ECOLOGY

CONTINUING THE PLANT WORLD

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FOREWORD

THIS journal is issued to meet the demand for the collective publication of articles on ecology. Its pages are open to all who have material of ecological interest from whatever field of biology. While the variety of fields may cause diversity of treatment, yet the ecological significance of the papers will make them of general interest. Specialization is inevitable, but makes more urgent the need for cooperation. To approach different subjects from similar points of view is to lay the foundations of cooperation.

THE SCOPE OF ECOLOGY[1]

BARRINGTON MOORE

My purpose today is to draw your attention briefly to certain facts and tendencies in the field of ecology.

All life is controlled by two great forces, heredity and environment, and ecology is the science dealing with the environment. It therefore covers practically the whole field of biology, and is related in one way or another to every science which touches life.

There have been three stages in the development of the biological sciences: first, a period of general work, when Darwin, Agassiz and others amassed and gave their knowledge of such natural phenomena as could be studied with the limited methods at hand; next, men specialized in different branches, and gradually built up the biological sciences which we know today; and now has begun the third or synthetic stage. Since the biological field has been reconnoitered and divided into its logical parts, it becomes possible to see the interrelations and to bring these related parts more closely together. Many sciences have been developed to the point where, although the field has not yet been fully covered, contact and cooperation with related sciences are essential to full development.

Ecology represents the third phase. You have but to glance at the list of ecological problems drawn up by the Committee on Cooperation of the Ecological Society and appearing in Science for January 16, 1920. And this list is far from complete. You will see problems requiring work by zoologists, botanists, foresters, geographers, meteorologists, soil chemists, soil physicists, bacteriologists, and geologists, to mention only some of the leading lines.

What, precisely, is the significance of this synthesis? No man can be a highly trained zoologist, botanist, forester, and meteorologist all in one. It means that the ecologist, though he specializes on animal ecology or plant ecology, must take the broad ecological point of view of his problem. He must be able to see all its aspects and how it is related to each of the sciences which can aid in its solution. In this way he will be enabled to carry the problem himself as far as his own field and training permit, and secure the cooperation of workers in related fields for those parts which he is unable alone to cover. For example, a forester is confronted with the reforesting of ten thousand acres of burned-over mountains. He begins by using data

[1] Presidential address delivered before the St. Louis meeting of the Ecological Society of America, December 31, 1919.

already accumulated bearing on his problem, but this is not enough. He secures the cooperation of a meteorologist in order to get accurate data on climate; he calls in a soil specialist to determine the suitability of the different soils for the different tree species; he asks the assistance of a zoologist in protecting his sowings from damage by rodents; he cooperates with the phytopathologist in overcoming fungous attacks, and so on.

There is hardly a science which has not been influenced by the ecological point of view, for ecology is new in name but not in fact; it is superposed on the other sciences, not an offshoot as phytopathology grew out of botany.

Our point of view toward ecology should be determined by consideration of what it is doing in all the fields of biology, whether in its own or under some other name. All agricultural research, except breeding, is ecology. To garner successful harvests it is necessary to know the relation of the cultivated plant to its environment. Investigations in alkali and drought resistant crops have added thousands of acres to the farms and homes of the country. The workers in this field are gradually recognizing their connection with ecology. Should we not endeavor to hasten this recognition?

In animal industry ecology rendered marked service in its own name when an ecologist in the Forest Service, after several years of painstaking investigation, devised a method of restoring depleted grazing lands without the expense of artificial reseeding or the hardship of closing the range against grazing. Many thousands of sheep and cattle were permanently added to our supply through the work of this ecologist.

Foresters have long recognized that information on the relation of the forest to its environment lies at the basis of their practice; they have sought this information under the name of silvics; now such work is beginning to be known as forest ecology.

Geography, in so far as it is the study of man in relation to his environment, is human ecology. In the field of sanitation men are endeavoring to change a dirty environment into a clean and therefore healthy one. What is this but ecology? During the war one of the army camps was infested with mosquitoes. An ecologist was summoned. He experimented, and found a certain kind of fish, which when introduced into the neighboring ponds destroyed the mosquitoes.[2]

In the field of history, since the time of the great French historian Taine, there has been a growing tendency to correlate events with the influence upon man of his environment.

The foregoing instances will call to your minds many others showing the scope of ecology and its relation to the present trend of science. All the biological sciences demand research which is fundamentally ecological in

[2] Hildebrand, S. F., "Fishes in relation to mosquito control in ponds," U. S. Dept. of Commerce, Bureau of Fisheries, Document 874, 1919.

character. Nobody can doubt that this demand will be even greater in the future.

How are we, as a Society, going to respond to this demand? Will we be content to remain zoolgists, botanists, and foresters, with little understanding of one another's problems, or will we endeavor to become ecologists in the broad sense of the term? The part we will play in science depends upon our reply. Gentlemen, the future is in our own hands.

FIG. 8. Forest on moist uplands with little or no running water; the site of sequoias of good sensitivity (see Fig. 10).

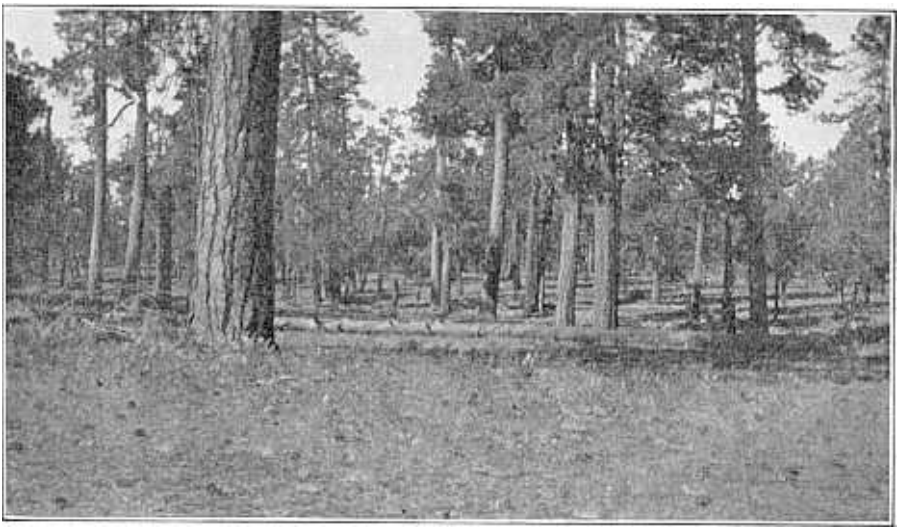
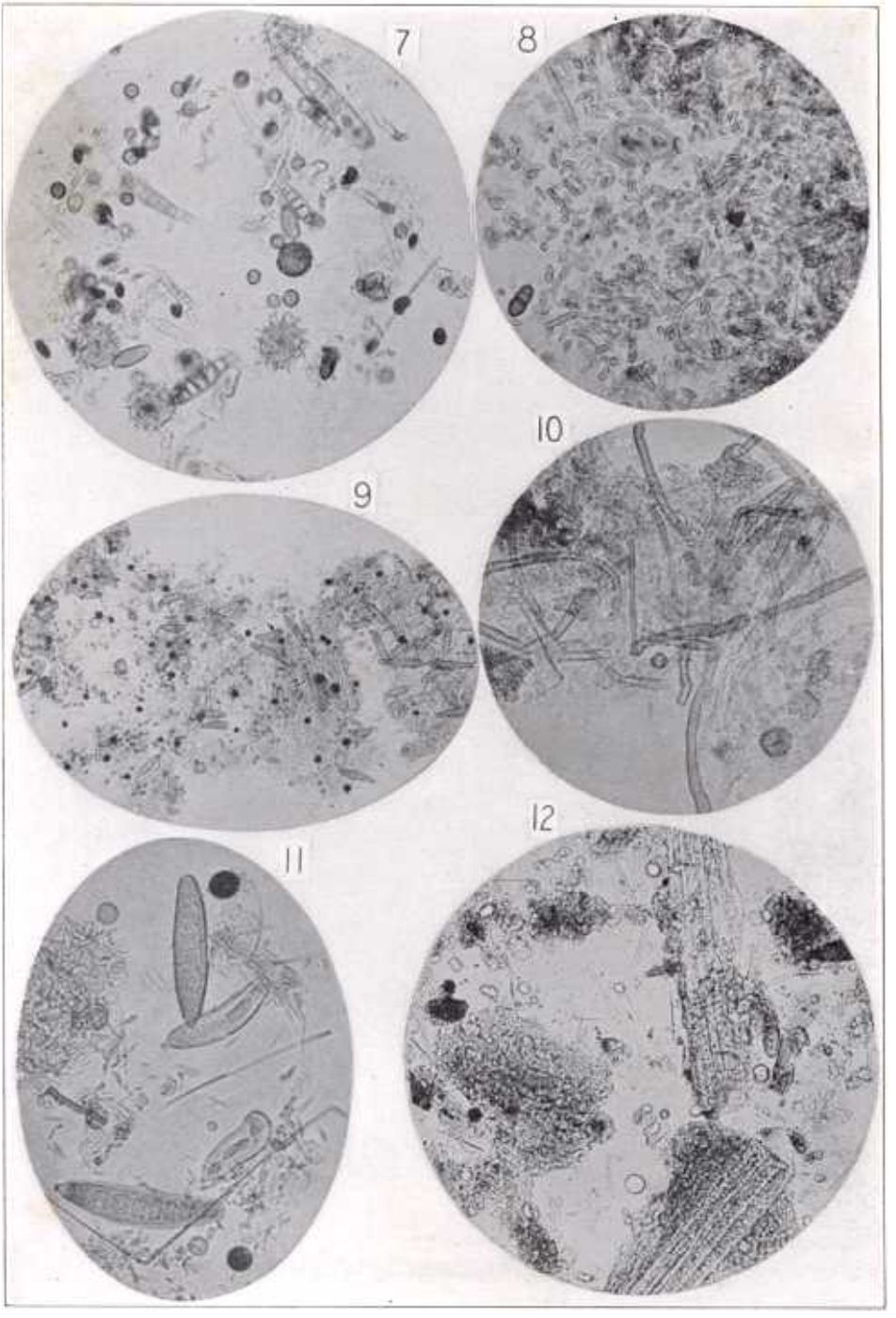
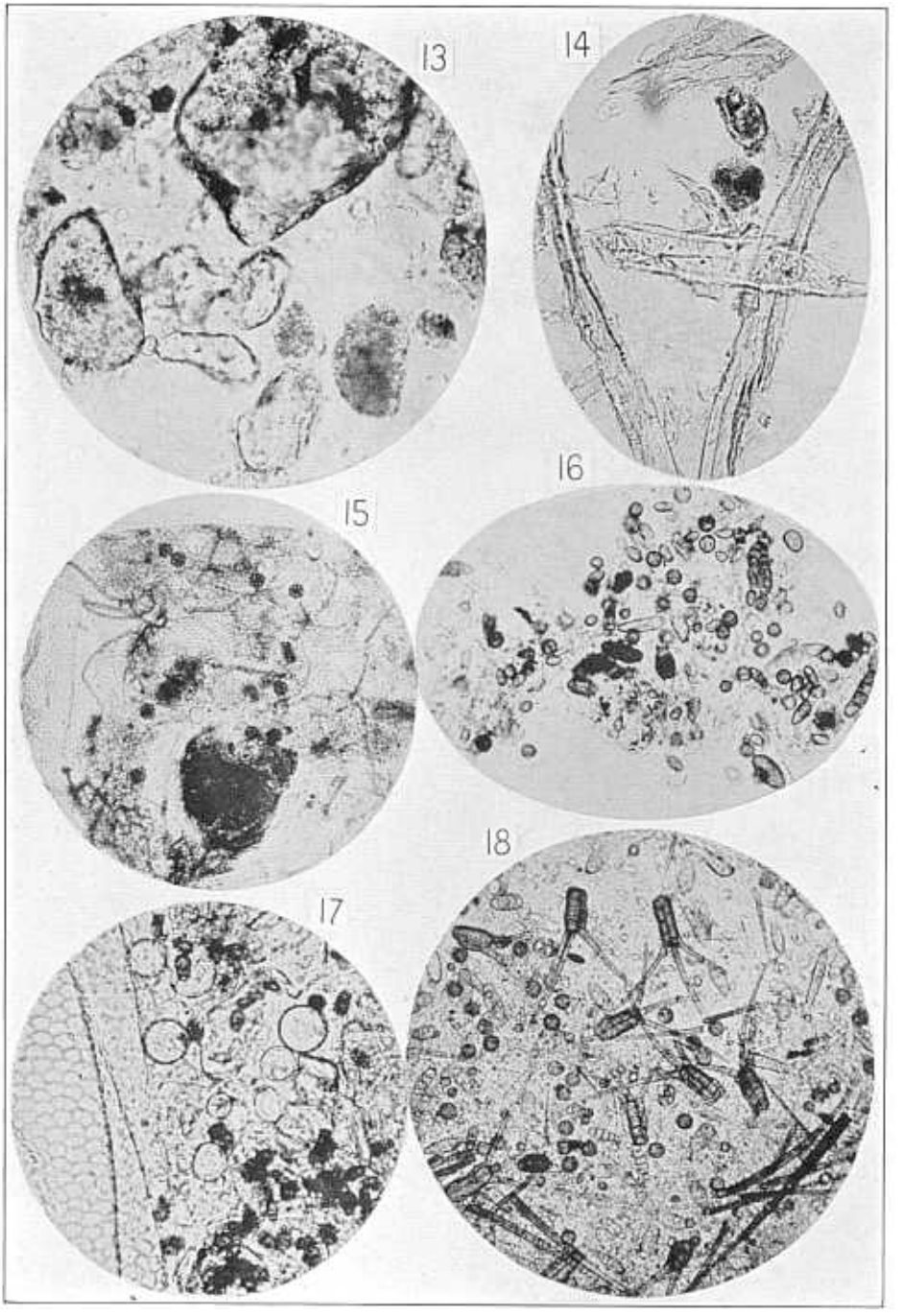


FIG. 9. Dry climate forest of western yellow pine in northern Arizona; site of trees of high sensitivity (see Fig. 10).



BAILEY ON ANTS AND FUNGI.



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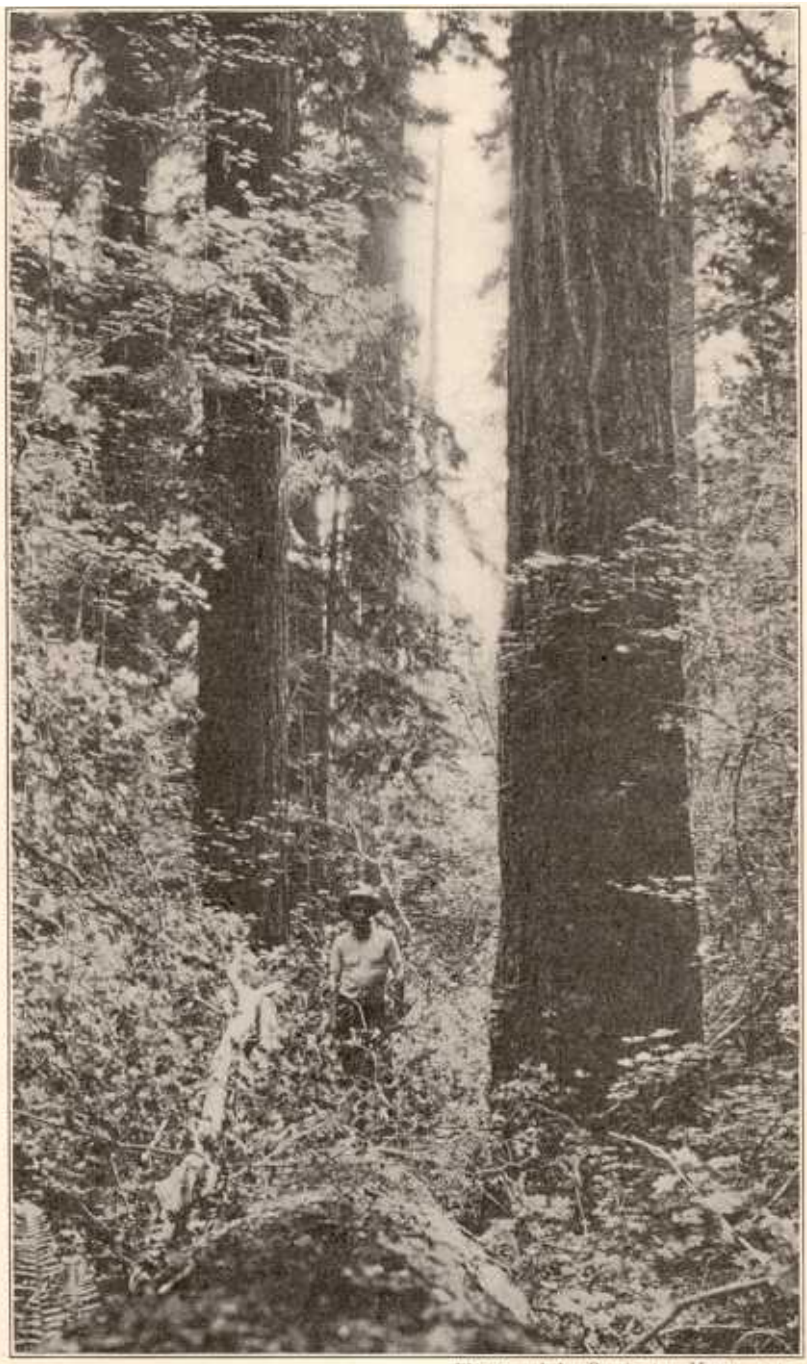
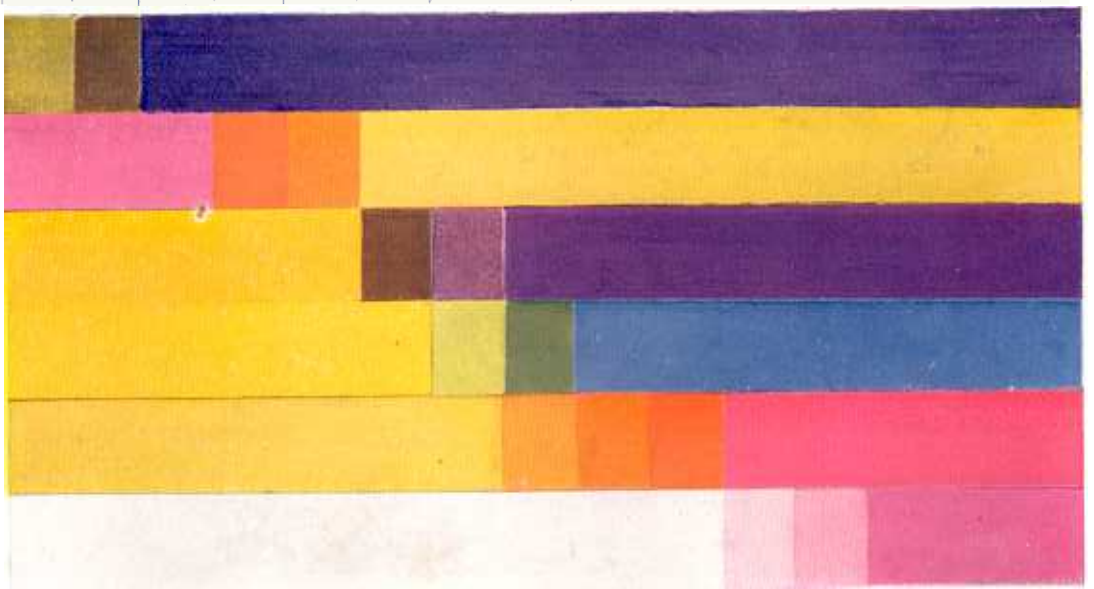


Photograph by Barrington Moore, 1913.

FIG. 1. A typical forest of Douglas fir (*Pseudotsuga taxifolia*) more than 200 years old but still thrifty. Picture taken from top of a log four feet in diameter owing to undergrowth of vine maple. Winberry Creek, Cascade National Forest, Oregon.

CHART SHOWING COLORS OF INDICATORS USED FOR DETERMINING SOIL REACTIONS.

Descriptive terms	superacid		mediacid		subacid		minimacid		minimalk.		subalk.		medialk.		superalk.
Ph. Values	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5
	← Acid							Neutral	Alkaline →						
Specific reactions	3000+	1000	300+	100	30+	10	3+	1	3+	10	30+	100	300+	1000	3000+



Typical soils

← bog-peat →
← upland peat →
← leaf-mold →
← limestone soil →
← "alkali" soil →

DIRECTIONS: To determine the specific acidity or alkalinity of a soil extract with the aid of this table, add first a drop bromthymol blue. If the liquid is colored green, the reaction is neutral; if yellow, it is acid; if blue, alkaline. If acid, repeat with successive indicators lying above bromthymol blue; if alkaline with those lying below. Continue until either an intermediate color of one of these indicators, or opposing extremes of two overlapping ones, are obtained. The specific acidity or alkalinity can then be found at the head of the corresponding column.