Fluorine Injury To Ponderosa Pine: A Summary

CHARLES GARDNER SHAW,* GEORGE W. FISCHER,*
DONALD F. ADAMS,* MARK F. ADAMS,*
AND DONALD W. LYNCH†

In addition to visible foliage damage, diameter growth of ponderosa pines in the damage area has been retarded since 1942. Damage is zonal, being most marked at a center coinciding with the industrial area north of Spokane, Washington. Damage cannot be correlated with climatic or parasitic factors.

Chemical analyses of 5000 needle samples collected during one-and-one-half years over 180 square miles reveal fluorides varying from 4 to 600 parts per million of the dry needle weight. Fluoride concentrations decreased with increased distance from the center of damage. Fluorides increase from year to year in pine needles until the needles fall. Maximum concentrations of fluorides in the oldest needles in different zones were: 1-mile radius, 620 p.p.m.; 3-mile radius, 130 p.p.m., 6- to 7-mile radius, 40 p.p.m.; 9-mile radius, 25 p.p.m.

Air analyses revealed significant concentrations of fluoride in the atmosphere in the pine-damage area. Highest concentrations (up to 351 parts per billion) were found within 1 mile of the center. At distances of 3½ to 7 miles, up to 42 parts per billion were present in the atmosphere.

Injury to ponderosa pines and gladiolus has been prevented by spraying them with calcium oxide. Typical injury has been produced on pines and gladiolus in controlled experiments by fumigation for 24 hours in an atmosphere containing 12 parts per billion of hydrogen fluoride.

The detailed report on the diameter growth of ponderosa pine in connection with this study follows on page 157.

* The State College of Washington.

† Northern Rocky Mountain Forest and Range Experiment Station, Inland Empire Research Center.