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INSECT INJURIES TO FOREST PRODUCTS.

BY

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United States Department of Agriculture,

BUREAU OF ENTOMOLOGY.

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INSECT INJURIES TO FOREST PRODUCTS.^a

By A. D. HOPKINS,

In Charge of Forest Insect Investigations.

Damage is caused by various species of insects which are attracted by the varying conditions prevailing at different stages during the process of utilizing the forest resources, from the time the trees are felled until the logs are converted into the crude and finished product and until the latter reaches the final consumer, or even after it is placed in the finished article or structure. As a result, additional drains are made on the timber to meet the demand for the higher grades of lumber and for other supplies to replace those injured or destroyed. From the writer's personal investigations of this subject in different sections of the country it is evident that the damage to forest products of various kinds from this cause is far more extensive than is generally recognized. This loss differs from that resulting from insect damage to standing timber in that it represents more directly a loss of money invested in material and labor.

CRUDE PRODUCTS.

Roundheaded borers, timber worms, and ambrosia beetles.—Round timber with the bark on, such as poles, posts, mine props, saw logs, etc., is subject to serious damage by the same class of insects as those mentioned under injury to the wood of dying and dead trees. The damage is especially severe when material is handled in such a manner as to offer favorable conditions for attack, as when the logs are left in the woods on skidways or in millyards for a month or more after they have been cut from the living trees. Under such conditions there is often a reduction in value of from 5 to 30 per cent or more, due to wormhole and pinhole defects caused by roundheaded and flatheaded wood-borers and timber beetles. Frequently the insects continue the work in the unseasoned and even dry lumber cut from logs which had been previously infested. They also con-

^a Revised extracts from Bulletin No. 58, Part V, Bureau of Entomology, U. S. Department of Agriculture, 1909.

tinue to work in mine props after they have been placed in the mine, and in logs and other material used for the construction of cabins, rustic houses, etc., and in round timbers generally.

The products from saplings, such as hickory hoop poles and like material, are often seriously injured or rendered worthless by round-headed and flatheaded borers and wood-boring beetles, sometimes resulting in a loss of from 50 to 100 per cent of the merchantable product.

Stave and shingle bolts left in moist, shady places in the woods or in close piles during the summer months are often attacked by ambrosia beetles and timber beetles. The value of the product is often reduced, as a consequence, from 10 to 50 per cent or more.

Handle and wagon stock in the rough is especially liable to injury by ambrosia beetles and roundheaded borers. Hickory and ash bolts from which the bark is not removed are almost certain to be greatly damaged if the logs and bolts cut from living trees during the winter and spring are held over for a few weeks after the middle of March or first of April.

Pulp wood, and cord wood for fuel and other purposes, cut during the winter and spring and left in the woods for a few weeks or months or in close piles after the beginning of the warm weather, are sometimes riddled with wormholes or converted into sawdust borings, causing a loss of from 10 to 100 per cent. One example reported from near Munising, Mich., represents a loss of \$5,000 from injury to spruce and fir pulp wood cut in the winter and kept in piles over summer.

MANUFACTURED UNSEASONED PRODUCTS.

Ambrosia beetles and other wood borers.—Freshly sawed hardwood placed in close piles during warm, damp weather during the period from June to September is often seriously injured by ambrosia beetles. Heavy 2-inch to 3-inch stuff is also liable to attack by the same insects, even in loose piles. An example of this was found in some thousands of feet of mahogany lumber of the highest grade, which had been sawed from imported round logs and piled with lumber sticks between the tiers of plank. Native species of ambrosia beetles had entered the wood to such an extent as to have reduced the value 50 per cent or more within a few weeks. Oak, poplar, gum, and similar woods often suffer severely from this class of injury, causing losses varying from 5 to 50 per cent.

Lumber and square timbers of both soft and hard woods with the bark left on the edges are frequently damaged by flatheaded and roundheaded wood borers, which hatch from eggs deposited in the bark before or after the lumber is sawed. There are examples of

losses from this character of injury amounting to from 20 to 50 per cent or more.

Telegraph and telephone poles, posts, mine props, etc., are frequently injured before they are set in the ground, especially if the bark remains on them during a few weeks after the middle of March.

SEASONED PRODUCTS IN YARDS AND STOREHOUSES.

Powder-post beetles.—Hardwood lumber of all kinds, rough handles, wagon stock, etc., made partially or entirely of sapwood, are often reduced in value from 10 to 90 per cent by a class of insects known as powder-post beetles. The sapwood of hickory, ash, and oak is most liable to attack. The reported losses from this source during the past five or six years indicate that there has been an average reduction in values of from 5 to 10 per cent or more.

Old hemlock and oak tanbark is often so badly damaged by various insects which infest dead and dry bark that in some tanyards as much as 50 to 75 per cent of the bark that is over three years old is destroyed. In one tannery in West Virginia it is estimated that more than \$30,000 worth of hemlock bark was thus destroyed.

FINISHED PRODUCTS.

The greatest loss of finished hardwood products, such as handle, wagon, carriage, and machinery stock, is caused by powder-post beetles. This is especially true of hickory and ash handles and like products in the large and small storehouses of the country, including the vast amount of material held in storage for the army and navy. When material of this kind is once attacked it is usually worthless for the purposes indicated, and therefore must be replaced with new material. In some cases losses have amounted to from 10 to 50 per cent, and it is estimated that the average losses have been as much as 10 per cent on nearly all sapwood material that has been in storage more than one year.

UTILIZED PRODUCTS.

Powder-post beetles, white ants, and other wood-boring insects.—The finished woodwork in implements, machinery, wagons, furniture, and the inside finish in private and public buildings are often seriously damaged by powder-post beetles, thus requiring increased demands for new material.

Construction timbers and other woodwork in new and old buildings are often so seriously damaged by powder-post beetles, white ants, and other wood-boring insects that the affected material has to be removed and replaced by new, or the entire structure torn down and rebuilt.

Construction timbers in bridges and like structures, railroad ties, telephone and telegraph poles, mine props, fence posts, etc., are sometimes seriously injured by wood-boring larvæ, termites, black ants, carpenter bees, and powder-post beetles, and sometimes reduced in value from 10 to 100 per cent.

PREVENTION OF INSECT INJURIES TO FOREST PRODUCTS.

The problem of artificial control and prevention of insect injuries to forest products offers less difficulties perhaps than that relating to many other branches of the general subject of forest-insect control. In most cases the principle of prevention is the only one to be considered, since the damage is done soon after the insects enter the wood, and therefore it can not be repaired by destroying the enemy.

CRUDE PRODUCTS.

The proper degree of moisture found in the bark and wood of newly felled trees, saw logs, telegraph poles, posts, and like material, cut in the fall and winter and left on the ground or in close piles during a few weeks or months in the spring and summer or during the period when the particular species of injurious insects are flying, are some of the conditions most favorable to attack. The period of danger varies with the kind of timber and the time of the year it is felled. Those felled in late fall and winter will generally remain attractive to ambrosia beetles and adults of round and flat headed borers during March, April, and May. Those felled during the period between April and September may be attacked in a few days after they are felled, but the period of danger from a given species of insect may not extend over more than a few weeks. Thus certain kinds of trees felled during certain seasons are never attacked, while if they are felled at other times and seasons the conditions for attack may be most favorable when the insects are active, and then the wood will be thickly infested and ruined. The presence of bark is absolutely necessary for successful infestation by most of the wood-boring grubs, because the eggs and young stages must occupy the inner and outer portions before the latter can enter the wood. Some ambrosia beetles and timber worms will, however, attack barked logs, especially those in close piles or otherwise shaded or protected from rapid drying. A large percentage of the injury to this class of products can be prevented, as follows:

(1) Provide for as little delay as possible between the felling of the tree and its manufacture into rough products. This is especially necessary with trees felled from April to September in the region north of the Gulf States and from March to November in the latter,

while the late fall and winter cuttings should all be worked up by March or April.

(2) Do not leave the round timbers in the woods or on the skidways during the danger period, or, if this is unavoidable, take every precaution to facilitate the rapid drying of the inner bark by keeping the logs off the ground, in the sun, or in loose piles, or else, if possible, the opposite extreme should be adopted and the logs kept in water.

(3) Remove the bark within a few days after the trees are felled, from poles, posts, and other material which will not be injured by checking or season cracks.

(4) Take advantage of the proper months or seasons in which to fell or girdle different kinds of trees to avoid danger.

Damage to products cut from saplings and left with the bark on can be prevented by transporting the material from the woods soon after it is cut, so that it will not be left in piles or bundles in or near the forest during the season of insect activity. Damage may also be prevented if care is taken not to leave the material stored in one place for several months.

Pinhole damage to stave and shingle bolts cut during a warm season can be prevented by removing the bark from the timber as soon as it is felled and by converting the bolts into the smallest practicable dimensions and piling them in such a manner as to facilitate rapid drying.

Damage to unseasoned handle and wagon stock in the rough can be prevented by taking special precautions to provide against the same favorable conditions for attack as mentioned in connection with round timbers. This is especially necessary with hickory and ash if cut during the winter and spring.

Damage to pulpwood and cordwood can be prevented to a great extent by placing the sticks of wood in triangular or crib piles immediately after they are cut from the trees, especially if the timber is cut during the danger period, or must be held for a few months during the warm season. Peeling or splitting the wood, or both, before it is piled will also provide against damage from insects.

MANUFACTURED PRODUCTS.

UNSEASONED PRODUCTS.

Freshly sawed hardwood lumber placed in close piles during warm, damp weather in the period from July to September, inclusive, presents the most favorable conditions for injury by ambrosia beetles. In all cases it is the moist condition and retarded drying of the lumber which induces attack. Therefore any method which will provide for the rapid drying of the lumber before or after piling will tend

to prevent loss. It is important, also, that heavy lumber should, as far as possible, be cut only in the winter and piled so that it will be well dried out before the middle of March.

The damage to lumber and square timber when the bark is left on the edges or sides can be prevented by removing the bark before or immediately after the lumber is sawed, or by sawing and piling the material during the winter, or if sawed at other times it should be piled so that rapid drying will be facilitated.

SEASONED PRODUCTS.

Unfinished seasoned products.—Injury by powder-post beetles to dry hardwood lumber and other material in stacks or storehouses can be prevented as follows:

(1) Have a general inspection of the material in the yards and storehouses at least once a year, preferably during November or February, for the purpose of (a) sorting out and destroying or otherwise disposing of any material that shows the slightest evidence of injury, as indicated by the presence of fine powdery boring dust, and (b) sorting out and destroying all old and useless sapwood material of any kind that will offer favorable breeding places for the insects.

(2) Prevent the introduction into the lumber yards or storehouses of any infested material, remembering that the insect may be thus distributed to or from all parts of the world.

(3) Adopt a system of classification of all dry or seasoned hardwood stock which will provide for (a) the separation of the pure heartwood material from the pure and part sapwood material; (b) classification of all kinds of wood most liable to attack, such as hickory, ash, oak; (c) the successive utilization or sale of the older material (remembering that material one year old or over is far more liable to injury); (d) providing against the accumulation of refuse material in which the insects could breed; and (e) treating the best material with linseed oil or kerosene to prevent attack.

Finished seasoned products.—Damage to finished handles, oars, spokes, rims, hubs, wheels, and other unpainted wagon, carriage, machinery, and implement stock in factories, wholesale and retail storehouses, and army and navy stores can be prevented by the adoption of the same general rules as those given under rough products. In addition, damage can be controlled and prevented in the following manner:

Sort out and (a) destroy all articles showing the slightest evidence of powder-post injury, or (b) treat with kerosene oil such infested and slightly injured articles as may be tested for required strength and found to be of sufficient value for retention, placing the same in quarantine for a sufficient time to determine whether the treatment is successful.

Damage by powder-post insects to many kinds of articles can be prevented and at the same time the material otherwise benefited by treating the sapwood with linseed oil or kerosene, either by immersing it in the oil or by applying the oil with a brush, the application to be made as soon as possible after the articles are finished from recently seasoned, uninjured stock.

PAST AND PRESENT CONDITIONS OF POWDER-POST INJURY.

Up to 1906 there were a great many reports of extensive losses of valuable material from the ravages of powder-post beetles which were seriously affecting all industries involved in the manufacture, sale, and utilization of the classes of hardwood products affected by them. In response to these reports and accompanying appeals to the Department of Agriculture for information on causes and remedies, the problem was thoroughly investigated and specific advice and instructions relating to practical methods of control and prevention have been widely disseminated, both through publications of the Department and special correspondence.

Reports of present conditions from our principal correspondents, together with the less frequent requests for advice, indicate that the disseminated information has been extensively utilized and that it has been worth many millions of dollars toward eliminating the losses and reducing the drain on the limited supply of the kinds of timber required to replenish the damaged and destroyed material.

The army and navy stores of handles, tent poles, wheelbarrows, oars, and many other hardwood articles have suffered severely from powder-post damage, involving an enormous loss, but the carrying out of the information already supplied has evidently contributed greatly toward the elimination of this source of loss to the Government.

TAN BARK.

Damage to hemlock and oak tan bark by the class of insects which in some cases has been so destructive to these products in the past can be easily prevented without cost, as follows:

- (1) Utilize the bark within three years from the time it is taken from the trees.

- (2) Prevent the accumulation in the yards and store sheds of old bark and waste material in which the insects can breed.

These simple methods have been extensively adopted since their recommendation in correspondence and publications between about 1894 and 1904, and afford one of the most striking examples of the value of expert information on the peculiar habits of insects and of how millions of dollars can be saved without cost through a simple adjustment in methods of utilization.

UTILIZED PRODUCTS.

Damage and loss from insect injuries to timber and other woodwork in structures of various kinds, to telephone and telegraph poles, posts, railroad ties, mine props, etc., can be prevented to a large extent through the adoption of the proper methods of management or of treating the material with preservatives before and after it is utilized.

TIMBERS AND WOODWORK IN STRUCTURES.

Injuries to timbers and woodwork in dwellings, outbuildings, bridges, etc., by powder-post insects can be prevented as follows:

(1) Use nothing but heartwood for the concealed parts most liable to damage.

(2) If it is necessary to use all or part sapwood material, attack can be prevented by treating the sap portions with kerosene, coal tar, creosote, or linseed oil. Facilities for future treatment can be provided wherever the rough or finished woodwork is exposed, as in outbuildings, bridges, etc., if care is taken to expose the sapwood portions.

(3) If the untreated timbers and woodwork in old buildings show evidence of attack, the affected portions should be given a liberal application of kerosene.

Damage by white ants, or termites, can often be prevented in the following ways:

(1) By the use of nothing but sound wood for underpinning and foundation timbers and the removal of decaying timbers from old structures.

(2) By preventing moist conditions of the wood in any part of the structure and especially that in foundation timbers.

(3) By the treatment of timbers necessarily exposed to moist conditions with creosote, zinc chlorid, corrosive sublimate, etc.

(4) If the timbers become infested, further progress of insect damage can be prevented by removing the badly damaged parts and soaking the remainder with kerosene, fumigating with bisulphid of carbon, and by removing any adjacent decaying or other wood in which the insects have been breeding or may breed, such as logs, stumps, etc.

Log cabins and rustic work.—Damage by bark and wood boring insects to the unbarked logs and poles used in rustic cabins, summer houses, fences, etc., can be largely prevented by cutting the material in October and November and utilizing it at once, or by piling it off the ground or under cover in such a manner as to offer the best facilities for the rapid and thorough drying of the inner bark before the middle of March or the 1st of April following. If these necessary

precautions are not taken, and there is evidence that insects are at work in the bark and wood, the damage can be checked by injecting bisulphid of carbon through natural or artificial openings in the affected bark, and immediately stopping these and other openings with putty or a similar substance.

Poles, posts, piles, ties, mine props, and similar products.—Insect damage to poles, posts, and similar products can be prevented to a greater or less extent by the preservative treatments which have been tested and recommended by the Forest Service for the prevention of decay. These should be applied before the material is utilized for the purposes intended, or, if it be attacked after it has been utilized, further damage can be checked to a certain extent by the use of the same substances.

It is often of prime importance to prevent injury from wood-boring insects, for the reason that such injuries contribute to more rapid decay. Therefore anything that will prevent insect injury, either before or after the utilization of such products, will contribute to the prevention of premature deterioration and decay.

Approved:

JAMES WILSON,

Secretary of Agriculture.

WASHINGTON, D. C., *October 7, 1910.*

[Cir. 128]



