

WESTERN NATURE STUDIES

By J. H. PAUL.

THE TRUTH ABOUT THE SOIL.

One truth about the soil is that we do not own it; we only borrow it, and our plain duty is to pass it on unimpaired for the use of our children. Another is that the American farmer is digging out the very heart of their fertile acres each year, and with their plows are annually sacrificing soil enough to fill the Panama canal. The riches of the American farmer, says Hough, are taking wings. The farmer does not see them go, and he does not understand that he is literally plowing his farm into the ocean.

"Not only do we waste, but that waste accelerates each year. That is the horrible feature of all these resource wastes—they increase geometrically with awful swiftness. The buffalo went 'all at once.' The trees, the fish, the ore, will go 'all at once.' We do not like high prices, but higher prices than we now can dream of are coming to us Americans unless we get down to a practical basis on religion, politics and business."

This article will begin to elucidate how and why we should take care of the soil.

Soil Is Our Heritage.

The soil is America's greatest heritage, the source of her power, the reason for her ascendancy over the nations in wealth and material prosperity. While the soil lasts the luster of our country's financial greatness will no doubt remain undimmed. Whatever advantage the American laborer enjoys over his European brother is due to the vast extent of the fertile areas which could be so freely taken up and employed to produce the food of nations. The fruitful land, the bounteous harvest, the wealth of standing timber—these are the original basis and the sufficient explanation of our national prosperity, which literally springs out of the ground.

"Mother Earth" Is Its True Name.

The productivity of our soil is what accounts not alone for our national greatness, but for our very existence. And yet this priceless heritage is, faster than most other things of the earth, passing away.

How Soil Is Made.

The writer of these notes stood, a short time since, on the mountains to the west of Elsinore, Sevier county, and looked upon the endless variety of igneous or fire-formed rock that constitutes the main part of the chain at that place. A dozen kinds of color, texture, weight and hardness, may be picked up or observed there within a few square rods. The different masses or small pieces show every degree and stage of disintegration, due to weathering, from the beginning of the process to the final formation of sand and clay from these rock materials. One of nature's great factories for soil making may there be observed in active operation and on a large scale. The rocks crumble into sand, clay, silt, gravel; these materials mix with decaying vegetation and form loamy soil; and the newly formed soils are then carried down the mountain side by rain, wind and melting snow, forming finally the deep rich earth of the valleys. On the mountain side the soil is shallow; in the valleys it is deep; that is, depth of soil with the consequent richness of products from it varies inversely with the steepness of the slope on which it rests. The slopes cannot hold much soil, and shallow soil can hold but little water, hence the slopes can support but little, while the valleys display an abundant vegetation.

How Soil Is Kept.

On the hillsides, a vertical rill soon plows out a gully; but if horizontal furrows should be made along the hillsides and mountain slopes the rapid descent of the soil into the valleys would be arrested to the advantage of both localities. If horizontal furrows were to be constructed at the same elevation around these great hills, time and nature would soon do the rest and would turn these little furrows into large arable terraces, on which different fruits and vegetables could be produced at the varying altitudes. Grass would first grow along the furrow; the powdered rock moving along the furrows would be arrested by the grass roots, and would form deep layers on these embankments, down which it is now uselessly washed away. Trees would soon grow on these terraces, especially if purposely planted there by foresters. Their roots would withstand the soil wash and so prevent the continuous waste. Without trees on these hillsides the rains and melting snows, and often the little gullies, or in little runnels, or in mud slides into the valleys below, where it is not needed, and is in most places a detriment. The paths trampled out by sheep may form the beginnings of little gullies that wash the soil from the mountain sides to be worse than wasted in the valleys.

The Labor of Centuries.

These rocks, we say, are wasting away; but the rock waste is slow according to the years of human life. On an average in our climate, with our kinds of rock, only a foot of each surface rock is disintegrated and pulverized in five or six thousand years. The lesson which this fact teaches is that the soil is slowly formed, and if lost cannot be naturally replaced in a human lifetime, and perhaps not in ages. Man is the latest occupant of the earth. He lives from the soil, which supports him, and which in some sense produced him, since he was formed out of the dust of the earth. Man is nature's newest invention, but he will have a successor if he destroys the soil; and the startling truth is that we are destroying this precious life preserver at a

rate much faster than nature's time of making it, which is, say, one inch in a thousand years. Geologists not only recognize the waste of American soils, but they have measured the rate of its removal.

The late Professor N. S. Shaler estimated the destruction of agricultural lands, chiefly through old field erosion, in the southern Atlantic and gulf states at several thousand square miles; and in portions of this region the waste involves a complete removal of a superficial geologic deposit (brown loam, loess, yellow loam), well adapted to forming a productive soil, from underlying older formations ill suited to the development of fertile soils and subsoils, in which case the loss is irremediable.

Generals Humphrey and Abbott half a century ago showed that the Mississippi then carried annually to the gulf something over four hundred million tons of solid matter. In addition to great quantities of earth salts, carried in solution, and of sand or other coarse material raised or swept along the bottom.

The Real Trade Balance.

American statesmen often manifest great concern over the supposed "balance of trade" against this country in its dealings with foreign nations. The "balance of trade" of which they speak, however, is a mere figment of the imagination. So far as its supposed detrimental effects are concerned, it has probably never existed outside of a misinformed and illogical mind alarmed over false and doctored trade statistics, and it would be as harmless as a "sucking dove" if it ever did or ever could happen to come into being. But the real balance of trade is against us in the soil. We are sending it away into the ocean. We are exporting, without importing, and there is no debtor to pay the balance. The Mississippi, for example, is dumping our wealth into the gulf. The effect of breaking up the new lands and of extending agricultural operations, says Emerson Hough, "has been to increase the soil matter carried by the Mississippi fully 25 per cent; while comparative determinations made on several other streams indicate that the rivers of the country outside of the Mississippi basin carry into the sea about as much soil matter as the great river itself. That is, that the annual soil-wash of the United States aggregates fully one billion tons! Our balance of trade is going some, isn't it? Also, unfortunately, our soil, which raised that balance of trade, is going some."

The Hymn of the Soil.

Moreover, only a fraction of the matter transported by the waters is coarse (sand and gravel), while fully 90 per cent consists of rich soil stuff washed from the surface or leached from the sub-surface of fields and pastures and the great forests of woodlands. The material could hardly be appraised at less than one dollar per ton; so that the annual loss to the agricultural interests of the country can hardly fall short of a billion dollars—equivalent to an impost as great as most other taxes combined and one yielding absolutely no return."

"The writer just quoted says further: 'This hymn of the soil is the one great hymn, it sings of the one great heritage of life. We speak of this or that man 'owning' thus or so much of the earth's surface. That, of course, is impossible. He takes it or borrows it, perhaps, but he can own no more than six feet of it, and that only for a short time. The soil belongs to life. The 'buried years' resent any embezzlement of our great heritage. The soil is owned by plants, by animals, by men of this or that nation, this or that age, that past, yonder future. If we sin against the soil, ours will be the great punishment—which is to say, extinction, oblivion. If you plow badly, it is you for the star-dust!'"

We Must Conserve It.

Now, it has been shown by the soil experts that the greater part of the loss from erosion of the soil is preventable. If the cleared and plowed lands that suffer the most—those that have been made ready for producing crops. The amount of this annual soil-wash is so great—75 million tons every twelve months—that it would fill four channels as big as that of the Panama canal. The state of Missouri alone sends enough soil every year to the sea to make a prism one mile square and 600 feet high. "The billion tons of soil wasted every year would spread a layer like Nile mud over Illinois."

The great depth of the soil of the valleys that lie within the great basin—from a few feet on the benches to many hundreds of feet in the lower parts of the drainage area—and the general fertility of western land are conditions that have led to a neglect of the necessary care, reparation and re-enrichment of the productive areas. Crop after crop has been taken from the soil, and little or nothing returned to it. This process, too, if long continued, must result in the final impoverishment of our great bank account in the soil. In many places the soil is being over-fertilized, washing out its natural fertility and depositing the minerals on the lower lands, making them finally alkaline—killing the plants with too much soil-enrichment. This process is going on rapidly in many parts of the country. "Bad handling of water means less crops, less soil, more polluted streams, more choked up channels, more floods, more waste and ruin. The balance of things thrown out of plumb and the world literally turned upside down." And the semi-arid west, as well as the water-plowed east, has great need to replenish, to care for and



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A Lesson for the West.

Campbell's Soil Culture Manual remarks that in the eastern part of the United States, as well as in the other countries, there is no need for argument to convince the farmers of the great value of barnyard manures. They have demonstrated it many times. They do not waste any.

In the western states, more especially in the semi-arid regions, farmers have come to have an entirely different view of the value of barnyard manures. In the entire belt it is probable that at the present time a large proportion of the barnyard manures are burned or thrown away.

"Campbell shows that this is all wrong. In no other section of the country is the soil of such a character as to respond more quickly and effectively to the use of barnyard manures, and in no other place will the effect of such manures last longer, or be of more permanent improvement than in the semi-arid west.

The reason is that our western soil is light and naturally rich in the primary elements necessary to fertility. But in the semi-arid belt, however, there is none of this loss of fertility by drainage. The light rainfall is therefore a distinct advantage in the treatment of manures.

But in the semi-arid regions there is difficulty in making the best possible application of manure. The atmosphere is dry, and the soil may remain dry for a long period, so that the manure lies dormant on top of the soil, a condition not conducive to nitrification or decomposition, and many farmers have failed to get good results. Then it is a fact that in the barnyard manure, as it is gathered in this dry country, there is much loose and coarse straw in an almost perfect state of preservation, not very well fitted for being the soil. When the manure is plowed under, as it must be to get the best results, the soil is so loose and light that there is not sufficient weight to press the whole down, and make a compact mass as best serves to make a good bed. But the liquid and best portion of stable manure, soaks in the ground under the stable if the floor is not tight or if enough bedding is not used. To save all of the liquid portions, an impervious floor is necessary. A large portion can be saved by the liberal use of absorbent bedding material. Where an impervious stable floor is used, it is necessary to use a great amount of bedding simply to keep the floor dry, unless it is built with a gutter and made to slope so that liquids may drain away.

The East Growing Wise.

It is usual in the east to use for the bedding of animals ground phosphate rock, gypsum, coarses, in addition to straw and chaff, the purpose being to absorb all the liquid manures in these materials and then spread them on the land.

Of these, ground phosphate rock is considered the best, since it has high fertilizing values of its own, and is most efficient as a fertilizer when used with stable manure or other decomposing organic matter. Coal ashes are usually considered a waste product and a nuisance in most places, but by using them for absorbing material they may become of real value. Their use is recommended on stiff clay lands for making the soil light, friable and retentive of moisture.

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