

Some Ecological Effects of Radiation on Plant Communities at the Lockheed Reactor Site

This spring, twelve months following the first radiation released at the Lockheed Reactor Site near Dawsonville, Georgia, the cumulative line of sight dosage ranged from about the equivalent of 30,000 r mixed gamma-neutron radiation at the 500-foot distance to about 4,000 r at 1000 feet. More than half of this was received during last June and most had been received by last fall.

The first effect was the killing of all pine trees up to 1000 feet from the reactor with many aberrations noted at greater distances.

The next general effect occurred in the fall of 1959 when the leaf abscission in the oak-hickory-pine forests at the 500-1200 foot distance ranged from one to three weeks early, thus curtailing the growing and photosynthetic seasons. This was also noted for many herbs, some annuals in the experimental cobalt field completing their entire life cycles three to four weeks early with about 10,000 r accumulated in chronic exposure over the growing season.

In the spring of 1960 there was a prolongation of winter dormancy in the woody vegetation around the reactor up to 1500 feet, resulting in an island of vegetation up to 3000 feet across still in its winter aspect after the surrounding vegetation had come into full leaves. Over a period of one month most of the trees leafed out to within 700-800 feet, the

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Box

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of dormancy being proportional to dose, and differentially affected by various species. The net result is a shortening of the winter period at both ends.

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Within 700-800 feet most of the terminal buds of the woody vegetation had been killed, growth being resumed by adventitious buds on wood several years old. Continued radiation will probably result in the death of the hardwoods, not because of relatively quick death of the whole tree as in the pine, but by continued destruction of the apical meristem, thus cutting off means for carrying on photosynthesis. Even if shoots persist, it is likely that their reduction in number and shortened photosynthetic season would result in starvation and death.

Another marked change is that in composition of the old-field communities, four to six hundred feet from the reactor, where marked shifts in dominance through the year have occurred as a result of differential sensitivity to radiation of the various species.

Shielding and scatter effects by the terrain and by woody vegetation are being evaluated. Neutron and gamma scatter through the upper two thirds of an oak-hickory stand 60-80 feet high has resulted in biological effects on the terrain-shielded lower third and forest floor of about one half that received in the direct line of sight. Tree trunks 10-12 inches in diameter have noticeable shielding effects on the protected side, with respect to the vines and the development of adventitious buds.

About one year's intensive study of the problem area was carried out prior to exposure to radiation. An area, ecologically equivalent, but outside the extent of radiation, was also studied and will continue under investigation.

In experiments at the University of Virginia 14 conifer species have been shown to be more sensitive to radiation than deciduous species. Experimental material consisted of ornamental shrubs.

Arnold Sparrow (BNL) has preliminary data which indicates to him that sensitivities is correlated with nucleus size, the larger the nucleus, the more sensitive the cell.