MAN-MADE CATASTROPHE

By ADALBERT EBNER

Approximately at the same time as the American press was expressing its triumph over the floods caused by the destruction of two German dams by Anglo-American bombers, the world learned that America herself was suffering from far worse floods in the Mississippi basin which had put more than a million acres under water and rendered 200,000 people homeless.

Dr. Ebner, whom our readers will remember from his article “Wood and Man” (November 1942), is a well-known forestry expert. In the following article he discusses the underlying causes of such natural catastrophes in America and elsewhere and shows us a dramatic chapter in the age-old conflict between Man and Nature. For reasons of space we have been compelled to publish his manuscript in a condensed form.—K.M.

FROM the world of mythology and legend we know that Greece was once a country of forests. We still find charm in the many tales of sacred groves. In the days of Homer, the mountains were covered by forests and fertile soil such as can still be found on a few small islands in the Aegean Sea. But all that has remained on Cyprus and Crete are bare mountain ranges and swampy river mouths. And likewise all of Greece is full of tragic stories of the exploitation of forests with ensuing erosion. Sheep came to graze where forests had once stood; and where the sheep found no more pasture, the destructive goats came and extirpated the last remaining saplings on the mountains. In Greece there are now more goats than people, and goats have always been the deadliest enemies of mountain forests. In the swamps of the plains which were formed by the erosion of the mountains, malaria rages. The mighty witnesses of ancient cultures must now be excavated from their coverings of sand and mud.

When, in the eighth century B.C., the Greeks began to settle in what is now known as Italy, they found richly wooded mountains and fertile plains. Sicily became the granary of Greece, and the mountains of Italy supplied the timber for Greece’s fleets. Among the early settlements, Sybaris was well known and enjoyed an unequaled prosperity for more than two hundred years. But by 510 B.C. the forests in the mountains had been destroyed, and the torrents of water coming from the stripped mountains could no longer be controlled. The Crati and Sybaris rivers carried more and more deposits into the plain, which turned into swamps and became a breeding place for malaria. For many centuries even the site of the city of Sybaris remained unknown: it had perished.

A similar process took place throughout the Italian peninsula. Ravenna, once the counterpart of Venice, is today six kilometers from the coast, and Adria, a harbor in the days of Emperor Augustus, is now separated by more than twenty kilometers from the sea. The deforestation of the southern and central Apennines began in ancient times, and the forests of the northern Apennines as well as of the eastern and maritime Alps disappeared during the Middle Ages when they had to supply the wood for the fleets of Venice and Genoa and the lumber for the fortifications against the invading Turks. However, modern Italy has energetically taken up the rehabilitation of areas destroyed by erosion, thereby setting an example to the world.

And so it was with Spain, Scotland, Palestine, Mesopotamia, Antioch, and Persia, all countries known to have been thickly wooded in ancient times. And in almost every case we have the same phenomenon: first deforestation, later followed by grazing sheep and, the final
destroyers, goats. China has two old proverbs which go right to the heart of the problem. One says: "Mountains exhausted of forests are washed bare by torrents," and the other: "Mountains empty—rivers gorged." The drought and flood disasters of China are tragic chapters in the history of erosion. The Yellow River alone carries 2.5 billion tons of silt out of the country every year, a quantity sufficient to cover 400 square miles with a layer more than six feet high. And finally, let us allow General J. C. Smuts to speak for South Africa: "Erosion is the biggest question before the country today, bigger than any politics."

WHAT IS EROSION?

The term "erosion" covers two very different phenomena. The carrying off of land surface by running water, wind, waves, and moving ice is a normal process known as geological erosion. It is a natural process which, undisturbed and uninfluenced by man, shapes the surface of the earth. In a continuous geological activity, the elements are gradually leveling the surface of the earth. In this way, mountains are turned into valleys, plateaus, and plains, and form the lowlands, the deltas, and alluvial areas by secondary deposits. Normal erosion, with the aid of the weathering of rocks, contributes much toward the growth of plant life, since through it soil is formed and carried to and distributed over one place after another.

The covering vegetation does much to slow up this natural erosion. Dead leaves and branches lying on the ground form a sort of filtering layer which cleanses water and even retains some of it. The growing vegetation with its branches, twigs, and leaves bears the brunt of rain, snow, etc., and breaks their destructive force. The roots bind the soil and offer a support against the motive power of water, wind, and gravity.

Under this upper layer there is the topsoil, the actual vessel of fertility. It is crisscrossed with innumerable tiny capillary tubes which in turn store up water. Gradually this water is passed on to the subsoil, till it is finally collected in a stream of underground water. Under favorable conditions, Nature requires some 1,000 years or more to form two centimeters of soil. As a rule, however, this process takes much longer as, with the increasing thickness of the soil, the formation of new material takes place correspondingly slower. The carrying off of soil by geological erosion under the protection of natural vegetation, and the new formation of soil from deep-lying original substances, are, under normal conditions, more or less balanced.

MAN ENTERS UPON THE SCENE

An entirely different process takes place in erosion when man interferes and alters the natural balance between erosion and soil formation. Under these artificially created conditions, the soil is reduced incomparably faster than it can be produced. This terribly harmful disintegration of the soil usually occurs on fallow soil which has been stripped of vegetation by axe, grazing, fire, and plowing. With the increasing disappearance of the absorbing and fertile topsoil, the process of disintegration gains in speed. The force of the elements gnaws away at the substance of the earth until it has been completely disintegrated down to the bedrock.

As we have said, the erosion of the soil is closely related to the vegetation growing upon it and is influenced by the contour of the land. Here are a few examples to show how long it takes to carry off 15 centimeters of topsoil:

<table>
<thead>
<tr>
<th>Years</th>
<th>(a) Sandy loam with an 8-per-cent slope covered with natural alfalfa...</th>
<th>4,540</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>agriculturally exploited (planted with corn)..........................</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>fallow .................................................................</td>
<td>10</td>
</tr>
<tr>
<td>(b)</td>
<td>Loamy soil with a 16-per-cent slope covered with natural grass.....</td>
<td>33,600</td>
</tr>
<tr>
<td></td>
<td>agriculturally exploited (change of crops) ..........................</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>lying fallow ..........................................................</td>
<td>7</td>
</tr>
<tr>
<td>(c)</td>
<td>Loamy soil with a 10-per-cent slope covered with primeval forest ...</td>
<td>575,000</td>
</tr>
<tr>
<td></td>
<td>&quot; natural grass .......................................................</td>
<td>82,150</td>
</tr>
<tr>
<td></td>
<td>agriculturally exploited (planted with cotton) .......................</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>lying fallow ..........................................................</td>
<td>up to 10</td>
</tr>
</tbody>
</table>
Other experiments have shown that land exploited by agriculture loses its soil 11,290 times faster, and loses 102 times more water, than when, under similar conditions, it is covered with timber. The comparative figures for natural grass coverage are 1,181 and 31. On fallow land, up to 68 per cent more water flows away and is lost.

FORESTS AND AGRICULTURE

We see that the forest is a blessing to a country when it is well distributed, well cared for, and well exploited. It protects fields and meadows, houses and villages, from the dangers of natural forces. It shields the soil from the destructive force of heavy rains and also from the slowly gnawing process of geological erosion. It helps to store up water, to cleanse and distribute it for domestic and industrial consumption. It helps to water the fields. It breaks the force of storms on wide plains and wards off dust storms. Its roots penetrate the earth of the mountains like a skeleton and hold it together. Its trunks hold up avalanches and bring wandering sand dunes to a stop.

Of course, a civilized country cannot be entirely covered with timber. However, it is important to have the timber distributed properly among fields and human settlements and especially to have those areas wooded which are most exposed to erosion, namely, mountains and the banks of many rivers. Thus the science of forestry is not only responsible for providing raw materials within the framework of a national economy but also determines the condition of the agricultural prosperity of a country. Perhaps the best living example of a lack of proper forestry and of the subsequent devastating erosion is the USA.

SETTLERS AND THE FOREST

The conquest of land and the exploitation of natural resources in America form one of the most interesting cases of human tragedy. The settling of the country and the opening up of its resources coincided with the great age of technical progress. Outward success and inner disintegration developed side by side like gathering thunderstorms. Out of the great sum of the clash of events we are only interested here in the part affecting forestry and, in a wider sense, in the results of soil exploitation and settlement.

The first settlers who came to America to clear the forests, to drive their plows across the earth, to build houses, to gather in harvests, and to exploit a country of unlimited size and incalculable riches, developed characteristics in the course of time which are now called typically American. Roads and railways have long since penetrated to the Pacific Coast, and the country has been opened up and taken possession of. Yet the people still live in the illusion of having a virgin country.

The entire agriculture is industrialized. There are practically no peasants, only farmers. They feel no bond to land and soil, a bond which is the very essence of peasant nature. They buy their bread and buy their flowers, because it is cheaper to buy them than to produce them on one's own land. They run their farms solely for the purpose of making money. Thus one year they only raise pigs, and in other years only corn, because these products happen to fetch the best prices. They completely lack the idea that their farm is a living whole, an idea which characterizes the peasant's attitude in old Europe. They work their land according to the "mining motive," exploiting it like a mine. The dollar is the dominating standard of success in the USA. Production is considered superior to social welfare, and temporary profits seem more important than the future of country, race, and people.

Penetrating everything there is the worship of the ideal of unlimited personal freedom. Any bond or obligation is rejected which might limit the individual's disposal of his own property, his land and his soil. The struggle with the virgin soil developed the characteristic of great energy in the American nation. In this respect, the spirit of the early
settlers, the courage to subdue Nature and to fight off its dangers, has led to an admirable trait. Such traits result in great progress; but, when they are employed at the wrong spot, they become destructive. Thus we can understand that these people, tireless but also insatiable, always began to exploit new regions as soon as the old land no longer seemed profitable or its flowering riches had been extinguished by ruthless exploitation.

THE FORESTS OF AMERICA

What are the forest reserves of the United States? In the main they consist of about 495 million acres, or one quarter of the area of the possessions of the USA on the American continent. This area is distributed as follows:

<table>
<thead>
<tr>
<th>Type</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timbered land</td>
<td></td>
</tr>
<tr>
<td>Commercial forests</td>
<td>495</td>
</tr>
<tr>
<td>Noncommercial forests</td>
<td>615</td>
</tr>
<tr>
<td>Farmland</td>
<td>413</td>
</tr>
<tr>
<td>Grazing areas</td>
<td></td>
</tr>
<tr>
<td>on farms</td>
<td>379</td>
</tr>
<tr>
<td>not on farms</td>
<td>317</td>
</tr>
<tr>
<td>Towns, farm buildings, roads, etc.</td>
<td>696</td>
</tr>
</tbody>
</table>

Originally, about 50 per cent of the United States was covered with timber, with almost 822 million acres of commercial forests. As a result of settling and clearing, the forest land was reduced to one quarter of the total area. Even so, it is still as large as the total area of Spain, France, Italy, Germany, Norway, and Sweden put together.

As regards ownership of the forests, the forest possessions of the lumber industry form by far the largest share in the United States. With its 270 million acres, the lumber industry owns not only more than half of the entire commercial forests but also by far the best stands of timber. About 127 million acres are in the hands of farms, while the Federal Government owns 88 million acres and other public bodies (states, communities, etc.) only 10.6 million acres. The Federal possessions include 7.5 million acres of forest belonging to Indian reservations and which can hence be eliminated from our considerations.

The annual depletion of timber amounts to some 16 to 20 billion cubic feet. This figure includes annual cuttings as well as losses through fire, insects, fungi, and other destructive natural forces. The annual accretion, on the other hand, amounts to no more than about 8 billion cubic feet.

From the very beginning, the commercial exploitation of the American forests took place in the form of a lumber industry supported by private capital and not as a result of forestry planning for the perpetuation of America's timber resources.

WHEN THE LUMBER INDUSTRY BOOMS

The United States has developed the greatest lumber industry ever known to mankind. All the methods of modern technical progress were employed to produce constantly growing quantities with increasing speed. At the peak of the boom some twenty-five years ago there were 48,000 lumber mills cutting up 25 billion cubic feet of lumber for all kinds of purposes and 150 million railroad ties every year. The additional annual losses through natural forces and waste in cutting are estimated to have been about 10 billion cubic feet. Even now—at a time when the peak of production has long been past—the amount of lumber cut every year would be sufficient to pave a road 7 meters wide with a 2.5-centimeter-thick surface reaching from the earth to the moon.

It is due to the mighty lumber industry that so many people in America have their own houses, for almost all the houses in the USA are built of wood. It is also due to this industry that the Mississippi regions were able so rapidly to develop into the great agricultural area that they are; for, without the wood to build houses, barns, stables, carts, and tools, America could never have become so gigantic a producer of agricultural goods.

The lumber industry has also been of certain benefit where Nature faced man with unexpected problems. Vast timber
resources in a mighty primeval land were waiting to be exploited. When mature timber is not cut—and every tree has a limited term of life—its vital force decays, and baneful natural forces in the shape of insects and fungi start their work of destruction. Moreover, ruined timber stands of this kind easily fall victim to forest fires or storms and are thus entirely lost to human exploitation.

THE OTHER SIDE OF THE PICTURE

However, the drawbacks of the American method of exploitation are revealed by an abundance of alarming facts.

83 million acres of forest land are now lying devastated, no longer of any use whatever. Nine tenths of it are in the hands of private owners. Even now, 850,000 acres are being cut and destroyed every year, 95 per cent being in the hands of private owners. 36 million acres are cut every year and left in a condition giving rise to the gravest anxiety for the future. 95 per cent of all cut-over areas belonging to private owners are left to themselves without any provision for the future. Compared with this, the area of 135,000 acres of Federal timber land, on which at least the modest beginnings of a regulated exploitation have been made, seems very small.

According to a ten-year average, the United States is afflicted by about 51,000 forest fires every year which attack some 41 million acres of forest land. 98 per cent of all forest fires during the last few years occurred on privately owned land, and of the 191 million acres of forest land in private possession almost nothing has been protected against forest fires. About 76 per cent of all forest fires could be traced to human influence and were caused by thoughtlessness, camp fires, smoking, flying sparks, etc. Only 8 per cent was traced to lightning.

The lumber industry leads a nomadic life: it exploits, destroys and, after having extinguished the natural riches, moves on to new places. In 1850, for instance, 54 per cent of the total lumber cut was produced in the northeastern parts of the USA and only 6 per cent in the West, while in 1929 only 3.3 per cent was produced in the Northeast and 44 per cent in the West. Originally the New England states and the Lake states were the location of the forest reserves and lumber industry; now the northern Rocky Mountains, New England, and the Middle Atlantic, Lake, and Central states contribute only about 2 per cent of the total lumber production of the country. This figure is all the more astonishing as these states contain 35 per cent of the total commercial forests and 85 per cent of the second growth.

INDUSTRIAL SUICIDE

What are the further consequences of this nomadic life? A large lumber mill is built. A settlement forms around this mill, and trade and commerce prosper. But twenty years later towns of 6,000 inhabitants are abandoned again, their life vanishes, and their houses fall into ruin. Twenty years is the period that suffices ruthlessly to exploit the forest reserves. This situation entails grave social problems, which are apparent in the lumber trade itself. In many places the labor turnover in one cutting season (six to eight months) amounts to 300 per cent. In such circumstances a regulated family life is naturally almost out of the question and there is practically no basis for any cultural development.

As a result of its system of exploitation, the lumber industry itself is heading for disaster: indeed, it has already met with it. The industry's investments in machinery and equipment amount to some 10 billion dollars. Competition and the investment of such great sums for the means of production have, of course, increased the desire to expand production in order to ensure good returns on the capital invested. The consequences were an increase in cutting, a decreased utilization of the cut timber so as to produce goods of a superior quality, more ruthless exploitation, and overproduction. Until recently, not more than 65 per cent of the goods produced in many regions of the West could be sold. The great
EROSION—
its Ancient Effects
and Modern Causes

Remains of the ancient town of Khorsabad in Mesopotamia. They were excavated from under a layer of dust, five meters thick, carried there by wind erosion. The town has been buried for about 2,600 years.

Man destroying the intricate structure of forest biology with all the means of modern technology.

Forest fire—the great scourge of North America’s primeval forests.
Man's ruthless exploitation eats deeply into a virgin forest on the Pacific Coast of North America.

Four Steps of Erosion

What was once a living forest has been turned into a scene of desolation by exploitation and fire. The disintegration of the soil begins.

A hillside stripped of its timber is being eaten away by erosion.

An abandoned American farm: erosion deposits in the plains have destroyed fertile fields and stifled the life of nature, settlement, and human beings.
American lumber industry is faced with total economic ruin. To this must be added that the large centers of consumption are in the East, where the timber reserves have long been used up, so that the places of production are separated by a whole continent from the main consumers, thus burdening the lumber with very heavy transport costs. As a final example of the system of exploitation of the lumber industry, let us quote figures of utilization. On an average, influenced by the distance from the forest to the finished product, 68 per cent of the timber cut is lost, while only 32 per cent reaches the stage of finished products.

As a consequence of this exploitation, many other tragic phenomena occur, although, from the purely economic point of view, they are of minor significance. The giant sequoia of California with its age of four thousand years will always remain one of the greatest natural marvels of the world. With their majestic beauty, these trees are among the oldest living things known on earth. About fifty years after their discovery they were practically exterminated, and only a few specimens in small groves have been preserved for posterity. Meanwhile, however, the number of visitors to these groves has increased to such a degree— in 1934 California had 18 million visitors to its forests!—that the ground under the protected trees has sunk three feet, which might even threaten the further existence of these giants.

Another example of the results of unlimited forest exploitation is the frightful decrease in the wild animal life of America. In spite of the efforts made on the part of the Federal Government through the establishment of wild-life reservations, the fact remains that 17 species of game have become completely extinct, while 52 species are almost extinct.

THE DESERT ADVANCES

However, the gravest result of America’s exploitation is the tremendously increased rate of her soil erosion. The annual soil erosion of the United States amounts at present to 3 billion tons of solid matter. The Mississippi alone carries an annual amount of 730 million tons of sediment to the Gulf of Mexico. This quantity represents only a comparatively small part of the actual erosion; by far the greater part collects at the bottom of rivers, in valleys, backwaters, and all low-lying parts of the country. This vast quantity of earth contains 92,172,300 tons of the five most important elements of plant nourishment, namely, phosphorus, nitrate, potash, calcium, and magnesium. 43,361,000 tons of this quantity consist of phosphorus, potash, and nitrate—the main ingredients of artificial fertilizers. It is estimated that an annual amount of 668,000 tons of artificial fertilizers (phosphorus, potash, and nitrate) with a sales value of $158,500,000, is put onto the fields in the USA. In other words, through erosion the soil is losing 60 times as much of these elements as is added by means of artificial fertilizers. And one must bear in mind that, while these elements can perhaps be replaced, soil and humus are irreplaceable.

No exact picture of the total damage done by erosion can be given as yet. Preliminary surveys have provided the following figures:

- 50 million acres completely destroyed. These are areas that were once fertile and that are now entirely denuded of vegetation. With the exception of tiny remainders, these areas are now depopulated.
- 50 million acres approaching the borderline of complete infertility. As regards vegetation and production they can no longer be taken into account.
- 100 million acres seriously damaged. At least a quarter of the valuable topsoil of these 100 million acres has already been carried off, often even more.
- 100 million acres damaged to such an extent by erosion that the soil must, in the long run, be considered as seriously threatened.

If we add up all the soil made use of by agriculture, pasturage, forests, etc., we obtain the following figures:

- 282 million acres can be regarded as completely or almost completely destroyed.
- 775 million acres have been seriously damaged by erosion.
1 billion acres are affected by erosion.
(For comparison: the total area of Germany in 1935 was 117.5 million acres, of which about 30 million acres are timbered.)

According to the present situation, serious measures for combating erosion must be taken on 75 per cent of the agricultural area in order to prevent further disaster. Unless drastic measures are taken immediately, the present agricultural area of 430 million acres will shrink to 150 million acres within the next 100 years. This acreage would no longer suffice to maintain the present requirements of America.

DUST STORMS

On May 12, 1934, a disaster occurred which was unknown since the white man had set foot on American soil: 300 million tons of earth were lifted into the air in the Great Plains and, in the form of dust storms, swept halfway across the country, darkening the sun in Washington and even drifting out into the Atlantic Ocean. Since that time these phenomena have been repeated. In 1937 a dust storm started in Texas and swept up into Canada. The razing effect of these storms is such that strong plants are cut off at the ground. About 10 million acres were devastated by dust storms, and still larger areas severely damaged by erosion and piled-up sand and dust. A new scourge had arisen for the land, and terrible economic, social, and spiritual suffering for the people affected. With fields destroyed, communications interrupted, machinery, rooms, and houses filled with dust, the cattle died of thirst and dust and people succumbed to dust inflammation of the lungs. The events were reminiscent of similar happenings in the border areas of the Sahara.

The dust storms are to be explained less by deforestation, for the Great Plains are poor in timber, than by the fact that the original cover of buffalo grass had been sacrificed to the plow. Land which did not yield the desired profits was abandoned and left fallow by the farmers, who opened up new land for their planting and moved farther and farther on. Heat and dryness impoverished the soil till storms carried it off in mighty clouds. The curse of exploitation could not be shown by a better example.

EROSION DAMAGES

According to very conservative estimates, the annual loss resulting from diminution in harvests caused by erosion amounts to 400 million dollars. The total losses will, within a few decades, reach the amount of 30 billion dollars, since the harvests on eroded soil are often no more than one thirtieth of the harvests on healthy, noneroded soil.

The effect of erosion is not only limited to the dissolution and devaluation of certain directly affected areas. Soil carried off by wind and water is deposited elsewhere. The extent of damage caused thereby cannot be grasped and can only be shown by examples. Low-lying areas along the banks of rivers which have been turned into swamps as a result of silt deposits amount to 17.5 million acres. The Ohio flood of 1937 deposited 70 million tons of silt which completely devaluated 425,000 acres of land worth $250 an acre.

Erosion is causing extensive damage to reservoirs, waterways, and harbors. Reservoirs fill up rapidly with silt and lose their value. The expanded surface of the water speeds up evaporation. In the USA there are 8,600 reservoirs with a total value of 2 billion dollars. They are of great importance for artificial irrigation and for the water supply in homes and industry. The reservoirs are threatened with destruction by erosion. In California a large number of reservoirs lost one third of their capacity as a result of the floods of 1938. In Virginia some reservoirs silted up to an extent of 80 per cent within a period of 20 years. In the southeastern parts of the States, 13 reservoirs which supplied important power stations lost their entire storage capacity within a few years.

Identical or similar phenomena are to be found in the case of rivers and harbors. The effect of erosion on routes of com-
Illumination is devastating. America has always been the country of good roads and railroads. Today, hundreds of thousands of miles of these costly constructions are seriously threatened by erosion. The washing out and carrying away of roads, railway embankments, and bridges, the filling up of drainage ditches, and the blocking of traffic, are among the immeasurable damage to be found here. Studies have shown that at least 40 per cent of all maintenance costs for communication systems—and these costs run into astronomical figures—can be traced to damage by erosion.

**FLOODS AND DROUGHTS**

Equally great is the effect of erosion on floods and droughts. There have always been floods, but their frequency, extent, and damage have increased incomparably. Today, as much silt and rubble collect in forty years as formerly did in the course of thousands of years. The former deposits consisted of fine, often fertile sands; today these deposits are in the form of coarse, useless rubble. The natural drainage systems of rivers and streams are already so silted up that they cannot even carry off the normal quantities of water.

Droughts, too, are closely related to erosion. As we have said before, the vegetation greatly influences the water reserves in the soil. Just as the artificial reservoirs silt up, so do the natural water reservoirs lose their storage and conductive capacity. The water stored in the soil is about 100 times the quantity of that on the surface. Not only does the process of silting decrease the storage capacity: it also makes the soil hard and impenetrable to plants. Thus the drying-out process has two effects. During the great drought of 1934, the underground water level in the Great Plains sank by 7 meters. Although part of this was due to the lack of rainfall, the main damage was caused by the silting up of the natural water channels as a result of erosion.

Heart-rending processes take place in the forest-pasture areas to the west of the Mississippi and along the Pacific Ocean. Originally a rich prairie land abounding in game and interspersed with trees and forests, these areas feed the water systems of vast regions and are responsible for the prosperity of their land, culture, trades, and settlements. In addition they originally fed 22 million domestic animals—cattle, sheep, goats, and horses. This was less than a hundred years ago. As a result of ruthless exploitation—overstocking with cattle, deforestation, and lack of care of the pasturage—the fodder supplied by these areas is now only just enough for 11 million animals. Consequently, the supply of meat and the production of wool have suffered drastically. The water supply for vast tracts of land has been jeopardized. 80 per cent of these areas is threatened by erosion, and the decrease in vegetation and water reserves is progressing rapidly.

If one has walked or ridden over the red earth of Arizona, New Mexico, or California, one can never forget this picture of wretchedness. The crust of the soil is fissured with cracks, some wide, some narrow; here and there juniper bushes and pine trees eke out a miserable existence; and the grass, with its roots already exposed to the air, fights for its bare life. A few drops of rain wash the loose dust into thick slime which at once eats its way deep into the soil, slowly coagulating in a deadly mush in the slow-moving, muddy rivers. And over the great expanses there are always towering masses of clouds indicating catastrophic downpours which, with their torrents, wash away tons of the loosely held earth.

**SOCIAL EFFECTS**

Moreover, such far-reaching problems do not affect only the soil, the forests, or agriculture; their force extends much farther. Where the timber has vanished, the soil lies fallow and is impoverished, and where the cultivation of wheat and corn has stopped, poverty begins. Taxes are raised for the survivors, public funds are strained, and migrations get under way.
Side by side with devastated forests, the abandoned farms have become a common sight. Numerous communities, counties, and regions are faced with bankruptcy. For a young country like America, whose prosperity depends on the strength of the soil, these are unimaginable disasters.

Attempts have been made temporarily to stem the disintegration and to postpone its effects by means of an unhealthy credit system. Continually deteriorating harvests have increased the demands for credits. The interest payments on these credits have again entailed an increased exploitation of the soil, usually leading to land expropriation, farm sales, dissolution of the soil, and impoverishment. Today 42 per cent of all farmers in the USA are tenants; in 1880 the figure was only 25 per cent. The average tenant farmer in the USA moves every 3 to 4 years. In many regions 50 per cent of the tenants sign leases for one year only. Such farmers are not concerned with the soil or its care and maintenance. Today, 45 per cent of all agricultural soil is worked by tenants. In a number of States, 30 per cent of the land belongs to credit associations. The farmer must pay his taxes from a dwindling income, till finally his farm falls victim to the taxes or to his debt with the credit association.

This example in agriculture is repeated in forestry. Soon the community begins to feel the consequences of erosion and exploitation. An impoverished forest owner or destitute farmer is a poor customer for electric power, for machinery, or other industrial products. Oppressed by his burden of taxes and heavily in debt, he takes no part in cultural or social evolution. His children lack proper education. Thus the entire economic, social, and cultural life disintegrates like the soil underfoot.

Now begin the dramatic migrations of the twentieth century. The emigration of the population of the Great Plains in 1936/37 stands as a living example of this human tragedy, a tragedy that cannot be expressed in a few words but that can be traced to the same origin: exploitation—erosion!

**IS THERE A REMEDY?**

America, the land of contrasts, also shows these contrasts in her processes of destruction and recovery. Generous and energetic as her people are in many of their dealings, they also present in many cases an exceptional attitude toward Nature. For example, the generosity of individual rich men and sometimes of the State has bequeathed to the nation its national parks with their some 11 million acres of surface.

In addition to the establishment of a Federal Forest Administration in 1902, all but six of the various states possess a similar organization. 25 colleges are endeavoring to educate young people in forestry. The Forest Products Laboratory in Madison, Wisconsin, is, with its 300 trained collaborators, the biggest and best-equipped institution of its kind in the world. Moreover, there are about 200 private or semipublic laboratories concerned with the study of wood and its uses. The Department of Agriculture in Washington, D.C., has formed its own Department of Soil Conservation. The founding of the Civilian Conservation Corps (the CCC) was originally intended for the restoration of America's neglected and ruined forests. Much was heard of the "Shelter Belt Project" which, however, was never executed and has long been forgotten again; its plans provided for the establishment of a forest belt reaching from Canada to the Gulf of Mexico, which was to prevent the occurrence of dust storms.

The sum of these measures, however, strongly supported by immense financial means, attacked the task from one side only: that of finding a technical solution to the problems. Some of these solutions would be to find a technique of forest exploitation which is less destructive; a technique of wood utilization that solves the problem of waste; and a technique of combating erosion which builds up the soil again or at least halts its disintegration. We must add that all these measures are intended to be carried out in times of peace only, and that, with the
beginning of acute political tension, they were largely throttled. The outbreak of actual war has probably put a stop to nearly all of them.

**THE PROBLEM**

Then, several years ago, a new term appeared overnight: conservation. Conservation became a slogan which means everything and nothing. The hanging up of nesting boxes for birds, the planting of trees, the forming of associations to discuss Nature—all this was called "conservation." But conservation really means the bringing about of harmony between the Nature and the people of a country. When the land provides for its owner's welfare, when the owner tends the land, when both prosper as a result of this "comradeship"—then we have that which the New World would like to call conservation.

The basic wealth of a country consists of the fertility of its soil, water, the wealth of its flora, and the wealth of its fauna. In America, three of these fundamental values were destroyed for the sake of the fourth. Incalculable riches were lost because the relationship of these components to each other was disturbed. In its final and most profound sense, conservation is concerned with the correct correlation of all these parts that determine the well-being of the country. To achieve this goal several paths are open.

There are technical measures, such as the provision of technical aid (for instance, of plants for reforestation or machinery for harvesting) and theoretical instruction on the advisability of certain actions. There are laws and decrees. All these measures are important, but they do not determine the final success. True success can only be achieved by a different attitude on the part of the people, an attitude which arouses love and joy in the heart so that a man may tend his soil free of the prosaic thought of profit. Self-sacrifice is needed which, renouncing private profit and willingly limiting personal freedom, gladly undertakes those measures which will benefit the whole of the country and the nation and its unborn generations.

Are the Americans with their traditions of business egotism and "rugged individualism" able to achieve this kind of attitude? Perhaps, but only if they take over many of the ideas of the nations against which they are fighting the present war.

"In 15 decades, Americans have transformed a wilderness into a mighty nation. In all the history of the world, no people ever built so fast and yet so well. This will be a land of Liberty, they said in the beginning, and as they hacked the forest, drove their ploughshares deep into the earth, and spread their herds across the ranges, they sang of the land of the free that they were making. Yet with astonishing improvidence, Americans have plundered the resources that made it possible to realize their dream."

Hugh Hammond Bennett: