

D. C.

moun qui dit li pas po-lie; Tout ça ye dit Sia! Mo bin fou bin, C'est li mo ou-lé, c'est li ma prend.  
 moun qui dit so m'man te folle; etc.  
 pas man-dé des bas brodé; Li pas man-dé sou-liers prinelle, C'est li, etc.

*George W. Cable.*

### WILL THE LAND BECOME A DESERT?

IN spite of the fact that Americans are really fond of trees, and do not, like Spaniards or Turks, exterminate them wantonly for the sake of exterminating them, the trees will yet be sacrificed under the strong demand for fuel, lumber, and land to cultivate. Forests will not produce bread, and the millions of the future must have bread. The question of forest extermination must be looked at quite unæsthetically. Under such a sacrifice of the woodlands as appears likely to come, will the land become a desert? Is there any less fearful side to the picture than that which Bryant shows us in his "Indian at the Burial-place of his Fathers":

"The springs are silent in the sun;  
 The rivers by the blackened shore  
 With lessened current run;  
 The realm our tribes were crushed to get  
 May be a barren desert yet?"

Our country is not now meagerly provided with forests. In addition to the vast aggregate expanse of woodlands which are the property of private persons or of States of the Union, the timber-lands owned by the Federal Government in 1880 were estimated (no exact account of the matter having ever been made) at 84,000,000 acres. This area is half the size of Texas, and twice the size of Virginia. These woods are widely scattered, 20,000,000 acres being in the Southern States, and a very large proportion of the remainder west of the Mississippi. But this total area falls far short of the one-quarter of the land which, it is held, should be left wooded for climatic reasons. If the land is to become arid for want of timber, it is clear that the Government, without planting trees on its lands or seizing private woodlands, cannot prevent it, though it may preserve in special districts the proportion of timber-land which is deemed desirable.

The forests of the region west of the hundredth meridian, themselves very considerable in extent, though not relatively so, do not prevent that part of the country from being arid as a whole; nor has the destruction of forests on the Atlantic slope made this region arid. In the Far West natural conditions have been undisturbed until very lately. In the East timber-cutting has been unchecked; but the East is vastly better wooded to-day than the West. The aridity of the Western plains cannot be due to their loss of trees at some former epoch, for it does not appear that they have ever been wooded. They are a raw and primitive surface. Our own arid regions, like the other great deserts of the world, are supposed to have been swept together or distributed by marine currents, and to have been elevated above the ocean by the same means as the other upheaved strata.\* Lieutenant Ives, an early explorer of the trans-Mississippi region, found, indeed, in the central basin, near the Mexican border, tracts with trees standing dry and dead, as if killed within a recent period; but such discoveries have been extremely rare. There is no large district in our West (I mean large relatively to the mass of the country) known to owe its aridity to disafforesting. The character of the soil, not the hand of man, has prevented the clothing of a great portion of the Western plains with woods. We find, for instance, that the line upon these plains marking the junction of the carboniferous rocks with the cretaceous and the tertiary is a distinct limitation of many trees. The soil and the underlying rocks are too porous to retain sufficient moisture to nourish forests, † though the earth struggles to clothe itself with trees, and has, where the conditions are in some measure favorable, been able to do so; and the gradual transformation of the surface

\* G. P. Marsh, "The Earth as Modified by Human Action," p. 546.

† "Distribution of the Forests and Trees of America." J. G. Cooper, Smithsonian Report, 1858.



by human occupancy is being followed by the extension of tree-growths. As for the prairie regions proper, further east, we shall presently see how they have spontaneously sought a tree-covering for themselves as their surface grew less primitive, and have been obliged to seek it from neighboring regions.

The soil has as great an influence in the East as in the West, but in a different direction. There can be no phenomenon more striking throughout the whole region east of the prairies than the great vitality and spontaneity of growth of kinds of trees suited to the soil. If a forest in this part of the country is cut down simply for its timber, and not with a view to the use of the soil, the new growth, being left free, springs up immediately. I have stood on the most barren portion of the pine-belt of Michigan, where the timber had all been cut away, and where the soil was clear sand. As far as the eye could reach there was a continuous though scanty stretch of scrub-oaks, thorns, blackberry-bushes, and other more or less stunted growths, interspersed with a crop of coarse weeds,—a poor vegetation, leaving the land unspeakably wearisome to the eye, and yet affording the beginning of a future genuine forest-growth. And in the Old Colony district of Massachusetts I know many stony wastes and hill-sides, never cultivated, but regularly and completely stripped of their timber for fuel as often as it grows large enough to “work up,” the last cutting having been within thirty years; yet there is on every hand a most promising growth of young trees of many varieties, deciduous and evergreen. A very large portion of eastern Massachusetts is now covered with a young forest-growth, everywhere vigorous, and sometimes almost impenetrable—a forest which no man planted, and which exists in spite of the most persistent and unsparing felling of the timber. This condition seems to be the rule except upon Cape Cod and other tracts bordering the ocean, where the severity of the winds blights young tree-growths.

If the forests are burned, the new growth asserts itself with astonishing vigor. The late Mr. Marsh, in the invaluable work already mentioned, “The Earth as Modified by Human Action,” mentions the case of the great forest fire of Miramichi in 1825, “probably the most extensive and terrific conflagration recorded in authentic history, which spread over six thousand square miles, and was of such intensity that it seemed to consume the very soil itself; but in twenty-five years the ground was thickly covered with trees of fair dimensions.” The same phenomenon has occurred in the case of forest fires throughout our eastern and central regions.

And if the original forest is cut down in order that the soil may be tilled or grazed, it need not suffer deterioration. The effect of tillage is not desiccation, and the land that is actually tilled must not be begrudged to man, whether it is taken from the forest or the savanna. If the soil is grazed, the covering of turf (except on very steep hill-sides) prevents it from washing away; holds the rain as it falls more readily than the forest itself, though it afterward throws it off more rapidly by evaporation; and grows richer, deeper, and more capable of retaining moisture, even though the springs may be “silent in the sun.” And if the pastures are not watched and guarded, evergreen-trees, which the cattle will not crop, quickly cover the ground, if there are trees of the sort in the neighborhood to cast the seeds. Hundreds of pastures in Vermont and New Hampshire are becoming pine or spruce forests, because they have been abandoned by farmers moving westward, or not properly cared for by their “shiftless” owners. Indeed, the white pine is now reasserting itself in its old New England habitat to an extent which threatens to turn the land into a wilderness.

Precipitous mountain slopes must, of course, suffer a considerable and rapid erosion during heavy rains if stripped all at once of their timber, the new growth finding it very hard to establish itself. But many of the steepest mountain slopes might lose their covering of soil without sensibly altering the climatic conditions of the surrounding regions. The space above the timber-line cannot be clothed with woods. The area of totally bare rock surface in the White and Green mountains and their spurs, which has been bare from a time antedating our knowledge, is sufficient to cause inundations which could not be prevented by any amount of reforestation, though they may be aggravated by an increase of the area of bare surface. The bare faces of Lafayette and Moosilauke alone must pour down into the streams below a vast volume of water in every heavy rain. If inundations are to be prevented in the districts below mountains, reservoirs must be constructed to retain the water; and these, it has been demonstrated, will perform this work more effectively than the forests themselves.

We can only conclude that the region of the Appalachians and the Atlantic coast are not in danger of falling into aridity through loss of trees from any process now going on. What is the condition and prospect with regard to the great Mississippi Valley, west of the wooded foot-hills of the Alleghanies and east of the arid plains? This region was not originally wooded. This is proved not only by the story told by the soil, but by the fact



that, though it was not without its woodlands at the time of its settlement, it *has no characteristic trees*. All are derived either from the Appalachian region or from the west and north, ninety varieties coming from the east, and only nine or ten from the west and north.\* The great prairie region has sought all the trees it possesses from adjoining regions. Does it lose these under occupancy? The testimony of the inhabitants is strongly to the effect that there are more trees in the prairie States than have ever been there at any previous epoch. Tree-planting is encouraged in many ways, and is a prevailing fashion. There is no systematic forest-planting worthy the name, but there is going on a process of spontaneous growth or spreading of certain kinds of trees upon the prairies, especially of cottonwoods, which may some time produce genuine forests. This large section is gaining trees, not losing them.

And here we reach the consideration of a highly important fact, which seems to teach us that the greater part of our national territory is beyond the danger of a serious change in its character. The fact that permanence of conditions may be reached is shown by Marsh, who says on the subject:

"If the precipitation, whether great or small in amount, be equally distributed through the seasons, so that there are neither torrential rains nor parching droughts, and if, further, the general inclination of ground be moderate, so that the superficial waters are carried off without destructive rapidity of flow, and without sudden accumulation in the channels of natural drainage, there is little danger of the degradation of the soil in consequence of the removal of forest or other vegetable covering, and the natural face of the earth may be considered as virtually permanent. These conditions are well exemplified in Ireland, in a great part of England, in extensive districts in Germany, and, fortunately, in an immense proportion of the valley of the Mississippi, and the basin of the great American lakes."

As for the South, it is still a land abounding in forests. Its great woods have scarcely been touched, save where the turpentine industry has stripped some of the more accessible districts of their pines. But this immunity is, unfortunately, not likely to continue. The lumbering industry is turning southward from exhausted Northern forests. The Southern hard-wood district extends over large portions of North Carolina, West Virginia, Virginia, Tennessee, and Kentucky. About one-half of the last-named State is said to be covered with fine and valuable forests. West Virginia has enormous forests of cherry, walnut, white

oak, maple, ash, and black spruce timber. In North Carolina there yet remain at least forty thousand square miles of fine forests. In that State and Tennessee there are white pine and the much-valued long-leaf pine in abundance, and further south is a vast area of yellow pine and cypress. But already inroads are being made in the Southern forests. A recent number of the Boston "Commercial Bulletin" names five places in Kentucky where large saw-mills have been erected within the last eighteen months. It adds that numerous wood-working establishments have been erected there and elsewhere in the South. This need not be a melancholy assurance, as it certainly is now, if the forests were to be *used* instead of destroyed; but the American woodman does not understand the distinction. Other Southern States will doubtless soon join Kentucky in the wood-working industry, and the Government timber will be taken first, because it is cheaper to "take" than to buy. It remains to be seen whether the South, with its fiercer sun, can stand the cutting down of its forests without unfavorable climatic effect. But there is little reason to suppose that the timber-growth of the South would not be found at least as persistent as that of the North and West.

At about the hundredth meridian west from Greenwich the prairies give way to the plains, so called, and new conditions begin. But the prairies, as we have already seen, are encroaching upon the plains; the latter are losing their buffalo-grass, even in advance of cultivation, exchanging it for the rich, sharp-bladed, thick, and tall prairie-grass, which covers the ground when it falls in masses, and around the roots of which a moss-like undergrowth forms and *humus* is created. The earth, with the true wild prairie-grass growing upon it, becomes as spongy as in a forest.† The shifty soil becomes fixed; the rainfall is equalized; roadside shade-trees and even orchards are planted, and begin to thrive under the new conditions. Very many of the people familiar with these changes believe that eventually the cultivated belt will extend to the base of the Rocky Mountains. An extravagant prediction, perhaps; but it is, at least, certain that the cultivated and measurably humid region is extending westward.

Forests grow upon the Rocky Mountains at an altitude of eleven thousand feet above the sea, and are often very extensive. More serious consequences follow their destruction

\* "Distribution of Forests and Trees of North America." J. G. Cooper, Smithsonian Report, 1858.

† This condition is perhaps reached only where the prairie-grass is left uncut for a few years. I have

known a prairie fire in southern Wisconsin, in an exceptionally dry season, to burn away two feet of the surface soil, because the soil for that depth was little else than a mass of roots of the grass, mingled with moss and light loam.



than follow the similar process on the Appalachian ranges. The spontaneity of reforestation characteristic of the more humid regions does not seem to prevail; very destructive avalanches and land-slides are the first effect of the destruction of these woods. The chief danger here is the drying up of the streams, upon which agriculture at the base of the mountains is wholly dependent for irrigation. Agriculture there does not thrive without artificial irrigation; a constantly increasing supply of water is needed, and vast sums are expended in making great irrigating canals. But if the sources of the streams are dried up by the destruction of the mountain forests, these great ditches, upon which millions are to be spent, will be useless. The people of Colorado, New Mexico, and other Western States and Territories dependent upon irrigation, appear quite indifferent to forest destruction; but it is the duty of Congress to be watchful in this respect, even if the people chiefly interested are not. All the Western mountain forests should be withdrawn at once from preëmption or sale—a step which would not, of course, prevent the Government from deriving a considerable revenue, in time, from the sale of the timber which could be spared.

It appears to be quite within the bounds of possibility, if the proper efforts of the settlers to water and cultivate the soil are seconded by prudent legislation, while such legislation is possible,—the work of both citizens and Government being still further advanced, as it would surely be, by the kindly efforts of nature,—to make the Western arid region no longer arid, and to render it fit for the occupancy of millions of people where thousands now subsist. Would not such a transformation be a result worthy of the efforts of the greatest statesmen? Would not the forwarding of such a work be a noble feature in the policy of any political party?

But with the destruction of the forests now on the mountains which are robbed by the Sierras of the moisture of the Pacific winds, we must look for the end of all possibility of successful irrigation in the entire region, except in certain favored valleys; for the relapse to a desert state of tracts already reclaimed; for the enlargement of the area of desolation; and for the aggravation of every climatic evil that now afflicts the region.

The Pacific coast proper has many advantages in climate, but the irregularity in precipitation that now constitutes so great a menace to the agriculture of California would, no doubt, be aggravated by loss of the forests now standing. In Oregon and Washington Territory the moisture is certainly abundant, and the immense forests, as yet almost un-

touched, exercise a beneficial effect upon the climate.

HAVING completed this rapid survey of our own country, with a result possibly in some degree reassuring, though not altogether so, we may with profit, I believe, note certain considerations of a general nature bearing on the question under examination. We have been told often that the Mediterranean countries indicate what the face of our own country may become through disafforesting. The conditions of that region, however, are not like those of any considerable portion of the United States. Parching winds from the African deserts tend to prevent reforestation, as the winds from the Australian deserts blight the vegetation of the Timor group of the Malay Archipelago, while all the islands protected from these winds are marked by a luxuriance and vigor of vegetation not equaled elsewhere.

True desert lands are the result of geologic causes; or, where lands have become desert through loss of forests and erosion, such lands have generally been within the reach of the parching influence of neighboring deserts. This is exemplified in the desolation of a large area upon the slopes of the Atlas Mountains in northern Africa. The breath of the Sahara has not only seconded the destructive agencies of man—and in this instance of the camel and goat, which crop all young vegetation—in rendering desolate a large portion of northern Africa, once fruitful, but is now, as we have seen, withering the shores of southern Europe. It is a significant fact that while the southern slopes of the Pyrenees are bare, the northern are wooded. On the other hand, lesser areas, arid from original causes, tend to clothe themselves with vegetation. The plains of Hungary were, within a recent geological period, a desert. They are now almost unwatered save by streams from the mountains which traverse them; the water in the wells and occasional pools is very brackish, and great sand-storms even now sometimes fill the streets of Debreczin and Pesth. Yet these plains are the most fruitful region of Austria-Hungary, producing immense crops of grain. They are treeless, and always have been; but nature has reclaimed them.

There is no proof that the amount of rainfall is diminished by destruction of forests, nor has any forest destruction in the United States, where summer rains fall, put an end to those rains; and we have good authority for assuming that “in the United States, where summer rains are abundant, the quantity of water furnished by deep wells and natural streams depends almost as much upon the



rains of summer as those of the rest of the year, and consequently a large portion of the rain of that season must find its way into strata too deep for the water to be wasted by evaporation."\*

Inundations certainly do result from the destruction of forests at the head-waters of rivers, but these and other resulting evils are curable in a very great degree, as a last resort, by the systematic cultivation of forests there. Even partial reforestation in Brescia, Bergamo, and other Italian provinces, is said to have stopped the inundations in their streams. The Landes or sand-wastes of Gascony have, to a great extent, been rendered once more inhabitable by the planting of woods.

Totally unwooded districts in a humid region, conditions of soil being favorable, are in no danger of becoming arid. Nantucket, Martha's Vineyard, Rhode Island, Block Island, and other islands on the Atlantic coast are practically treeless, but are no more subject to droughts than wooded districts on the mainland. On these islands, however, the natural water-courses are to a great extent dried up.

Inundations, it has been proved, can be prevented by artificial reservoirs upon the head-waters of rivers.

Nature appears to pass through periods of loss and recovery. In France, where a sentiment has, during the present generation, been aroused in behalf of forest preservation, destruction is no new thing. "Under the reign of Augustus," says Ribbe, in "La Provence," "the forests which protected the Cévennes were felled or destroyed by fire in mass. A vast country, before covered with impenetrable woods, was suddenly swept bare, and soon after a scourge hitherto unknown struck terror over the land—the mistral." Provence, however, was once more thickly clothed with

woods. Once more a large part of it has been stripped with disastrous results. In the great alluvial plain of northern Italy the superficial stratum of fine earth and vegetable mold is very extensively underlaid with beds of pebbles and gravel, brought down by mountain torrents at a remote epoch.† Now the torrents are again overlaying the mold with gravel. This points to an ancient erosion from which there was recovery.

THE reasonable conclusion of the whole matter would seem to be that while there is no present serious menace to the eastern half of the United States through the loss of forests, there is good reason to urge the preservation of as much of them as possible and the encouragement of new plantations; while in the western half of the country the immediate withdrawal from sale of the whole body of forests belonging to the Government is highly desirable. There should be an exhaustive inquiry, at the hands of a competent Government commission, into the subject of the extent of forests belonging to the Government, their location, value, character, etc., the proportion of private lands now wooded, and the apparent dependence or independence, as the case may be, of all sections of the country upon the modifying effect of forests. Exact information is now needed, which could scarcely be obtained except through the efforts of such a commission.

Sentimental considerations, I suppose, are to be held secondary to the practical in the matter; but they are powerful, and should be aroused in behalf of no object more readily than the woods, which have occupied so large a place in the sentimental life of man from the earliest times.

*Joseph Edgar Chamberlin.*

\* Marsh, p. 217. † Baird Smith, "Italian Irrigation."

## RETROSPECT.

*Los Angeles.*

A BREATH of balm,— of orange bloom!  
By what strange fancy wasted me,  
Through the lone starlight of the room?  
And suddenly I seem to see

The long, low vale, with tawny edge  
Of hills, within the sunset glow;  
Cool vine-rows through the cactus hedge,  
And fluttering gleams of orchard snow.

Far off, the slender line of white  
Against the blue of ocean's crest;  
The slow sun sinking into night,  
A quivering opal, in the west.

Somewhere a stream sings, far away;  
Somewhere from out the hidden groves,  
And dreamy as the dying day,  
Comes the soft coo of mourning doves.

One moment all the world is peace!  
The years like clouds are rolled away,  
And I am on those sunny leas,  
A child, amid the flowers at play.

*Ina D. Coolbrith.*