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NOTES ON FOREST DISTRIBUTION IN IOWA.

BY T. H. MACBRIDE.

The peculiar character of our American forest geography early attracted the attention of intelligent observers. Civilized men, Frenchmen, crossing the continent from the Atlantic seaboard, after threading for two hundred leagues a forest almost unbroken, suddenly found themselves in the presence of vast treeless plains, extending westward across a large portion of the central Mississippi valley. In wonder and admiration the *voyageur* looked upon these great plains, grass-grown and flower-bedecked, and found them counterpart to the green meadows of France; to them he gave the name prairie, a word now so familiar as to have long lost for all English-speaking men every vestige of foreign origin. How these great meadows ever came to exist or persist in the region where they first were seen, or why the forests of the east should so suddenly stop was a problem the *voyageur* could not solve, and has been a problem from the days of the *voyageur* until now.

In these times of almost universal forest extermination, when we are in sight of the era in which Americans must laboriously undertake the work of re-forestration, it is well that we should closely attend to conditions once established by nature, that we may hereafter act with her assistance, for in plant distribution, whatever our blunders may be or have been, nature we may be sure has seldom made a mistake.

In general, two factors are said to control forest distribution on the planet; the one, rainfall, the other, temperature. If the rainfall is deficient there can be no forest, rainfall seems never to be excessive, and if a region is too cold there is no forest. In proof of this we have but to look at the high altitudes and latitudes of the earth. What makes our Iowa problem therefore peculiar, is the fact that forest distribution here, as elsewhere in prairie regions, does not accord with these general

principles. Our country is not too cold, neither is it too dry; the rainfall in eastern Iowa being almost, if not quite as great as in Indiana, where the primeval forest was once heaviest. Indeed the uniformity of general conditions raises the problem: there seems to be nothing to hinder, therefore why is not the forest universal?

Various answers have been given to this question.¹

The opinion first entertained and that which is generally still current among common people, was that the continental forests were limited by fires. The Indians started fires and these fires were slowly, at the advent of the white man, consuming the woods, had stripped large areas in the Mississippi valley and unchecked would eventually have reached the Atlantic coast. No one who has been an eye-witness of the conflagrations that once rolled in annual tides across Iowa or Illinois can doubt the force of the theory so long and so widely entertained. The difficulty lies in the fact that the forest stood the attack so well, in fact seemed largely unaffected, actually held its own in nearly every part of the fire-infested district. Then again, if the truth had been that the aborigines were destroying the woods at the time when the whites first became witnesses, proof of the fact should be found over the whole region in form of charred logs, stumps, etc., of which, needless to remark, there has been no trace whatever. The fire theory not wholly satisfactory, some students went to the other extreme and urged that the distribution of the woods was due to causes efficient in times remotely past, so that fires or present conditions had nothing at all to do with the matter; the solution of the problem must be sought in some earlier geologic age. Others again sought to solve the problem by *a priori* method. It was urged that trees exhaust the soil of one set of elements while grasses, herbaceous plants, demand something entirely different, so that either set of plants occupying for long ages a given region would exhaust its availability though leaving the ground serviceable for something else. Thus trees once occupied the whole Mississippi valley but had exhausted the ground of tree-material, so to speak, had worn out their welcome. The answer to this is that here in Iowa trees seem to grow everywhere if planted and cared for.

¹See *inter al.* Am. Journal of Science VI, 384; XXXVIII, 332 and 344; XXXIX, 317; XL, 23 and 293. Geol. Survey of Illinois I, 238 *et seq.*; Geology of Iowa, Hall, I. Part I, p. 23 *et seq.*; U. S. Geol. Survey, Eleventh Annual Report of the Director, p. 236 *et seq.*

Prof. Lesquereux carries the idea of suitability of soil a little farther. He traces all prairies to old time lakes; declares that prairie soil is "neither peat nor humus, but a soft, black mould, impregnated with a large proportion of ulmic acid, produced by the slow decomposition, mostly under water, of aquatic plants, and thus partaking as much of the nature of peat as of that of true humus." * * * "It is easy to understand," he says, "why trees cannot grow on such kind of ground. The germination of seeds needs free oxygen for its development, and the trees, especially in their youth, absorb, by their roots, a great amount of air, and demand a solid point of attachment to fix themselves, etc." That is, the reason why our prairies are treeless is that they are too wet, and they contain, in virtue of their origin, certain elements to trees inimical. Professor Whitney also finds explanation of our prairies in the nature of the soil, "as the prime cause of the absence of forests and the predominance of grasses over this widely extended region. And although chemical composition may not be without influence in bringing about this result, * * * yet we conceive that the extreme fineness of the particles of which the prairie soil is composed is probably the principal reason why it is better adapted to the growth of its peculiar vegetation than to the development of forests."

Whitney makes also another very suggestive statement, the importance of which he did not himself realize. He says: "Wherever there has been a variation from the usual conditions of soil on the prairie or in the river bottom there is a corresponding change in the character of the vegetation. Thus on the prairie we sometimes meet with ridges of coarse material, apparently *deposits of drift*, on which from some local cause there has never been an accumulation of fine sediment; in such localities we invariably find a growth of timber. This is the origin of the groves scattered over the prairies for whose isolated circumstances and peculiarities of growth, we are unable to account in any other way."

It is interesting to notice the emphasis which Whitney here places on the character of this soil. No doubt there is something about prairie soils which makes them different from all other soils with which we are acquainted, and no doubt difference in soils is responsible for the difference in the forms of vegetation which they carry, but while both these excellent students, Lesquereux and Whitney, came in their surmises

very near the truth each of them in his theory missed the mark. It remained for an almost lifelong resident of the prairie, a former active member of this academy, to study to better purpose, Iowa's forest distribution, when, as a vigorous geologist he made his now famous pilgrimage through our eastern counties. Mr. McGee was quick enough to notice that the soils of our prairie region are indeed peculiar, and of several sorts, and that the vegetation varies with the soil, but he went farther: he referred the whole problem back to conditions geological, to a situation resultant from the nature and manner of the latest geological deposit. The soils of Iowa are three, the drift of the prairie, the loess of the hills, the alluvium of the river flood-plains, and Mr. McGee's contribution to our problem lies in his emphasizing the fact first noticed by Whitney, that the forests and groves of Iowa, except where alluvial, are everywhere coterminous with the distribution of the loess. Since Mr. McGee has called attention to the fact, of course, everybody sees it. The merest tyro in such studies has but to drive across some eastern county of our state to see how very striking the relation is. Every hill is clay-capped, and every clay-capped ridge is covered with woods. Sometimes the clay is replaced by sand, but the woods cover the sand, as Whitney says, just the same.

There is one other fact, however, to which attention has not yet been called, which has a distinct bearing upon our problem and that is the fact that subsequent to the occupancy of the state by civilization the forest began slowly to enlarge. Many localities might be cited in proof of this statement. I have in mind one field of thirty acres in 1844 cultivated as a cornfield, now used year after year as a grove for Fourth of July celebrations. Then again, as Whitney remarked, trees grow on all the alluvial soils of Iowa, so that outside the fact of soil-difference, there must be still a factor operating to make the difference in soil efficient. That factor in my opinion is that already mentioned as of universal popular appreciation, namely, *fire*. Fires have prevailed on the continent not only for generations as man reckons the years, but for forest-generations for hundreds and hundreds of years. In the presence of fires forests endure only as they have some special defense. This may be found in one or both of two conditions; in a limited amount of surface-moisture or in lack of combustible material on the surface of the ground. The alluvium offers both conditions; the

loess the latter. That is, to be more explicit, the loess with its sand and clay is a soil for cereals so poor as to raise but a small crop of grass, hence to furnish for sweeping fire a small amount of fuel, hence giving rise to less destructive fires, in which young trees were not universally destroyed. The drift on the other hand produces enormous wealth of grass, burning in conflagration which no seedling trees can endure; hence on the drift there are no trees. The presence of trees on rocky soils is to be explained in the same way. River bottoms furnish a special case. Here in the first case the current formed soil is in the nature of a sand bar, made of the coarser elements met with by the eroding flood. On sand bars cottonwoods and willows start, but not grass. The soil after a little becomes richer it is true, by subsiding slime, but by this time the locality is become moister than all the surrounding region; in summer, being lower, receiving heavier dews; in winter catching and longer retaining a larger proportion of snow, all tending as check to sweeping fires.

In conclusion, we are therefore prepared to say that all the students of our problems have been right, though each presented but a partial truth. Those who affirmed the agency of fire were right, but they failed to notice the fire's selective operation or to explain it. Those who attributed forest distribution to differences in soil were also right, but they failed to show or see how or why such difference availed. Those who looked back to a former geologic age were also right, but such failed entirely to show what the influence was which geologic structure has upon the problem.

To sum up: (1) The immediate agent in the limitation and distribution of Iowa forests was fire. (2) The sweep of fire was determined by a modicum of moisture and by the presence of *fuel upon the ground*. (3) The drift being especially adapted to gramineous vegetation, furnished fuel in such amount as to prevent the development of tree-seedlings, while the loess, using the term in a broad sense, less suited to gramineous species, furnished less fuel, hence gave to tree seedlings on loess regions opportunity to rise. (4) Special localities, as swamps, alluvial flood-plains, etc., present special cases and require special explanations.

As a corollary we may remark: (1) That the drift-plains of the state offer greatest promise to the farmer who seeks the cereals as his principal product. The wooded regions should

be left to woods as to their appropriate crop. The loess clay will never enable its cultivator to compete with his more fortunate fellow-citizen who farms the drift, and the sooner the people of Iowa find it out the better. (2) It is likely that orchards and vineyards will thrive better on the loess than on the drift, as trees generally may be supposed to have been subject to similar discipline in all time and in all parts of the world.

THE NOMENCLATURE QUESTION AMONG THE SLIME-MOULDS.

BY T. H. MACBRIDE.

That a man's difficulties are often of his own creating is a fact patent in science as in other fields. The imperfections of our methods form ever increasing nets of complexity about the feet of our progress. No one feels this more keenly than the naturalist, especially he who would attempt to give more exact account of some limited group or series of animals or plants. No matter how carefully he may arrange his materials, no matter how industriously he may have worked out the various problems of structure and morphology, there comes at last to plague him, to hinder him, to mar his purpose and waste his time, the question of nomenclature; his specimens must be named. This ceremony, the christening, which ought to have been the simplest matter in the world, has really become, if not the most difficult, at least the most annoying and thankless portion of his task. Preposterous also as it may seem, it is precisely the oldest and most universally recognized of the forms with which he deals that are apt to give the most trouble. There has arisen a class of critics among us who have devoted their energies to the unsettling of scientific nomenclature in every department of research, with the result that, rightly or wrongly, every systematic work in the world needs revision if not re-writing, and every herbarium in the world needs a new set of labels. Now, this might all not be so bad if such a revolution were final. If the wheel were only weighted on one side, so that once it came to rest we could feel