greater than in 1914.

SUMMARY OF LUMBER AND TIMBER CUT, 1920——TABLE II.

Product	Amount		Value At Shipping Point
Lumber	6,235,000	Bd. Ft.	$249,400
Veneer Logs	2,600,000	" "	130,000
R. R. Ties	101,150	" "	96,000
Poles	7,175	" "	64,575
Copper Poles	4,770	tons	19,000
Piling	2,700	pieces	19,000
Cordwood	1,800	cords	14,400
	Total		$592,375

Lumber.—The lumber cut of the County consisted almost entirely of hardwoods, the amount of pine being negligible. Of the 6,235,000 feet board measure, produced, 70 per cent. was oak; 15 per cent., tulip poplar; 10 per cent., chestnut; and 5 per cent. miscellaneous species. Five years ago, chestnut formed nearly 50 per cent. of the lumber cut. The sudden dropping off is due to the destruction of the species by the chestnut blight. A great bulk of the lumber is cut by portable mills which usually operate but a few months in the year, generally during the fall and winter, although a few operate the year round. There are several operated by water power, doing a small custom sawing business.

The value of the lumber output, delivered at shipping points, is estimated at $249,400.

Veneer Logs.—For many years, the cutting and shipping of high grade logs from selected trees, particularly for the export trade, has been followed. In recent years, however, since the beginning of the War, there has been little or no demand for such export woods. In its place, however, has come a demand for large, high grade logs for the veneer plants located at Baltimore, and in adjoining states.

This is particularly true of tulip poplar used largely for veneer, basket making, and for cigar boxes. The cut of such material amounted to 2,600,000 board feet, the value f. o. b. cars at $50 per thousand, making a total of $130,000.

Railroad Ties.—The production of railroad ties has always been an important industry in the County. Some years ago, when labor costs were not so high, a considerable proportion of ties were hewn. Now, however, practically all are sawed. About 70 per cent. are oak, 20 per cent. chestnut, and 10 per cent. miscellaneous species. The total number cut in 1920 was 101,150 of the different grades, the average price at the railroad being 95 cents, making a total value of $96,092.

Poles.—Poles used by the telephone, telegraph, electric light, and trolley companies around Baltimore and vicinity drew heavily upon the rapidly diminishing chestnut pole supply of the County. Pole companies are finding it increasingly difficult to secure the supply of poles from local sources. During 1920, 7,175 poles varying in lengths from 20 to 50 feet, averaging about 35 feet, were sold from the forests of the County. The average price f. o. b. cars was $9.00, making a total value of $64,575. This did not include a large number of poles furnished by woodland owners in the construction of local lines, or for replacement, in such lines.

Copper Poles.—Copper poles, so called, are used at the copper smelters in Baltimore in the process of reducing ore to the pure metal. They consist of poles of varying length, although usually 30 feet long, and 3 inches, or over, at the small end, any kind of hardwood being taken. 4,770 tons of such poles were cut in 1920, which, at the value of $4.00 per ton f. o. b. cars, give a total value of $19,080 for this product.

Piling.—The demand for piling has fallen off very sharply since the War, but still constitutes an important product of Baltimore County's forests. This special use requires a strong wood in reasonably straight sticks. Oak, including both white and red, were the only kinds cut for this purpose. The production for the year amounted to 2,700 pieces, ranging from 30 to 60 feet, averaging about 35 feet in length, and worth $7.00 each f. o. b. cars, making a total value of $18,900.

Cordwood.—The increasing cost of coal and the difficulty of obtaining it has increased the market for cordwood. The high cost of cutting it, however, has been a serious drawback, so that the amount cut and sold was not large,—about 1,800 cords, which, at a value of $8.00 per cord at the shipping point, yielded $14,400. This does not include the fuel wood used on farms, which would probably increase this figure by 20,000 cords.

Miscellaneous Products.—It is known that small quantities of other products are produced and sold from the forests of the County, but as it was not possible to get reliable figures, they have been omitted from the estimates. They include small quantities of shingles cut by local mills, and used locally; a large quantity of posts cut from the woodland and usually sold in the neighborhood, also small quantities of pulpwood, tanbark, and walnut logs gathered up by buyers who scout around the country for such material.

THE WOOD-USING INDUSTRIES.

An intensive study of the wood-using industries of Maryland was made in 1916, just prior to the disturbance of normal conditions, occasioned by the War.* The information obtained showed the amount of wood of the various kinds that went through many processes of manufacture after coming from the sawmills or the forests, and being converted into finished products. These industries are of the greatest importance to Baltimore County, since they furnish an excellent market for home products.

The industries of Baltimore City and Baltimore County were not separated in this report, and while Baltimore City contains, probably, 95 per cent. of the industries, their proximity to Baltimore County makes them almost a part of it.

Baltimore City and County naturally lead the State in forest industries, as in all other kinds. Twenty-four per cent. of the County is wooded, and this and neighboring counties produce more than 7,000,000 feet of the timber which it manufactures. It is, of course, the heaviest importer in the State of high-priced foreign woods. All together, there are 38 varieties of wood used by this trade in Baltimore. Manufactories of wood employ nearly 8,000 people in 164 plants. These plants are of prime importance to the industrial activity of the City and the State. With unparalleled shipping facilities by rail and

*Wood-Using Industries of Maryland by F. W. Besley and J. G. Dorrance.

MEN EMPLOYED IN MARYLAND, BY INDUSTRIES—TABLE III.

Industry.	Baltimore.		Balance of State.		Total for State.	
	No. Men.	No. Plants.	No. Men.	No. Plants.	No. Men.	No. Plants.
1. Ship and boat building	1,901	17	173	10	2,074	27
2. Boxes and crates, packing	1,188	24	646	45	1,834	69
3. Planing mill products	942	27	415	44	1,357	71
4. Furniture	716	15	575	9	1,291	24
5. Instruments, musical	628	3	275	1	903	4
6. Vehicles and vehicle parts	509	46	75	6	584	52
7. Brushes	200	1	350	1	550	2
8. Car construction	260	2	200	1	460	3
9. Baskets	25	2	356	23	381	25
10 Fixtures	306	8	66	3	372	11
11 Tanks and silos, cooperage	135	7	102	11	237	18
12 Woodenware and novelties	175	5	19	3	194	8
13 Toys	175	2	----------	----------	175	2
14 Boxes, cigar	165	4	----------	----------	165	4
15 Caskets and coffins	115	1	----------	----------	115	1
16 Picture frames and mouldings	66	3	----------	----------	66	3
17 Portable houses	60	1	----------	----------	60	1
18. Trunks, valises, luggage	48	3	----------	----------	48	3
19. Molds and patterns	7	2	----------	----------	7	2
The State	7,621	173	3,252	157	10,873	330
Average men per plant	44	----------	21	----------	33	----------
*Total firms listed	----------	164	----------	118	----------	282

* 282 represents total wood-using industries in Maryland.

330 also represents the 282 firms, some of which, however, manufacture more than one wood product, and are therefore divided accordingly and indicated more than once.

BALTIMORE CITY (AND COUNTY)
AMOUNT OF WOOD USED, SOURCE, AND COST—TABLE IV.

Kind of Wood.	Maryland Grown	United States.	Foreign.	Total Bd. Ft.	Per Cent. of Whole.	Av. Cost Per M at Factory.	Total Cost F. O. B. Factory.
1. S. yellow pines	1,804,000	156,281,000	--------	158,085,000	70	$17.85	$2,821,126
2. Oak species	4,632,000	10,759,000	--------	15,391,000	7	40.99	630,806
3. Cypress	--------	7,962,000	--------	7,962,000	4	35.82	285,182
4. Black gum	95,000	6,940,000	--------	7,035,000	3	19.12	134,510
5. Basswood	--------	6,183,000	--------	6,183,000	3	29.88	184,774
6. Tulip poplar	300,000	5,834,000	--------	6,134,000	3	47.39	290,679
7. E. white pine	--------	4,114,000	--------	4,114,000	2	49.16	202,229
8. Chestnut	539,000	2,627,000	--------	3,166,000	1.5	29.46	93,264
9. Red maple	--------	2,140,000	--------	2,140,000	1	21.88	46,825
10. Red gum	--------	2,137,000	--------	2,137,000	1	22.62	48,345
11. Hard maple	--------	1,282,000	--------	1,282,000	.6	35.19	45,119
12. Beech	--------	1,230,000	--------	1,230,000	.5	20.32	25,000
13. Yellow buckeye	--------	1,000,000	--------	1,000,000	.4	50.00	50,000
14. Mahogany	--------	--------	937,000	937,000	.4	138.26	129,547
15. Douglas fir	--------	860,000	--------	860,000	.4	34.97	30,075
16. W. white pine	--------	820,000	--------	820,000	.4	34.48	28,275
17. Hickory species	104,000	582,000	--------	686,000	.3	60.12	41,240
18. Ash species	11,000	648,000	--------	659,000	.3	39.61	26,095
19. Birch species	--------	609,000	--------	609,000	.3	47.02	28,636
20. Eastern spruce	--------	485,000	--------	485,000	.2	24.48	11,875
21. Spanish cedar	--------	--------	332,000	332,000	.1	229.52	76,200
22. Hemlock	--------	200,000	--------	200,000	.1	26.00	5,200
23. Black walnut	35,000	152,000	--------	187,000	.1	103.37	19,330
24. Cotton gum	--------	175,000	--------	175,000	.1	29.86	5,225
25. American elm	--------	163,000	--------	163,000	.1	34.66	5,650
26. Circassian walnut	--------	--------	115,000	115,000	.1	228.26	26,250
27. Western spruce	--------	100,000	--------	100,000	.05	35.00	3,500
28. Cherry	35,000	61,000	--------	96,000	.05	71.15	6,830
29. Cedar species	--------	52,000	--------	52,000	--------	56.83	2,955
30. Lignum-vitae	--------	------	30,000	30,000	--------	162.50	4,875
31. Rosewood	--------	--------	26,000	26,000	--------	348.07	9,050
32. Cucumber	--------	15,000	--------	15,000	--------	39.00	585
33. Teak	--------	--------	9,000	9,000	--------	350.00	3,150
34. Tamarack	--------	5,000	--------	5,000	--------	50.00	250
35. Redwood	--------	1,000	--------	1,000	--------	55.00	55
36. Holly	--------	1,000	--------	1,000	--------	126.00	126
37. Sycamore	--------	1,000	--------	1,000	--------	120.00	120
38. Boxwood	--------	--------	1,000	1,000	--------	120.00	120
Totals	7,555,000	213,419,000	1,450,000	222,424,000	100	$23.72	$5,323,073

water, there is no reason why Baltimore should not continue a leader in the manufacture of forest products along the Atlantic Coast.

PROTECTING THE FORESTS.

The chief causes responsible for the poor condition of the forests of the County are forest fires, destructive methods of cutting, pasturing the woodland, insects and tree diseases.

Forest Fires.—The chief causes of forest fires are hunters and campers, brush burning, railroads, and incendiarism. Nearly all fires could be prevented with reasonable care.

The Maryland Forest Laws impose heavy penalties upon anyone who sets fire to woodlands, not his own. Any owner who sets fire on his own land and allows it to escape to the injury of other lands is liable for the cost of extinguishing the fire, and for the damage that is done to adjacent property. Fire damage in Baltimore County has not been excessive, due to the isolated character of many of the woodlands, and also that most of the woodlands are on farms where a closer watch for fires is possible. Nevertheless, the annual loss from forest fires is considerable, and a fire that burns over any woodland does serious damage in reducing the productive capacity of the forests.

The effects of fire are: (a) the burning of the leaves and litter on the ground which are needed to conserve the moisture, to protect the seed and to fertilize the soil: (b) the destruction of the seed, and young seedlings that have already started, and which are so essential for the renewal of the forests: (c) the burning of the cambium, or living wood, of young trees, on the side most exposed to fire, causing the bark to peel off, thus exposing the wood to decay. The tree becomes stunted, decay enters the wood and gradually works its way up into the trunk, rendering the tree practically worthless: (d) a severe fire in the brush, left by logging operations, often kills all the trees that remain, entailing a total loss of growing stock.

Preventive Measures.—In the case of small woodlands, surrounded by cultivated land, the danger from forest fires is very much reduced. But where the woodlands are in large tracts, particularly where they border public highways or railroads, the danger is greatly increased.

The most effective preventive measures are extreme care on the part of the owner and his employees engaged in work in the woods,

and the elimination, so far as possible of dead and down timber and dry tops. Where there is a particular fire hazard, such as along the borders of the roadways and railways, all inflammable material should be removed for some distance from the edges of the roadways, and along the rights-of-way of the railroads.* Woods roads through the property should be kept clear of inflammable material to serve as fire lines, from which fires that occur may be more easily and more effectively combated.

Destructive Cutting Methods.—In past years when timber was cheap, usually only the best was taken from the woodland, and that of the poorer species and poorer quality was left. This practice has continued for many years, nearly all of the forests having been cut over in this way, with the result that culled forests are the prevailing type. Most of the forests have been cut over two or three times, and under this system of always removing the best, rapid deterioration has followed. Not only that, but the remaining small trees of no merchantable value have been recklessly destroyed in taking out the larger timber, and there has been an excessive amount of waste in logging methods. The woods have been strewn with dead tops and brush, covering or weighing down the young trees, and at the same time greatly increasing the fire hazard.

To correct such abuses and to restore forest productivity, the cutting should be made in such a way as to favor the most valuable species, and to eliminate, so far as practicable, the undesirable species and the crooked and defective trees, even of the valuable species. This necessitates the careful selection of trees by the owner in any cutting that may be done. Especially in taking out trees for firewood, the poorer kind should be taken, thereby improving the character and composition and leaving the more desirable trees for reproducing the forest.

Grazing.—It is a common practice, throughout the County, to include the woodland in the permanent pasture. This has resulted in serious damage by creating conditions unfavorable to tree growth. The soil becomes hard and dry from the constant tramping of the cattle, the seed bed is destroyed, and the growth of the trees seriously checked, if not altogether stopped. The woodland becomes open and very much understocked, due to the destruction of the young growth.

*Railroad companies will, usually burn such strips at their expense, when requested to do so by the owner.

PLATE II. FIG. 1.—DEVASTATION.

Caused by unrestricted timber operation.

PLATE II. FIG. 2.—PROTECTION.

The result of a timber operation where the trees for cutting were marked by the State Board of Forestry, the small trees and young growth being fully protected for a second crop.

and it ceases to be of value for timber production. The small amount of pasturage is poor pay for the loss in the production of timber, and the result is that there is neither good pasture nor good woodland.

Insects And Fungi.—No serious insect attacks have been reported from Baltimore County. While immense damage is done each year to shade trees, comparatively little damage is done to the trees in the forest. Here the insects seem to be held in check by their natural enemies.

The one fungus disease that has been particularly destructive is the chestnut blight which has badly affected, practically, all the chestnut. This disease attacks only the chestnut, and there appears no danger of its spread to other kinds of trees. There is no practical method of control, and the chestnut, as a commercial tree species, appears to be doomed. This is the more unfortunate, because it is one of the most valuable trees in the woodland. It is by far the best pole timber available, and one for which there is no suitable substitute.

FOREST MANAGEMENT.

No County is more favorably located for the practice of forestry than is Baltimore, and few counties have suffered more from the lack of good forestry practice. The growing of timber is just as certainly crop production as is the growing of corn or wheat, and like any other crop from the soil, certain cultural operations can be conducted with much profit in icreasing the final yield. These operations can often be so conducted as to bring in an immediate revenue, and at the same time improve growth conditions.

The farmer in handling his woodlands is in the very best position to give them the careful management that is required to get the maximum results. The work in the woods should be as carefully planned as that in the fields, and with the same purpose in view—to get the maximum yield. The selection of the trees for cutting should not be left to inexperienced farm hands,with no thought other than getting wood in the easiest way, and having no permanent interest in the land. Work in the woods can be done in the winter-time, when other work on the farm is not pressing. Frequently, woods-work provides employment for farm hands during the winter months, when they could not otherwise be profitably employed.

A woodland is fully productive when the ground is occupied en-

tirely, that is, to the exclusion of any open places, by the best trees of the best species for which the soil is adapted. The proper density of the forest is, therefore, of prime importance, for not only will the greater volume of wood be produced when the crowns of the trees are close enough together to touch each other on all sides, but this crowding will produce tall straight trees with long clear stems that make the most valuable timbers. After trees attain their principal height growth, they will require a little free space around their crown to promote the greatest diameter growth. Starting then with a young thicket stand of any species, or with mixed species of trees, crowding is beneficial in that it forces the most likely ones into rapid height growth to keep them above their competitors, and the dense shade kills off the small lower branches that would otherwise make knotty timber. During the small pole stage (under 5 inches in diameter) the stand may be greatly improved by cutting out undesirable trees, such as black gum, red maple, beech, etc., when they are overtopping or crowding the more valuable species, such as the oaks, hickories, tulip poplar, etc. This is termed a "weeding" in a young stand, and is similar to the same operation in the garden or cornfield, and for the same purpose. By working over the forest at frequent intervals, with the idea of always favoring the more promising trees, and removing the undesirable ones as soon as they begin to interfere with the trees selected for the permanent stand, it is possible to mould the forest into the form desired.

Instead of a fully stocked young forest, the problem may be one of restocking and regenerating a badly burned and culled forest. In this case the important thing is to encourage a reproduction of the species best suited to the locality. Seed trees are generally present to begin with, and by keeping out fires a young growth will, in most cases, spring up rapidly. As the young growth develops such of the inferior trees as were left in the former cutting operations should be cut and utilized, so that they will cease to overtop and check the growth of the young saplings. By a gradual process of thinnings and improvement cuttings, the undesirable trees may be eliminated from the forest and a full stand of desirable trees secured for the final crop.

Another common problem of forest management is that of a forest in which there is a considerable amount of merchantable material that the owner desires to cut and turn into money, but, at the same

time, he wants to get it out in such a way that the producing power of the forest shall not be destroyed, since he intends to hold the woodland for future timber crops. In most cases of this kind, there is already on the ground a good young growth, which, if properly protected, will insure a satisfactory second crop. The main consideration should be to frame the cutting contract (if the timber is not to be cut by the landowner) in such a way that the young growth will be saved. The usual practice is to specify a minimum diameter limit, to be measured at a certain height from the ground. In cutting to a diameter limit the inferior species, such as gums, red maple and beech should be taken, as well as the more valuable species, since it is very desirable to prevent these inferior trees from gaining any advantage in the stand which is to succeed the one that is being cut. Unless special care is taken in felling the trees, cutting roads, and getting out saw logs, a great deal of this young growth will be destroyed. Some damage is unavoidable, but unreasonable damage should be guarded against in framing the contract, even if the price secured for the timber is a little less in consequence. These are precautions such as any careful business man would take, and they will pay well in the end.

The destruction of the chestnut, caused by the chestnut blight, has introduced a new problem in forest management. Where the chestnut represented only a small percentage of the mixture, natural seeding from the other species has generally taken the place of the trees killed by the blight. In place, however, where the chestnut forms a large percentage of the trees in the forest, the killing of this species has created gaps that will take many years to fill up satisfactorily, through natural means, and the importance of artificial seeding, or planting, to fill up these open places is apparent.

For this purpose, it will, ordinarily, be necessary to use trees that will stand a considerable amount of shade. For the high dry ridges, the planting of chestnut oak acorns will, probably, be most satisfactory, while on the slopes the planting of white pine seedlings is recommended. On the lower slopes and better soils, the planting of red oak acorns, or of white pine seedlings, is to be recommended.

The extent to which conservative forest management may be applied in any case will depend upon a number of factors, chief of which are the danger of fire risk, and the market for the different kinds of forest products. If these conditions are favorable, there is the opportunity to practice forestry very profitably. Even if there is a serious

fire risk, and the present market conditions are not favorable, the fact remains that nearly all of this land will be held for timber production, and since that is the case, why not make the lands as productive as possible, especially as so much can be done by way of improvement at little expense? The danger from fires will rapidly decrease, as people generally come to appreciate the damage they do, and as the State makes more liberal provisions for forest protection. The market for timber products is sure to improve, so that timber growing is certain to become more remunerative. The landowners, who are taking care of their forests now, will be the ones who will have the timber to sell a few years later, when so much better prices will, undoubtedly, be secured.

FOREST PLANTING.

The forest survey made in 1910-1911 showed 65,739 acres, or17%, of the total land area of the County as waste land, exclusive of salt marshes. This represents land upon which there is growing no crop of value, and includes swamps, gullied hill sides, and other unproductive areas. Practically, this entire area will grow timber, if planted or seeded with suitable species of trees.

There is such a wide range of valuable native species in the County, that it is possible to find kinds suitable for any conditions that exist, and for most of the waste land, there is no more profitable crop that can be grown upon it than timber. Some of this land is suitable for permanent pasture, and will, eventually, be so used, but for a large part of it, forest planting is the only solution of the problem.

It is not alone on the waste lands of the County that planting is practicable, but there is need for much forest planting on other lands, such as the reinforcing of depleted woodlands, the providing for fence posts and other timbers on farms, where the supply of these materials is lacking; the planting of strips for wind-breaks; the planting of lands now used for other purposes, that would bring better returns in a timber crop.

Before planting is undertaken, the area that it is proposed to plant should be carefully examined, with a view to selecting the best

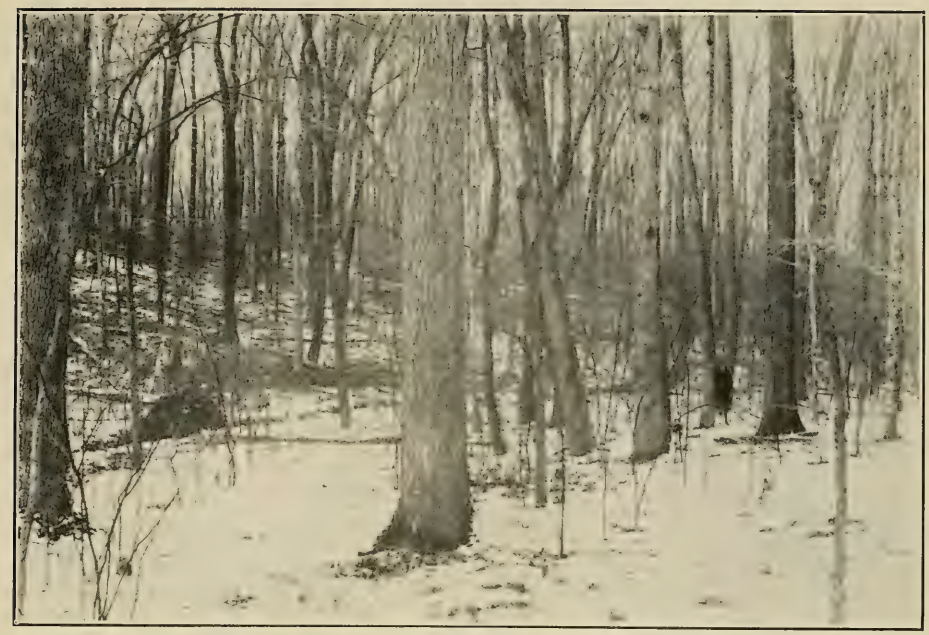

PLATE III. FIG. 1.—AN ORIGINAL FOREST.

Consisting of mixed oak, hickory, tulip poplar, and so forth, of which little is left, but shows what can be grown again if properly protected and managed.

PLATE III. FIG. 2—A PLANTED FOREST.

A plantation of white pine to take the place of chestnut, which is rapidly dying out—Mt. Wilson.

species, with reference to the soil, moisture conditions, and the purposes for which the timber is to be grown.*

Trees For Forest Planting.—Black locust (Robinia pseudacacia), also called yellow locust, or simply locust, is a native tree of rapid growth, producing a heavy, hard, durable wood, highly prized for fence posts, and for this purpose exceeds in value any other species. It casts so little shade that grass and weeds will grow under the trees and compete for moisture and soil fertility. For this reason and also because of possible attack from the locust borer, it is advised to plant it in mixture with other species, of somewhat slower growth, that will endure shade, and at the same time more completely shade the ground, such as white pine, or red oak. The trees should be spaced 6x6 feet, in alternate rows, with a row of white pine, or red oak, whichever is used in the mixture on the outside of the plantation. On good soils, the locust will grow 2—4 feet in height in a year. Fence posts will be produced in about 15—20 years, leaving the other species to produce a timber crop some years later. One-year-old locust seedlings should, generally, be used for establishing the plantation.

White pine (Pinus strobus) is found growing naturally along the Gunpowder River, and in the northern half of the County, and is suitable for planting in all sections, except the southeastern on the Coastal Plain. It is a rapid growing tree, averaging from one to two feet in height, each year, and produces a soft, even-grained wood, useful for many purposes. It will produce saw timber in 30 to 40 years on good soil.

White pine is subject to attack by the white pine weevil,—an insect that bores into the leader and kills it, often causing a forked stem. This species has been extensively planted in the County, in the Gunpowder watershed lands owned by Baltimore City, and appears to be making a most satisfactory growth. A spacing of 6x6 feet, using two year old seedlings, will, generally, give the best results on land that is free from undergrowth. A mixture of locust with white pine is recommended as most practical for fully utilizing the ground, using the same spacing, 6x6 feet, but with alternate rows

*The State Forester, Baltimore, Maryland, will upon request examine lands and prepare planting plans. Planting stock may be obtained from the State Nursery at small cost.

of locust, which will come out for fence posts and stakes, when the pine needs more room.

Red oak, (Quercus rubra) is one of the common native trees, suitable for forest planting on medium to good soil. It is the most rapid growing of the oaks, producing a heavy, hard strong wood, very useful on the farm for general construction purposes and for fuel wood. Red oak is fairly tolerant of shade, and therefore, useful for underplanting in woodlands, in need of reinforcing. The best method of propagation is by planting the seeds, two or three in each hole, where the trees are needed. In establishing a plantation, a spacing of 5x5 feet is recommended when seed is used, and 6x6 when seedlings are planted.

Other species that can be recommended under specific conditions:

White ash, bottom lands or lower slopes.

Tulip poplar, bottom lands or lower slopes.

Black walnut, deep well-drained fertile soil.

Shortleaf pine, dry upland soil.

Loblolly pine, wet sandy soil of Coastal Plain.

BASKET WILLOW CULTURE.

The growing of basket willows is an important industry centered around Baltimore, particularly in the vicinity of Lansdowne, Patapsco, Rosedale, and Catonsville. There are 13 willow gardens in Baltimore County, comprising a little over 46 acres. This acreage could be greatly increased with profit, as there are extensive areas in the County suitable for the purpose. The best gardens are on flat land which, however, is not water soaked during the growing season. Willows will grow on land that is wet during winter and spring, but they must have reasonably dry surface conditions during the summer growing season. On the other hand, willows will not thrive on lands, where the permanent water table is more than 6 feet below the surface.

There are three standard varieties that are principally used, the Lemley, the American Green, and the Welsh. In Baltimore County, there are 20.25 acres in Lemley, 21.50 in American Green, and 4.50 in Welsh. The net annual returns from willow gardens when established, range from $75 to $200 per acre. Further information about willow culture is contained in a report of the State Board of Forestry entitled "Basket Willow Culture in Maryland," by Karl E. Pfeiffer, Assistant Forester.

BALTIMORE COUNTY REPORT.

SUMMARY.

103,515 acres, 24% of the land area of Baltimore County, is in woodland. This area is sufficient to supply the timber requirements, if maximum production is secured.

The woodlands are confined, generally, to the rocky ridges, steep slopes, or wet bottom lands—soils not suited for field crops.

The forest lands are not producing more than one-half of their maximum yield, due to forest fires, destructive cutting methods, grazing, and tree diseases, causing depleted woodlands.

Adequate forest fire protection and good forest management would in a few years increase timber production and forest revenues 50%.

The demand for forest products is exceptionally good, transportation for such products to nearby markets especially favorable, resulting in good prices.

The timber cut of the County amounts to more than 14,000,000 ft. board measure, annually, with a value of nearly $600,000 at the shipping points.

The wood-using industries of Baltimore City and Baltimore County include 164 plants, employing nearly 8,000 people, using 222,424,000 ft. board measure of lumber for which they pay $5,323,000.

There are 65,739 acres of waste land in the County upon which nothing of value is being produced. Most of this area is suitable for forests which, if planted to trees, will produce a good paying crop.

The growing of basket willows is, probably, the most profitable use of many small areas of low ground along streams subject to overflow and too wet for other cultivated crops.

MAP
OF
BALTIMORE COUNTY
AND
BALTIMORE CITY
SHOWING THE
FOREST AREAS
BY
COMMERCIAL TYPES
PREPARED BY
F. W. BESLEY
MARYLAND BOARD OF FORESTRY
WM. BULLOCK CLARK
F. W. BESLEY
1914

BOARD OF FORESTRY
WM. BULLOCK CLARK
EXECUTIVE OFFICER
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