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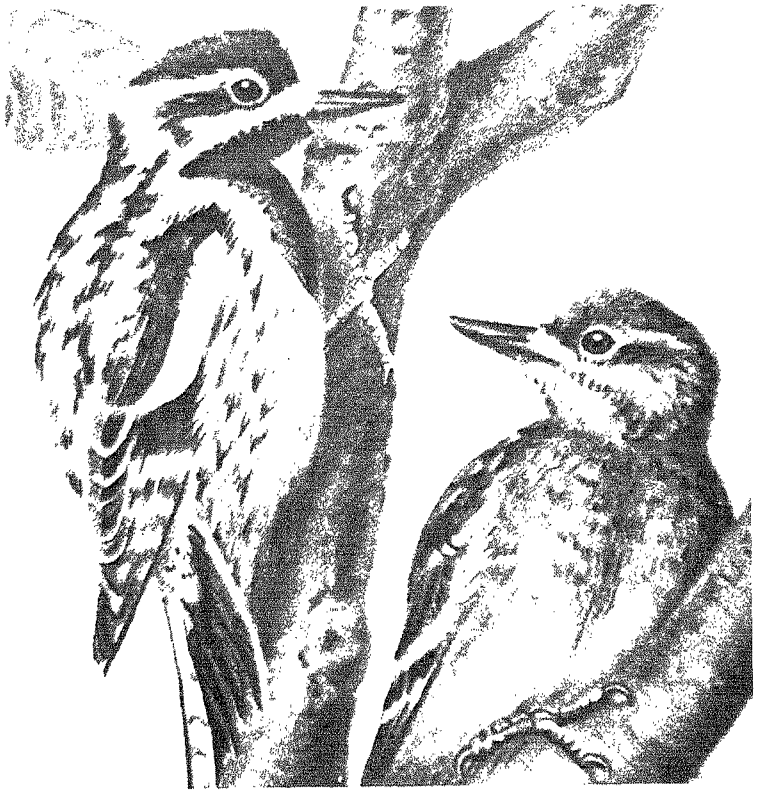
Figure 1. — The yellow-bellied sapsucker; adult male on the left and a young bird at right. From *The Birds of Minnesota,* vol. 1, by Thomas S. Roberts. The University of Minnesota Press, Minneapolis. Copyright 1932 by the University of Minnesota.



The Sapsucker

THE three species of woodpeckers properly classed as sapsuckers have been called the evildoers of the woodpecker tribe (Roberts 1932). These three birds differ in several ways from the 20 or so other woodpecker species found in the United States. Though their chief insect food is ants, a large part of their diet consists of the cambium and inner bark of trees, and they drink a great deal of tree sap (Beal and McAtee 1922).

These sapsuckers sample the sap and cambium of many trees around their nesting sites, and select the particular trees that appeal to them for future tapping. The selected trees become the birds' orchard, and the birds tap them repeatedly until many are badly injured, and some are killed. Sapsuckers are known to attack

more than 258 species of woody plants, and defects due to sapsucker attack have been found in the wood of 174 tree species (Beal and McAtee 1922).

The type of damage that sapsuckers do has been known for a long time, especially by people concerned with fruit orchards and ornamentals (Roberts 1932). However, sapsucker damage has not been a matter of much concern for foresters. This is partly because most of the injuries are on hemlock, a low-value species; and damage on hardwoods is high on the stem, where it is difficult to notice in a dense forest. Recently, though, Ziller and Stirling (1961) pointed out the damage done by the western species of this bird—the red-breasted sapsucker—in coastal British Columbia. Here these sapsuckers caused considerable damage to mature hemlock (*Tsuga heterophylla* (Raf.) Sarg.) by inflicting many small wounds at the base of the tree.

In the Northeast the common species of sapsucker is *Sphyrapicus varius varius* L., the yellow-bellied sapsucker (fig. 1). Some recent observations indicate that there is a direct association between sapsucker injury and the separation of the wood at the growth rings —commonly called ring shake—in living softwood and hardwood trees.

Observations

The observations of sapsucker damage were made since 1959 in the Saco River district of the White Mountain National Forest in New Hampshire. Sapsucker injuries were observed on the following tree species: eastern hemlock (*Tsuga canadensis*), paper birch (*Betula papyrifera*), yellow birch (*Betula alleghaniensis*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), and beech (*Fagus grandifolia*).

In the field observations it was noted that the birds concentrated on certain trees in each area, but did not touch other trees nearby. On the attacked trees, the bark was completely killed on some parts of the stem; and older healed areas had the appearance of old scrape wounds (fig. 2).

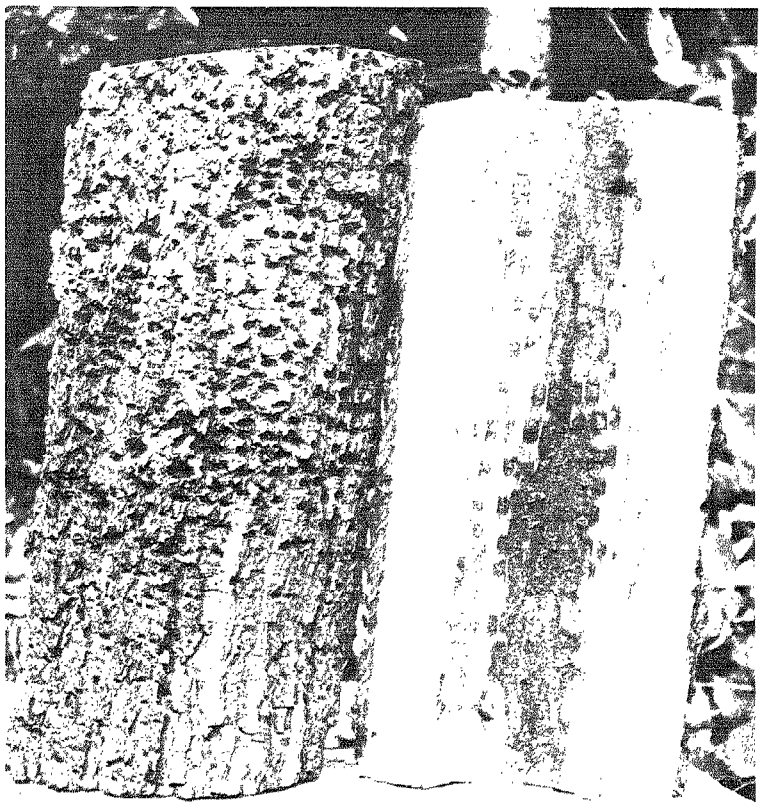


Figure 2. — Two sections of a hemlock tree, showing sapsucker wounds. Left, the bark is pocked with sapsucker wounds, and the smooth patch of bark shows where concentrated wounds killed the bark 40 years ago. Right, inside the tree a ring-shaken piece was pulled off, exposing a large dark 40-year-old wound and a number of small wounds.

The sapsucker injuries were first examined on trees that had been cut for studies of decay. (The fungi associated with the discolorations around the injuries were isolated from samples collected in the field. A few noteworthy fungi isolated were *Verticillium* sp., *Ceratocystis* sp., *Graphium* sp., and *Daldinia concentrica*.)

The importance of the sapsucker damage was not fully realized until hemlock trees were dissected and examined. Two interesting

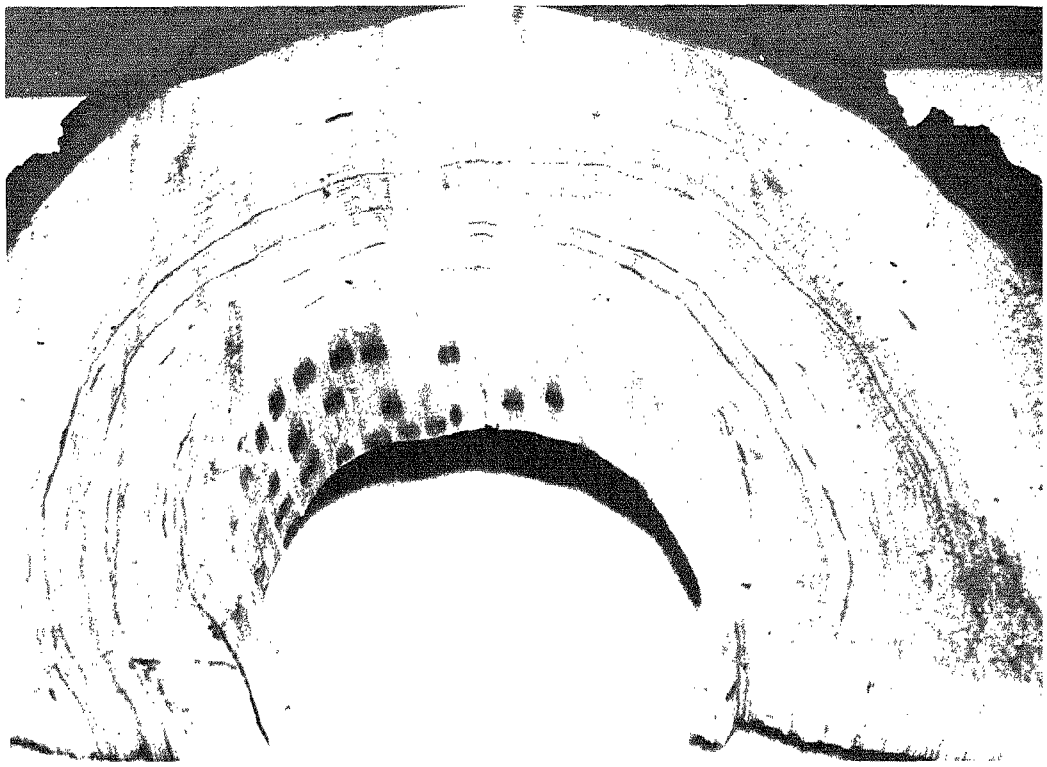


Figure 3. — A sample section from a hemlock stem, showing the dark lines along the growth rings, and 75-year-old sapsucker wounds on the surface exposed by pulling out the ring-shaken core.

defects in the wood were noted. Cracks between the growth rings —ring shakes—were abundant near the lower part of the trees. And heavy dark lines were found between some annual rings higher up the stem (fig. 3).

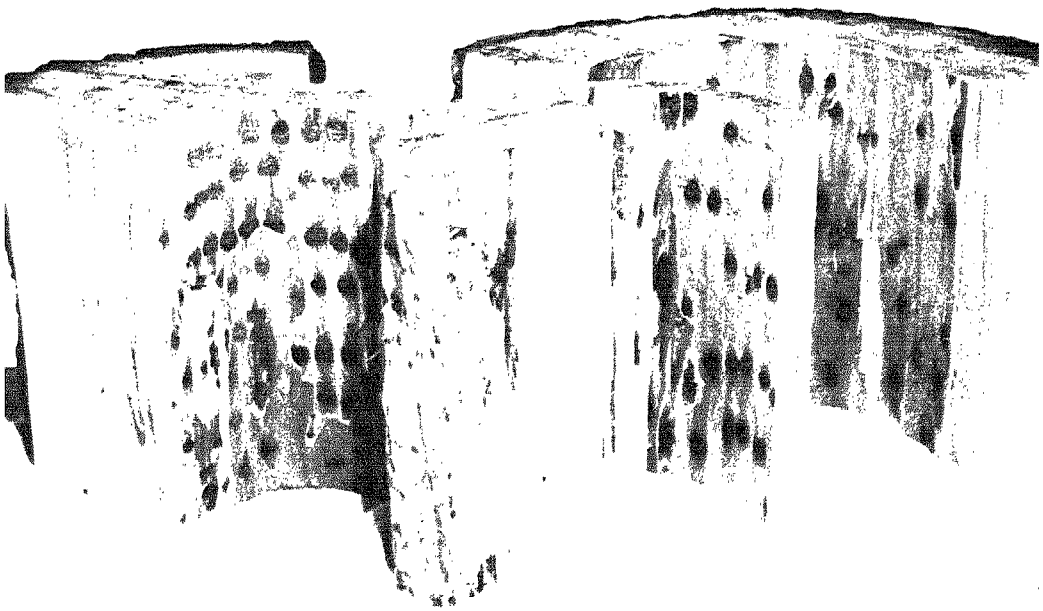
Many tree sections having shake, and those having the dark annual rings, were pulled apart and examined (figs. 2, 3, and 4). The sections from the lower parts of the stem usually separated easiest. Many small scars were seen on the inside surfaces of the separated sections. The smooth hemlock wood was pink to yellow when first separated, and the dark red scars formed a striking

pattern on this background. The pattern was disrupted only where the wood had been so badly scarred that callus tissue was present, and in some areas where decay had obliterated most of the old scars (fig. 2).

To verify these observations, 25 trees on different sites that had old but discernible sapsucker wounds in the bark were dissected and examined. All had internal sapsucker scars, and the wood separated at these injured places. The holes could still be seen in the bark (fig. 2) more than 60 years after the injuries had been made. The holes in the bark matched with scars on the wood 40 and 60 years inside the stem. In one hemlock 18 inches in diameter breast high, sapsucker scars were found on the growth ring that had formed when the tree was 2 inches d.b.h.

The ease of separation of the wood at the growth rings depends on the time since the wounds were inflicted, the concentration of

Figure 4. — This hemlock sample pulled apart along several ring-shake cracks. Sapsucker wounds line the surfaces of the separated sections.



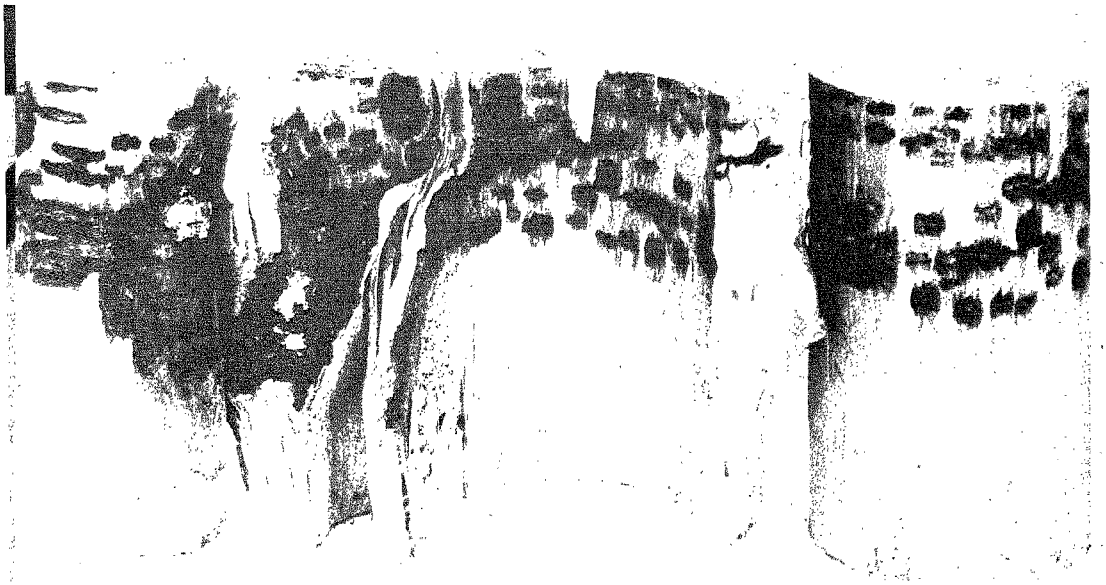


Figure 5. — The sapsucker attacks some hardwoods, too. This separated ring-shake sample from a paper birch bears old sapsucker wounds. The separation was evident several inches above and below the wound.

wounds in any one area on the tree, and whether decay fungi have invaded these areas.

An examination of hardwoods injured by sapsuckers revealed that the pattern of the internal scars was similar to those found in hemlock (fig. 5). The ring shakes found in the hardwoods were limited to a few inches above and below the old injuries. And the areas injured on hardwoods were much smaller than those on hemlock.

Repeated sapsucker tappings in one area on the bark of hardwoods was not common. Usually the birds girdled a section, which resulted in the death of the portion above (fig. 6); or the concentrated wounds killed portions of the stem, resulting in one large wound (fig. 7). It was hard to realize that sapsuckers caused the open smooth wounds frequently found in the crowns of trees, but

Figure 6. — The top of this paper birch was killed by girdling sapsucker wounds.

Figure 7. — Sapsucker wounds on red maple. On the section at right, old dead strips of bark still cover the lower wounds. Similar strips of dead bark can be seen around the large wound on the section at left.

several of these wounds were found that still had some of the old dead bark covering them (fig. 7).

Ring shake was found in paper birch trees where the sapsucker wounds went around the stem, but did not completely girdle it (fig. 5). These old injured areas appeared as black swollen bands around the trees, and were usually near the base of the crown.

Discussion

Many different explanations for ring shake have been presented (Wilson 1962), but none have been widely accepted. Growth stresses and compression failures have been pointed out as possible causes (Koehler 1933). Mergen (1958) states that shakes are the results of rupturing between the cells, and occur either along the boundary of two rings, or within the cells of the ring itself.

The concentrated small injuries made by the sapsuckers could easily weaken the fibers along the newly-formed ring of wood, and these weakened areas may not separate until certain stresses that accompany aging of the wood begin. If obesrvations are made only on well-separated sections of wood near the center of old trees, the sapsucker scars would probably not be noticed because of the obliteration of these small scars by decay and the natural fading of the small wounds. The work of the sapsucker would also be missed, especially in hemlock, if old shakes were examined and the sapsucker injuries were located at a slightly different area, above or below the place examined. Also, concentrated wounds that kill the bark in one area usually leave few small individual scars in the wood, and in this case too it would be difficult to realize that a bird had caused the large wound.

The mature eastern hemlock trees cut in logging operations in the White Mountains are usually more than 18 inches d.b.h. and fairly old. As these trees get older, the bark thickens and the birds find the trees less appealing. At the same time it becomes progressively more difficult to notice the old sapsucker wounds in the bark. When these trees are finally cut, it is almost impossible to associate the old sapsucker injuries with the ring shake. Therefore, to observe the shakes associated with sapsucker injuries, trees must be dissected and examined that still have an abundance of discernible sapsucker wounds on the bark, and the trees should be at least 100 years old.

In the observations reported in this paper, ring shake was found consistently where concentrated sapsucker wounds were inflicted at least 75 years ago. A more intensive investigation is necessary for an understanding of the full impact of sapsucker damage.

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