WETWOOD AND SLIME FLUX IN LANDSCAPE TREES

by W. Douglas Hamilton

Unsightly and often foul-smelling seepage from tree wounds in a familiar sight. The nature and treatment of this condition, however, is little understood. This discussion describes the cause of this abnormal tree behavior for the practical tree worker.

Wetwood and slime flux defined. Wetwood is a bacterial disease of live wood. Sap often accumulates under pressure in affected wood and produces a water-soaked appearance, hence the term wetwood. Causal bacteria have many pathways of infection; insects, birds, wind, equipment, frost cracks, pruning wounds, propagation wood, and split crotches.

Exuding of fermented sap through trunk wounds, trunk cracks, or other trunk injuries is called fluxing. It is commonly called slime flux if the flux become contaminated by air-borne bacteria, yeasts, and other fungi. The appearance is frothy and slimy and has a foul smell.

Importance. Wetwood is a chronic type disease that may contribute to the general decline of trees, especially old trees and trees of low vitality. It does not cause a rapid dying; parts of some trees may show symptoms for 100 years or longer.

The importance of wetwood is its contribution to general tree decline, its unsightly appearance, and increased safety hazard in weakened limbs. Wetwood in at least one instance benefits the host; black poplar in Canada. The anaerobic wetwood conditions prevent decay as long as anaerobic conditions prevail. It may prevent butt rot in several species. Under most other conditions, wetwood retards or prevents callus formation over wounds and therefore lengthens the susceptible period for entrance of decay fungi. Dripping wetwood flux is known to kill turf. While wetwood flux can prevent or delay formation of new callus, it is not observed to cause injury to callus tissue already formed or to live tissues beneath contaminated bark.

Very few infected branches die during a single growing season and infected trees most often recover in succeeding years. In some trees, however, a few scattered branches die annually, leading to a gradual and perhaps total decline.

Tree susceptibility. Wetwood occurs mostly on profusely-bleeding trees, such as birch, elm, and maple on the east coast. In California, wetwood is seen on the large elms, Siberian elm, albizia, walnut, willows, poplars, birch, southern magnolia, sycamore, tulip tree, oaks, mulberry,

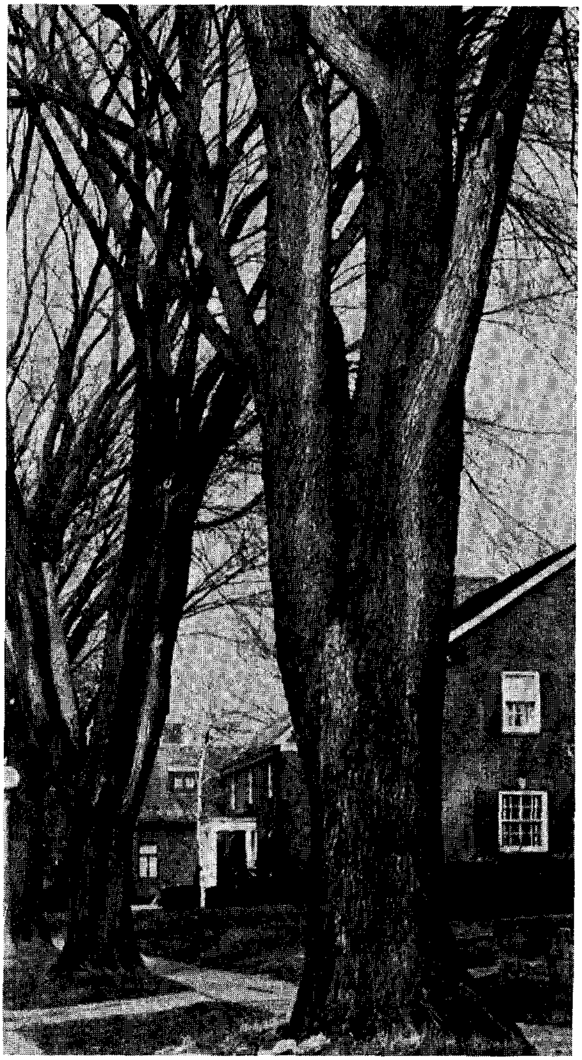

Fig. 1. Wetwood of elm.

and apple. Other trees reported to be susceptible include: redbud, hemlock, hickory, linden, and mesquite (the list is probably incomplete). Poplars in the southeast United States are reported to be killed by wetwood in less than 15 years; in the west and farther north, poplars are more tolerant. To date, wetwood has not been observed on redwood or eucalyptus species in California nor has it been readily observed on shrubs.

Cause. The cause of wetwood in eastern elms (*Ulmus americana*) is a bacterium, *Erwinia nimipressuralis*. The cause is variable in other trees and there may be other organisms involved. Wetwood in elms results when bacteria invade and grow in spring wood of one or more annual growth rings in the trunk or large limbs; this may be current seasons' wood. The causal bacteria are small, motile, rod shaped, single celled-organisms with up to six flagella.

Symptoms. Wetwood in some instances, occupies the central core of the heartwood. In others, it appears in isolated pockets of sapwood. It appears as a progressive disease in some cases. In others it seems to be a common feature of a healthy tree. Western cottonwoods are often seen to be infected from early stages of growth. Dark streaks or broken bands in one or more annual rings or in limited portions of annual rings are symptoms. This is in addition to the appearance of dark-brown water-soaked wood often with oozing sap. Discoloration is most extensive in heartwood and older sapwood, but can occur in wood of the current season. Foliage of affected limbs of trees is often prematurely yellow, scorched, and wilted. Early defoliation may occur. Swelling of the affected trunk or limb may also be seen. Flux oozing from the infection is the most conspicuous symptom and usually occurs. At first colorless, it later turns tan and darker upon exposure to air. As it dries, it leaves a light gray to white crust. It is most active in the late winter and spring in California. Symptoms of wetwood are often similar to verticillium wilt, Dutch elm disease in elm, and Dothiorella wilt. It can be distinguished from other wilt diseases by laboratory analysis.

Conditions for development. An abundance of foul-smelling gas may be produced in wetwood affected tissues by fermenting bacteria on carbohydrates and other materials in the sap. When confined, pressures of up to 60 psi can be produced; five to 10 psi are more common. The foul odor produced from contamination of the fluxing sap by airborne microorganisms is unmistakable evidence of slime flux. It is not uncommon to see a tree worker going home with his shirt off after discovering an infected pocket of wetwood under pressure. An analysis of wetwood sap or flux in elm in the east showed 14% carbon dioxide, 5% oxygen, 1% hydrogen, 46% methane, and 34% nitrogen. Carbon monoxide was found. Sap of wetwood was high in phosphorus and potassium. The pH of infected wood of several species tested was higher (7.1 to 8.5) than a normal range of 5.5 to 6.6 for the species.

Treatment. Treatment of severely affected trees and limbs includes removal of dead limbs in the spring following symptoms. Fertilizing the tree may aid in overcoming adverse effects. An accepted practice to relieve pressure and drain the infected sap is to drill a small hole upward into the infected wood and insert a tight-fitting pipe. A 3/16 inch copper tube has been used successfully. Some practitioners prefer a semi-ridged plastic pipe. It should protrude from the bark to prevent dripping on the tree. The hole is drilled through the tree to within a few inches of the opposite side. The corings are examined to determine the depth of infection. More than one infected area may be found. Sometimes a drain placed at the base of the trunk of large trees will stop fluxing of several wounds. The operation of drilling the hole and inserting a drain must be preplanned and quickly done because wood fibers surrounding the fresh hole rapidly expand, thus sealing-in the pipe. This tight fit also helps prevent new infections.

Cures for wetwood have not been developed. No chemical treatment has, as yet, been successful although the application of a paste of Bordeaux has been recommended. Eliminating the causal bacteria by preventing flux and allowing complete wound closure has not been demonstrated, although proper pruning techniques which encourage rapid wound closure are certainly suggested. Professional tree care, however, will include making clean pruning cuts at locations where callusing is likely to be rapid, and draining infected wood to prevent fluxing through wounds.

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ABSTRACTS

Chapman, Douglas. 1980. **Ash, hackberry and katsuratree offer elm's urban adaptability.** Weeds Trees & Turf 19(3): 24-25, 27.

Ash (*Fraxinus*), hackberry (*Celtis*), and Japanese Katsuratree (*Cercidiphyllum*) are three trees which offer adaptation to many urban conditions (as did elm), be it park or landscape tree. Of the four ash species normally used in the landscape, green ash is by far the best selection. It is a rapid grower that tolerates urban conditions, e.g. air pollutants, salt, etc., is less susceptible to borers, and grows well in wet, high pH soils, rarely showing ill effects from calcium or sodium chloride, applied for snow removal. Hackberry is another plant that grows in most urban areas where elm thrives. It seems to tolerate urban conditions well and should be used more extensively as a park or street tree on these heavy soil sites. Japanese Katsuratree is an outstanding specimen plant for use in parks, golf courses, institutional grounds, or as a street tree. Karsuratree, hackberry, and ash all grow well in moist, fertile soils. They are fast growing, respond well to fertilizer, and, if pruned actively when young, form a good structure.

Kerr, John. 1980. **Knowledge of spray equipment contributes to applicator efficiency.** Weeds Trees & Turf 19(3): 28, 30, 34, 36, 38, 41-42, 44.

Knowing how spray equipment functions not only makes someone a better applicator, but can save valuable time during work or back at the shop. A basic understanding of the spray system can provide, at the least, an intelligent and time-saving report of a malfunction, should one occur. Once you've decided on what chemical to spray, you need to know how to spray it. "The chemical does the work; it just has to be applied at the proper rate and time, according to the manufacturer's specifications," says Ed Gray, sales engineering manager of Spraying Systems Co. "If you have the right equipment, you're halfway there." The right equipment on a spray system consists of five basic components. These are the tank, nozzles, agitator, pump, and regulating devices.