

THE MAY FLOOD (1901) IN THE SOUTHERN APPALACHIAN REGION.

I.

IN THE CATAWBA RIVER VALLEY, NORTH CAROLINA.

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THE disastrous freshets in the valley of the Catawba River during the past year have set the people to thinking, and they will hail with delight any practical scheme that may be advocated to lessen the danger from these floods in the future. The matter has been very thoroughly discussed since the heaviest flood of the series occurred, last May, and the conclusion has been reached that the destructiveness of the flood is to be attributed not so much to the amount of rainfall as to the destruction of the forests along the headwaters of the Catawba and its tributaries. The contention is made by people who have lived along the Catawba River all their lives, that while the recent rainfall has not been unprecedented, the destruction

wrought by the freshets last year is without a parallel.

The characteristics of the Catawba River floods have undergone a sudden and alarming change. In previous years all floods along this river rose slowly. The water stagnated like a mill-pond over the bottom lands and, gently receding, left a deep, rich deposit on the already fertile bottoms. The floods have changed, therefore, from an agency of good to the farmers to one of absolute destruction—a quick, tumultuous rise of waters and a swiftly rushing current that tears up the soil down to the rocks and hard clay and leaves barren wastes. This extraordinary and deplorable change in the characteristics of the floods has followed the laying



A FLOODED FARM. ORCHARDS AND FIELDS UNDER WATER, WITH RESIDENCE AND OUTBUILDINGS THREATENED.

waste in recent years of thousands of acres of woodlands in the western part of this state.

The illustrations accompanying this article were taken along the Catawba River during and after the flood of May 21, 1901, and a study of them will give a better idea of the destruction wrought than could be obtained from any written description.

The rainfall which produced this flood began falling along the Catawba and its headwaters on May 18 and ended on May 21. The rise of the river was very rapid, and the current was at different points 10, 12, and 15 miles an hour, making an average of over 12 miles. This was in the lower section of the state, where a



VIEW OF A CORN FIELD BURIED UNDER A BED OF SAND TWO TO SIX FEET IN DEPTH.

current of that swiftness was unprecedented. Along the upper Catawba the current was, of course, much swifter. So rapid was the rise that farmers had no chance to take measures for safety, and great numbers of cows and hogs were lost.

In many places residences which had never before been approached by the river were partly submerged, but it was not until the flood had subsided that the farmers obtained an idea of the extent of the devastation it had wrought to their lands. Some bottoms were buried under a deposit of sand varying from two to eight feet in depth, while others were washed out to the bare clay. These two peculiarities of the flood are shown

in two of the illustrations. One is that of a corn field destroyed by a deposit of sand. Here and there the photographer could see the corn tassels protruding from the sand. The railroad embankment to the left prevented this bottom from being washed out and caused the deposit.

At other points along the river steep hillsides brought about the same results. The other illustration in question shows where the soil was washed away to a depth of eight feet. The tips of the "cow root," as it is known by the farmers, held up by the man, are yet in the hard clay down to which it had grown. The leaves at the top show the former level of the bottom land. These

pictures represent the conditions prevailing to a greater or less extent along both banks of the Catawba in McDowell, Burke, Caldwell, Alexander, Catawba, Iredell, Lincoln, Gaston, and Mecklenburg counties.

The most serious aspect of the situation is that in most cases the damage to farm lands, if not permanent, will outlast the present generation. The cutting down of the banks have lowered them so that in the future the lands will be more at the mercy of floods than ever. The crops will be damaged as much

by the small freshets now as they were by the larger and less frequent floods of the past.

Mr. E. W. Myers, of Chapel Hill, who is connected with the United States Geological Survey, made a tour of the Catawba River valley a week after the flood, and estimated the apparent damage to farming lands at \$500,000; but this estimate is probably below the mark. In his official report he says: "The whole secret of the bad effect and extent of the flood lies in the deforestation in the western part of the state. Along the Linville River and in all parts of western North Carolina the country is being stripped of trees, and this is followed by forest fires, which sweep away

all undergrowth. When the rains fall on such land there is nothing to retard the current of the water. With great force it strikes the river. The velocity of the Catawba is increased by the mad violence of the water, and the current develops a wonderful and dangerous power. Every man who lives by the river says without hesitation that the cutting away of the timber is entirely responsible for the serious floods."

There have been two notable floods in the Catawba River in the past. The first was in 1848, and the second was in 1876. In neither instance was there any damage to farm lands. The water rose slowly and receded gently, leaving the river bottoms richer by a deposit of fertile sediment. There is no government record of the rainfall during those periods, but Catawba River land-owners say that there was as much water in the bottoms during the freshet of 1876 as there was last May.

The official reports of the Weather Bureau are interesting as bearing out the theory that the destructiveness of the floods of recent years is due to forest denudation. The heaviest rainfall of last May was 8.86 inches, at Marion, on the 19th and 21st. At Morganton it was 4.50 inches and at Charlotte 3.60 inches. On September 22 and 23, 1898, the rainfall at Marion was 7.11 inches, at Morganton 4.77, and at Lenoir 6 inches. On October 21 and 22, 1900, the rainfall at Marion was 7.97 inches, and at Linville 9.50 in one day (October 21). The rainfall at Morganton was 5 inches on October 11, 1897; 8.67 inches on July 3-8, 1896; 5 inches on October 13, 1893; 6.60 inches on September 9-13, 1893, and 5.80 inches on September 22, 1892. Morganton is about central of the Catawba head-



EIGHT FEET OF SOIL GONE. A "COW ROOT" IN THE HARD CLAY. THE TOP WAS FORMERLY AT THE SURFACE OF THE LAND.

waters, and the rainfall there is about an average of the mountain sections.

Bearing out the theory of forest protection for the prevention of floods is the experience of Dr. P. L. Murphy, superintendent of the state hospital at Morganton, and it is a practical illustration of how the proper care of forest growth affects the flow of water in a stream. The state hospital obtains its water supply from a stream in the South Mountains, known as Black Fox Creek, and owns 400 acres of land, including its head springs and watershed. For twenty years past no timber has been cut on this reservation, there have been no forest fires, and the ground is thickly covered with leaves, mold, and undergrowth. Near by is another stream of the same size, but the hills that shelter its head springs have been denuded of timber, and the leaves have been frequently burned. Dr. Murphy had the volume of water in each stream accurately measured last year, in May and again in August. Between those periods the Black Fox Creek had lost only



WRECK OF BRIDGE ON THE SOUTHERN RAILWAY OVER THE CATAWBA RIVER; PART STANDING WAS SAVED BY RUNNING LOADED CARS UPON IT.

10 per cent. of its volume of water, while the loss in the other stream was 38 per cent.

The three agencies at work in the destruction of the forests are the woodman's axe, the tanbark stripper, and the forest fire. The chips and debris and the dead trees left by the two first named feed the latter and facilitate its work of destruction. The destruction of the forests in North Carolina is really a work of recent years, and has been carried on to an alarming extent within the past twelve months. It has become a very serious matter, and the need for some measures to put a stop to it is urgent. The only remedy is government protection, and the people of the state look to it for the salvation of their forests. It is certain that if the denudation of the forests of the Appalachian Range is not stopped, there will be a recurrence of these floods in a more aggravated form.

The establishment by the national government of forest reservations appears to be the



THE DAY AFTER THE FLOOD. VIEW OF FLOODED FARM LANDS.

only solution. The state laws for the protection of the forests are inadequate, and were they of a character more nearly suited to the case, it is doubtful if the state would be able to secure their proper enforcement. The constantly increasing danger from floods and the ravages to crops and farm lands is a serious thing in itself, but coupled with this is the rapid sacrifice of the noblest forest lands east of the Rockies.

The interest manifested by the people of this state in the establishment of a national forest reserve in western North Carolina is manifested in a special act passed last year by the legislature, which gives to the United States the power to acquire by purchase and condemnation lands in the high mountain regions of western North Carolina, and authorizing Congress to legislate concerning the control of said acquisition.

II.

THE MAY FLOOD IN EASTERN TENNESSEE.

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THE mountain torrents of eastern Tennessee, like other torrents, are habitually surprising to non-resident people; even the mountaineers, who have lived among them since childhood, sometimes lose buildings or fences, or have fields gullied by the overflow of the streams; roads are blocked by every freshet, but farmers and the town people of the river valleys suffer most notably.

The mountaineer is near the source of the stream and can see the storm

and its intensity and provide somewhat against it; but the valley people seldom have much warning of a coming flood. The most thorough destruction, too, occurs along alluvial bottoms, at those points where the torrents capriciously change their courses or leave their loads of boulders, sand, or clay during one flood, to be carried further during another. The most dangerous places are near the points where the beds of the streams lessen their grade and the tor-



WRECK OF A MILL, HAMPTON, TENNESSEE.

rents change to quieter streams. Here boulders are left during one freshet in bars, guiding the current, until a greater freshet moves them or forms a new channel around them. Here eddies collect silt and form fertile farm land that may either be swept away the next year or remain during many years of profitable cultivation. In addition to the movement and lodgment of earth and stone, driftwood has caused even more dam-

banks and from wooded islands, orchards, and flats. A large portion of other debris consisted of fence rails, slabs, edgings, and lumber from saw-mills; wreckage from barns, outhouses, houses, stores, mills, and bridges, among which there was much furniture and machinery.

The amount of damage is very difficult to estimate, owing to its variety and the far-reaching effect of the changes made.

Besides the usual items of loss, such as human lives, domestic animals, buildings, mills, logs and lumber, bridges, railroads, wagon roads, and growing crops, agricultural and other lands were washed away or gullied, deprived of humus, or covered with sand or other debris. The streets of towns and villages were covered with slime, and wells have been filled with polluted water. The flood was followed by epidemics of fever and dysentery. Stagnation of business and the discouragement of enterprise was caused through lack of transportation.

Several of the counties of eastern Tennessee suffered a direct loss of over \$1,000,000 each. Four railroads in Carter and Washington counties lost \$300,000 by damage to tracks, bridges, and buildings.

Why so much damage?

There has been much carelessness in placing buildings, bridges, roads, and railroads in exposed situations, and few people have considered the increased liability to floods through the effect of fire, grazing, and clearing

upon the forests that once covered the mountain sides.

Rain must fall before it can run off, but the rapidity of the run-off may be greatly modified. How much was the run-off modified in this case? Before the flood the streams were full and the ground was thoroughly saturated; they could hold no more water; then the heavy rain came, during which 8.8 inches of water fell in 12 hours. The amount of water to be disposed of was unusually great. In this region there



WRECK OF A RAILROAD BRIDGE, DOE RIVER, TENN.

age, especially to bridges, most of which would have staid had not floating forest debris, logs, buildings, and other bridges lodged against them and pushed them over or formed dams to spread the flood.

The debris from the forest is composed largely of branch wood, logs, and uprooted trees left along banks and bars by former freshets; but in this flood were also many culled logs, fresh from stump land, valuable logs from broken booms, and a very large number of freshly uprooted trees, torn from river

are no lakes and no dams of importance. There is very little to affect the run-off of water except the forest and other vegetation. In all his work, since the region was first settled, man has done nothing worth mentioning that has had a tendency to retard the run-off of water, but his logging, clearing, road-making, ditching, cultivation, and pasturing of land all have tended to increase it; greatly increased floods have resulted, and under present conditions may be expected in the future.

The river waters in the flood of last May were five to ten feet higher than ever known before, and when a similar abundance of rain and ground water combine again a greater flood may be expected. This will be the result unless we change our customs somewhat and keep the surface of the earth better covered, avoid making roads in stream beds, leave brush and trees growing along streams, and have ravines and gullies obstructed by forest growth. Dams also should be avoided, as, by bursting, they increase floods.

The value of the retarding effect of forest debris is a factor very difficult to determine. Mountaineers, who are close observers of such matters, say the forest, especially where the ground is well

covered by brush, leaves, and humus, and where roots make the soil porous, greatly retards the water and causes more of it to soak into the earth, while the cleared land, especially old pastures where the earth is compacted clay, sheds water rapidly. These thoughtful men undoubtedly have the right view. Evidence on this point is abundant and can be seen by any one walking over the ground. It is perhaps needless to discuss it. It is surprising, after looking over the field, that these floods are unexpected to anybody. There is abundant evidence in the alluvial deposits along the water-courses of the former volume and power of the torrents before the mountains were wooded. And why should there be surprise as we cause a return to that condition by clearing away the forest? These effects are to be expected by every reasoning person familiar with the circumstances. They are known to the observing people of the region. Why should the national government hesitate in a policy to ease or prevent the increase of these torrents while the adaptability of these mountains to forest growing, rather than agriculture, supports the reasonable demand of the people for whatever protection can be secured against floods?