pairing watershed service. Three fifths of this area is adding to the silt load of major western streams.

It will probably require more than 50 years of management to restore the depleted range sufficiently to carry even the 17.3 million livestock units now grazed and probably an additional 50 years to restore it to the nearest possible approach to its original grazing capacity of 22.5 million units.

Action of greatest immediate urgency and importance is to—

Stop soil and forage depletion, and start both on the upgrade;

Reduce excessive stocking, place all range lands under management, and restore cheap range feed;

Rectify land ownership and use maladjustments, and obtain a sound distribution of ownership between private and public agencies;

Build up economic private and public units;

Balance and integrate crop and range use;

Correlate the livestock, watershed, forest, wildlife, and recreation forms of range-land uses and services;

Obtain a recognition of the responsibility of stewardship by private owners;

Minimize or remove various financial handicaps of stock producers;

Reconcile range conservation and the financial needs of State institutions;

Solve the tax delinquency problem;

Place public lands under the supervision of agricultural agencies as a step toward unification of public responsibility for the entire range problem. Provide on such lands for a sound distribution of grazing privileges, and prevent the establishment of prescriptive rights;

Obtain and apply the information necessary for the conservation and wise use of the range resource;

Prevent human wastage and insure social and economic security.

This report should be studied in connection with the symposium "Scientific Aspects of Flood Control," sponsored by the Ecological Society of America and the American Association for the Advancement of Science at the Rochester meeting of the association. The papers presented in this symposium were of such outstanding value that they are being issued with illustrations as a supplement to SCIENCE in the Occasional Paper Series of the American Association for the Advancement of Science. They will be invaluable to all interested in soil conservation and flood control.

A. F. WOODS

SPECIAL ARTICLES

SOME RESULTS OF INVESTIGATIONS ON POLYPORUS SCHWEINITZII FR.

IN July of 1928, while forest pathologist in the New York State Conservation Department, the senior writer's attention was called to a resinosis disturbance which was present in the root crown and in the roots of northern white pine (*Pinus strobus* L.) in forest plantings at Norwich, N. Y. A year later, there was reported to him a similar condition in the municipal forest plantings of the city of Rochester, N. Y., located along Hemlock and Canadice Lakes. Preliminary surveys of these situations showed that, although the disease was making very rapid progress, the cause was quite obscure. The plantings along Hemlock Lake, where the disturbance was most severe, were established from 1910 to 1914 on abandoned fields. All the stock had been grown from seed in the nurseries of the New York State Conservation Department. Imported white-pine seedlings had been grown a few years previously in some of these nurseries which have since been abandoned. This fact suggested the possibility that a parasitic fungus of foreign origin might have been introduced into the nursery soil and spread to various places in the state on stock grown from seed in these nurseries.

Intensive investigations of the cause of this disturbance were begun in the summer of 1930 by the senior writer and have been conducted largely in the region of Hemlock and Canadice Lakes. Reddish streaks suggestive of incipient decay were observed occasionally in the central part of some of the "resinosed" roots; many cultures from these discolored regions failed to yield any organism known to cause the decay of wood; bacteria were the only organisms present in the majority of the cultures.

In August, 1932, a single sporophore which resembled *Polyporus Schweinitzii* Fr. was found, but it was so imperfectly developed that a species determination was impossible. It was attached to the base of a living tree which showed little evidence of resinosis. In the summer of 1933, sporophores of *P. Schweinitzii* were occasionally observed near the base of dead and diseased white-pine trees in an eleven-acre tract along Hemlock Lake. Sporophores of this fungus were quite abundant in this and two other plantings in the summer of 1935. The earliest date on which a perfect sporophore of *P. Schweinitzii* has been observed in this locality was June 6, 1935. With this discovery of *P. Schweinitzii,* the senior author then sought to determine whether the resinosis was caused by this organism or if it was due to some other pathogene. Hundreds of cultures from the "resinosed" lesions failed to yield *P. Schweinitzii,* but a grayish-black fungus developed in approximately 75 per cent. of these cultures; all efforts to induce the latter to fruit have been unsuccessful. Thus it would seem that no direct connection

exists between the resinosis disturbance and the injury caused by *P. Schweinitzii,* since the trees attacked by the latter may never show any, or very little, evidence of resinosis.

No sporophores of *P. Schweinitzii* have thus far been found in the plantings at Norwich, even though hundreds of trees have died from resinosis. The roots of trees which die from this disease may never show any traces of the reddish streaks. Resinosis has been found to be most severe where the pH of the soil is 6.0, or above, and the colloidal content 52 per cent. or more. Even though *P. Schweinitzii* has been found to be very abundant in such areas, it is also causing very severe damage where the pH of the soil is around 5.5 and the colloidal content varies from 46 to 50 per cent. or even less. The resinosis disease is of minor importance, as contrasted with the damage which is being caused by *P. Schweinitzii.*

Advanced stages of decay in the roots of living trees of white pine due to *P. Schweinitzii* were first observed in the summer of 1933. By the end of the summer of 1934, this root rot was found to be very wide-spread in plantings totalling about 1,200 acres of white and red pine in the Hemlock Lake region. Living trees whose roots were badly rotted had begun to fall over and have continued to fall in increasing numbers. At the present rate of destruction, not a single tree in this area will reach merchantable size. The losses from the damage caused by *P. Schweinitzii* along Hemlock and Canadice Lakes are the most serious which have thus far been reported in forest plantings in the United States, if not in the world. *P. Schweinitzii* was reported in 1925 as causing root rot in forest plantings of Douglas fir near Biltmore, N. C.[1]

Chemical analyses of soil extracts show that in plantings where *P. Schweinitzii* is present there is nearly 21 per cent. more calcium in the upper four inches of the soil than where the organism is not known to occur. A number of chemical analyses of the ash of the wood of infected trees show less calcium present than in the wood of normal trees. It occurred to the senior author that the activities of *P. Schweinitzii* in the soil may render the calcium less available to the trees.

Chemical analyses of a water extract of silica quartz sand from around the roots of three-year-old seedlings of eastern white pine in pot cultures, which were inoculated with *P. Schweinitzii* and supplied with a given nutrient by Wean's method,[2] showed twenty-five times more calcium where the fungus was present than in the controls. These cultures and inoculations were made by Wean while a graduate student in forest pathology at the University of Pennsylvania. He found that *P. Schweinitzii* was highly parasitic on the roots of one- and three-year-old seedlings of white pine. The hyphae readily penetrated both the epidermal and peridermal layers, especially in pot cultures with nutrient solutions at a pH of 6.0 and 7.0 and under conditions of a reduced supply of phosphorus. Reddish streaks were present in the central part of infected roots which were even less than two millimeters in diameter. These results are indicative of the possibility that *P. Schweinitzii* may be distributed in nursery stock.

In view of the possibility that *P. Schweinitzii* as found in the Hemlock Lake region might be of foreign origin, Childs, while a graduate student in forest pathology at the University of Pennsylvania, worked with cultures of this organism from various parts of the world, including many from the Hemlock Lake area. At present, it appears that *P. Schweinitzii,* which is causing root and butt rot in the forest plantings in question, is purely of local origin. He has found that within *P. Schweinitzii* there are a great many individuals which, when grown under a given set of conditions, show a wide range of cultural reactions. He has also found that a number of these individuals are definitely homothallic and fruit readily in culture; clamp connections have not been observed in any of these cultures.

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[1] G. G. Hedgcock, G. F. Gravatt and R. P. Marshall, *Phytopathology,* 15: 568–569, 1925.

[2] Robert E. Wean, SCIENCE, 82: 336, 1935.

PROLONGATION OF THE CORPUS LUTEUM IN THE PSEUDOPREGNANT RABBIT

IN the course of some experiments designed to study the effects of prolonged action of oestrin and progestin on the rabbit's uterus, it became necessary as one type of control experiment to inject oestrin for several days beginning on the eleventh day of pseudopregnancy. Under these conditions we were surprised to find that the corpora lutea persisted in a healthy state much longer than usual as judged by microscopic studies. The many possibilities of this finding have not as yet been fully explored, but by the continued injection of appropriate amounts of oestrin we have been able to prolong the corpora for as long as 25 days after a sterile mating.

Corpora prolonged by this means appear to be functional; the uterus remains refractory to pituitrin for as long as 21 days after mating, and the mammary glands do not regress as they do normally at the end of pseudopregnancy. Further, when the ovaries are removed at either the sixteenth or twenty-fifth day, but the oestrin continued at the same or increased level, lactation has occurred in every case and nesting in sev-