(Continued from Page One)

bottom land is used for pasture and some of it is under cultivation.

Considerably hard ditching and straightening of the Creeks has been done at one time or another, and no loops or bad bends occur. Trees and logs have fallen into the streams at places which help to retard the flow. Some rock may be encountered in places also.

Mud Creek has a width of about 18 feet at the Flat Rock road increasing to 45-50 feet at the lower end, with banks five to six feet deep at these places, but considerably shallower at points between. Bat Fork has an average width of 12 feet and depth of 5 feet, increasing to a width of 25 feet and shallow depth below the junction of King Creek. King and Devils Fork Creeks average from eight to ten feet wide and about four feet deep

The beds of the Creeks have been elevated by the deposition of sand and silt until, in places, they are now very little lower than the bottom land back from the streams, and successful farm drainage is imposible. Overflows occur frequently and the constricted and shallow channels prevent its rapid removal. The banks of the creeks have been built up by deposits and the bottom land slopes off gradually to the foot-hills, along which the land is seepy and full of springs.

Although Mud Creek is located in the mountain section of the State, where most of the streams are torrential in character, yet it has a small fall as compared to streams in the Piedmont section of the State. Also the watershed is not as hilly except at the headwaters of the streams. According to Mr. Justice's survey, Mud Creek has a total fall of 21.47 feet in a distance of 5 1-2 miles between the Flat Rock road and Johnson's bridge, an average of about 3.9 feet to the mile. Bat Fork Creek has a fall of 15 feet in 3 1-2 miles, and Devils Fork 10 feet in 2 miles, thus averaging 4.3 and 5.0 feet to the mile, respectively.. The other creeks have falls slightly larger than this. The Mud Creek bottom lands extend to the French Broad River and merge with the River bottom land. The bottom lands nearer the lower end are probably damaged more by back water from the French Broad River than by the overflow of the creek, and there is a question as to how much benefit they would derive by the dredging of the creek. It is estimated that a distance of a mile or two at the lower end of the district is affected by back water.

Located about 3 1-4 miles below the outlet of Mud Creek on the French Broad River, in Buncombe County, are what is known as the Buck Shoals (called locally Big Buck Shoals). The French Broad River between Brevard, N. C., and Buck Shoals, a distance of about thirty miles, is a rather placid stream with an average fall of about 1 1-2 feet to the mile. Beginning at the head of Buck Shoals, however, a succession of shoals is encountered that extends practically to Asheville, N. C. According to a survey by the War Department Engineers in 1878, the French Broad River between the outlet of Mud Creek and the head of Buck Shoals has a fall of 4.15 feet. Buck Shoals, 2280 feet long, has a total drop of 2.78 feet. Thus the total fall between the mouth of Mud Creek and the foot of Buck Shoals is 6.93 feet. It is the belief of some of the residents along Mud Creek, that this creek cannot be sucessfully drained until the river is lowered by the removal of Buck Shoals. The effects of these shoals and back water from the river are discussed later on in this report.

Rainfall and Run-Off

In order to design a successful system of drainage for an area of land, account must be taken of the amount of water which must be removed through the proposed drainage channels. This surplus water which passes off through the drainage channels is called run-off.

The chief factors affecting the rate and total amount of run-off are: rainfall, topography; the size, shape and location of the water-shed; and character and culture of the land. Rainfall is the most important element to be considered in the estimation of run-off and topography comes next. A region of heavy rainfall will generally be one of heavy runoff.

According to the U. S. Weather Bureau records, the Mountain section of North Carolina is subject to some of the heaviest precipitations in the United States. Rock House, Macon County, N. C., near the Georgia line, 3100 feet above sea-level, and situated on the Southern slope of the Blue Ridge, receives on an average 82.29 inches of precipitation in the year (a greater amount than is received at any other station in the United States except on the North Pacific Coast). Hendersonville, elevation 2137 feet, has an average annual precipitation of 63 inches. This is a very heavy rainfall, greater than in any of the drainage districts which have been constructed in North Carolina.

Level areas require smaller coefficients of run-off ratio of drainage to rainfall is less for large areas than for small. A drainage area having fan-shaped outline with numerous tributary channels uniting to form an outlet at the small end of the fan, will have a comparatively high run-off, because water from the greater part of the area will be concentrated in the main channel. Mud Creek water-shed is rolling and hilly, and has a fan-shaped outline.

Undulating or rolling lands which have a hard and smooth face, like meadows and pastures, give a larger run-off than cultivated fields. If hilly lands are terraced so as to conserve a part of the water and distribute the surplus down the slope, the drainage coefficient will be less than if no care in that regard is exercised. The Mud Creek water-shed is largely under cultivation although terracing is not practiced to a large extent.

The really only reliable method to employ in determining what run-off should be used in the design of ditches for a drainage district, is to compare it with some district which most nearly resembles it, whose drainage run-off has been ascertained, and select a coefficient for computing the outlet ditches. In the design of the ditches for the Piedmont section of North Carolina, a run-off of 3-4 to one inch depth over the contributing water-shed has been used, and, in general, found to be satisfactory. Investigations which have been conducted by this office for the past six years on Third Creek, Iredell County, N. C., indicate that for rainfall, topography, and other conditions like those in the Third Creek drainage area drainage improvements should provide for the above mentioned amount of run-off.

All the features of the Mud Creek drainage area seem to indicate that a rather large run-off is to be expected. A heavy rainfall, rolling topography, fan-shaped drainage area, unterraced cultivated fields, sand in the channels, lead to this conclusion. There is one feature, however, which may tend to relieve an excessive run-off and that is, that while the topography of the watershed is rolling in character, it is not believed to be as hilly as many of the districts in the Piedmont section, except at the head-waters of the streams.

Taking everything into consideration, however, it is believed that the drainage improvements for Mud Creek should provide for a run-off of one inch depth over the watershed in 24 hours for satisfactory results. A rate of run-off larger than this no doubt at times occurs, but to provide a drainage system sufficient to carry without overflow the largest storms would require canals of enormous capacity. Their cost would in the case of most of the streams of the hilly section of the state render the projects impracticable because of the small amount of land benefited. It is generally conceded that a slight overflow covering a short period of time, with good drainage afterwards, will not, as a rule, injure the lands or crops.

Improvements Required

As stated earlier in the report, the proposed district includes the improvement of 8 3-4 miles of Mud Creek, 3 1-2 miles of Bat Fork Creek, 3-4 miles of King Creek, 2 miles of Devils Fork Creek, 1-2 mile of Clear Creek and 1-4 mile of Brittain's Creek, a total of 15 3-4 miles The work to be done on King, Clear and Brittan's creeks is for such short distances on each that it can easily be done by a dredge working up stream in them as it progresses down the main channel. A dredge placed in Bat Fork Creek at the upper end of the proposed district in working down stream to Mud Creek and thence on to the French Broad River, could in its passage stop and excavate up stream on King, Devils Fork, Mud and the Edneyville road, Brittan's and Clear Creeks in succession, before proceeding further down the main ditch. Some difficulty may be encountered in working up stream 2 miles on Devils Fork, and 1 1-4 miles on Mud Creek, but by building dams (the fall of these streams not being excessive), the entire project may be done with one dredge.

On account of the comparatively flat grades in this district as compared to other Piedmont districts, and also because of the larger water-shed area below the junction of Clear Creek, canals of larger capacity will be required, and further, because of the present high prices for dredge work, the cost of reclaiming the bottom lands along Mud Creek will be considerably higher than that of the projects that have been undertaken in the Piedmont section of the State, and for that reason may be considered prohibitive unless present economic conditions are taken into consideration.

In the following estimates of ditch dimensions a minimum depth of 10 feet below the general surface of the ground has been used for Mud and Clear creeks, and 9 feet for Bat Fork, King, Devils Fork and Brittan's creeks, with side slopes fixed at 1-2 horizontal to 1 vertical.

A rate of fall around 4 feet to the mile has been assumed throughout. With the assumed rate of run-off (1 inch in 24 hours) the dimensions given will provide for a flow line within about 1 foot or more of the top of the ditch at high water stage, except on Mud Creek below the entrance of Clear Creek, where the flow will be very close to the surface of the ground. While this is not as large a margin of safety as might be desirable, yet it is believed that it will furnish fairly good drainage. Larger ditches would increase the cost considerably, and since the ditches recommended will be costly, the maximum flow line has been raised. Furthermore, these dimensions are not based upon an actual profile of the valley but upon an average fall; a profile may indicate that the sizes should be changed slightly.

Based upon the above assumptions, for Mud Creek above the Edneyville road a ditch of 14 foot bottom width will be required, below this road to the junction of Clear Creek it will be 25 feet, below Clear Creek 45 feet increasing to 50 feet near the French Broad River. All the other creeks will have ditches with 14 foot bottom widths, with the exception of Clear Creek which should probably be 25 feet wide.

The alignment of the present channel is good, due to the former straightening, and they would probably be followed to a large extent in the location of the new ditches, thus apparently making the actual depth of excavation less than 9 to 10 feet as the case may be. Considering, however, that the highest land in the valley is usually adjacent to the streams, in order to obtain drainage for the lowest parts it will be desirable to excavate to the full depths as described above, and those depths are used in the estimate.

The flood level of the French Broad River is probably around 8 feet above the low water level, and in extreme cases goes on high as 13 or 14 feet. Assuming a rate of fall at the lowest end of Mud Creek of 4 feet to the mile, the creek would be subject to inundation from the river for a distance of 2 miles above its mouth, and in extreme cases 3 or 4 miles. Hence, the 2 miles or so where the creek bottoms merge those of the river will receive very little benefit from the construction of a ditch through Mud Creek. Furthermore, since the rains are more or less general in this section of the State, Mud Creek and the French Broad River will be in flood at about the same time, and there will be a tendency to retard the flow of water in Mud Creek above, flooding the lower bottom lands.

Cost

If the district is carried to the French Broad River, it is estimated that there will be required the removal of approximately 959,000 cubic yards of dirt, which perhaps could be contracted for at 10 cents per cubic yard. (At present, prices for dredge work are very uncertain.) Adding 10 per cent for engineering and other expenses, the total cost is estimated as $105,500. For 2,000 acres of land assessed uniformly, this would mean about $53 an acre.

The principal value of a ditch through to the river will be to provide for a rapid removal of the water above when that in the river begins to subside. Therefore, special care must be taken in assessing the bottom lands at the lower end because of the damage these lands receive from back water. This condition should be carefully considered, and the assessments near the river undoubtedly should be small..

Effect of Buck Shoals

As stated before, according to a survey by the War Department engineers in 1878, there is a fall of 4.15 feet in the low water level of the French Broad River, between the mouth of Mud Creek and the head of Buck Shoals, in a distance of about 3 1-4 miles. Buck Shoals, with a length of 2,280 feet, have a drop in that distance of 2.78 feet. The average rate of fall in the river between Mud Creek and the head of Buck Shoals is therefore 1.28 feet to the mile.

The effect of the removal of Buck Shoals, if the low water surface be assumed as a straight line from Mud Creek to the foot of Buck Shoals. would be to increase the rate of fall to 1.88 feet to the mile, which it is believed would not appreciably lower either the low or the high water level in the French Broad River, since the river has but a fall of about 2.00 feet for the mile below the Shoals and then flattens to almost level to the head of Long Shoal. Furthermore, the high water discharge of the French Broad River is so large that no increase in the cross-section of the river nor increase in rate or fall, for short distances, will improve conditions.

Other Plans of Improvement

Should it seem desirable to eliminate from the proposed district those lands along the lower end of Mud Creek below the junction of Clear Creek, the new ditch could be stopped one mile below Clear Creek and need only 25 feet in bottom width. This would make the total length of ditch excavation in the district 11 1-2 miles, and the excavation about 465,000 cubic yards. On the same basis as before, 10 cents per yard, plus 10 percent, the cost is estimated $51,150, or an average of $42 per acre on 1,220 acres estimated in the district.

So-called partial or incomplete drainage for the lands below the mouth of Clear Creek could be obtained by continuing the 25-foot ditch to the river. The estimated excavation for the district then would be about 722,000 cubic yards, and the cost about $79,400 or $40 per acre on 2,000 acres. This ditch, 25 feet in bottom width and 10 feet deep, would provide for 1-2 inch run-off in 24 hours (one-half the rate provided by the ditches recommended above the mouth of Clear Creek) and woul give satisfactory drainage during a considerable portion of the time.

Prevention of Sand Deposits

Undoubtedly the present condition of the creeks is due largely to the fact that proper attention has not been paid to the protection of the hillsides in the past against eresion, and tons upon tons of sand have been washed down into the creeks, gradually filling them up. If the farmers on the uplands realized the value to their own farms of conserv-

Continued on Page Seven)

City and County DIRECTORY

CITY

Mayor: C. E. Brooks.

Town Council: J. W. Bailey, W. M. Bacon, A. H. Hawkins, John S. Forrest, J. A. Fletcher, K. G. Morris.

Tax Collector: G. W. Brooks.

Chief of Police: Otis V. Powers.

Superintendent Water Works and Streets: A. A. McCall.

COUNTY

County Commissioners: J. N. Russell (Chairman) J. A. Maxwell, S. J. Whitaker.

Clerk of Court: J. M. Pace.

Register of Deeds: A. O. Jones.

Sheriff: Allard Case.

Tax Collector and Treasurer: A. E. Hudgins.

Superintendent Education: W. S. Shitle.

Road Supervisor: P. F. Patton.

Physician: Dr. L. B. Morse.

Farm Demonstrator: Frank Fleming.

Attorney: O. V. F. Blythe.

Register Births and Deaths: B. F. Hood.

Board of Health: J. N. Russell, (Chairman), W. S. Shitle (Secretary), Dr. J. L. Egerton, Dr. J. S. Brown, C. E. Brooks.

CHURCHES

First Baptist

Dr. E. E. Bomar, Pastor.

Services: Sunday 11 a. m.

Sunday School, 9:45 a. m., N. M. Hollowell, Supt.

East Hendersonville Baptist

Rev. C. S. Blackburn, Pastor|

Services: Sunday 11 a. m., and 7:30 p. m.

Wednesday Night Prayer Meeting: 7:30 p. m.

Sunday School: 9:45 a. m., C. S. Fullbright, Supt.

Catholic

Father Marion, Priest.

Services: Sunday 11 a. m. Weekdays 7:30 a. m.

St. James Episcopal

Rev. A. W. Farnum, Rector.

Services: Sunday 7:30 a. m., and 11 a. m.

Sunday School: 9:00 a. m.

Methodist

Rev. M. F. Moores, Pastor.

Services: Sunday 11 a. m.

Sunday School 9:45 a. m., F. E. Durfee, Supt.

Presbyterian

Rev. J. F. Ligon, Pastor.

Services: Sunday 11 a. m., and 7:30 p. m. Wednesday Evening Prayer Meeting, 7:30 p. m.

Sunday School: 9:45 a. m. Dr. A. H. Morey, Supt.

TRAIN SCHEDULE

Trains Southbound

No. 42..... .....7:35 a. m.
No. 28... ... . 10:55 a. m.
No. 10... ... .4:35 p. m.

Trains Northbound

No. 41... ... . .10.30 a. m.
No. 9... ... .1.05 p. m.
No. 27... .....6.55 p. m.

Toxaway Division

No. 8 Leaves... ....11.10 a. m.
No. 6 Leaves... .... 4.50 p. m.
No. 5 Arrives... ....10.05 a. m.
No. 7 Arrives.... .....4.15 p. m.

INTERURBAN COMPANY

Lv. Hendersonville.....9:30 a. m.
Arr. Asheville .....11:00 a. m.
Lv. Asheville..... ..4:15 p. m.
Arr. Hendersonville... 5:45 p. m.

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ADMINISTRATORS NOTICE

Having qualified as administrator of the estate of J. T. Osborne, deceased, late of the County of Henderson and State of North Carolina, this is to notify all persons having claims against the estate of said deceased to exhibit them to the undersigned on or before the 19th day of March, 1920, or this notice will be pleaded in bar of their recovery.

All persons indebted to said estate will please make immediate payment.

This the 19th day of March, 1919.

J. D. OSBORNE,

Administrator of J. T. Osborne, Deceased. 8-6t-p.

ADMINISTRATORS NOTICE

Having qualified as administrator of Perry Williams, deceased, late of Henderson County, N. C., this is to notify all persons having claims against the estate of said deceased to exhibit them to the undersigned on or before the 18th day of March, 1920, or this notice will be pleaded in bar of their recovery. All persons indebted to said estate will please make immediate payment.

This the 18th day of March, 1918.

J. J. ALLEN,

8-6t-c. Administrator.

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DR. E. A. McMILLAN
(Successor to Dr. W. T. Wallace)
DENTIST
Office: Buckmyer Building, 4th Ave.
Phone 442.
Hendersonville, N. C.

DR. EHRINGHAUS
Dentist.
PHONE 57-J.
Office over J. O. Williams.
HENDERSONVILLE, N. C.

DR. GEORGE WRIGHT
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Patterson Building
Phone 105—1R.

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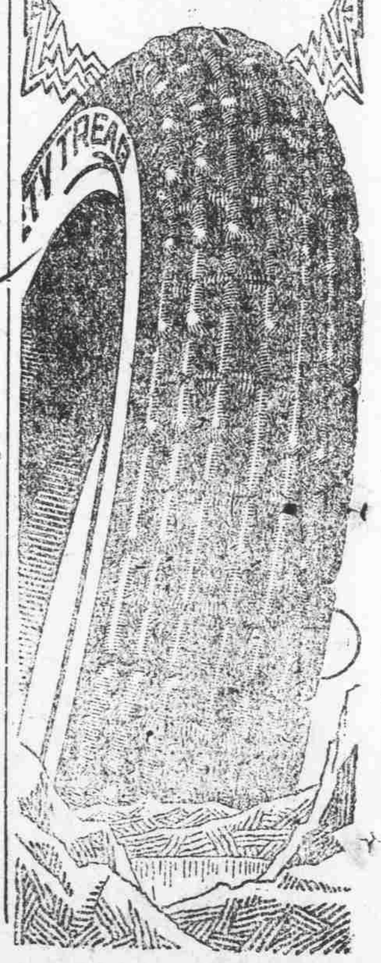
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