Our Vanishing Farm Lands

By Hugh Hammond Bennett

"At least 17,500,000 acres of farm land have been destroyed by erosion in this country and the present annual loss to farmers is more than $200,000,000"

Again wrathful waters have marched down the streams of America. Again, lives have been lost and property has been damaged or destroyed to the extent of millions of dollars. Houses have been swept at midnight down flooded valleys, livestock drowned, and watersheds stripped of productive soil.

Floods in Alabama, the Carolinas, Georgia and Florida; floods in the Mohawk Valley of New York; floods in Tennessee, Illinois, Iowa, Kansas, Texas, Oklahoma, Kentucky and Wisconsin; and again the Father of Waters has piled converging torrents dangerously high within his banks, with no one knowing how high the threatening rise would be nor what damage it might spread across the great valley. Millions have read for the first time the names of inconsequential streamlets: Tight Eye Creek, Murder Creek and Persimmon Creek in southern Alabama; White's Creek, Little Duck River and Emery River in Tennessee — streams that recently have taken the lives of many people and wrought vast damage to property.

Tomorrow we shall have forgotten, as most of us have now forgotten the essential facts of the great flood that swept down the Mississippi two years ago, when that mighty stream carried the greatest volume of flood water of which we have reliable record, took the lives of 231 human beings and caused a property loss estimated at more than $350,000,000. Nevertheless, this havoc may recur at any time.

Floods belong to the natural order of things. From the remotest days of recorded history, mankind the world over has stood in awe of the sweeping fury and ruthless destructiveness of angry waters. In America, floods are becoming more frequent, and this phenomenon is not difficult to understand when we look carefully into the causes.

A contributing cause to the greater frequency of floods, and one that weighs heavily upon American agriculture, is the unrestrained erosion of the land by abrasive rainwater. The damage which has been done by this agency is so enormous that the mind is incapable of comprehending its significance. With our vast area of

farm land and our rapidly expanding industrial life we have not concerned ourselves about the situation; have not recognized it nor thought of it. We have felt perfectly safe, not only about our agricultural lands but about our timber supply. Already the folly of our complacency in considering the supply of wood inexhaustible is giving serious concern to those who are looking ahead. We still have among us buoyant optimists who think, or profess to think, and vociferously assert that we have a lasting supply of timber. They undertake to console us with the comforting references to a recent timber harvest that has actually exceeded the demand and then, to brim the cup of comfort, they inform us that the vast forests of the Pacific Northwest have scarcely been touched.

TWENTY-FIVE years ago that same false picture was painted with reference to the great yellow pine belt of the South. Now, with the exception of a few isolated tracts, that vast forest is gone. Where formerly were magnificent stands of longleaf pine, millions of denuded acres lie idle and subject to wasteful fires. Reforestation is checked or prevented entirely on millions of acres and the humus layer that would protect the sloping areas from excessive rainwash is destroyed or prevented from forming.

It has been much the same with the white pine of the New England and Lake States, and the hardwoods of Pennsylvania, Ohio, Indiana and Maryland. Now the cutting has been completed over large portions of the southern Appalachians. It was practically completed in the foothills to the east and west long ago. That we are cutting our remaining stands four times faster than timber is growing, that we are still using wood in our daily life for a thousand purposes, are importing lumber from the tropics for our furniture factories, and are procuring 41 per cent of our annual supply of wood pulp, and wood pulp equivalent, from Canada and another 14 per cent from other countries, evidently means little to those cheerful optimists who see no danger to our timber supply.

WHAT about the even more dangerous erosion of farm and grazing lands of the nation? Not so many years ago we were told with gleeful assurance that the soil was our one immutable, inexhaustible resource. When we have studied the situation with open eyes it becomes painfully apparent that the soundest part of this gem of intended wisdom is the rhythm of its meter.

The facts are that all the soil we cultivate and graze is susceptible to change by erosion and that much of it is susceptible, not only to rapid exhaustion, but to absolute destruction. Erosion affects the physical character of the earth's surface more than the activities of all other natural and artificial agencies combined — more than volcanoes, earthquakes, tornadoes, tidal waves and the excavations of burrowing animals and trench-digging human beings. More than eight-tenths of the surface of this country is underlaid by sedimentary rocks that extend in many places to depths exceeding ten thousand feet. It is not uncommon to drill into these beds of water-formed materials more than four thousand

feet in search of oil. It was erosion that whittled out the valleys of the country and trenched their slopes with picturesque glens and canyons. It was the same process that carved the Grand Canyon of the Colorado, Bryce Canyon and the pinnacles of the Bad Lands. Thus, while the ancients were building temples to the sun, Mother Nature was erecting some elaborately magnificent structures in her own style of architecture.

Immeasurable as has been the work of abrading water through the countless ages of geologic time, however, it is not this slower type of soil removal that appals those who observe and understand conditions on our farms and ranges. It is the accentuated soil washing following the destruction of forests and their soil-saving leaf-mold, the removal of herbaceous and shrub growths, the breaking of the matted prairie grasses, and the loosening of the soil by farming implements and by domestic animals that give us greatest concern.

BAD as the situation is, the country, nevertheless, is not on the verge of a land shortage. We are still producing surpluses of some crops in years of favorable seasons. Probably we shall be able to produce ample food to meet the requirements of an increasing population for a considerable time to come, even with the wasting of farm and grazing lands continuing.

It is not the threat of a land shortage that we are most concerned with at the moment, although the available estimates of soil losses are discouraging. It is, rather, the necessity of discovering ways and means for recovery from existing unhealthy conditions. A forerunner of what may be done is the appropriation made by the last Congress through an amendment offered to the Agriculture Bill by Representative Buchanan of Texas, providing $160,000 for studying, devising and installing effective methods of erosion control in the various vulnerable parts of the country. This was the first important step the Government has taken to put chains on the giant that is devastating our agricultural lands.

SAYS Representative Buchanan, in this connection:

"We have in our midst a master criminal, a gigantic thief, a highwayman. I want you to act as a jury, listen to the evidence, render a righteous verdict upon the destructive depredations of this, the master criminal of our age, and by your verdict not only find this criminal guilty, but condemn the inaction and neglect of the governments of States and Nation in not sooner apprehending and condemning to eternal confinement this master criminal, thereby stopping his depredation. The name of this master criminal is soil erosion.

"If the priceless heritage transmitted to us by our forefathers is to be preserved unmarred, and by us transmitted to our children, we must control our surface water and conserve our soil. The three most valuable gifts of God to man are soil, sunshine and rain. They constitute the earthly trinity, absolutely essential to the existence of man. If any one is destroyed, then our civilization and our people will perish from the earth."

It is incontestably true that land impoverishment, chiefly by erosion, has caused the downfall of nations and probably the disappearance of some civilizations. What has happened to much of China is a record of terrifying import, told in terms of destroyed land, famines and millions stricken with dire poverty. Until recently many historians have explained that exhaustion of man power in wars of conquest caused the decadence of the Roman Empire. But a factor of equal or even greater importance was a terrific decline in the productivity of her agricultural lands. Excepting the fertile lowlands of the Po and the strip of coastal plain on the west, most of the land is now thin and poor and has been for many centuries. Every vestige of soil has been swept from numerous areas. The treeless and rocky lands that were clothed with forests centuries before Christ are so parched in summer that crops have insufficient moisture for growth. Approximately the same situation has existed since Roman times.

THE consequence of this waste of a natural resource — of soil lost by unrestrained erosion, of devastated forests, of streams run dry or choked with silt — is so clearly revealed in the impoverished lands throughout the world that no American, comprehending the danger, will refuse to join in national combat against the evil that lowered the Roman standard from its high place, brought depopulation to Asia Minor, afflicted much of China with indescribable poverty, and is now adding rapidly to our already large area of abandoned farm land and devegetated ranges.

Although we still are in no immediate danger, we actually have arrived very near the limit of supply with respect to good farm land. Our better agricultural lands have been in use for some time. Future expansion must be, for the greater part, on poorer soil — the kind economists designate marginal and submarginal lands. Yet, present practices on most farms are encouraging rather than discouraging impairment of the soil by slow surface washing and rapid gullying. This wastage is proceeding in some degree on practically all lands steep enough for water to run downhill. Run-off water from fields and closely grazed pastures and ranges is always discolored with soil material picked up from the surface, the richest part of the land.

IN SUB-HUMID Texas, on some of our best cotton land, it was found by measurement that in one year 40 tons of soil matter were actually washed from an acre of unprotected ground having a slope of only two feet in a hundred. Also, approximately one-fourth of the rainfall ran off the land. The seriousness of such losses becomes the more apparent when it is considered that the average precipitation in the region is only 21 inches and there is an additional loss of about 25 per cent of the rainfall by evaporation of light showers. More than 75 per cent of the crop land of the United States is steeper than this Texas slope which lost so much of its soil and water into the drainage system of the Gulf of Mexico. Although all lands are not so erosive as this Texas area, some, on the other hand, are even more vulnerable. For example, a single rainy

period in the fall of 1927 swept out of thousands of fields in northeastern Kansas more than 40 tons of soil per acre, along with most of the young grain that was growing on the land. The wastage was repeated in the fall of 1928. A decade of crop rotation would not correct the damage which was done these splendid grain lands by a few days of heavy rainfall.

A SURVEY has shown that not less than half of the land now in cultivation in this country is subject to damaging rainwash. Half of this area, or more, is being washed so destructively that farms are being abandoned every year because the soil has been made too thin by erosion or gullying to warrant further cultivation. The damage is taking place so gradually in many sections, each rain sweeping a film of soil from the surface of entire fields, that farmers frequently are unconscious of the process, ascribing their diminishing yields to soil impoverishment by the crops removed. When unproductive clay spots and even bare rock appear here and there over the slopes, it is too late in many instances to remedy the situation. Consequently the land is abandoned to pasture, weeds, brush or whatever trees will grow on it. Some of these worn areas have been so dissected with gullies which divide like the ribs of a leaf that the land not only can not be tilled but can not be reclaimed.

In a single county of the southern Piedmont region, the rolling plateau country lying east of the Blue Ridge Mountains, 91,000 acres of land formerly cultivated and considered good soil have been classed and mapped by a Federal survey as rough gullied land without agricultural value. Centuries of rock decay would be required to restore this devastated area to arability.

In another county not far from this one 73,000 acres, once farmed, now have no agricultural value. Much of this land has but little value even for growing pine trees. About forty years ago a schoolhouse stood where now chasms a hundred feet deep ramify the countryside.

A recent survey has shown that 86 per cent of the upland in a former fertile valley tributary to the Missouri River, in northeastern Kansas, has lost from 8 to 40 inches of soil since it was cleared forty-two years ago. Among a few clumps of trees left standing by the axemen the original deep, rich, humus-filled soil is still preserved. It was the depth of this virgin woodland that furnished the standard for measuring the wastage that has taken place over all the cleared areas, now an ugly spectacle of impoverished fields and devastated orchards in a valley once charmingly beautiful and as productive as any part of the nation.

DURING the past decade valuable dairy farms in southwestern Wisconsin have been gullied beyond any possibility of reclamation. Sixty per cent of the farms in one large county of this section have suffered severely as a consequence of uncontrolled gullies and surface wasting. If the wastage were confined to the one county, we might forget it, perhaps, as an unfortunate instance; but the same thing, or an approximation of it, pertains to fourteen other counties in the southwestern part of that

State, and to still other counties to the south in Illinois and across the Mississippi River in Minnesota.

Fully 75 per cent of our vast western grazing lands are undergoing the same kind of depreciation, following excessive grazing. The region so affected extends from the Pecos River in Texas to California, and from Mexico into Wyoming, Idaho and Oregon. Entire valleys which, when the country was settled, were richly carpeted with grama and other valuable grazing plants, have been so ripped to pieces, so ruthlessly despoiled, that not a sprig of vegetation can be found over acres of ground. Only in old graveyards and other protected spots can one find anything like virgin conditions of plant life and soil cover.

W. R. CHAPLINE, the range expert of the United States Forest Service, says of the situation:

"Following 1870 there was a rapid expansion of the range livestock industry in the West, especially in sheep raising. By the late 'Seventies the expansion in cattle was in full swing and pressed on with prospects for a rich harvest. As numbers of livestock increased the palatable forage plants were grazed closer and closer, and their vigor was sapped. Instead of thick grass knee deep, of which the early stockmen speak, there were shorter and sparser grass blades and stems; finally many of the plants gave up the struggle, and the stand was thinned. The less valuable plants were then grazed more severely, until they too were practically eliminated. The hungry animals in their search for feed trampled the range, destroying plant roots and packing the soil. The ranges became dust beds. Residents of Utah tell of being able to count the herds of sheep on the mountains by the dust clouds rising as the sheep trailed through the country. Under such conditions there was nothing to check the rain as it fell; the more compact soil could not absorb the water, which ran off and was quickly converted to a slimy mass of flowing mud. Shoe-string gullies started and speedily gained depth, while the main drainage channels became raging torrents. The rich friable surface soil was washed away and the heavy clay subsoil exposed.

"THE regulation of grazing within the national forests and the consolidation of private holdings have greatly reduced the area of range overgrazed, but extensive areas throughout the West are still deteriorating through excessive or otherwise improper grazing use. The most serious situation at present exists on the 196,000,000 acres of unappropriated and unreserved Federal lands with their unfenced, intermingled State and private lands, where grazing can not now be legally controlled. Much of this public domain lies in the foothills and should furnish the abundant spring and fall feed essential to profitable livestock production. Drought and overgrazing, however, are seriously impairing the feed and watershed values of large expanses of these important Federal lands by robbing them, through erosion, of the soil material necessary to maintain a productive covering."

The best estimates show that at least 17,500,000 acres of land for-

merly cultivated in this country have been permanently destroyed or so damaged that farmers, working alone, are unable to restore them to agricultural use. This permanently devastated area exceeds the total extent of arable land in Japan. Unfortunately it dwindles to insignificance in comparison with the enormous area of our lands which has been reduced by surface washing to a condition of comparative infertility or advanced poverty.

AT LEAST 126,000,000,000 pounds of potential plant food are being washed out of our fields every year. This loss exceeds the net loss in the crops removed by twenty-one times. Furthermore, the plant food taken by crops can be restored in the form of fertilizers; that taken by running water can not be restored, for water takes not only the plant food but the soil that contains it.

The value of the loss in potential plant food alone amounts to $2,000,000,000 annually. Of this there is practically conclusive evidence that at least $200,000,000 is an actual, tangible yearly loss to the farmer. Part of this washed soil is spread over alluvial plains, where it is generally not needed and frequently damages the land while vast amounts pass out to tidewater. The Mississippi alone handles every year 428,000,000 tons of this traffic in wastage. But this is only part of the story.

When the topsoil, the rich surface layer formed by the slow processes of Nature, is washed off, comparatively infertile subsoil takes its place. This the farmer must now till or abandon. Not only is the exposed material less productive, but it is stiffer, more expensive to plow, and requires heavier implements and stronger draft for tillage operations. This subsoil is less retentive of moisture, and crops suffer on it more during dry seasons. Also, water flows across the denuded slopes faster, and erosion is more rapid than when the spongy topsoil was present. This washing adds silt and sand to the floods of swollen streams, and valuable alluvial plains and lower slopes are buried beneath unproductive sand, gravel, and cobbles, or finer material that is not needed.

In one place 40 acres of highly productive Missouri River bottom land were covered 8 feet deep in ten years with silt pouring out of small streams from the neighboring uplands. The farmer had built an 8-foot dyke to hold the débris out of his productive corn fields. The entire area back of the dyke was filled level with its top. Deposition had taken place at the rate of 1,200 tons per acre per year.

ALONG Buffalo River in west-central Wisconsin a gully leading down from an erstwhile good farm, now dissected beyond the point of usefulness, recently laid down over the bottom lands of an adjacent valley farm 8 feet of unproductive, loose sand during a single heavy rain. Fifty acres of rich soil were covered, as well as an excellent highway with its culverts, and a tractor, a mowing machine, hay rake and wagon.

Irrigation ditches, reservoirs and stream channels are being filled with mud, gravel and silt. As a consequence navigation is impeded or along many streams is prevented.

Large expenditures are necessary to remove the deposits from rivers, harbors and irrigation ditches. As yet, no method has been devised for clearing reservoirs of the solid débris, which takes up the space intended for water.

FORTY years ago Coldwater River, in the lower Mississippi Valley, was a navigable stream. Cotton was loaded on riverboats which steamed up to the town of Coldwater. Following the wholesale clearing and cultivation of the regional uplands, including much soil of high susceptibility to erosion, increased floods gradually caused the river channel to choke with sand and silt. Today no boats of any description can ascend this stream, so filled it is with the products of erosion, and numerous valuable plantations along it have been partly or wholly converted into useless swampland. The same thing has happened to the Tallahatchie River and other streams regularly plied by boats only a few years ago.

Blue River in southeastern Nebraska and northwestern Kansas, so named because of the crystal clearness of its waters in the days of timbered slopes and unplowed prairie sod, has not been clear for many years.

During the last twenty-five years a farmer in the bottoms of the Brazos River, Texas, reports that he has suffered from fifteen floods, as against only three floods experienced by his father, who previously operated the same farm for thirty years.

From 400 to 600 pounds of commercial fertilizer are required to grow as much cotton per acre in thousands of washed fields through the Old Cotton Belt of southeastern United States as was produced formerly with only 200 pounds of fertilizer or with no manurial treatment whatever. In the Corn Belt, the Wheat Belt and other regions the soil-improving crops must be resorted to in order to maintain the productivity of the land. And so it goes with countless fields and expansive ranges throughout the entire nation, on public lands as well as those in private ownership.

IF so much land has been impoverished or made worthless, how then are we to explain the crop surpluses so much discussed recently in connection with the Farm Problem? is a pertinent question often asked.

The explanation is simple. In the first place we still have a very large area of good farm land. Much of this is subject to precisely the same process of wastage that has brought impoverishment or ruin to so many acres; but it will be a long time before the deeper soil and the comparatively flat and porous absorptive lands have lost all of their topsoil. In the meantime, a large total area, enfeebled to varying degrees, ranging from soil that produces only fair or mediocre crops to that which is practically worthless for crops, is still being farmed. Although most of this acreage gives yields too low to enable a comfortable standard of living, the aggregate production is large. Every year farms are being abandoned throughout these waning areas. Some of the operators turn to other lands, hopeful of finding better soil; others give up farming and move to cities or go into factories.

These poor-land farmers and

others operating in dry regions where good crops are dependent on good rains, contribute largely to the problem of crop surpluses. Few of them gain more than a bare living from their efforts; many of them sink deeper and a little more hopelessly into debt each year. But, by enlarging the national surplus, their aggregate production adds to the difficulties of those who farm on the more favorable lands.

EROSION is a cumulative evil which, if not obstructed, will sooner or later painfully affect the majority of our agriculturists. Farmers generally have little to say about the subject, at least to the general public. When, however, one meets them along the highways and field sides pungent expressions relating to the agricultural situation are often heard. Recently a farmer of good education, an industrious worker, a good citizen and the owner of considerable farm land, said to the writer:

"In my section the average farmer is paying taxes on land worn-out by washing and long cropping, under tax laws that were passed a hundred years ago, in order that they may lose more money. Such farmers are going backward not forward."

"What can be done about it?" he was asked.

"Quit farming," was the quick reply.

"Would it be possible for the farmer to better his situation by improving his fields — prevent washing by terracing and add to the fertility of his land by growing soil-improving crops in rotation with his staple crops?"

"Doubtless. If he knows how to build terraces, he can save much of his land. Growing soil-improving crops is an excellent way to build up the land; but you must remember these crops are grown, not for sale, but solely to improve the soil. A good farmer can arrange for this in his cropping plans. But when yields are increased, what happens? Why you simply get back to the starting point. There's no money in farming under existing conditions, and the farmer has no control over these conditions."

"Yes, but when prices improve the farmer with land in good, productive conditions is the one who will be in the most advantageous position."

"That's true," said my farmer acquaintance, "but many things can happen on the farm while waiting for the hoped-for improved conditions."

CULTIVATION of marginal land, whether it be eroded land or land that is too wet or too dry for safe farming, is not, of course, the sole cause of surpluses; but it is a contributing cause of major importance. Take out of cultivation the severely eroded areas and the steeper sloping lands, plant them to trees on an extensive scale, and a long step will be made toward farm relief. Also, this would save much land, keep much silt out of stream channels and reservoirs, and protect much rich alluvium in the stream bottoms. On much of this land the trees will grow up without any planting, if fires are prevented.

Apart from these benefits, the turning of these lands to better uses would be in line with a sound national land policy. Only the Federal

and State Governments can undertake a programme of this kind on a sufficiently large scale to have a real effect on the crop surplus situation. This is precisely what the Government and States should do, if for no other purpose than to save the soil now wasting so rapidly. Foresters tell us that the growing of trees on these areas would prove a good investment, one that would yield 4 or 5 per cent annually. The tree planting could be done on a large scale without any cramping of local agricultural operations. Indeed, it would vastly improve the situation by encouraging better cultivation and better care of the better lands, besides establishing farm woodlots and, in some sections, fairly large privately owned tracts of timber.

WHEN one views the perfectly terraced slopes of the Rhine and the Mediterranean Basin, and sees grapes, olive trees and even bananas growing on walled benches, some of which were built two thousand years ago, one wonders why we of America, who are wasting our lands faster than any other people of the world, have not learned more from these conspicuous examples of land conservation. The answer comes back again to the vast expanses of good land we once had and should have preserved, the large area we still have; and, of course, to our characteristic indifference to conservation in general.

In the United States we have not been entirely negligent of our farm lands, though we have closely approximated that situation. In the older South, field terraces, which really are plowed embankments adjusted to the slope in such a way as to impede the flow of run-off water, sink part of it into the ground and pass part slowly out of the fields, have been used effectively for seventy-five years in conserving the soil. The use of these structures did not spread rapidly beyond the Southern States. Only recently terracing, as an important farm practice, crossed the Mississippi into Texas and Oklahoma. The Federal Land Bank at Houston now carries a clause in its contracts on land loans requiring the owner to protect his fields by terracing, if the soil needs protection. In case the farmer does not know how to do this, the bank sends out an expert to show him how.

This great bank looks upon the surface *six inches* of soil as the principal substance of the land, from the standpoint of productivity. When that is gone the average type of agricultural land, according to the bank's calculations, is too severely impoverished to lend money on. Accordingly, if it is found that a farmer is permitting his fields to wash at a rate greater than six inches in 35 years, where a farm loan is made for this length of time, the bank forecloses on him. It is significant and highly encouraging that, with thousands of loans outstanding, the Houston bank has found it necessary thus far to foreclose on but one or two farms.

THAT the farmers of that great cotton and grain region are applying the teaching of these significant experiments to their fields as rapidly as possible is sufficient proof that we can save much of the erosive lands throughout the country and that,

while saving it, much better use can be made of the rains that fall on the land.

The Federal Government, coöperating with the States, is now putting in soil and rainfall conservation experimental and demonstrational stations in all the major soil regions of the country where losses of soil and water are excessive. Every effort will be made to show the farmers and ranchmen of the Nation how menacing are the wasting effects of erosion, and also how the evil may be controlled. Much research and experimental work remains to be carried out, but this will be attacked vigorously and persistently.

It is expected that the remedies which will be employed in this fight against erosion will pay their way many times over. Whatever benefits may accrue in addition to holding the soil and more of the rainfall in the fields where they belong, such as water and silt kept out of streams and out of reservoirs and irrigation ditches and erosional débris kept off valuable valley lands, will be by-products that cost nothing.

Leaf Mold

By Charles Wharton Stork

What's the chief charm of woods — beside mere trees?
Not tang of balsam; not the gray voiced croon
Of pine harps, with a bird call flashing bold
Against it; nor the fingered light on moss
And flowers that play "I spy", courted in turn
By bourgeois bees and foppish butterflies;
Not rabbits dodging with their fluffy tails,
Or the striped chipmunks either, jauntily
Rehearsing family secrets. No, I think
It's leaf mold. Only fancy if the trail
Were asphalt, or macadam! Leaf mold gives
The heartbeat of the mystery, all the sap
And vigor of centuries underneath your soles
At every buoyant motion. Stretch your thighs
And run your bravest, leaping root and stone,
Rising and plunging on the mounded trail
To float as on delicious tropic waves.
So will the leaf mold be transformed again
To living rapture. Leaf mold, damp and dark,
The wreck of woodland life — you vent a sigh,
For the lost green and gold, the frail slain flowers,
For balm dispersed, for happy songsters dumb
With unrecorded fame; but from this mold
Is born new wonder: fragrance, color, song,
All freshly woven by the patient years.
When I tread leaf mold, a dark thrill of strength
And awe speaks through me like a tactile voice:
"Here is a perennial joy fed rich on death."