The Biological Task of Forestry*

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Forestry and Agriculture Compared

Forestry and agriculture have always been closely associated; both depend upon the productive capacity of the soil, the one devoted to production, harvesting and marketing of wood crops and the other to grains, fruits, vegetables and animals. Fish and game may be considered subsidiary forest crops just as animals, milk and poultry are indirect products of farm crops. Forestry and agriculture are well suited to coordination and practice by the same resident owner, as parts of the same farm, the forest providing fuel, construction timber and lumber, fence posts, maple products and a source of winter employment for men, draft animals and power equipment in the tending and harvesting of forest products for sale. Conversely agriculture supplies foodstuffs for sale to workers in industrial forestry enterprises and subsistence to workers in the woods. The economy of forestry and that of agriculture are intimately connected. So close is this integration of forest and farm that when a farmer suddenly sells all his marketable timber or his entire woodlot it is a symptom of unsoundness in his whole agricultural economy. It is a precursor of the decline of the whole farm. Subsistence farming on submarginal lands is especially sensitive to changes in forest economy. Farm abandonment and the decline of agriculture have paralleled forest deterioration and destruction in the northeast, in the Lake States, and these tendencies are now discernible in the south and far west as timber resources are progressively depleted.

That forestry and agriculture are similar in dependency on the soil for crop production is readily granted, but much stress has been laid on the long time required to produce the forest harvest contrasted with that of agriculture, and this has been used to excuse a failure to practice forestry. It is true that any given tree requires many years to mature, but almost any woodlot contains thousands of trees of different ages and sizes so that some are ready for cutting each year. Many so-called agricultural crops, such as fruit trees, require several years to come into bearing, and many commercial orchards contain several blocks of different-aged trees—an exact parallel to forest management.

Other contrasts between forestry and agriculture are less familiar. Among these may be mentioned the indirect influences of the forest while it is growing. Hay and grains provide shelter for ground-nesting birds and rodents and protect soil from washing to some extent, but they are far less effective, or diversified in their influence than forest. They are also pleasing to the eye, especially when waving in the summer breeze or golden under an autumn sun; but forests are there for man's protection and enjoyment winter and summer, and can be used for recreation and shelter in a multitude of ways. To enumerate them all here would take us too far afield. It is significant to remark, however,

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that growing forests have many outstanding benefits to the public welfare, regardless of ownership.

A second unique feature of forest crops is the possibility of securing intermediate or incidental products during the growth of the main crop and without detracting from it. Among these may be mentioned maple syrup and sugar, various gums and resins, such as turpentine and rosin from southern pines, cones, twigs, needles, leaves, branches, ferns and other plants for decorations, berries, wild honey, mushrooms and other fruits as well as fish, game and birds.

It is of especial interest to this group that continuous forest culture and cropping normally follow a more natural soil management than conventional agriculture. The forest supplies its own fertilizer, through the annual fall of leaves, bark and twigs, since the parts of the tree harvested and removed are poorer in ash content than those which remain. Inorganic fertilizers are never applied, and neither have poison sprays been used except in a few minor instances. There have been and are, of course, grave abuses in the treatment of forest soils through devastating cuttings, forest fire, grazing and monocultures. These will be described in succeeding paragraphs. Perhaps it would be better to say that forestry offers a far easier and logical natural utilization of soil productivity and the opportunity for developing its biological activity by cheap and easy means. It can do this where agriculture fails or proves too expensive.

The Forest as a Biological Unit

Forests are not merely aggregations of trees, from the biological viewpoint, but are ecological habitats, including the air surrounding the trees, the shrubs, herbs, mosses and fungi growing beneath; the litter, humus and soil in which the roots are anchored, and the mammals, birds, reptiles, insects and all other forms of life inhabiting the space influenced by the forest. Even the fish and other aquatic life in waters shaded or dependent on the forest are included as well as man himself, in aboriginal state, living by the chase and with food and shelter found in the forest. It is necessary to consider the forest thus if we are to study and understand the interrelationships and influences of the different components of the forest organism.

These coactions between different plants, between plants and animals, animals and insects, etc., are so countless that an attempt to enumerate them would fill volumes. They are taken for granted, yet often overlooked in forestry plans, with sometimes unfortunate results. Pure stands of conifers, besides failing to provide litter with soil-improving properties, also offer an unfavorable habitat for wild life. Lacking browse, deer may damage the trees directly; or squirrels and grouse destroy buds (Hosley '28), porcupines eat the bark. European foresters have long experienced difficulty with game in artificially established forests. Birds may forsake such environments because of the absence of food, and thus permit insect infestations to become established unmolested. Insectivorous birds are well known to be important controls of forest insects and foresters often erect birdhouses to attract them. Birds are responsible for the distribution of many tree seeds, especially cherries and other species having fleshy fruits. The efficiency of the jay, the "Eichelhacher," in planting acorns was mentioned at your last meeting. Birds may occasionally also exercise injurious influences on forests, again usually where the natural balance has been

disturbed. Burleigh ('38) noted that almost the entire seed crop of southern pines was destroyed by blackbirds and several other species. The birds frequented burned areas by preference where the seeds lay exposed on the soil. An unusual example is provided by the complete destruction of a plantation of white pine by roosting starlings described by Young ('36). The concentration of birds was so great that the mechanical effect of roosting and the accumulation of droppings damaged the trees. They even deposited viable seeds of Ribes, the intermediate host of the white pine blister rust! The gregarious habits of the starling and the fact that it is an introduced species accounts for its failure to be adapted to the American forest environment. Rodents are of course notorious seed eaters, consuming large quantities of tree seed in the West, so that natural reproduction of trees may be precluded in some areas for this reason alone. (cf. Moore '40). Yet even they exert influences beneficial to the forest in a variety of ways. Some seed is distributed widely and abandoned to germinate; the burrows work over the soil and many harmful insects and their eggs are destroyed. An interesting observation is that squirrels eating the bark around white pine blister rust aecial cankers may reduce the volume of aecio-spores for infection of the Ribes host plants (Mielke '40).

The relationship of host and fungus, and the functions of alternate hosts in tree rusts are well known; so also that of insect vectors in the transmission of tree diseases such as the Dutch elm disease. The operation of symbiotic fungi such as the mycorrhize on tree roots is less obvious or well understood, but indicative of the delicate biological equilibrium which reigns in the forest community. Attention has recently been directed to a number of lower fungi which may live as a normal flora in the sap stream of trees, becoming parasitic only when the metabolism of the tree is disturbed. Each new discovery of this sort only strengthens the need for caution in disturbing the highly complex forest environment.

If the forest is viewed as a natural microcosm, inhabited by animals, birds and insects as well as trees, disturbances of the environment designed to favor one component may react adversely on others. Thus Kulash ('40) after reporting the vastly greater population of insects and other organisms in the soil of alder bottoms (4,939,700 per acre) compared to upland forest types (2,000,000 or less) remarks that draining the alder swamp and conversion to a commercially valuable forest type would lessen the supply of food for game birds and fur-bearers. Every hunter knows that woodcock frequent alder bottoms, not alone for earthworms which abound in this vegetation type, but for those insects which are available when worms seek deeper levels. The same is true to lesser extent for other game and song birds and mammals. Fisher ('28) noted changes in the composition of the bird population when white pine was cut and replaced by hardwoods. Earthworm eaters replaced insectivorous birds to some extent. The natural fauna may be of greater importance in protecting the forest by maintaining a natural biological balance among all forms of life than is at present realized.

(To be continued.)