

either the time of adult emergence or before egg laying begins. Particular attention should be paid to spraying the upper canopy since many adults roost there. Most larvae emerge from the egg at the point of egg-bark contact and are never exposed to insecticides applied to the bark. Also, most present day insecticides are seemingly not effective against the insect egg itself.

This paper was not prepared to be a substitute for a short course in entomology. Rather, it is only a brief discussion of types of insect injury to trees and shrubs. If you find that you are stimulated and are interested in learning more, so much the better.

The controls have not been specifically discussed, either in material, modes of application or timing. Since controls change so rapidly and

since geographical location tends to regulate timing of any application of materials, it is suggested that the local county agent, farm advisor or pest control advisor be contacted to learn more of the specific details involved. Just remember the axiom of good pest control is: The right material at the right place at the right time.

If the ghoulies and ghosties and long-leggety beasties and things that go bump in the night are still keeping you awake, you've got a problem.

All photos are by Leland R. Brown, Department of Entomology, University of California, Riverside, California.

*Department of Entomology
University of California
Riverside, California*

ABSTRACTS

Heidmann, L.J. 1976. **Frost heaving of tree seedlings.** USDA Forest Service Tech. Rept. RM-21, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

Frost heaving of tree seedlings is more serious among seedlings less than 1 year old than among transplanted stock. It appears to be a surface soil phenomenon, and occurs because of a segregation of soil water which freezes into layers or lenses of ice. Lens formation causes an uplift of the surface soil and the tree seedling. Upon thawing, the tree remains in an extruded position on the soil surface while the soil recedes to approximately its original level. Segregation of the soil water occurs within the total matrix because of supercooling of the water in smaller soil pores and the water adsorbed on soil particles. The difference in freezing points provides the energy necessary to draw water to the ice lens and to lift the surface. Segregation of soil water is related to soil permeability and negative pressure on the water. A silty soil is more likely to heave because the right combination of permeability and tension can be developed. Heaving in a clay soil is determined to a great extent by the type of clay and the nature of the ions adsorbed by the clay particles. Heaving can be controlled by lowering the freezing point of the soil water, by restricting the water flow to the freezing front, or by cementing the soil particles together. Chemicals such as calcium chloride have been successful in reducing frost heaving by lowering the freezing point of the soil water. Dispersing agents, mainly sodium compounds, reduce heaving by plugging the soil pores, thus limiting water movement to the freezing front and subsequent growth of ice lenses. Cementing agents make the soil less frost susceptible by reducing the proportion of finer soil particles (clay and silt).

Lofgren, D.E. 1976. **How to write maintenance specifications for tree and shrub care.** Grounds Maintenance 11(6): 20.

Suggestions are given for maintenance specifications on location, scope of work, general instructions, new plantings, established plantings and times of operation.