PROFILE MOUNTAIN FRANCONIA NOTCH STATE FOREST RESERVATION

State of New Hampshire

BIENNIAL REPORT

OF THE

FORESTRY COMMISSION

FOR THE TWO FISCAL YEARS
ENDING JUNE 30, 1930

CONCORD
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CONTENTS

REPORT

To His Excellency the Governor
and the Honorable Council:

The Forestry Commission herewith presents its report for the two fiscal years ending June 30, 1930.

Economic conditions relating to the production and utilization of timber unfavorably reported two years ago have continued on a downward trend. The demand for pine boxboards, pulp and hardwood lumber has been steadily falling off. The general depression and continued importation of high grade pulp from Europe and lumber from the West Coast at prices below the cost of production of native products, together with changing market requirements, have reduced stumpage values to at least one-half those of a few years ago.

From a forestry point of view it might be argued that present conditions favor relief from cutting of our small second growth trees and afford opportunity to build up new forest capital in larger and more valuable growth. The facts of the case are that the amount of lumber cut locally is not being reduced greatly, large amounts of waste are apparent, much of the lumber and pulp cut cannot be disposed of and farmers and other owners of stumpage seem to be willing to sell at a sacrifice. Winter work in the woods, particularly of the North Country, is to a considerable degree the bread and butter of many small owners of land. Letting down the barriers against Russian pulp and lumber and the recent activities of the Soviet government to disrupt our markets have increased importations to an alarming degree. In pulp alone there was an import of only about 3000 cords in 1929. A group of eastern concerns is said to have contracted for 280,000 cords during 1930. Low values of local stumpage are bringing discouragement to

forest land owners who are paying high taxes on their standing timber, resulting in lessened interest in fire protection, reforestation, blister rust control and improvement of their young forest growth.

The total lumber cut in New Hampshire was 234,664 M in 1928 and 220,690 M in 1929. The average of these two years is 3,500 M greater than the average of the last five years. The white pine cut in 1929 is about the same as in 1927 but about 25 million less than in 1928. The hardwood cut increased in 1929 over 1928. The number of portable mills registered in 1929 was 248, the same as the preceding year, but only 202 registered in 1930. This reduction for 1930 indicates a probable reduction of white pine cut for 1930, figures not yet being available.

Conditions in the wood using industries are much disturbed. Those which have been built up to make use of local wood supplies are suffering from changing demands of the market. An example of this is shown in the wood heel industry which has made use of birch, beech and maple but now is largely restricted to the use of hard maple. Our northern forests contain a vast quantity of unsalable old growth hardwoods which prevent the growth and development of more promising second growth. A few mills apparently take care of the market for excelsior. Railroads are not using hardwoods for ties to the extent hoped for. Efforts to bring in new forest industries do not seem to materialize.

There is great need for investigation of new uses for present low grade products and waste wood, more particularly pine, hemlock and hardwoods. A study of the chemical conversion of wood into other useful products has barely made a beginning in our state except for spruce. Unlimited possibilities exist for research work in the chemistry of white pine where practically no progress has yet been made. It is said that in the conversion of wood fibre into new materials by chemical means the value of the wood used may be increased from 300 to 1200 per cent.

This gives some suggestion of what the future may hold if funds and efforts such as have been at work in recent years in developing substitutes for wood can be directed to the analysis of wood itself.

There is no lack of faith in the ultimate demand for all the wood and timber supplies which our forest lands can produce. The fundamental purposes of the Forestry Department are to protect forest land against fire and disease, to build up by natural means and by planting crops of valuable timber to sustain our forest industries, to beautify and make useful an area representing more than three-fourths of our total land area, which otherwise becomes unproductive and valueless, and to assure ourselves of watershed protection for our streams and continuous and satisfactory conditions for fishing, hunting and recreation in general.

We cannot evade the conviction which has been repeatedly pointed out in previous reports that taxing forest growth each year under the general property tax is unfair in principle and destructive in practice. With lowered stumpage values and depressed markets these taxes become even more intolerable, especially when valuations do not move downward proportionately with lowered market values. During the past two or more years much progress has been made in tax education through the efforts of the Recess Tax Commission and those interested in forestry. Failure of the last legislature to bring about a change in forest taxation should be no discouragement to continued efforts. A change can probably be made now with less difficulty and hardship than if forest values were high. The Forestry Commission firmly believes in forest tax reform applicable to all private forest property, by any reasonable means which will not necessitate an increased tax burden on other real estate.

Forest Fire Protection. Fire conditions the last two fiscal years could scarcely be more extreme. The 1929 season was one of the most favorable in the records of the Forestry Department, only about one-half of the average number

of fires, cost, area burned and damages having occurred. Actually there were 192 town fires, not including railroad fires, against a 19 year average of 339 such fires. Only 1661 acres burned over in 1929 as against a 19 year average of 9374 acres.

The 1930 spring fire season began in February and continued almost unabated for eleven weeks. The woods were closed by proclamation May 1 to 16 and again in the fall. During most of the season rainfall was far below normal. Drouth conditions even then were mild compared with conditions existing in states west of New York. There were 765 town fires in 1930, over twice the normal average and over 200 of which started in grass land. The area burned over was 18,750 acres, including one fire of 2000 acres, three fires of over 1000 acres each and two of 500 acres. Damage amounted to $93,191 which, high as it is, appears low in proportion to the area burned. This is due to the amount of grass land involved and the lowered values prevailing for woodland and growth. The cost to the State of $14,470 was a matter of serious embarrassment. While less than one-half of the appropriation of $5000 for fighting fires was used in 1929, it was necessary to expend the $5000 appropriation in 1930 and to use $9,470.32 from the Emergency Fund of the Governor and Council in order to pay the state's share of these expenses.

Aside from railroad fires the two serious causes appear to have been the throwing down of lighted cigarettes and matches and the careless burning of brush and rubbish. Wherever burning has been done without permit and evidence of neglect was sufficient, parties responsible have been required to pay the cost of fire suppression. Uncut grass is a grave and increasing hazard along highways. No funds are available for systematic disposal of these hazardous areas and the danger of fires getting out of control causes town and state officers, as well as the land owners, to fear the responsibility of burning where the work

could otherwise be done. This problem of uncut grass is increasing in seriousness year by year.

The cost of extinguishing forest fires is increasing due to the more general use of trucks and motorized apparatus called from adjoining towns where no such facilities are available at home. The average cost per acre burned however, $1.54 in 1930, is lower than any recent year. The average cost is always greater for smaller than for larger fires.

During the last two years about 20 towns have added substantial equipment for fire fighting purposes. It is a fact that ingenuity and effort on the part of towns, not necessarily the expenditure of much money, are gradually building up needed equipment such as the towns can individually use. Much improvised equipment, making use of automobile parts and adding new equipment of hose, small tools, portable pumps, etc., can be accomplished at relatively little expense and render valuable service for buildings as well as for forest fires. There is a tendency for fire organizations having motor equipment to charge more and more to adjoining towns forced to call upon them for aid. This will in time force towns without such equipment to supply their own needs. The Forestry Department with small funds appropriated and available for the purpose has been able to join with many towns in paying one-half the cost of small tool equipment such as hand pump tanks, extinguishers, knapsack sprayers and shovels. No town in the state should be without a reasonable amount of this type of equipment.

Continued improvements to the lookout service have been made from federal co-operative funds without expense to the state. It is the policy to gradually increase the number of stations as funds permit with the objective of arriving at a final distribution of these stations at approximately 20 mile intervals; also to gradually build up better and permanent equipment, telephone lines, cabins for the watchmen, better water supplies and facilities for making the watch-

men comfortable and better able to attend to their duties.

During 1929 stations on Federal Hill in Milford and Crotched Mountain in Francestown were built to replace temporary stations used years ago at these places and afterwards abandoned. These new stations have 45 foot steel towers and two room cabins nearby. A new station was completed the present season, although too late for use, on Hyland Hill in Westmoreland, to take care of a section between Keene and the Connecticut River never covered heretofore. This station has a steel tower 53 feet high and a two room cabin and will be put in operation in 1931. With these three new stations and replacements of telephone lines a total of 22 miles of new telephone has been constructed during the biennium. Two new cabins to replace old ones have been built on Cardigan and Blue Job stations. On three stations old type ladders have been replaced by stairs so that only two towers now remain which are not reached by modern stairs with railings. Certain repairs have been made to some of the roads approaching the lookout stations in order to make them more accessible to visitors and useful to the service.

State Nursery and Reforestation. The output of the State Nursery the last two years has been 2,381,470 trees. The peak of distribution appears to have been in 1927 since which time there has been a falling off of 23 per cent in the demand for trees. Prior to 1926 the supply of trees was not sufficient to take care of the demand. Approximately 643 acres of state forest land have been planted on 9 state forests in the two year period. Much of this planting has been on cut over land and burns due to recent railroad fires. One of these, 92 acres on the Mast Yard State Forest, was covered with planted white and red pines two feet high which were destroyed. At the present time practically all areas of state forests adapted to white pine have been set out. Additional areas better suited to spruce and other species will be planted when funds are available and the Nursery is able to supply the trees. The cost of state

land planting for the two years averaged $9.06 per acre including the cost of trees or $4.67 for planting alone.

A major project at the State Nursery has been the rebuilding of the basement of the barn, including new cement walls, floor and partitions. This work has been done over the two fiscal years using largely federal co-operative funds and at a cost of approximately $5000. Ornamental trees are now being grown at the State Nursery in co-operation with the Highway Department for the beautification of the roadsides. There is evidence of an increased demand for spruce due to the growing interest in Christmas trees and on account of present low values of pine, weevil injury and the blister rust disease. Since three or four years are required to readjust the nursery to new lines of trees it is evident that there is a shortage of spruce and an over abundance of white pine at the present time.

A notable advance in nursery practice has been brought about, much to the credit of L. N. Watson in charge, by producing root pruned three year old seedlings equally as good as four year old transplanted trees sold for many years. Root pruned seedlings are being grown at a cost of about $2.50 per thousand less than the cost of four year old transplants. They will be produced for future use, not only here but in other states. Free trees to the extent of 276,000 have been given to 25 different towns for planting on town forest land. Agricultural high schools, 4-H clubs and juvenile granges have received 335,000 trees, these provisions having been made by the last legislature.

State Forests and Reservations. No appropriations for the purchase and care of state lands have been made for 4 years. Before 1927 annual appropriations of $5,000 were made available for these purposes and by means of which the state has acquired many important roadside and mountain tracts of varying sizes entirely aside from the special purchases of Crawford and Franconia Notches and the numerous gifts of land to the state. We not only believe in the soundness of this policy of state acquisition of forest

lands by gifts and by purchase wherever they may be located but we urge the importance of appropriating funds to improve and maintain them. Unprofitable but necessary cuttings of weed growth must be made one or more times to favor important species, particularly releasing plantations which would otherwise be destroyed or permanently injured. Many of the state tracts adjoining highways should be made attractive and accessible to campers and visitors. During the past two years 160 acres of plantations have been released from weed growth at a cost of $2.36 per acre. Fuel wood cuttings and removal of wind fall trees on nine forests netted about $350.

Larger tracts of particular importance for recreational purposes, such as Franconia and Crawford Notches, Monadnock and Pawtuckaway, require the services of a caretaker or guard during the tourist season to enforce necessary regulations and keep these places clean and respectable. A new rest building has been erected on the Crawford Notch Reservation and a gift of a caretaker's cabin at the parking place on Monadnock was made by Mrs. Joel H. Poole of Jaffrey. In order to share in small part with the Forestry Society in necessary improvements and permanent construction as well as pay for policing Franconia Notch the past season, the Governor and Council furnished $5000 from the emergency fund. While the two Notches can in the future be policed and kept in attractive condition with funds received as rentals, no such funds are available for use on other reservations where the need is already felt. The past season a caretaker was employed on Monadnock and paid jointly by the town of Jaffrey, Forestry Society and the state. On Pawtuckaway the fire lookout acted as caretaker and rendered such general service as he could when not in the fire tower. The Pillsbury Reservation of 3000 acres requires supervision and is likely to become a game sanctuary in co-operation with the Fish and Game Department. Other sanctuary possibilities exist on other reservations.

Bathing beaches

A new and worth while prospect, contingent upon funds for improvements, supervision and maintenance, is that of accepting gifts of areas with unusual facilities for bathing, to be used for the benefit of the public under proper regulation. More and more this need is apparent and many states are paying large sums to purchase similar places for public use. There is a growing tendency to deprive the general public of access to bathing, picnic and camping places freely enjoyed in the past. It is incumbent upon the state to take advantage of and be in a position to accept gifts of such places and provide for their care. An appropriation of $5000 should be made for each of the next two years to be available for the purchase and care but chiefly for the care of state forests.

The total acreage of state forests and reservations two years ago was 29,168 acres. There has been a shrinkage of 16 acres as a result of more accurate surveys of certain lands made by the Department. Gifts of six small tracts have added 275 acres making the present total 29,427 acres. These are more fully described in the report. The gift of 12 acres of beautiful roadside pines in Ossipee by Frank S. Lord opposite his homestead in that town and the transfer to the state of the well known Pot Holes and Bears Den tract of 93 acres at the top of Gilsum Hill on the state road north of Keene by the Keene Chamber of Commerce and Society for Protection of N. H. Forests, are worthy of special mention. It should also be stated that a small area including Arethusa Falls adjacent to the Crawford Notch Reservation has been purchased for the state with funds donated by Miss Mary P. Williamson of Cleveland, Ohio. These falls, relatively little known by the public and surrounded by fine old timber, are perhaps the most beautiful in the state.

Blister Rust Control. Two years ago the Forestry Commission reported that 187 towns and cities had carried on more or less control work for 10 years and over 60 towns had completed the work. During this period three-fourths

of the white pine growing areas of the state have been covered. The majority of towns have maintained a reasonably consistent program of control. There were, however, 34 towns which had never paid for any control work and about 35 others which had appropriated but one year. Many of these were among the most important white pine towns and where the disease was prevalent. The advisability of compulsory blister rust legislation was considered by the last legislature and an amendment was passed providing that the Governor and Council, upon recommendation of the Commissioner of Agriculture and the State Forester, may order towns to carry out control measures specified by the State Forester not to exceed $400 in any one year. This emergency legislation was put into effect the beginning of the present season when 43 towns, mostly those which had never appropriated, were notified that work in their towns would be done this year and asking their co-operation. Most of these towns accepted the situation and have either paid or promised to pay their share of the expenses involved. In one or two towns only has the state received no co-operation during the present season and at the time of writing there is the possibility of suit by the Attorney General to collect. Funds to the extent of $5000 to enable the Department to finance the emergency work was advanced by the Governor and Council, of which $4000 has already been returned to the emergency fund.

During the biennial period 377,296 acres were covered by control work and over 4,700,000 currant and gooseberry bushes removed. Of this area only 6,833 acres were re-eradicative work. There are now 90 towns and cities which have completed their initial eradication. The total area covered since 1918 is 2,432,348 acres.

The Forestry Commission is confident in its belief that the blister rust program entered into 10 years or more ago to remove currant and gooseberry bushes within the white pine growing areas of the state should be consistently carried to completion. Not to do so would be unfair to the

large majority of towns which have either completed their work or are co-operating consistently with the state and unfair to property owners who have been unable to persuade their towns to co-operate. New Hampshire cannot afford to take a weak position in regard to control measures in the face of an interest as extended and wide spread as the range of five needle pines in the United States and with the conviction of experts that unless controlled the disease will in time make the commercial growing of this important species impossible. The most immediate effects of failure to control the disease are in losses to reproduction and young growth.

Recommendations. The itemized budget of the Forestry Department calls for increases of $11,325 and $11,675 respectively each of the next two years. These increases for the most part are to restore certain amounts cut from the budget two years ago which were needed then and are needed now. Among the principal items are the following:

Maintenance and acquisition of state lands for which $5000 was budgeted and nothing appropriated.

Fire bills to towns now carries an appropriation of $5000 which is not sufficient for an average fire year. For the present season the Governor and Council from their Emergency Fund made up a deficit of $9,470.32. An increase of $2,500 is requested, which is the amount formerly appropriated and is reasonable in the absence of knowing what the cost may be in any year.

Blister rust control requires an increase of $1,500 to carry on the work each of the next two years. It was necessary the present season for the Governor and Council to advance funds to temporarily finance the emergency work done in some of the towns.

Incidentals and fair exhibits, owing to the permanent character of the Eastern States Exposition needs an additional $500.

Printing the biennial report should be increased from $500 to $800, which was formerly appropriated. This

report has always been of recognized educational value and in addition to describing all forestry activities and progress during the biennial period, usually includes the results of some particular study or project of worthwhile interest.

Printing blanks has for several years included the cost of mailing the quarterly bulletin which is sent free to about 3200 persons and firms within and outside the State and reflects much credit in a publicity way to the State itself. The cost of publication is paid from advertisements received.

Reforestation and nursery items call for an increase of $1,000 which are needed in part to help pay for permanent improvements to the barn at the State Nursery. Without federal aid in this as well as other forest fire items, much of the work now being done would be impossible.

Several amendments to the forest laws are worthy of consideration. The Forestry Commission should be specifically authorized to make rules and regulations governing the use of the state forests and reservations and there should be a penalty for violations thereof. The need of such legislation is apparent on the Notch Reservations and others coming into such general public use today (Chapter 192).

The Forestry Commission should be given jurisdiction over all State owned lands including islands owned by the State in public waters, wherever such jurisdiction has not been placed in other commissions, departments or institutions of the State. Such lands should be a part of the state forests and reservations.

There is an increasing demand on the part of town and state officers as well as land owners for legislation against throwing down lighted matches, tobacco or other burning substances in or near woodlands. More than half the town fires in the last two years were due to this cause. While such a law would be impossible to enforce generally, there would be much value in having it during periods of unusual fire hazard. Such a provision is now in effect when the

woodlands are closed by proclamation. (Section 36, Chapter 197). As a matter of fact land owners and agents should be prohibited from smoking on their own land during the period of a ban.

In this connection it appears that the 1927 amendments to the fire laws (Chapter 191) inadvertently repealed a clause which provided that "fires kindled by throwing down a lighted match, cigar or other burning substance shall be deemed...." to be a violation. Since this clause is no longer in the law, it is sometimes difficult to convince the Court that a fire caused by throwing down a lighted cigar or cigarette is a violation. This clause apparently should be restored.

W. R. BROWN,
B. K. AYERS,
H. K. ROGERS,
Forestry Commission.

JOHN H. FOSTER, *State Forester.*

AMENDMENTS TO THE FOREST LAWS IN 1929

THE changes in the forest laws made by the legislature are given below:

Chapter 191, relating to forest protection, was amended so that Sections 23, 26 and 67 read as follows:

Section 23. **Apportionment.** The expenses of fighting forest and brush fires in towns and cities, and other expenses lawfully incurred by wardens and deputy wardens of said towns and cities in preventing forest fires, shall be borne equally by the municipality and the state, except as otherwise herein provided.

Section 26. **State's Portion.** A duplicate bill, showing that the same has been audited and paid by the town, shall be filed by the selectmen or the mayor with the state forester, who, if he finds the same to be reasonable, shall forward it to the state treasurer with his approval, and the governor shall draw his warrant on the state treasurer in favor of said town or city for the portion of said bill for which the state is liable in accordance with the provisions herein; the state, however, shall not reimburse municipalities or unorganized places at a rate in excess of that established from time to time by the forestry commission and the state forester.

Section 67. **Expenses.** The town forest wardens and deputy wardens so summoned by the state forester shall be paid for their time and expenses in attending such conferences, such payment to be borne equally by the municipalities represented and the state in the same manner as provided in sections 21 to 27, inclusive, of this chapter.

Chapter 192, relating to public lands, was amended by adding a new section 6-a after Section 6, revising Section 9, and adding a new Section 22, which sections read as follows:

Section 6-a. **Privileges and Concessions.** On terms approved by the commission, the state forester may make contracts for the leasing of privileges and concessions on state forests and reservations for periods not exceeding five years.

Section 9. **Seedling Trees.** He shall raise seedling trees of useful varieties for planting, and shall, on terms approved by the commission, sell said trees to persons who desire to plant them within the state, and may, with like approval, distribute them free of charge, at the point where grown, to towns for roadside and town forest planting and to boys' and girls' clubs within the state for educational purposes.

Section 22. **Exchange of Lands.** Upon the recommendation of the forestry commission the governor, with the advice and consent of the council, is authorized to exchange state forest land for land in New Hampshire owned by the United States when, in their opinion, it is for the interest of the state so to do; provided that no money shall be received by the state or paid to the United States as a part of the exchange contract.

Chapter 194 of the Public Laws, relating to registration of arborists, was amended by striking out Sections 1 to 5 inclusive and the following new sections were inserted:

1. **Certificate Required.** No person, firm or corporation shall advertise, solicit or contract to improve the condition of fruit, shade, forest or ornamental trees, by pruning, trimming, or filling cavities, or to protect such trees from damage by insects or disease, either by spraying or any other method, without having secured a certificate as specified in section 2 of this chapter; and any person, firm or corporation failing to comply with the terms of this chapter shall be fined not more than one hundred dollars; provided any person may improve or protect any tree on his own premises or on the property of his employer or on any property within the limits of the town of which he is a legal resident, without securing such a certificate.

2. **Board; Examination.** The state forester, the commissioner of agriculture and the entomologist of the agricultural experiment station shall constitute a board which shall, upon application from any person, firm or corporation, examine the qualifications of the applicant to improve, protect or preserve fruit, shade, ornamental or forest trees; and if satisfied that the applicant is qualified, may issue a certificate stating that such person is a registered arborist; which certificate shall expire at the close of the calendar year unless sooner revoked as provided in section 3 of this chapter, and may be renewed by the board for succeeding years without further examination upon payment of the fee hereinafter required, provided any person, firm, or corporation receiving such certificate shall be responsible for the acts of all employees in the performance of such work.

3. **Powers and Duties of Board.** Said board shall prepare all necessary forms and prescribe all rules and regulations governing examinations, and any certificate issued under the provisions of this chapter may be revoked by it upon proof that improper methods have been used or for other sufficient cause.

4. **Fee.** A fee of two dollars shall be required for each certificate or renewal issued.

Chapter 195, relating to white pine blister rust control was amended by adding the following section:

Section 16. **Order of Governor and Council.** When in the opinion of the state forester and the commissioner of agriculture an emergency exists creating the necessity for the destruction of currant and gooseberry bushes in any town, the governor and council may order such town to carry out, under the direction of the state forester, the control measures specified by him. If such order is not complied with, the state forester, or his authorized agents, may remove or destroy any currant and gooseberry bushes within such town and charge the expenses to the town; provided, however, that no town shall be required to expend

more than four hundred dollars in any one year for such control measures.

Chapter 244 as amended provides (Section 13) that the governor and council may grant, and from time to time renew, to any public utility license to construct and maintain a pipe line or conduit, or a line of poles and towers and wires and fixtures thereon, over and across any of the lands owned by this state, or to flow any of such lands, upon terms and conditions fixed as provided.

Section 16 provides that compensation derived from licenses affecting state forests or forestry reservations shall be added to the Forest Improvement Fund.

FOREST FIRE PROTECTION

Review of Forest Fire Conditions

THE STORY of forest fire occurrence in New Hampshire during the two fiscal years ending June 30th in 1929 and 1930 is one in which weather condition extremes played a major part. The first fiscal period, on the whole, was one of very favorable fire weather whereas just the opposite was true of the succeeding twelve months. A drought

Photo by L. C. Swain
FOREST FIRES IN 1929-1930 BURNED OVER AREAS AGGREGATING MORE THAN 22,000 ACRES

nationwide in extent and critical in proportions took place during this last fiscal year, eleven months of which were seriously short of rainfall. The spring of 1930 was the worst fire period now under consideration. Indeed, fire occurrence during these months rivalled the worst seasons on record. In the south and central portions of the state, snow disappeared almost entirely before the

beginning of March. Our first fires, in fact, occurred February 27th and fire raged almost continually thereafter during most of the following eleven weeks.

The woodlands of the state were closed by proclamation of His Excellency, Governor Tobey, on May 1st, 1930, and the restrictions imposed by the ban remained in effect until the morning of May 16. There was a partial revocation of the closure from May 9 to May 11 in Grafton county. This temporary suspension of the stringent ban regulations was granted to fishermen whose sport had been prohibited by the ban and whose requests for relief were received in literal hundreds. It is unfortunately true that while the ban has great forest protective value, its full potential benefits are not always realized because of practical difficulties which stand in the way of its prompt imposition in times of danger.

A study of the causes of fire confirms the repeated assertion that careless smokers start the greatest number of fires. More than one-half of all the town fires during the biennium are attributed to careless smoking. Really effective means of checking this hazard have yet to be devised. The reason is obvious. The number of persons involved is so great that only an enforcement unit out of all proportion to the importance of the subject matter could achieve measurable results. Our only hope lies along educational lines.

Fires kindled to burn brush and debris which escaped from control were next important in seriousness. Fires so caused accounted for about 20% of the town fires. Misuse of permits granted by town wardens and errors of judgment in some cases in granting permits resulted badly. Under the provisions of the law, the costs of extinguishing 176 fires were paid by the persons who caused them unlawfully. This course of action does not seem to have produced desired results and it is therefore proposed to restrict the kindling of fires in the spring by suspending the issuance of town warden permits in the case of all but the most

necessary burning and only when great safety from fire is indicated.

Railroad fires were quite numerous but relatively less serious than other fires. One bad fire kindled to burn ties along the track burned a large land area which included 88 acres of the Mast Yard State Forest which had been planted with young trees.

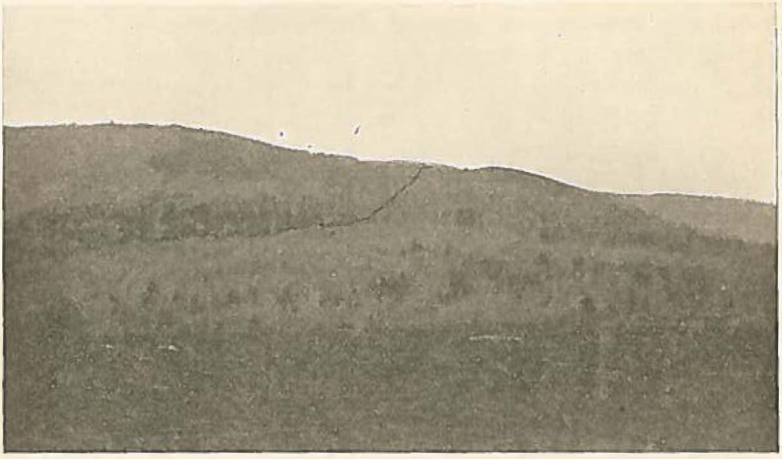


Photo by Forestry Department

FLYING EMBERS AND SPARKS FROM BURNING BUILDINGS RESULTED IN THE DESTRUCTION OF MUCH WOODLAND. SUNAPEE MOUNTAIN FIRE HAD ITS INCEPTION FROM A BURNING HOME IN GOSHEN

Other important classes of fires were caused in varying ways such as by flying embers or sparks from burning buildings; children playing with matches, etc. A few fires were attributed to incendiarism. A notable case of this kind occurred in Sandown during August, 1929, where it was alleged that a series of fires were caused by an incendiary. The suspect was apprehended, tried, convicted and sentenced to serve six months in the Rockingham county jail.

Fires of Fiscal Years 1929 and 1930

For purposes of comparison, statistics concerning town fires, so-called, are used and railroad fires are excluded be-

cause accurate annual averages for this class over a period of years are not available.

There were 192 town fires during the fiscal year 1929 and 765 during the next year. The 19-year average number is 339. It will be seen that a few more than one-half the normal number of fires occurred in the year 1929 and that more than twice this normal number occurred during the succeeding period. In this connection, it should be noted that more than 200 of the 765 fires started in and were confined to grassland of comparatively high inflammability.

Area burned by town fires was 1,661 acres in 1929 and 18,750 acres in 1930. It is important to point out that while the normal burned area per year is 9,374 acres and burned area appears to be excessive, the average per fire is 24.5 acres which compares favorably with the 19-year average of 27.7 acres—especially in view of the fact that the dry, uncut hayfield hazard entered into this result in a large degree. The most serious fires of the biennium occurred during the spring of 1930 and included, among others, a fire in Chesterfield and Hinsdale which burned slightly more than 2,000 acres; the Hollis-Milford fire of 1,600 acres; the fire in Walpole and Langdon which burned 1,400 acres; the fire of 1,000 acres in Westmoreland; the Goshen-Newbury fire which burned 500 acres and buildings; and the Ashland fire which burned 500 acres.

Damage caused by town fires was $9,188.00 in the fiscal year 1929 and $93,191.00 in 1930. The normal figure for damage is $73,569.00 annually. In view of the abnormally large area burned in 1930 and what might appear to be a disproportionately small total damage, it should be explained that there is reflected in the damage the large area of burned grassland to which damage was slight. Several fires also burned large areas of light-producing land which have been repeatedly burned and to which a low damage resulted. Lower stumpage and land values now prevailing are also taken into consideration.

The aggregate cost of fire fighting differed from normal in about the same way that the number of fires was different for each of the fiscal years. During the year 1929, the state's share of fire bills was $2,152.38 or slightly less than one-half of the fund appropriated for the purpose of reimbursing towns. Incidentally, only once before in the annals of the forestry department has this cost been lower. That was in the fiscal year ending August 31, 1917. In direct contrast, the bills of the year 1930 aggregated $14,470.32 or nearly three times the appropriation available. It was necessary to obtain $9,470.32 from the Contingent Fund of the Governor and Council with which to meet these obligations to the towns. Here again, it should be observed that while the total cost of fire fighting was high, the cost per acre was not excessive. This was $1.54 and compares with $2.59 in 1929; $1.70 in 1928; and $1.85 in 1927. These figures show that the average cost of fighting fire, per acre, is greater for small fires than for large fires. This merely means that it is necessary to incur an irreducible minimum of expense for fighting small fires which would be sufficient in many cases to care for larger fires.

The following tables of fire statistics contain other information showing results of fire occurrence during the biennium. On the whole, it is felt that the forest fire organization in the state has functioned well under trying conditions. Improvement is still needed, of course, but the fundamental plan is sound.

FOREST FIRE RECORD FOR TWENTY-ONE YEARS

(Exclusive of Railroad Fires)

Year	No. Fires	Area Burned	Average Area Burned Per Fire	Damage	Average Damage Per Fire
1910	272	9,038 A.	33.2 A.	$40,000.00	$147.06
1911	462	30,958	67.0	175,000.00	378.79
1912	344	8,474	24.6	62,000.00	180.23
1913	609	14,507	23.8	100,000.00	164.20
1914	315	8,119	25.8	53,000.00	168.25
1915	792	29,480	37.2	174,567.00	220.41
1916	128	6,630	51.8	40,075.00	313.09
1917	197	1,680	8.5	18,205.00	92.41
1918	357	8,693	24.3	94,468.00	264.61
1919	308	3,502	11.4	41,287.00	134.05
1920	138	1,996	14.4	17,681.00	128.12
1921	276	7,172	26.0	59,503.00	215.59
1922	295	9,484	32.1	94,917.00	321.75
1923	199	2,333	11.7	27,786.00	139.63
1924	330	5,351	16.2	83,347.00	252.57
1925	486	8,368	17.2	97,508.00	200.62
1926	295	8,181	27.7	115,614.00	391.91
1927	367	9,420	25.7	75,762.00	206.44
1928	271	4,714	17.4	27,090.00	99.96
1929	192	1,661	8.7	9,188.00	47.85
1930	765	18,750	24.5	93,191.00	121.82
Totals	7,398	198,511 A.		$1,500,189.00	

Average Number Fires Per Year	352
Average Area Burned Per Year	9,453 A.
Average Damage Per Year	$71,437.57
Average Area Burned Per Fire	26.8 A.
Average Damage Per Fire	$202.78

NUMBER OF FIRES BY MONTHS

(Exclusive of Railroad Fires)

Fiscal Year Ending June 30, 1929		Fiscal Year Ending June 30, 1930	
July, 1928	7	July, 1929	71
August, 1928	1	August, 1929	33
September, 1928	2	September, 1929	34
October, 1928	8	October, 1929	51
November, 1928	4	November, 1929	4
December, 1928	4	December, 1929	1
January, 1929	2	January, 1930	0
February, 1929	0	February, 1930	8
March, 1929	13	March, 1930	111
April, 1929	68	April, 1930	333
May, 1929	57	May, 1930	101
June, 1929	26	June, 1930	18
Total	192	Total	765

FIRE RECORD FOR FISCAL YEARS 1929 AND 1930

(Exclusive of Railroad Fires)

County		No. Fires	Total Acres Burned	Average Area Per Fire in Acres	Total Damage	Average Damage Per Fire	Total Cost of Fighting	Average Cost Fighting Per Fire
Belknap	1929	6	28	4.7	$5.00	$.83	$76.45	$12.74
	1930	39	772	19.8	10,994.00	281.90	1,501.84	38.51
Carroll	1929	10	55	5.5	250.00	25.00	164.15	16.42
	1930	34	278	8.2	605.00	17.79	392.08	11.53
Cheshire	1929	18	62	3.4	157.00	8.72	238.85	13.27
	1930	86	6,049	70.3	18,006.00	209.37	7,495.98	87.16
Coos	1929	7	17	2.4	60.00	8.57	300.59	42.94
	1930	30	163	5.4	632.00	21.07	819.92	27.33
Grafton	1929	13	59	4.5	65.00	5.00	126.65	9.74
	1930	45	1,176	26.1	5,265.00	117.00	3,309.96	73.55
Hillsborough	1929	49	391	8.0	2,122.00	43.31	1,007.45	20.56
	1930	180	4,320	24.0	25,416.00	141.20	4,835.90	26.87
Merrimack	1929	34	560	16.5	1,945.00	57.21	696.35	20.48
	1930	117	1,868	16.0	7,409.00	63.32	3,418.22	29.22
Rockingham	1929	43	361	8.4	3,334.00	77.53	727.08	16.91
	1930	168	2,014	12.0	13,626.00	81.11	3,903.49	23.24
Strafford	1929	10	116	11.6	1,090.00	10.90	236.25	23.63
	1930	37	1,156	31.2	6,221.00	168.14	1,524.30	41.20
Sullivan	1929	2	12	6.0	160.00	80.00	28.80	14.40
	1930	29	954	32.9	5,017.00	173.00	1,035.42	35.70
State Totals	1929	192	1,661	8.7	$9,188.00	$47.85	$3,602.62	$18.75
State Totals	1930	765	18,750	24.5	$93,191.00	$121.82	$28,237.11	$36.91

RAILROAD FIRE RECORD FOR FISCAL YEARS 1929 AND 1930

Year	No. Fires	Total Area Burned	Average Area Per Fire	Total Damage	Average Damage Per Fire
1929	111	288	2.4	$955.00	$7.89
1930	311	1,873	6.0	$12,968.00	$41.70

TOTAL NUMBER OF FOREST FIRES, AREA AND DAMAGE BY CAUSES

For Fiscal Years 1929 and 1930

CAUSES	Percent Total Number of Fires	Percent Total Area Burned	Percent Total Damage Caused
Railroads	30.5	9.6	12.0
Smokers	37.6	44.0	41.3
Burning Brush	14.4	14.9	19.1
Miscellaneous	8.4	15.0	17.0
Lumbering	1.3	2.0	2.3
Incendiary	1.9	11.0	4.4
Lightning	1.9	.4	.4
Camp Fires	1.2	1.1	2.5
Unknown	2.8	2.0	1.0
Totals	100.0	100.0	100.0

COMBINED FOREST FIRE RECORD

For Fiscal Years 1929 and 1930
All Agencies Reporting

NUMBER OF FIRES

Year	Town	Railroad	White Mountain National Forest	Total
1929	192	111	1	304
1930	765	311	8	1,084
Total	957	422	9	1,388

AREA BURNED

Year	Town	Railroad	White Mountain National Forest	Total
1929	1,661	288	5	1,954
1930	18,750	1,873	51	20,674
Totals	20,411	2,161	56	22,628

DAMAGE

Year	Town	Railroad	White Mountain National Forest	Total
1929	$10,188.00	$955.00	$5.00	$10,148.00
1930	93,191.00	12,968.00	142.00	106,301.00
Totals	$103,379.00	$13,923.00	$147.00	$116,449.00

Forest Fire Fighting Equipment

PACK-SACK FIRE PUMP

The lack of forest fire fighting equipment in many towns has been deplored for many years and towns have been urged to purchase at least the ordinary forms of small tools at the attractive rates provided by the state's offer of 50-50 co-operation. During the fiscal year 1929, 30 towns purchased tools on this basis, paying $839.11 as their share of the cost. In 1930, 49 towns expended $1,071.32 in the same way. Many towns, of course, also purchased equipment elsewhere. Among these are Dublin, Errol, Fitzwilliam, Francestown, Lyndeboro, Madison, Marlboro, Mont Vernon, Pelham, Sandwich, Stewartstown, Stoddard, Tamworth, Walpole and Wilton. These towns have purchased small portable motor fire pumpers with hose. Other municipalities like Hillsboro, Laconia, Northwood, Peterborough and Raymond are provided with motor fire trucks designed especially for forest fire service. In most cases, these trucks were designed locally through the efforts of a few interested per-

sons with a view to providing effective protection within reasonable financial limits.

The fact remains, however, that many fires grow to large

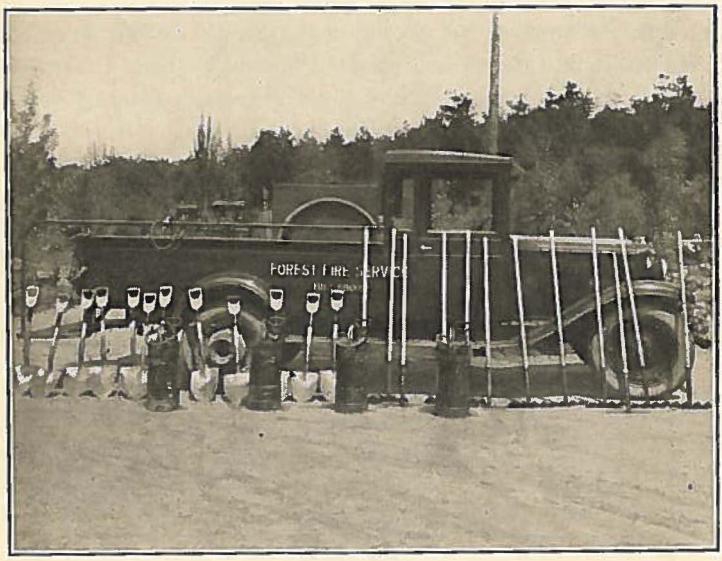


Photo by Morgan

DESIGNED BY LOCAL INGENUITY AND AT REASONABLE COST, SEVERAL TOWNS HAVE SECURED EFFECTIVE PROTECTION. MORE COMMUNITIES SHOULD DO LIKEWISE

and destructive proportions for lack of adequate equipment with which to control them. This phase of the fire problem is far from solved and the state probably cannot do more in a financial way than is being done at the present time.

Patrol

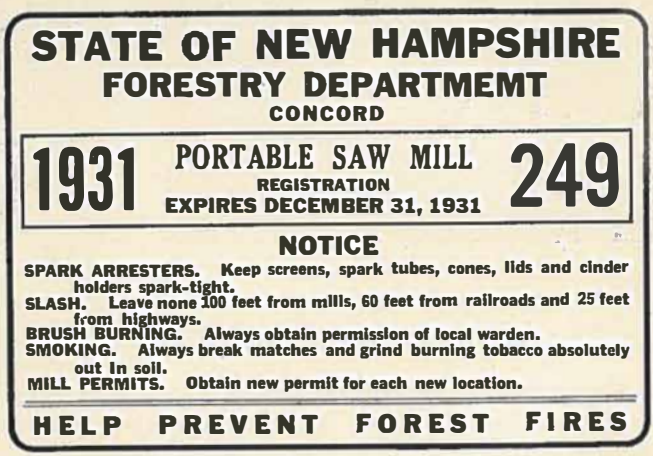
During the biennial period, two patrolmen with automobiles have worked with the chief of the south fire district in connection with law enforcement and other fire preventive endeavors. The added assistance to town wardens has proved to be distinctly beneficial. The patrolmen investigated many fires and were responsible for the settle-

ment of many cases. In addition, many persons were warned against the danger of starting fires and intensive inspections of slash and portable saw mill conditions were carried on in connection with the patrol work.

The success of the work in the south district leads to the belief that it can be extended advantageously to include the central portion of the state if suitable arrangements can be made.

Portable Saw Mills

For the two fiscal years covered by this report, the department is happy to record the fact that no forest fires were started by portable saw mill operations in the woods.



NEW REGISTRATION PLATE FOR PORTABLE SAW MILLS. REGULATIONS REQUIRE THAT THE PLATE BE ATTACHED TO THE MILL. (Illustration ⅓ actual size)

Heretofore, some serious fires have been caused in this manner. It is true, of course, that the substitution of gasoline engines for the time-honored steam power plant has greatly lessened fire danger but much of the success achieved in this direction must be credited to the carefulness of the operators themselves whose good will we enjoy and gladly acknowledge.

Present regulations governing the operation of all portable mills sawing lumber are adequate. These require the annual registration of such mills and permits for each new setting. The law now in effect was enacted in 1925 and interesting statistical information has been gathered since that time. It is believed that this information shows quite accurately the relative degree of portable saw mill activity from year to year. The increasing use of gasoline power is also clearly indicated. A resume of this information follows:

Year	Number of Mills	Power Used		Number of Permits	
		Steam	Gas, etc.	Steam	Gas, etc.
1925*	163	116	47	163	81
1926	240	171	69	267	165
1927	254	177	77	265	194
1928	249	164	85	255	188
1929	248	145	103	207	233
1930	202	111	91	118	192

*July 1 to December 31, 1925.

Lookout Service

During the past two years the number of lookout stations operated has been increased to twenty-five and their efficiency has been improved by furnishing new and up to date maps, better telephone lines and equipment, several of the inferior cabins have been replaced by new ones and three new stations have been built, the last one to be opened next season. They have been operated from the latter part of March in the southern section of the state, varying as the fire danger extends up the state, to the last of May in the extreme northern section, and kept in continuous service until the last of October. Repairs have been made on several of the highways leading to the trails, thus furnishing a better opportunity for the many thousands of visitors to get to the stations.

The record of watchmen in service in 1930 shows that six of them have been employed more than fifteen years,

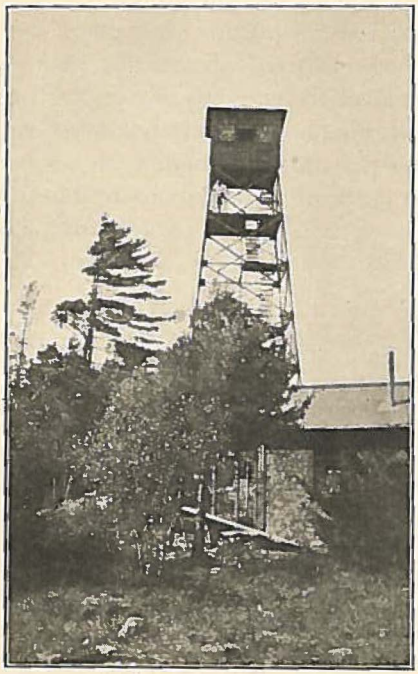


Photo by Forestry Department

NEW FIRE LOOKOUT TOWER AND CABIN ON FEDERAL HILL NEAR MILFORD

three from five to ten years, eleven from two to five years and that only five new men were employed. Fifteen are married and in eight instances the women have lived at the stations during the season. These men have rendered excellent service. The reports show a considerable increase in the percentage of the number of fires where the "first report" is rendered by the watchman. There are, however, numerous fires occurring in the more thickly settled sections of the state which are discovered and reported by some one in the vicinity before the watchman has time to get a report over the wire. There are also fires occurring in places where it is impossible for the watchman to see them until they have gained considerable headway and in some instances where they can not be seen from any lookout point. Then again there are times when atmospheric conditions prevent seeing more than a short distance from the stations.

In addition to our regular service there is a co-operative arrangement with the Massachusetts Forest Fire Service for assistance from Mt. Grace and Watatic, which are reporting fires in the southern part of the state. Also the

stations operated by the Federal Forest Service within the National Forest on Pequaket, Carter Dome, Osceola, Middle Sister and Mt. Hale (completed in 1929) are furnishing valuable assistance.

One feature of our lookout service that has proven very interesting and highly educational is the fact that many thousand people visit the various stations during each season, coming from nearly every state in the Union and several foreign countries.

The following table gives a list of stations, names of watchmen for 1930 and the number of visitors reported the last two years.

Names of Stations	Town	Watchman	Visitors 1929	Visitors 1930
Mt. Agassiz	Bethlehem	W. S. Phillips	*14,000	*15,000
Mt. Monadnock	Jaffrey	David Gegan	9,298	13,552
Uncanoonuc	Goffstown	A. G. Lillis	4,843	4,792
Kearsarge	Warner	J. W. Tucker	4,038	4,884
Red Hill	Moultonboro	C. W. Chates	2,443	2,371
Mt. Belknap	Gilford	James Walker	2,104	1,658
Cardigan Mt.	Orange	F. W. Johnson	1,740	1,851
Pitcher Mt.	Stoddard	F. R. Jennings	1,509	1,349
Green Mt.	Effingham	Harlan Colby	977	947
Oak Hill	Loudon	J. C. Langmaid	820	963
Blue Job	Farmington	C. T. Fowler	789	1,177
Pawtuckaway Mt.	Nottingham	J. T. Lawrence	740	1,675
Rock Rimmon	Kingston	G. E. Shaw	601	571
Black Mt.	Benton	L. C. Nichols	600	677
Federal Hill	Milford	John Lillis	457	479
Stinson Mt.	Rumney	J. F. Baker	451	543
Jodrie Hill	Milan	Ralph Knox	358	273
Jeremy Hill	Pelham	E. J. Teer	273	1,172
Croydon Mt.	Croydon	C. W. Crane	210	144
Cabot Mt.	Kilkenny	F. C. Leavitt	179	266
Carrigain Mt.	Livermore	David Murray	114	131
Magalloway	Pittsburg	H. J. Main	36	9
Signal Mt.	Errol	F. G. Jipson	32	41
Sugar Loaf	Odell		31	Not opened
Deer Mt.	Pittsburg	E. C. Nash	21	9
Hyland Hill	Westmoreland		To be opened in 1931	
Crotched Mt.	Francestown	H. N. Chase	Not opened	2,283
		Total Visitors	46,664	56,817

* Estimated.

New Construction and Special Improvements—1929

During 1929, the lookout service was improved by the construction of two new stations and in several other ways. Nearly eight miles of insulated ground wire were used to connect the new stations and to replace old style pole and tree lines very much out of repair.

At Black Mountain, one and one-half miles were used. Stinson Mountain was connected directly to the Rumney exchange with two miles of ground line and one-half mile of new pole line. The tree line on Pawtuckaway was replaced with ground wire and the Goodrich house connected with the station by the use of about two-thirds of a mile of the new wire. Cabot Mountain required two miles of ground wire up the side of the mountain. Ground wire here has suffered on account of porcupines eating away the insulation but plans have been made to remedy this condition. The old ground wire circuit at Signal Mountain was made into the approved metallic circuit by stringing a second wire to connect with a rebuilt line leading to the base of the mountain. This was made possible through efforts of this department to interest the Coos Telephone Company in rebuilding about five miles of line leading to the point of our connection.

Federal Hill

During the earlier years of the Forestry Department temporary lookout stations were established and used for short periods during extremely dry weather. Such a station was Federal Hill in Milford which began its service in 1911 and was used from time to time until 1918. It had been felt in the past that a permanent station was needed in this vicinity and Federal Hill was finally chosen. A new up-to-date station has been constructed and equipped with a forty-five foot steel tower having an enclosed observation room. A new-type two-room cabin was also built and the whole connected with the telephone line at the highway by using about one-third of a mile of ground wire. The

station was opened in June and did good work. Many visitors came to see the view from the top and to learn about its part in forest protection.

Crotched Mountain

In 1915, Crotched Mountain was established as a lookout station with an open top, wooden tower, a small cabin and telephone connection with Bennington. It was operated

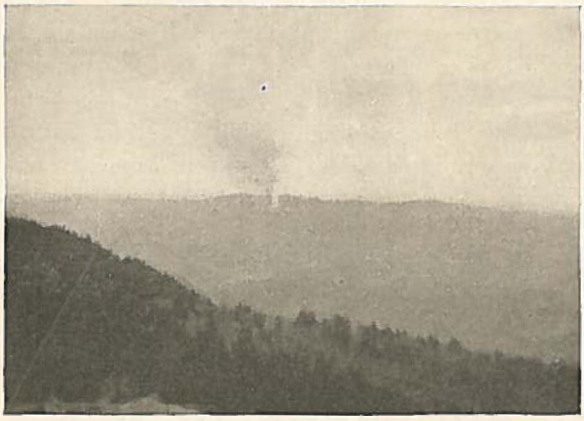


Photo by Stevens

THE BEGINNING OF A FOREST FIRE REPORTED BY THE WATCHMAN ON CROTCHED MOUNTAIN

for a few years and then placed in the temporary class. In 1921, it was definitely abandoned. However, it had covered a section in the southern part of the state in need of better protection and has again been put in commission. A steel tower forty-five feet high and a new two-room cabin have been built and an insulated ground wire telephone line laid down the mountain side one mile to connect with a new line at "Hob Nob Farm," summer home of Mr. Sidney W. Winslow of Brookline, Mass., who is a large property owner in Francestown. A caterpillar tractor was the novel means of transporting construction materials to the top of the mountain. The state is indebted to Mr. Winslow for

his generous contribution of the labor involved in hauling material and for the use of the land for the station. Several automobiles have been to the top over an old road leading close to the tower and with a small amount of repair work, this will be one of the few stations where the tower may be reached readily by automobile.

Pawtuckaway Mountain

At Pawtuckaway Station it was decided to use the old Goodrich house as living quarters for the watchman who will also act as caretaker for the nearly 1,000 acres now in the Pawtuckaway Reservation. The house has been renovated and the road leading to the Goodrich place, which was very nearly impassable, has been repaired with the co-operation of the towns of Deerfield and Nottingham. Automobiles may now be easily driven to this reservation.

The roads to the Rock Rimmon and Oak Hill Stations have also been sufficiently repaired to make these stations accessible to visitors by automobiles. This is also true of Mt. Agassiz where Mr. W. S. Phillips, owner of the property with whom the state cooperates in operating the lookout station, has built an automobile road to the top of the mountain.

During the extremely dry seasons, considerable difficulty has been experienced by some of the watchmen in obtaining sufficient quantities of water without having to carry it long distances. Metal eaves troughs and water barrels have accordingly been provided for several stations to obtain water for general purposes.

New Construction and Special Improvements—1930

The severe ice and sleet storm during the winter caused considerable damage to telephone lines, especially in central and southern New Hampshire. Early in March telephone construction was first undertaken by rebuilding the pole line from Jeremy Hill to the main road leading to Nashua.

The Pawtuckaway telephone line was also badly damaged and it became necessary to rebuild that section from the Deerfield-Raymond road to the old Goodrich Farm at the base of the mountain. From this point to the summit, "Parallel Pair" was laid along the ground, thus avoiding future breakage through storms or falling timber. The same type of wire was also laid from the summits of Mount Belknap and Blue Job to the pole lines on the nearest highway and 2000 feet from the summit of Croydon down over the steep slope.

At Kearsarge a portion of the tree line was rebuilt and 3000 feet more parallel pair laid at the foot of the mountain. At this station the experiment of laying parallel pair on the ground was first tried out and the wisdom of its use has been well demonstrated. On Monadnock, considerable damage has been done to the ground line by ice, and 2000 feet of parallel pair was relaid between the ledges and down through the ravines in such a manner as probably to eliminate any future damage of this sort. In all, telephone construction carried on during the year totaled 7 miles of pole and tree lines rebuilt; 2 miles parallel pair relaid, and about 7 miles of new lines constructed by laying parallel pair.

Improvements and additions have been made to the cabins in order that the watchmen might have more comfortable living quarters. A new cabin was built on Blue Job near the old location, while on Cardigan, a new one was erected 1,500 feet nearer the summit.

From funds provided through the generosity of Mrs. Joel H. Poole, it was possible to build a cabin at the end of the "Poole Memorial Road" so that a caretaker might be housed for the protection of the Jaffrey water supply and furnish additional fire protection and supervision to a section visited annually by many thousands of persons. This particular cabin differs considerably from the regular lookout buildings, being much larger and divided into two rooms. One is equipped with a pay station telephone for the use of the public, while the other serves as living quarters for the

caretaker. An excellent imitation of a log cabin is secured by covering the exterior with spruce slabs.

Access to the observation platform of many of the earlier constructed steel towers was effected by ladders. During the past few years all new stations built have been equipped with stairs. This new construction not only makes it easier for the watchman, but adds a factor of safety to the thousands of visitors. This year ladders were replaced by stairs on Pawtuckaway, Blue Job, Cardigan and Jeremy Hill Stations. The only stations having steel towers not equipped with stairs are Pitcher and Green Mountain which will be changed in the near future. It is a source of great satisfaction to observe how the public has reacted to this change of construction at the lookout towers, evident by the large increase in numbers who have climbed to the observation platforms. Since the completion of the stairs on Jeremy Hill about the middle of July, the watchman reports four times as many visitors as during previous seasons and at Pawtuckaway and Blue Job a large increase has been recorded.

The only new forest fire station constructed in 1930 is

Photo by Forestry Department

ONE OF THE MANY ROADSIDE "ARROWED SIGNS", LOCATED ON MAIN HIGHWAYS AND POINTING TO FOREST FIRE LOOKOUT STATIONS

located on Hyland Hill in the town of Westmoreland. The tower is 53 feet in height, and the watchman's cabin the two-room type. Three-fourths of a mile of parallel pair telephone line connects it with the public telephone service at Keene. This station will be in operation next season, and will afford protection to a section of country lying between Keene and the Connecticut River, well beyond the reach of Monadnock.

In addition to construction work on telephone lines, towers and watchman cabins, several other improvements have been made. Among them is the elimination of the coin boxes at the various stations, thus permitting the watchmen to put their calls through without having to keep sufficient change on hand to use in the coin box. Visitors at the station may still use the telephone by making payment to the watchmen who settle the account through the office. Most of the cabins have also been equipped with a telephone instrument thus enabling the watchman to be reached at any time.

Large arrow signs showing the names of stations have been placed beside the main highways nearest to where the towers can best be seen. This informs the traveling public that they are within the observation range of a forest fire lookout and gives the name of the station seen.

REFORESTATION

Photo by F. A. Gardner

Forest planting in New Hampshire reached its highest peak in 1927. Since then prices have been less favorable to forest products and there has been less planting for the last two years than for the same previous two year period. This decline of about 23% the Forestry Department believes is due to the present method of taxing timber in this state, to the low price of stumpage and to business depression. These conditions all exist at present. However, it would seem that only the tax may remain real, and have any effect on the harvest of the crop that is planted today.

Our forests as they stand today cannot supply our needs. They have been culled until comparatively few areas contain anything better than the cheaper grades. Such timber cannot compete with the lumber of better quality that is coming from the last old growth stands left in the country. Big lumber interests operating these holdings are beginning to plant in order that they may be assured of a continuous supply, even though their markets are hundreds of miles away. New Hampshire is spending $5,000,000 for lumber grown elsewhere, a sum that could be better spent on New Hampshire labor and industries.

Markets today are paying premiums for quality, something that cannot be obtained in second growth lumber without knowledge of tree growth and the management

necessary to produce it. The best quality trees in a stand should be carried over a longer rotation to develop them to their best. Man can assist nature and with the proper spacing of plantations and further assistance as may be needed, more may be expected of such areas than those left to nature alone. Fifty year old plantations have been cut in New Hampshire that produced 50 M. feet of lumber per acre. Such growth well managed for quality on New Hampshire's worn-out fields, abandoned pastures, steep slopes and unused farm corners, will prove a good investment. We are not planting for immediate harvest, but for the future when the better and more valuable supply is still further from the market. Forty years is as short a time as any of the more valuable trees can produce lumber, and all require a longer time for the better grades. This means that our plantations and young growth should reach the market under more favorable conditions, and in the meantime have a higher potential value.

New Hampshire lacks proper reforestation on hundreds of thousands of acres of non-producing land. Nearly a million acres of such land contain little or nothing of value at present. Many areas, particularly those recently cut over or burned, offer an opportunity for immediate planting. If they are not planted immediately, sprout and weed growth prevent successful planting and occupy the land for another generation.

Forest planting pays dividends in many ways to all classes of people.

It pays towns and communities because of protection to the water supply; furnishes play grounds for the recreation of the communities, furthers civic pride, and is eventually an endowment to the towns.

It pays the farmer and land owner because it puts land to work, and produces timber for the maintenance of buildings, fences and equipment, cheaper than it can be bought.

It pays water and power companies because it retains moisture and regulates stream flow.

It pays conservationists because it furnishes food and protection to birds and animals, and protects the streams.

It pays the state and nation because it builds up and maintains the natural resources of the country, guarantees wood using industries a continuous supply of wood, and steady work in each community.

State Land Planting

FOREST planting on state land for the past two years covered 643 acres on nine state forests. These operations ranged in size from 4 to 128 acres on practically all types of planting sites. A large percentage of these sites were cut over areas with small amounts of abandoned farm and sprout land, and about 100 acres of burned area. The burned areas were the result of two railroad fires on two state forests, one of 12 acres on the Connecticut River Tract south of Charlestown village and the other of 92 acres on the Mast Yard Forest west of Concord. The Mast Yard fire was particularly unfortunate as the same area had been severely burned several years before, and was again supporting a planted stand of red and white pine. These trees were about two feet in height and making excellent growth.

These plantings have covered nearly all of the larger areas of state land on which it would seem advisable to plant pine now. Several sizable areas remain unplanted, but are either high areas better suited to growing spruce or land having some agricultural value. It is the department's policy to rent such areas as long as they are better suited or needed for pasture and then plant them. The higher areas will be planted with suitable trees as more spruce becomes available in the nursery.

The following table gives the details of planting operations on state lands during the past two years:

PLANTING ON STATE LAND
BY TRACTS, NUMBER AND SPECIES

Tract	Acres Covered	White Pine	Red Pine	White Spruce	White Ash	Total
Annett	20	20,000	.....	.....	.....	20,000
Cardigan Mountain	4	.....	.....	4,000	.....	4,000
Connecticut River	10	3,000	.....	.....	2,000	5,000
Dodge Brook	34	8,500	.....	.....	.....	8,500
Honey Brook	100	55,000	.....	.....	.....	55,000
Hubbard Hill	138	62,650	.....	.....	3,500	66,150
Mast Yard	95	63,500	.....	.....	.....	63,500
Merrimack River	50	12,500	.....	.....	.....	12,500
Pawtuckaway Mt.	88	37,000	1,000	1,050	5,000	44,050
Totals	539	262,150	1,000	5,050	10,500	278,700

FIRE DAMAGE PLANTINGS BY TRACTS

Tract	Acres Covered	White Pine	Red Pine	White Ash	Total
Connecticut River	12	.....	.....	8,000	8,000
Mast Yard	92½	109,150	2,000	.....	111,150
Totals	104½	109,150	2,000	8,000	119,150

Total area state lands planted ..... 643 Acres
Total number of trees planted on state lands 397,850

SUMMARY OF COSTS

No. trees planted	397,850	No. acres covered	643
Cost—setting per M.	$7.54	Cost—setting per acre	$4.67
Cost—trees per M.	7.10	Cost—trees per acre	4.39
Complete Costs Per M.	$14.64	Complete Costs Per Acre	$9.06

Summary of costs includes both state land and fire damage figures.

Forest Nursery

SEVERAL important developments have taken place at the nursery during the past two years, and one unsatisfactory situation has presented itself, the accumulation of older trees due to the lessening of the demand by private planters, and the lack of opportunity for planting on state land.

A new type of tree called a three year root pruned seedling has been developed and is being offered to the public

Photo by Forestry Department

SOME OF THE BUILDINGS AND TRANSPLANT BEDS AT THE STATE FOREST NURSERY IN GERRISH

for planting. It is an outstanding development that will save time in the nursery, and money to the planter.

The first story of the nursery barn was rebuilt with cement walls, floors and partitions. This construction is permanent, and convenient for the workmen.

Ornamental trees and shrubs were grown in the nursery for the first time this spring. These trees are for the Highway Department and will be used by them in their roadside beautification program.

Any situation such as the decline in forest planting during the past biennial period must necessarily have a serious

effect on the nursery output. Although this output is 23% below the previous two years output, it is 11% below the last five year average and approximately the same as for the last six years.

Previous to this time and during the early part of this six year period, the nursery received orders for hundreds of thousands of trees which it could not furnish. Unfortunately it takes four years after increased amounts of seed are sown, before an increase in the output can be realized. It is also as unfortunate, or more so, that it takes as long to scale down the output as to increase it. The increased demand which reached a peak in 1927 was greater than the nursery could supply until 1926. From 1926 through 1928, a period of three years, the demand and the supply balanced. In 1929 several hundred thousand trees which were seeded in 1925 remained unsold. In 1930 prospective planters were offered these 5 year trees in place of 4 year transplants if they wished them. This disposed of about 50% of the 5 year trees but resulted in about the same amount of 4 year trees being left unsold.

During the past two years it has been necessary to shift the stock from a large percentage of white pine to more spruce and other species. This is due to white pine losing favor because of the low stumpage prices and from injury by weevil and blister rust. The demand for spruce has been stimulated by the Christmas tree industry. Much larger areas of pure spruce are being planted and in many cases spruce are set between regularly spaced rows of a pine plantation. This allows the spruce about ten or twelve years to grow into Christmas trees, before the pine branches cover the space between the rows. In this length of time spruce should grow five or six feet, except on light sandy areas which are not suitable for spruce. Red and Scotch pine are being used more as they are not affected by blister rust and are less likely to be attacked by the weevil. Many who prefer the white pine because it makes better lumber, are planting either red or Scotch with it in order that they

may be sure of a stand if the white pine is injured. Shifting of species in the nursery can not be made in one season, but must be made through a period of years. The necessary change in the nursery has already begun but it is doubtful if a reasonably good balance of supply and demand can be reached for another two years.

During the past four years the nursery has been developing the three year root pruned seedlings which we are now ready to offer the public. Many foresters have called this the most outstanding achievement in nursery practice for a century. A tree has been developed that will meet practically all the requirements of a 4 year transplant and can be produced in less time for much less money. In growing planting stock, seed beds are sown with enough seed to insure a fully stocked bed. Both seedlings and transplants remain in these beds for two years. If transplants are to be grown the beds are spaded up after two years and the trees transplanted to other beds with more space. In these beds the rows are 5 inches apart and the trees 1½ inches apart in the rows. This gives the trees a chance to grow and develop many roots, and after two years in these beds the stock is called 4 year transplants.

In growing three year root pruned seedlings the seed beds are planted and the trees grown the same as for transplants for the first two years, except that less seed is used per bed. This gives the trees more room and a chance to grow in the seed beds for three years. Before the third year's growth is made the beds are gone over and any surplus trees weeded out. Then the roots are cut four or five inches below the surface of the bed. This prevents the lower roots from growing deep and helps develop the more desirable ones near the surface. In offering this tree to New Hampshire planters the Forestry Department feels that real progress has been made in nursery practice. Its use will reduce the cost of planting stock about $2.50 per M, a substantial reduction in the initial planting costs, which largely govern the success or failure of the investment.

NURSERY OUTPUT: FALL 1928—SPRING 1929

Age of Stock	White Pine	Red Pine	White Spruce	Norway Spruce	White Ash	Total
4 yr. tps.	892,075	62,429	71,495	12,050	.....	1,038,049
3 yr. tps.	149,750	36,050	.....	.....	.....	185,800
2 yr. sdlgs.	500	.....	.....	.....	12,150	12,650
Total	1,042,325	98,479	71,495	12,050	12,150	1,236,499

NURSERY OUTPUT: FALL 1929—SPRING 1930

Age of Stock	White Pine	Red Pine	White Spruce	Norway Spruce	White Ash	Total
4 yr. tps.	365,925	73,579	15,450	21,800	.....	476,754
5 yr. tps.	138,925	1,000	1,050	.....	.....	140,975
3 yr. tps.	473,279	18,750	250	.....	.....	492,279
2 yr. sdlgs.	5,000	50	.....	.....	29,850	34,900
Total	983,129	93,379	16,750	21,800	29,850	1,144,908
						2,381,407

Improvement Construction at Nursery

Of the buildings on the nursery property purchased by the Forestry Department in 1913 for nursery purposes, the barn was in the poorest state of repair. Within a few years after the property was purchased, a section of the roof fell in and it was necessary to make this repair and shingle the barn in order to preserve it temporarily. Other comparatively small repairs were made from time to time on other buildings, in as permanent a way as possible. The dilapidated and unsightly condition of the barn together with its large size and construction made the problem a difficult one. Being originally built from the frames of other barns, and located in the lowest spot in the immediate vicinity contributed to its inconvenience and decay. The necessity of spending money made it seem advisable to do the work in as permanent a way as possible, and to divide the work and cost between two fiscal years with the help of the federal Clarke-McNary funds.

Contracts were let for raising and lowering the upper

story and for constructing a cement wall 8 feet high and 10 inches thick underneath. The ground under the barn was graded a foot to keep out the water, and a heavy cement base was put in for the cement wall to stand on. Doors and windows were conveniently placed and iron pipe replaced all wooden posts under the barn. As the barn was 40 by 100 feet there was opportunity to use one end as a garage while the balance would serve for tree packing, a tool room and storage space. A cement wall separated these two spaces and cement floors were placed in the garage and tool room. About a third of the floor in the upper

Photo by Forestry Department

MAIN BARN AT FOREST NURSERY ILLUSTRATING FOUNDATION AND FIRST STORY IMPROVEMENTS

story was rebuilt, and 8 x 8 inch sill timbers bolted to the top of the cement wall for the upper part of the barn to rest on. All parts of the barn coming in contact with the ground are cement and should never need to be replaced. The only maintenance cost to this part of the barn will be the painting of the doors and windows. The upper story of the barn is the only part of the nursery plant now in poor condition. This should be rebuilt as soon as possible, and in a manner to keep maintenance costs at a minimum. The cost of the new construction follows:

Nursery Barn Costs

Contract for raising and lowering barn	$650.00
Contract for cement wall and foundation..	1,800.00
Plans for wall contract	16.88
Labor	1,289.59
Cost of material	1,408.83
Total	$5,165.30

The State Nursery co-operated with the State Highway Department in growing and carrying stock which will be used in their program of roadside planting. The work started for the first time during the spring of 1930 and was handled by the regular nursery crew. About one and a half acres of the nursery area was set aside for the work. Many different kinds of trees and shrubs were transplanted to this area from outside nurseries, and several thousand pine and spruce were furnished from the regular forest

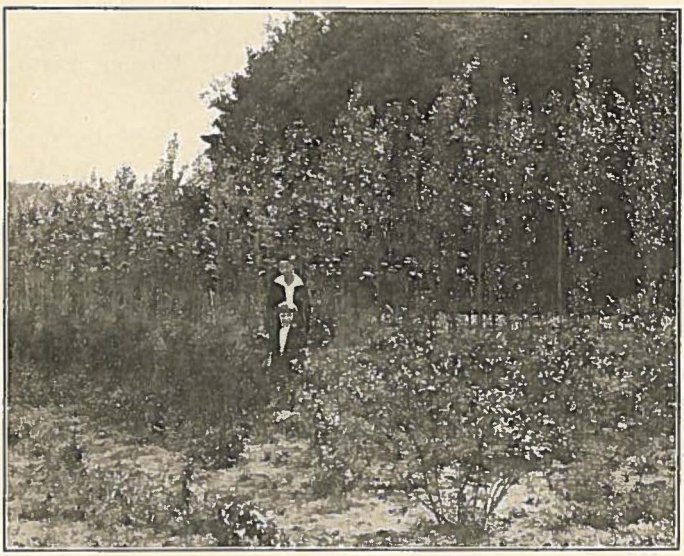


Photo by F. A. Gardner

NURSERY STOCK WHICH IS BEING GROWN AT THE STATE FOREST NURSERY FOR ROADSIDE BEAUTIFICATION

nursery stock. While further co-operation will continue with the Highway Department, the scope of the work will rest largely with that Department.

Free Trees Distributed 1929—1930

The policy of giving free trees to towns was continued and 276,000 trees were given to 25 towns for planting on town forests and other municipal areas. Free trees to the extent of 335,000 were also given to 4 H boys and girls clubs, to Agricultural High Schools and Juvenile Granges throughout the state. The following list shows the towns accepting the offer of free trees and the number planted by each.

Antrim, 500; Belmont, 5,000; Claremont, 47,000; Concord, 1,500; Dover, 2,000; Dummer, 1,000; Dunbarton, 3,000; Durham, 17,000; Franconia, 1,000; Hanover, 50,000; Haverhill, 1,000; Hillsboro, 5,000; Jaffrey, 20,000; Lebanon, 6,000; Manchester, 31,000; Milton, 2,000; Nashua, 2,000; Northwood, 13,000; Pittsfield, 5,000; Portsmouth, 4,000; Richmond, 30,000; Walpole, 5,000; Warner, 14,000; Warren, 5,000; Winchester, 5,000.

The table following shows the value of trees produced and by whom used.

Value of Nursery Stock Produced

Year Ending June 30, 1929

Trees sold to private planters	$5,091.67
Trees given to 4-H and other juvenile clubs	2,354.75
Trees given to towns	1,386.25
Trees used on State Lands	1,407.36
	$10,240.03

Year Ending June 30, 1930

Trees sold to private planters	$3,103.24
Trees given to 4-H and other juvenile clubs	1,860.46

Trees given to towns	656.13
Trees used on State Lands	1,315.24
	$6,935.07

State Land Operations

State land operations have been largely release cuttings in some of the older plantations, using small amounts of the reforestation money for this work. Many areas remain which are greatly in need of the same treatment. Other improvements are needed on many of the state lands but cannot be carried on because of the lack of funds.

Release cuttings on five state forests covered 160 acres at an average cost of $2.36 per acre. This cost is somewhat higher than would naturally be expected and was due to abnormal conditions on three of the areas. Two of the areas were cut for educational purposes as well as for releasing, and more work was done than was really necessary to release the pine. The other area was a large dense gray birch area that had been under planted. In releasing it more time was taken to keep the cut birches off the little pine than to do the cutting.

Small lots of fuel wood were sold from nine state forests bringing a total of $179.00, and one lot of logs resulting from a blow down sold for $171.00. Two carloads of cord wood cut on the Merrimack River tract and not yet sold should net a fair stumpage price as the wood is well located.

WHITE PINE BLISTER RUST CONTROL

FOR THE five year period of 1925-1929 inclusive, returns from lumber operators indicate that nearly 70 per cent of the lumber cut in New Hampshire is confined to but one species, namely, *white pine.*

The peak of stumpage prices for white pine reached its height during the World War, in 1917, when as high as $14.00 per M was paid pretty generally throughout this state. Since that year there has been a gradual decline in stumpage values, due to a variety of influences, until today, owners of white pine growth appear to be fortunate if they receive an offer as high as $6.00 per M on the stump.

Photo by U. S. D. A.

WHITE PINE IS STILL AN IMPORTANT FACTOR IN THE LUMBER BUSINESS OF THIS STATE; ABOUT 66 PER CENT OF THE ANNUAL CUT BEING OF THIS SPECIES

It would seem to any student of economics that such a decline in white pine values would naturally witness *a decided falling-off* in the cutting of this particular forest tree. However, its logging still continues, and during 1929, out

of a total lumber cut of all species, which aggregated 220,690,000 board feet, 145,682,000 feet, or 66 per cent, was white pine. Apparently there is a fairly steady market for that most common of all our softwoods. If there is a market, then there exists a value in dollars and cents to every owner of white pine growth, and with a return to normal business conditions there must be an upward trend for white pine stumpage.

The growing of trees is not a short-term investment, since to bring a forest into maturity requires many years. White pine is a prolific seeder, and with little or no encouragement, springs up on abandoned fields and pastures. As it is also the most rapid grower on poor soils, white pine is the logical species for the forest owner to concentrate on.

Since pine contributes so much to the lumber industry of New Hampshire, it is only natural that many towns, cities and individuals have been active in combating the Blister Rust disease as it constitutes a real and serious menace to the growing of this important tree. During the two years covered by this report 156 towns and cities have co-operated with the Forestry Department in blister rust control. Since the inception of this work 205 towns and cities have appropriated funds, and nearly 600 persons, firms and other organizations have paid for control measures upon their pine holdings.

Co-operative Control in 1929

In the Spring of 1929 there were 97 towns and cities which voted funds in the amount of $29,533.00. This sum was increased 25 per cent from the state appropriation. Individual pine owners to the number of 30 made available $2,814.79.

The total of all areas examined in 71 towns and cities aggregated 151,050 acres, on which 1,781,683 currant and gooseberry bushes were located and up-rooted. Individual control measures were instrumental in covering 4,564 acres, and destroying 91,020 bushes. A portion of the out-lying

Photo by U. S. D. A.

OVER 30,000,000 CURRANT AND GOOSEBERRY BUSHES HAVE BEEN LOCATED AND DESTROYED IN NEW HAMPSHIRE

lands comprising the State Forest Nursery was also worked and this area totaled 115 acres.

Re-eradication was carried on by 26 towns and cities and 15 individuals. The immediate environs of the State Forest Nursery and a portion of the Hubbard Hill State Forest in Charlestown was also re-examined. The total of all such work came to 96,245 acres. An average of but two bushes to the acre was found on these areas as against an original growth of fifteen. This indicated that excellent work had been performed at the time of the initial eradication.

Co-operative Control in 1930

At their annual meeting in 1930, eighty-four (84) towns appropriated $23,800. Later in the Spring, the City of Rochester voted the sum of $500, thus making a total of $24,300. Sixteen individuals made available the sum of $2,116.12.

Shortly after the middle of May, until the latter part of

June, general rains throughout the state greatly retarded field work. During the last two weeks of August, owing to the drought, the leaves of certain species of wild currants fell off rapidly, and as this condition made the identification of such bushes difficult, several projects were curtailed.

The total of all initial control measures, both town and private, came to 137,683 acres, and currant and gooseberry bushes to the number of 1,882,325 were destroyed.

Re-eradication projects totaled but 6,933 acres. Several towns appropriated funds for this purpose, but owing to the large volume of initial work, it was impossible to handle these projects. A re-survey of the State Forest Nursery, in order to locate any re-growth of wild currants or gooseberry bushes, was made. Since none were found it will not be necessary to re-work this property for some years.

Compulsory Control

The legislature of 1929 amended the existing blister rust law by providing for compulsory eradication of currant and gooseberry bushes in towns where little or no control work had been conducted, and where the disease was known to be generally present. The amendment is quoted elsewhere in this report.

While this act became a law on March 13, 1929, the Forestry Department did not request action by the Governor and Council until last Spring. On April 14th, 1930, the Governor and Council notified 43 towns of the provisions of this act, and that control measures were to be carried on under the direction of the State Forester. This project was undertaken beginning July 1st and a total area of 83,884 acres were examined, and 932,718 currant and gooseberry bushes destroyed. During the course of the field work a considerable number of outbreaks of the rust were discovered on white pines.

Summary of Control Work 1918—1930

In the biennial report for 1927-28 the progress of control measures indicated a total area of 2,055,052 acres of initial work, upon which 27 million currant and gooseberry bushes had been destroyed. The total area for the present biennial period amounted to 377,296 acres, thus giving a grand total to date of 2,432,348 acres and 31,687,746 currant and gooseberry bushes removed.

Re-eradication A Necessity

In the last biennial report the following statement was made:

> "....Experience has indicated that it is not possible, in all types of woodlands, to secure complete and final eradication of those plants which spread the rust. Even the most carefully trained and conscientious crews miss a bush occasionally, in most instances owing to its small size, or in pulling plants of skunk currant, whose roots are brittle, broken-off shoots are bound to occur. Furthermore, seed which is in the ground at the time of the first examination is likely to germinate and ultimately develop. Investigations, by the Federal Office of Blister Rust Control, indicate that often ground apparently free from all currant and gooseberry bushes, will, after logging operations, show new growth of these bushes."

The results of blister rust control, not only in New Hampshire, but in all other states as well since 1928, all point to the necessity for a re-examination of white pine areas, and their adjacent lands, anywhere from five to eight years after the initial covering. It may be well to point out that in the work of controlling blister rust we have the first illustration in the history of the world where a nation-wide effort is being made to eliminate a plant having an abundant and wide-spread distribution in forest land.

Success has attended this effort, not alone in the eastern states, but in the far west as well.

Re-eradication measures commenced in New Hampshire in 1925, and now amount to 333,373 acres. Today 13 towns and cities have completed a second examination of their woodlands, in co-operation with the Forestry Department,

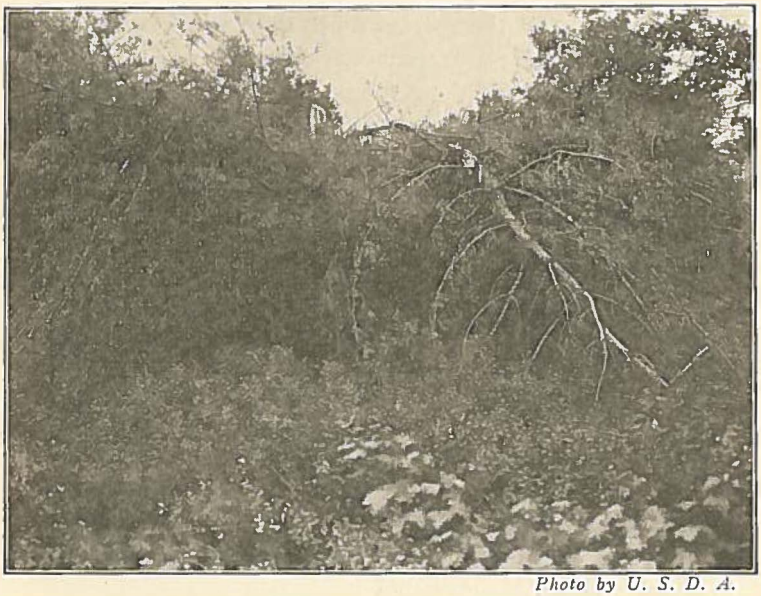


Photo by U. S. D. A.

BLISTER RUST IS NO RESPECTER OF AGE. IT KILLS PINES OF MERCHANTABLE SIZE IN ADDITION TO YOUNG GROWTH

and 31 others have undertaken re-eradication. This policy on the part of 44 towns and cities ought to be a guide to other New Hampshire communities that re-eradication will be necessary from time to time where inspections show that new infections are still taking place.

The Forestry Department is glad to report that eradication of currant and gooseberry bushes has been successful in preventing further spread of the blister rust in the areas put under control. The fact must be stressed, however, that in the majority of towns where little or no control has

been carried on, the spread of the rust is on the increase.

It is true that in some towns the disease has yet to gain much of a foot-hold, but experience over a period of 12 years has proved conclusively that, sooner or later, it will become abundant, if the currant and gooseberry bushes are fairly common. While investigations in respect to the development and spread of blister rust have been painstaking and numerous, there is yet much to be learned regarding this most unusual and serious forest tree disease. The daily reports submitted by the crew foremen indicate that during the season of 1930, nearly 36,000 infections on white pine were noted in the daily performance of their duties. This number does not in all cases refer to individual trees but rather to groups of trees or even several acres.

During the past summer, the State Agent, in charge of control measures made a survey of white pines planted years ago on lands owned by Dartmouth College within the College Grant in Coos County. These plantations are situated in a spruce, fir and hardwood forest, nearly 80 miles north of the white pine belt of this state. However, in northern New Hampshire wild species of currant and gooseberry bushes are more abundant than they are south of the White Mountains. This fact, coupled with a condition of heavy rainfall, probably explains the presence of the blister rust in these particular white pine plantations at the old Van Dyke Farm.

In addition to these outbreaks on the Dartmouth College Grant, natural re-seeding of white pine in and around Errol is heavily infected by the rust. Infected areas, not previously reported in former reports, have recently been discovered in the towns of Gilford, Barnstead, New Ipswich, Alstead, Acworth, Warren, Landaff, Lyman, Littleton, Milan, Northumberland, Candia, Deering, Francestown and Lyndeboro. While some of these outbreaks had their inception prior to eradication work, a large majority have come in quite recently, owing to the fact that little or no control work has been carried on by the towns in which

these infections occur. For those persons who doubt the effect of the rust on white pines of merchantable size, it may be said that on an area in the Littleton region, trees from 24 to 36 inches in diameter have been killed by the rust in as short a time as five years.

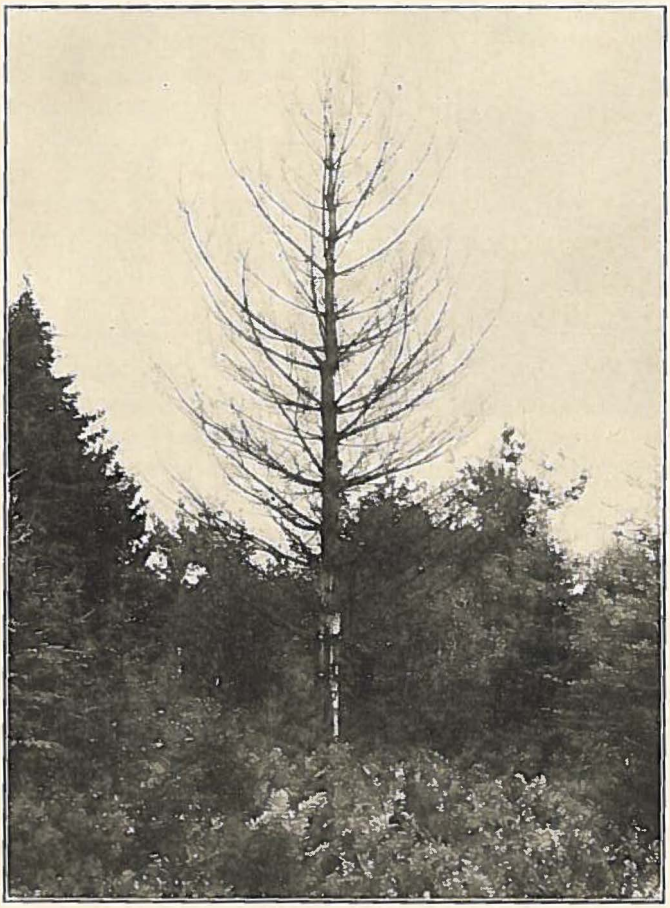


Photo by U. S. D. A.

A WHITE PINE 15 INCHES IN DIAMETER KILLED BY THE RUST

STATE FORESTS AND RESERVATIONS

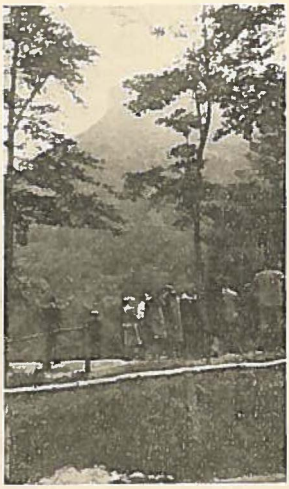


Photo by F. A. Gardner
THE PROFILE, FRANCONIA NOTCH

Since 1891 when the first tract of forest land was given to the State until the present time, the Forestry Department has been acquiring either by gift or purchase many valuable and scenic state forests and reservations. The total acreage is now nearly 30,000 acres with an approximate value of $500,000. The Legislature from 1915 to 1927 made an annual appropriation of $5000 for the acquisition and maintainance of forest land. The failure to appropriate funds since 1927 is causing much concern as to the means of caring for many of these tracts. Valuable stands of young spruce and pine are being over topped and shaded by sprout hardwoods. Roadside reservations occasionally need attention; yet no funds are available for this work. An improvement fund has been created by the Legislature but it is impossible to build up this fund sufficiently to carry on the work that should be done. This problem of maintaining our reservations should be carefully studied and plans made to place many of these valuable tracts upon a sound basis for future management and improvement.

The total acreage of forest lands owned by the State of New Hampshire in the last biennial report was 29,168 acres. Recent surveys of the Black Mt. tract in Haverhill, N. H., changed the acreage from 383 to 401 acres, an increase of 18 acres. A survey of the Poole lots in Jaffrey changed

the acreage from 200 to 166 or a decrease of 34 acres. Gifts of land during the past two years have added 275 acres, making the total now 29,427 acres. A list of the gifts of forest land during 1929 and 1930 is as follows.

Name	Location	Date	Acreage
Gay Tract	Jaffrey	1929	52
Lord Tract	Ossipee	1929	12
Pot Holes and Bear Den	Gilsum	1930	93
Newell Lot	Acworth	1930	26
Arethusa Falls	Livermore	1930	25
Stockdale Tract	Manchester and Hooksett	1930	67
	Total		275

Previously reported	29,168
Addition by gifts	275
Corrections in surveys	—16
Total	29,427

The following is a short description of the gifts of forest land during the past two years:

Gay Tract

In March, 1929, Mrs. Anne H. Kimball of Milton, Massachusetts, deeded to the State a tract of forest land of 52 acres. This piece of land is located in Jaffrey on the westerly slopes of Mt. Monadnock and west of the Halfway House. Part of this tract is covered with a good growth of spruce. Mrs. Kimball's gift is in memory of Joseph E. Gay who was a life long resident of that part of Jaffrey.

Lord Pines

Mr. Frank S. Lord of Center Ossipee gave to the State in October, 1929, about 12 acres of land covered with fine mature white pine as a roadside reservation. Many years ago when Mr. Lord operated this lot he reserved a strip of growth on both sides of the highway for more than half a mile. These tall, stately pines average over 30 M feet to the acre and add greatly to the attractiveness of the roadside in this section.

Pot Holes and Bears Den Reservation

In 1922 the Society for Protection of N. H. Forests in co-operation with the Keene Chamber of Commerce purchased 93 acres of forest land in Gilsum. Since that time Mr. Robert T. Kingsbury of Keene has acted as trustee of the property and with others suggested that the whole tract be presented as a gift to the State. In 1929 the balance due on the property was paid up and during November the same year the deed was executed and recorded. The Society agreed to erect a bronze tablet and this was unveiled and the dedication held during the afternoon of May 19th, 1930. Although the Highway Department was building a cement road at this point all construction was held up during the exercises. Over a hundred people attended the dedication at which Mr. Robert T. Kingsbury of Keene presented the reservation to the State. Mr. John H. Foster, State Forester, accepted the gift for the State and spoke about the splendid possibilities of the reservation. Mr. Allen Hollis of Concord, President of the Society, also gave a short address.

This property has much scenic value. The pot holes are very interesting, indicating probably that the ice sheet during its recession of two thousand years from what is now the State of New Hampshire, rested for a century or two at this place and gouged out great holes in sheer rock. In the eastern part of the tract and located at the base of some steep cliffs is a bear's den. This cave, some 15 feet or more in depth, requires artificial light for exploration. The surroundings are picturesque and rugged. From the high point in the reservation the views are exceptionally fine, showing Mt. Monadnock in the distance to the south, and many high peaks to the north. Good trails lead to the Pot Holes and Bears Den.

Newell Lot

Mr. Chauncy J. Newell of Alstead, former State Senator, made a gift to the State of 26 acres of forest land on the

N. H. 101 highway in Acworth. This lot joins land now owned by the State on the north. The tract recently cut over has much valuable young growth. Many open areas have been planted with pine and spruce by the Forestry Department.

Arethusa Falls

Although Arethusa Falls, located on Bemis brook, are less than two miles from the Crawford Notch highway, not many people have heard of them and fewer have seen them. These falls, just outside the Crawford Notch reservation,

Photo by Forestry Department
ARETHUSA FALLS, BEMIS BROOK, CRAWFORD NOTCH

are considered the highest in New Hampshire with a sheer drop of 140 feet. During high water they present a wonderful spectacle. Miss Mary P. Williamson, of Cleveland, Ohio, who spends her summers in this region, graciously offered to advance funds to acquire a small tract of land including the falls and the timber on both sides of the brook. This tract of 25 acres was purchased from the three Saunders sisters of Lawrence, Mass., whose father, the late Daniel Saunders, owned practically all of the township of Livermore and operated and built the settlement known as Livermore Mills. It is planned to erect a suitable marker near the falls to inform the public that Dr. Frederick Tuckerman, whose name is given to the famous ravine on Mt. Washington, first discovered these falls about 1840. The Appalachian Mountain Club maintains the present trail and possibly some improvements can be made to further attract the public.

Stockdale Tract

Mr. William K. Stockdale of Manchester, N. H., deeded his old farm of 67 acres by gift to the State in December, 1930. There are two tracts of land, one of 46 acres and the other of 21 acres. The first tract includes his home farm where he has lived many years. Just to the rear of the buildings are two acres of white pines which form an attractive picnic ground. All the open pasture land is well adapted for planting. The 21 acre piece is divided by the Manchester-Hooksett town line which leaves 8 acres in Hooksett. Both of these tracts are located on the Mammoth Road which lies about two miles easterly from the city proper.

Improvements to State Forests and Reservations

Permanent improvements have been undertaken only on the larger reservations. The State in co-operation with the Society for Protection of N. H. Forests has made many permanent and noteworthy changes in Franconia Notch.

All of the income from leases in Crawford Notch is used for improving this reservation. Most of this fund during the last two years was expended in the construction of a rest house. Necessary work has been performed on a few of the other tracts. A brief summary of these improvements is made.

Photo by Forestry Department
THE CLEARING AND PROFILE MOUNTAIN, FRANCONIA NOTCH STATE FOREST

Franconia Notch

The State of New Hampshire acquired the Franconia Notch property of 5244 acres from Frank H. Abbott & Son in June, 1928. During that summer and fall certain buildings left by the fire which destroyed the hotel in 1923 were taken away, the terraces near the hotel site were planted and the old Profile store moved a short distance up the road. Later the Forestry Commission decided to engage the services of a manager to operate the Profile Shop and Echo Lake Tea House for the season of 1929. Mr. Andrew M. Rankin who was Assistant Supervisor of Athletics at Dartmouth College was appointed to undertake this work. All his assistants were Dartmouth students and this change in personnel was generally satisfactory. There

were many difficulties and problems met in carrying on this work as no appropriations by the State were available. The total gross sales were undoubtedly reduced by the removal of the Profile Shop, but in spite of this and much rain during the summer months the first season closed without loss, although no final profit was realized.

It was apparent that the management of these two small stores should not be undertaken independently of the Flume concessions owned by the Society, especially since sales are secondary to the development of scenic attractions. The Forestry Commission accordingly leased these stores to the Society for the season of 1930. The Society at once started to make certain necessary changes which have been much desired but could not be accomplished because of lack of funds. The State Highway Department in co-operation with the Society and the Forestry Commission established a new parking area with a capacity of 250 cars just south of the old Profile Hotel site. A new bridge and under pass were built so that people could walk from their parked cars on the easterly side of the road to a new Profile shop, erected during the summer of 1930 and located on the path to Profile Lake, and thence onward to view the "Old Man of the Mountains." Every effort was made to have this building adequate for serving the public. It is of sufficient size to accommodate people desiring to purchase novelties and souvenirs with ample opportunity for refreshment counters. Adequate toilet facilities were included with a complete sewage disposal system according to plans of the State Board of Health. During the last few weeks of the season this store proved beyond question the wisdom of placing it in this location. The Governor and Council granted the Forestry Commission $5000 for use in making improvements and for co-operating with the Society in constructing the Profile shop.

Necessary improvements were likewise made by the Society at Echo Lake. The bath house erected the previous season was moved to the Echo Lake Tea House and used

for living quarters and storage. Three small cottages were erected for housing the shop attendants. Additional water supply was installed and changes made of the large storage shed to a kitchen and dining quarters.

During the spring of 1929 the State leased to the Appalachian Mountain Club the cabin and furnishings at Lonesome Lake. A hutmaster who was stationed at the camp catered to the needs of the many trampers. The lease was renewed for the season of 1930. The Appalachian Mountain Club have made many permanent changes and improvements.

The Forestry Department has employed two men during the past season; a patrolman to direct tourists to camp grounds and police the property and a truck driver to keep the roadsides clean.

Crawford Notch

Increase in the number of visitors to Crawford Notch in recent years has necessitated certain changes. The most

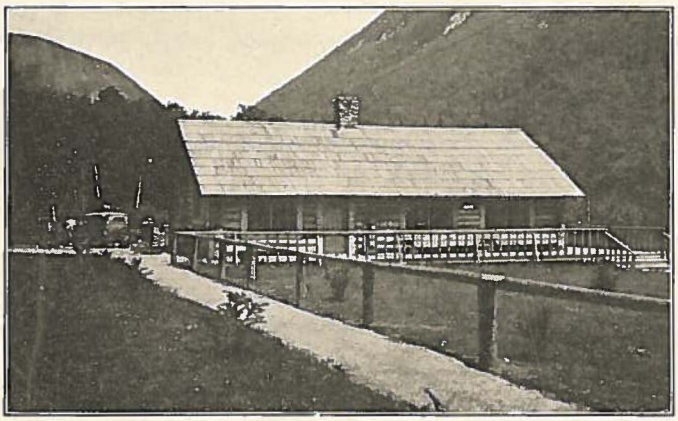


Photo by Forestry Department
THE NEW REST HOUSE IN CRAWFORD NOTCH

urgent was the building of a rest house which was constructed during the late fall of 1929 and spring of 1930. This log building 30 x 40 feet is centrally located and offers

an opportunity for tired travellers to rest and enjoy the mountain scenery. It has been estimated that nearly 10,000 persons have registered from nearly every state in the Union and from several foreign countries. Every evening during the summer a cheerful fire burns in the big fireplace and people spending the night at the Willey camps congregate in the living room for games and a social hour.

The appearance of the Saco pool has been improved by the removal of the ice house which stood near the dam to a place adjacent to the highway and near the old camp grounds. Nearby also will be located the new power house and the laundry. This unit of buildings, well concealed by the woods, will enable greater efficiency and accessibility.

The opening of vistas in the Notch has been often discussed by those interested in its development. During the fall of 1930 a wide cutting of hardwoods at the southern entrance to the reservation was made. This vista opens an excellent view of Mt. Washington and nearby slopes. About one mile up the road another vista has been made showing Frankenstein cliffs. At Avalanche Brook some growth was cut giving excellent views to the north of Mt. Willey, Mt. Willard and Mt. Webster.

Several cabins have been built by the lessees, Donahue & Hamlin, for accommodation of tourists; others were moved to better locations and the space now used for auto parking. The scars of the old gravel pit have been gradually obliterated and the slopes are now covered with shrubs and vines.

Monadnock

The number of tourists visiting Mt. Monadnock has been increasing each year. One of the most frequented routes to the mountain is by the Poole Memorial road to the parking space near the new Jaffrey reservoir. There are three types of public ownership of land on this mountain; the State of New Hampshire, the Society for Protection of N. H. Forests and the Town of Jaffrey. In order to pro-

tect the forest interests of this group it was decided during the spring of 1930 to employ a ranger to look after the various properties. This ranger commenced his work May 30th and was engaged to look after the campers and hikers on the state reservation, to protect the woodlands recently acquired by the Society, and to prevent any trespass on the water supply areas owned by the town. Mrs. Elizabeth S. Poole kindly offered to pay for a new cabin built during the summer at the parking space. This building was the headquarters of the ranger and its location allowed him supervision of the parking and camping and enabled a close check up on all parties visiting the mountain. The ranger's services were paid jointly by the three agencies.

Pawtuckaway

The road to this reservation has been in bad condition for many years as little effort has been made to maintain it and logging operations have done much damage. The towns of Deerfield and Nottingham have co-operated with the State and much improvement has already been accomplished. The road to the Chase place has been opened and much brush cut back on each side. Within the reservation the old road around Middle Mountain is now in fairly good condition so that it is possible to make the circuit from the Goodrich place to the old Chase farm by way of the Boulder trail. This section likewise has been improved by cuttings about the Boulders so that people can now better see them and realize their size. The logging on the reservation is now at an end and the State can begin to plant areas formerly used for sticking lumber.

Pillsbury

The Cherry Valley Outing Club have cabins and shelters under lease by the State along the shores of May Pond. During the summer months the water has become so low that this Pond has lost much of its attractiveness. The

Club and others in the vicinity recently co-operated in building a dam at the outlet so that the level of the water has been raised several feet. The muddy shores and many protruding boulders are now under water and this improvement will be greatly appreciated. The caretaker has put the road into the valley in excellent condition and spent much of his time in patrolling the reservation and protecting it from forest fires.

Photo by U. S. Army Air Service
CRAWFORD NOTCH STATE FOREST RESERVATION

TOWN FORESTS

INTEREST in acquiring and improving town forest lands in New Hampshire still continues. During the last biennial period many towns came into possession of forest lands either by gift or purchase. Other towns realized their importance and made appropriations for improvements or plantings. The Forestry Department again assisted by furnishing free trees to towns which owned forest land. A total of 276,000 trees were shipped from the State Nursery for this purpose during the past two years. One city and several towns received gifts of forest land: Nashua, New Boston, Lisbon, Dunbarton, Ossipee and Wilton. Brookline and Waterville purchased large tracts for future use. The town of Sutton acquired 50 acres of valuable timber land by non-payment of taxes. Gilsum sold her 100 acres of forest land to pay a note due on January 1, 1931. This sale is one of the first recorded helping the town to free itself from debt.

The first conference of town forest selectmen and committeemen in the vicinity of Concord was held at Warner on November 19, 1930. Eight towns sent representatives and a very profitable afternoon was spent inspecting the cuttings and plantations on the Warner town forest. Similar meetings should be held in other towns which have been active in this work so that those interested may examine and discuss the various problems involved.

To date there are 79 towns owning forest land having an acreage of 16,049 acres and plantations of over 2,000,000 trees. The following is the latest information obtained in regard to town forest ownership:

LIST OF TOWN FORESTS

Municipality	Ownership	Purpose	How Acquired	Date	Acres	No. Trees Planted
Alton	Town	Forest	Gift	1924	8	
Antrim	Village	Watershed	Purchase	1893	58	15,500
Auburn	Town	Forest	Tax title	1925	10	
Boscawen	Town	Forest		1917	8	8,000
Bow	Town	Forest	Gift	1925	20	
Brentwood	Town	Forest	Purchase	1917	4	
Brookline	Town	Watershed	Purchase	1930	374	
Campton	Town	Cemetery	Purchase	1886	25	
Charlestown	Town	Forest	Gift	1928	50	
Claremont	Town	Watershed	Purchase & Gift	1890	488	210,000
Concord	City	Watershed	Purchase	1872	500	157,000
Conway	Town	Forest	Gift	1917	10	
Danville	Town	Parish	Purchase	1775	75	
Deerfield	Town	Forest	Gift	1908	5	
Derry	Town	Forest	Gift	1920	60	5,000
Dover	City	Watershed	Purchase	1920	14	5,000
Dublin	Town	Gravel pit	Purchase	1925	40	
Dummer	Town	Forest	Purchase	1927	160	1,000
Dunbarton	Town	Forest	Gift	1930	305	3,000
Durham	Town	Forest	Gift	1900	65	23,000
Effingham	Town	Forest	Tax title	1915	120	
Errol	Town	Forest	Unallotted	1774	150	
Exeter	Town	Forest	Gift	1911	18	
Franklin	City	Town Farm	Purchase	1840	210	18,500
Gorham	Town	Watershed	Purchase	1912	220	3,000
Grantham	Town & Church	Forest	Unallotted	1818	125	
Greenfield	Town	Forest	Gift	1878	22	
Hanover	Village & College	Watershed	Purchase	1893	1,417	158,000
Henniker	Town	Forest	Gift	1921	50	
Hillsboro	Town	Forest	Purchase	1895	55	30,000
Hollis	Town	Forest	Gift	1916	201	21,000
Hopkinton	Town	Forest	Gift	1925	59	8,000
Jaffrey	Town	Watershed	Purchase	1773	506	116,000
Keene	City	Watershed	Purchase	1886	1,910	90,000
Kingston	Town	Cemetery	Purchase	1923	10	4,500
Lempster	Town	Forest	Tax title	1901	31	
Lisbon	Town	Forest	Gift	1930	5	
Littleton	Town	Watershed	Purchase	1921	1,087	500
Loudon	Town	Forest	Gift	1905	119	
Lyndeboro	Town	Forest	Gift	1890	5	
Madison	Town	Forest	Gift	1924	175	
Manchester	City	Watershed	Purchase	1872	2,681	803,850
Marlboro	Town	Forest	Unallotted	1860	53	
Mason	Town	Forest	Gift	1923	27	
Meredith	Town	Forest	Gift	1896	175	
Merrimack	Town	Forest	Purchase	1925	93	6,000
Milan	Town	Forest	Purchase	1895	350	3,000
Milton	Town	Town Farm	Purchase	1839	140	2,000
Mt. Vernon	Town	Forest	Tax title	1900	8	
Nashua	City	Forest	Gift	1930	32	2,000
New Boston	Town	Roadside	Gift	1930	8	
Newington	Town	Forest	Unallotted	1710	112	10,000
Newport	Town	Forest	Purchase	1903	30	
Northwood	Town & Church	Forest	Unallotted	1773	400	26,000
Ossipee	Town	Forest	Gift	1929	10	
Peterboro	Town	Gravel pit	Purchase	1903	11	
Pittsfield	Town	Forest	Purchase & Gift	1924	54	8,500
Portsmouth	City	Watershed	Purchase	1886	240	14,000

Municipality	Ownership	Purpose	How Acquired	Date	Acres	No. Trees Planted
Raymond	Town	School	Gift	1918	12	1,000
Richmond	Town	Forest	Purchase	1880	592	160,000
Salisbury	Town	Forest	Purchase	1880	5	2,000
Sandown	Town	Forest	Tax title	1928	11	
Somersworth	City	Watershed	Purchase	1910	10	
Springfield	Town	Forest	Purchase & Gift	1916	35	
Sullivan	Town	Town Farm	Purchase	1859	100	
Sunapee	Town	Forest	Purchase & Gift	1928	100	
Sutton	Town	Forest	Tax title	1930	50	
Swanzey	Town	Forest	Gift	1928	175	
Wakefield	Town	Forest	Purchase	1925	110	6,000
Walpole	Town	Forest	Gift	1925	200	5,000
Warner	Town	Forest	Gift	1919	804	50,000
Warren	Town	Forest	Tax title	1914	80	20,000
Waterville	Town	Forest	Purchase	1929	306	
Weare	Town	Town Farm	Purchase	1837	100	
Webster	Town	Forest	Gift	1874	16	
Wilton	Town	Roadside	Gift	1930	5	
Winchester	Town	Forest	Gift	1927	66	4,500
Wolfeboro	Town	Forest	Purchase & Gift	1925	34	9,000
Woodstock	Town	Forest	Gift	1897	40	1,000
79		Total			16,049	2,010,850

Nashua

The city of Nashua during the spring of 1930 received 32 acres of forest land, a gift of Mr. Clayton Proctor of that city. Announcement of this gift was made at a meeting of the Woman's Club which has been active in this matter. Over 2000 white pines were planted by the Nashua Boy Scouts on this land.

Dunbarton

The town of Dunbarton was for a long time the home of Major Caleb Stark. Here too his illustrious father, General John Stark, visited after the Revolutionary War. The old homestead still stands filled with reminiscences of days long gone by and in the cemetery near the mill pond amidst a grove of mammoth white pine trees lie the remains of Major Stark and many of his descendants.

One of the Stark descendants, Mr. Arthur Winslow of Boston, Mass., conceived the idea of dedicating a tract of forest land, which was held by some of the heirs, and mak-

ing a gift to the town of Dunbarton. To carry out this idea caused Mr. Winslow much effort as there were many descendants and numerous papers had to be signed making this act possible and legal. This spring the work was completed and a deed covering 225 acres of forest land adjacent to the old homestead was made. Mr. Winslow had a stone monument with bronze tablet erected at the junction of two roads which pass through the tract. The dedication and presentation to the town was made June 13th when townspeople and visitors from nearby towns were present. Mr. Winslow made the principal address and briefly sketched the early history of Dunbarton and the lives of General John Stark and his son, Major Caleb Stark. Mr. F. E. Garvin, Chairman of the Selectmen, accepted the gift for the town. Short talks were given by Mr. John H. Foster, State Forester; Mrs. A. H. McDuffie, representing the Society for Protection of New Hampshire Forests, and Assistant State Forester Warren F. Hale. Following these exercises, refreshments were served at the Barnard farm nearby.

Actual forestry work is being done on this tract which is composed of all kinds of forest growth. About 50 cords of poplar were cut this summer and sold to Haseltine and Gordon, Merrimack, N. H., makers of excelsior. Cordwood is being cut for the schools and a general cleaning up of some of the woodland is in process. A town forest committee of three has been appointed and they are cooperating with the Forestry Department in the care and management of this tract of forest land.

In addition to this gift the town recently acquired by tax title a tract of 80 acres of forest land. This lot is located in the easterly part of the town and will in time produce wood and timber of value. A right of way across this tract was granted by the town to the New England Power Company for $400. It is hoped that this revenue will be made a town forest fund for care and management of its forest lands.

Brookline

For the past 10 years on town meeting day the subject of a water supply for the main village has been discussed. All residents of the precinct of Brookline favored the purchase of a tract of land about a small pond located at the north of the village. In 1930 the town voted to acquire and later purchase 374 acres of forest land for $3,800. A stand of mature pine valued at about $500 is located around this pond while the balance of the lot has a scattering growth of young pine and hardwoods. This lot was cut over several years ago and there is a possibility of planting about 10 acres of open land. The future plan of the town is to develop this into a water supply and it is expected that this matter will be discussed at the next town meeting. The selectmen and committee appointed to handle this affair are as follows: George H. Nye, Orville D. Fessenden, Ernest W. Nye, Lawrence E. Corey, Walter B. Fessenden.

Claremont

The town of Claremont decided in 1887 to have an adequate water supply. A water board was then established and has been functioning since that time. Mr. James L. Rice has been Superintendent for the board since its beginning and has been the means of creating and establishing a water supply area of 313 acres. The lands were for the most part farms bordering the watershed which have been purchased by the water board. Six different tracts have been bought and all open land fit for tree growth planted. During tht past 15 years 210,000 white pine have been set out around the reservoir at an average cost of $10 per acre. These trees are flourishing and in time the town should derive much revenue from this growth. The approximate valuation of these lands is $15,000.

Moody Park

Moody Park is a public park in the town of Claremont, the gift of Hon. William H. H. Moody to the town in 1915.

Mr. Moody was born in Claremont May 10th, 1842, and lived here until 1861 when he went to Boston to engage in business. He was a very successful shoe manufacturer. On retiring from business he returned to Claremont where he had a beautiful estate known as "Highland View." Moody Park is a part of what was his "Highland View" estate and consists of about 175 acres of partly wooded land on the outskirts of the town. The trees have been trimmed and the grounds developed for use for picnic parties. There is also a playground where base ball and other games are played. A road has been built from the highway through the woods and up on to the height of land in the Park where a beautiful view is had of Ascutney, the Green Mountains and the Connecticut valley. The Park is becoming more and more popular each year.

The Park is under the direction of a Park Board appointed by the selectmen of the town and the town each year appropriates from $1500 to $2000 for the upkeep of the Park. The Board employs a caretaker during the summer season.

Gilsum

This town accepted 100 acres of forest land in 1900 from a citizen in town with the understanding that the town would assist him financially. This tract remained in the possession of the town until the fall of 1930 when Mr. B. F. Blue offered the selectmen $1,000 for the lot. After much discussion it was decided to sell as the town had a $1,000 note which was becoming due at about that time. This lot was assessed for the amount sold. The sale of this lot reduced the town debt by $1,000. Although it is regretted that a forced sale was necessary, everyone believes that the town received full value.

TIMBER CUTTING IN NEW HAMPSHIRE

Photo by Forestry Department

Reports received from lumbermen cutting timber in the state during the past two years (except cordwood and pulpwood) have suggested a very interesting problem. There has been a concentrated effort on the part of the New Hampshire Lumbermen's Association and others to curtail the amount of cutting, yet timber has been cut in larger quantities than the market consumption would warrant, at a price which did not net reasonable profit to the operator or give the owners of stumpage a fair value for their growth.

While the number of operators cutting timber during the past five years has declined continuously, the amount of cutting has not decreased, but shows an actual increase. The number cutting from 100 M to 500 M has materially decreased while the number cutting from 500 M to several million feet remains about the same. It will be shown that the major part of our cutting is being done at present by less than 150 operators.

The following table gives the number cutting 100 M or more and the total cut within the state for the entire period that reports have been required.

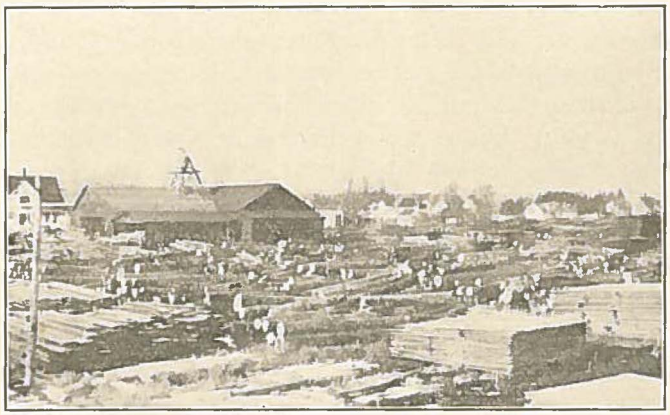
Year	Cutting Between 100-250 M	Cutting Between 250-500 M	Cutting Between 500-1000 M	Cutting Over 1000 M	Cut of Hardwoods	Cut of Softwoods	Cut of Pine	Total Cut
1925	83	81	63	73	30,376 M	47,128 M	170,652 M	248,156 M
1926	52	60	47	68	31,553 M	45,290 M	135,121 M	211,964 M
1927	51	33	54	73	22,615 M	34,055 M	145,305 M	201,975 M
1928	40	34	62	72	24,823 M	38,653 M	171,188 M	234,664 M
1929	43	32	51	67	39,183 M	35,825 M	145,682 M	220,690 M
1930	43	24	26	47	32,125 M	31,499 M	98,966 M	162,593 M

It will be noted from this tabulation that the average cut per year for the five years was 223,960 M while the average cut the past two years was 227,677 M showing an increase of about 3,500 M over the average for the entire period.

A study of the timber cut for the past five years brings out three interesting trends. *First,* the total number of operators is rapidly growing less. *Second,* the larger operators cutting 500 M or more are each year cutting a larger percentage of the total. *Third,* the total cut is not diminishing but rather on the increase. This trend toward an increased cut is shown particularly in the case of pine. The average cut for the past five years being 153,589 M and for the past two years 158,435 M. This increase of cut has not been warranted either by the price of stumpage or by the amount of such lumber consumed by the factories. In fact the recent survey made by the New England Council discloses that the amount of pine used by all of the factories in New England has been for the past two years constantly decreasing. Why then should New Hampshire pine be cut faster than the demand for the same?

Confiscatory taxation has been forcing our timber of all sizes but more particularly our small, immature timber upon an unwilling market at a rate faster than the same can be consumed. The direct result has been a demoralized market condition tending toward constantly lower stumpage prices. All of the yearly growth or income of a timber lot is now being taken by the taxing precinct in the form of taxes.

There are innumerable cases brought to our attention tending to prove this statement, one concrete example of which shows actual conditions. A 250 acre tract in this state remaining in the same ownership for over 53 years was purchased for $2000 in 1876, including a set of farm buildings that were burned 13 years later. The total tax assessed for that year was $16.96 and the tax for 1929 was $491.83. The total taxes paid during the entire period were $5078.26, interest charges at 4% total $15,983.20 making a total expense of $23,066.46. The only revenue received has been from cutting chestnut poles during the last few years to the value of $3,000. According to our best information the lot is not now worth over $15,000



"CONFISCATORY TAXATION HAS BEEN FORCING OUT TIMBER OF ALL SIZES — UPON AN UNWILLING MARKET"

showing a deficit to the owner up to 1930 of $5,066.46. Other interesting facts given are that the tax in 1926 figured 16 cents per acre while the tax in 1929 was $1.96 per acre. The total taxes paid the first 25 years amounted to $391.34 while for the remaining 28 years the total was $4,686.92.

If the law provided that all of the income of interest

bearing securities should be thus taken from the owner, that law would be amended very radically at the next Session of the General Court. The holding of timber is a long term investment, comparable with the holding of interest bearing securities, except that the owner thereof is confronted with greater risks. The taxation laws relating to forest growth should be revised so as to be more nearly comparable to the taxation of securities. The present property tax on growing timber should be abolished and a severance tax substituted therefor, paying a just proportion of the public taxes at the time of cutting; or else some other system enabling the owners of growing timber to hold their timber to a reasonable maturity.

REGISTERED ARBORISTS

A LAW was passed in 1929 requiring the registration of persons, firms and corporations soliciting business in improving shade, ornamental and fruit trees and the payment of an annual fee of $2 for registration. Provision was made, however, that registration was not necessary to do such work in towns or cities where legal residence was held, or on a person's own land or that of his employer. Registration places the responsibility for the acts of employees upon the person, firm or corporation receiving a certificate.

This law was put into effect in 1930 by the Arborist Registration Board which is made up of the State Forester, Commissioner of Agriculture and the Entomologist of the Agricultural Experiment Station. Fifty-two persons and companies were certified either for general care of trees or for such types of work as they were capable of doing in a satisfactory manner. Reports of work done are required and inspection is being carried on. A certificate may be revoked by the Board upon proof that improper methods have been used or for other sufficient cause. The text of the law will be found elsewhere in this report.

Under this law the public is protected from unreliable and incompetent persons and companies and an improvement in work done is already noticeable. Arborists have co-operated with the Board in carrying out the spirit of the law.

STATE APPROPRIATION ITEMS

July 1, 1928 — June 30, 1929

	Appropriation	Expenditure
Salary of Forester	$3,250.00	$3,250.00
Field Assistants	2,500.00	2,500.00
Clerical Expense	5,450.00	5,300.00
Traveling Expense	1,000.00	1,000.00
Incidentals	1,000.00	1,000.00
Printing Blanks	1,200.00	1,200.00
Printing Report	800.00	800.00
District Chiefs	7,500.00	7,500.00
Lookout Stations	10,000.00	10,000.00
Conferences	1,000.00	947.03
Prevention of Fires	2,000.00	2,000.00
Nursery	12,960.00	12,960.00
Forest Fire Bills to Towns	5,000.00	2,152.38
Reforestation	2,000.00	.....
Transferred from Executive Department	1,000.00	3,000.00
White Pine Blister Rust	20,000.00	19,984.55
Forest Fire Equipment	1,000.00	1,000.00
Totals	$77,660.00	$74,593.96

July 1, 1929 — June 30, 1930

	Appropriation	Expenditure
Salary of Forester	$3,500.00	$3,500.00
Field Assistants	2,500.00	2,500.00
Clerical Expense	5,500.00	5,450.00
Traveling Expense	1,000.00	999.94
Incidentals	1,500.00	1,499.76
Printing Blanks	1,200.00	1,200.00
District Chiefs	7,500.00	7,498.27
Lookout Stations	10,000.00	9,999.73
Conferences	1,000.00	829.21
Prevention	3,000.00	3,000.00
Nursery	10,500.00	10,499.82
Forest Fire Bills to Towns	5,000.00	.....
Transferred from Executive Department	6,519.61	11,519.61
Reforestation	3,500.00	3,498.05
White Pine Blister Rust	17,500.00	17,499.07
Forest Fire Equipment	1,000.00	1,000.00
Totals	$80,719.61	$80,493.46

WOOD USING INDUSTRIES, STATIONARY SAW MILLS AND RETAIL LUMBER DEALERS

BELKNAP COUNTY

NAME	ADDRESS	MANUFACTURED
Barnstead Wood Heel Company	Barnstead	Wood Heels
Boulia-Gorrell Lumber Company	Lakeport	Box Shooks and Retail Lumber
Chase & Veasey	Lakeport	Veneer Boxes and Lumber
Cook Lumber Company	Laconia	Saw Mill, Box Shooks and Retail Lumber
Drake, E. B. Estate	Barnstead	Saw Mill and Retail Lumber
Emery, Charles M.	Tilton	Saw Mill, Boxes, Shooks and Retail Lumber
Gordon & Plastridge	New Hampton	Saw Mill
General Heel Company	Bristol	Wood Heels
Howe, C. G.	Sanbornton	Saw Mill
Hutchinson & Hutchinson	Bristol	Picker Sticks
Lapham, Albert H.	Alton	Toys and Novelties
Leighton, J. P.	Center Harbor	Saw Mill
Lovejoy & Smith, Inc.	Laconia	Lumber
Maloon, E. H.	Meredith	Box Shooks
Meredith Casket Company	Meredith	Burial Cases
Meredith Grain Company	Meredith	Retail Lumber
Prescott, F. R.	Meredith	Box Shooks, Doors, Sash and Blinds, Retail Lumber
Seward, T. F.	Center Barnstead ..	Saw Mill and Retail Lumber
Smith, C. Sherman, Inc.	Bristol	Retail Lumber
Wells & Allard	Bristol	Saw Mill and Retail Lumber

CARROLL COUNTY

NAME	ADDRESS	MANUFACTURED
American Lumber Products	Ossipee	Dowels
Ames Mfg. Co.	Ossipee	Dowels
Berry, O. P. Co.	Wolfeboro	Excelsior
Bosse, Paul	Conway	Wholesale and Retail Lumber
Chandler, Arthur W.	No. Conway	Retail Lumber
Clow, S. W.	Wolfeboro	Boxes and Shooks
Carroll County Lumber Co.	Center Ossipee	Novelties and Miscellaneous
Conway Wood Heel Company	Conway	Door, Sash and Blinds and Retail Lumber
Chase, J. M.	Effingham	Saw Mill
Drew, Lyle S.	Wakefield	Wood Novelties and Toys
Evans, F. P.	Tamworth	Saw Mill
Frankson Furniture Mfg. Corp.	Ossipee	Tables and Novelty Furniture
Gibson, J. L. Company	No. Conway	Retail Lumber
Goodhue & Hawkins	Wolfeboro	Boats
Hoyt, Edwin E.	East Madison	Saw Mill and Retail Lumber
Huckins, S. O.	Ossipee	Saw Mill and Retail Lumber
Hutchins, Frank	Wolfeboro	Excelsior
Jackson Brothers	Conway	Clothespins and Novelties
Kearsarge Pegs Company	Bartlett	Pegs
Kelley, Percy	Moultonboro	Saw Mill
Kennett, Frank E.	Conway	Wholesale and Retail Lumber
Lasky, A.	Union	Saw Mill
Libbey, W. H.	Intervale	Planing and House Finish
Livermore Mills	Livermore	Wholesale and Retail Lumber
Lord, William H.	Union	Excelsior
Lucy, Arthur O.	No. Conway	Saw Mill
Mason & Moulton	Ossipee	Wholesale and Retail Lumber
Milliken & Merrow	Freedom	Chair Stock
Mudgett, H. H.	Intervale	Saw Mill and Retail Lumber
Pitman & Dinsmore	Jackson	Saw Mill
Rust, Horace	Wolfeboro	Wholesale and Retail Lumber
Smart, C. E. & H. P.	Center Ossipee	Saw Mill
Snow, William	Snowville	Novelties and Lumber
South Tamworth Industries	South Tamworth	Saw Mill, Toys and House Finish

CARROLL COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Tappan, W. S.	Sandwich	Saw Mill
Twombly, W. M.	Conway Center	Saw Mill
Vinall, George W.	Sandwich	Saw Mill
Willey, A. H.	Tuftonboro	Saw Mill
Wolfeboro Lumber Co.	Wolfeboro Falls	General Mill Work and House Finish

CHESHIRE COUNTY

NAME	ADDRESS	MANUFACTURED
Amidon & Martin	Winchester	Wholesale and Retail Lumber
Annett Box Company	East Jaffrey	Boxes and Saw Mill
Bean & Symonds	East Jaffrey	Saw Mill, Box Shooks and Retail Lumber
Beauregard, George	Marlboro..	Saw Mill
Beverstock, O. D. Company	Keene	Hoops and Rims
Braggs, L. F.	Alstead	Saw Mill
Burdett Chair Co.	Keene	Chairs and Brush Handles
Carey Chair Manufacturing Co..	Keene	Porch Chairs
Cleaves, S. H. & Son	West Rindge	Saw Mill, Baskets and Retail Lumber
Colburn, S. J.	Walpole	Saw Mill
Currier, M. A.	Alstead	Wood Working
Damon, Walter S.	Rindge	Brush Handles and Retail Lumber
Damon, Jonas, Estate	Fitzwilliam	Saw Mill and Wood Turning
Demerritt Fischer Company	Keene	Porch Chairs
Donovan & Pierce	Ashuelot	Wholesale and Retail Lumber
Farrar Brothers Co.	Troy	Wood Turning
Fish, A. E. & Company	Keene	General House Woodwork
Frost, C. C.	North Walpole	Boxes and Shooks
Green Mfg. Co.	North Walpole	Boxes
Hart, D. J. Box Company	Marlboro	Boxes and Lumber
Hatch, C. E.	Alstead	Saw Mill and Retail Lumber
Hastings, B. A.	East Sullivan	Saw Mill
Hopkins, Frank G.	Keene	Wholesale and Retail Lumber
Keene Screen Company	Keene	Screens
Keene Chair Company	Keene	Chairs

CHESHIRE COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Lane, C. L. Co.	East Swanzey	Pails and Buckets
Lane Chair Company	East Swanzey	Chairs
Lawrence Box Company	Keene	Boxes
Leach Mfg. Co.	Hinsdale	Wood Working
Lempster Queen Clothespin Mfg. Co.	Marlow	Clothespins
Lynn Wood Heel Company	Keene	Wood Heels
Martin, Leason & Son	Richmond	Saw Mill, Woodenware and Lumber
Mathes, W. J. & Son	Walpole	Saw Mill
N. E. Box Company	Keene, Swanzey, Winchester	Boxes and Saw Mill
New Hampshire Match Co.	East Jaffrey	Matches
Nelson Manufacturing Co.	East Swanzey	Lumber
Newell, C. J.	Alstead	Saw Mill and Retail Lumber
Norwood Calef Co.	Keene	Porch Chairs
Norcross, O. V.	Keene	Wholesale and Retail Lumber
N. E. Wooden Ware Corp.	Swanzey	Cooperage
Pittsburg Plate Glass Co.	Keene	Brush Handles
Platt Box Co.	Troy	Boxes and Toys
Robinson Brett Lumber Co.	Keene	Door, Sash and Blinds and Retail Lumber
Russell, C. L. & Sons	Keene	Chairs
Service Wood Heel Co.	Keene	Wood Heels
Scott, Glenroy W.	Keene	Retail Lumber
Spaulding,M. O.	Keene	General Woodworking
Sprague & Carleton	Keene	Porch Chairs
Stone, R. W.	Fitzwilliam	Saw Mill and Retail Lumber
Seaver, E. W.	Chesham	Box Shooks
Stone, S. S. & Son	Fitzwilliam	Saw Mill—Stretchers and Shims
St. Pierre, August	Jaffrey	Retail Lumber
Thayer Portable House Co.	Keene	Portable Houses
Thompson, O. G. & Son	Westmoreland	Woodenware
Granite State Mfg. Co.	Marlboro	Reels and Wood Turning
Union Box & Lumber Co.	East Rindge	Boxes
Walker, C. W. & Sons	Rindge	Saw Mill—Headings, Lumber
Watson, L. S. & Co.	Marlow	Cattle Cards and Lumber
Whitney Brothers	Marlboro	Toys
Whitcomb, W. T.	Swanzey	Chairs
Winn Brothers	Harrisville	Chairs

COOS COUNTY

NAME	ADDRESS	MANUFACTURED
Baldwin, Frank W.	Pittsburg	Saw Mill and Lumber
Brown Company	Berlin	Paper, Pulp, Lumber, Etc.
Buber, Luther Sons Company	Berlin	Retail Lumber
Cone, H. N.	Columbia	Saw Mill
Demers, Fred	Stratford	Saw Mill
Grover, Scott A.	Errol	Saw Mill
Groveton Paper Company	Groveton and Northumberland	Paper and Pulp
Gardner Table Mfg. Co.	Whitefield	Furniture and novelties
Hammond, Frank	Colebrook	Mill Work and Lumber, Doors, Sash and Blinds
Hicks, A. C.	Colebrook	Retail Lumber
Holt, Orrin S. & Son	Dummer	Saw Mill
Hunt, S. G.	Whitefield	Saw Mill
International Paper Company	Berlin	Paper and Pulp
Kimball, W. H. Estate	Stratford	Lumber, Laths and Dowels
Lemiex, Oliver	Berlin	Saw Mill and Furniture
Libby, E. & Sons Co.	Gorham	Mill Work and Retail Lumber
Lombard Brothers	Colebrook	Retail Lumber
Moore, Herbert A.	Lancaster	Retail Lumber
N. H. & Vermont Lumber Co.	Stratford	Lumber and Chair Stock
Poulin, John	Dalton	Retail Lumber
Paris Manufacturing Co.	Dummer (P. O. So. Paris, Me.)	Saw Mill
Parker, George F.	Lancaster	Retail Lumber
Rolfe, A. J.	Groveton and Northumberland	Doors, Sash and Blinds, Retail Lumber
Thompson Manufacturing Co.	Lancaster	Door, Sash and Blinds, Retail Lumber
United Shoe Machinery Co.	Lincoln	Lumber
Whitefield Manufacturing Co.	Whitefield	Lumber and Bobbins
White Mountain Mfg. Co.	Berlin	Lumber and Bobbins

GRAFTON COUNTY

NAME	ADDRESS	MANUFACTURED
Ashland Lumber Company	Ashland	Saw Mill and Retail Lumber
Blodgett, Fred W.	Wentworth	Saw Mill
Boothby Company	Lincoln	Paper Plates
Brooks & Whitney	Franconia	Bobbins and Lumber
Burtt, A. F. & Co.	Plymouth	Retail Lumber
Clayburn Bros.	Piermont	Boxes and Shooks
Clough, N. P. & Co.	Lebanon	Saw Mill and Retail Lumber
Calley & Currier Company	Bristol	Crutches
Cushman Manufacturing Co. ..	Canaan	Saw Mill
Clark, E. M.	Haverhill	Retail Lumber
Cone, N. B.	Rumney	Crutches
Collins, E. R.	Enfield	General Mill Work and Lumber
Conrad, E. J.	Beebe River	Saw Mill
Draper Company	Lisbon	Saw Mill and Bobbins
Eaton, H. A. & Sons	Littleton	Bobbins & Lumber
Eastman, C. A.	Ashland	Saw Mill and Lumber
Ellingwood, O. D.	Littleton	Retail Lumber
Elliott, E. A.	Rumney	Crutch Manufacturer
Farr, A. N. & Co.	Littleton	Saw Mill and General Mill Work and House Finish
Flanders Woodworking Co. ...	Lebanon	Retail Lumber
Ford, Charles A.	Orange	Saw Mill
Gale, C. M. Estate	Landaff	Wholesale and Retail Lumber, Saw Mill and Bobbins
Gibson, Hamlin & Spaulding ..	Plymouth	Wholesale and Retail Lumber
Gordon, John C.	No. Woodstock ...	Saw Mill and Retail Lumber
Hambleton Bobbin Company ...	Lebanon	Bobbins
Hutchins, H. E.	Groton	Saw Mill
Kenniston, G. L. & Sons	Rumney	Tennis Racquets
Lary, Asa	Canaan	Saw Mill
Lavoie, Peter	Warren	Bobbins
Lewis, E. H.	No. Haverhill	Planing Mill, Lumber and Finish
Lisbon Bobbin Co.	Lisbon	Bobbins
Lisbon Mfg. Co.	Lisbon	Saw Mill and House Finish
Littleton Lumber Co.	Littleton	Retail Lumber
Lisbon Products Co.	Lisbon	Bobbins
McKenzie, E. J.	Franconia	Saw Mill and Retail Lumber
Merrill, A. D.	Thornton	Saw Mill and Retail Lumber

GRAFTON COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Moulton, A. C. & Son	Piermont	Saw Mill, Wholesale and Retail Lumber
Noyes, C. M.	Landaff	Saw Mill and Bobbins
Nutter, Joshua	Bath	Lumber and Laths
Pennock, I. F. & Son	Littleton	Lumber and Cabinet Work
Parker Young Company	Campton	Wet Pulp
Parker Young Company	Lincoln	Lumber and Paper
Parker Young Company	Franconia	Saw Mill
Pattee, Fred L.	West Canaan	Saw Mill
Pike Mfg. Co.	Pike	Bobbins and Lumber
Pratt, O. M.	Plymouth	Saw Mill and Lumber
Richardson, Frank	Littleton	Retail Lumber
Rogers, A. H.	Canaan	Saw Mill
Ross, E. J.	Bath	Saw Mill
Sawyer, A. W.	No. Woodstock	Saw Mill
Shellow, Charles H.	Bath	Bobbins
Stone, D. S.	Haverhill	Retail Lumber
Squam Lake Lumber Co.	Ashland	Saw Mill and Retail Lumber
Tobey, Fred E.	Plymouth	Wholesale and Retail Lumber
United Shoe Machine Co.	Lincoln	Wood Heels
U. S. Dowel Company	Ashland	Dowels
Wells & Flanders	Enfield	Boxes
Whitney, E. P.	Franconia	General Mill Work and Bobbins
Young, Charles A.	Easton	Lumber and Bobbins

HILLSBOROUGH COUNTY

NAME	ADDRESS	MANUFACTURED
Abbott, J. C. Estate	Antrim	Cradles
American Box & Lumber Co.	Nashua	Lumber, Boxes, Shooks, Saw Mill
American Shoe Form Co.	Manchester	Shoe Forms
Amoskeag Paper Mills	Manchester	Paper
Atwood, F. T.	East Manchester	Box Shooks
Bailey, Arthur A.	Manchester	Wholesale and Retail Lumber
Balch, Albro L.	New Ipswich	Saw Mill
Bates, E. R.	Nashua	Wholesale and Retail Lumber
Batchelder Worcester Co.	Manchester	Box Shooks

HILLSBOROUGH COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Bernies, W.	Greenville	Saw Mill
Bickford Lumber Co.	Nashua	Wholesale and Retail Lumber
Blanchard & Son	Greenville	Chairs
Blanchard Chair Mfg. Co.	Greenville	Chairs
Builders Supply & Mfg. Co.	Manchester	Builders Finish
Carpenter, H. J.	Manchester	Barrels and Boxes
Chagnon, E. A.	Nashua	Retail Lumber
Chase, Warren H.	Milford	Saw Mill and Retail Lumber
Clement Toy Co.	Weare	Toys and Fire Work Foundation
Commonwealth Last Co.	Manchester	Lasts
Converse, Robert	Amherst	Saw Mill
Cook, F. D. Lumber Co.	Nashua	Retail Lumber
Crescent Woodworking Co.	Manchester	Toys and Handles
Crockett, George	Hancock	Cooperage
Curtis, A. L.	Wilton	Saw Mill and Cooperage
Crescent Wood Heel Co.	Manchester	Wood Heel Finishing
Dalton, A. Box Co.	Manchester	Paper and Wooden Boxes
Dawson Mfg. Co.	Hudson	Wood Novelties
Drewry Bros.	Weare	Toys
Eastern State Package Co.	Peterboro	Baskets
Falconer, W. M.	Milford	Saw Mill
Fellows & Son	Manchester	Saw Mill, Boxes, Shooks and Burial Cases
Felton, S. A. & Sons Co.	Manchester	Brush Handles
Fessenden, B. & A. D.	Brookline	Lumber and Staves
Fessenden, O. D.	Brookline	Cooperage
Flanders Hardware Co	Weare	Tool Handles
French & Heald Co.	Milford	Furniture
Frye, E. B. & Sons	Wilton	Saw Mill and Woodenware
Goodell Co.	Antrim	Saw Mill
Granite State Wood Heel Co.	Manchester	Wood Heels
Gregg & Sons	Nashua	Door Sash and Blinds
Greenville Chair & Table Co.	Greenville	Chairs and Tables
Hadley, Harry G.	New Boston	Saw Mill, White Pine Finish
Hadley, Frank E.	West Wilton	Saw Mill, Chair Frames, Toys, General Work
Hall, Lester M.	Nashua	Saw Mill
Hartshorn, Frank Lumber Co.	Milford	Lumber and Box Shooks
Haskell, A. B. Co.	Nashua	Burial Cases
Hayden, S. J.	Brookline	Wholesale and Retail Lumber
Hayden Brothers	Hollis	Saw Mill
Hazeltine & Gordon	Merrimack	Excelsior
Hermsdorf, W. R.	Manchester	Cabinets and Store Fixtures

HILLSBOROUGH COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Hodge, J. C.	Manchester	Doors, Sash and Blinds and Retail Lumber
Hubbard, Sash, Door & Lumber Co.	Manchester	Doors, Sash and Blinds
Indian Head Casket Co. Inc.	Nashua	Burial Cases
Johnson Lumber Co.	Manchester	Wholesale and Retail Lumber
Jones Table Co.	Merrimack	Tables
Kendall & Epply	Manchester	Cigar Boxes
Kendall & Hadley	Goffstown	Door, Sash and Blinds
Kimball, F. G.	Manchester	Wholesale and Retail Lumber
Langdell Lumber Co.	Manchester	Wholesale and Retail Lumber
Maine Manufacturing Co.	Nashua	Refrigerators
McElwain, W. H. Co.	Manchester	Wood Heels and Forms
McLane Manufacturing Co.	Milford	Post Office Furniture
Melendy, C. F.	Hudson	Saw Mill
Merrimack Wood Heel Co.	Salem	Wood Heels
Muir Lumber Co.	Manchester	Retail Lumber
Nashua Building Co.	Nashua	Retail Lumber
N. E. Bobbin & Shuttle Co.	Nashua	Bobbins and Shuttles
N. E. Mill & Lumber Co.	Hudson	Retail Lumber
Nettleton & Harris	Goffstown	Door, Sash and Blinds and Retail Lumber
N. H. Cabinet Works	Manchester	Cabinet
Newton, H. G.	Francestown	Saw Mill and Wood Working
Paige, Morton & Son	Antrim	Reels
Parker Wood Heel Co.	Nashua	Wood Heels
Parker, Frank A.	Goffstown	Wholesale and Retail Lumber
Proctor Bros.	Hollis and Nashua	Saw Mills, Barrels, Pails, Tubs, House Finish, Etc.
Proctor, D. W.	South Merrimack	Saw Mill
Putnam, J. A. G.	South Lyndeboro	Saw Mill Lumber
Rumrill, E. C.	Hillsboro	Mill Work and Retail Lumber
Sanborn Carriage Company	Manchester	Truck Bodies
Sheldon, H. M.	Hancock	Clothes Pins
Smith Box Co.	Manchester	Boxes and Shooks
Snow Wood Heel Co.	Manchester	Wood Heels
Stevens, Kemp & Hazen	Peterboro	Retail Lumber
Sutherland, O. A.	New Boston	Boxes and Lumber, Saw Mill
Snyder Wood Heel Co.	Derry	Wood Heels

HILLSBOROUGH COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Tolles, J. H. & Co.	Nashua	Boxes, Lumber, House Finish
Toy Manufacturing Co.	Weare	Toys
U. S. Bobbin & Shuttle Co.	Manchester and Goffstown	Bobbins
Utility Table Co.	Nashua	Tables
Upton and Whitcomb	Hancock	Wholesale and Retail Lumber
Walden Knife Co.	Bennington	Knife Handles
Walker, A. F. & Son	New Ipswich	Wood Handles
Warren Lumber Co.	Peterboro	Wholesale and Retail Lumber
Weare Manufacturing Co.	Weare	Toys
West Side Lumber Co.	Manchester	Lumber
Wheeler, Scott M.	Manchester	Wholesale and Retail Lumber
White Mountain Freezer Co.	Milford and Nashua	Saw Mill, Freezers and Lumber
Whiting, David & Son	Wilton	Saw Mill, Boxes and Lumber
Wilds, C. D.	Hancock	Finish and General Work

MERRIMACK COUNTY

NAME	ADDRESS	MANUFACTURED
Ames Wood Products Co.	Concord	Handles and Dowels
Bailey Lumber Co.	Suncook	Box Shooks and Retail Lumber
Bartlett Excelsior Co.	Warner	Excelsior
Bickford & Huckins	Gossville	Saw Mill, Lumber and House Finish
Blodgett, F. E. & Son Co.	Concord	Wholesale and Retail Lumber
Boutwell Lumber Co.	Concord	Saw Mill, Retail Lumber
Chadwick & Kidder	Franklin	Mill Work and Retail Lumber
Clark, A. T.	Pittsfield	Saw Mill
Clark, Walter E.	Franklin	Retail Lumber
Collins, Arthur W.	Henniker	Wood Handles
Concord Lumber Co.	Concord	Doors, Sash and Retail Lumber
Crown Woodworking Co.	Contoocook	Boxes and Handles
Danbury Novelty Company, The	Danbury	Wood Novelties
Davis & Rogers	Suncook	Wholesale and Retail Lumber
Dow, Barton & Pettingill	Suncook	Wholesale and Retail Lumber
Dow, Harold W.	Warner	Saw Mill and Retail Lumber
Eastman, H. A.	New London	Saw Mill and Retail Lumber
Ela Box Co.	Warner	Boxes
Emerson Toy & Chair Co.	Hooksett	Furniture and Toys
Emery, M. W.	New London	Saw Mill

MERRIMACK COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Graves & Son	Concord	Chairs
Heath, C. E. & Co.	Penacook	Wholesale and Retail Lumber
Henniker Handle Co.	Henniker	Handles and Novelties
Hill Toy Co.	Hill	Toys
Hill Lumber Co.	Hill	Saw Mill and Retail
Holmes & Choate	Henniker	Wholesale and Retail Lumber
Holt Bros.	Concord	Wheels and Truck Bodies
Hutchinson Bldg. Co.	Concord	General Mill Work and Retail Lumber
International Paper Co.	Franklin	Paper and Pulp
K. & C. Mfg. Co.	Henniker	Bicycle Rims
Ladd, J. P. Co.	Hill	Crutches
Loveren, Frank O.	Loudon	Saw Mill
Martin & Sawyer	Warner	Wholesale and Retail Lumber
Moody, A. L.	E. Andover	Box Shooks
N. E. Box Company	Concord	Boxes
N. E. Novelty Works	Hill	Wood Novelties
Rolfe, C. M. & A. W.	Penacook	Saw Mill, Doors, Sash and Blinds and House Finish
Russell & Foster	Franklin	Retail Lumber
Sanborn, C. G.	Concord	Wholesale and Retail Lumber
Schoonmaker Chair Co.	Concord	Chairs
Stevens, C. P.	Franklin	Clothes Reels
Stevens Bros.	Bradford	Saw Mill
Stoddard, A. B.	Sutton	Saw Mill
U. S. Hame Co.	Andover	Hames
Woodward, O. H.	So. Sutton	Saw Mill

ROCKINGHAM COUNTY

NAME	ADDRESS	MANUFACTURED
Barton Wood Heel Co.	Plaistow	Wood Heels
Bartlett, W. S.	Kingston	Saw Mill and White Pine
Batchelder & Janvrin	Hampton Falls	Wholesale and Retail Lumber
Belanger Bros.	Salem	Mill Work, Door, Sash and Blind
Benson, G. W. & Co.	Derry	Retail Lumber

ROCKINGHAM COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Bodwell Heel Co.	Salem	Wood Heels, Finish
Borchers, C. H.	Salem	Doors, Sash and General Wood Work
Belanger Bros.	Londonderry	Door, Sash and Blinds
Carpenter, J. N.	Newmarket	Saw Mill, Lumber and Finish
Chase, Benjamin Co.	Derry	Wood Specialties
Cheney, R. W.	Kingston	Saw Mill and White Pine Finish
Colard, S. J.	Exeter	Saw Mill
Cole, William M.	Salem	Wholesale and Retail Lumber
Critchet, Arthur	Candia	Saw Mill
Davis, Bert	Derry	Retail Lumber
Dow, Albert N.	Exeter	Wholesale and Retail Lumber
Edwards, C. H.	Chester	Saw Mill
Ellis, J. H.	Fremont	Saw Mill
Exeter Lumber Co.	Exeter	Retail Lumber
Emery, C. M.	Auburn	Wholesale and Retail Lumber
Fashion Wood Heel Co.	Plaistow	Wood Heels
Fellows, G. F.	Kingston and Brentwood	Boxes, Lumber and Wood Heels
Fessenden Company, Inc.	Londonderry	Saw Mill and Retail Lumber
Folsom, E. S.	West Epping	Saw Mill
Folsom, Frank	Raymond	Wholesale and Retail Lumber
Griffin, W. H.	Auburn	Saw Mill
Goldsmith, N. H.	Chester	Saw Mill
Hall, C. M.	Atkinson	Saw Mill
Harvey, J. P. & Son	Lee	Saw Mill
Hunt, L. H. & Sons	Canobie Lake	Wood Heels
Janvrin, B. T.	Hampton Falls	Retail Lumber
Janvrin, John A.	Hampton Falls	Retail Lumber
Ladd, L. P.	Epping	Wholesale and Retail Lumber
Lincoln Wood Heel Co.	Salem	Wood Heels
Littlefield Lumber Co.	Portsmouth	Wood Turning and Retail Lumber
Lord-Champlin Co.	Epping	Box Shooks
Lord & Carlisle	Hampton Falls	Saw Mill
Martin, O. A. & Co.	Exeter	Wood Heel Finishing
Mears, Fred W. Co. Inc.	Salem	Wood Heels
Merrimack Wood Heel Co.	Salem	Wood Heels
Morgan, William Company	Salem	Wood and Window Frames
Newton Box Company, Inc.	Newton	Boxes
Nye, E. W.	Sandown	Staves and Lumber

ROCKINGHAM COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Odell, M. E.	Derry	Mill Work and Retail Lumber
Pingree, A. W.	Auburn	Saw Mill and Retail Lumber
Peaslee Lumber Company	Plaistow	Saw Mill and Retail Lumber
Priest, Clifford F.	Plaistow	Heel Finishing
Rand, G. W.	Chester	Saw Mill and Novelties
Randall, Isaac	Hampstead	Wholesale and Retail Lumber
Rockingham Wood Heel Co.	Derry	Wood Heels
Seavey, George S. Estate	Windham	Saw Mill and Retail Lumber
Spaulding & Frost Co.	Fremont	Saw Mill, Cooperage and Retail Lumber
Standard Wood Heel Co.	Seabrook	Wood Heels
Towle, H. M.	Kensington	Saw Mill
Varney, George	East Derry	Saw Mill
Varrill & Hoyt	Exeter	Wood Heels
Wadleigh, E. L. & Son	Exeter	Boxes and Lumber
Webster Wood Heel Co.	Exeter	Wood Heels

STRAFFORD COUNTY

NAME	ADDRESS	MANUFACTURED
Allen Manufacturing Co.	New Durham	Wood Turners and Enameling
Berry, F. J.	R. F. D., Rochester	Wholesale and Retail Lumber
Brock. Martin S.	Rochester	Wholesale and Retail Lumber
Champlin, W. H.	Rochester	Box Shooks and Lumber
Chartland, C. S.	Dover	Wholesale and Retail Lumber
Chase Handle Co.	New Durham	Handles
D'Arcy Company	Dover	Window Sash
Diamond Match Co.	Rochester	Lumber
Felker Bros.	Rochester	Wholesale and Retail Lumber
Foss, D. & Son	Dover	Saw Mill, Boxes, Doors, Sash and Blinds
Foss and Hersey	Somersworth	Wholesale and Retail Lumber
Giles & Langley	Farmington	Boxes, Shooks and Lumber
Halliday, Penfield Lumber Co.	Rochester	Retail Lumber

STRAFFORD COUNTY—*Continued*.

NAME	ADDRESS	MANUFACTURED
Lapham, Albert H.	Alton	Toys and Novelties
Mooney, G. F. & Son	Farmington	Wood Turners and Retail Lumber
Proctor Bros. Co.	Rochester	Stave Stock and Lumber
Richards, A. W. & Co.	East Rochester	Woodenware
Rochester Lumber Co.	Rochester	Retail Lumber
Shaw & Royal	New Durham	Wood Turning
Spaulding Fiber Co.	Rochester	Boxes
Studley Box & Lumber Co.	Rochester	Saw Mill, Boxes and Lumber
United Box & Lumber Co.	Rochester	Box Shooks
Varney, Harry	East Rochester	Wholesale and Retail Lumber
York, E. J.	Dover	Retail Lumber

SULLIVAN COUNTY

NAME	ADDRESS	MANUFACTURED
Alexander, G. E. & Sons	Sunapee	Wood Novelties
Boardway & Cowles	Claremont	Retail Lumber
Bowen, G. G.	Charlestown	General Mill Work and Retail Lumber
Buss, G. W.	East Acworth	Saw Mill
Chatfield, H. H.	Newport	General Wood Working
Claremont Ice & Lumber Co.	Claremont	Saw Mill and Retail
Claremont Paper Co.	Claremont	Paper
Cook, Bert E.	Cornish Flat	Saw Mill
Cutts, Herbert	Newport	Saw Mill and Retail Lumber
Kendall Grain Store	Charlestown	Retail Lumber
Nelson & Warner	Charlestown	Retail Lumber
Osgood, Edwin B.	Claremont	Retail Lumber
Putney, C. E.	Claremont	Mill Work and Finish
Reed, F. W.	Acworth	Saw Mill
Robinson, E. S.	Goshen (P. O. Mill Village)	Saw Mill

SULLIVAN COUNTY—*Continued*

NAME	ADDRESS	MANUFACTURED
Rowell, Frank P.	Sunapee	Saw Mill
Rowell, J. W.	Newport	Retail Lumber
Sargent, John G.	Newport	Wholesale and Retail Lumber
Trow & Sons	Sunapee	Saw Mill, Lumber and Finish
Walker Bros.	Unity	Saw Mill

TREES AND SHRUBS
OF
NEW HAMPSHIRE

By JOHN H. FOSTER, *State Forester*

State of New Hampshire
Forestry Commission
1931

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INTRODUCTION

The report of the first Forestry Commission to the Legislature of 1885 contained a chapter on "Trees and Shrubs Comprising the New Hampshire Forests" by William F. Flint, a member of the Commission, and author of "Distribution of Plants in New Hampshire," printed in Hitchcock's "Geology of New Hampshire," in 1874.

It is hoped that the present brief and simple description of our New Hampshire trees and shrubs, prepared chiefly for the older boys and girls, may further contribute to the knowledge and enjoyment of outdoor life and help to bring about a better understanding and appreciation of the importance of trees and forests to the welfare of our State. Protecting our trees from destructive insects and diseases and safeguarding our forests from fire are of fundamental importance and need our constant effort and hearty co-operation.

Shrubs differ from trees only in their smaller or clustered stems. Some trees may become of great size and the oldest of living things. Both are woody plants living and adding on new growth year after year. Brambles (*Rubus*) are shrubs with stems that die after the second season of growth. Herbacious plants on the other hand either die altogether or else down to the roots each year when their fruits have matured or winter approaches. Shrubs are included because they constantly mingle with trees, are intensely interesting and adorn the landscape winter and summer for our pleasure, and because they supply certain

wants of mankind, if not in wood and timber. Also who shall say when a woody plant is really a tree or only a shrub? Generally speaking, botanists call them trees if they produce single stems taller than 8 or maybe 15 feet.

Botanically, all plants are placed in families, each family being further divided into genera and species, according to common characteristics. A variety (hybrid) is the result of crossing two species. With ornamental plants and in fruit culture plant varieties become of great importance and many people devote their lives, as Luther Burbank has done, to their study. In addition to the many common English names which most species bear, botanists have given them scientific names in Latin which ought to be definite and unchanging for each species but which unfortunately is not the case. The Latin name of a species has two parts; the first that of the genus to which it belongs, while the second is its distinguishing or specific name. A variety will have still a third part or a name consisting of three parts.

In attempting to identify unknown trees and shrubs, the beginner should follow some simple plan based on general and botanical information. Keys to the families, genera and species and definitions of terms used are frequently prepared to aid in identification. They are omitted here for the sake of brevity and to avoid further detail. The reader should note that the sign (′) is used to denote feet and the sign (″) to denote inches. The following may be important also to keep in mind:

Trees and shrubs are called evergreen if their leaves remain green over winter and deciduous if the leaves fall or die at the end of the season. Cone bearing (coniferous) trees in general are called evergreens or softwoods as distinguished from deciduous trees which are called broadleaf or hardwood trees. These terms are loosely and often incorrectly applied. The leaves of conifers are usually called needles. Leaves grow from the stem in three ways; alternate along the stem, in opposite pairs, or in whorls of

three or more. Alternate leaves are far the commonest. Leaves are usually simple, consisting of a single leaf but some are compound when there are several leaflets on one main leaf stalk. In our descriptions it is understood that a tree or shrub has deciduous, simple and alternate leaves unless otherwise stated. The form of leaf, character of its margin, veins, leaf stalk and surface, as well as the appearance of old leaf scars on twigs, are important to study and understand. A pocket magnifying glass reveals many things not seen by the naked eye.

In cold climates like ours the buds of leaves and flowers of the following year are usually developed by midsummer and from fall to spring aid greatly in identifying leafless specimens. Buds may be leaf buds, flower buds or produce both leaves and flowers. They may be of different shape, size, color and arrangement. Buds are commonly covered with overlapping scales; sometimes two scales meeting (valvate). Others have a single covering or cap. The base of the leaf stalk sometimes entirely covers the bud. Just as with the leaves, buds may be alternate, opposite or in whorls. The terminal is usually larger and more conspicuous than the lateral or side buds.

Twigs, together with the buds, are particularly important as a means of identification in winter. Their size, shape, color, taste and odor and the appearance of old leaf scars, should be noted. The pith at the center is sometimes large or of peculiar shape or color and may be solid or chambered. A woodsman knows trees by the bark. It is difficult to describe varying types of bark but often important to know them.

All trees and shrubs belong to the flowering plants, having stamens and pistils and developing seeds, as distinguished from the lower forms of plants without true flowers and producing spores (simple cells) in place of seeds, such as ferns, mosses, sea weeds and fungi. Staminate or male flowers bear the pollen and pistillate or female flowers produce the seeds. A perfect flower is one having both

stamens and pistils together. More often trees and shrubs have the two kinds of flowers borne on different parts of the same plant or else on different plants. Since flowers last but a short time, are not easy to examine on tall trees and because many are insignificant or lack entirely the showy petals (corolla) which give color and character to our beautiful flowering plants, we cannot depend on them for the identification of most trees and shrubs. The same is true to a much less extent of the fruits which often persist late into the winter. A knowledge of the various forms of fruit is helpful in distinguishing different genera and species. Fruit is of course absent from plants having only staminate or male flowers.

Trees and shrubs in our part of the country increase the diameter of their stems by annual layers of wood formed next to the bark (cambium layer). We can therefore tell the age of a stem by the number of such layers (rings) between the central pith and the bark. The outside rings of sapwood next the growing layer of cambium often differ in color and hardness from the heart wood next to the pith. Medullary rays or lines crossing the annual rings at right angles and seen in cross section, are of particular interest. Much may be learned about the character, color, hardness, durability and uses of wood by study which cannot be described here.

Any reader interested in knowing and understanding trees and shrubs should also study their forms and the surrounding conditions under which they live naturally. Each species grows best under certain conditions of light, moisture, soil and temperature. Association of species together brings about root competition and a struggle for moisture and light which some cannot survive and which at least influences their form and vigor. A world of interest awaits those who seek to learn these secrets of plant association and distribution.

Many of the less well known species and varieties of shrubs are not very clearly defined by botanists, either as

to name or distribution. For this reason it has been difficult to determine what material to use and what to omit, in an effort to be reasonably complete and at the same time accurate. Many errors and omissions may have been made. There is opportunity for much original botanical work to be done in our state. Those who become especially interested are referred to standard books on botany and dendrology or the more complete and fully illustrated popular books on trees and shrubs. A visit to the Arnold Arboretum of Harvard University at Jamaica Plain, Massachusetts, is both stimulating and instructive.

ACKNOWLEDGMENTS

The arrangement and names of families, genera and species of the trees conform in general to the "Checklist of Forest Trees of the United States" by George B. Subworth, published as "Miscellaneous Circular 92" by the U. S. Department of Agriculture.

"Gray's Manual of Botany, 7th Edition" and Britton's "Manual of the Flora of the Northern States and Canada" have been chiefly consulted in preparing the text. The writer wishes to pay tribute to Mr. F. Schuyler Mathews, artist and botanist, whose familiarity with New Hampshire flora has been gained through many years of summer residence in our state.

For special permission to photograph and reproduce the line cuts used, grateful acknowledgment is hereby given to the following:

The U. S. Forest Service and Mrs. A. E. Hoyle whose original drawings of trees have appeared in many publications both of the Forest Service and various state forestry departments.

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Director J. L. Hills of the Vermont Experiment Station for cuts showing the needles of four native pines and the cones of three native spruces, originally illustrating "The Trees of Vermont."

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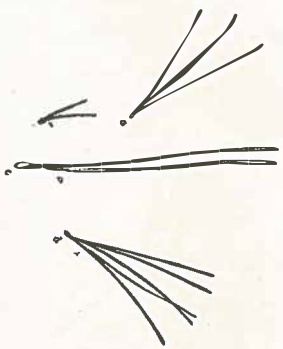
CONIFEROUS FAMILY (*Pinaceae*)

Eight genera or groups of the Coniferous Family (cone bearing) are native in our State: Pine, Tamarack, Spruce, Fir, Hemlock, Arbor Vitae, Coast Cedar and Juniper. Douglas Fir, of another genus from western United States, (*Pseudotsuga*) is sometimes planted. All are evergreen except Tamarack. The leaves of all are needle-like, either in clusters or singly, except Arbor Vitae, Coast Cedar and Juniper which have flat, overlapping scales appressed to the stem. Juniper also has needles which are sharp-pointed or awl-shaped. Flowers are inconspicuous, scaly clusters, both kinds (male and female) usually borne on same tree. The fruits of all are cones, with overlapping scales and two winged seeds under each scale, except Juniper which is berry-like.

PINES (*Pinus*)

The largest group of trees in the Coniferous Family, comprising about 75 known species, of which 34 are found in North America. Four are native to New Hampshire, but others are planted for reforestation and ornamental purposes. Until the recent exploitation of Douglas fir in the Northwest, more pine lumber was manufactured in the United States than all other kinds of lumber combined. Pines are adapted to a wide variation in soil and climatic conditions, in our State below an elevation of about 2500 feet. On better soils they are generally crowded out by more shade enduring trees. They are divided commercially into two classes,



NEEDLE CLUSTERS OF NATIVE PINES.
Lower — White; Center — Red; Upper left—Jack; Upper right—Pitch.

Soft and Hard Pines. Our White Pine is the only eastern representative of the Soft Pines.

Leaves or needles of our pines are much longer than of other conifers and occur in clusters of 2, 3 or 5, depending on the species. Hard Pines have a persistent sheath wrapped about the base of each cluster of needles. Needles are triangular or semicircular in cross section and remain on the tree two years or longer. Buds are borne in clusters consisting of one terminal bud and several lateral buds in a whorl or circle. From each terminal bud the stem is continued and from the whorls of lateral buds new side branches develop. The number of whorls of branches on the main trunk indicates in general the age in years of the tree. Flowers appear about May, naked, scale-like, both kinds on the same tree; male in clusters at the base of the season's growth, often producing quantities of yellow pollen; female near the ends of branches, solitary or in clusters. Cones mature at the end of the second or sometimes the third season.

WHITE PINE (*Pinus strobus*)

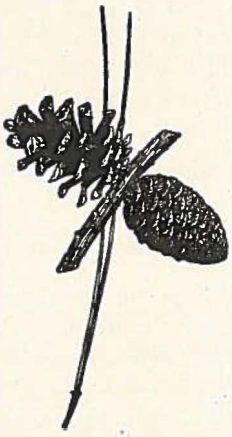
One of our most common and valuable forest trees. Soft pine with 5 needles in a cluster, 3″ to 5″ long, slender, falling at the end of the second season, triangular in cross section. Cones 4″ to 6″ long, with thin scales, requiring two years to mature, seeds ripening in September and soon falling from the cones. Bark on young trees smooth, greenish; on older trees dark and rough. Wood soft, light in color and weight. Used for interior woodwork, doors, window-sashes, blinds, for pattern making, kegs and barrels (cooperage) packing boxes and for many other purposes. Has played an im-

WHITE PINE.

portant part in the development of New Hampshire, building our colonial homes, furnishing masts for ships, creating industries and wealth. In the primeval forest of colonial days this splendid tree grew to a diameter of 5′ or even 6′ and height of over 150′. A few old trees are still to be found in the Primeval Pines Reservation in Sutton, in the State University Forest at Durham and elsewhere. Now seldom found much larger than 2′ in diameter. Favorite species for reforesting light, sandy loam soils. Subject to weevil injury on terminal shoots. Only species in our State attacked by the Blister Rust disease.

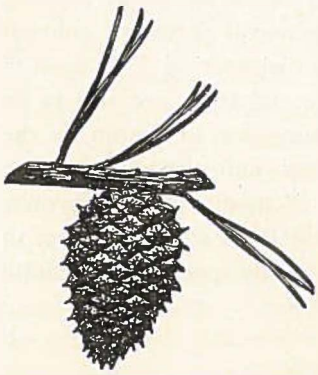
RED OR NORWAY PINE (*Pinus resinosa*)

Tall, valuable timber tree, frequent but scattered, growing singly or in groves, more abundant northward on gravelly soils. Needles 2 in a cluster, long, persistent sheath at the base, 4″ to 6″ long, flexible, sharp pointed, flat on one side, remaining on the tree 3 to 5 years; forming dense plumes at the ends of branches. Buds reddish-brown. Twigs stout, roughened, yellowish or reddish-brown. Bark reddish-brown, thick, divided by shallow furrows into broad flat ridges. Cones 2″ to 3″ long, egg-shaped, scales smooth, thickened at the end, maturing the second year and holding the seed fairly well. Wood reddish, heavier than White Pine. Useful for timbers of buildings, general construction, piling, boxes, etc. Planted for reforestation purposes nearly as much as White Pine. Relatively free from insects and diseases.



RED OR NORWAY PINE.

PITCH PINE (*Pinus rigida*)



PITCH PINE.

Rather scrubby, quick tapering tree, common south of the White Mountains, often growing in pure stands on sandy plains soils. Has little commercial value but lives in unfavorable situations which most other trees cannot endure. Only one of our conifers to develop sprouts following fire or other injury. Needles 3 in a cluster, sheathed at base, mostly 2″ to 4″ long, stiff, yellowish green. Cones 1″ to 3″ long, abundant, stalkless, often in clusters, mature the second year and remain on tree for years; scales thick with sharp prickles. Bark thick and rough, even on quite young trees, deeply furrowed with flat ridges between, dark reddish-brown. Wood brittle, resinous, coarse-grained, reddish-brown.

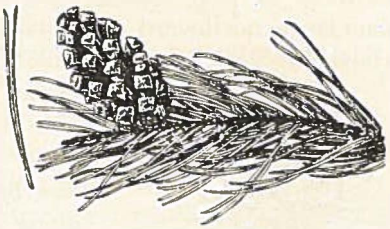
JACK PINE (*Pinus divaricata or Banksiana*)

A scrub pine of the North, reaching its southern limit in New Hampshire where it is found only in a few places. On Welch Mountain, Waterville, there are low clumps of it near the summit. Needles 2 in a cluster, ¾″ to 1½″ long, stout, curved, divergent, covered with grayish bloom. Sheaths at base short, loose, silvery. Bark dark, reddish-brown, with shallow, rounded ridges. Cones about 1½″ to 2″ long, curved, persistent for many years; scales rather thin, with small prickles.

SCOTCH PINE (*Pinus sylvestris*)

A more or less scrubby, fast growing pine introduced from northern Europe where it is an important timber tree.

In our State found in numerous forest plantations, mostly from stock furnished from the State Nursery during the last 20 years. Much variation in character of growth. While generally producing crooked trunks, some trees are remarkably straight. Efforts are made to secure seed from the Riga district. Most valuable feature of Scotch Pine is its ability to form a quick cover on all kinds of soil, even sterile sand and gravel. Needles 2 in a cluster, 2″ to 3″ long, stiff, twisted, semi-circular in cross section, bluish-green, with short, persistent sheaths. Cones about 1½″ to 2½″ long, short stalked, tapering to a dull point, with thickened, angular scales, tipped with curved prickles. Bark thick, rough, with long, shallow grooves, grayish-brown; upper trunk smooth and reddish. Wood light, soft, coarse-grained, similar to White Pine; suitable for cooperage and box boards.



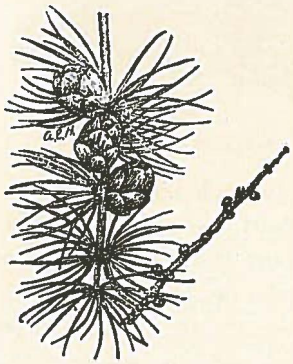
SCOTCH PINE.

AUSTRIAN PINE (*Pinus nigra austriaca*)

Native of eastern Europe and sometimes planted for ornamental purposes. Tall, thick foliaged tree, somewhat closely resembling our Red Pine. Needles 2 in a cluster, 3″ to 5″ long, stiff, sharp-pointed, flat on one side, with short, persistent sheaths, very dark green. Buds tan color. Cones 2″ to 3″ long, with thickened scales and no prickles; empty cones quite persistent. Bark rather smooth, grayish-brown, becoming dark and rough with age. Wood light, soft, durable; used in Europe for lumber and turpentine.

TAMARACK. AMERICAN LARCH. HACKMATACK. (*Larix laricina*)

The only native species of a small group of slender, spire-like trees with horizontal or drooping branches. Found scattered in peat swamps and low places, increasing in abundance northward to Canada. It is our only conifer whose needles are deciduous, falling each autumn and giving trees the winter appearance of being dead. Needles in dense clusters on short, spur-like branches, sometimes singly along terminal shoots, ¾″ to 1″ long, soft, triangular in cross section, light green, turning yellow before falling in autumn. Buds small, round, smooth, dark red. Flowers April or May, both kinds on the same tree; male yellowish, rounded, borne on one or two year old branches; female reddish, on lateral branches of previous year. Cones not over ¾″ long, with about 20 thin, roundish, light brown scales; mature in one year and remain on trees over winter. Bark smooth, separating into thin, reddish-brown scales. Wood close-grained, heavy, strong, durable. Used for fence posts, poles, railroad ties, ship knees; could have many uses. The larch saw-fly has been very destructive in years past.



TAMARACK OR LARCH.

EUROPEAN LARCH (*Larix decidua*)

Important timber tree of the Alps and northern Europe. Frequently planted in parks and lawns and for reforestation purposes. Adapted to drier soils and grows more rapidly than American Larch. Distinguished by longer needles, more erect and longer cones, more drooping branches, and stouter and yellowish twigs. An excellent plantation over

15 years old may be seen at the State Nursery in Boscawen. There are many fine, old trees in the Dartmouth College Park in Hanover.

SPRUCES (*Picea*)

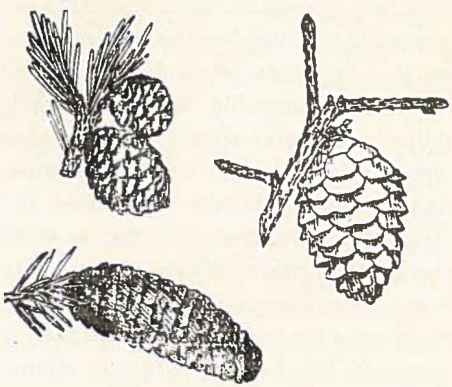
A group of conifers of highest value for pulp and paper making; important also for lumber and other wood products, Christmas trees and for ornamental purposes. White Pine was the principal wood used in the earlier days and the splendid spruce forests of our higher slopes and the northern part of New Hampshire remained uncut for the most part until within the last 75 years. Now there is very little primeval spruce remaining in the Northeastern States, the largest single area in our State being in the White Mountain National Forest in Waterville. The demands for paper and pulp products alone give spruce wood so high a value that lumber uses are mostly out of the question. Airplane stock and piano sounding boards have been extensively made from clear spruce lumber. Christmas trees are largely cut from mountain pastures where land has grazing value and farmers are consequently less anxious to preserve them. Spruce is most important to encourage on northern cutover and pasture lands for our future economic needs.

Needles are about ½" to ¾" long, stiff, 4-sided, not clustered but grow singly from separate, minute, woody bases which give a roughened appearance to twigs without needles; often persisting for many years. Flowers, both kinds on the same branch or tree, pale red to yellowish-green, April or May. Cones ripen in one season and usually fall early, drooping, with thin scales without prickles. Bark thin, scaly, reddish-brown, resinous, exuding gum from wounds and cracks, well known and liked for chewing. Wood is light, soft, elastic, smooth-grained, very strong for its weight. There are three native species and others have been introduced.

BLACK SPRUCE (*Picea mariana*)

Small tree usually found along borders of swamps and cold slopes from the Coast northward throughout the State, at low and high altitudes. Associates with Tamarack to the northern limit of tree growth. Needles are dark bluish-green, rather short, straight, sharp-pointed. Twigs rough, stout, yellowish-brown, hairy. Cones ½" to 1½" long, nearly round when open, short stalked, remain on tree several years; scales stiff, with uneven edges.

RED SPRUCE (*Picea rubra*)



NATIVE SPRUCES.
Upper left—Black; Upper right—Red; Bottom—White.

Valuable timber tree which has produced most of the lumber and paper products of the White Mountains and northward. Grows in pure and in mixed stands up to about 4000′ in elevation, extending south on the higher slopes between the Merrimack and Connecticut watersheds nearly to Massachusetts. It is slow growing, shade enduring, usually in mixture with northern hardwoods, beech, birch and maple, and tends to be replaced by these hardwoods unless they are also cut in the process of lumbering. Needles are short, curved, abruptly sharp-pointed, yellow-green, crowded. Twigs rough, slender, covered with rusty brown hairs when young. Cones 1" to 2" long, short-stalked, with stiff, rounded scales; usually fall the first autumn or winter.

WHITE SPRUCE (*Picea glanca or canadensis*)

Slender, spire-like, most beautiful of our native spruces, usually overtopping all other trees in the forest, scattered, not common, except in extreme northern part of State. Seedlings supplied for reforestation purposes from the State Nursery. Needles somewhat longer, ½" to 1", slender, more or less curved, sharp-pointed, bluish with a slight bloom; peculiar and unpleasant odor when crushed. Twigs light yellow, smooth. Bark smoother, grayish brown. Cones slender, 2" to 3" long, greenish, with thin, soft scales, margins rounded, falling early.

NORWAY SPRUCE (*Picea excelsa or abies*)

Native of northern Europe and extensively planted for ornamental and reforestation purposes. Trees of large size planted 50 to 75 or more years ago often seen in parks, old cemeteries, and private estates. One of the best conifers for wind-breaks and for hedges. Reforestation stock furnished from the State Nursery. Faster growing tree than our native species, except possibly white spruce. Easily recognized by the long, drooping branches and large, light brown cones, 4" to 7" long.

COLORADO BLUE SPRUCE (*Picea pungens*)

Is a Rocky Mountain species often planted as a lawn tree on account of its sturdiness, broad, symmetrical form and the variable, bluish-green to silvery color of the foliage. Needles are rigid, incurved, sharp-pointed, ¾" to 1" long. Cones are light brown, glossy, 2½" to 4" long, scales narrowed with irregular margins. Young branches smooth, bright, yellowish-brown. By means of careful selection and by grafting, nurserymen are able to develop dwarf as well as tall varieties of extreme

NORWAY SPRUCE.

and uniform color, the bright silvery being popular. The so-called *Koster Spruce* is a well known, grafted variety. White Spruce is often used as the rooted stock on which to graft the finer varieties.

HEMLOCK (*Tsuga canadensis*)

One of our largest and most shade enduring conifers, found scattered or in groups on rocky ridges, cool northern slopes and ravines throughout the state, mostly below elevations of 2000′. Only one species is native. Needles are short, ½″ or less, flat, borne singly, each with a tiny, thread-like stem and rounded or notched at the end, arranged in two rows so that the twig appears flat, shiny, yellowish green above, with two silvery stripes beneath, remaining on tree about three years. Flowers both kinds on the same branch or tree. Cones are ½″ to ¾″ long with thin, soft scales, suspended singly on short, slender stalks, maturing in one season and falling during the winter or spring. Bark thick, reddish, with deep, coarse ridges in old trees; formerly and to a less extent now used in tanning leather. Wood coarse, brittle, splintery, difficult to work, quite durable. Used for heavy timbers, rafters, bridge planks, also with White Pine for box making, but not for finished lumber. In early days large numbers of trees were cut for their bark and otherwise wasted. A graceful, ornamental tree, not difficult to transplant and desirable for hedges and wind breaks on good soil. In the natural forest hemlock often suffers from exposure and drying out of the soil following thinning or removal of surrounding trees.

HEMLOCK.

CAROLINA HEMLOCK (*Tsuga caroliniana*) of the southern mountains, with darker, longer needles, larger cones and more drooping foliage, is sold by nurseries for ornamental planting.

DOUGLAS FIR (*Pseudotsuga taxifolia*)

Not native in New Hampshire but the most important timber tree of western United States whose lumber is now marketed throughout the Northeast. Leads all woods in lumber production. Occasionally planted for ornamental purposes. A forest plantation near Squam Lake looks healthy but grows more slowly than pine or spruce in our State. Douglas Fir is neither a fir nor a spruce but has characteristics of both. Needles are slender, ¾″ to 1″ long, flattened, blunt, grayish or bluish green, growing singly and straight out from the twig, giving it a singularly round appearance, persistent for many years. Terminal buds often ¼″ long, acute, not resinous. Cones 2″ to 4½″ long with thin, rounded scales and green, arrow-shaped bracts extending from between the scales, maturing in one season. Bark smooth and thin on young trees. Wood rather hard, coarse-grained, reddish.

FIR BALSAM (*Abies balsamea*)

This is the true Christmas tree, although spruces are used fully as much. Only one native species, growing with spruce throughout the north country and found only at higher elevations or in swamps farther south. It becomes a stunted shrub at the upper limits of tree growth in the White Mountains. Growth of younger trees is produced by regular whorls of branches surrounding the upright leader or terminal, (as in the pines) making a symmetrical tree with broad base and narrow top. Older trees have slim, spire-like tops but are less symmetrical. It is relatively short lived in the forest, and gives way to more enduring spruce and hardwoods when a foot or more in diameter.

FIR BALSAM.

Needles ¾″ to 1″ long, flat, often strongly curved, growing singly without stem or woody base, leaving twig smooth

after falling, tips blunt or notched, dark green, shiny and grooved above, pale with two silvery lines below, fragrant when crushed, remaining on tree for many years. Twigs with needles have a generally flattened appearance. Flowers both kinds usually on same branch. Cones 2″ to 4″ long, purplish, standing erect on branches, (unlike all other conifers) with soft, resinous scales soon falling apart after cone ripens; maturing in one season. Bark smooth, thin, grayish, even on old trees, distinguished by soft blisters containing a clear, colorless resin. Wood soft, light in color and weight, weak and decays rapidly. Not of great value but used to a limited degree with spruce in paper making, for butter tubs, pails, etc.

The White Fir of the West (*Abies concolor*) is probably the best of the firs for ornamental planting. It is hardy, graceful, symmetrical and deserves to be as widely planted as Colorado Blue Spruce. Needles are soft, silvery, very long, often over 2″, and the upright, purplish or greenish cones are 3″ to 5″ long. Specimens planted in our State and now upwards of 30′ high appear not to have lost their symmetry or beauty.

Arbor Vitae. Northern White Cedar (*Thuja occidentalis*)

ARBOR VITAE.

A small conical tree found in our northern swamps, nowhere abundant, mostly north of the White Mountains and in the upper Connecticut watershed. The only native species of this genus. Planted for hedges and shelter breaks. The trunk is often swollen or buttressed at the base. Branches are short, the lower ones horizontal, the upper closely crowded into a narrow, pointed top. Needles flat, scale-like, 1/8″ to ¼″ long, closely

overlapping one another, arranged in pairs, yellow green, fragrant, aromatic, generally dying during the second year but not falling. Small branches form coarse, flat, horizontal, fan-like sprays. Flowers both kinds on the same branch or tree. Cones ½″ to ¾″ long, oblong, with 6 to 8 loose, thin, rounded scales, ripening the first season and falling after winter. Bark reddish brown, usually furrowed on older trees and peeling off in shred-like strips. Wood pale reddish-brown, brittle, very durable, fragrant. Valuable for fence posts, railroad ties and small poles. Not abundant enough to be widely used.

COAST WHITE CEDAR.

Many varieties of Arbor Vitae, as well as introduced species, are sold by nurserymen. Some are tall and pyramidal in form, others dwarf and globe-like. There is a wide variety also in the character and color of the sprays. Oriental Arbor Vitae is distinguished by having flat, vertical sprays instead of horizontal, as in our native species.

Coast or Southern White Cedar (*Chamaecyparis thyoides*)

Small, slender, straight conifer found only in swamps near the Coast; not abundant; somewhat resembles Red Cedar and Arbor Vitae. Larger and more abundant south of Cape Cod.

Needles small, 1/16″ to ⅛″ long, scale-like, overlapping, arranged in pairs, entirely covering the slender twigs which do not form flattened sprays, and which are finer and more delicate than Arbor Vitae; olive or blue-green, fragrant. Needles remain on twigs for many years. Cones ¼″ in diameter, nearly round, woody, with thick shield shaped scales, each with a raised knob, ripening in one season and

falling after first winter. Bark gray brown, thin, fibrous, peeling off in spirally twisted shreds. Wood light, soft, brownish, sapwood pale, slightly fragrant, close grained, durable. Not abundant or large enough in our State to be of commercial importance except for small posts. Used farther south in boat building, for posts, poles, stakes, rustic furniture, etc.

JUNIPERS (*Juniperus*)

The only group of the Coniferous Family with fruit berry-like instead of a cone. Botanically the blue berry is a cone transformed by the thickening and growing together of the scales. Sprays not flat or fan-shaped as in Arbor Vitae. Foliage has a reddish hue in winter. Flowers two kinds mostly on different trees. Two species are widely distributed over southern New Hampshire, particularly Rockingham County; growing on poor, dry soils in the open, such as waste areas and abandoned pastures. Birds aid in the distribution. Junipers cannot stand shading and are rapidly killed out by the cover of other trees. Said to be the most widely distributed genus in North America.

DWARF JUNIPER. GROUND HEMLOCK (*Juniperus communis*)

Our common form (*depressa*) is a low, spreading shrub, under 3′ high, branches radiating and curving upwards, often in dense masses covering acres in extent and most difficult to walk through. Renders land unfit for any farm crops and difficult to reforest. Needles of one kind, awl-shaped, 1/3″ to ¾″ long, rigid, growing singly in whorls of three, spreading nearly at right angle from twig, flattened, grooved, with a white band in the groove, rounded below, tapering to a very sharp point, remaining on twig many years. Buds scale-like. Fruit a dark blue berry, requiring 2

DWARF JUNIPER.

or 3 years to mature, containing 3 seeds or sometimes 1 or 2. Many other variations in form occur, the most uncommon being nearly tree-like, with longer needles and smaller berries. The variety *horizontalis* is a creeping shrub with scale-like, nearly opposite needles and berries on backward curving stalks; found on rocky or sandy borders of swamps.

RED CEDAR (*Juniperus virginiana*)

Generally a small, slender, symmetrical tree, especially when young. Most common in the eastern and southern parts of our State but found in the lower Connecticut Valley and elsewhere. Mostly absent from the White Mountains and northward. Although slow growing, it is often planted for decorative purposes and there are many varieties. Needles are of two kinds: (1) scale-like, overlapping, pressed to the twig, 1/16″ long, entire, arranged in opposite pairs, giving twig an angular appearance, persistent for many years; (2) awl-shaped needles, usually on young trees and vigorous shoots, in opposite pairs, sometimes in threes, ½″ to ¾″ long, narrow, spreading, long-pointed, scattered, not scale-like, light yellowish-green. Fruit a dark blue berry, ripening the first or second season, sweet, resinous, freely eaten by birds; seeds 1 or 2, sometimes more. Bark thin, reddish-brown, peeling off in long, narrow strings. Trunk irregular in cross-section. Wood light, soft, fine-grained, heart wood deep red, sapwood white, very durable, fragrant. Used locally for fence-posts but commercially valuable for pencils, moth-proof chests and many other purposes in regions where abundant.

RED CEDAR.

Fungus diseases known as Cedar Apples sometimes form yellowish-brown, jelly-like fruiting bodies on the twigs of Red Cedar and others of this group, having alternating stages on the cultivated apple and species closely related. A disease of Red Cedar also causes the so-called Witches' Broom, a peculiar, broom-like growth of the branches affected.

YEW FAMILY (*Taxaceae*)

American Yew. Ground Hemlock (*Taxus canadensis*)

AMERICAN YEW.

A low, evergreen shrub, rarely over 3′ high, growing in clumps with slender, spreading branches; may be mistaken for young hemlocks. The only native species, local but quite generally distributed up to 2000′ elevation in the White Mountains and elsewhere in the State. Grows in shady, rocky woodlands, especially under other evergreens. Leaves are linear, needle-like, flat, abruptly and sharply pointed, very dark green above, yellowish green below, larger than Hemlock. Flowers insignificant. Fruit a red, waxy, cup-shaped berry, not entirely enclosing a single, dark, bony seed; ripens in August or September.

WALNUT FAMILY (*Juglandaceae*)

This family contains two groups of well known nut trees: Walnut and Hickory. Medium or large trees with coarse, wide spreading branches, conspicuous winter buds and large leaf scars, alternate compound leaves (five or more leaflets) and fruit a single, hard, edible nut, maturing in one season. Flowers both kinds usually on the same branch, opening after the leaves unfold; male in long, drooping catkins; female in small, terminal clusters.

BUTTERNUT. WHITE WALNUT. (*Juglans cinerea*)

Medium sized tree scattered along open roadsides and brook borders, pastures and hillsides in moist, rich soils, common in southern and western parts of state. Trunk usually short, with irregular, coarse branches, lower ones horizontal, forming an open crown with thin foliage. More abundant in Vermont where large quantities of nuts are gathered each year.

BUTTERNUT.

Leaves 15″ to 30″ long, with usually 11 to 17 leaflets, which are pointed, unequally rounded at base, finely toothed, yellowish-green, stalkless or nearly so. Twigs and leaf stalks sticky and hairy at first, bitter; pith chambered, dark brown. Terminal buds ½″ to ¾″ long, velvety, angular, flattened, blunt-pointed, not scaly; lateral buds smaller, oval, often one above another. Fruit in clusters of long, oval nuts; husks sticky, non-splitting, green until ripe, afterwards brown, used for making a yellow dye; shells covered with sharp, rough ridges, (sculptured) pointed at one end; kernels sweet, oily, delicious. Bark light gray, smooth when young, later separating into smooth, flat ridges. Wood light brown, soft, weak; not of commercial importance.

BLACK WALNUT (*Juglans nigra*) is not native but sometimes planted for fruit and ornamental purposes. A large, tall tree formerly abundant farther west and of great value for cabinet and furniture making and gun stocks—the wood that Abraham Lincoln split into fence rails in his boyhood days. May be distinguished from our native Butternut by its darker, finer bark, light brown chambered pith, shorter and thicker terminal buds, large, round nuts and chocolate-brown wood.

SHAGBARK HICKORY (*Hicoria ovata*)

SHAGBARK HICKORY.

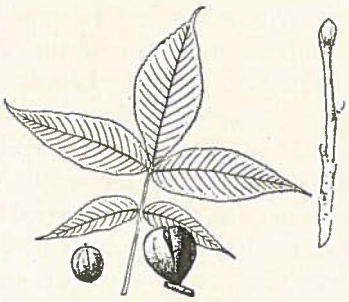
Common and well known but not abundant woodland tree in moist, fertile soils southern part of the State and Connecticut Valley. Leaves are 8″ to 14″ long, with 5, rarely 7, leaflets. Terminal buds ½″ to ¾″ long, overlapping scales, outer ones with long, narrow tips. Piths of all hickories are solid, not chambered. Fruit solitary or in pairs; husks thick, freely splitting to the base; shells rather thin with the kernel large and sweet. Bark of old trees separates into long, loose plates. Wood heavy, hard, very strong. Useful for tool handles, agricultural implements, wheel spokes, etc., where strength rather than flexibility is required. One of the best fuelwoods.

MOCKERNUT (*Hicoria alba*)

Rare in our state but may be found along southern and western borders. Similar to shagbark hickory. May be identified by the 7 to 9 large, fragrant leaflets, very stout, downy twigs, large, hairy terminal buds, whose outer scales fall early and large fruit with thick husks and shells with smaller kernals. Husks do not split quite down to the base. Bark is very thick but does not separate into loose strips like the Shagbark.

MOCKERNUT.

PIGNUT HICKORY (*Hicoria glabra*)



PIGNUT HICKORY.

Scattered woodland tree on upland soils in southern part of state. Similar to Shagbark. Leaflets 5 to 7, rather small and narrow. Buds smaller, rounded, scaly, outer scales falling early. Twigs slender by comparison, smooth. Fruit variable, usually smaller, often pear-shaped, with thin husks, splitting halfway, thick shells with small and often bitter kernel. Bark smooth and usually does not shag off.

BITTERNUT HICKORY (*Hicoria cordiformis*)

BITTERNUT HICKORY.

Widely scattered near swamps and streams; not common except in the Connecticut Valley. Leaflets 7 to 11, narrow. Buds bright yellow, valvate, not scaly, different from all other hickories. Twigs slender. Fruit small with thin husk, splitting halfway, and thin shell; kernel bitter and not edible. Bark thin, tight, with flat, narrow ridges. Wood inferior to other hickories.

BAYBERRY FAMILY (*Myricaceae*)

Aromatic shrubs with rather thick, alternate, fragrant leaves; generally resinous or waxy characteristics. Buds small and scaly. Flowers in short, scaly catkins.

SWEET GALE (*Myrica gale*)

Shrub 3′ to 5′ high, forming low tangled thickets in stream bottoms and swamps overflowed part of the year, found mostly south of the White Mountains, common in Merrimack Valley. Leaves 1½″ to 2½″ long, simple, blunt, wedge-shaped at base, entire with a few coarse teeth toward the end, yellow resinous dots on both sides. Twigs rusty, purplish or brownish. Leaf buds minute; flower buds in axils of upper leaves, both kinds mostly on different plants. Fruit in clusters of 2 to 6 small, waxy, nutlets on short twigs, each with two scales attached at the base.

BAYBERRY. WAX MYRTLE (*Myrica carolinensis*)

Shrub 3′ to 8′ high found near the Coast and lower valleys, in dry sandy or rocky soil. Similar to Sweet Gale. Twigs grayish-brown, leaves somewhat larger. Fruit in crowded clusters of dry berries, almost white, consisting of hard stones coated with wax. Wax from the fruit was used by early settlers to make candles, obtained by boiling the berries in water.

SWEET FERN (*Myrica asplenifolia*)

Bushy shrub 2′ high, with sweet scented, fern-like leaves. Grows in thickets in open, dry pastures mostly in the southeastern part of state. Often becomes a pest like juniper. Leaves 3″ to 6″ long, thick, narrow, with scalloped margins, dark green, shiny above, downy beneath, dotted with minute yellowish, resinous dots, very fragrant. Stems yellowish, becoming coppery brown when old. Fruit a small, shiny nut enclosed in burr-like scales.

WILLOW FAMILY (*Salicaceae*)

The well known poplars and willows make up this family of mostly northern trees and shrubs. Leaves are simple, alternate, bitter to taste, with small leaflets (stipules) at

the base of the leaf-stalks, either persistent or deciduous. Flowers are mostly in drooping catkins, without petals and sepals, male and female on different trees, produced in early spring before the leaves. Fruit consists of many small capsules or pods on a stem, each containing many seeds provided with silky hairs and carried long distances by the wind; usually ripens as leaves become full grown. Wood light and soft.

Poplars (*Populus*)

Trees with smooth, very brittle twigs, prominent leaf scars, resinous, scaly buds, yellowish green bark and broad leaves, stipules very minute, falling early. Adapted to a variety of soils.

Common Poplar. Trembling Aspen. Popple (*Populus tremuloides*)

A rapid growing, short-lived tree, common on drier soils in all parts of state below 3000′. Grows best and to largest size in heavier soils of the north where it frequently reforests burned areas in nearly pure stands. Requires abundant light. Leaves more or less rounded, not large, finely and bluntly toothed. Leaf stalks slender and flattened sidewise which causes leaves to tremble or flutter with the slightest movement of air. Bark on young trees smooth, green, with dark patches and a whitish bloom, blackish and rough near the base of older trees, bitter. Wood soft, white, not durable but valuable for paper making and excelsior.

COMMON POPLAR.

LARGE TOOTH ASPEN.

LARGE TOOTH ASPEN (*Populus grandidentata*)

Very similar, less abundant and widely scattered tree, usually found growing in mixture with Common Poplar and having most of its characteristics. Easily distinguished by the larger, coarsely toothed leaves. Twigs are usually stouter and the buds less resinous.

BALSAM POPLAR (*Populus balsamifera*)

A large tree of the north, found along river bottoms and borders of swamps, mostly in the Connecticut Valley and northwestern part of our State. Has the general characteristics of the poplars. Buds are large, long-pointed and very resinous. Leaves finely toothed like Common Aspen but are narrower, long pointed and whitish below; leaf stalks slender and less flattened than the two preceding species.

BALM OF GILEAD (*Populus balsamifera candicans*) A variety of Balsam Poplar or a separate species commonly planted in the past as a shade tree. Has wide-spreading branches and tendency to sprout from roots. Leaves broader, heart-shaped at base, teeth fine and regular, rusty-white or hairy below; leaf stalks usually hairy and somewhat flattened. Twigs coarse and buds large, fragrant and very sticky.

CAROLINA POPLAR. COTTONWOOD (*Populus deltoides*)

The large, well-formed, southern cottonwood is said to be native as far north as Westmoreland in the Connecticut Valley. It is, however, frequently planted as a quick-growing ornamental but like all poplars, is short lived,

easily broken by ice and wind, decays quickly and is attacked by leaf eating insects. Leaves about as broad as long, triangular, wedge shaped at base, large toothed, shiny green above, pale below; leaf stalks long, distinctly flattened. Twigs yellowish, stout, often with prominent ridges running down from the leaf-scars. Buds are large, pointing outward and often curving upward.

CAROLINA POPLAR.

NORWAY POPLAR (*Populus canadensis or eugenei*) A variety of Carolina Poplar sometimes called "Sudden Sawlog" and sold by commercial nurseries on account of its exceedingly rapid growth. Tall, well formed tree, adapted to northern conditions. Leaves similar to preceding but finely toothed. Buds long and slender. Little is known as to its use in our State.

LOMBARDY POPLAR (*Populus nigra italica*)

Said to be the first ornamental tree brought to America. Very popular a century ago, is often planted and has value for purposes requiring quick growth and a tall, very narrow crown. Its spire-like habit of growth is too well known to need description. Leaves are triangular, wider than long, smooth, shiny, rather fine-toothed. Twigs slender, smooth, olive green to gray. Branches short, ascending, hugging the trunk.

There are several forms of White or Silver Poplar (*Populus alba*) planted for ornamental purposes. Their leaves are irregularly lobed or with wavy margins, silvery or woolly white below and the twigs are usually white and velvety.

Willows (*Salix*)

Both trees and shrubs, generally growing near water. Many species extend nearly to the Arctic Circle. Twigs are slender, mostly flexible, often shiny, yellowish. Buds small, flattened against the twig, covered by a single scale or cap. Leaves narrow and finely toothed; stipules persistent or falling early. Propagated from cuttings of green wood and seldom from seed. Wood is used for making artificial limbs, excelsior, charcoal, baskets and willow furniture. Easily grown from cuttings. Often planted to prevent river banks from washing and for ornamental purposes. There are many native and introduced species, as well as numerous hybrids impossible to identify.

BLACK WILLOW.

Black Willow (*Salix nigra*)

Our largest native willow. Found along banks of streams, usually a shrub but sometimes 40′ or more high. Widely distributed. Leaves 3″ to 6″ long, narrow, shiny, yellow-green, tapering to a long point, usually curved. Stipules large, crescent-shaped, remaining as long as the leaf grows. Small branches very brittle at the base. Bark of larger trees usually dark brown, very rough and scaly.

Shiny Willow (*Salix lucida*)

Bushy, native tree not over 15′ to 20′ high, common along streams. Leaves nearly as long as Black Willow but much broader, tapering to a long point, smooth and lustrous when full grown; stipules often persistent. Twigs bright yellow-green. A desirable tree for ornamental planting.

PUSSY WILLOW (*Salix discolor*)

Native shrub or small tree 15′ to 20′ high, favorite of boys and girls for the "pussy" flower buds which are large and blackish and open at the first signs of spring. Common throughout on low, wet land. Leaves 3″ to 5″ long, broad, narrowed at both ends, smooth, bright green above, silvery white below, either coarsely toothed or lacking; stipules falling early. Bark thin, smooth, greenish. Small branches stout, reddish purple.

Some of our largest, best known and most beautiful willows are not native trees, but originated from Europe, as the following:

WHITE WILLOW (*Salix alba*)

A large tree with leaves 2″ to 5″ long, narrow, long-pointed, silky on both sides, whitish below. Twigs green, smooth. Bark brown, coarsely ridged on old trunks. The golden variety, (*vitellina*) is the commonest form in cultivation; has brilliant yellow twigs in spring, becoming reddish brown with age.

CRACK WILLOW (*Salix fragilis*)

Large tree, introduced before the Revolution for basket making and charcoal for gunpowder. Leaves 4″ to 7″ long, smooth, shiny above, pale below. Twigs are yellow-green, shiny, very brittle at the base, often breaking off and covering the ground after a heavy wind.

WEEPING WILLOW (*Salix babylonica*)

Large, graceful, ornamental tree, easily recognized by its long, plume-like, drooping branches. Leaves very narrow, 2″ to 6″ long, smooth, bright green above, pale below. Twigs are delicate, yellow green, shining.

Other native willows are either small trees or low shrubs, of which the following are reported:

BALSAM WILLOW (*Salix balsamifera*)

Shrub or sometimes a small tree, often in clumps, growing in open, northern swamps. Leaves 2″ to 4″ long, pointed, slightly heart-shaped at base, teeth minute, irregular, dark green above, pale and veins prominent below, aromatic when crushed; leaf-stalks long, slender.

BEAKED WILLOW (*Salix bebbiana or rostrata*)

Common shrub or small tree growing in dry soil as well as along streams. Leaves 2″ to 3″ long, variable, dull green, slightly downy above, usually whitish-downy below, veins appearing like network, margins faintly toothed. Twigs dark brown, downy.

LONG-LEAF WILLOW (*Salix longifolia*)

Shrub or small tree not over 20′ high. Often grows on river sand-bars. A western willow reported in the Connecticut Valley. Leaves often 5″ long, narrow, with scattered, minute teeth.

HEART-LEAVED WILLOW (*Salix cordata*)

Shrub usually under 12′ high, often inclined, growing in clumps along sand-bars and banks of streams. Leaves rounded or heart-shaped at base, pointed, finely toothed, mostly smooth when full grown; stipules persisting. Branches smooth, flexible, tough, often sprouting about older, dead stems.

SILKY WILLOW (*Salix sericea*)

Tall, slender shrub 6′ to 12′, with purplish, slightly downy twigs, forming upright clumps in swamps and near streams. Widely distributed. Leaves 2″ to 4″ long, narrow, sharp pointed, smooth, dark green above, pale, silky below; leaf-stalks short.

PRAIRIE WILLOW (*Salix humilis*)

Shrub under 8′ high, with slender, grayish branches; found on dry uplands. Leaves 2″ to 4″ long, variable, often acute at both ends, somewhat downy above and below; leaf-stalks short; stipules persistent.

DWARF GRAY WILLOW (*Salix tristis*)

Small, slender shrub 1′ to 2′ high, also found on dry soils and sandy plains. Leaves 1″ to 2″ long, thick, blunt-pointed, often standing out straight, olive-green above, densely woolly below, margins rolled back; leaf-stalks short. Twigs woolly.

HOARY WILLOW (*Salix candida*)

Straggling shrub under 5′ high, with younger branches densely white and older ones reddish. Found in bogs northern part of State. Leaves 2″ to 4″ long, narrow, lance-shaped, woolly white below; leaf-stalks short.

BOG WILLOW (*Salix pedicellaris*)

Grows 2′ to 3′ high, also in northern bogs. Leaves clustered, 1″ to 2½″ long, narrowed at base, smooth, entire, bright green above, pale below. Twigs slender, brown.

Four native willows are dwarf shrubs growing at high elevations above timber line in the White Mountains.

DWARF WILLOW (*Salix herbacea*) has stems but a few inches long and roundish, heart-shaped leaves ½″ to 1″ long.

BEARBERRY WILLOW (*Salix Uva-ursi*) has equally small leaves but oval, narrowed at the base, crowded on stems a foot long.

SILVER WILLOW (*Salix argyrocarpa*) rarely over a foot

high, has leaves 1″ to 2″ long, narrow at base, silky or silvery below.

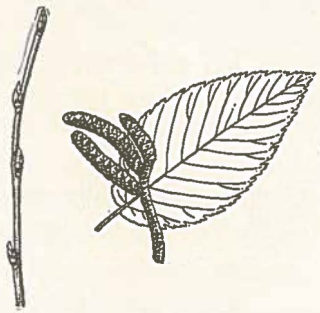
Tea-leaved Willow (*Salix phylicifolia*) is a larger shrub of high mountain ravines. Leaves 1″ to 2½″ long, lance-shaped, whitish below, smooth, leathery, entire or nearly so. Twigs purplish.

BIRCH FAMILY (*Betulaceae*)

Consists of the true birches, hornbeams, (2 genera) alders and hazel-nuts; all with simple, alternate leaves. Both kinds of flowers are catkins, (*aments*) borne on same tree; the staminate (male) mostly appear in autumn, generally three together, erect, and remain immature but conspicuous during the winter. Pistillate (female) mostly appear in the spring.

The true birches (*Betula*) have bark of distinctive color and character, smooth, tending to separate into thin, papery sheets, marked with short, horizontal lines, resembling cherry. Leaves are triangular or heart shape, sharply toothed, mostly thin, from lateral buds and often in pairs. Buds with overlapping scales, pointed, conical. Fruit cone-like, (*strobile*) 1″ to 2″ long, containing many small, winged seeds and lobed scales, falling in winter and may be seen on the snow.

Black or Sweet Birch (*Betula lenta*)

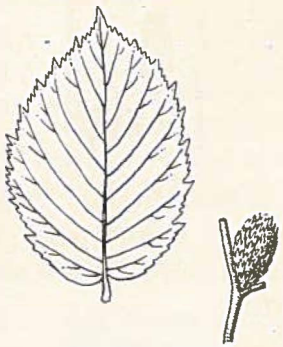


BLACK BIRCH.

Becomes a large forest tree on rich, upland soil, more often found as small tree or shrub, distinguished from other birches by very brittle twigs and sweet, wintergreen flavor of bark and leaves. Common throughout. Leaves heart-shaped, uneven at base, finely toothed. Buds slim,

pointed, scales edged with brown. Bark of larger trees very dark, thick and broken; on young stems outer bark thin, brown, peeling readily, exposing green, fragrant inner bark. Wintergreen oil is obtained by distillation. Wood brownish, heavy, hard, brittle, sapwood yellowish; valuable for furniture and interior finish.

Yellow or Silver Birch (*Betula lutea*)



YELLOW BIRCH.

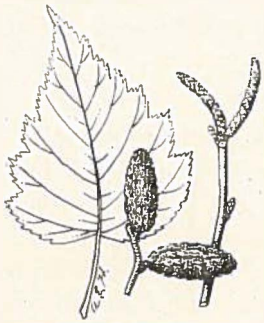
One of our most valuable hardwood trees and largest of all the birches. Common throughout state, growing best in White Mountains in mixture with spruce and other hardwoods on better soils. Leaves similar to but less heart-shaped and rougher than Black Birch, doubly toothed, hairy beneath on veins. Buds similar to Black Birch. Bark yellowish, silvery, separating from tree in thin, curly strips, except on very young trees. Twigs much less brittle than Black Birch, slightly fragrant. Wood yellowish, hard, strong, heavy. Used extensively for lumber, furniture and variety of wood products.

River or Red Birch (*Betula nigra*)

Small tree found occasionally along streams in southwestern part of state; not common. The only birch increasing in abundance south of New Hampshire. Easily recognized by its reddish bark, separating from tree in thin strips. Leaves narrow, wedge shaped at base, doubly toothed. Twigs and buds downy or hairy when young. Wood light brown, sapwood yellowish.

GRAY BIRCH (*Betula populifolia*)

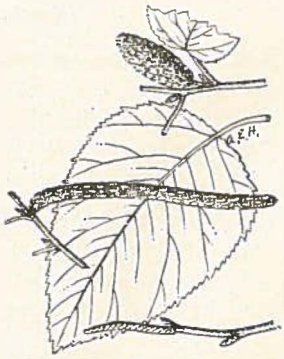
Small tree on poor soils, waste areas and borders of swamps. Abundant in southern part of state. Grows only in the open, often acting as "nurse" tree for white pine seeding in open pastures. Short lived, being crowded out by longer lived hardwoods, pine and other growth. While the outer bark is white, somewhat like Paper Birch, it does not peel off in thin layers. Leaves are thin, triangular, pointed, coarsely toothed, shiny above. Bark white, close, firm, marked by black spots on older trees. Small branches and twigs are dark, roughened by whitish dots. Wood is soft, weak, not durable. Useful chiefly for fuel when split, well dried and kept under cover.



GRAY BIRCH.

PAPER, WHITE OR CANOE BIRCH (*Betula papyrifera*)

Loveliest of the birches, common throughout the state, increasing in size and abundance northward, reaching high elevations in the mountains. A comparatively short lived tree, often forming pure stands temporarily. Recognized by its chalk-white outer bark, and the successive layers of cream to tan-colored inner bark, all separating freely into many very thin layers. Used by the Indians in canoe-making and unfortunately stripped from trees regardless of location by thoughtless persons. Once deeply removed the bark never becomes white again. On



PAPER OR CANOE BIRCH.

very small trees the bark is reddish-brown, easily confused with yellow or other birches. Twigs are hairy with yellowish dots, tough; without marked wintergreen fragrance. Leaves slightly heart-shaped, firm, deep green, sharply toothed. Wood relatively soft, smooth, fine-grained, sapwood white, thick, heart brownish. Valuable for spools, all kinds of turnery, paper making, lumber, and variety of wood products.

Bog or Low Birch (*Betula pumila*)

A shrub sometimes 10′ or more high, with dark, somewhat papery bark and hairy twigs is found in northern swamps. Leaves small, ½″ to 1½″ long, rounded at base, thick, coarsely toothed, net-veined and pale below.

Dwarf Birch (*Betula glandulosa*)

A low, half-trailing shrub under 4′ high, found on high mountain summits. Leaves small, ¾″ long, rounded, smooth, thick, bright green, coarsely toothed. Branchlets brown, glandular or warty.

Blue Birch (*Betula pendula coerulea*)

A rare, unusual birch of tree size may be looked for at higher elevations in the north. Recognized by rounded, bluish-green leaves and shining, pinkish white bark. Given in Checklist of the U. S. Department of Agriculture as a separate species.

Several varieties of the European Birch (*Betula alba*) are described which are doubtless also native. Others are frequently planted as lawn trees and are characterized by deeply cleft or downy white leaves, drooping branches or narrow, pyramid-like crowns.

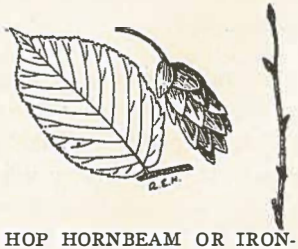
HORNBEAM. BLUE BEECH (*Carpinus caroliniana*)

Slow growing tree of small size and irregular, spreading branches; formerly not uncommon two feet or more in diameter. Scattered in moist woods and borders of streams and swamps, not abundant. Bark smooth, steel gray like beech, except for wavy furrows up and down the lower trunk, giving muscular or fluted appearance. Leaves oval, 2″ to 4″ long, rounded base, pointed, doubly toothed; leaf-stalks very slender. Buds small, oval, pointed, downy at apex. Twigs slender, smooth, shining, reddish. Male catkins appear in the spring, unlike all others of this family which may be seen during the winter. Fruit a loose cluster of three-lobed leaflets with a small exposed nutlet at the base of each. These leaflets are green at first, turning brown as fruit ripens in the fall. Wood very close-grained, hard and strong. Useful for levers, wedges and mallets.

HORNBEAM OR BLUE BEECH.

HOP HORNBEAM. IRONWOOD. LEVERWOOD (*Ostrya virginiana*)

Once a large tree in the forest; now of small size, not abundant, widely distributed in deep, moist woods and fairly dry, gravelly soils. Easily distinguished from Blue Beech by the bark and fruit. Leaves are similar but broader. Bark thin, gray brown, with soft, flaky scales which lift up from the edges and cling in the middle. Buds



HOP HORNBEAM OR IRONWOOD.

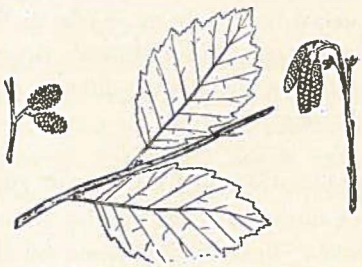
larger than Blue Beech, smooth, divergent, somewhat gummy within; twigs very slender. Fruit a cluster of bladder-like sacks, each enclosing a small, flat nut attached at the base, the whole having appearance of a cone. Wood very hard and strong. Useful for wedges, mallets, etc.

ALDERS (*Alnus*)

Small slender trees growing in clumps, usually not more than 10′ to 12′ high, forming thickets called "alder swamps" along borders of streams and in low places. Bark is smooth and dark, often covered with white dots, contains tannin and is bitter to taste. Leaves stiff, oval, sharp-toothed. Buds deep red, blunt, growing on stalks, outer covering consisting of two scales meeting (*valvate*). Fruit a cone-like, woody structure ½″ to ¾″ long, from which small, flat, slightly winged nuts fall, the blackened cones remaining indefinitely on the trees. Wood soft, yellowish, turning brown when exposed, pith triangular, greenish. There are three species in our state, similar in appearance and habits.

SPECKLED ALDER (*Alnus incana*)

Common throughout State. Distinguished by whitish, horizontal spots on bark; leaves rounded at base, doubly toothed and downy or rusty beneath.



SPECKLED ALDER.

SMOOTH ALDER (*Alnus rugosa*)

Found only near coast. Leaves smooth, narrowed at base, sharply and regularly toothed.

GREEN OR MOUNTAIN ALDER (*Alnus veridis or crispa*)

A stout shrub 6′ high found in thickets in northern ravines and high slopes of the White Mountains. Leaves are broad, large, slightly heart shaped, deep green when mature, margins slightly ruffled, often small and thick at high elevations. Old branches smooth, dark brown. A somewhat larger variety (*mollis*) with light brown, downy branches and larger leaves, downy beneath, is more widely distributed.

HAZELNUT (*Corylus americana*)

A shrub 3′ to 8′ high growing in thickets in moist, light soils in exposed places, edges of woods, and along fences. Leaves 3″ to 6″ long, thin, heart-shaped, dark yellowish green, somewhat rough above, pale and downy below, irregularly toothed. Young stems russet brown, covered with pinkish hairs. Bark smooth, thin, dark brown. Buds rounded, reddish brown, scaly, with hairy margins. Fruit a roundish nut ½″ long, covered by a pair of nearly distinct downy, leaf-life bracts, one or several in a cluster; ripens by August or September, resembles European filbert of the market, edible and delicious.

HAZELNUT.

BEAKED HAZELNUT (*Corylus rostrata*)

A more northern species found in rich woods, similar to above. Best distinguished by the two leaf-like bracts enclosing the nut, which unite at the summit and extend into a bristly, tube-like beak, twice the length of the nut.

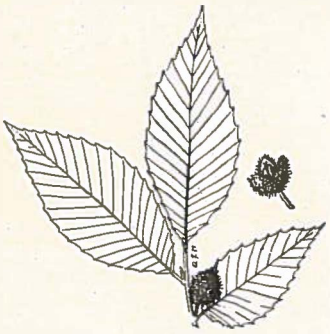
BEECH FAMILY (*Fagaceae*)

An important family consisting of three genera, Beech, Chestnut and Oak, all in our State being trees, except two

dwarf oaks. Both kinds of flowers appear in spring on the same tree; the male in long, slender catkins; female tiny, urn-like, developing the fruit. Fruits are nuts, many of them edible.

BEECH (*Fagus grandifolia*)

Large, long-lived tree common throughout the forests, less abundant near the Coast, sometimes in pure stands, growing best in moist, cool, upland soils. Endures extreme shade. Leaves 3″ to 5″ long, oval, smooth, thin, tough, coarsely toothed, with straight veins terminating at the teeth; dry leaves remaining long on tree. Buds very long, slender, sharp. Bark smooth, hard, steel gray, with darker or lighter patches. Male flowers borne in a slender-stalked head. Fruit a small burr with soft prickles, dividing into 4 parts, containing two triangular, brown, shining nuts, sweet and edible. Wood reddish, hard, with rays of greatly varying width, not durable, difficult to season. Used sparingly for lumber and flooring, turned and novelty products and ties when creosoted. One of the best fuelwoods.



BEECH.

Several cultivated varieties of European Beech having purple, copper-colored or cut leaves are planted for ornamental purposes.

CHESTNUT (*Castanea dentata*)

A rapid growing, valuable forest tree which has well-nigh been destroyed throughout its northern range by the chestnut bark disease. This disease has killed practically all trees of any commercial size and attacks and destroys the sprouts as soon as they are well started and before they

can produce seed. No control measures are known. The joy of gathering chestnuts is unknown to most of our boys and girls today. The natural distribution of chestnut is confined to the southern towns, extending farther north in the Merrimack and Connecticut valleys. Leaves 5″ to 8″ long, pointed at both ends, coarsely toothed, smooth on both sides, veins straight, terminating at the teeth. Buds ¼″ long, oval, rather blunt, terminal buds absent, 2-3 brown, overlapping scales showing. Twigs smooth, stout, covered with whitish dots, pith star-shaped; leaf-scars raised. Fruit a prickly burr, opening in 4 sections, containing usually 3 nuts, sweet and edible, ripening in autumn. Wood soft, brown, very durable. Valuable for telephone poles, fence posts, ties and lumber for interior finish, etc; rich in tannic acid for tanning leather.

CHESTNUT.

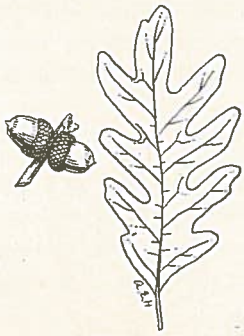
Oaks (*Quercus*)

World famous and generally valuable trees on account of their great sturdiness, long life, strength, beauty of wood and commercial uses. Wide variation in leaf characteristics. Some in warm climates are evergreen. In our climate dead leaves apt to remain all winter on trees. Twigs have five sided or star shaped piths. Buds with overlapping scales and clustered about a prominent terminal bud. Fruit an acorn seated in a cup. Wood hard, strong, with prominent rays. Naturally divided into two groups, white and black oaks.

White Oaks: Leaves with rounded lobes, not bristle-tipped. Buds rounded, blunt. Bark light, often scaly. Acorns mature in one season, mostly sweet and edible.

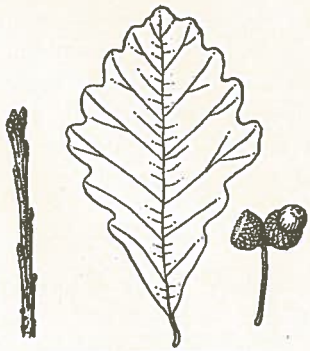
WHITE OAK (*Quercus alba*)

One of the most valuable timber trees of the United States. Grows best in rich, moist soils at lower elevations mostly southeastern part of state. Not now of large size or commercially abundant in our State. Named for its light colored bark and wood. Leaves smooth, olive green above, pale below, usually with seven deep, rounded lobes, rounded between the lobes. Bark ashy gray, separating into soft scales on older trees, smooth, greenish on young branches. Acorns about ¾" long, rather narrow, often in pairs, about one-fourth enclosed by the cup; cup scales knobby; kernel sweet, edible. Wood light-brown, close-grained, with broad rays, very beautiful when quarter-sawed for furniture, inside finish, flooring, etc. Formerly prized in ship building. Now used for high grade lumber, implements, baskets, tight barrels, etc. Trees of size are far too valuable for railroad ties, fuel and general uses.



WHITE OAK.

SWAMP WHITE OAK (*Quercus bicolor*)



SWAMP WHITE OAK.

Much less common but valuable member of white oak group and similar to White Oak. Found in low, moist situations along lower Merrimack Valley and in Rockingham County. Leaves rather large, narrow at base, only slightly lobed, margins scalloped, dark-green above, pale whitish or fine hairy beneath. Bark light, flaky, separates into

shreds or scales on young trees and is deeply furrowed on older ones. Acorns about 1″ long, rounded, 2 or 3 borne on a long stalk; cups enclosing one-third to one-half the nut, often fringed at margin. Other means of identification are the stout, yellowish twigs, blunt buds with chestnut colored scales and irregular drooping of lower branches.

CHESTNUT OAK (*Quercus montana or primus*)

CHESTNUT OAK.

Occurs in belts and patches in eastern part of State and lower Ashuelot Valley; probably elsewhere. Not common. Adapted to rocky slopes and dry situations. Leaves somewhat like Chestnut, but shorter, 5″ to 6″ long, broader, less pointed, thick, stiff, and with shallow, rounded lobes. Bark on older trees dark, hard, divided into long, continuous grooves and ridges. Buds pale, rather sharp-pointed. Acorns about 1″ long, slender, nearly half enclosed by the thick, knobby cups, borne on short stalks.

DWARF WHITE OR CHINQUAPIN OAK (*Quercus prinoides*)

Shrub, 5′ or more high, usually growing in clumps on dry, rocky or sandy plains soils in the lower Merrimack Valley and elsewhere. Leaves smaller, narrowed at base, with shallow, rounded lobes, pale or hairy beneath, resembling others of white oak group. Bark thin, grayish, scaly. Acorns small, with thin cups covering one-half the nut, annual and abundant, sweet and edible. Should not be confused with more common Scrub or Bear Oak.

BUR OAK (*Quercus macrocarpa*)

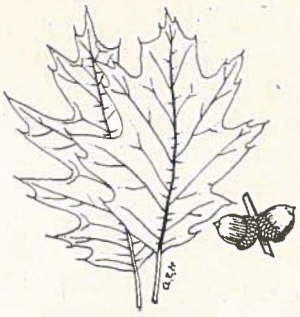
Is not reported from New Hampshire but is native in Maine and Vermont and may be found here. A white oak with large leaves and rounded lobes, terminal largest,

variable, middle often cleft nearly to mid-rib, deep green above, pale and hairy below. Twigs with corky wings. Acorns large, with fringe-like, scaly cups covering half or more of the nuts.

BLACK OAKS: Leaves sharply lobed, bristle-tipped. Buds sharp pointed. Bark generally dark and rough. Acorns require two seasons to mature, generally bitter.

RED OAK (*Quercus borealis or rubra*)

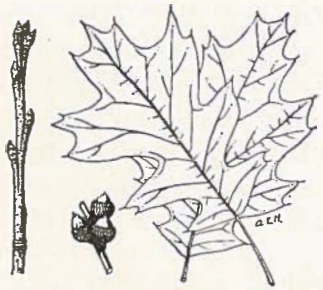
Most widely distributed, rapid growing and tallest of our oaks. Common throughout State and in the White Mountains at lower elevations on rich and gravelly soils. Leaves symmetrical, firm, smooth, thin, dull green, with sharp pointed lobes, rounded between, some tipped with soft bristles, cleft halfway or less to mid-rib. Buds light brown, pointed, smooth. Twigs slender, smooth. Bark on young branches smooth, becoming dark, with coarse, flat-topped ridges, never very rough, except at base of large trees. Acorns mature the second year, ¾″ to 1½″ long, broad, flat at base, cup very shallow, covering only base of nut. Wood reddish, less valuable than white oak but extensively used for interior finish, furniture, cooperage, ties, etc. Though once despised, now brings high prices in the market; our principal commercial oak.



RED OAK.

BLACK OR YELLOW OAK (*Quercus velutina*)

Large tree not very common in lower Merrimack and Connecticut Valleys and southeastern section on gravelly uplands and ridges. No other oak has as great a variety of leaves, sometimes shallow-lobed and again divided nearly to mid-rib; usually large, thick and leathery. Buds large,



BLACK OR YELLOW OAK.

pointing outward, scales covered with soft, woolly hairs. Twigs stout, rusty, with ridges extending from old leaf scars. Bark on young stems smooth, becoming black and rough on old trees, inner bark orange-yellow and bitter. Acorns smaller, half enclosed in cup, kernel yellow and bitter, cups covered with coarse scales. Wood heavy, hard, coarse-grained.

Scarlet Oak (*Quercus coccinea*)

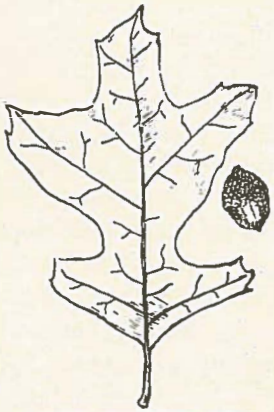
Somewhat smaller tree of the black oak group. Distribution uncertain but scattered over lower Merrimack Valley and probably elsewhere on gravelly uplands and ridges. Has many characteristics of both Red and Black Oak. Foliage very brilliant in autumn. Leaves like Red Oak except smaller, more deeply cleft and broader at the base. Buds small, reddish-brown, woolly toward the tips. Twigs slender and smooth. Inner bark reddish. Acorns somewhat like Black Oak but more rounded, with scaly cup covering half the nut, kernel white; shape very different from Red Oak.

SCARLET OAK.

Scrub or Bear Oak (*Quercus ilicifolia*)

Dwarf oak taking possession of sandy plains, and cut over pine areas on poor soil, especially where burned,

common throughout the south and central parts of state. Often successfully prevents reforestation of desirable trees. Grows usually 4′ to 8′ high in dense clumps over large areas. Leaves small, with few lobes, stiff, thick, bristle-tipped, grayish and downy beneath, persist throughout the winter. Bark smooth, dark, hard. Acorns in clusters, small, not over ½″ long, half enclosed by the cup.



SCRUB OR BEAR OAK.

ELM FAMILY (*Ulmaceae*)

The elms form the only group of this family of importance in New Hampshire. Hackberry and Mulberry are closely related. Flowers mostly perfect, not conspicuous. Fruit a winged seed or berry. Absence of true terminal buds give twigs more or less of a zig-zag appearance.

American Elm (*Ulmus americana*)

Planted in our towns and villages since pioneer days, American Elm is known to more people as a shade than a forest tree. Long recognized as superior to all others for street purposes on account of beauty, grace, rapid growth and long life. Native throughout the State in moist river bottoms and rich, fertile soils. In the forest it grows tall and straight; alone in the open, the trunk usually divides into gracefully upward-spreading branches with drooping foliage. There are other forms, however, sometimes oak-like, or the trunk dividing abruptly with long, horizontal branches.

AMERICAN ELM.

Leaves are oval, pointed, upper surface rough when rubbed one way, smooth when rubbed the other, lower surface smooth, unequally based, doubly toothed, veins straight, extending to edge of leaf. Buds smooth, reddish brown, scaly, slightly flattened, terminal absent. Twigs smooth, slender, reddish brown. Bark thick, firm, gray-brown, becoming rough and deeply furrowed on old trees. Flowers appear before the leaves in reddish-green, drooping clusters from lateral buds, both kinds in same flower (perfect). Fruit drooping, long-stalked clusters of flat, oval seeds, each entirely surrounded by a thin, papery wing. Ripens in May before leaves are fully grown. Wood heavy, tough, reddish, difficult to split. Used for wheel hubs, slack barrels, hoops, baskets, bridge planks, ties, novelties.

Slippery Elm (*Ulmus fulva*)

Rather uncommon, spreading tree found in moist, rich soil, western part of State, probably elsewhere. Its name is given on account of the juicy, stringy, slippery inner bark, pleasant to taste, and commonly used in throat tablets. Leaves somewhat larger than American Elm, very rough above when rubbed either way and somewhat rusty and downy below. Buds and twigs rusty or hairy. Bark very thick, rough, dark brown; inner bark yellowish-white, very characteristic. Wood dark reddish-brown, heavy, easy to split, quite durable.

Rock or Cork Elm (*Ulmus racemosa*)

A rare tree, listed as occurring in Meriden and other places in northwestern New Hampshire. May be recognized by thin, corky ridges or wings which are present on the two year old branches. Leaves are quite smooth, branches horizontal and bark very rough. Twigs and buds downy or hairy.

ENGLISH ELM (*Ulmus campestris*)

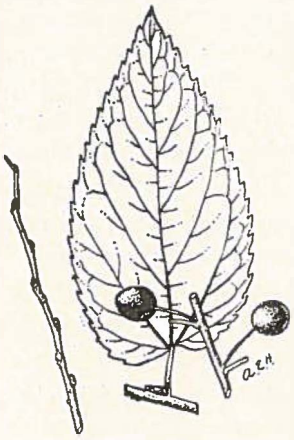
Large tree introduced from Europe and frequently planted in the early days. Does not have the drooping habit of American Elm but is more oak-like in form with wide-spreading branches. Leaves very rough above. Buds very dark. Bark on large trees very rough. Foliage remains green longer than native elms.

CHINESE ELM (*Ulmus pumila*)

Quite recently introduced into the United States and now sold by many nurserymen. Extremely rapid growing, graceful, hardy, and adapted to poor soils. Smaller tree than American Elm. Leaves quite small, opening early in spring and remaining late. Said to be free from insect injury and desirable for ornamental planting.

HACKBERRY, SUGARBERRY (*Celtis occidentalis*)

Small or medium-sized tree rarely found in Connecticut Valley. Leaves long-pointed, 2″ to 4″ long, rounded and uneven at base, fairly smooth, sharply toothed except near base, few veined; leaf stalks slender and grooved. Buds small, sharp pointed, closely pressed to twig, 3 or 4 overlapping scales. Twigs slender; pith white, chambered. Bark grayish, more or less smooth, with raised, warty projections. Fruit a round, sweet, purplish-black berry borne on slender stalk, ripening in September. Wood yellowish, heavy, coarse-grained.



HACKBERRY OR SUGARBERRY.

The Mulberries are planted for ornament and fruit production. Red Mulberry (*Morus rubra*) is rarely native but has been reported from the Connecticut Valley and elsewhere in New Hampshire. A medium sized tree with spreading limbs, broad, heart-shaped leaves, downy below, sometimes lobed; large, greenish-brown, scaly buds; stout, smooth, greenish twigs; milky sap and dark purple fruit, resembling a blackberry. White Mulberry (*Morus alba*) imported from China where it is the food of the silk worm, is less hardy than preceding. Leaves are smaller, glossy above, sometimes deeply lobed; fruit a similar berry but cream-white.

BARBERRY FAMILY (*Berberidaceae*)

Common Barberry (*Berberis vulgaris*)

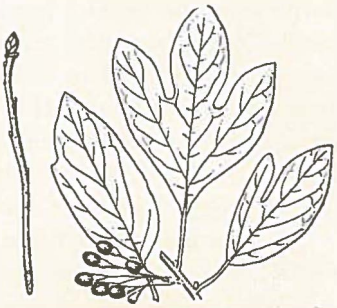
Thorny shrub, mostly 4′ to 10′ high, originally introduced from Europe but now growing wild in old pastures and waste places, toward the Coast. Leaves small, rounded and with fine, bristly teeth at tip, narrow at base, in clusters. Thorns are a form of leaf, slender, often three together, ⅜″ to 1″ long, from the axils of which the leaves of following year grow. Flowers small, yellow, perfect, in drooping clusters. Fruit in clusters of smooth, slender, red berries, ½″ long, a black spot at tip, containing one or more seeds, acid, palatable, often used for preserves. Wood yellow, contains a dye. Other introduced species, especially Japanese barberry (*Berberis thunbergii*) are more often planted for hedges and borders.

LAUREL FAMILY (*Lauraceae*)

The laurel family, mostly tropical, includes Sassafras and Benzoin occasionally found in southern New Hampshire and distinguished by their aromatic and spicy twigs. Fruit a one-seeded berry. Closely related to the bays, avocado, and camphor trees of warmer climates.

SASSAFRAS (*Sassafras variifolium*)

Shrub or small tree not over 20′ to 30′ high in our State, found in lower Merrimack Valley eastward to the Coast, and the lower Connecticut; not common. Prefers rich, well drained soils. Leaves 2″ to 5″ long, smooth, entire, very distinctive, varying in shape, some oval, others with one or more lobes, resembling the thumb of a mitten. Terminal buds large, lateral small, with few, overlapping green scales, loosely arranged. Twigs brittle, yellowish green, sometimes reddish, very spicy to taste, mucilaginous. Bark soon becomes thick and scaly, on older trees deeply fissured, with block-like ridges, always spicy and fragrant. Flowers insignificant, greenish-yellow, clustered, two kinds borne on different trees in April. Fruit a cluster of dark blue, shiny berries, each containing one seed, borne on a red, club-shaped, fleshy stem, ripens in early autumn and falls early. Wood soft, brittle, light brown, durable, fragrant. Oil from roots and bark used in medicine and flavoring.



SASSAFRAS.

SPICE-BUSH (*Benzoin aestivale*)

Shrub 4′ to 6′ or more high with about the same distribution as sassafras. Very fragrant and spicy. Leaves 2″ to 5″ long, oval, pointed, smooth, entire. Leaf and flower buds distinct, former small, pointed, single; latter in clusters, rounded, larger. Twigs smooth, green or brownish, brittle. Flowers insignificant, yellow, clustered, stemless. Fruit a cluster of small, oval, scarlet berries.

GOOSEBERRY FAMILY (*Grossulariaceae*)

The well known shrubs, gooseberries and currants, (*Ribes*) make up this family, every wild and cultivated species of which is a menace to our white pine trees on account of the blister rust disease. The Government, State, towns and land owners have spent many thousands of dollars in New Hampshire alone and nearly 30 million bushes have been destroyed in order to control the disease. It is illegal to bring any of these bushes into the State or to plant them wherever control measures have been carried on. A description of the various species is highly important here, as a means to their continued destruction.

Leaves are generally 3 to 5 lobed or heart shaped, palmately veined, in clusters. Flowers mostly small, bell-shaped, slender, perfect, 5 or 4 parted, greenish-purple or yellowish, borne singly or in small clusters. Fruit always a round, pulpy berry, tipped with the remains of the flower calyx, usually red or purplish in color. Gooseberry stems bear spines below the leaf clusters and branches often have numerous, scattered prickles; berries sometimes prickly. Stems and branches of currants, except *Ribes lacustre*, without spines or prickles, erect or trailing.

PRICKLY GOOSEBERRY (*Ribes cynosbati*)

PRICKLY GOOSEBERRY.

Widely distributed shrub 3′ to 4′ high, usually found in rocky woods but thrives in all soils and exposures. Leaves 1″ to 2″ broad, 3 to 5 lobed, in clusters of 3 or 4, densely hairy above and below, rather thin. Leaf stalks downy, glandular. One, sometimes three, sharp, slender spines usually below each leaf cluster, sometimes lacking. New twigs dull gray-brown. Branches have scattered, weak

prickles. Flowers small, green. Fruit a brownish-purple, very prickly berry, ½" diameter, containing several seeds, ripens in August, edible.

Smooth-fruited Gooseberry (*Ribes hirtellum*)

Low shrub 2′ to 4′ high, common in Merrimack and lower Connecticut Valleys and eastward to Coast. Leaf spines whitish, slender, often lacking. Branches are commonly crooked, smooth, sometimes with scattered prickles. Leaves 3 to 5 lobed, wedge-shaped at base, smooth, rather thick; leaf stalks usually with branched hairs. May be easily recognized by large, smooth, purplish fruit. Edible. Similar to Ribes oxyacanthoides.

SMOOTH-FRUITED GOOSEBERRY.

Cultivated Gooseberry (*Ribes reclinata*)

Upright shrub which has often escaped from cultivation. The twigs have stout spines, usually in threes; older branches often prickly. Leaves are 3 to 5 lobed, hairy. Flowers green. Fruit yellowish to red, more or less hairy or bristly and glandular.

Prickly Currant (*Ribes lacustre*)

Erect or reclining shrub found in swamps and cold, wet woods. Leaves thin, smooth, not wider than long, deeply 5 to 7 lobed. New twigs reddish. Spines slender, weak, in threes or clustered; branches covered with bristly prickles. Fruit small, prickly, purplish-black, unpleasant to taste.

SKUNK CURRANT (*Ribes glandulosum*)

SKUNK CURRANT.

Trailing, thornless shrub common in wet woods, swamps, borders of streams and along mountain slopes throughout the State. Leaves, flowers and fruit have skunk-like odor when crushed. Leaves 5 to 7 lobed, heart-shaped at base, broader than long, hairy below; leaf stalks smooth, slender, 1″ to 3″ long. Fruit small, pale red, bristly, not unpleasant to taste.

WILD BLACK CURRANT (*Ribes americanum*)

Erect shrub 3′ to 5′ high, common in wet woods and low ground. Luxuriant foliage and long drooping clusters of flowers and fruit. Stems are smooth and branches angular. Leaves large, 3 to 5 lobed, broader than long, thin, smooth, with a few yellow resin dots above, downy and many resin dots below. Fruit black, smooth, ¼″ in diameter, edible. Sometimes cultivated.

EUROPEAN BLACK CURRANT (*Ribes nigrum*)

Similar to the above. Is commonly found in gardens and occasionally about abandoned farms. Stems are smooth and round. Leaves 3 to 5 lobed, thick, broader than long, smooth, with yellow resin dots below. Fruit smooth, black, somewhat musky.

SWAMP RED CURRANT (*Ribes triste*)

Creeping or upright shrub. Stems and branches smooth. Leaves large, 3 to 5 lobed, broader than long, rounded at base, like red maple, very hairy below. Flowers dull yellow to purple. Fruit small, red, smooth.

CULTIVATED RED CURRANT (*Ribes rubrum*)

This is the common, garden currant planted for its fruit, and often found growing in the woods and about abandoned farms. Leaves thick, 3 to 5 lobed, not broader than long, downy below when young, becoming smooth, not resin dotted, mild odor when crushed. Branches thick and stocky. Flowers yellowish green. Fruit smooth, shiny, thin-skinned, tart, bright red or white.

FLOWERING CURRANT OR SPICE BUSH (*Ribes aureum and odoratum*)

Two ornamental species of currants commonly cultivated for their fragrant, showy, yellow flowers. Twigs and branches smooth. Leaves thick, leathery, 3 to 5 lobed, lobes entire or toothed at ends, usually hairy; leaves of *aureum* smaller and more wedge-shaped at base. Flowers yellow with pleasing odor. Fruit of *aureum* yellow, red or black; fruit of *odoratum* black.

WITCH HAZEL FAMILY (*Hamamelidaceae*)

WITCH HAZEL (*Hamamelis virginiana*)

Shrub or small tree common throughout in moist woodlands, generally in clusters of slender, irregular stems. Has remarkable habit of flowering as last year's fruit ripens and the leaves are falling in autumn. Leaves oval, broad, not symmetrical at base, margins wavy, principal veins prominent. Buds flattened, curved, covered with scale-like, undeveloped leaves with short brown hairs; terminal slender, sickle-shaped, nearly ½″ long, lateral very small. Twigs slender, zigzag, often downy near

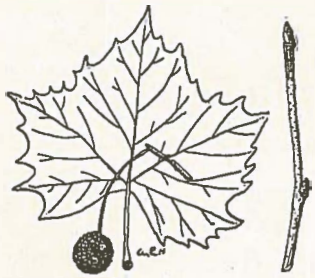
WITCH HAZEL.

the end. Flowers in long, yellow, curled and stringy clusters, perfect. Fruit a woody, hairy, 2-celled pod which splits open when ripe, often forcibly ejecting the two black bony nuts; empty pods remain all winter. Bark brown, mottled, smooth, becoming scaly on older trunks. Wood pale brown, tough, close-grained. Witch hazel oil is extracted from the bark, useful as a skin lotion. Forked witch hazel branches are used sometimes to indicate the presence of under ground water.

PLANE TREE FAMILY (*Platanaceae*)

SYCAMORE. BUTTONWOOD. PLANE TREE (*Platanus occidentalis*)

Large, massive tree growing near streams and on rich bottom lands, mostly in Merrimack and Connecticut Valleys. Frequently planted for ornamental purposes. Leaves very large, broad, grape-like, base of stalk covering new bud.



SYCAMORE.

Buds reddish, conical, smooth, entirely surrounded by scar of old leaf stalk. Flowers spherical, on long stalks, both kinds on same tree. Fruit a round ball, 1″ in diameter, singly or in twos, containing a mass of closely packed, hairy, club-shaped seeds, hanging from a slender stalk, ripening in autumn. Bark reddish brown or gray, on older trunks breaking off in large, thin plates, exposing white or greenish inner bark. Wood heavy, reddish brown, with very wide rays, not durable in soil. Used for furniture and interior finish in states where abundant.

ORIENTAL SYCAMORE (*Platanus orientalis*) is occasionally planted for ornamental purposes. The leaves are smaller and fruit stalks carry 2 to 4 balls.

ROSE FAMILY (*Rosaceae*)

One of the largest families of plants, including trees, shrubs and herbs. Only a few are timber trees. More of them are valuable for their fruit and berries. Others are attractive shrubs. Included in this family are plums, cherries and peaches, apples, pears, hawthorns, mountain ashes, service berry, choke berries and spiraea, roses, raspberries, blackberries and many others less well known. Leaves are simple or compound, always alternate on the stem. Flowers in clusters, perfect, rose-like, mostly with five petals, showy, often fragrant. Fruits variable, many being fleshy and edible. Of the many native and introduced shrubs and smaller woody plants belonging to this great and varied family, it is not possible to describe all in each group.

PLUMS AND CHERRIES (*Prunus*)

Trees or shrubs with smooth, somewhat reddish bark, marked with horizontal lines, bitter to taste, exuding gum from cracks. Leaves simple, oval, finely toothed. Buds with overlapping scales. Flowers white, in clusters. Fruit fleshy with hard, round or flattened and grooved stone. (Seed or pit)

CANADA PLUM (*Prunus nigra*)

Small, spreading tree or shrub scattered through northern woods, rare near the Coast; prefers rich, bottomlands. Naturalized for fruit and ornamental purposes. Leaves broadly oval, narrowed at base, terminating abruptly in long, narrow, sharp point, finely and doubly toothed. Buds chestnut brown, terminal lacking. Flowers in May before the leaves, in clusters of three or four, white,

CANADA PLUM.

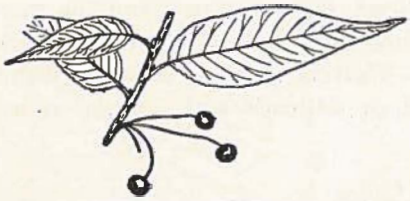
slightly fragrant. Fruit a sour, fleshy plum about an inch long, orange red skin, without bloom, yellow flesh, and oval, flattened stone, grooved on one side, ripening in early autumn. Bark thin, gray brown, scaly, roughened with age. Twigs smooth, slender. Wood reddish brown, hard, close grained.

BEACH PLUM (*Prunus maritima*)

Low shrub, 3′ or 4′ high, ranges south along the coast in sandy soil. Common on Cape Cod where fruit is used for preserving. Leaves oval, not sharp pointed, finely toothed, slightly hairy below; leaf stalks hairy. Fruit is smaller than Canada plum, purplish, covered with bloom.

RED, BIRD OR PIN CHERRY (*Prunus pennsylvanica*)

Small, slender tree very common throughout. Often forms pure stands temporarily after lumbering and fires. Short-lived and light demanding, it is eventually replaced by other trees. Leaves long, narrow, 3″ to 4″ long, sharp pointed, shiny. Buds small, often clustered. Twigs slender, glossy, reddish, with yellowish dots, bitter to taste. Bark on older trunks dark red-brown, thin outer bark peeling off readily and exposing green inner layer. Fruit loosely clustered, on slender stalks, bright red, round, size of a small pea, thin-skinned, sour flesh and hard, roundish or oblong stone, ripens in late summer. Wood soft, light brown.



RED OR PIN CHERRY.

BLACK CHERRY (*Prunus serotina*)

Large, valuable, rapid growing tree, widely distributed, not abundant, prefers rich, moist soil. Leaves variable,

rather long pointed, smooth, dark shiny green above, paler below, with fine, rounded teeth. Buds sharp pointed, reddish brown, usually not clustered. Bark smooth, very bitter, reddish brown on young trunks, becoming dark, almost black, roughened by thick irregular plates on old trees. Fruit in narrow drooping clusters from single, reddish stalks, shiny black when ripe, pleasant to taste; remains of calyx always showing. Wood reddish brown, sapwood yellowish, hard, fine-grained, takes beautiful polish. Highly prized for interior finish, furniture and cabinet work. No longer of sufficient size locally to be of commercial importance.

BLACK CHERRY.

CHOKE CHERRY (*Prunus virginiana*)

Small tree or shrub within our state, widely distributed in open places, along streams, borders of woods and abandoned areas at lower elevations. Best distinguished from black cherry by its smaller size, thin, broad and abruptly pointed leaves, larger and more rounded buds, smooth, grayish-brown bark without marked horizontal lines, harsh and more puckery taste. Fruit is borne in thick clusters, berries without calyx scars and reddish-black when ripe. Wood is hard, light brown.

CHOKE CHERRY.

A dwarf, trailing sand cherry, (*Prunus pumila*) less than 6′ high, is reported growing on sandy shores of the Merri-

mack, Connecticut and other rivers. Leaves smooth, slender, narrowed at base, toothed toward the tip, pale below; leaf stalks whitish. Fruit dark red or nearly black, borne singly or in small clusters on short stalks, sweet and insipid.

Another dwarf cherry, called Appalachian Cherry, (*Prunus cuneata*) under 4′ high, is described as occurring in New Hampshire. It grows in moist, sandy soils or rocky banks in thickets. Leaves are rounded and finely toothed at the end, narrow at base. Fruit small, purplish-black, in small clusters with longer stalks.

Apple Group (*Pomes*)

The wild crab-apples of Europe and perhaps other parts of our own country are the parents of cultivated apples. The apple, pear and quince are not native in our State, and wild trees found have escaped from cultivation. Closely related botanically to the apple (*Malus*) and the pear (*Pyrus*) are the Mountain Ash, (not a true ash) Shadbush or Serviceberry, Chokeberry, and the large group of hawthorns.

Mountain Ash (*Sorbus americana*)

Small, usually bushy tree of the north country, found on rich, moist soils and rocky slopes. Common throughout White Mountain region where it grows to its largest size and at high elevations. Leaves compound, 6″ to 10″ long, with 13 to 17 smooth, narrow, sharp pointed, finely toothed leaflets, in pairs and stalkless, except terminal; main leaf stalks reddish. Buds shiny-red, scaly, terminal large. Twigs gray, smooth, with conspicuous, pale

MOUNTAIN ASH.

dots and large brownish pith. Bark thin, smooth, grayish, scaly on older trees. Flowers white, in broad, flat clusters. Fruit berrylike, ¼", bright red, sour, borne in flat topped clusters with bright red stalks, ripens in early autumn and remains into the winter. Wood close-grained, weak, brownish.

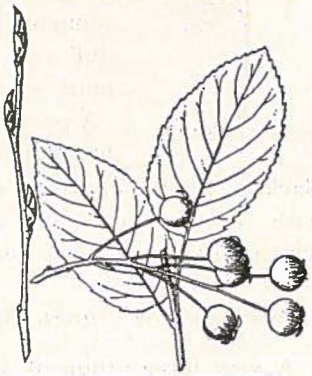
ELDER-LEAVED MOUNTAIN ASH (*Sorbus sitchensis*)

Another native species, not over 15′ high, is found on slopes and high elevations in the White Mountains. Leaflets are broader, blunt at ends, smooth, coarsely toothed. Flowers and fruit are larger than preceding.

EUROPEAN MOUNTAIN ASH (*Sorbus aucuparia*) is extensively planted for ornamental purposes on account of its beautiful foliage and brilliant, red berries. Leaves similar to our *americana* but with blunt, somewhat hairy leaflets. Buds are silky, and fruit large like *sitchensis* but with more abundant, rounded clusters.

SHAD-BUSH. SERVICE-BERRY (*Amelanchier canadensis*)

Usually a shrub, sometimes growing 25′ high, with slender, spreading branches, scattered in moist woods, swamps and along river banks. Graceful white flowers on slender stalks, conspicuous, first to bloom in early spring, when the shad were known to ascend the tidal rivers in earlier days. Leaves heart-shaped, sharp pointed, finely toothed, stalks and veins below distinctly woolly. Buds scaly, long, slender, pointed, greenish brown. Bark smooth, with reddish brown streaks. Fruit a dry, edible berry borne in clusters, few, reddish



SHAD-BUSH OR SERVICE BERRY.

purple, covered with bloom, 1/3″ to ½″ in diameter; contains small seeds, ripens in early summer. Wood dark brown tinged with red, hard, strong.

Several very similar species or varieties of our northern shad-bush are described by botanists. Smooth-leaved Shad-bush (*Amelanchier laevis*) with smaller, smoother leaves and leaf stalks, coarser teeth, less heart-shaped at base. Flower clusters are larger, drooping, and showy. This is a more northern species common in the State.

A small species (*Amelanchier bartramiana*) under 8′ high, is found on some of our higher mountains. Leaves are very small, oval, blunt, with fine, sharp teeth; leaf stalks short. Flowers small, in clusters of 1 to 3, long-stalked. Fruit large, ripening in July or August.

Chokeberry (*Aronia arbutifolia*)

CHOKEBERRY.

One of a small group of shrubs growing in clumps in swamps and wet woods. Leaves oval, 1″ to 3″ long, narrowed at base, abruptly pointed, shiny olive-green above, densely woolly below. Flowers white or purplish tinted, ½″ wide, in terminal clusters. Fruit berry-like, somewhat pear shaped, ¼″ diameter, in loose, compound clusters, on long, slender stalks, dull red, ripens in autumn and remains until winter, astringent.

A purple-fruited variety, (*atropurpurea*) has smaller leaves and large purple or blackish fruit. There is also a dwarf, black chokeberry with smooth leaves and shiny black, less puckery fruit, which falls soon after maturity.

Hawthorns or Thorn Apples (*Crataegus*)

A very large group of small trees and spreading shrubs reaching their best development on limestone soils in eastern

United States. Hawthorns have made the hedges of England famous. It would be hopeless for any beginner to attempt to separate them. They can usually be distinguished as a group by their long, unbranched thorns. Buds are small, scaly, rounded. Leaves simple, oval, toothed, sometimes lobed or deeply and doubly toothed. Flowers generally white, in flat, showy clusters. Bark grayish, smooth, sometimes roughened. Fruit resembles a very small apple, with dry, mealy flesh, containing 1 to 5 small, bony nuts, ripening in autumn. Wood is reddish brown, hard, heavy. Numerous species and varieties are listed as occurring in New Hampshire. Two types are described. below.

COCKSPUR THORN (*Crataegus crus-galli*)

Leaves oval, narrowed at base, variable, thick, smooth, finely toothed, usually entire at base. Thorns 3″ long. Fruit under ½″ long, greenish or dull red, remains all winter. Commonly cultivated.

CRATAEGUS (Cockspur Thorn)

SCARLET HAWTHORN (*Crataegus coccinea*)

CRATAEGUS (Species)

Leaves broad at base, pointed, deeply and doubly toothed. Thorns 1″ to 2″ long. Fruit round, bright scarlet. Found in old pastures.

MEADOW SWEET. WHITE HARDHACK (*Spiraea latifolia*)

Erect, straight stemmed shrub, 2′ to 4′ high, familiar to nearly everyone. Abundant in moist, open pastures and waste areas, often forming low thickets. Best known by

its white or pinkish flowers, borne in dense, steeple-shaped clusters, blooming from July to September. Leaves simple, 2″ to 3″ long, oval or rounded, toothed above the middle, smooth and bluish below, short-stalked. Stems slender, smooth, dark reddish-brown. Buds small, closely appressed. Fruit consists of clusters of dry, smooth capsules.

Another species, commonly called Steeple-bush or Red Hardhack, (*Spiraea tomentosa*) is very similar to the above, not quite so abundant, and may be distinguished by densely woolly twigs and under sides of leaves, short leaf stalks, and tall, slender, very pink or purple flowers.

There are several well known cultivated species such as *Spiraea vanhouttei, Spiraea thunbergii* and *Spiraea Anthony Waterer,* which have beautiful flowers but little resembling the wild species.

Ninebark (*Physocarpus opulifolius*)

Shrub 3′ to 10′ high growing on river banks, closely resembles some of the cultivated spiraeas. Leaves usually 3-lobed, smooth. Twigs smooth, slender, golden-brown. Bark peels off in thin strips. Buds small, close to stem. Flowers usually white, in rounded clusters on short branches. Fruit clusters of purplish capsules, persistent, containing bony seeds.

Shrubby Cinquefoil. Five Finger (*Potentilla fruticosa*)

A small, leafy, branching shrub in moist swampy or rocky soil, under 4′ high, with peculiar, shreddy bark. Leaves compound, with 5 to 7 slender leaflets, ½″ to ¾″ long, edges entire, wavy, silky or hairy, whitish. Flowers borne singly or in clusters, bright yellow, ½″ wide. Fruit dry, clustered.

Brambles (*Rubus*)

Includes raspberries and blackberries, having prickly, woody stems, (canes), and large piths which die after the

second season of growth, giving way to new shoots from the root. Because of their abundance and edible fruit, a few of the native species are mentioned below.

WILD RED RASPBERRY (*Rubus strigosus*)

Common throughout but most abundant following cutting in White Mountain forests. Leaves compound, lower with 5 leaflets, 3 in upper, yellow-green, smooth above, pale or whitish, downy beneath, coarsely toothed or slightly lobed. New stems have weak prickles. Flowers with 5 white petals, ½" wide, in clusters. Fruit red, delicious, easily separates from white base when ripe.

BLACK RASPBERRY. THIMBLE BERRY. BLACK CAP (*Rubus occidentalis*)

Similar to red raspberry. Not abundant, more southern in range. Found along stone walls and rocky pastures. Leaflets 3, sometimes 5, lower sides and stems covered with whitish bloom. Often roots from tips, prickly. Fruit purple-black.

PURPLE FLOWERING RASPBERRY (*Rubus odoratus*)

Leaves large, 3 to 5 lobed, not compound; lobes pointed, finely toothed. Stems hairy, not prickly. Flowers large, rose-purple, showy. Fruit red, depressed, sour, scarcely edible.

HIGH BLACKBERRY (*Rubus nigrobaccus*)

The parent of most cultivated blackberries. Common throughout, especially in forest clearings and along roadsides at lower altitudes. Leaves compound, 3 to 5 leaflets, somewhat downy beneath. Stems often 8′ high, with stout, curved prickles. Flowers white, showy, clustered at the end of branches. Fruit black, usually long, sweet. There are many varieties of form and habit and other distinct

species not easy to distinguish. *Allegheniensis* is a mountain type.

THORNLESS BLACKBERRY (*Rubus canadensis*)

Similar to high blackberry but having nearly thornless canes, long, slender and smooth leaflets and roundish fruit.

RUNNING SWAMP BLACKBERRY (*Rubus hispidus*)

Often forming a tangle of slender, creeping, prickly stems on flat or low ground. Leaflets mostly three, shiny, thick, tending to be evergreen. Fruit composed of a few grains, reddish black, sour.

DEWBERRY (*Rubus procumbens*) is a low-running species found along roadsides and banks in dry soils. Leaflets 3 to 7, large, firm, rounded at base, sharply and doublv toothed. Fruit a few, large, shiny, black grains.

WILD ROSES (*Rosa*)

Erect or climbing shrubs, usually with prickly stems, sometimes thorns, conspicuous, large fragrant flowers with usually five petals and cup shaped calyx which becomes fleshy and in fruit contains the bony seeds. This calyx cup, (called hip) is usually bright red when mature. Leaves are compound, with 3 or more leaflets. There are several species and not easily separated.

SWAMP ROSE (*Rosa carolina*)

Forms thickets up to 8′ high in swamps and low ground. Most abundant in eastern part of State. Leaflets usually 7, finely toothed, often pubescent below, not resinous. Twigs slender, purplish, with stout, scattered prickles, sometimes lacking. Flowers, pink, about 2″ wide, in clusters. Fruit or hip 1/3″ high, roundish, remains all winter.

SMOOTH ROSE (*Rosa blanda*)

Low shrub, under 3′ high, stems reddish with soft, few prickles. Leaflets smooth, short-stalked, broad stipules at base of leaf. Flowers large, often solitary, blooms early. Grows in dry or rocky places.

PASTURE ROSE (*Rosa humilis*)

Also low shrub on dry soils, 6″ to 3′ high, erect stems with few slender thorns below the narrow stipules, also prickles. Leaflets 5 to 7, thin, not shiny.

SHINY OR GLOSSY ROSE (*Rosa lucida*)

Bushy 3′ to 6′ high, in wet places. Leaflets 7 to 9, shiny above, thick.

NORTHEASTERN ROSE (*Rosa nitida*)

Under 2′ high, reported from southern parts of State. Grows in swamp borders and low ground. Leaflets narrow, thick, shiny, sharply toothed. Stems reddish, covered with slender, straight prickles.

SWEET BRIER (*Rosa rubiginosa*)

Originally introduced from Europe; now a common wild rose in pastures and along roadsides. Grows 4′ to 6′ high. Stems greenish, stout, armed with stiff, curved thorns but no prickles. Leaflets 5 to 7, doubly toothed, resinous, smooth above, pale or pubescent below. Flowers rather small, borne singly or in clusters of 2 or 3.

DOG ROSE (*Rosa canina*) is also an introduced species run wild, similar to Sweet Brier but with short hooked thorns and flowers without fragrance.

PULSE FAMILY (*Leguminosae*)

A notable family of world plants, including the mesquites and acacias of semi desert regions as well as the beans and peas of our gardens and clover and alfalfa of the hay farms. All belong to the pod bearers and mostly all have compound leaves, some doubly compound. Tropical members include medicinal and dye woods. A remarkable power of the roots of most legumes is that of taking up nitrogen, a valuable plant food, from the air. By plowing clover and such plants into the soil, fertility is restored. It is doubtful if any trees of this family are native in our state or even in New England. The locusts have been so commonly planted, especially black locust, that they are included.

Black or Yellow Locust (*Robinia pseudacacia*)

Rapid growing, light demanding tree with thin, lace-like foliage, frequently planted for ornament and often escaped from cultivation. Spreading by underground roots, it tends to form thickets and groves over small areas. Easily identified. Leaves compound, 8″ to 14″ long, leaflets 7 to 21, about ½″ long, oval, smooth, margins entire. Twigs brittle, more or less angular and ridged, often with two short prickles at the base of the leaf. Buds small, 3 or 4, one above another, imbedded in twig under large leaf scars, without scales, covered by last year's leaf stalk; terminal buds absent. Bark rough, deeply furrowed. Flowers white, clustered on slender stalks, like pea blossoms, fragrant, perfect. Fruit a smooth, flat pod about 3″ long, containing 4 to 8 small, hard, dark brown seeds. Wood very hard, strong and durable, sapwood yellow and heart reddish-brown. Valuable timber tree useful for fence posts, telephone insulator pins, turnery, etc.

BLACK OR YELLOW LOCUST.

HONEY LOCUST (*Gleditsia triacanthos*)

Large tree in the Middle West, occasionally planted and has escaped to uncultivated places. Has the family characteristics of black locust and other pod bearers. The long, single or barbed thorns on the twigs, branches and trunk leave no doubt about its identity. Leaves are singly or doubly compound, 7″ or 8″ long, leaflets 18 to 28, narrow, oval, margins somewhat irregular. Buds similar to preceding. Flowers are greenish, not conspicuous, male and female on the same or often on different trees. Fruit a flat, curled or twisted pod 10″ to 18″ long containing many, brown, flat, oval seeds the size of small beans. Wood hard, heavy, durable, heartwood reddish-brown, sapwood pale.

HONEY LOCUST.

RUE FAMILY (*Rutaceae*)

PRICKLY ASH (*Xanthoxylum americanum*)

This small, prickly tree or shrub has been reported from near Nashua and elsewhere in the State, perhaps escaped from cultivation. Its range is Quebec to Virginia; uncommon in New England. Low branching, 4′ to 12′ high, growing in rocky woods and along streams. Leaves compound, leaflets 5 to 11, sharp pointed, broad at base, nearly entire and stalkless, dotted with oil glands, aromatic, lemon-like odor. Buds round, reddish brown. Small branches smooth, grayish, with single, often opposite pairs of short, stout prickles. Flowers small, greenish, clustered, appearing before the leaves, two kinds on different trees. Fruit small, oval capsules, containing one or two shiny, black seeds.

AILANTHUS FAMILY (*Simaroubaceae*)

AILANTHUS. TREE OF HEAVEN (*Ailanthus altissima*)

Large, coarse looking tree, native of China and planted because of very rapid growth. Rank odor of female flowers and tendency to sprout from roots have made it unpopular. Often found growing in waste spots and near buildings within congested cities. Branches are coarse, clumsy, without delicate branchlets and pleasing ornamental effects; ugly in winter. May be mistaken for sumac.

AILANTHUS.

Leaves compound, 1′ to 3′ long, with 11 to 30 or more leaflets 3″ to 5″ long, sharp pointed, toothed near base, unpleasant odor. Leaf scars very large, heart-shaped, half enclosing the buds, which are small, round, downy, with open scales not covering end of bud. Twigs large, yellowish or reddish green, covered with velvety down, large, hard, light brown pith. Flowers small, greenish, in terminal clusters, male and female on different trees. Fruit a cluster of twisted, leaf-like wings, 1½″ long, each containing a single seed in center. Bark, smooth, thin, gray on young trees; dark on old trees. Wood soft, white or pale yellow, not durable; might be useful in paper making.

CROWBERRY FAMILY (*Empetraceae*)

Low, rare, creeping shrubs with very small, narrow, crowded, evergreen leaves and berry-like fruit.

BLACK CROWBERRY OR HEATHBERRY (*Empetrum nigrum*)

This low shrub may be looked for only in dense, branching masses on some of the higher mountain summits. Leaves

⅛" to ¼" long, narrow, edges entire, curled back, thick, bright green. Flowers in summer, purplish, inconspicuous. Fruit a round, black berry, size of a pea, slightly acid, containing 6 to 9 seeds.

BROOM CROWBERRY (*Corema conradii*)

Very rare shrub, 6" to 2' high, evergreen, may be looked for in rocky or sandy soil near the Coast. Leaves linear, about ¼" long, curled, thick, crowded, bright green. Flowers without petals, in terminal clusters, inconspicuous. Fruit very small, round, dry berry, with usually 3 seeds.

SUMAC FAMILY (*Anacardiaceae*)

Small trees or shrubs with large, pithy twigs and milky or sticky and resinous sap. Leaves compound; leaf scars large. Two of the five species of Sumac native to New Hampshire are poisonous and they are the only poisonous woody plants we have. Both have white berries while all other sumac berries are red. The smoke-tree, (*Cotinus*) of our gardens belong to this family.

STAGHORN SUMAC (*Rhus hirta or typhina*)

Small tree, not poisonous, grows to 20' high or over, common throughout the State at lower elevations. Prefers moist, rocky, open situations. Usually found in clumps and thickets with characteristic flat tops. Velvety twigs resemble the young horns of a deer. Leaves are 16" to 24" long, with 11 to 21 or more opposite leaflets, very short stalked, toothed, smooth, pale below; leaf stalks hairy. Leaf scars nearly encircle the small, rounded, scaly and rusty buds. Twigs velvety, brownish, becoming smooth

STAGHORN SUMAC.

after about three years; tips often winter-killed. Pith large, yellowish brown. Bark thin, smooth, brown, later covered with rough dots. Flowers yellowish-green, cone-like clusters, male and female on different trees. Fruit compact, erect, cone-like, consisting of dry, red, hairy berries, each containing a hard seed; matures in late summer and remains all winter. Wood soft, brittle, orange to greenish, satiny.

SMOOTH SUMAC (*Rhus glabra*)

Common shrub under 10′ high, similar to Staghorn, but with smooth twigs and lighter bark. Leaves distinctly whitish below. Sap milky. Not poisonous.

DWARF SUMAC (*Rhus copallina*)

A low shrub, usually under 4′, similar to above two species. Leaves 6″ to 12″ long, always with winged leaf stalks; leaflets 9 to 21, shiny, often not symmetrical, margins mostly entire or toothed near end. Twigs velvety like Staghorn. Sap watery, resinous. Not poisonous.

POISON SUMAC (*Rhus vernix*)

Small, rather uncommon, extremely poisonous tree, 10′ or more high, found in moist swamps southern part of State. Sometimes called poison oak and poison dogwood. Has the general appearance of other sumac, not so flat-topped, but is easily identified, if care is used, and should be avoided. For most persons it is very poisonous to touch, especially in early summer. Leaves 7″ to 14″ long, with 7 to 13 thin, smooth leaflets, margins entire; leaf stalks without wings. Twigs

POISON SUMAC.

smooth, rather stout, often glossy. Terminal buds present; leaf scars do not encircle buds. Sap watery, turning yellow. Bark grayish. Fruit a loose, drooping, grape-like cluster of ivory or yellowish white berries, size of a small pea. Since male and female flowers occur on different trees, many specimens do not bear fruit.

POISON IVY (*Rhus radicans or toxicodendron*)

Creeping and climbing vine, which should be instantly recognized and avoided. Very common in thickets about rock piles, fences and stone walls, frequently climbing trunks of trees. Leaves are compound, with three broad, oval leaflets, entire, partly toothed or lobed. Fruit white, similar to the preceding. Easily distinguished from two harmless, common vines, Virginia Creeper which has five palmate leaflets in a cluster and from Bittersweet which has simple leaves. If poisoned by either of the above plants, at once apply a paste of common baking soda, a saturated solution of acetate of lead, or pure alcohol.

HOLLY FAMILY (*Aquifoliaceae*)

In our state this family is represented only by certain deciduous shrubs with bright red berries, valued for winter decoration. The well known evergreen Christmas holly (*Ilex opaca*) of the South is found sparingly on Cape Cod but is not reported within our State.

BLACK ALDER. WINTERBERRY (*Ilex verticillata*)

Slender shrub mostly under 10′ high. Common throughout in swamps and low, moist places. Leaves simple, oval, pointed, 2″ to 3″ long, finely and sharply toothed, thick, smooth above, somewhat hairy below. Buds very small, brown, sometimes one above another. Bark gray, mottled, smooth, bitter. Flowers small, inconspicuous, greenish-white. Fruit solitary or clusters of two or three round,

BLACK ALDER OR WINTERBERRY.

scarlet berries about ¼″ in diameter, close to twigs in axils of the leaves; pulp nauseous, contains 3 to 8 seeds. Fruit remains long after leaves have fallen. Used for Christmas decoration. There are several varieties.

SMOOTH WINTERBERRY (*Ilex laevigata*)

A shrub similar to the above and found in swamps southern part of State. Leaves are thin, pointed, smooth on both sides and mostly entire. The red berries are larger, less clustered and fall earlier than Black Alder.

A small, evergreen shrub, under 6′, called Ink berry, (*Ilex glabra*) with thick, leathery, shiny leaves, narrow at base, toothed near the end, ashy, downy twigs and black berries, may be looked for along the Coast on low, sandy soil.

MOUNTAIN HOLLY (*Nemopanthus mucronata*)

This slender, branching shrub, not over 6′ high, is a member of the Holly Family and closely related to the winterberries. Found throughout the State, more commonly in the highlands of the North, in rich, damp woods; rare near the Coast. Leaves in tufts or clusters on short branches, less than 2″ long, oval, smooth, firm, light yellowish green, mostly entire. Bark ashy-grey, often covered with lichens. New stems often reddish. Flowers small, white, inconspicuous. Fruit round, crimson berries, ¼″ in diameter, with 4 or 5 seeds, borne singly on long, slender stalks from axils of the sleeves.

MOUNTAIN HOLLY.

STAFF-TREE FAMILY (*Celastraceae*)

A family of trailing, upright or climbing shrubs, including Euonymus with several species not quite native in New Hampshire, and many varieties of evergreen winter creepers sold by nurserymen for ornamental effects. All have opposite leaves except Bitter-sweet.

Climbing Bitter-sweet (*Celastrus scandens*)

This climbing shrub, sometimes called wax-work, common near the Merrimack and Connecticut Rivers and elsewhere, is the only native representative of the family. It twines about trees and shrubbery, sometimes ascending 20′ to 25′ or more. Stems smooth, grayish, showing tough, silvery threads when broken. Leaves simple, alternate, deciduous, 2″ to 4″ long, ovate, pointed, smooth, finely-toothed. Flowers small, greenish, in terminal clusters, not conspicuous. Fruit a showy, 3-valved, orange or yellow capsule, ½″ diameter, which splits open, exposing a fleshy, crimson center (aril) containing 3 to 6 crimson seeds; remaining into the winter. Often cultivated.

BLADDER-NUT FAMILY (*Staphyleaceae*)

American Bladder-nut (*Staphylea trifoliata*)

Shrub or small tree not over 16′ high, reported only in Connecticut Valley. Leaves are opposite on the twig, compound with three leaflets borne on a long stalk; leaflets broadly oval, pointed, smooth above, finely toothed. Twigs and bark smooth, gray or greenish striped. Flowers small, white, with five erect petals, in long, drooping clusters,

AMERICAN BLADDER-NUT.

perfect. Fruit a three-angled, pale green, papery capsule 1½" long, containing 2 to 5 hard, brown, flattened seeds. When ripe, seeds become detached and rattle in the balloon-like pods.

MAPLE FAMILY (*Aceraceae*)

Consists of but one American genus, (*Acer*) mostly trees well known for their lumber and maple sugar products, as well as for their ornamental value. Leaves are large and broad, simple (except one), and all are opposite on the twigs. Flowers are small, reddish or yellow-green. Fruit consists of a pair of winged seeds, joined together to form the familiar key or samara.

Sugar or Rock Maple (*Acer saccharum*)

Largest and most valuable of the maples for timber and sugar products and with American elm, the commonest shade trees throughout New Hampshire. Grows best on better soils of central and northern parts of State. Leaves usually 5-lobed, coarsely toothed, broader than long, thin, smooth, bright green above, pale below. Buds slender, smooth, brownish, pointed, with overlapping scales. Twigs slender, smooth, yellowish-brown, dotted. Flowers with the leaves, yellow-green, without petals, male and female in different clusters on same tree. Fruit in short, terminal clusters, matures in September, wings of the keys one inch or more long, parallel or slightly spreading out. Bark on older trunks grayish brown, hard, shaggy, cracking into coarse scales and vertical plates. Wood hard, heavy, close-grained, reddish brown. Used for inside finish, flooring, furniture, shoe lasts, turnery, etc. Curly and bird's eye maple caused by abnormal

SUGAR OR ROCK MAPLE.

growth and are highly prized in cabinet making. Sugar maple groves near farms are in general use and have high value for the production of maple syrup and sugar.

Black Maple (*Acer nigrum*)

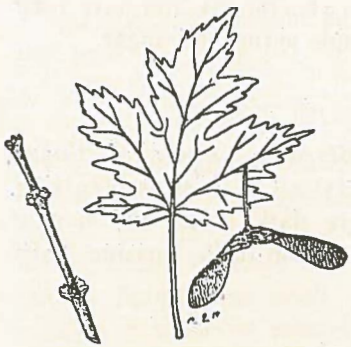
A large tree formerly considered a variety of Sugar Maple. Reported in Forest Service Checklist as occurring in Cheshire County. Leaves are dark green and downy below, generally 3-lobed, lobes without teeth, variable. Bark of old trunks is almost black.

Red or Swamp Maple (*Acer rubrum*)

Common, rapid growing and widely distributed tree bordering streams, low swampy lands and often dry uplands where it forms brushy areas after lumbering. Named for red buds, twigs, flowers and autumn foliage. Leaves longer than broad, not large, with three principal lobes and rounded, semi-circular base or with two small, additional lobes at the base, sharp angles between lobes, irregularly toothed, smooth, bright green above, pale or whitish below; leaf stems long, slender, reddish. Buds red, blunt, scaly; flower buds separate, conspicuous. Flowers appear before the leaves in red clusters on short stems, petals present, male and female in different clusters on same or different trees. Fruit matures in early summer, wings of keys about one inch long, reddish, spreading out when full grown. Bark on older trunks grayish, thick, separating and often peeling in long up and down scales. Wood relatively soft, light brown, not extensively used, except for fuel and recently for paper making.

RED OR SWAMP MAPLE.

SILVER OR WHITE MAPLE (*Acer saccharinum*)



SILVER OR WHITE MAPLE.

Similar in habits to the Red Maple. Common in lowlands and along larger streams except near the Coast. Leaves are 5-lobed, deeply cut, silvery white below, margins doubly toothed. Buds red, blunt, clustered. Twigs green or reddish, strong odor when bruised. Flowers appear before the leaves from separate, lateral buds, greenish-yellow, without petals. Fruit ripens even before leaves are full grown, large, wings of keys about 2″ long, spread wide apart. Wood moderately hard, similar to Red Maple, brittle. Often planted for ornamental purposes. Valuable for paper making.

STRIPED MAPLE. MOOSEWOOD (*Acer pennsylvanicum*)

STRIPED MAPLE OR MOOSEWOOD.

Small tree or shrub growing in moist, shady forests at higher elevations. Uncommon near the Coast. Leaves very large, 3 lobed toward the end, base deeply rounded, finely toothed, thin, bright green above, paler with russet hairs below. Buds large, red, glossy, angular, stalked, valvate; lateral buds closely appressed. Flowers in drooping clusters after leaves are full grown. Fruit ripens in September, wings of keys ¾″ long, thin, widely spread. Bark smooth, greenish, conspicuously streaked with white and black; resembles a snake skin.

MOUNTAIN MAPLE (*Acer spicatum*)

Also a small tree or shrub loving the shade of moist, highland forests. Common only in the mountains, rocky stream borders and ravines. Leaves 3 to 5 lobed, narrow, coarsely toothed, smooth above, pale or woolly below. Buds small, stalked, one or two pairs of hairy scales showing. Twigs green or purplish, hairy. Flowers after the leaves, small, whitish or yellow, in erect, terminal clusters, 5″ or 6″ long. Fruit in September, wings of the keys smallest of the maples, less than ¾″ long, slightly spread out, reddish. Bark smooth, grayish brown, somewhat mottled but not striped.

ASH-LEAVED MAPLE. BOXELDER (*Acer negundo*)

This tree is probably native only in the Connecticut Valley, although frequently planted for ornament. Grows along stream borders and in moist soils. It is the only maple with compound leaves. Leaflets are 3 to 5, oval, irregular in shape, often lobed, especially terminal one, coarsely toothed; leaf stalks enlarged at base, nearly covering the next year's bud. Twigs greenish, often covered with white bloom. Flowers appear before or with the leaves, yellowish-green, male and female on different trees. Fruit keys in long, drooping clusters, with wings 1½″ to 2″ long, parallel or curved inward. Wood is soft and light colored.

ASH-LEAVED MAPLE OR BOXELDER.

NORWAY MAPLE (*Acer platanoides*)

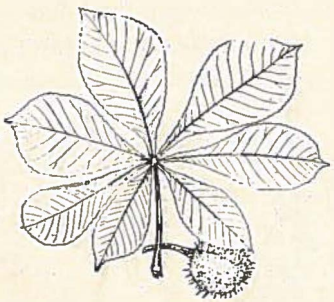
Among a number of introduced maples only the Norway will be mentioned. This is a large, beautiful tree from Europe, now being extensively planted along city streets. Quite free from insect and fungus attack and endures un-

favorable conditions. Leaves are similar to Sugar Maple but larger, darker and thicker, and remain on tree longer. Leaf stalks contain a milky sap. Fruit large with keys widely spread; matures in autumn. In winter the terminal buds are large, blunt, glossy red, more or less greenish at base. Bark with dark, firm, even ridges, not scaly.

HORSE CHESTNUT FAMILY (*Hippocastanaceae*)

Horse Chestnut (*Aesculus hippocastanum*)

Not one member of this family is native to New Hampshire. Our commonly planted horse chestnut was introduced from Europe and originated in Greece or Asia. In the West and South several native species are known as buckeyes. On account of the large, mahogany colored nuts, Horse Chestnut is as well known and as much enjoyed by the boys as any native trees. It is really one of our most beautiful ornamental trees, especially when in bloom. A brief description may be of interest.



HORSE CHESTNUT.

Leaves are opposite on the twigs, compound, usually 7 (sometimes 5) large leaflets extend radially from the end of the long leaf stalk; leaflets 5″ to 7″ long, wedge-shaped, abruptly-pointed, coarsely toothed, thick, dark green and rough above, pale below. Leaf scars large, shield-shaped. Buds terminal very large, brown, scaly, covered with resinous gum. Twigs coarse, smooth, reddish brown, with large, pale pith. Flowers white, spotted with red or yellow, in large, erect, pyramid-like clusters, perfect or both kinds on the same tree. Fruit a prickly, rounded capsule, 1½″ diameter, containing one or more red-brown, shiny nuts,

each with a large, pale scar. Bark brownish, smooth, becoming somewhat scaly or fissured on old trunks. Wood white, soft, weak.

The red flowered horse chestnut, sold by nurserymen, is probably a hybrid of Horse Chestnut and a red buckeye of the South.

BUCKTHORN FAMILY (*Rhamnaceae*)

Two genera of this family of shrubs or small trees are found in New Hampshire. Fruit a round, black berry, sometimes used in medicine and to make dyes.

Alder-Leaved Buckthorn (*Rhamnus alnifolia*)

Small, rare, native shrub, 2′ to 4′ high. May be looked for in clumps in swamps and moist ground. Leaves alternate, oval, pointed at both ends, veins deep and prominent, smooth, shiny above, finely toothed. Buds scaly. Branches grayish, nearly smooth, not thorny. Flowers without petals, yellowish, inconspicuous. Fruit round, black, with 3 grooved seeds.

BUCKTHORN (Species)

Common Buckthorn (*Rhamnus cathartica*)

Naturalized from Europe and formerly cultivated as a hedge plant. Frequently has escaped from cultivation. Not over 12′ high, usually thorney. Leaves small, rounded, blunt pointed, smooth above, somewhat downy below, finely toothed, veins conspicuous. Buds scaly. Branches rather short, stiff, often ending in sharp, thorny points. Flowers after the leaves, clustered, small, with 4 yellowish green petals. Fruit a black, round, shiny berry, nauseous, singly or in clusters. Wood hard, reddish or orange-colored.

NEW JERSEY TEA. RED ROOT (*Ceanothus americanus*)

NEW JERSEY TEA.

Fairly common shrub under 4′ high, growing in rounded clumps in dry open woods, southern part of State. Leaves said to have been used to make tea during the Revolutionary War. Leaves are oval, slightly heart-shaped at base, pointed, finely toothed, smooth above, somewhat hairy and veins prominent below. Twigs yellow-green to red, downy. Roots deep red. Flowers small, white, forming rounded, lace-like clusters at ends of leafy branches. Fruit a dry, nearly black, 3 celled berry, each cell containing a seed or nut.

GRAPE FAMILY (*Vitaceae*)

Three species of wild grapes and common woodbine belonging to this family are native at lower elevations in New Hampshire. All are woody vines which climb by means of tendrils. The grapes cling by coiling tendrils; while woodbine has tendrils tipped with disks which cling to the support. Leaves of grapes simple, large; leaves of woodbine compound, with 5 leaflets. Flowers are all small, yellow-green, clustered. Fruit of grapes is the well known pulpy berry containing several pear shaped seeds; fruit of woodbine is a small, reddish black or blue, large seeded berry.

FOX GRAPE (*Vitis labrusca*) Common wild grape, origin of many cultivated varieties, found in low, moist soils. Leaves large, thick, strongly veined, each opposite a tendril or flower cluster, varying in shape, sometimes lobed, rounded between the lobes, toothed, white or rusty below. Leaf stalks, forked tendrils and young twigs densely woolly. Fruit large, blue or reddish, skins thick and tough, sweet, fragrant.

SUMMER GRAPE (*Vitis aestivalis*) Leaves similar to above but smooth, same color below as above, tufts of reddish hair on veins below, tendril lacking opposite each third leaf. Fruit blackish, 1/3″ diameter or less.

FROST GRAPE (*Vitis riparia or vulpina*) Reported as far north as Fifteen Mile Falls of the Connecticut. Leaves thin, heart-shaped, often 3 lobed or irregularly toothed, glossy above and mostly smooth below. Fruit small, ½″ diameter or less, purple or black with bloom, seedy, tart, ripens only after frost.

WOODBINE. VIRGINIA CREEPER (*Ampelopsis quinquefolia*)

Native vine in thickets and moist woods and often found on tree trunks and stone walls. Extensively cultivated. Sometimes confused with poison ivy. May always be recognized by its 5 clustered leaflets. Leaf scars are rounded and raised, with sunken centers. Tendrils numerous, adhering at ends. Fruit, blue, size of pea, reddish stalks, not edible.

LINDEN FAMILY (*Tiliaceae*)

BASSWOOD OR LINDEN (*Tilia glabra or americana*)

Large and valuable timber tree and the only member of this family native in our State. In the South often called Linn or Bee Tree, a favorite of bees in gathering honey. Scattered or in clumps throughout the hardwood forests on moist, bottomland soils. Trees of large size not now very common. Leaves unequally heart shaped, 4″ to 7″ long, one side broader than the other, pointed, coarsely toothed, smooth above and nearly so below. Buds large, deep red or slightly greenish, flattened, one side humped, three scales showing. Twigs

BASSWOOD.

mostly smooth, olive green, reddish or grayish, with dark dots, flattened and slightly zigzag. Bark smooth and grayish, becoming thick and ridged on old trunks. Flowers perfect, 5 yellowish white petals, fragrant, in drooping clusters; flower stalk attached to middle of a long, leafy wing. Fruit a cluster of round, hard, green nuts, attached to leafy wing mentioned above which acts as a parachute when fruit falls. Wood nearly white, soft but strong, easy to work. Formerly used for barrel heads, wooden ware, furniture and miscellaneous purposes. Valuable tree to plant for timber production and for ornament.

A EUROPEAN LINDEN (*Tilia europoea*) is extensively used for street planting in Washington, D. C., and many other cities of the Northeast and is hardy in New Hampshire. Similar to Basswood but with smaller leaves.

ROCKROSE FAMILY (*Cistaceae*)

A family of low shrubs and herbs of which the genus Hudsonia is represented by one or two species in our State.

WOOLLY HUDSONIA (*Hudsonia tomentosa*)

Small bushy shrub growing erect in dense patches less than a foot above the ground. May be found in dry, sandy, pine barrens or near the sea shore. It spreads from underground stems. Leaves simple, scale like, ¼″ long on branching stems, stiff, entire, appressed, covered with white down. Flowers tiny, bright yellow, short-stalked, crowded near the ends of branches. Fruit a very small, oblong capsule, containing one or several seeds.

MEZEREUM FAMILY (*Thymeleaceae*)

LEATHERWOOD (*Dirca palustris*)

Shrub 2′ to 6′ high, mostly growing as an understory in moist, shady woods and in thickets. Has exceedingly tough inner bark, used by Indians for bow strings and fish lines.

Generally distributed. Leaves simple, 2″ to 3″ long, oval, narrow at base, entire, smooth, yellowish; leaf stalks short, covering next year's brown, velvety, scaly buds. Flowers perfect, light yellow, before or with the leaves, 3 or 4 in a cluster, without petals. Fruit an egg-shaped berry, 1/3″ long, reddish, leathery, containing one large seed. Twigs smooth, yellowish green, peculiarly jointed appearance, clustered at end of branches. Old bark golden brown, tough, fibrous, of great strength. Wood is white, soft, brittle.

LEATHERWOOD.

OLEASTER FAMILY (*Elaeagnaceae*)

Buffalo-Berry (*Shepherdia canadensis*)

A northern shrub 3′ to 8′ high, with light colored, scurfy shoots, found on gravelly banks along streams and on sterile soils elsewhere. Leaves opposite, oval, 1″ to 2″ long, narrow at base, blunt, thick, entire, rather smooth above, densely rusty below; leaf stalks short, enclosing the buds. Flowers small, yellowish, clustered. Fruit small, oval, red or yellowish berry, ¼″ long, flesh insipid, enclosing a smooth seed.

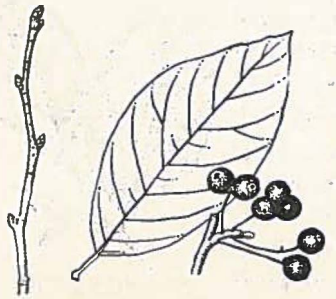
GUM FAMILY (*Nyssaceae*)

The Gums are trees of the southern swamps, except that Black Gum also inhabits drier soils and has its northeastern limit in New England. Many botanists class them in the Dogwood Family, to which they are closely related.

Black Gum, Tupelo or Pepperidge (*Nyssa sylvatica*)

A medium sized tree occasionally found in moist, low woods south of the White Mountains; rather rare. Old trunks are distinguished by their nearly black, deeply furrowed bark, broken into alligator-like sections. The branches tend to grow straight out from the trunk, the lower

ones often drooping. Leaves are simple, alternate, oval, 2″ to 4″ long, mostly entire, thick, dark and shiny above, pale and sometimes hairy below. Buds reddish brown, rather broad, ¼″ long, covered with 3 to 5 overlapping scales; lateral ones smaller, close to or within the old leaf scar. Leaf scars prominent, crescent shaped, with three dark dots (bundlescars) within. Twigs smooth, grayish, with white pith, separated by layers of hard cells. Flowers small, yellowish green, inconspicuous, borne in clusters on long, slender, somewhat downy stalks, two kinds on different trees. Fruit in clusters of 1 to 3 oval, dark blue, acid berries, each containing a single, hard seed; matures in September. Wood light yellow, tough, difficult to split, not hard or durable. Used for wheel hubs, chopping bowls, various kinds of turnery, etc.



BLACK GUM.

DOGWOOD FAMILY (*Cornaceae*)

A group of small spreading trees and shrubs with distinctive bark, mostly smooth, red or greenish; leaves simple, opposite, except one, entire, veins prominent below; fruit a blue, red or white berry, mostly in flat clusters; wood very hard. More or less common throughout the State in moist borders of woods and along streams. Attractive as ornamental shrubs.

Flowering Dogwood (*Cornus florida*)

Largest of the dogwoods, 20′ to 30′ high, not common, probably found only in the south-eastern and the lower Connecticut Valley sections. Prefers rich, moist soils under forest trees. Leaves opposite, oval, clustered toward ends of twigs, entire or wavy margins, pale below, veins

prominent. Buds brown, valvate, lateral small, covered by old leaf stalks; large terminal flower buds round, flattened, button shaped. Flowers perfect, white, showy part not petals but consists of 4 outside bracts 2″ or more wide. Fruit in clusters of 2 to 5 scarlet, oval berries, each with a hard, grooved stone. Twigs red or greenish. Bark reddish brown, becoming black and breaking into small, 4-sided blocks on old trunks. Wood pinkish-white, heavy, hard and strong; used farther south for heads of golf sticks, shuttles, wedges, tool handles, etc.

The little woods flower, Bunch Berry (*Cornus canadensis*) with its 4 white flower bracts and clusters of red berries in autumn, is a diminutive example of the Flowering Dogwood.

Alternate Leaved Dogwood (*Cornus alternifolia*)

Small tree or shrub under 20′ high, very common near streams and moist places in the open. The only dogwood with alternate leaves. Buds small, brown, pointed, 2 or 3 scales showing. Flowers small, cream colored, in flat topped, lace-like clusters, very unlike Flowering Dogwood. Fruit in clusters of round, dark blue berries; fruit stalks reddish. Twigs slender, smooth, dark green streaked with white, bitter to taste.

ALTERNATE LEAVED DOGWOOD.

Round-leaved Dogwood (*Cornus circinata*)

Shrub mostly under 6′ high, smaller but somewhat similar to above, reported in Connecticut Valley and probably found elsewhere. Leaves large, broadly oval, very woolly below. Flowers small, white, in flat, compact clusters. Fruit round, pale blue berry, clustered. Twigs and bark green, with gray, warty dots.

Silky Cornel (*Cornus amomum*)

Shrubs to 10′ high quite common near streams at lower elevations. Leaves are narrow, long pointed, pale and silky below. Flowers like the preceding but in small, compact clusters. Fruit pale blue. Twigs green streaked with red and brown; older bark brown to purplish.

Red Osier Dogwood (*Cornus stolonifera*)

Shrub usually under 6′ high, very common, extends to the White Mountains and upper Connecticut Valley. Distinguished by dark red bark, lighter on young stems and always most brilliant during the fall and winter. Spreads underground and forms dense thickets in borders of meadows and low ground. Leaves rounded at base, slightly hairy on both sides, strongly veined; leaf stalks red. Flowers white, clustered. Fruit white or lead colored, stalks reddish.

Panicled Dogwood (*Cornus paniculata*)

Shrub under 12′ high, mostly along streams in moist or drier soils in the lower portions of the State. May be distinguished by its smooth, gray, very slender twigs and branches. Leaves narrow, long pointed, slightly downy above and below. Flowers white, often abundant. Fruit lead white, in dense clusters on red or pinkish stalks.

HEATH FAMILY (*Ericaceae*)

Large family of shrubs and small woody plants, both evergreen and deciduous, including very familiar and popular genera such as azalea, rhododendron, laurel, blueberry, cranberry, arbutus, wintergreen and others common or rare within our State. Scotch heather belongs to this family. In fact the heaths for the most part inhabit open pastures, peaty swamps and mountain summits in our country, where lime soils are absent. Leaves are simple, alternate, oval,

mostly thick with entire margins. Flowers generally (except Sweet Pepperbush and Labrador Tea) with petals more or less united, the corolla being bell or cup-shaped, toothed, lobed or sometimes 2-lipped, mostly perfect. Fruit usually a small capsule or berry. The native species of the different groups are briefly described.

SWEET PEPPERBUSH. WHITE ALDER (*Clethra alnifolia*)

SWEET PEPPERBUSH.

Shrub under 10′ high, in late summer bearing a profusion of white, fragrant flowers. Common from the lower Merrimack Valley to the Coast, sometimes in wet places along streams and swamps submerged during periods of high water. Adapted to cultivation in poor soil and shade. Leaves oval, 2″ to 4″ long, slender pointed, wedge-shaped at base, smooth, sharply toothed toward the end, dark green above, yellowish below, veins prominent. Twigs slender, straight, yellowish brown, somewhat downy in star-like patches, not much branched. Flowers small, white or pinkish, perfect, borne on upright, slender spikes 4″ to 6″ long, opening first at bottom, spicy. Fruit many small, smooth, round capsules on long, erect stalk; many seeds in each capsule.

LABRADOR TEA.

LABRADOR TEA (*Ledum groenlandicum*)

Evergreen, sub-alpine shrub, under 4′ high, growing in moist, peaty soils in the White Mountains northward and rarely in cold bogs elsewhere in the State. Leaves 1″ to 2″ long, narrow, blunt,

thick, rolled backward, amber dotted above, woolly brown below, fragrant when crushed. Twigs velvety or hairy; old branches dark or copper-colored. Root stem very large. Juices bitter. Flowers with 5 white, distinct petals, borne in terminal clusters on long, hairy stalks. Fruit an oval, downy capsule ¼" long, opening at base, containing many seeds.

SWAMP PINK OR WILD HONEYSUCKLE (*Rhododendron viscosum*)

Spreading shrub 4' to 8' high, mostly in swamps near the Coast. Almost the northern limit for the species; not common. Leaves about 3" long, narrow at base, broader near the end, thick, margins entire but hairy, shiny green above, somewhat hairy below. Twigs bristly-hairy, grayish in color. Flowers very fragrant, showy, 1½" to 2" long, white or pinkish; corolla deep, funnel-shaped, sticky-hairy outside, 5 lobed; stamens and pistils long white; borne in terminal clusters from large, scaly buds, appearing after the leaves. Fruit a narrow, oblong, bristly capsule about ½" long, containing many small seeds. At least three varieties are described by botanists.

PURPLE AZALEA OR JUNE PINK (*Rhododendron nudiflorum*)

Shrub much like the preceding but more common and variable in habits. Grows in moist, rocky woods as well as borders of streams and swamps. Reported in eastern and western parts of State and the highlands around Monadnock. Leaves narrow at both ends, margins finely hairy, dull green above, pale and often downy below, short stalked. Flowers only slightly fragrant; funnel shaped corolla broad, scarcely deeper than the lobes, dark pink to white, hairy; stamens and pistils long; appearing before or with the leaves.

There is a fragrant, mountain species (*Azalea canes-*

cens) with broader leaves, otherwise quite similar to the above.

RHODORA (*Rhododendron canadense*)

Low, slender, upright shrub, not over 3′ high, resembling Azalea. Found in moist woods, swamps and hillsides southern part of State. Leaves 1″ to 2″ long, narrow, blunt, thick, margins entire, smooth above, slightly downy below. Flower buds terminal yellowish brown, scaly; leaf buds minute. Each branch divides into 4 or 5 branchlets, which are straight, pale yellowish brown. Bark on older stems peels off, exposing copper-colored, smooth bark beneath. Flowers before or with the leaves, in terminal clusters, corolla rose-purple, not funnel-shaped, 2-lipped, the upper one 3 lobed, the lower divided into 2 distinct petals. Fruit a slender capsule, many seeded.

RHODORA.

GREAT LAUREL (*Rhododendron maximum*)

Tall evergreen shrub or bushy tree, sometimes 15′ or more high, found in moist woods only in a few localities in the southern part of our State, the best known of which is the Rhododendron Reservation of the Appalachian Mountain Club in Fitzwilliam. In earlier days it was much more common. Leaves 4″ to 10″ long, very thick, smooth, dark green above, paler below, margins entire, clustered at the ends of twigs. Buds large, cone-like, scaly. Bark reddish-brown, peeling off in shreddy scales. Flowers appear about July, in clusters 4″ or 5″ in diameter, pale rose or white corollas deeply 5 cleft, with orange colored dots. Fruit an oblong, hairy capsule ½″ long, containing oblong, flattened seeds. There are many cultivated varieties.

LAPLAND ROSE BAY (*Rhododendron lapponicum*) is a dwarf, trailing species occurring at alpine elevations in the

White Mountains, forming broad, carpet-like masses near rocky summits. Leaves ½″ to 1″ long, oval, obtuse, rusty, persistent. Branches rusty, scaly. Flowers few, purple, bell-shaped, 5 lobed, dotted.

Alpine Azalea (*Loiseleuria procumbens*)

This dwarf, trailing, evergreen shrub also forms carpet-like masses on alpine slopes of the White Mountains. Leaves minute, ¼″ long, mostly opposite, crowded, narrow, margins entire, blunt-pointed, curled, dark green, shiny above, pale and with main veins prominent below, short stalked. Branches many, 2″ to 4″ long, smooth, tufted. Flowers July and August, in terminal clusters of 1 to 5, bell shaped, 5 lobed, white or pink, very small. Fruit a rounded capsule, 2 to 3 celled, many seeded.

Mountain Laurel (*Kalmia latifolia*)

Much branching, bushy, evergreen shrub under 15′ high, often forming dense thickets in cool, moist, rocky woods, mostly south of Concord and most abundant between the Merrimack and Connecticut Rivers. Our most popular forest shrub, because of the beautiful masses of pinkish white bloom in June and the evergreen understory ornamenting the landscape throughout the year. General appearance and habits similar to Rhododendron. Easily cultivated in soils containing leaf mould and without lime. Large quantities are marketed each year for wreaths and Christmas decoration.

Leaves lance-shaped 3″ to 4″ long, narrow at both ends, margins entire, thick, dark glossy green above, yellowish-green below, crowded at ends of twigs in groups of 2 or 3, falling during the second summer. Buds greenish, scaly. Leaf scars prominent. Bark thin, reddish brown, peeling off in thin scales exposing reddish inner bark. Flowers in dense clusters 4″ or 5″ in diameter, corollas saucer-shaped, with 5 pointed borders and short tubes, pink or white,

purplish tinted within, somewhat sticky. Fruit a small, woody, rounded, hairy capsule containing many seeds. Wood heavy, hard, brittle, heart reddish brown, sapwood lighter. Used in the South for tobacco pipes, tool handles, etc.

SHEEP LAUREL. LAMBKILL (*Kalmia augustifolia*)

A slender evergreen, much smaller but very similar species, under 3′ high, common within the same general range as Mountain Laurel. Grows in more open pastures and waste areas in fairly moist soil. Leaves are narrower and lighter green. Flowers are smaller, pink or reddish, and bloom later. There is a common belief that all laurel, especially Lambkill, is poisonous to cattle and sheep when eaten by them.

SHEEP LAUREL.

PALE OR SWAMP LAUREL (*Kalmia polifolia*)

Rare, small, straggling, evergreen shrub, not over 2′ high, closely resembling the other laurels. Reported only in cold, sub-alpine peat-bogs and swamps to the north. Leaves are opposite or grouped in threes, under 2″ long, very narrow, thick, entire, curled, bright green above, whitish and with main vein prominent below, almost stalkless. Branches smooth, yellow-brown, two-ridged, ridges changing direction at each set of leaf scars. Flowers of laurel type, larger than Sheep Laurel, reddish purple, in clusters of less than 12 on long stalks, blooming early.

MOUNTAIN HEATH.

MOUNTAIN HEATH. BRYANTHUS (*Phyllodoce coerulea*)

Low, evergreen, alpine shrub found only near the summits of the higher mountains. Name implies growing among mosses. Leaves

alternate, linear, needle-like, crowded, about ¼″ long, margins rough. Flowers are purplish bells, with 5-lobed corollas, contracted at the throat, borne in upright, nodding clusters or singly at the ends of branches, July or August. Fruit a round capsule with many seeds.

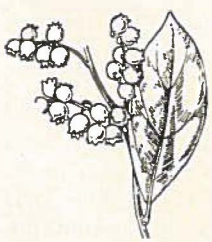
Moss-Plant (*Cassiope hypnoides*)

One of the smallest of shrubs, moss-like, evergreen, with stems rising but 2″ to 4″ high. Found only on the summits of the higher mountains. Leaves needle-like, about ⅛″ long, acute, without stalks or veins, crowded, flat above, rounded below. Flowers are open bells, ¼″ to 1/3″ wide, white or pink, solitary, on upright slender stalks from the ends of branches, July or August. Fruit capsules rounded, with numerous, small seeds.

Bog Rosemary (*Andromeda glaucophylla*)

Rare, creeping, evergreen shrub, less than 12″ high, with smooth branches. Found on turfy hillocks in swamps, peat bogs and along river banks to the south, as well as on high slopes of the White Mountains. Leaves alternate, not over 2″ long, narrow, thick, blunt or short-pointed, curled, smooth above; white and fine-hairy below. Flowers are tiny, white or pinkish, terminal globes, borne on stoutish, short, curved stems. Fruit capsules turban-shaped, 5-celled, with many seeds; stalks mostly curving downward.

A similar species (*Andromeda polifolia*) with small leaves inhabits the far North.



PRIVET ANDROMEDA.

Privet Andromeda. Male Berry (*Lyonia ligustrina*)

Bushy, deciduous shrub, under 10′ high, growing in open, moist or swampy soils. Commonly associated with High Blueberry and resembling it, except for the fruit. Common throughout. Leaves 1½″ to 2½″

long, wedge-shaped at base, pointed, margins entire or very finely toothed, mostly smooth above and downy below, stalks short and downy. Buds reddish, scaly. Twigs finely hairy, gray or yellowish. Old bark stringy, darker in color. Flowers are small, white globes borne in dense clusters on long, terminal, leafless stalks, May to July. Fruit stalks conspicuous, with many small, dry, persistent capsules, giving ends of branches appearance of being dead.

LEATHER LEAF. CASSANDRA (*Chamaedaphne calyculata*)

Low, branching shrub, 2′ to 4′ high, forming dense masses in bogs and along the low shores of ponds. Common throughout. Often blooms before the snow is gone. Leaves ½″ to 1½″ long, narrow, blunt, thick, leathery, curled, margins obscurely toothed, both sides more or less scurfy, covered with rusty dots; upper leaves gradually smaller; tendency to be persistent and evergreen. Twigs covered with scurfy scales. Bark of older stems smooth, dark copper colored. Flowers in April, white or rose tinted, corollas small, cylindrical, narrowed at throat, 5-toothed, borne singly in axils of upper, small leaves; appear on one side of stalks. Fruit a capsule, containing many flattened, wingless seeds, persistent throughout winter.

LEATHER LEAF.

RED BEARBERRY (*Arctostaphylos uva-ursi*)

Evergreen, trailing and spreading shrub found on rocky hillsides and dry, sandy barrens. Not common but reported in eastern part of State north to White Mountains. Leaves ½″ to 1″ or more long, blunt, narrowing to the short, downy leaf stalks, thick, margins entire, dark and shiny on both sides, midveins prominent. In winter leaves darken to

chocolate color above and reddish below. Branches reddish, 2′ to 3′ long; twigs downy. Roots large, spreading. Flowers small, white or pinkish, bell-shaped, borne in few-flowered, terminal clusters, corollas 5-toothed, narrowed at the throat, hairy within; May or June. Fruit red, smooth, berry-like, size of a large pea; pulp tasteless, containing few or many, bony seeds, each in a separate cell; persists throughout winter.

Arctostaphylos alpina, a depressed, deciduous species is found on summits of the higher mountains. Leaves are oval, blunt, wrinkled, margins toothed, netted-veined. Fruit black, juicy, edible.

Trailing Arbutus. Mayflower (*Epigaea repens*)

Small, trailing, evergreen shrub, which needs no introduction in our State, where it has been cherished since Colonial days. Grows best under protecting vegetation, especially under evergreen trees, and on well drained, gravelly soils. Spreads in patches, often covered by dry leaves and grass. Leaves thick, oval, rounded at base, 1″ to 3″ long, entire, mostly smooth above and hairy below; leaf stalks slender, short, hairy. Twigs rusty hairy; branches short. Flowers pink or white, very fragrant, in thick, stalkless clusters at ends of branches; corollas 5-pointed; blooms in early spring. Fruit capsules dry, rounded, containing many seeds.

Wintergreen or Checkerberry (*Gaultheria procumbens*)

Tiny, evergreen shrub, creeping on or below the surface and spreading in patches like Arbutus. Well known and common throughout. Leaves oval, finely toothed or bristly tipped, about 2″ long, reddish-yellow and very aromatic when young, dark green, thick and shiny when old, clustered at ends of erect branches 3″ to 5″ above the ground.

Flowers white or pinkish, small, bell-like, borne on short stalks; in axils of the leaves; corollas 5-toothed. Fruit a bright red, round berry, containing many soft seeds, spicy and edible, increasing in size toward spring.

Wintergreen is sometimes confused with Partridge-Berry (*Mitchella repens*) which has red berries and is otherwise similar. Latter plant is a tiny, creeping perennial herb, leaves roundish, opposite, evergreen, with whitish lines; berries red, tasteless, in pairs, containing hard, gritty seeds.

Huckleberries and Blueberries

Huckleberries are shrubs not very common in New Hampshire while Blueberries are well known and of high commercial value. The reverse is true farther south. The Huckleberry group, very closely related to Blueberry botanically, differs chiefly in the fruit, which is 10-celled, each containing a hard, gritty seed. Blueberry has many more seeds but they are smaller and soft. Leaves and young branches of Huckleberry are resinous dotted.

Black Huckleberry (*Gaylussacia baccata*)

Straggling shrub not over 3′ high, mostly found in dry, pine woods in the eastern part of our State south of the White Mountains. Leaves are oval, 1″ to 2″ long, narrowed at base, margins entire, pale green on both sides, with yellowish, resinous dots. Buds small, reddish, scaly. Twigs downy, often reddish. Flowers are reddish or yellowish bells, nearly round, 5-toothed, borne in one-sided clusters in axils of leaves. Fruit a black, shiny berry usually without bloom, sweet, edible, seeds gritty, ripening in July or August. Varieties with blue fruit and bloom are reported.

Dangleberry (*Gaylussacia frondosa*)

A shrub 3′ to 6′ high, of doubtful distribution in New Hampshire, may be looked for in moist, sandy situations by lake borders and edges of woods near the Coast. Distin-

guished from preceding by the leaves which are larger, pale and downy on veins below, and larger, dark blue berries with a bloom. Flowers are in loose, drooping clusters. Bark smooth, grayish, peeling.

DWARF HUCKLEBERRY (*Gaylussana dumosa*)

A creeping shrub 1′ to 2′ high, not common but may be found in sandy or swampy soils mostly near the Coast. Variable and difficult to identify by leaves or fruit. Small branches are somewhat hairy, glandular; fruit purplish-black without bloom.

DWARF OR LOW BLUEBERRY (*Vaccinium pennsylvanicum*)

Low shrub, 6″ to 2′ high, forming patches small and large in old fields, pastures and open, dry woods in dry, sandy or rocky soils, sometimes bordering wet lands. Common throughout the eastern and southern parts of State. Lowest and earliest of the Blueberries to ripen. Leaves ¾″ to 1½″ long, acute at both ends, finely but distinctly toothed, callous tipped, smooth and shiny on both sides or slightly downy on veins below. Buds rather large, reddish-purple, scaly. Twigs olive-green, warty; older stems reddish purple. Flowers are white or pinkish bells, 5-toothed, few in a cluster. Fruit a round, blue berry covered with bloom, very sweet, perishable; seeds many, small and not gritty, as in all Blueberries. There are several varieties described.

CANADA BLUEBERRY (*Vaccinium canadense*) is a low, late bearing shrub with fine hairy branches, common in the Provinces and in Coos County and the mountains. Leaves are broader and more downy, margins entire. Fruit very blue with bloom.

LATE OR HALF-HIGH BLUEBERRY (*Vaccinium vacillans*)

Stiff, erect shrub, not over 4′ high, common but somewhat more restricted in distribution to high, rocky pastures and

borders of woods. Leaves 1″ to 2″ long, smooth, entire, larger, broader and lighter in color than Low Blueberry. Small branches smooth, yellowish-green. Flowers and fruit borne in clusters on leafless summits of last year's twigs. Fruit is harder, larger, less sweet, keeps longer and ripens later than Low Blueberry.

HIGH BLUEBERRY (*Vaccinium corymbosum*)

Large, common shrub growing as high as 15′ high and 2″ in diameter in swamps, borders of ponds and other moist soils. Leaves are 1″ to 3″ long, entire, rather sharp-pointed, smooth above and slightly hairy on the veins below. Twigs are yellowish green; bark of larger branches peels off, giving mottled, coppery appearance. Flowers and fruit borne on leafless, terminal branches in large or straggling clusters. Fruit generally purplish-black with bloom but there are several variations in form and color of fruit and leaves. Last of the Blueberries to ripen.

Vaccinium atrococcum is a similar high-bush species with leaves downy below and berries black without bloom. Ripens earlier than preceding.

Two other dwarf alpine species, both called Bilberry, are reported occurring above timber line near summits of the higher mountains. *Vaccinium uliginosum,* not over 24″ high, stems rough; leaves very small, less than 1″ long, thick, entire, blunt, pale below, very short stalked; flowers white or pink, often 4-lobed, solitary or few in a cluster; fruit bluish-black with bloom, sweet.

Vaccinium caespitosum, not over 12″ high; leaves larger than preceding, finely toothed, narrow at base; flowers white or pink, mostly 5-lobed and often solitary in axils of leaves; fruit blue with bloom, sweet.

AMERICAN OR LARGE CRANBERRY (*Vaccinium macrocarpon*)

Trailing, evergreen shrub, 1′ to 4′ long, with short, upright, fruiting branches. Cranberry named from fancied

resemblance to a crane's head and neck. Found in peat swamps, mostly south of the White Mountains. Extensively cultivated for commercial purposes on Cape Cod. Leaves less than ½″ long, mostly obtuse, entire, white or pale below, nearly stalkless. Flowers several in a cluster on slender stalks, each with 4 nearly separate, pinkish petals. Fruit a large, rounded, reddish, acid berry, 1/3″ to 1″ in diameter, 4-celled, containing many seeds.

SMALL CRANBERRY (*Vaccinium oxycoccus*)

Very slender, trailing, evergreen shrub, 4″ to 10″ or more long, generally similar to the preceding, but in every way smaller. Common chiefly in peat bogs of the northern part of State. Leaves acute, ¼″ long.

MOUNTAIN CRANBERRY. COWBERRY (*Vaccinium vitis-idaea*)

MOUNTAIN CRANBERRY.

Low, matted, evergreen shrub, 3″ to 8″ high, stems creeping and branches erect. Common in peaty soils at higher elevations in the mountains and rarely near the Coast. Leaves crowded, very small, ¼″ to 2/3″ long, broad at the base, round or grooved at point, thick, mostly entire, leathery, dark green and shiny above, pale and marked with blackish points below, short stalked. Flowers white or pinkish bells, 4-lobed, in short, terminal clusters. Fruit a dark red, rather bitter, acid berry, 1/3″ long, with many seeds; in northern Canada it is a food for man and beasts.

CREEPING SNOWBERRY (*Chiogenes hispidula*)

Slender, hairy-stemmed, trailing, evergreen shrub, scarcely woody, resembling Cranberry. Found in cold, wet,

northern woods, usually under shade, often growing with moss. Leaves in pairs, ¼" long, oval, entire, pointed, smooth above and rusty below. Flowers small, solitary, greenish-white, bell-shaped, on short stalks in axils of leaves; petals 4-lobed. Fruit small, round, snow-white, aromatic berries, covered with minute bristles, many seeded.

OLIVE FAMILY (*Oleaceae*)

This family includes a variety of trees and shrubs of temperate and tropical regions. One of the best known is the Olive tree, first cultivated in Syria and Palestine, now extensively grown in California and the Southwest. Syringa, (Lilac) Forsythia and Privet are groups of ornamental shrubs common in our own gardens. Ash is the only group native to New Hampshire but this includes one of our most valuable timber trees. All have opposite leaves, simple except Ash. Fruit of Syringa and Forsythia is a dry capsule containing many winged seeds; Privet has a black berry; Ash a winged seed. (samara)

WHITE ASH (*Fraxinus americana*)

Large, very valuable timber tree, growing tall and straight in mixed hardwood forests with beech, birch or maple in moist, fertile, often rocky soils. Common but scattered throughout at lower elevations, especially in ravines and brook borders. Frequently seeds under white pine stands. Seedlings for reforestation purposes are supplied in limited quantities from our State Nursery. Grows fast on strong, moist soils; not adapted to sandy or gravelly situations.

WHITE ASH.

Leaves are opposite and compound with terminal leaflet; leaflets usually 7, acute, margins

irregularly toothed, smooth above and pale or silvery below, often slightly hairy on veins below; stalks of leaflets nearly ½″ long, terminal longer. Buds blunt, rather broad, scales in pairs, valvate, dark brown. Leaf scars large, raised, semi-circular, with many bundle dots arranged in curved line. Twigs stout, greenish-gray, usually smooth with pale lenticels, flattened at the nodes. Flowers before the leaves, without petals, male and female on different trees, former in dense, reddish purple clusters, latter in more open clusters. Fruit long, drooping clusters of lance-shaped, winged seeds or samaras, remaining until winter, each 1″ to 2″ long, with one round seed at the base; stalks slender. Bark of older trees grayish brown, rather thick, not hard to the touch, furrowed, with narrow, uniform ridges. Wood very strong, hard, elastic, white to brownish. Most valuable for such uses as implements, ball bats, tennis rackets, canoe paddles, oars, archery bows; also in basket making, furniture, etc.

RED ASH (*Fraxinus pennsylvanica*)

Medium sized tree, similar to White Ash and not very common in New Hampshire. Found in moist, fertile, river bottom soils in southern part of State. May be distinguished from other species of ash by its downy or velvety twigs and leaf-stalks. Leaflets are also downy below. Terminal buds somewhat pointed. Inner bark on branches is reddish. Fruit samaras have the wing extending along each side as well as attached to the end of the seeds.

BLACK OR BROWN ASH (*Fraxinus nigra*)

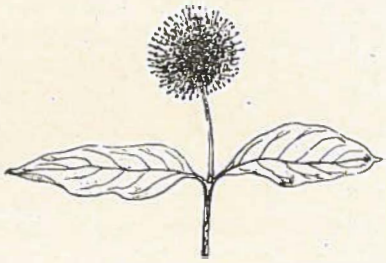
Medium sized tree with distinctly light, soft, corky bark and mostly found in swampy situations. Widely scattered and more abundant than Red Ash. Very similar to other Ashes in general appearance. Leaflets, except terminal, with very short stalks, 7 to 11 in number, otherwise similar to White Ash. Terminal buds quite pointed and very black,

contrasting with the light, grayish twigs which are stout and smooth. Leaf scars large, narrowly crescent-shaped. Fruit samaras with broader wings which completely surround the flattened seeds and are notched at the ends. Wood comparatively soft, weak, coarse grained, heart wood dark brown, sapwood nearly white.

MADDER FAMILY (*Rubiaceae*)

Button Bush (*Cephalanthus occidentalis*)

Erect, vigorous shrub or small tree 5′ to 12′ high, the only one in a large family of herbs, most of which are tropical. Grows along moist borders of ponds, stagnant pools and in swampy depressions southern part of the State. Leaves opposite or in whorls of three, simple, 3″ to 5″ long, oval, pointed, round or narrowed at base, entire, dark glossy green above, pale and veins prominent below; leaf stalks ½″ to 1″ long, grooved and sometimes twisted. Twigs reddish brown, becoming dark gray on older branches; tips usually dead. Terminal buds absent; lateral small. Bark smooth, cracked or flaky. Flowers perfect, white, tubular, 4-toothed, fragrant, with protruding, pin-like styles, borne in dense, spherical heads 1″ in diameter at tips of branches, July or August. Fruit a ball consisting of many, closely crowded capsules, each containing one or two seeds.



BUTTON BUSH.

HONEYSUCKLE FAMILY (*Caprifoliaceae*)

Includes groups of shrubs commonly found in our State, some large enough to be called small trees. All have opposite leaves, small, perfect flowers with petals united, 5-lobed

or sometimes 2-lipped. Fruit a berry, drupe or capsule. The native Elders, Viburnums, Snowberry and Honeysuckles described are chiefly of ornamental value.

AMERICAN ELDER (*Sambucus canadensis*)

Shrub 5′ to 10′ high with soft, pithy stems. Common throughout State along stream borders and moist, open places; forming thickets from underground roots. One of our most attractive roadside shrubs, on account of large sprays of white flowers in summer and purple berries in autumn. Leaves opposite, compound, 5 to 11, usually 7, leaflets, with leaf stalks 2″ or 3″ long, grooved and swollen at the base; leaflets short stalked, except terminal, oval, pointed, margins sharply toothed, sometimes entire toward the base, and lower ones sometimes lobed, smooth above, pale, somewhat downy and veins prominent below; odor unpleasant when crushed. Buds conical, acute, scaly, terminal absent. Twigs weak, grayish, warty with prominent lenticel dots; pith large, white. Flowers consisting of small, short tubes, cream-white, borne in broad, nearly flat, spreading clusters 5″ to 8″ wide. Fruit in broad, flat clusters of dark purple, juicy berries, size of small peas, each with 3 to 5 seeds.

AMERICAN ELDER.

RED-BERRIED ELDER (*Sambucus racemosa*)

A similar shrub found on drier, upland soils, farther North than American Elder. Seldom found in southeastern part of the State. Easily identified by the brown pith, warty appearance of older branches, narrower leaves, downy leaves and twigs, and conical clusters of white flowers which bloom in early spring. Fruit in cone-like clusters of bright red berries, maturing when American Elder is in bloom.

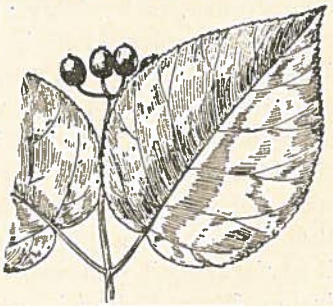
SWEET VIBURNUM. SHEEPBERRY (*Viburnum lentago*)

Shrub or small tree sometimes 20′ high. Largest of the Viburnums. Grows in moist woods and stream banks at lower elevations; not abundant. Like others of this genus, it is distinguished by simple, opposite leaves, showy, 5-pointed, white flowers in flat clusters, and dark blue or black fruit, (drupes) each with a single flattened stone.

Leaves oval, about 2½″ long, rounded at base, abruptly pointed, finely but sharply toothed, thick, shiny, smooth above, pale with blackish dots below; leaf stalks long. Buds long, slender, consisting of a pair of downy, reddish-brown scales; terminal flower buds swollen at the base; lateral buds close to stem, much smaller. Twigs smooth, reddish brown. Bark of older branches divides into small, thick plates. Flowers cream-white, star-like, 5-pointed, borne in flat, terminal clusters 2″ to 5″ wide. Fruit a fleshy drupe, borne in few-fruited, flat clusters on slender, red stalks; drupes oval, flattened, blue-black with bloom, sweet, each containing one very flat stone; ripening in September. Wood deep orange brown, hard, heavy, with unpleasant odor.

HOBBLE-BUSH OR WITCH HOBBLE (*Viburnum alnifolium*)

Irregular, straggling shrub, sometimes 10′ high, with long, flexible, drooping branches, often taking root at the ends, and large leaves. Prefers moist, shady woods; abundant throughout the mountains northward growing under spruce and hardwoods. Forms dense tangles difficult to walk through without tripping. Flowers may be forced into bloom in winter by putting cut branches in water in a warm room. Leaves pinnately veined, large, 3″ to 8″ long, broadly oval, heart-shaped at base, finely toothed, wrinkled



HOBBLE-BUSH.

above, veins rusty below; petioles 1″ or more long, rusty. Buds naked or without covering. Twigs hairy in star-like clusters. Bark purplish gray. Flowers white, showy, borne in flat, broad clusters, 3″ to 5″ across, two forms in each cluster; outer, surrounding flowers are raised, 5-lobed petals, ½″ or more across, without stamens or pistils; inner flowers very small, perfect, 5-pointed; bloom in May or June. Fruit in flat clusters of dark purplish, fleshy drupes, each containing a single, flat, grooved stone.

High-bush Cranberry (*Viburnum opulus americana*)

Very attractive shrub about 4′ to 10′ high, rather common along streams, borders of swamps and in low ground in the White Mountains and northward. Not a true cranberry but fruit has been used as a substitute. Parent of the cultivated snowball of our gardens. Leaves three-lobed, maple-like, 2″ to 4″ long, rather sparingly and coarsely toothed, wrinkled above, pale, slightly downy below. Buds with a pair of scales. Twigs and branches smooth, grayish. Flowers of two kinds, similar to Hobble-Bush, white, May or June. Fruit bright red, translucent, very acid and slightly bitter, clustered, not eaten by birds; each drupe containing a flat stone without grooves; remaining through the winter.

Maple-leaved Viburnum (*Viburnum acerifolium*)

Small shrub under 6′ high, with slender, upright branches, growing on upland soils in deep woods or more exposed situations, generally in clumps. Very common. Leaves have marked resemblance to the red maple. They are 3-lobed and 3 ribbed, 2″ to 5″ long, rounded at base, coarsely and unequally toothed, more or less downy on both sides, paler below. Branches smooth, straight, dark brown. Buds dark, acute, only slightly appressed. Flowers in June, all perfect, small, yellowish white, borne in loose terminal clusters 2″ or 3″ broad. Fruit purplish-black, ¼″ long,

pulp thin, with stone slightly grooved, in clusters remaining through winter.

ARROW WOOD (*Viburnum dentatum*)

Slender, bushy shrub, 6′ to 10′ or more high, common in clumps along stream borders and very wet places. Branches smooth, grayish brown, straight, tendency to be 4-sided. Used by the Indians for shafts of arrows. Leaves broadly oval, about 2″ long, rounded at base, very coarsely and evenly toothed, smooth, dark green above, veins prominent and tufts of hairs in axils of veins below. Lateral buds sharp, closely appressed to twig. Flowers in June, small, all perfect, borne in dense, flat, white clusters 2″ to 3″ broad. Fruit clusters of dark blue drupes, ¼″ in diameter, dry, somewhat acid; stone flattened, deeply grooved on one side, rounded on the other.

WITHE ROD (*Viburnum cassinoides*)

Straggling shrub, usually under 6′ high, inhabiting swamps and wet soils. Common throughout. Leaves oval, thick, smooth, dull, rounded or narrow at base, sharp pointed, nearly entire, sometimes wavy, veins not prominent. Twigs often dotted, scurfy; bark of older branches gray. Flowers all perfect, very small, in rounded clusters. Fruit similar to preceding; stone very flat and even.

Another species (*Viburnum pauciflorum*) is a straggling, northern woods shrub under 5′ high, with light brown, smooth branches. Leaves variable, mostly with 3 shallow lobes, unequally toothed, smooth or fine-hairy below, 5-ribbed. Flowers small, perfect, in narrow clusters. Berries few, light red, with flat, nearly smooth stones.

Viburnum pubescens, reported from southern part of State, under 5′ high, has oval, pointed leaves with few coarse teeth, very downy below. Flowers in small clusters, white, all perfect. Fruit dark purple with grooved stone.

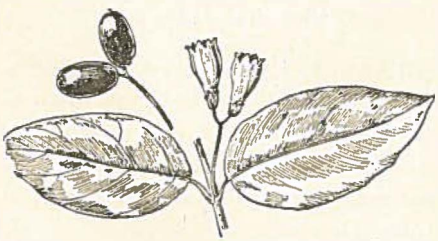
SNOWBERRY (*Symphoricarpos racemosus*)

Erect, slender shrub mostly under 5′ high, growing in rocky places and along river banks. A northern shrub with distribution in New Hampshire uncertain. A garden variety is often cultivated. Leaves oval, 1″ to 2½″ long, blunt, mostly entire, variable, pale or hairy below. Flowers small white or pinkish bells, borne in few-flowered, leafy clusters at tips of branches and axils of leaves, June to September. Fruit clusters of white berries, ¼″ to ½″ in diameter, loosely cellular within, two seeded.

HONEYSUCKLE (*Lonicera*)

The true honeysuckles are upright or climbing shrubs with simple, opposite, entire leaves and scaly buds. Flowers in terminal pairs or whorls in axils of upper leaves, fragrant; corollas tubular or funnel-shaped, often one sided at base, 5-lobed or 2-lipped. Fruit a several seeded berry, sometimes two flowers united in one berry; always bitter. Best known by some cultivated vines which adorn our porches and by the erect shrub, Tartarian Honeysuckle, with pairs of red berries, commonly cultivated. The native species are less well known.

AMERICAN FLY HONEYSUCKLE (*Lonicera canadensis*)



AMERICAN FLY HONEYSUCKLE.

Straggling shrub under 5′ high, common in rocky, highland woods northward. Leaves 1″ to 2″ long, oval, rounded at base, rather pointed, smooth above, downy below when young. Branchlets smooth, light brown, with elevated lines descending from leaf stalks. Flowers in May, slender, funnel-shaped, 5-lobed, greenish-yellow, ¾″ long, always in pairs

in axils of leaves. Berries in pairs, separate, ¼″ in diameter, red.

MOUNTAIN FLY HONEYSUCKLE (*Lonicera caerulea villosa*)

Low shrub under 3′ high, forming matted, upright branches, in moist, alpine ravines in the White Mountains and swampy land in northern and western parts of State. Leaves 1″ to 2″ long, oval, rounded or narrow at base, narrow-pointed, margins wavy, usually downy below, net-veined. Branches often bluish purple and downy or with bloom. Flowers in June, pale yellow, short stalked, in pairs, similar to above. Berries united, two perfect flowers forming one oblong, dark blue, 2-eyed berry, bitter and acid.

SWAMP FLY HONEYSUCKLE (*Lonicera oblongifolia*)

Erect shrub under 5′ high, found in bogs and swamps. Northern shrub with distribution in New Hampshire uncertain. Leaves 1″ to 2½″ long, blunt, short-stalked, downy when young. Flowers May or June, slender, ½″ long, greenish yellow, corollas slightly purple within, hairy without, 2-lipped. borne in pairs on slender stalks in axils of leaves. Berries in pairs, usually not united, dark red or purplish.

SMALL HONEYSUCKLE (*Lonicera diocia*), a twining or half erect shrub or woody vine with smooth branches and leaves joined together at the base, is reported along the Connecticut River tributaries. Leaves 2″ to 3″ long, blunt, almost stalkless, upper pairs joined, whitish below, curled or wavy. Flowers greenish yellow or purplish, 2-lipped, borne in whorled, short-stalked clusters or spikes. Berries red.

BUSH HONEYSUCKLE (*Diervilla Lonicera*)

Low, upright shrub under 4′ high, often forming dense masses in rocky places and open woods. Closely related to

Lonicera group. Common in Connecticut Valley uplands and elsewhere. Leaves are simple, opposite, 2″ to 5″ long, rounded at base, long-pointed, finely toothed, short stalked, smooth on both sides, veins prominent below. Branchlets smooth, yellowish. Flowers small, yellow, funnel shaped, 5-lobed, slightly 2-lipped, mostly in clusters of three, either terminal or in axils of upper leaves, May or June. Fruit smooth, slender, pointed capsules, ¾″ long, containing many small seeds.

DESTRUCTIVE INSECTS AND DISEASES OF FOREST AND ORNAMENTAL TREES

Insects such as moths, butterflies and beetles generally have four stages or forms of life: egg, larva, pupa and adult. Eggs are deposited close to the food supply, in clusters or singly, exposed or hidden. Often they are exceedingly inconspicuous. The larva hatches from the eggs and is generally the destructive stage. From an egg of the beetle the larva is called a grub. From the fly it is called a maggot and from a moth or butterfly, the larva is a caterpillar. Caterpillars may be hairy or smooth. The pupa stage is the apparently inactive period when the larva is transforming to the adult, often within a cocoon or woven covering, or else in the soil or ground cover. From the pupa emerges the adult, usually with wings, which lays its eggs to begin the life cycle over again. Some of the scale insects, however, have but two stages, the adults producing the living young instead of depositing eggs.

It is important in control measures to consider insects as divided into the following groups: those which bite and swallow their food and those which suck the food juices through tubes. Caterpillars and sawflies are leaf eaters and belong to the first group; lice and scale insects suck the juices from leaves, twigs and bark and belong to the second. Boring insects, both grubs and beetles, make tunnels in inner bark and wood and form a third group.

General Control Measures.

1. Pruning, cutting and destroying parts of trees or whole trees affected in order to get rid of the insects and likely breeding places, as well as to improve the health of injured trees. This applies particularly to fruit and ornamental trees.

2. Destroying insect egg masses, caterpillars in webs or cocoons wherever they may be found, usually in the winter quarters. Adults on the wing may also be destroyed by baiting or attracting them to traps.

3. Spraying to destroy the feeding insects, usually an arsenical, stomach poison for the chewing kind and a contact solution, like lime-sulphur, oils, nicotine sulphate, or some dusting powder, for the sucking kind. Other measures are applied for boring insects and for other specific purposes.

NATURAL CONTROL.

Birds and animals, various insect parasites and diseases, and unfavorable weather conditions are natural means of control, without which insects would overrun the world. This is by far the most important reason for protecting all kinds of insect eating birds.

The number of insects and diseases attacking our common trees is almost unlimited. Most of them are not serious in the forest, and therefore control measures apply chiefly to ornamental trees. Similar treatment of forest trees is usually impractical on account of the expense. A few of the most important enemies are briefly described and control measures given. For a description of others, interested persons should consult bulletins or other publications on the subject.

LEAF EATING INSECTS

SAWFLIES.

There are several species of false or hairless caterpillars, which feed upon the needles of coniferous trees, defoliating branches or whole trees during the summer. They winter in the cocoon and the adult fly emerges in spring and lays eggs in a slit or saw-cut in the bark. The larvae work together in clusters and are ravenous feeders. They have the habit of lifting head and tail when disturbed.

The larch sawfly has done great damage in the past; its larvae is bluish-gray in color. Other species attacking pine, fir and spruce have larvae with black or red heads, green or yellowish bodies and dark stripes. Control when feasible is to spray with arsenate of lead or break off branches containing large number of larvae.

Spruce Bud Worm.

A defoliating insect attacking fir and spruce. Very destructive periodically in the past. The last epidemic started about 1910 and is now on the decline. Moths are grayish in color and lay eggs the latter part of July on spruce and fir needles exposed to sunlight. The young larvae, at first light green and later reddish-brown, hibernate over winter and feed on the opening buds and developing needles. Control lies through systematic cutting operations in infected areas and where new outbreaks are expected.

Gypsy Moth.

This pest is too well known to require description. Wide spread over New England, vast sums have been spent for its control. Defoliates most broadleaf trees and white pines when nearby; especially important to keep oak away from young pine stands in badly infested sections. Caterpillars are distinguished by a double row of spots, five pairs nearest the head being blue and the remainder red. The female moth is white, larger than the brownish male, and cannot fly though she has wings. Egg clusters are conspicuous and should be painted with creosote during fall or winter months. Spray foliage with arsenate of lead during the early spring feeding period. Inspection of all forest and quarry products to be shipped outside the quarantine area is required by the Federal Government.

Brown Tail Moth.

Another serious, defoliating pest brought to New England about 1890. Its control is usually in conjunction with

that of Gypsy Moth. The adults are small, pure white moths with brown tails. They are strong fliers and may travel many miles during mid-summer. Eggs are laid on the under side of leaves and hatch about late August. The tiny caterpillars feed for a while, then construct a winter web with terminal leaves and silk, in which they remain until spring. The principal feeding and defoliation take place before the middle of June when the caterpillars are full grown. They may be recognized by the reddish-brown body, with a double row of whitish dots, long barbed hairs, and two red spots at the hind end. The hairs are poisonous. These caterpillars feed on many broadleaf trees, particularly oak and apple; coniferous trees are not attacked. Damage begins on the buds and on the leaves as soon as the buds open. Early and complete stripping of the foliage is often fatal to the trees. Webs should be cut off and destroyed during the winter and the foliage sprayed with arsenate of lead soon after the buds open. Federal quarantine inspection required of forest products to be shipped out of infested territory.

ELM LEAF BEETLE.

A serious enemy of planted elms in towns and cities, introduced from Europe nearly a century ago. Adult beetle, ¼ inch long, yellowish or brownish, black spotted, with a dark stripe along each side of back. Winters in sheltered places, even in buildings, and begins feeding and making pin-holes in young leaves in spring. Eggs are laid on under side of leaves and the small, yellowish, tapering grubs feed on the under side, causing leaves to turn brown and fall. When full grown the larvae crawl down the trunks and transform to adults in bark crevices or on the ground. A second generation late in July adds to the seriousness of the pest farther south. Control is by spraying with arsenate of lead on the under sides of leaves as soon as the leaves are well started and again when the grubs are at work.

FOREST TENT CATERPILLAR.

Defoliates many broadleaf trees. During the winter short, ring-like masses of eggs may be seen encircling twigs of trees. Caterpillars emerge in the spring and feed largely at night, migrating in search of food. When full grown they are about 2 inches long, blackish, slightly hairy, with a line of large dots and a yellowish band on each side. They do not form tents or webs but spin thick, yellowish cocoons in sheltered places. Yellowish-brown moths with two dark bars across each fore-wing emerge about mid-summer. Spray foliage with arsenate of lead.

The *American Tent Caterpillar*, whose conspicuous webs are commonly seen on old apple trees and cherry sprouts, is a similar species. Egg masses encircling the twigs are longer and taper at the ends. Caterpillars are velvety-black, stouter than the preceding, with a white line along the back and alternate blue and white dots along either side. It is their habit, when not feeding, to return to their webs or tents, usually made at the forks of branches. The moths are dull reddish or yellowish-brown with two white lines across each fore-wing. Destroy tents in early spring and spray young foliage with arsenate of lead.

CANKER WORMS.

A group of moths whose larvae are known as measuring worms, inch worms or loopers, about one inch long, smooth, satiny; they travel by arching their bodies, drawing up the hind part and thrusting forward part ahead. Two common species feeding on fruit and broadleaf foliage are the *"Spring"* and *"Fall"* Canker Worms, the adult moths appearing at opposite seasons. Female moths are without wings. Infested trees should be sprayed with arsenate of lead.

At times the *Hemlock Looper* is very destructive to coniferous and broadleaf trees beginning about June. They are pale greenish caterpillars with small black spots. Moths appear in September, light yellowish-gray in color with

double line across the wings. Eggs are laid on the trunk and twigs and hatch the following spring.

SATIN MOTH.

A recent destructive pest from Europe which is spreading northward and defoliating willow and poplar trees. The eggs are laid in oval, silvery patches on bark, under side of leaves or near the base of the trees late in July. The caterpillars feed for a short time, winter in very small cocoons in the bark and begin feeding again in May. When full grown they are an inch or more long, black, with large white spots along the back. Control measures consist of painting egg clusters and spraying with arsenate of lead.

LARCH CASE BEARER.

A European pest of the larch which has become serious during the last few years. Large areas are defoliated in northern New England. The larvae hatch from orange-colored eggs laid on the needles and in September. After feeding for a time, they hollow out part of a needle for a case or cocoon and migrate with it to the twigs or branches for the winter. In the spring feeding is resumed, the larvae dragging their cases with them and afterwards transforming in them. Small, grayish moths appear in July.

A similar case bearer attacks birch, cutting out portions of the leaf to make its case, moving from place to place with it in search of food, spending the winter on the twigs and feeding again in the spring. The small, adult, bronze-colored moth appears in July. For ornamental trees lime-sulphur or miscible oil should be sprayed before the leaves come out.

BIRCH LEAF SKELETONIZER.

A smooth, green caterpillar, 1/3 inch long, feeds on the under sides of leaves of white and yellow birches in late summer, causing trees to turn yellow prematurely. Damage slight in the forest owing to lateness of the season of

feeding. Winter is spent in ribbed cocoons on under side of leaf. Adult is a tiny, brown moth.

LEAF MINERS.

There are numerous leaf miners which work between the upper and lower surfaces of leaves. Among them are the *Birch Leaf Miner,* which makes mines and blister-like cells in leaves of birches during the summer, in which the larvae spend the winter, changing to small black flies the following summer. *Cedar Leaf Miner* causes browning of the foliage of arbor-vitae or cedar trees. Adult is a tiny, gray moth which may be seen hovering about cedar trees during mid-summer.

BORING AND SUCKING INSECTS

WHITE PINE WEEVIL.

A common and generally destructive enemy of sapling white pines. Most prevalent in plantations and natural growth of old fields and pastures in pure stands in the open. Sometimes attacks red and Norway spruce and rarely the red pine and white spruce. This small, reddish-brown beetle, ¼ inch long, emerges from the ground and lays its eggs in the terminal shoots or leaders early in the spring. Upon hatching the small, white grubs begin feeding just under the bark, working downward and deeper in the wood as they grow larger. A fishhook like curl of the leader identifies weevil injury. By July the terminal shoot dies and with the needles begins to turn brown. Sometimes the grubs continue feeding until they have passed one or more whorls of branches. Trees attacked are usually under 15 feet in height.

Nature attempts to correct the injury done by causing one of the side branches to grow upward to take the place of the dead leader. If succeeding attacks do not take place on the same tree and the trees are closely enough spaced to force the growth upward, the recovery is fairly complete in time, except for a slight crook in the trunk where a side

branch turned upward. Cutting off and burning the dead leaders while infested with grubs, by mid-summer if possible or even later, tends to reduce the damage another year. Much depends on the vigor and density of the stand if it is to survive repeated weevil injury and make a forest of shapely trees. Experiments in trapping beetles while on the wing, are being conducted.

Pine Shoot Moth.

This European pest has lately been found in New England, doing considerable damage to white pine trees. Adults are small, orange and silvery marked moths, flying during June and July. Eggs are laid on terminal buds. Larvae, small, brown with black heads, feed within the buds and new shoots, causing dead tops and crooked, bayonet-shaped stems. Treatment is to remove and burn infested buds and shoots.

Spruce Gall Aphid.

Causes injury to ornamental spruce trees and to some extent spruce forests. Eggs are laid at the base of the buds in the spring. The young crawl to the opening buds and their feeding results in enlarged buds which finally turn brown and break open. Treatment is to remove green galls before the winged aphids escape. Spray for sucking insects in early spring. Lime-sulphur has been found effective.

Pine Bark Aphid.

A sucking insect appearing as white, cottony patches on the trunks and limbs of white pine trees. The dark, reddish-brown aphids may be found within this white material. Eggs are deposited in downy balls near the base of needles in the fall. Eggs hatch about the first of June and the young migrate to tender bark of young growth. There are several generations each year. In addition to the unsightly appearance, aphids draw upon the vitality of infested trees.

Spray with a nicotine solution or miscible oil during the late dormant period.

Scale Insects.

Small insects of the nature of aphids which live under scale-like coverings formed from their bodies. Important only on fruit and ornamental trees. Damage is caused by sucking out the juices from tender bark, resulting in the dying of limbs or whole trees. These tiny creatures hatch from eggs under the scales in early summer, insert their sucking beaks and begin feeding. There the females remain for life. The male is winged at maturity and appears as a minute fly. Lime-sulphur or oil sprays are applied during the dormant season.

Bark Beetles.

Trees weakened from any cause are subject to attack by bark beetles during the summer months. They are small, hard shelled insects attacking various kinds of trees, pine, spruce and fir particularly. They sometimes attack pines in great numbers, boring into the bark and laying eggs which hatch into small, white larvae. These grubs tunnel out from the central galleries and effectively girdle the trees attacked. Their presence may be first seen by the sawdust or pin holes in the bark from which pitch oozes. Dry weather conditions or proximity to lumber piles and logging operations may be the cause of an attack on seemingly thrifty trees. Control is in cutting infested trees, peeling the bark from logs and cleaning up and burning the slash.

Several species of large, black, mottled or brownish round-headed borers are injurious to pine and spruce, especially logs and wood left with the bark on during the summer in the vicinity of logging operations. Eggs are laid in the bark and the larvae feed first just beneath the bark, then enter the wood, boring holes through the sap and heart wood and causing much damage to logs of commer-

cial value. Larvae are white, an inch or more long, becoming gradually smaller toward the hind end.

Larvae of flat-headed borers are longer and slender, with a much enlarged segment next the head. They are destructive to pine and spruce in the same way. Adults are bronzed, flat bodied beetles.

An insect known as the Spruce Bark Beetle, (*Dendroctonus* species) results in the death of considerable quantities of large spruce in the north country, sometimes following injury by the Bud Worm. Small trees are rarely attacked. The beetles bore directly into the lower trunk, making egg tunnels four to ten inches long, and lay eggs alternately along the sides. The yellowish-white grubs tunnel in the inner bark and large numbers will girdle the tree. Foliage becomes brown and falls.

Bronze Birch Borer.

White and yellow birches, sometimes poplar, are attacked by a boring insect which causes the tops to die. Beetles are bronze colored and lay their eggs in the bark. The white grubs make zig-zag tunnels in the sapwood.

Sugar Maple Borer.

Very common and the most serious injury to Sugar Maple trees, particularly ornamental trees in open places. Adults are large black and yellow beetles. Two years are required to complete the life cycle, as with most others. Larvae are whitish grubs hatching in summer and boring in the bark and sapwood, spending two winters in the burrows; about 2 inches long when mature. The greatest damage occurs the second season, caused by the wide galleries which encircle and even girdle the tree. Grubs should be cut out or killed with a wire introduced into the galleries wherever their presence is shown by bleeding or borings. Carbon bisulphide may be injected. Holes should be plugged up after injection.

MAPLE AND OAK TWIG PRUNER.

Presence of this insect is shown by the falling of twigs and small branches in late summer, the ends of which appear to be sharply cut off. A dark colored beetle deposits eggs in the twig in July. The white, slender grubs girdle the twigs and winter in the burrows made in them. Raking up and burning these twigs blown off by the wind is desirable.

PALES WEEVIL.

A black snout beetle which eats the tender bark on young pine seedlings, usually in the vicinity of fresh cutting of pine. These adult beetles carry on their destructive feeding in the fall, usually at night; they winter in the ground and lay their eggs in freshly cut stumps and logs the following summer. While this insect has not been found to be as destructive in our State as in Massachusetts, it is not desirable to plant white pine seedlings near pine lumbering operations until at least three years after logging.

ANTS.

It is often observed that mound-building ants will frequently kill small trees, particularly young pines, within a circle around their mounds. This is done by stinging the bark and injecting formic acid into the tissues. Unless the ants can be destroyed, it is not well to plant pines within 15 or 20 feet of their mounds. Carbon disulphide, used for borers in wood, may be effective in destroying ant colonies.

Pines in the woods, if unhealthy, may be attacked by the large black, or red and black, carpenter ants which hollow out the wood within.

TREE DISEASES

Disease, as distinguished from insect injury, is a form of plant life itself, which lives upon or within the host tree, often entering through wounds or dead branches, and

frequently the result of weakened condition of the tree, due to insect injury or other causes. Diseases of trees may infect the leaf, twig, branch, trunk or root and may injure or destroy the trees. Much less is known about them generally than about insects. Control measures are not so certain, except so far as destroying diseased trees or carriers of a disease and thus preventing further spread.

CHESTNUT BARK DISEASE. (*Endothia parasitica.*)

The most remarkable and unfortunate example of an imported tree disease which has practically destroyed our native Chestnut throughout its range during the past 25 years. The disease is of little importance in its native home in the Orient. Rapid spread and almost complete destruction in America is due to the susceptibility of American Chestnut and the fact that the disease spreads directly from one tree to another. Methods of control at first attempted soon proved of no avail and were abandoned. The only hope for Chestnut in the future is the possibility that resistance to the disease may in time be acquired by certain trees and extended through methods of selection and propagation. It is therefore important for pathologists to know of any relatively large trees which do not become diseased.

WHITE PINE BLISTER RUST. (*Cronartium ribicola*).

Brought to this country on imported nursery stock and in a little over 20 years has spread from the Atlantic to the Pacific wherever five needle pines are found. The disease is particularly and immediately destructive to reproduction and young trees and for this reason its destructive possibilities are often overlooked. Its spread depends upon having some species of currant and gooseberry (*Ribes*) as alternate host or carrier. Infection on white pines cannot spread directly to healthy pines but the spores or seeds developed in the bark first infect the leaves of Ribes bushes and there spores are developed which infect white pine

needles. From the pine needle the disease penetrates the twig, branch and ultimately the trunk and the tree is destroyed. Fruiting bodies are formed on pine bark in early spring after growth starts; on Ribes leaves the fruiting bodies are developed during the summer.

Control, in order to save white pines, depends upon destroying all species of currant and gooseberry bushes wherever they may be located within one thousand feet of the pines. It is upon this eradication principle that our state and all other states where white pine is of commercial importance are spending many thousands of dollars annually in co-operation with the federal government, towns and private land owners to check the spread of the disease within white pine growing areas.

There are many other similar alternate host diseases. Those affecting forest trees have never gained serious proportions. One of these alternates between two and three needle pines such as red or Norway pine and the leaves of Sweet Fern. The wheat rust of the West alternates on the leaves of Barberry.

Shoe-String Root Rot. (*Amillaria mellea*).

Common on many kinds of coniferous and broadleaf trees. Occurs everywhere on dead stumps and wood and also on living trees in weakened condition. Also attacks roots of young, healthy trees. Bark and wood of roots infected, extending up into bark and sapwood of lower trunk. Diseased tree shows dead limbs, scant and light colored foliage and little growth. In conifers resin exudes from base of tree, forming in cakes. May be identified by appearance of long, black strands attached to bark of roots and trunk or running through the soil. Within are thin, white strands of mycelium, often forming white sheets between bark and wood. Fruiting bodies are yellowish toadstools on the trunks, exposed roots or on the ground, attached to the black shoe-strings. Disease spreads under-

ground from one tree to another or through wounds at the base of tree or exposed roots.

PECKY WOOD-ROT. (*Trametes pini*).

Commonly known as red rot or ring shake. Very destructive decay of the wood of many kinds of coniferous trees, especially infecting pine and spruce. Starts at branch wounds where heartwood is exposed, penetrates to heart of the trunk and spreads upward and downward. Fruiting bodies occur only where branch stubs or broken tops furnish outlets for mycelium. They are of two forms, large shelf or bracket kind and smaller ones which lie close to bark and only project slightly. Spruce wood is purplish stained around decayed area, and in cross section is full of small holes or pockets with white linings.

BUTT OR ROOT ROT. (*Polyporus Schweinitzii*).

Occurs in various conifers and is nearly as important as the preceding. Enters through the heartwood of the roots, turning wood to yellowish color and causing splitting along the rays and annual rings. Wood afterwards becomes soft, cheesy and red-brown. Fungus spreads to base of trunk for several feet. Tree usually is uprooted by wind. Fruiting bodies are often large, umbrella-shaped with central stalk, growing from exposed roots or those near the surface. Spreads through the soil from tree to tree.

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