FLOODS ON PIGEON RIVER

Vicinity of CANTON & CLYDE, North Carolina

TENNESSEE VALLEY AUTHORITY

DIVISION OF WATER CONTROL PLANNING

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DIVISION OF WATER CONTROL PLANNING

FLOODS ON PIGEON RIVER
IN VICINITY OF
CANTON & CLYDE, NORTH CAROLINA

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Upper left photo shows the yard of the Champion Paper and Fibre Company in Canton during the flood of August 30, 1940, with the water 1½ feet below the crest.

Lower right photo is in the Fibreville section of Canton during the flood of August 13, 1940.

PREFACE

Tennessee Valley Authority
Division of Water Control Planning

PREFACE

This is a report on the flood situation along Pigeon River in the vicinity of Canton and Clyde, North Carolina. It is one of a series of reports that TVA is preparing to aid communities in the Tennessee Valley (1) in the solution of local flood problems which are not eliminated by TVA's reservoir system and (2) in the best utilization of lands subject to overflow. These reports are based on work that TVA has been carrying on since its beginning in connection with its water resources operations throughout the Tennessee Valley. TVA has assembled information on rainfall, runoff, historical and current flood heights, and other technical data bearing on the occurrence and magnitude of floods in localities throughout the region. These data provide the basis for preparation of flood histories of many streams so that this information may be made available to states, communities, and groups which are interested in local flood problems. This report has been prepared at the request of the Mayor and Board of Aldermen of the towns of Canton and Clyde, through the Board of Water Commissioners of the State of North Carolina.

Flood problems in the two communities and in their vicinities are chiefly the result of high water on the Pigeon River. This report discusses floods on this stream.

The Carolina Division of the Champion Paper and Fibre Company at Canton and much of the commercial and residential developments in both Canton and Clyde are located in the flood plain of Pigeon River and have been subject to inundation during large floods in the past. Main highways through Canton are blocked by overflow and local traffic is interrupted in both towns during floods.

The many buildings on the flood plain at Canton, together with fills that have been made and the several highway and railway bridges located in the town, have materially encroached upon the natural waterway that was once available for flood flows. As a result flood heights are higher than they would be under prior natural conditions. The same is true to a lesser extent at Clyde.

The largest known flood on Pigeon River in the Canton-Clyde vicinity occurred on August 30, 1940, only 18 years ago, and is still vivid in the minds of many residents of both places. This was a severe flood which was centered in the mountain region of the Tennessee Valley and affected particularly those streams lying between Mt. Mitchell in the headwaters of the Nolichucky River and the upper Little Tennessee River Basin. Rainfall in excess of 11 inches occurred on the high divide at the head of East Fork and West Fork Pigeon River above Canton. This flood came just two weeks after another flood resulting from a tropical hurricane disturbance which had caused widespread damage throughout the mountain region of the Valley and which in the Pigeon River Basin was almost as high as any flood in the memory of man. The August 30, 1940, flood at Canton was nearly a foot higher than the second highest known flood which came in 1810, almost a hundred and fifty years ago. Other large floods occurred in 1876, 1893, and 1928. The most recent high water was in June 1949 at which time the flood crest was more than 5 feet lower than the August 30, 1940, flood crest.

Floods above bankfull stage on the Pigeon River at Canton and Clyde have fortunately not been frequent and have occurred on an average of about one every 8 years. The most serious floods have occurred in the summer months.

During past large floods, Pigeon River has risen above bankfull stage at a rate of about 2 feet per hour. There are a large number of residences in the flood plains at Canton and Clyde so that there may be danger to life from such rising floods on Pigeon River especially if the flood occurs at night.

Velocities in the main channel average 8 to 10 feet per second during floods such as those of August 1940 with maximum velocities up to 15 feet per second. During such floods, overbank depths range from 3 to 6 feet on the streets of Canton and Clyde and velocities range up to 4 feet per second. During the Maximum Probable Flood on Pigeon River, velocities in the channel at Canton and Clyde would approach 20 feet per second and in the overflow areas 7 feet per second. Velocities of these magnitudes create hazardous conditions.

This report is in three parts, (1) a history of past floods on Pigeon River in the vicinity of Canton and Clyde, (2) a description of past floods on streams of similar physical characteristics in the general geographical region of Canton and Clyde, and (3) a discussion of the Maximum Probable Flood that has been estimated as possible of occurrence on the upper Pigeon River at some future time.

The first section of the report brings together a record of the largest known floods at Canton and Clyde. Profiles are presented showing the high water crests of the largest known flood, that of August 30, 1940, and of the mid-August 1940 flood. Maps show the area that was inundated in the late August flood.

The second section of this report treats of the largest floods known to have occurred on streams of similar physical characteristics located in the same general geographic region as that of Canton and Clyde and not more than 60 miles away. Floods in this category, which have been experienced on streams having characteristics similar to and located in the same general region as Canton and Clyde, together with the Maximum Probable Flood, described in Section III of this report, indicate the magnitude of the floods that may reasonably be expected to occur in the future on Pigeon River at Canton and Clyde.

The third section of the report relates to the Maximum Probable Flood. Floods of this magnitude on most streams are considerably larger than any that have been experienced in the past. They are the floods of infrequent occurrence that are considered in planning protective works, the failure of which might be disastrous. Such floods are used by TVA in the design of physical features of reservoirs, dams, powerhouses, and local flood protection works. Such floods should be considered in the utilization of the unprotected flood plains at Canton and Clyde where the occurrence of such a flood would result in large losses and should also be considered in development of the reach between the two communities. The profile for this flood is shown in this report and the areas which would be inundated by such a flood are shown on the maps.

In problems concerned with the control of developments in the flood plain, it is important to give appropriate consideration to the

occurrence of floods of the magnitude of those that are recognized as possible of occurrence at Canton and Clyde. The facts should be weighed with regard to such floods in reaching decisions for the utilization of the lands in the flood plain along the reach covered by this report.

This report does not include plans for the solution of flood problems. Rather, it is intended to provide a basis for further study and planning on the part of Canton and Clyde in arriving at solutions to minimize vulnerability to flood damages. This might involve (1) construction of flood protection works, (2) local planning programs to guide developments by controlling the type of future use made of the flood plain by zoning and subdivision regulations, or (3) a combination of the two approaches.

The maps in the report show the extent of the flooded area and the profiles show elevations of high water through the reach of the Pigeon River covered by this report. Elevations of the ground are shown by contours on the maps. Cross sections also show ground elevations along the line of each section. From these data the depth of probable flooding by either recurrence of the largest known historic flood or by occurrence of the much larger Maximum Probable Flood at any location may be ascertained. Having this information, floor levels for buildings may be planned either high enough to avoid flood damage or at lower elevations with recognition of the chance and hazards of flooding that are being taken. Probably most large developments would have site maps made by private engineering firms. Such maps would show ground elevations in considerably greater detail than do maps in this report and, in conjunction with the maps and profiles in this report, would provide the necessary basis for the development of any site.

I.

PAST FLOODS

ON

PIGEON RIVER

VICINITY OF

CANTON AND CLYDE, NORTH CAROLINA

Figure 1.--AUGUST 30, 1940, FLOOD AT CANTON

Pigeon River in its highest known flood in the Canton-to-Clyde reach of river. Residences shown are in the Fibreville section of Canton with the water down $1\frac{1}{2}$ feet from crest.

Tennessee Valley Authority
Division of Water Control Planning
Hydraulic Data Branch

I.

PAST FLOODS ON PIGEON RIVER

VICINITY OF CANTON AND CLYDE, NORTH CAROLINA

This section of the report covers investigations of floods which have occurred on Pigeon River in the vicinity of Canton and Clyde, North Carolina. The portion of the river covered is that from just below the lower corporation limit of Clyde to a half mile above the upper corporation limit of Canton, a distance of eight river miles. Pigeon River is within the city limits of Canton for a distance of 1.6 river miles. At the lower end of Canton the river enters a two and one-half mile reach of narrow valley which is mostly in woods. Then the river valley opens up into broad farm bottoms for a two-mile distance to the upper limit of Clyde. The length of river within the city limits of Clyde is 1.1 miles. The drainage area of the Pigeon River at Canton is 134 square miles and at Clyde is 162 square miles.

Records of streamflow have been maintained continuously since 1928 at a recording stream gage located near the upper Canton city limit. There have been no observations of streamflow at Clyde, but since there is relatively little drainage area contributing between Canton and Clyde, the Canton streamflow records are applicable to Clyde. Engineers of TVA's Hydraulic Data Branch have investigated all significant floods during the past 25 years on Pigeon River immediately following their occurrence. Information on floods prior to that time has been obtained through research in newspaper files and historical records and from interviews with old residents who might have information on high floods of the past.

From all of these sources it has been possible to develop the history of known floods on the Pigeon River in the Canton-Clyde vicinity covering the past 150 years.

SUMMARY OF FLOOD HISTORY

1. The flood of August 30, 1940, was the highest on the Pigeon River in the Canton-Clyde vicinity during a period of about 150 years. This flood, resulting from intense thunderstorm activity over the western North Carolina mountain area, exceeded by more than two feet any flood known since the general settling of the basin by white men.

2. The second highest flood occurred in 1810, when the Pigeon River Basin was only sparsely settled. The next highest flood was that of June 1876.

3. A flood nearly as high as the 1876 flood came on August 13, 1940, only two weeks before the record flood of August 30, 1940.

4. Other large floods occurred in September 1893, October 1918, August 1928, and June 1949.

5. The largest floods on Pigeon River in the vicinity of Canton and Clyde have occurred in the summer months. The origin of these is about equally divided between tropical hurricane storms and intense thunderstorm activity. Floods from winter type storms cause little overbank flow in the Canton and Clyde areas.

6. In the past 82 years there have been ten known floods at Canton which have exceeded the bankfull stage of 12 feet, an average of one flood every eight years.

7. Principal flood damage is to business places and residences in the flood plains at Canton and Clyde and to the large pulp and paper mill industry at Canton. Agricultural damage is relatively small in the reach between Canton and Clyde.

8. Three highway bridges and two railroad bridges in Canton, together with the extensive building development on the flood plain at Canton and filling which has taken place there, affect flood flows. At Clyde a wide area of agricultural land on the right bank takes the larger part of overbank flow in floods and minimizes the restrictive effect of the highway bridge and the business and residential development which is on the left bank.

9. Channel improvement work and levees built through the paper mill property at Canton following the severe floods experienced in 1940 will probably prevent serious overflow in the plant area for a flood equal to any experienced in the known past. The maximum flood considered possible of occurrence at Canton would overtop the levees as they are presently constructed and flood the whole plant area and wood storage yard.

PIGEON RIVER VALLEY

Settlement

The Pigeon River Valley was recognized as hunting land of the Cherokee Indians until 1783 when the General Assembly of North Carolina repudiated Avery's Treaty and declared these lands open to settlement by the white man. A few hardy pioneers had moved into the Valley before then, but the first legal grants that are found date from about 1790 when the territory was considered a part of Burke and Rutherford Counties. Some of the early grants were for land near the present sites of Canton and Clyde, where John Davidson and James Chambers had settled. By this time other settlers had moved into Jonathan Creek, Hemphill Creek, Richland Creek, Dutch Cove, and East and West Forks of Pigeon River.

Buncombe County was formed in 1792 from a part of Burke and Rutherford Counties, and included at this time all the land in North Carolina lying west of the Blue Ridge. Haywood County was formed from a part of Buncombe County in 1808 and included, at its inception, all of what is now the counties of Haywood, Macon, Swain, Graham, Cherokee, and Clay. The county was named for John Haywood, who was Treasurer of North Carolina during the period 1787 to 1827. Waynesville has been the county seat from the start and was named for General Anthony Wayne.

Poor transportation and communications hampered the early development of the county. Until 1870 the only market for produce was through Greenville, South Carolina, over very poor roads. The "Western Turnpike" from Asheville to Murphy, North Carolina, and Ducktown, Tennessee, had been authorized by the General Assembly in 1848-49. Later acts provided for means of financing the road, which reached Murphy in 1856. Weekly stages began operating from Asheville to Murphy about 1870, but four days were required for the trip.

The railroads brought the first real impetus to development of the region but progress in building was slow due to financing difficulties, costly construction and gross mismanagement. Rail service to Asheville from the east came in October 1880 and the railroad reached Canton in January 1882 and Waynesville later that year. It was 1891 before the work was completed to Murphy, giving rail connection to Georgia and Tennessee from that point.

Canton was known first as Fords of the Pigeon and later Pigeon River. With the coming of the railroad in 1882 a move was made to change the name to Buford in honor of the president of the railroad but the name never caught on. The town was incorporated in 1889 under the name Pigeon River. The name was changed to Canton in 1894. The generally accepted story on the origin of the name "Canton" is that it was suggested from the nameplate of the manufacturer on a steel bridge in the town, a bridge made by the Canton Bridge Works, Canton, Ohio.

In April 1906 construction was begun on the plant of the Champion Paper and Fibre Company at Canton and the real growth of the town began. The initial plant installation, costing about $2,000,000, produced pulp for shipment to the company's plant at Hamilton, Ohio. The capital investment was doubled in a few years and the company was soon employing over 2,000 persons. The plant now employs over 3,000 persons, drawing from all parts of Haywood County and portions of Buncombe County.

In 1861, Canton consisted of only two houses. The first census report which gave a population figure for Canton was in 1900, when 230 persons were listed for the town. The 1950 census lists 4,906 persons as residents of Canton, a slight decline from the peak listing of 5,117 in the 1930 census when transportation conditions required that the paper plant employees all live close in. Now a large number of employees live in outlying sections and do some farming.

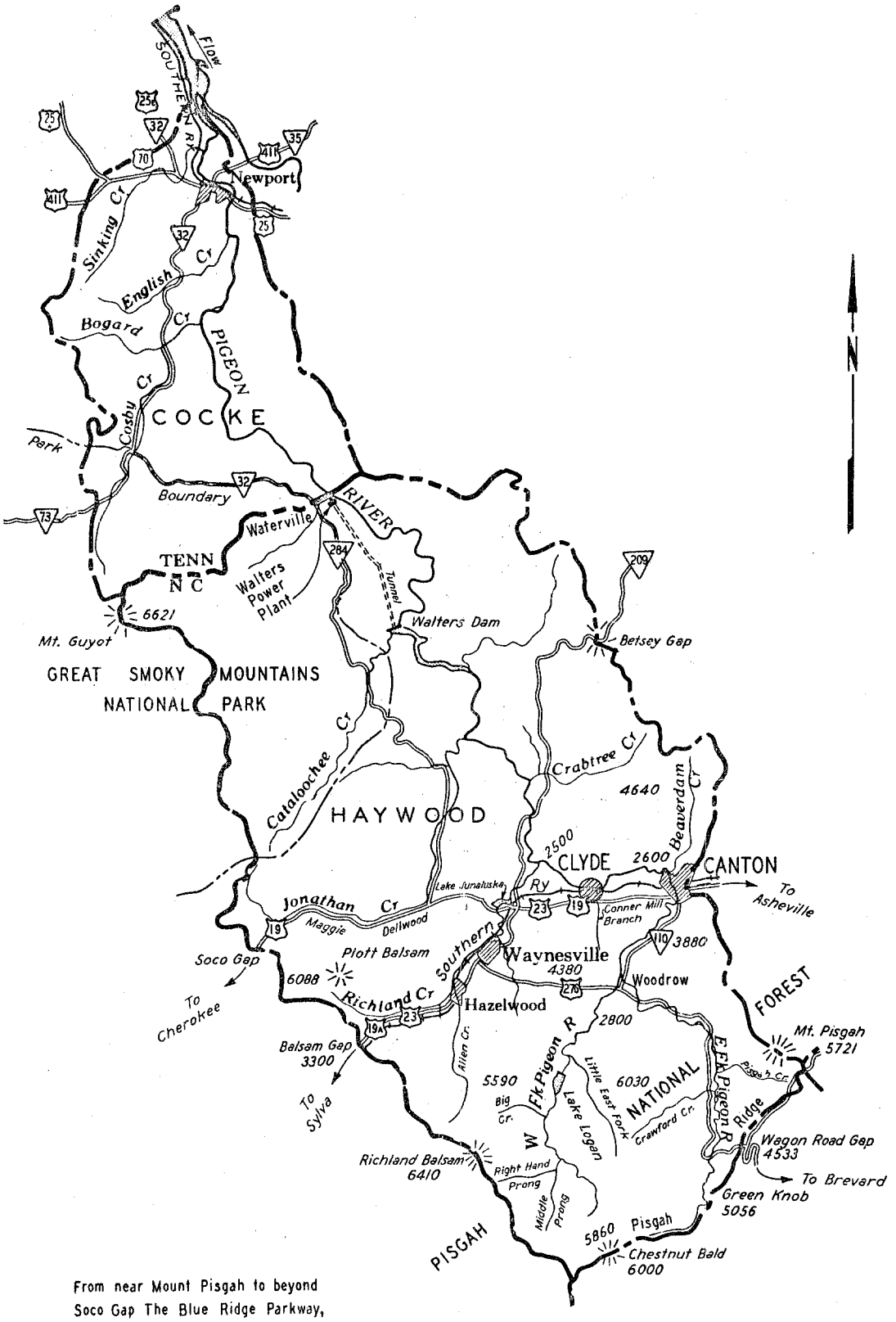
The Canton corporation limit has changed from time to time over the years as various areas adjoining the town were brought in after petition by the residents involved. At present the limits include all property on the right bank of Pigeon River from the bridge above Canton School, at River Mile 64.51, to Beaverdam Creek at Mile 62.87 and on the left bank from the Memorial Recreation Park, Mile 64.25, to the lower end of Fibreville, Mile 62.66.

Clyde Township was formed in 1877 but the town of Clyde consisted of only one or two houses until the coming of the railroad in 1882. Clyde was incorporated in 1889 and the census for 1890 lists 90 persons as residents. The 1950 census gives the population as 598. The Clyde corporation limit is a circle one mile in diameter. The name "Clyde" is of Anglo-Saxon origin and probably came from the town and river of that name in the British Isles. However, no historical reference as to the origin of the town's name has been found. An area to the west of the present corporation limit is currently being considered for addition.

Pigeon River Watershed

Size and Location--The Pigeon River watershed is shown on Plate 1. The basin outline is rectangular, 50 miles in length and 20 miles wide at its widest point. The Pigeon River flows in a generally northwesterly direction to its confluence with the French Broad near Newport, Tennessee. The area of the watershed is 689 square miles, with 536 square miles, about three-quarters of the basin, in Haywood County, North Carolina. The remainder of the watershed lies in Cocke County, Tennessee. Haywood County is somewhat unique in that it so nearly comprises a complete watershed. Some 19 square miles of the Hominy Creek Basin is within Haywood County, the North Hominy Creek and Dutch Cove sections lying just east of Canton. Elsewhere the Pigeon River Basin divide in North Carolina exactly follows the Haywood County line. Geologists have discovered that the portion of Haywood County which is now in the Hominy Creek Basin was "pirated" from the Pigeon River Basin in fairly recent geologic time. One evidence of this is that the valley floor of Hominy Creek adjacent to the basin divide at Canton is 400 feet lower than the valley floor of Pigeon River. Hominy Creek is actively engaged in cutting away at the divide; in the course of geologic time, the upper Pigeon River will be diverted to the French Broad River basin through the present Hominy Creek.

Streams--Pigeon River is formed by the confluence of East Fork and West Fork Pigeon River at Woodrow, six river miles upstream from Canton. East Fork and West Fork rise on the heavily wooded slopes of Pisgah Ridge and Balsam Ridge at the south edge of the basin. The largest tributary entering Pigeon River in the vicinity of Canton and Clyde is Beaverdam Creek, which drains some eleven square miles of the watershed lying northwest



From near Mount Pisgah to beyond Soco Gap The Blue Ridge Parkway, now under construction, follows generally the watershed divide.

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

PIGEON RIVER WATERSHED

Scale 0 5 10 Miles

FEBRUARY 1959

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of Canton and joins the Pigeon River at Mile 62.9, in the Fibreville section of Canton. Channel slopes on East Fork and West Fork Pigeon River average about 30 feet per mile. Pigeon River averages twenty-three and one-half feet of fall per mile for the 69.5 miles from the confluence of East and West Fork to the mouth. The slope varies considerably over this length, however, being 12 feet per mile above Canton, 9.6 feet per mile for the 8-mile reach through Canton and Clyde covered by this investigation, 48 feet per mile through the gorge section from the mouth of Jonathan Creek to the North Carolina-Tennessee state line and back to seven and one-half feet per mile near the mouth. The banks along Pigeon River are relatively high, being 12 to 20 feet above low water through the reach covered by this investigation. Hence general overflow takes place only in the larger floods. Upstream from Canton some bottoms are only 8 feet above low water and general overflow takes place at rises of 12 feet or more.

Topography--The upper Pigeon River watershed above Clyde lies within the Blue Ridge physiographic province. The area is characterized by high mountain ridges, with deep valleys and well developed drainage systems. The mountain ridges have sharp crests, steep slopes and spur ridges extending in all directions. Elevations within Haywood County range from 6,621 feet at Mount Guyot in the Great Smoky Mountains National Park to 1,425 where Pigeon River leaves the county at Waterville. Pisgah Ridge at the head of East Fork and West Fork is mostly above 5,000 feet elevation. Peaks along the rim include Mount Pisgah, 5,721 feet; Green Knob, 5,056 feet; and Chestnut Bald, 6,000 feet. Wagon Road Gap, at 4,533 feet, is the lowest point on the upper rim. The railroad cut in the low gap in the basin divide in east Canton is elevation 2,598 feet, only 26 feet above low water elevation in the Pigeon River, just 1,700 feet from the divide. The headwater streams tumble steeply from the basin rim and break sharply at the base of the ridges. At places along the base of the ridges and in the mountain coves some land is found that is fairly level, but such areas are small and scattered. Bottoms along the principal streams are well drained and vary greatly in width, ranging up to a hundred feet or so along the upper forks and up to 2,000 feet near Woodrow, 1,500 feet just above Canton, and 2,500 feet in Canton. Soils in

in these bottoms are in general highly productive sandy loams with well drained rocky subsoils. Much of the rolling to hilly land adjoining the bottoms have fairly deep loamy soils, well suited to pastures.

Cover--The Pigeon River watershed above Canton is approximately 75 percent in forest. Some 78,000 acres or about 18 percent of the Pigeon River watershed is within the boundary of the Great Smoky Mountains National Park. Sixty thousand acres of the county is in land designated as National Forest. The Champion Paper and Fibre Company owns 4,700 acres in the county, about 4,300 acres in managed timberland on the head of West Fork Pigeon River, and 142 acres within the corporate limits of Canton.

Canton--The Champion Paper and Fibre Company built its plant on the broad flood plain just below the Southern Railway at Canton. The business section of the town, along with a number of residences, occupies the remainder of the bottom land at this location. Most residences of the town surround the plant and business district and are on higher ground. Homes subject to flood damage on the low ground near the business district or in the Fibreville section below the Champion plant total some 100.

Clyde--Clyde is built on the left-bank half of a broad flood plain at the mouth of Conner Mill Creek. The business section developed first at the side of the railroad and along Broad Street, which carried U. S. Highway 19 and 23 until the four-lane relocation of this route through Clyde went into use in 1954. The route now follows along the south side of the railroad through Clyde. New businesses are now building along this road at elevations 5 to 10 feet higher than in the old business district. Some 60 houses, the Clyde School, and the old business district are all subject to flood damage.

Highways--Three Federal highways cross the Haywood County portion of the Pigeon River basin. The principal east and west traffic follows U. S. Highway 19. In addition to heavy local traffic, the route carries a large volume of seasonal tourist traffic from Asheville on the east, through Canton, Clyde, Lake Junaluska, Maggie Valley, and Soco Gap to the Cherokee Indian Reservation and the Great Smoky Mountains National Park. U. S. Highway 23 follows the same route as U. S. 19 through Canton and Clyde, turns south at Lake Junaluska to Waynesville and with Highway 19-A leaves the basin at Balsam Gap. U. S. Highway 276 runs from U. S. 19-A

and 23 at Waynesville, crosses the upper Pigeon River Basin by way of Woodrow and East Fork and leaves the basin at Wagon Road Gap, toward Brevard and South Carolina. Motor trucks follow U. S. 19 through the Pigeon River watershed with freight between Asheville and Chattanooga. State Highway 110 follows the right side of the Pigeon River valley between Canton and Woodrow. The limited access highway between Knoxville and Asheville which will be a part of the Federal interstate highway systems will follow a by-pass route north of both Clyde and Canton. The by-pass will leave present U. S. 19 and 23 just west of Clyde, cross the Southern Railway and Pigeon River near Mile 57, run east along the north side of Pigeon River, pass to the north of Canton and into the Hominy Creek basin, rejoining the present U. S. 19 and 23 alignment at the Buncombe County-Haywood County line four miles east of Canton. The Blue Ridge Parkway, now under construction, follows the upper rim of the Pigeon River watershed from Mount Pisgah to Soco Gap, a distance of nearly 50 miles. Principal access points will be at Wagon Road Gap, Balsam Gap, and Soco Gap.

Railroads--The Murphy Branch of the Southern Railway crosses the basin from east to west. The line enters the basin at the low gap in Canton, crosses the Pigeon River in Canton, runs south of the river through Clyde to Lake Junaluska, then follows Richland Creek to Waynesville and goes out of the basin at Balsam Gap. The line's principal business is with the Champion plant at Canton, hauling the larger part of the pulp wood required by the plant and hauling finished paper, pulp, and other products to the main line at Asheville.

Drainage Areas--Drainage areas at points of interest in the Pigeon River watershed are as follows:

Stream and Location	Mile	Drainage Area sq.mi.
Pigeon River		
At mouth	0	689
At bridge in Clyde	57.6	162
At Main Street, Canton	63.7	134
At Junction East and West Forks	69.5	118
East Fork Pigeon River	0	52.8
West Fork Pigeon River		
At mouth	0	64.8
At Lake Logan Dam	-	33.3

Developments in the Flood Plain

The Champion Paper and Fibre Company plant, a good part of Canton's business district, and some 100 of the city's residences are in the flood plain of Pigeon River. All of the plant buildings are located on the bottom land on the right bank of the river, occupying an area of some 40 acres. An area nearly as large on the left bank opposite the manufacturing plant is taken up by a wood storage yard which supplies the plant.

Business places occupy most of the bottom land between the Southern Railway bridge and the Main Street bridge. On the right bank these are along Park, Sorrells, Water, and Main Streets. Some twenty establishments are here, including a theatre, the City Library, a large supermarket, two garages, three service stations, a bus station, a barber shop, a diner, a dry cleaner, a laundry, a coal and fuel business, an appliance store, a tire recapping plant, and a feed store. Nine establishments on the left bank are subject to flooding: three automobile agencies, a drive-in restaurant, a hotel, a lumber yard and builders' supply, an auto parts supply, a plumbing shop, and a cabinet shop. Many of these on the left bank have been located here since the record flood of August 30, 1940.

The 100 or more residences presently in the flood plain at Canton are distributed approximately as follows: ten scattered throughout the business district between Park Street and Main Street, eighteen in the Highland Park section on the right bank along Valley, Conley, and Vance Streets, six on the left bank above Main Street bridge, and sixty-five in the Fibreville section. The houses in the Fibreville section were built by the Champion Paper and Fibre Company for use by their employees. The houses are now being sold to the occupants and will soon all be in private ownership.

The athletic field for the Canton High School, the National Guard Armory Building, and the Memorial Recreation Park and Swimming Pool are on the left bank flood plain near the upper city limits.

Canton, since 1910, has obtained its principal water supply from an intake on Rough Creek, a tributary of Beaverdam Creek, four and one-half miles north of the town. A 6-inch pipeline feeds by gravity to a reservoir at the north corporation limit. Mains through the town are fed by gravity

from this reservoir. In 1936 an intake was put in on Pigeon River from which the supply is supplemented during periods of low flow at Rough Creek. The intake and pumping station is located on the left bank of the river at Mile 64.57, just upstream from the present upper city limit. The floor of the pump house is at elevation 2591.4. A filter plant is located on the hill above the pumping plant and a treated water reservoir is located on top of the hill above the plant. Capacity of the treatment plant is one million gallons per day. Large floods enter the pump house, making it necessary to shut down the treatment plant and rely on the Rough Creek supply plus water in storage. No hardship results since in time of good streamflow, the Rough Creek supply is ample for the town needs. Storm and sanitary sewers from Canton have their outlets at various places along Pigeon River and are affected by backwater in large floods. Canton has no sewage treatment works, but a study is being made of the problem.

In Clyde all the business section is in the flood plain except that which has sprung up in the last few years along the new location of U. S. Highway 19 and 23. Business and commercial buildings now on the flood plain include a bank, two food stores, a hardware store, a drug store, the fire department, the post office, and two service stations. Approximately sixty houses are subject to flooding. The Clyde School is on the left bank of the river and has a large gymnasium on the right bank. All school buildings are subject to flood damage, the gymnasium being at the lowest elevation.

Clyde has used Conner Mill Creek as a water supply since 1925, when an intake and treatment plant were installed just south of the Clyde city limits. Three wells have been drilled in recent years to supplement the supply. Two of these are at the treatment plant and are well above possible flood height. Well No. 3 is just out of the flood plain on the right bank of Pigeon River opposite the business district. The floor of the well house is 37 feet above the elevation of the record flood of August 30, 1940. Storms and sanitary sewers empty into the river at several points in Clyde and a number of houses have basement drains which lead directly to the river. All these lines are subject to backwater.

Bridges

In the eight-mile reach of Pigeon River covered by this investigation there are six existing highway bridges, two railroad bridges, and one footbridge. The following Table 1 lists the pertinent elevations at the bridges.

TABLE 1

BRIDGE ELEVATIONS AND CLEARANCES

VICINITY OF CANTON AND CLYDE, NORTH CAROLINA

Mile Above Mouth	Identification	Stream Bed Elev. feet	Floor Elev. feet	Flood Crest Aug. 30, 1940 feet	Underclearance Elev. feet	Above Aug. 30, 1940 feet	Below Aug. 30, 1940 feet
57.54	Footbridge		2525.5	2530.7	2524.5		6.2
57.65	Clyde	2508.2	2531.1	2531.4	2529.7		1.7
62.92	Fibreville	2559.5	2581.6	2580.8	2578.0		2.8
63.15	C.P.&F. Co. RR	2560.8	2582.5	2584.3	2579.2		5.1
63.33	C.P.&F. Co. Pipeline (under construction)	2566.6	2612.0	2585.9	2602.0	16.1	
63.55	Southern Railway	2566.0	2591.5	2588.7	2583.1		5.6
63.60	U. S. 19, 23	2568.7	2588.0	2588.9	2583.4		5.5
63.71	Main Street	2565.0	2590.5	2589.8	2589.0		0.8
64.51	Bridge	2577.2	2599.0	2599.8	2597.0		1.8
64.78	Bridge	2579.0	2598.8	2600.6	2596.8		3.8

None of the bridges has an underclearance elevation which is high enough to pass a flood of the magnitude of the flood on August 30, 1940. At two of the highway bridges floor elevations are a little higher than the crest elevation reached in that flood but at both of these the bridge approaches are subject to overflow. Depth of overflow is sufficient to put the bridges out of service during large floods, with the result that none of the highway bridges in the Canton-Clyde area is usable during major floods. A bridge structure is being built over Pigeon River on the Champion Paper and Fibre Company property in Canton to support pipelines to the waste treatment plant. It will have an underclearance elevation 16.1 feet above the August 30, 1940, flood.

The Southern Railway bridge at Canton has a top-of-rail elevation 2.8 feet higher than the August 30, 1940, flood. The bridge approaches are not overflowed at this stage but the bottom of the main-span girder is 5.6 feet lower than the elevation of the flood crest so that the span could be endangered by a heavy pile up of debris against the span such as might occur in a large flood.

The U. S. 19 and 23 bridge, a reinforced concrete structure just upstream from the Southern Railway bridge in Canton, has a floor elevation 0.9 foot below the August 30, 1940, flood crest elevation at that point. The clearance elevation is 5.5 feet under the 1940 flood crest. The steel truss bridge at Main Street, next upstream from the highway bridge, has its floor just above the August 30, 1940, flood elevation and a clearance elevation which is 0.8 foot lower.

The new bridge over Pigeon River in the Fibreville section of Canton has a floor level which averages three feet higher than the old bridge at the site, but the floor slopes and the left end would be under water in a repetition of the August 30, 1940, flood. Fibreville Street, which runs parallel to the river at the left end of the bridge, is seven feet lower than the bridge floor.

The railroad bridge at the Champion Paper and Fibre Company plant, which connects the plant area with the wood storage yard on the left bank, has a top-of-rail elevation 1.8 feet lower than the August 30, 1940, flood which overflowed most of the plant area and wood yard. The levees and channel improvement work done through the plant area after the floods experienced in 1940 have altered flood flow conditions materially. The effect of these changes is set forth in a succeeding paragraph in this section of this report.

The Champion Company is now building a four-span steel-truss bridge over Pigeon River near the upper end of their property. This bridge will be used to carry pipe lines which will transport the plant's waste effluent to a sewage treatment plant which is to be built on the left bank. Plate 8 shows the location of this bridge and the planned waste treatment plant. The clearance elevation of the pipe line bridge will be some sixteen feet above the August 30, 1940, flood crest profile.

The two highway bridges just above the Canton Corporation Limit are steel girder structures with floor elevations a foot or more lower than the flood crest elevation reached at the sites on August 30, 1940. At the lower of these two structures high banks confine flood flows to the bridge opening and considerable heading up occurs.

The steel truss bridge at Clyde has its floor at just about the same elevation as that reached by the flood of August 30, 1940. The underclearance elevation is about two feet lower. Wide overflow occurs on both banks and heading up at the bridge is negligible under present conditions.

A suspension type footbridge at the Clyde School provides access to the athletic field and gymnasium on the right bank opposite the main school buildings. The bridge floor is one foot lower than the August 30, 1940, flood crest at the center and some six feet lower at the ends of the span.

Encroachments on Natural Floodway

The description of the extensive developments in the flood plain makes it evident that the natural valley of Pigeon River has been encroached upon by works of man which impair the natural flood-carrying capacity of the stream. The effect of these encroachments is more important at Canton than at Clyde.

Plates 7 and 8 show the extent of encroachment on the flood plain at Canton by buildings and bridges. Nearly all the buildings shown would interfere to some extent with overbank flow during an occurrence of a flood as high or higher than the flood of August 30, 1940.

Plate 9, the profile of Pigeon River, gives some indication of the interference to flood flow in the river channel by the bridges in the Canton-Clyde reach. The bridge at Main Street offers less interference to flood flow than the other bridges at Canton. The flood of August 30, 1940, reached the floor of the bridge. Considerable building has taken place on the flood plain at the left end of the bridge since 1940 and the flood crest profile would probably be higher at this point in a recurrence of the 1940 floods today.

At the U. S. Highway 19 and 23 bridge at Park Street the bottom of the bridge girders is 5.5 feet under the crest of the flood of August 30, 1940. Flood discharges of about 19,000 cubic feet per second reach these girders. The bridge floor is overtopped at discharges of 30,000 cubic feet per second. The top of the bridge guard rail is 3.6 feet above the bridge floor. At discharges which overtop the bridge floor overflow extends about 500 feet to the left and 750 feet to the right of the bridge. Plates 7 and 8 show the heavy concentration of buildings which reduce the flood-carrying capacity of this overbank area. Considerable filling has been done in the left overbank area over the years.

At the Southern Railway bridge a long fill cuts off all overbank flow for any floods which have occurred at Canton in the memory of man. A discharge of about 35,000 cubic feet per second will overtop the bridge and fill. The bottom of the bridge girders is reached by a discharge of about 19,000 cubic feet per second. Between these two discharges heading up is caused by the restricted opening under the bridge.

The water supply intake dam for the Champion plant just below the Southern Railway bridge is four feet high. It backs up water a distance of 0.6 mile under low-flow conditions but has a negligible effect on large floods.

The reinforced concrete bridge at Fibreville is three feet lower at the left end than at the right end. The bridge floor ranges from one foot below to two feet above the crest elevation of the August 30, 1940, flood. The underclearance of the bridge is at an elevation equal to that flood crest at the right end and $3\frac{1}{2}$ feet lower at the left end. Discharges of 25,000 cubic feet per second, equal to the flood of August 13, 1940, reach the lower end of the bridge girders.

At Clyde there has been relatively little change in the flood-carrying capacity of the valley bottom up to this time. Filling has been negligible and although there has been much building on the left bank, at the point where this has the greatest effect on flood flow, at the center of town, the right bank flood plain is lower than the left and carries the larger part of overbank flow. Because of the wide overflow, the bridge at Clyde has no noticeable effect on flood heights. In the

record flood of August 30, 1940, water was just above the bridge floor but overflow extended for 400 feet in the business section on the left bank and for 500 feet on the right bank where the depth was as much as six feet.

Flood Protection Works of Champion Paper and Fibre Company

After the costly flood damage experienced in the two floods in August 1940, the Champion Paper and Fibre Company took steps to reduce its flood hazard. The channel through the plant area was enlarged, several small islands were removed and levees were constructed along both banks of the river. Flood gates were built where the railroad tracks leave the lower end of the plant property and at both ends of the company's railroad bridge over Pigeon River. A levee was constructed along the bank of Camp Ground Branch, where it flows along the north edge of the plant area, to prevent overflow into the plant at that point by high flows in the branch or by backwater from Pigeon River. Gates were installed on plant sewers at critical points in the area. When an important rise in the river is threatened, the plant must be shut down but serious flooding of the plant can be prevented by closing the gates on the sewer lines and by dropping the flood gates into place at the railroad tracks if the rise continues to those elevations. A profile was developed by the Flood Control Branch of TVA for the improved reach for a discharge equal to that of the record flood of August 30, 1940. This is shown on Plate 9.

The pumps at the water intake plant at the upper end of the plant property can be used to remove surface water from the plant area. Some portions of the plant area are two feet lower than the ground at the pumping plant and there is no provision for pumping out this lower area.

Confining all flood flow to the channel section through the plant area will cause the Champion railroad bridge to have a greater effect on flood heights than was the case when wide overflow occurred at the site. Heading up at this bridge for a discharge equal to that of August 30, 1940, would amount to about two and one-half feet now as compared with about half a foot when the flood occurred. Thus the flood height would be affected all the way upstream to the Southern Railway bridge, partially nullifying the beneficial effect of the channel improvement work which has been done in this reach. The study shows that the flood would probably overtop the flood wall at the Champion pumping

plant by about one foot under present conditions. Above the Southern Railway bridge there would be no adverse effect on flood heights as a result of the flood protection works on the Champion plant property.

Lake Logan on West Fork

Lake Logan Dam was built on West Fork of Pigeon River by the Champion Paper and Fibre Company in 1931 to create a reservoir to provide storage to supplement water supply for the plant during periods of low flow. The dam is a concrete arch structure impounding water to a depth of 45 feet at the dam and creating a reservoir with a surface area of 85 acres and a storage volume amounting to 2000 acre-feet at the present normal full pool level. The spillway section of the dam is 450 feet in length. A length of 150 feet at the center of the dam was built one foot lower than the rest of the spillway. Flashboards were added to the low section to bring the pool level up to the elevation of the higher spillway section. In November 1941 the pool level was raised 18 inches more by the addition of flashboards across the full spillway. In August 1953 the boards were altered to raise the pool level an additional 12 inches, so that the pool level is now maintained at an elevation 42 inches above the low section of the spillway as constructed in 1931. This level is 3.5 feet below the elevation of the short non-overflow sections at the ends of the dam. The flashboards are permanently mounted and are not intended to go out during periods of high spillway discharge.

The lake is maintained at the level of the top of the flashboards except for the periods when releases are necessary to supplement low streamflow during droughts or when severe freezes reduce streamflow available at the plant intake at Canton. Under this plan of operation flood peaks on West Fork below the dam are normally reduced to some extent by Lake Logan as water goes into storage as the lake fills above the initial water level in the lake. Storage in Lake Logan amounts to 140 acre-feet for a head of 1.5 feet on the present flashboards and 420 acre-feet for a head of 4.5 feet on the flashboards. The loss of all or any part of the flashboards during a flood would alter conditions. During the two floods in August 1940, 12-inch flashboards were in place on the lower spillway section and in the flood of June 1949 flashboards

were 18 inches higher than in 1940. The boards remained in place throughout these floods.

FLOOD SITUATION

Flood Records

The U. S. Geological Survey has maintained records of streamflow on Pigeon River at Canton continuously since December 6, 1928. Until January 3, 1929, observations were made on a staff gage. Records since that date are from a recording gage. Intermittent observations of river stages were made from a staff gage at the Main Street bridge, 0.4 mile downstream from the present gage site, between May 25, 1907, and June 30, 1909.

Investigations by engineers of the Hydraulic Data Branch were made immediately after their occurrence for the floods of August 13 and August 30, 1940, and June 16, 1949, to obtain flood heights and pertinent information for each of these floods. Local residents who possess knowledge of past floods were interviewed to obtain data regarding floods that occurred prior to the keeping of gage records on Pigeon River. A thorough search was made by Hydraulic Data Branch engineers throughout the Pigeon River flood plain for high water marks of past floods. In addition, research was carried out for flood information in available files of newspapers and historical documents.

Flood Stages and Discharges

Table 2 lists dates of occurrence, crest elevations, order of magnitude, and peak discharges for floods which have exceeded bankfull stage of 12.0 feet at the Canton stream gage. The list is complete for the period since continuous streamflow records were begun in December 1928. Floods shown prior to 1928 are those found in the flood history research and no doubt this list is incomplete, especially for the lesser floods of which there is no record or memory. Where crest stages are shown for these prerecord floods they have been estimated from high water marks, newspaper accounts, or other historical information.

TABLE 2

FLOOD CREST ELEVATIONS AND DISCHARGES

PIGEON RIVER AT CANTON, NORTH CAROLINA

This table includes all known floods which have exceeded bankfull stage of 12.0 feet at the U. S. Geological Survey gaging station on Pigeon River at River Mile 64.1 at Canton, North Carolina. Drainage area at gaging station site is 133 square miles. Zero elevation of gage is 2572.22 feet above sea level.

Date of Crest	Gage Height		Order of Magnitude	Peak Discharge	
	Stage feet	Elevation feet		Amount cubic feet per second	Per Sq. Mi. cubic feet per second
Approximately 1810	20±	2592	2	29,800	224
June 15, 1876	18.3	2590.5	3	25,700	193
September 12, 1893	17.8	2590.0	5	24,700	185
May 21, 1901	12.0	2584.2	10	12,500	94
February 28, 1902	12.5	2584.7	9	13,400	101
August 31, 1910	12.0	2584.2	11	12,500	94
October 25, 1918	13.0	2585.2	8	14,300	107
August 16, 1928	16.4	2588.6	6	21,500	162
August 13, 1940	18.0	2590.2	4	25,100	189
August 30, 1940	20.75	2593.0	1	31,600	238
June 16, 1949	15.44	2587.7	7	19,500	147

Flood Occurrences

Plate 2 shows the crest stage and month of occurrence of known floods on Pigeon River at Canton. The monthly distribution of these floods is as follows:

January	0	July	0
February	1	August	4
March	0	September	1
April	0	October	1
May	1	November	0
June	2	December	0
			10

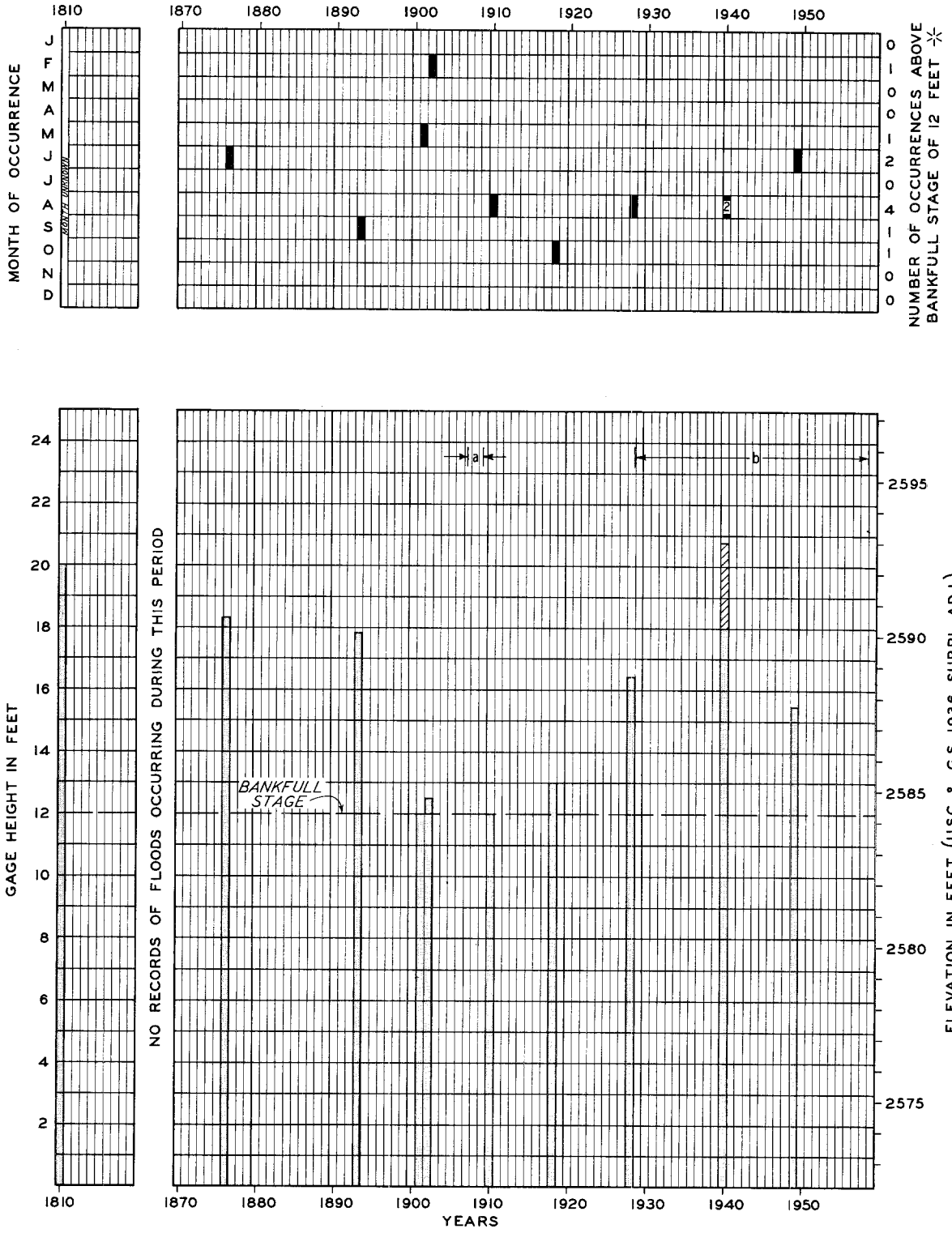
This shows that floods on Pigeon River in the past have been most likely to occur in the summer months when thunderstorm conditions prevail or when storms occur which originate in tropical hurricane disturbances. In the history of the Pigeon River floods there have been no known winter floods that were serious in the Canton-Clyde area.

Rate of Rise and Velocities in Large Past Floods on Pigeon River

The rate of rise during large floods on Pigeon River at Canton and Clyde is illustrated by the stage hydrographs, Plate 3, for the floods of mid-August and late August 1940 at Canton. The late-August flood is the highest known on Pigeon River at Canton and Clyde and the mid-August flood is the fourth highest known.

The rate of rise of each of these floods above bankfull stage was about 2 feet per hour at practically a uniform rate. The mid-August flood rose to 6 feet above bankfull in about 3 hours, the rise above bankfull beginning about 10:00 a.m. on the 13th. The late August flood came out of banks in the night about 2:00 a.m. on the 29th and rose sharply 8.75 feet to a crest about 6:30 a.m. The rapid rise during this latter flood coming in the night hours could be hazardous to people sleeping in residences on the flood plain. Fortunately no such loss of life occurred in 1940.

During floods of the magnitude of those of August 1940, average velocities in the Pigeon River channel at Canton are from 8 to 10 feet per



(a) Staff gage record

(b) Recording gage record

✳ Based on gage records and high water research.

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

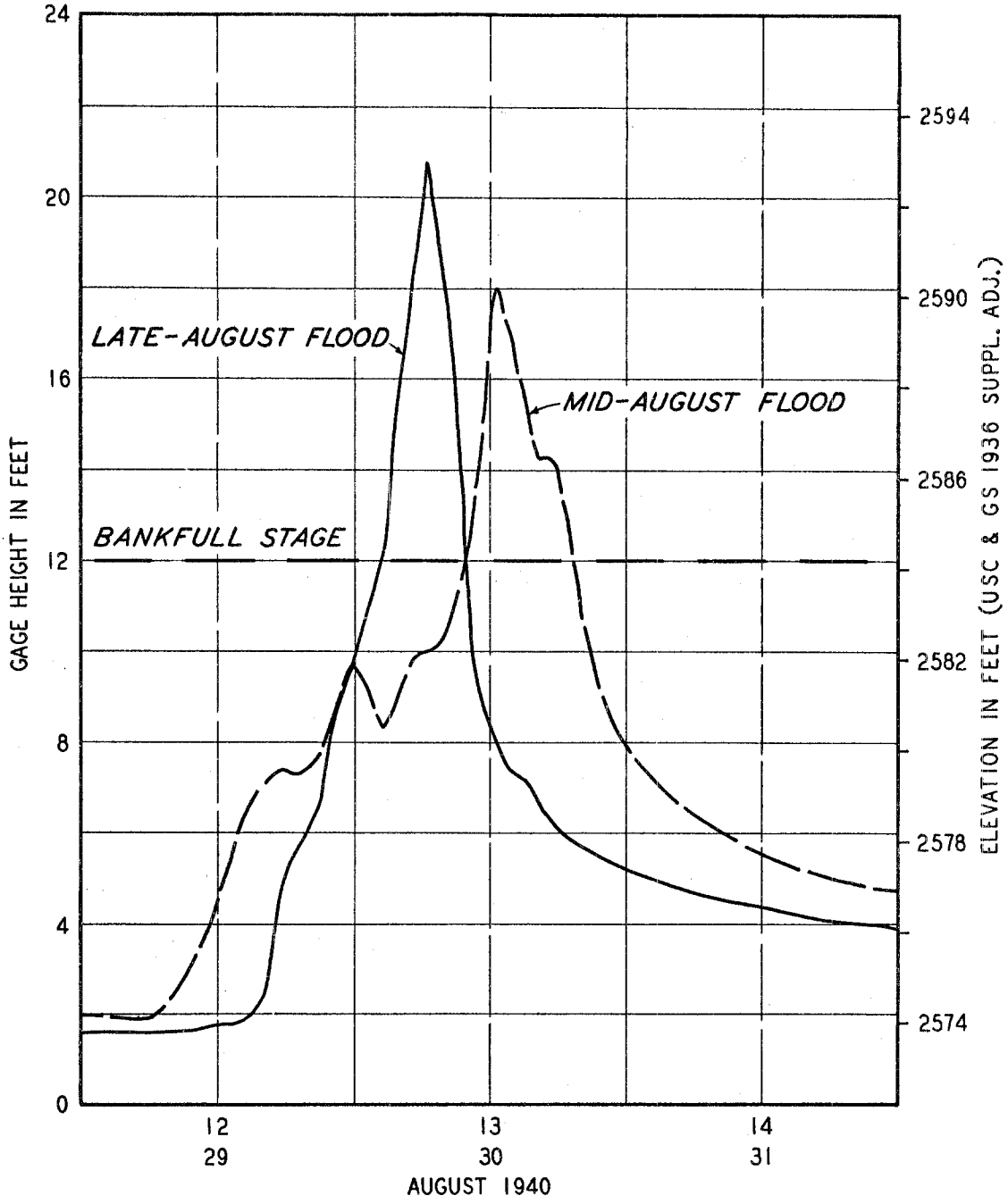
FLOOD CRESTS

PIGEON RIVER

VICINITY OF CANTON - CLYDE, N.C.

FEBRUARY 1959

ASF - 1311



TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

STAGE HYDROGRAPHS

PIGEON RIVER

AT CANTON, NORTH CAROLINA

FEBRUARY 1959

ASF-1311

second. Maximum velocities are from 12 to 15 feet per second. In the overflow flood plain bordering the river, depths during the two 1940 floods ranged from about 3 feet in mid-August to nearly 6 feet in late August and velocities are estimated to have varied from 1 to 4 feet per second. Such high velocities as these can be hazardous.

Flooded Area on August 30, 1940

Plate 7 shows the areas that were actually overflowed along the Pigeon River in the reach covered by this report in the flood of August 30, 1940. Plate 8 shows at an enlarged scale the same flooded area through Canton. As previously stated the late August 1940 flood was the record flood on this reach of river and the overflow experienced there is the largest that has ever been known to occur.

The limits of overflow as shown on the maps were estimated using flood profile elevations, valley cross sections, topography shown on the maps, and observations by Hydraulic Data Branch engineers immediately following the flood. The boundaries of the overflow areas on Plate 7 as defined by these data are sufficiently accurate for the indended purpose, but the actual limits of the overflow on the ground may vary somewhat from that which is shown on the maps. This is because the contour interval of Plate 7, which is 20 feet, does not in all cases permit precise plotting of the flooded area boundaries. To define these limits with a higher degree of accuracy would require costly surveys which present purposes do not warrant.

Flood Profiles

Plate 9 shows the high water profiles on the Pigeon River for the two floods of August 1940, the late August profile being that for the highest flood known. High water marks from which the profiles of these floods were developed were obtained by Hydraulic Data Branch engineers immediately after each flood occurred. Several high water marks for the August 1928 flood are shown on Plate 9. These were obtained from local people who witnessed these floods or who had been told about the flood by older people.

Shown also on Plate 9 is a profile of low water in Pigeon River as it was on October 10-15, 1958. Profiles of both left-bank and right-bank levees built by the Champion Paper and Fibre Company and the water surface through this reach for a flood equal to the August 30, 1940, flood are shown. Plate 9 also shows profiles of the left and right river banks except through the gorge from Mile 60.0 to Mile 62.5 where the banks are high and there is no appreciable flood plain. Plate 9 shows elevations of floor and underclearance at bridges. The Maximum Probable Flood profile shown on Plate 9 is discussed in Section III of this report.

Valley Cross Sections

Plate 10 shows seven valley cross sections of the channel and flood plain area along the Pigeon River in the Canton-Clyde reach. These were selected from the 17 sections which were obtained for engineering purposes during the investigations for this report. Locations of all the cross sections are shown on the map, Plate 7, and on the profile, Plate 9. The cross sections not reproduced are available from the Hydraulic Data Branch of TVA to anyone who may have need for them.

Each cross section shows the elevation and limits of overflow for the August 30, 1940, flood and also for the Maximum Probable Flood. The Maximum Probable Flood is discussed in Section III of this report.

Section 12 at Mile 63.59 is taken along Park Street in Canton and shows first floor and basement elevations for business and other buildings located along that street. Many of these were inundated by the late August 1940 flood and all are below the elevation of the Maximum Probable Flood.

FLOOD DESCRIPTIONS

The following descriptions cover the more important floods that have occurred on Pigeon River in the vicinity of Canton and Clyde for which information is available. The flood descritpions are based on investigations made by TVA Hydraulic Data Branch engineers, on information furnished by local residents, on newspaper accounts of past floods, and on historical documents. In the absence of actual records of stream heights and discharges,

local residences, diaries, and newspaper accounts are the best available sources of information covering past floods. The Asheville "Citizen-Times" files were reviewed back to 1889 including files of the Asheville "Gazette-News." Available files of the "Canton Enterprise" and the "Waynesville Mountaineer" were both searched for flood information at Canton and Clyde. Each newspaper account has been reviewed to present only material that appears to give a correct portrayal of the flood being reported.

1810

Two old residents of the upper Pigeon River basin who have been interviewed mentioned a flood which occurred somewhere around 1810 to 1820. Mr. Will Moore, who was born near Woodrow in 1871, stated that his father told him of hearing a woman, who was one of the earliest residents of the basin, talk of wading through shoulder-deep water in getting out of her house on what is now the Forest Justice farm. The house referred to was said to be located on the lower end of West Fork Pigeon River at a point where overflow reached depths of about five feet in the flood of August 30, 1940. Mr. Moore said that it was his recollection that this flood was supposed to have occurred in 1817.

Mrs. R. E. Sentell recalls that her father-in-law used to talk of this flood as having occurred in 1810. No other leads on the flood could be found and its relation to later floods could not be established with any greater accuracy. However, the information obtained indicates that this early flood approached closely the height reached by the flood of August 30, 1940. A height of about 20 feet at Canton is reasonable for this great flood and it is ranked second among known floods at Canton.

June 15, 1876

Known as "The June Freshet," this flood is the greatest known along much of East Fork Pigeon River. Through Canton it was apparently a little higher than the August 13, 1940, flood and was exceeded only by the 1810 flood and the flood of August 30, 1940.

A diary kept by Mr. W. H. Hargrove, one of the early residents of the Canton vicinity, contains a description of the flood which includes the following:

> We all planted our crops as usual and on the night of 15th of June had a freshet in Pigeon River which run over much of the bottom lands doing a great deal of damage but still continued to rain until the morning of 17th Saturday and the river came down two feet higher which run over almost all the bottom land on the river and doing more or less damage to near all except my own and a few more.

Mr. John Holtzslaw was able to point out where the flood reached in the vicinity of the Main Street bridge at Canton. Mr. James Anderson showed how high the flood was at a tree in the Fibreville section and Mr. Joe Thompson was able to show the height reached at Thompson Ford below Canton. A high water mark found at the old Morgan Mill at the lower edge of Clyde shows that the 1876 flood height at Clyde has about the same relation to other known floods as at Canton.

September 12, 1893

Above Canton this flood is known as the "Sam's Knob Flood" because of the large slides which occurred on the peak in the West Fork drainage as the result of the cloudburst rains. At the Morgan Mill at Clyde this flood was 10 inches lower than the 1876 flood. Through Canton the flood was about half a foot under the 1876.

The Asheville "Daily Citizen" of September 13, 1893, contains the following account of the flood at Canton, the earliest newspaper account of floods on Pigeon River:

FLOOD NEWS

Pigeon River Way Up - Logs Lost In The Tuckasegee

> Canton, N. C., Sept. 12 - Pigeon River was higher last night than at any time since the memorable June freshet of 1876. No serious damage was done in this locality but farther up the river considerable damage was done. The old store of Captain W. S. Jerrell at Sonoma was washed away together with a small quantity of goods, plunder, etc., also a great deal of hay and other farm products, and some stock. His family were, when heard from this morning at nine o'clock, in the upper story of his house, the water being several feet deep over the premises and no way of getting out.

May 21, 1901

This was a lesser flood on the upper Pigeon River but was one which overflowed banks in the Canton area, as shown by the following abstract from the "Asheville Citizen" of May 23, 1901:

AT CANTON

> Canton, N. C., May 22 - Owing to the recent rains, Pigeon River at Canton yesterday afternoon at 5 o'clock was out in the field and some crops were considerably damaged. For about two hours the railroad bridge was the center of attraction as the water was getting very close to the cross-ties on the bridge.

The field at Canton which is referred to is probably the river bottoms which were later occupied by the plant of the Champion Paper and Fibre Company, when construction of the plant was begun in 1906.

February 28, 1902

This was a severe flood on the lower reaches of Pigeon River, but was not so important at Clyde and Canton. Very heavy flood flow from Richland Creek and Johnathans Creek contributed to the flood below Clyde.

The only mention found of the flood in the upper Pigeon River basin is in the March 7, 1902, issue of the "Asheville Citizen":

WAYNESVILLE DID NOT SUFFER GREATLY

> Waynesville, N. C., March 7 - The rainfall here was not excessive and would not have raised the waters to the danger point except for the melting snow in the mountains.
>
> . . . . The damage in this county was not to be compared with that suffered in other places. Only one bridge, the iron bridge across Pigeon River at the mouth of Fines Creek, which was washed from its piers, is so far reported damaged.

The account of the August 31, 1910, floods states that that flood "did not quite reach the height of 8 years ago."

August 31, 1910

Newspaper accounts are the only reference to this flood. The following account puts the flood as slightly lower than the flood of February 1902. Water in some rooms of the Champion Paper and Fibre Company apparently was surface water and not overflow from Pigeon River.

From the Asheville "Gazette-News" for September 1, 1910:

THE RAINS DESCENDED AND THE FLOODS CAME

CONSIDERABLE DAMAGE IS DONE
THROUGHOUT WESTERN NORTH CAROLINA

. . . . . .

News From Canton

A telephone message to the Gazette News this morning from Canton stated that the Champion Fibre Company was forced to shut down more than half its operations yesterday on account of the floods. The waters from the hills gathered to a depth of 2 to 3 feet in some of the rooms of the plant. Pigeon River did not quite reach the height of 8 years ago. It flooded many bottoms and the damage will be great.

. . . . . .

July 16, 1916

This was a record flood on the upper French Broad River, but the hurricane rains that caused the floods there did not get over the mountains into the Pigeon River watershed. As a result only a modest rise occurred on the upper Pigeon. The "Asheville Citizen" for July 19, 1916, contains the following reference to the Pigeon River:

CANTON LITTLE DAMAGED AND CHAMPION FIBRE
COMPANY IS UNINJURED

. . . . Pigeon River has been high for the past 10 days but little property damage has been caused. The only damage sustained by the Champion Fibre Company was caused by cutting off of the mill from supplies. (Due to interruptions to rail service.)

No actual shut-down resulted from delays of shipments.

October 25, 1918

The "Asheville Citizen," October 26, 1918, reported:

NO SERIOUS DAMAGE RESULTED FROM FLOOD
GREATEST RAINFALL IN HISTORY OF WEATHER STATION

> What is believed to have been the heaviest rainfall in a 24-hour period is recorded for the 24 hours ending yesterday afternoon. The official figures given out by the local weather department show that in this time a total rainfall of 8.24 inches came down since Thursday afternoon.
>
> . . . . Two or three bents in the trestle over the Pigeon River at Canton were washed away. . . .

August 16, 1928

This flood was the sixth highest known at Canton. It was not a serious one on West Fork, but on the East Fork the flood was the highest since 1876 and was slightly higher than the August 30, 1940, flood but was not so severe as the flood of August 13, 1940.

Two storms of tropical origin brought heavy rainfall over the Pigeon River basin in August 1928. The center of the first storm passed southeast of the basin, through Charlotte, North Carolina, on August 11-12 and brought rains which put many streams out of banks in the mountain region. The second storm moved from Florida northward, along the Alabama-Georgia line, on August 14-16 and brought rains to the upper Pigeon River basin which produced a flood which was the sixth in order of magnitude of floods known in the Canton and Clyde vicinity, ranking below the two 1940 floods and the floods of 1810, 1876, and 1893. The crest was some four feet lower than the record flood of August 30, 1940, but the flood is notable in that it was the first flood to cause appreciable damage and inconvenience since the start of the industrial development of Canton in 1906. Water did not invade the plant buildings but flood water caused curtailment of operations on two days. The railroad trestle that connects the plant area with the wood storage yard on the left bank was washed out, other trackage was affected and pulp wood was washed away. The steel bridge at Fibreville was lost, houses in the Fibreville area were surrounded, and water supply to the area was cut off. The Canton business district was affected by

overflow. In Clyde water blocked the highway at both ends of town and flooded a number of houses.

Accounts of the flood are found in three issues of the "Asheville Citizen" and one issue of the "Canton Enterprise."

The "Asheville Citizen," August 16, 1928, states:

HIGHWAYS ARE BLOCKED FROM SLIDES, FLOODS

With highways blocked in all directions and train service suspended between Asheville and Spartanburg and Asheville and Salisbury, Western North Carolina this morning faced one of the worst traffic tie-ups in recent years as a result of slides and flood waters from streams swollen by nearly 36 hours of continuous rainfall.

. . . . . .

The stream reaching the highest level last night was the Pigeon River with a flood tide of 20 feet above its normal level. Fifteen families were moved out of their homes at Clyde and heavy damage was felt at Canton.

The "Asheville Citizen," August 17, 1928, states:

CHAMPION FIBRE COMPANY SHUT DOWN

Canton, N. C., August 16 - Champion Fibre Company's large pulp mill was paralyzed here today on account of flood waters from yesterday's heavy rains. It was expected that some operation would be resumed sometime tonight.

. . . . Pigeon River was estimated to be from 9 to 10 feet higher than normal.

. . . . . .

The "Asheville Citizen," August 18, 1928, carried the following report:

PIGEON RIVER HIGH

Waynesville, N. C., August 17 - Lenoir Gwyn, of Waynesville, who is spending the summer at . . . . Springdale on Route No. 284, the highway from Waynesville to Brevard and which crosses the Pigeon River at Woodrow and follows the course of the East Fork of the Pigeon for some distance, reports that

the Pigeon River was higher in that section (the East Fork at Springdale) Wednesday and yesterday than it has been in 50 years; that it overflowed its banks. . . . .

The "Canton Enterprise" for August 17, 1928, describes the flood in more detail.

CANTON IS VISITED BY HEAVIEST RAIN IN YEARS

SWOLLEN STREAMS GREATLY DAMAGE CROPS
AND PROPERTY IN PATH, HIGHWAYS BLOCKED

The continuous downpour of rain here Wednesday from early morning till night, caused damage to property in this section such as has not been witnessed in a great number of years. Pigeon River began rising at a rapid rate early in the afternoon, and by midnight had swept out a number of small buildings and bridges and damaged crops along its path to a great extent.

Business places and dwellings nearby were much endangered by the rising waters, and in many instances the occupants moved to safety. Cars from the Felment and Russell Motor Company garages were moved for safe keeping, and a number of the Fibreville residents left on account of their homes being surrounded by water. Fibreville was practically cut off when the iron bridge across the river was swept away and water and sewer connections were put out of service. Relief was soon given, however, when the water supply was temporarily restored, and plans for a walkway across the river is being made. The main road from Fibreville will be through the Phillipsville section and on to the No. 10 Highway until the bridge is rebuilt.

The Champion Fibre Company suffered heavy losses when the trestle across the river used for transportation of wood was swept away, together with a considerable amount of the trackway and pulp wood. Work in many sections of the plant was suspended during the night and did not start until late in the day Thursday.

Considerable damage is reported from the East Fork and Woodrow sections also. The Dick's Creek bridge, two small houses and some outbuildings are said to have been swept away, while other buildings and property were greatly damaged.

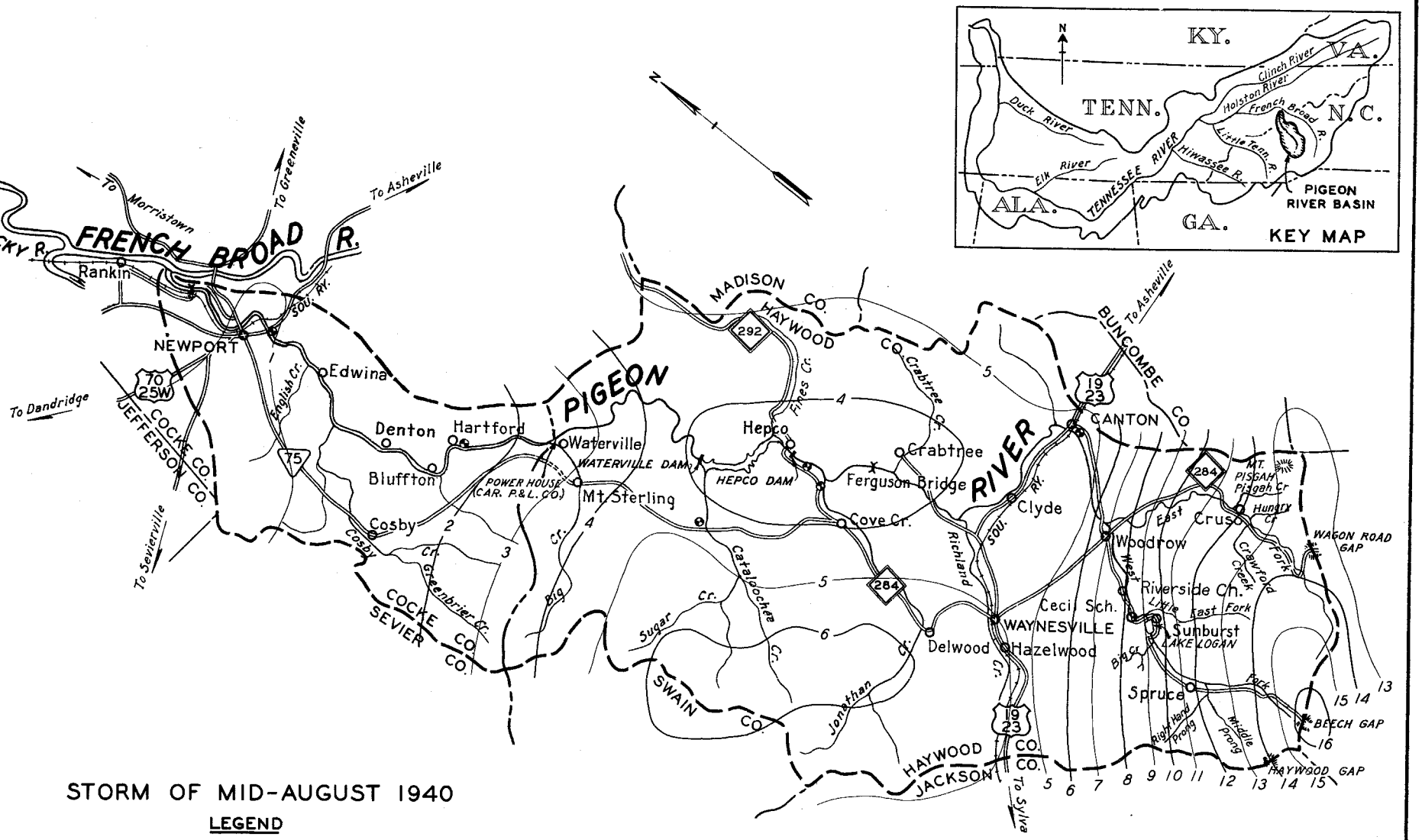
Clyde is said to have been completely cut off by the No. 10 Highway being flooded at both ends of the town and a number of the residents nearest the river were forced to move out, taking their stock with them for safe keeping. A number of houses were said to have been flooded also.

August 13, 1940

On August 13, 1940, a West Indian hurricane, which had swept inland, resulted in an intense storm over the eastern section of the Tennessee Valley which produced high floods on streams in that area. On the Pigeon River at Canton and Clyde the flood was very nearly equal to the flood of June 1876, the highest prior flood about which any appreciable amount of information is available. The flood slightly exceeded the flood which occurred in September 1893. It was about two feet under the best estimate that can be made for the height of the flood of 1810.

The August 13, 1940, flood was by far the most damaging up to that period in the history of Canton and Clyde. The plant of the Champion Paper and Fibre Company was flooded. Production was lost and equipment was damaged. A large part of the business section of Canton was flooded and houses which were flooded or surrounded by water totaled 84 at Canton and 17 at Clyde. TVA Hydraulic Data Branch engineers began investigations immediately after the flood and assembled extensive data on the rainfall amounts and distribution, the storm runoff, extent of flooding, and the flood damages.

The storm of mid-August 1940 was of tropical origin, as had been the storm which caused the flood of August 1928. This storm developed in the Atlantic Ocean east of the Bahamas and was of hurricane intensity when it moved inland over Georgia and South Carolina late on August 11, 1940. As it moved overland the storm rapidly lost its hurricane winds but its intense activity and high moisture content were retained as the storm center moved first over Atlanta, then swung in a slow circle over Knoxville, Bristol, and then Greensboro, North Carolina, in a period of some three and a half days. As the storm moved parallel to the Southern Appalachian Mountains on August 12 and 13, very heavy rainfall occurred, particularly to the east and northeast of the storm center. Plate 4 shows the storm rainfall over the Pigeon River basin. At Beech Gap, at the head of West Fork, a rainfall catch was located which totaled 16.8 inches for the storm. In Haywood Gap, at the head of Middle Prong of West Fork, a TVA recording rain gage showed 12.88 inches for the storm. At Wagon Road Gap, at the head of East Fork, the storm total was 12.41 inches and at Mt. Pisgah the rainfall exceeded the 14-inch capacity of the


KEY MAP
PIGEON RIVER BASIN
KY.
VA.
TENN.
N.C.
ALA.
GA.
Clinch River
Holston River
French Broad R.
Duck River
Little Tenn. R.
Elk River
TENNESSEE RIVER
Hiwassee R.
FRENCH BROAD R.
NOLICHUCKY R.
To Morristown
To Greeneville
To Asheville
Rankin
SOU. RY.
NEWPORT
70
25W
To Dandridge
COCKE CO.
JEFFERSON CO.
English Cr.
Edwina
75
To Sevierville
Denton
Hartford
PIGEON
Waterville
WATERVILLE DAM
POWER HOUSE (CAR. P&L. CO.)
Bluffton
Mt Sterling
Cosby
Cosby Cr.
Greenbrier Cr.
COCKE CO.
SEVIER CO.
Big Cr.
Sugar Cr.
Catalpochee Cr.
SWAIN CO.
Jonathan Cr.
MADISON CO.
HAYWOOD CO.
292
Fines Cr.
Crabtree Cr.
Hepco
HEPCO DAM
Crabtree
Ferguson Bridge
RIVER
Cove Cr.
Richland Cr.
SOU. RY.
Clyde
284
Delwood
Hazelwood
WAYNESVILLE
Ceci. Sch.
Riverside Ch.
Sunburst
LAKE LOGAN
Spruce
Big Cr.
Right Hand Prong
Middle Prong
Fork
Little East Fork
West Fork
Crawford Creek
Woodrow
East Cruso
Hunting Cr.
MT. PISGAH
Pisgah Cr.
WAGON ROAD GAP
BEECH GAP
HAYWOOD GAP
19
23
CANTON
BUNCOMBE CO.
To Asheville
HAYWOOD CO.
JACKSON CO.
To Sylva
STORM OF MID-AUGUST 1940
LEGEND
STREAM GAGE
6 RAINFALL IN INCHES
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH
PIGEON RIVER BASIN
SCALE 0 5 10 MILES
FEBRUARY 1959
PLATE 4

recording rain gage. From these points on the basin rim, amounts for the storm graduated downward to 8 inches at the confluence of East Fork and West Fork at Woodrow. At Canton the storm total was 4.55 inches. From Canton to Walters Dam rainfall totals dropped off to about $2\frac{1}{2}$ inches. The principal part of the rain over the Pigeon River basin fell in a period of 50 hours and the maximum hourly intensity rate was slightly under 1 inch per hour.

Rural areas throughout the Pigeon River basin suffered heavy damage to corn, tobacco and potato crops. Practically every bridge on East Fork was washed away. Highways were damaged extensively throughout the storm area. At Canton, the Pigeon River began to rise slowly at 6 a.m. on Monday, August 12, and continued to rise at an irregular rate to a 10-foot stage at 6:30 a.m., August 13. At that time the river began a much more rapid rise, at a rate of about 1.3 feet per hour. The banks were overflowed and a considerable portion of the business section was flooded, along with adjoining residential areas. Upwards of 100 families were driven from their homes, the plant of the Champion Paper and Fibre Company was flooded and was forced to close down. The rise crested at 12:40 p.m. on August 13, at a stage of 18.00 feet. The crest stage held for only a short time and by 9 p.m. the river was back within its banks.

At the Champion plant, water entered low buildings on the morning of August 13, flooding motors and stopping operations. When water reached pump motors in the water treatment plant, the water supply to the mill was interrupted and the entire plant was shut down. As the water continued to rise other buildings were flooded until three quarters of the plant had been affected. Many motors were raised ahead of the rising water, but some 200 motors were reached by the water and had to be removed, cleaned and dried out. Machine shop equipment had to be torn down, cleaned and reassembled. Other machinery and controls were damaged by the mud and water. Pulp and paper in storage at low elevations was moved above the flood waters and was not damaged. Water surrounded coal stored in the plant yard and the coal was damaged by loss of fines and deposit of silt. Close to a thousand cords of pulp wood was lost from the wood storage yard on the left bank and a like quantity was left lodged against the company's railroad bridge at the lower end of the yard. Work lost by plant employees

due to the enforced shutdown totaled thousands of man-hours. Figure 2 is a scene in the Champion plant after the flood waters had receded.

In the Canton business section supplies and machinery were damaged and a 24-hour shutdown resulted at Canton Laundry on the right bank below Park Street. Flood water reached a depth of 32 inches in the plant. Stock was damaged at the Smoky Mountain Candy Company and some damage was caused by mud and water at the Champion Motor Company and at Spears Inn. Heavy coal cars were run onto the Southern Railway bridge as a protection against loss of the structure when water and debris piled up against the bridge. Similar precautions had been taken at the railroad bridge on the Champion property. Water over U. S. Highway 19 and 23 closed that route to traffic for 3 hours. Overflow on the approaches prevented use of Main Street bridge as well.

Water entered or surrounded 84 houses in Canton. Of these 59 were in the Fibreville section, owned by the Champion Paper and Fibre Company, 16 were in the Highland Park section, at Valley, Vance, and Conley Streets, on the right bank above Main Street bridge, and 9 were scattered through the downtown section. Flooding in Fibreville is pictured on the cover at the lower right. Depths of flooding ranged from a few inches to more than five feet. Since the rise came during daylight hours, it was possible to organize the evacuation of persons with some efficiency, preventing a possible loss of life.

At Clyde the low-lying residential section was flooded. Water entered basements of 15 private homes but did not reach the floor level of any. Extensive damage was done to furniture and buildings when water entered the Pines Tourist Rooms. Water was up to 4 feet deep on U. S. Highway 19 and 23 and through traffic was stopped for several hours. The suspension footbridge at the Clyde School was damaged by drift and the high water.

Communications were interrupted throughout the storm area. Because of the heavy damage to secondary roads and bridges, several schools were forced to close for periods up to two weeks. Mail service was disrupted to many areas and power service interruptions were common.

Damages from the flood totaled $102,300 at Canton and $2,200 at Clyde. Adjusting these figures for the increased construction,

Figure 2.--AFTER THE MID-AUGUST 1940 FLOOD ON PIGEON RIVER

Inside the plant of the Champion Paper and Fibre Company at Canton. The late August flood was about 3 feet higher than the flood line shown in the picture. (Photo courtesy "Asheville Citizen-Times")

Figure 3.--CANTON STREET FLOODED AUGUST 30, 1940

On Park Street, Canton, North Carolina, business and commercial establishments were flooded by the late August 1940 flood.

equipment, and labor costs of 1959 and making a moderate allowance for the increased development which has taken place in the flood plain gives damage figures for a recurrence of the August 13, 1940, flood under present conditions which amount to about $400,000 at Canton and $8,000 at Clyde.

August 30, 1940

Two and a half weeks after the flood of August 13, 1940, the upper Pigeon River watershed was again deluged with very heavy rainfall which resulted in Pigeon River rising to its greatest known heights at Canton and Clyde. The storm differed greatly from the first August 1940 storm, but the flood which resulted on the Pigeon River was more devastating than the first. Two lives were lost when a house was swept away on a tributary of West Fork Pigeon River above Lake Logan. Through Canton and Clyde the flood was 2 to 3 feet higher than the flood of August 13, 1940. Industries and businesses which were just beginning to recover from the first flood were again hit. Other businesses and homes, previously thought to be above flood danger, were flooded this time. When overflow began, store goods, equipment, and furniture were raised to above the elevation of the first flood, only to see the water continue to rise, submerging everything that was thought safe. TVA Hydraulic Data Branch engineers again went throughout the flood area investigating rainfall, runoff, and damages, and outlining the flood crest profile.

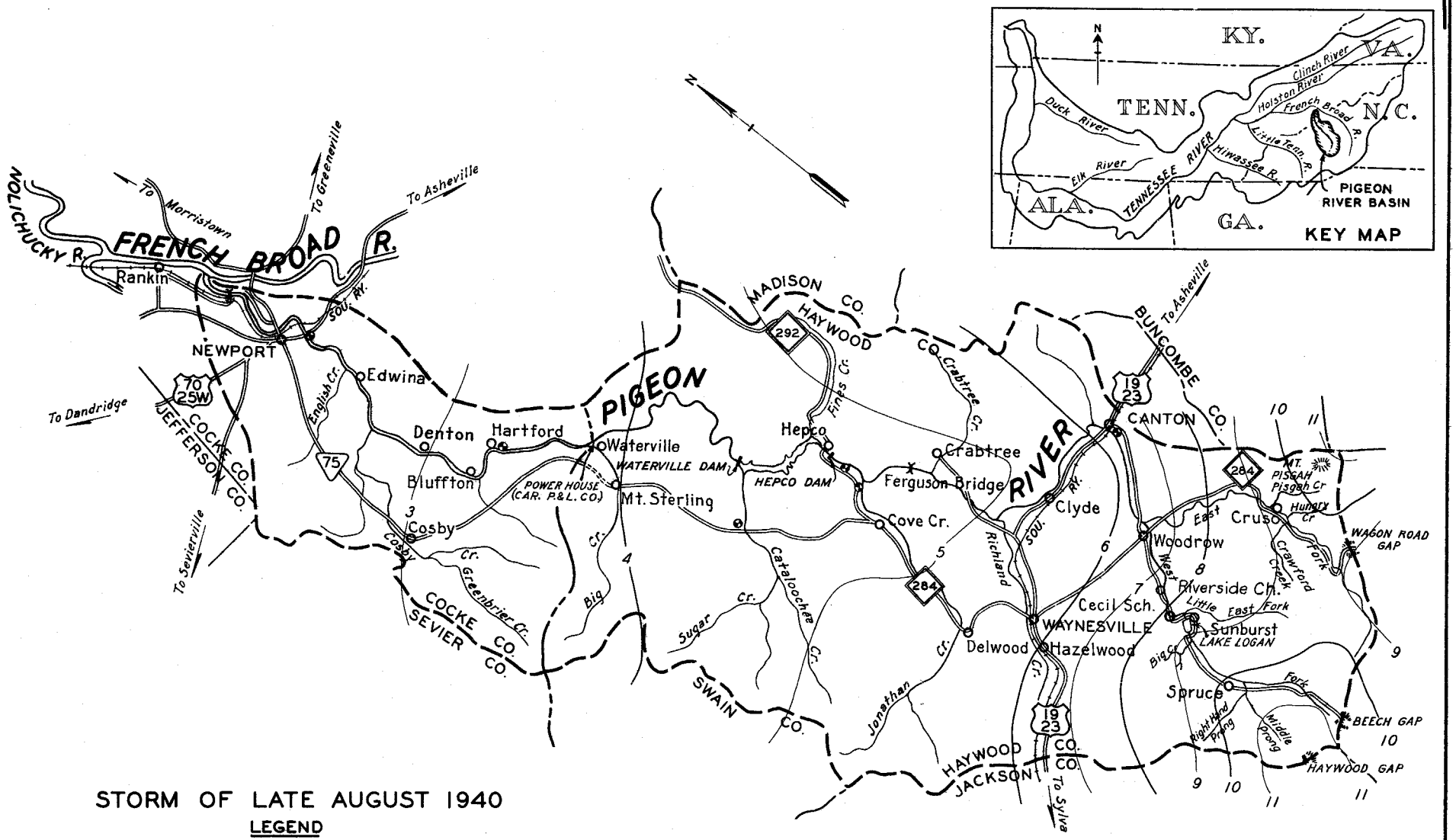
The storm of August 29-30, 1940, was much different from the storm of August 12-13. Where the first storm was due to a tropical hurricane which moved inland, the second storm originated in a purely local meteorological disturbance. The first storm had covered a wide area, including the eastern part of the Tennessee River Basin from the headwaters of the Clinch River to the headwaters of the Little Tennessee River, and in addition, a large area in North and South Carolina and Virginia. The second storm was primarily confined to the North Carolina portion of the Tennessee River Basin, extending from Mt. Mitchell in the headwaters of the Nolichucky River in Mitchell County, to the headwaters of the Little Tennessee in Jackson and Macon Counties. The Pigeon River Basin lies in the region where these two storm areas overlapped and had

severe floods from both storms. The August 29-30, 1940, storm seemed to develop over the immediate area affected. There were no definite indications of the intensity of this storm on the surface weather maps either prior to or subsequent to the appearance of the storm over the Southern Appalachian Mountains.

A broad and relatively deep current of moist tropical air had been flowing over the area for a number of days, producing scattered showers and thunderstorms. During the night of August 29-30, a mass of cold polar air moved southward along the Atlantic coast. The presence of these air masses, along with a strong southerly current, lifted the moisture-laden tropical air and produced the heavy shower activity. Undoubtedly the rough physiographic conditions over the area also aided in initiating the release of shower activity. Such a catastrophic rainstorm, when being of a local nature such as this one, cannot be accurately forecast for any long period in advance, with the present knowledge and available sources of data on developing conditions.

Plate 5 shows the storm rainfall over the Pigeon River basin for the August 29-30 period. Distribution of rainfall was somewhat more uniform than for the mid-August storm, with amounts decreasing gradually from the headwaters to the mouth of the river. The East Fork and West Fork drainage basins received about the same total precipitation, with amounts in excess of 11 inches along the high divide of the watershed, dropping off to about 9 inches one-third of the way to the confluence of the forks and $6\frac{1}{4}$ inches at the Junction at Woodrow. At Canton the storm total was 6.36 inches. At Waterville the storm total had dropped off to 3.47 inches. The tributary watersheds of Richland Creek, Jonathans Creek, and Crabtree Creek each had $5\frac{1}{2}$ to 6 inches of rain. The storm lasted 20 to 22 hours as compared to 50 hours for the August 12-13 storm. The maximum hourly recorded intensity rate was about $2\frac{1}{2}$ inches per hour.

Although the total precipitation amounts for the storm were about the same on East Fork and on West Fork, the intensity rate must have been greater on West Fork. The flood there was 2 to 4 feet higher than on August 13, while on East Fork the crest was $1\frac{1}{2}$ to 2 feet lower than in the first flood. Many bad mountain slides were observed in the head of West Fork above Lake Logan, which indicate very high intensity rates. On Big Creek and Right Hand Prong slides were found which started



STORM OF LATE AUGUST 1940

LEGEND

STREAM GAGE

—6— RAINFALL IN INCHES

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

PIGEON RIVER BASIN

SCALE 0 5 10 MILES

FEBRUARY 1959

PLATE 5

near the basin divide and continued to the mouth of the streams, where huge piles of drift and debris were left. It was on Big Creek that the Reverend and Mrs. Bill Hampton lost their lives when their home was carried away as they slept. Mrs. Hampton's body was located below Lake Logan two days after the flood. The body of Mr. Hampton was lodged in a pile of drift a quarter of a mile below the mouth of Big Creek and was not found until a week after the flood.

Roads and bridges repaired after the first flood were washed out or damaged again, land was scoured and crops were lost at some points where they had survived the first flood. Traffic was interrupted by high water and by washed out roads and bridges. Power service and communications were disrupted.

At Canton, the Pigeon River began a sharp rise at 7 a.m. Thursday, August 29, and continued at a rate of 1 to 2 feet per hour to a crest of 20.75 feet at 6:30 a.m. the following morning. This was 2.75 feet higher than the crest reached on August 13. Plate 8 shows the area overflowed in Canton. Ninety-six homes were flooded and the occupants were forced to evacuate from many more. The Champion Paper and Fibre Company, scarcely back to normal operation after the first flood, was again heavily damaged. Water was 3 to 4 feet deep in the heart of the Canton business district, the bridge at Fibreville was washed out, and other bridges or their approaches were damaged.

At the Champion Paper and Fibre Company water flowed through or around all the plant buildings except the office, as seen on Plate 8. The upper left cover picture shows conditions in the railroad yard of this plant. Employees worked throughout the night Thursday as the river rose raising hundreds of motors to what they thought was a safe height, only to see them submerged as the waters went 3 feet higher through the plant than on August 13. In all, some 500 motors were covered by the water. Chemicals were lost or damaged when touched by the water. A large quantity of pulp and finished paper was damaged in basements and other storerooms. Damage to the stock increased as the piles tipped over into the water when the bottom cartons or bundles became water-soaked. In other cases water seeped upward from one package to the one above and caused damage above the water line. Trackage and equipment in the plant yard were damaged and additional

coal in storage in the yard was affected. About 1500 cords of pulp wood was washed from the wood yard. The shutdown period averaged 100 hours for the plant as a whole. All motors reached by the water had to be removed, dried out, and cleaned. Damaged pulp and paper stock was salvaged and reworked where possible. Loss in payroll to the employees due to the enforced shutdown again was large.

A total of 22 commercial establishments in Canton were damaged by the flood. Figure 3 shows flooding on Park Street. Water was 6 feet 4 inches deep in the plant and office of the Canton Laundry, resulting in a shutdown of 36 hours for the plant. Additional damage was done to supplies and equipment. An ice plant, operated in conjunction with the laundry, was shut down a week as a result of the flood. The Smoky Mountain Candy Company lost almost their full stock of candy when water reached a $3\frac{1}{2}$-foot depth in the building.

Many places were flooded this time which had escaped the first flood. Rugs and seats were damaged in the Colonial Theatre. Water stood 26 inches deep in the barber shop in the theatre building and $3\frac{1}{2}$ feet deep in the adjoining Colonial Restaurant, causing a shutdown there that extended over the busy Labor Day weekend. At the Union Clothing Company no precautions had been taken since water did not enter the store in the August 13 flood. Water was 2 feet deep in the store this time, causing heavy damage to suits, clothing accessories, and equipment. Six service stations and six garages were flooded. The Spears Inn suffered more damage and the Pines Tourist Home had heavy damage to floors and furniture.

In the Highland Park section water entered 12 homes and surrounded 3 others. In central Canton 18 houses were flooded and 5 had water around them. In Fibreville a total of 61 houses were flooded, with water standing up to the eaves of several houses. Figure 1, the frontispiece, shows the flood on Pigeon River at Fibreville. Two houses were moved off their foundations. Town policemen, firemen, and volunteers had worked through Thursday night evacuating the people and such furniture as time would allow. The Fibreville bridge went out at 6 a.m. on Friday, taking with it the water line which served the community.

Water was 8 feet deep in the National Guard Armory near the Canton School, marooning two members of the Guard unit overnight. Walls were damaged when a corner of the building was undercut by the flood waters.

Damage to the left bank approach fill and a trestle section of the Southern Railway bridge in Canton interrupted train service for 3 days.

At Clyde, as at Canton, residents made preparations for a flood similar to the August 13 flood when they saw the river breaking overbank. They were entirely unprepared for a flood which rose 3 feet higher. Twenty homes were flooded, where none had been before, and 23 others were surrounded by water or had their basements flooded. Traffic through the town was halted when water reached a depth of 4 feet on U. S. Highway 19 and 23. The steel truss bridge over Pigeon River in Clyde, a landmark for 50 years, was washed out. The footbridge at the Clyde School was heavily damaged and building materials were carried away from the construction site of a school addition. Three service stations and a machine shop were flooded. Water lines were broken and streets and sewers were damaged.

Damages from this flood totaled $303,100 at Canton and $15,600 at Clyde. Adjusting these figures to 1959 costs and values and allowing for the increased development in the flood plain gives estimates of damage if the August 30, 1940, flood were to recur today which amount to about $1,200,000 at Canton and $55,000 at Clyde.

June 16, 1949

This was the highest flood which has occurred since 1940 and the only flood in that period to overtop the banks at Canton and Clyde. TVA Hydraulic Data Branch engineers made investigations immediately following the flood.

From 6 to 12 inches of rain fell over the Pigeon River above Canton, much of it in the last 24 hours of the storm. East Fork Pigeon River near Cruso rose three feet higher than in the highest of the two floods in 1940, due to very heavy contribution from the two tributaries, Pisgah Creek and Crawford Creek. Houses were flooded at Woodrow and in the Fibreville section of Canton. Crops, highways, and bridges had heavy damage.

A widespread storm, accompanied by the passage of a cold front and squall line over the mountain area, produced heavy rain over the headwater regions of the French Broad, Pigeon, Little Tennessee, and Hiwassee Rivers. The greatest amounts fell during the night of June 15

and the daylight hours of June 16. By the afternoon of the 15th rainfall totaling 3 inches had fallen along the high rim of the Pigeon River basin. Up to 9 inches fell in the next 24-hour period, ending at 6 p.m. on June 16. Rainfall for the storm totaled 5.1 inches at Canton and 5.4 inches at Chambers Mountain near Clyde.

East Fork Pigeon River was out of banks from 10 a.m. to 6 p.m. on June 16. High velocities scoured secondary roads and farm lands. East Fork at Woodrow was about as high as on August 30, 1940. Eight houses were flooded to depths ranging from 0.5 foot to 4 feet. West Fork Pigeon River did not reach serious flood stages and the Pigeon River between Woodrow and Canton was 3 to 4 feet lower than in the record flood of August 30, 1940. Wide overflow occurred but velocities were lower and scouring was relatively light.

At Canton the crest occurred at 3 p.m. at a stage of 15.44 feet, 5.3 feet under the August 30, 1940, flood. At the recreation park, built since the 1940 flood near the National Guard Armory, the fill and fence around the swimming pool were damaged, and the filter plant and pump were flooded. Water entered a basement at the Canton Motor Company to a depth of 3.8 feet. The basements of two nearby houses were flooded.

Following its experiences in the two 1940 floods, the Champion Paper and Fibre Company dredged the channel of Pigeon River and constructed dikes on both banks through the plant property. Flood gates were installed on the water intake and on sewer lines. The June 1949 flood passed through the dredged channel at the plant with little damage. Without these protective measures the flood would have been 2 feet deep on the lower floors of the plant. The plant was shut down ahead of the crest of the flood, as a precautionary measure, and 8 hours of production were lost. Surface water which collected behind the dike entered the lowest floors and flooded 5 motors.

At Fibreville 6 houses were flooded and a suspension type foot-bridge was washed out. Figure 5 shows flooded houses in this area. The local National Guard Company had been organized in the emergency and assisted in the evacuation of 15 families in advance of the flood.

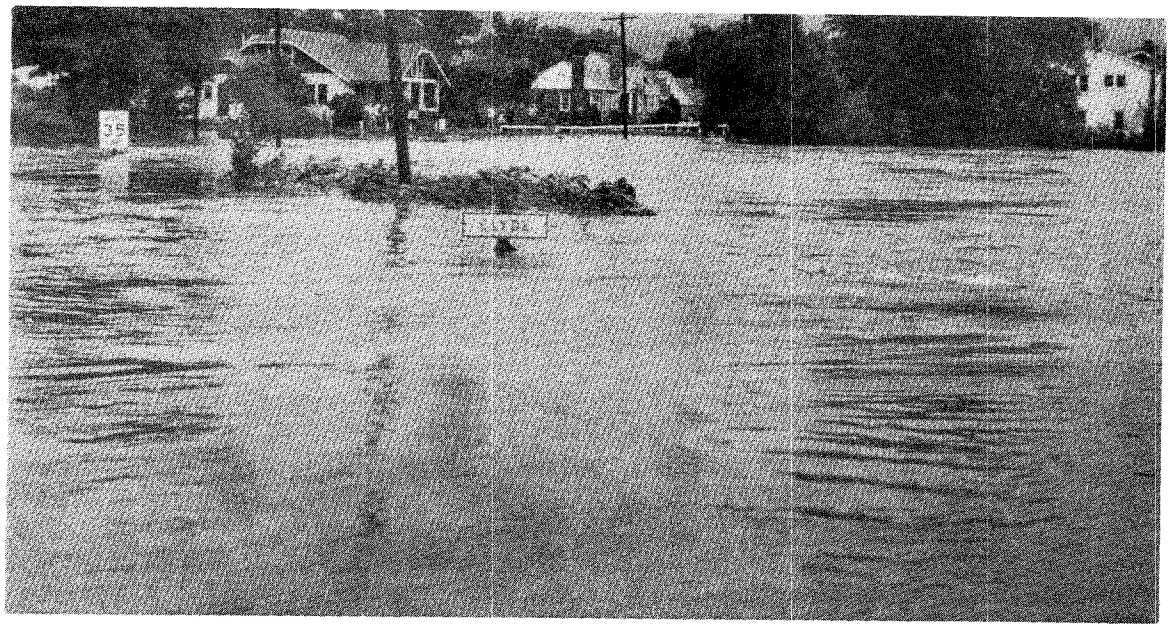


Figure 4.--JUNE 1949 FLOOD IN CLYDE

Near the east city limits of Clyde, flood water overflowed U. S. Highways 19 and 23. Crest was 1.5 feet higher than the water in the photograph. The crest of the August 30, 1940, flood was about 7 feet higher than the water in the picture.

(Photo courtesy "Waynesville Mountaineer")

Figure 5.--HIGH WATER IN CANTON, JUNE 1949

Homes in the Fibreville section of Canton were overflowed on the afternoon of June 16. The crest of the flood is indicated by the dark stains on the houses. The 1940 flood reached nearly to the eaves of these houses.

(Photo courtesy of Guy Teague, Canton, N. C.)

Overflow began at Clyde at 2 p.m. and lasted until 6 p.m. The crest was 3 feet under that of August 30, 1940. Water in U. S. Highway 19 and 23 blocked through traffic. Figure 4 shows the flooding of these highways. Water did not reach the floor level of any house, but 15 yards were flooded and water entered 33 basements in the town. At Thompsons Tourist Court, at the upper end of Clyde, 16 cabins were flooded. Water reached a 16-inch depth in the Pines Grocery, at the lower edge of Clyde.

ACKNOWLEDGMENTS

This section of the report has been prepared by personnel of the Hydraulic Data Branch, Division of Water Control Planning, under the general direction of Reed A. Elliot, Chief Water Control Planning Engineer, and the immediate supervision of Albert S. Fry, Chief, Hydraulic Data Branch.

Field investigations were made under the direction of James W. Beverage, Head of the Field Investigations Section. High water investigations in the field were carried out by District Engineer Myron O. Jensen, assisted by Area Engineer Joseph S. Enloe.

Thomas C. Bounds, Head of the Office Engineering Unit, prepared charts and maps for the report under the direction of Paul C. Spath, Head of the Hydraulic Investigations Section. Newspaper files at Asheville, Waynesville, and Canton were searched for flood information by Mr. Jensen and Mr. Enloe.

Flood information was analyzed and this report was prepared by Mr. Jensen.

II.

PAST FLOODS ON STREAMS IN CANTON-CLYDE REGION

Tennessee Valley Authority
Division of Water Control Planning
Hydraulic Data Branch

II.

PAST FLOODS ON STREAMS IN CANTON-CLYDE REGION

Large floods have been experienced in the past on streams in the general geographical and physiographical region of Canton and Clyde, North Carolina, as a result of heavy rainstorms that have occurred over the watersheds of these streams. Such storms, except for the vagaries of the weather, could just as well have occurred over the upper Pigeon River watershed. Had they done so, floods would have resulted on the Pigeon River comparable in magnitude to those that happened on the neighboring streams. It is therefore desirable in connection with any determination of floods that may occur on the Pigeon River in the future, to consider the floods that have occurred on streams in the Canton and Clyde region and whose watersheds are similar in physical characteristics to the upper Pigeon River watershed. Such characteristics include both topography and watershed cover.

Maximum Known Regional Floods

Table 3 contains a list of the maximum known floods that have been experienced on streams in the region of Canton and Clyde, which in this report is considered to be the area within 60 miles of these places. All of the floods occurred on streams whose watersheds are similar in physical characteristics to that of the upper Pigeon River. This necessarily limits the neighboring streams considered to those that lie in the Southern Appalachian Mountains since streams in other areas differ greatly in watershed characteristics from those of the upper Pigeon River.

One of the earliest floods known to have occurred in the region was that of April 1791 on Swannanoa River at Biltmore, North Carolina. Other early floods that have occurred in the region were those of March 1867 on Nantahala River at Almond, North Carolina, and of March 1875 on Little River near Walland, Tennessee.

TABLE 3

MAXIMUM KNOWN DISCHARGES ON STREAMS

IN GENERAL REGION OF CANTON-CLYDE, NORTH CAROLINA

All floods listed occurred within 60 miles of Canton-Clyde.

Map Reference No.	Stream	Location	Drainage Area sq.mi.	Date	Peak Discharge Amount cfs	Peak Discharge Per Sq. Mi. cfs
1	Pigeon River	at Crabtree, N. C.	243	August 30, 1940	32,000	132
2	Tuckasegee River	near East Laport, N. C.	200	August 30, 1940	45,000	225
3	Little River	near Walland, Tenn.	192	February -- 1875	50,000	260
4	Cheoah River	at Johnson, N. C.	177	November 19, 1906	40,000	226
5	Nantahala River	at Almond, N. C.	174	March -- 1867	20,000	115
6	Cane River	near Sioux, N. C.	157	August 13, 1940	31,800	203
7	Pigeon River	at Canton, N. C.	133	August 30, 1940	31,600	238
8	Oconaluftee River	at Cherokee, N. C.	131	May -- 1840	17,500	134
9	Swannanoa River	at Biltmore, N. C.	130	April -- 1791	40,000	308
10	French Broad River	at Calvert, N. C.	103	July 16, 1916	22,000	214
11	Broad River	near Chimney Rock, N. C.	97	August 15, 1928	26,000	268
12	Cullasaja River	at Cullasaja, N. C.	86.5	August 30, 1940	16,500	191
13	E. F. Tuckasegee River	near Tuckasegee, N. C.	80.3	August 30, 1940	30,000	374
14	South Toe River	at Newdale, N. C.	60.8	August 13, 1940	29,400	484
15	Clear Creek	near Hendersonville, N. C.	44.6	July 16, 1916	20,600	462
16	Davidson River	near Brevard, N. C.	40.4	June 15, 1876	14,000	347
17	Caney Fork	above Cowarts, N. C.	39.4	August 30, 1940	21,700	551
18	W. F. Pigeon River	at Lake Logan Dam, N. C.	32.8	August 30, 1940	14,900	454
19	N. F. Swannanoa River	near Black Mountain, N. C.	23.8	June 16, 1949	16,500	693
20	Cane River	near Pensacola, N. C.	18.1	August 13, 1940	15,000	829

Some of the greatest flood-producing storms in this region in the past have been West Indian hurricanes. Particularly significant are the hurricanes of July 1916 and mid-August 1940. The storm of July 13-17, 1916, caused record flooding along the upper French Broad River. A considerable area on the eastern French Broad watershed divide experienced over 16 inches of rain, the major portion falling in a 12-hour period on the night of July 15-16. The greatest amount of rainfall recorded in a 24-hour period in the Tennessee River Basin, 22.2 inches, occurred at Altapass, North Carolina, during this storm. The rainfall amounts decreased westward and northward across the Valley and only moderately heavy rains of 4 to 5 inches fell on the upper Pigeon River watershed.

The hurricane of mid-August 1940 produced large floods on watersheds on the eastern Tennessee Valley divide from the Blue Ridge Mountains south to the Hiwassee Basin. In a 48-hour period from August 11 to 13, rainfall amounts up to 15 inches fell in the vicinity of the Watauga River watershed causing record floods in that area. A 16-inch center of rainfall at Haywood Gap on the divide between the Pigeon and French Broad Rivers south of Canton caused the highest known flood on the East Fork Pigeon River.

The storm of late August 1940 which followed the mid-August storm by only $2\frac{1}{2}$ weeks was of the thunderstorm type with heavy rains along the Southern Appalachian Mountains of eastern Tennessee and western North Carolina. Rainfall amounts up to 13 inches occurred in a relatively narrow band along the Blue Ridge Mountains. In general, rainfall intensities at those stations receiving heavy rainfall were higher than in the mid-August storm. The upper Little Tennessee and its tributaries, the Tuckasegee and Cullasaja Rivers, which were only moderately flooded during the mid-August storm, rose to record heights during this storm. The Pigeon River at Canton which approached record flood heights in mid-August reached unprecedented stages during the late August flood. An average of over 9 inches of rain fell in Pigeon River watershed above Canton in approximately 24 hours.

The floods that are listed in Table 3 have all occurred on physically similar watersheds in the general region of Canton and Clyde.

This indicates that floods of like magnitude, modified to take into account differences in drainage area characteristics, may occur in the future on the Pigeon River at Canton and Clyde.

Pigeon River vs. Regional Flood Discharges

The flood discharges in Table 3 have been plotted on Plate 6. This chart illustrates graphically for drainage areas of various sizes the maximum flood discharges that have been experienced on streams in the Canton and Clyde region. The key map on Plate 6 shows the locations of the streams for which the discharges have been plotted and listed in Table 3. Included on Plate 6 and in Table 3 is the maximum known discharge on the Pigeon River, that for the flood of August 30, 1940.

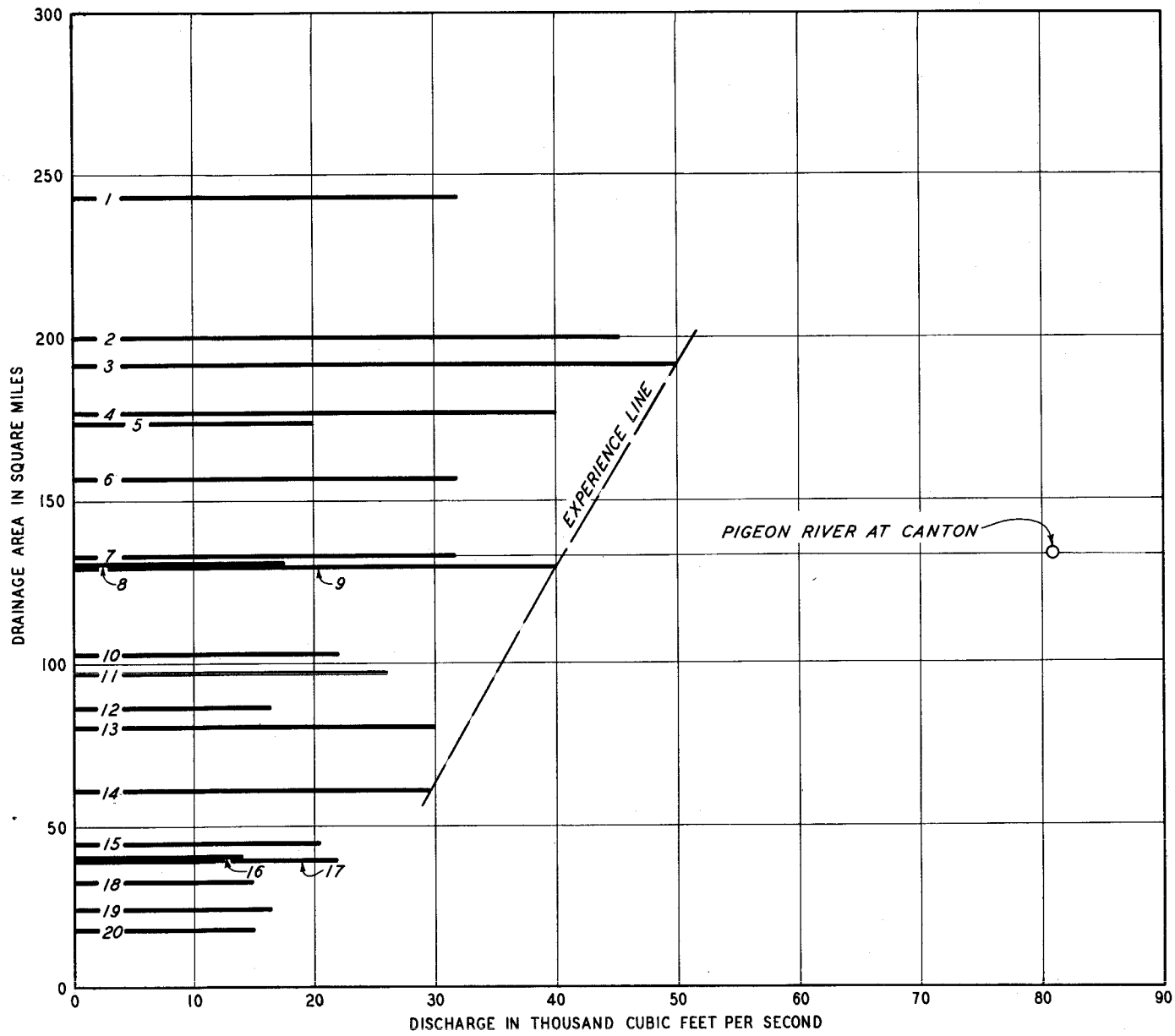
The flood of August 30, 1940, is the largest that is known to have occurred at Canton since 1810. However, comparison of this flood with others in the region indicates that more severe floods have occurred on neighboring streams. In particular, higher peak discharges in relation to the drainage area have occurred on Little River at Walland, Tennessee, in 1875 (No. 3, Table 3 and Plate 6), Swannanoa River in 1791 (No. 9), East Fork Tuckasegee River on August 30, 1940 (No. 13), and the South Toe River on August 13, 1940 (No. 14).

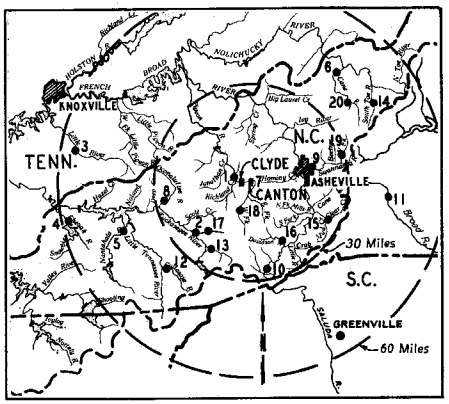
Based only on a consideration of the maximum flood discharges that are known to have been experienced on streams in the Canton-Clyde region, it is reasonable to expect future floods in the order of 41,000 cubic feet per second at Canton and 45,000 cubic feet per second at Clyde.

Flood Heights for Various Discharges

The peak discharge for the flood of June 16, 1949, in the Canton-Clyde reach of Pigeon River was over bankfull in many places and considerable flooding resulted. This high water is doubtless remembered by many people who have homes, businesses, or other interests along the Pigeon River. In order to show the height of floods greater than that of 1949, as compared to that flood at Canton and at Clyde, Table 4 has been prepared.

ASF-1311





KEY MAP

Scale 0 20 40 60 Miles

Numbers on chart refer to those on Key Map and in Table 3.

O__*Estimated Maximum Probable Flood determined by Flood Control Branch.*

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

MAXIMUM KNOWN FLOOD DISCHARGES
REGION OF CANTON-CLYDE, N.C.

FEBRUARY 1959

PLATE 6

TABLE 4

RELATIVE FLOOD HEIGHTS FOR VARIOUS DISCHARGES

PIGEON RIVER AT CANTON AND CLYDE

Date of Flood	Peak Dischage At Canton Stream Gage Cubic Feet Per Second	At Canton Mile 64.1 Feet Above 1949 Flood	At Clyde Mile 57.65 Feet Above 1949 Flood
June 16, 1949	19,500	0	0
August 30, 1940	31,600	5.3	4.0
--	41,000	9.1	6.8
--	60,000	12.7	11.6
Maximum Probable Flood	81,000	16.7	16.3

The elevations of floods at Canton and Clyde greater than that of 1949 are shown by ticks on the profile, Plate 9, at Mile 64.1 and Mile 57.65.

Acknowledgments

This section of the report has been prepared by personnel of the Hydraulic Data Branch, Division of Water Control Planning, under the general direction of Reed A. Elliot, Chief Water Control Planning Engineer, and the immediate supervision of Albert S. Fry, Chief, Hydraulic Data Branch. Flood studies and preparation of this section of the report were made under the direction of Willard M. Snyder, Head of the Hydrology Section, by Roger P. Betson.

III.

MAXIMUM PROBABLE FLOOD

Tennessee Valley Authority
Division of Water Control Planning
Flood Control Branch

III.

MAXIMUM PROBABLE FLOOD

The preceding sections have told about the floods that have already occurred on the Pigeon River in the vicinity of Canton and Clyde and of large floods that have occurred on other streams close to those communities. This section describes the basis for the Maximum Probable Flood that may reasonably be expected and discusses the extent of the flood plain that would be affected by this flood. Floods of this magnitude are of the kind considered in planning the design and operation of protective works, the failure of which might be disastrous.

Extreme floods on Pigeon River in the vicinity of Canton and Clyde, where the drainage areas are 133 and 162 square miles, respectively, can occur as a result of various combinations of meteorologic and hydrologic events. Large floods have resulted from winter storms of fairly long duration when infiltration and other losses are small and, in one case, when snow was a contributing factor. The largest floods have resulted from intense storms of the cloudburst or hurricane type occurring in the summer or early fall when loss rates are high.

DETERMINATION OF MAXIMUM PROBABLE FLOOD

In determining the Maximum Probable Flood on the Pigeon River, consideration was given to great storms and floods that have already occurred in the Pigeon River watershed and to those which have occurred elsewhere but could have occurred in this area. This procedure helps to overcome the lack of hydrologic data in the relatively short period for which dependable records are available.

Section I stated that the maximum known flood on Pigeon River occurred on August 30, 1940. Peak discharge for this flood is estimated

to have been 31,600 cubic feet per second at the Canton stream gage. It is reasonable to expect that greater floods than that of 1940 will occur on the Pigeon River.

Observed Storms

The watershed of the Pigeon River is unusual from a meteorological standpoint in that it is divided by the Appalachian Mountains. These mountains have prevented major storms from centering over the entire watershed. Storms center on the east or west side of the mountains, depending upon their source. The major portion of this watershed is to the east of the mountains. Consequently, it was assumed that critical storms will occur there.

Observed storms are meteorologically transposable to the Pigeon River watershed from within a broad region extending generally from the Atlantic Ocean to the Appalachian Divide and from Florida through Pennsylvania. The moisture source for storms in this region is the warm, moist air flowing northward from the tropical Atlantic Ocean. In general, the moisture potential for a given region decreases with its distance from the moisture source. When transferring storms within the broad region to the Pigeon River watershed, appropriate adjustments were made for differences in this moisture potential and for the elevation of the surrounding mountain barrier.

Table 5 lists known rainfall depths for several large storms transposable to the Pigeon River watershed.

TABLE 5

SELECTED MAXIMUM OBSERVED STORMS

Date	Location	Rainfall Depth on 133 Sq. Mi. in 6 Hours inches
July 1916	North Carolina	7.1
August 1939	New Jersey	8.9
October 1941	Florida	10.2
September 1940	New Jersey	16.5

On the basis of these and other data, a rainstorm of 11.4 inches in 6 hours was adopted for computing the Maximum Probable Flood on the Pigeon River at Canton-Clyde. The unit hydrograph technique, with appropriate watershed factors, was used in this computation.

Storms greater than that which would produce the Maximum Probable Flood can occur. The storm considered to be the greatest from a meteorological standpoint would be approximately twice the storm adopted for the Maximum Probable Flood.

Observed Floods

When considering peak discharges on other streams, factors such as the meteorology of the region and flood-producing characteristics of the watershed were given consideration in determining whether their application to the Pigeon River would be appropriate. In addition to the floods listed in Table 3 of Section II, the following Table 6 lists peak discharges for observed floods on several streams of approximately the size of the Pigeon River. For comparison the discharge of the maximum known flood on the Pigeon River at Canton is listed.

TABLE 6

SELECTED MAXIMUM OBSERVED FLOODS

(Streams listed are approximately the size of the Pigeon River at Canton-Clyde.)

Stream	Location	Drainage Area	Date	Peak Discharge	
				Amount	Per Sq. Mi.
		sq.mi.		cfs	cfs
Elk Creek	Elkville, N. C.	50	1940	70,000	1,400
Linville River	Branch, N. C.	65	1940	39,500	608
Wilson Creek	Adako, N. C.	66	1940	99,000	1,500
Johns River	Collettsville, N. C.	69.1	1940	31,000	450
Warrior Fork	Morganton, N. C.	80.5	1940	38,000	470
Watauga River	Near Sugar Grove, N. C.	90.8	1940	50,800	560
Mud Creek	Naples, N. C.	109	1916	40,000	367
Tuckasegee River	Tuckasegee, N. C.	143	1940	40,800	285
Catawba River	Marion, N. C.	170	1940	71,000	418
S.F. New River	Jefferson, N. C.	207	1940	52,800	256
N.F. New River	Crumpler, N. C.	277	1940	79,400	287
Pigeon River	Canton, N. C.	133	1940	31,600	238

Maximum Probable Flood Discharges

From consideration of the flood discharges in Table 6 and of the transposition to the Canton-Clyde area of outstanding storms which have occurred elsewhere but can occur over the Pigeon River watershed, the peak discharge of the Maximum Probable Flood for this stream at the Canton gage was determined to be 81,000 cubic feet per second. The same rate was used at Clyde, downstream, because the reducing effect on the flood wave in traveling from Clyde to Canton would neutralize the additional inflow which enters from the small drainage area between these places. This peak rate of discharge is about two and one-half times that of the presently known maximum flood of August 30, 1940.

Frequency

The frequency of a flood of the magnitude of the Maximum Probable Flood is not susceptible of definite determination. Such a flood would occur on the average only at rather long intervals of time, but it could occur in any year.

Possible Larger Floods

Floods larger than any of those discussed are hydrologically possible. However, the combination of factors that would be necessary to produce such floods would occur at rare intervals, if at all. The consideration of floods of this magnitude is of greater importance in some flood problems than in others and should not be overlooked in the study of any flood problem. Such floods, because of their extreme rarity and uncertainty of occurrence on a given watershed, need be considered only where dependence is placed on protective works, the failure of which would cause loss of life or destruction of valuable property.

FLOOD HEIGHTS AND VELOCITIES

Flood Crest Profiles and Overflow Areas

The crest profiles computed for the Maximum Probable Flood on the Pigeon River in the vicinity of Canton and Clyde are shown on Plate 9.

They were computed using stream characteristics for selected reaches as determined from valley cross sections and observed flood profiles. They are based on channel conditions existing in 1958. The height of the Pigeon River Maximum Probable Flood profile above elevations already experienced varies between 8 and 14 feet. The height that would be reached by a Maximum Probable Flood at several locations in Canton and in Clyde is shown in Figures 6 through 11.

It is impossible to foretell the destructive effect of velocities such as those described in the succeeding paragraph of this report, "Velocities and Rates of Rise," on bridges over the stream and other nearby structures. In computing the profile of the Maximum Probable Flood there was no choice but to assume the survival of all structures. No clogging was assumed at bridges.

The elevations shown on Plate 9 and the overflow areas shown on Plate 7 have been determined as accurately as possible consistent with the basic data, but actual elevations may vary from those shown on the profile and map. The standard contour interval of the map permits only an approximate plotting of the boundaries of the flooded area. To determine flood elevations and limits with a higher degree of accuracy would require costly surveys and studies that are not warranted.

Velocities and Rates of Rise

During the Maximum Probable Flood, velocities in the main channel of Pigeon River would range from about 6 to more than 20 feet per second. In the overflow area, velocities would range from 2 to 7 feet per second. The greatest channel velocities would occur at the constricted channel sections at Mile 62.1 and Mile 65.0. The greatest overbank velocity would occur in the reach near Mile 59.5 where the overflow area is a smooth open field.

The Maximum Probable Flood on the Pigeon River at the Canton stream gage, Mile 64.1, would rise about 32 feet above low water to its crest stage in about 8 hours. The maximum rate of rise would be about 12 feet in 2 hours.

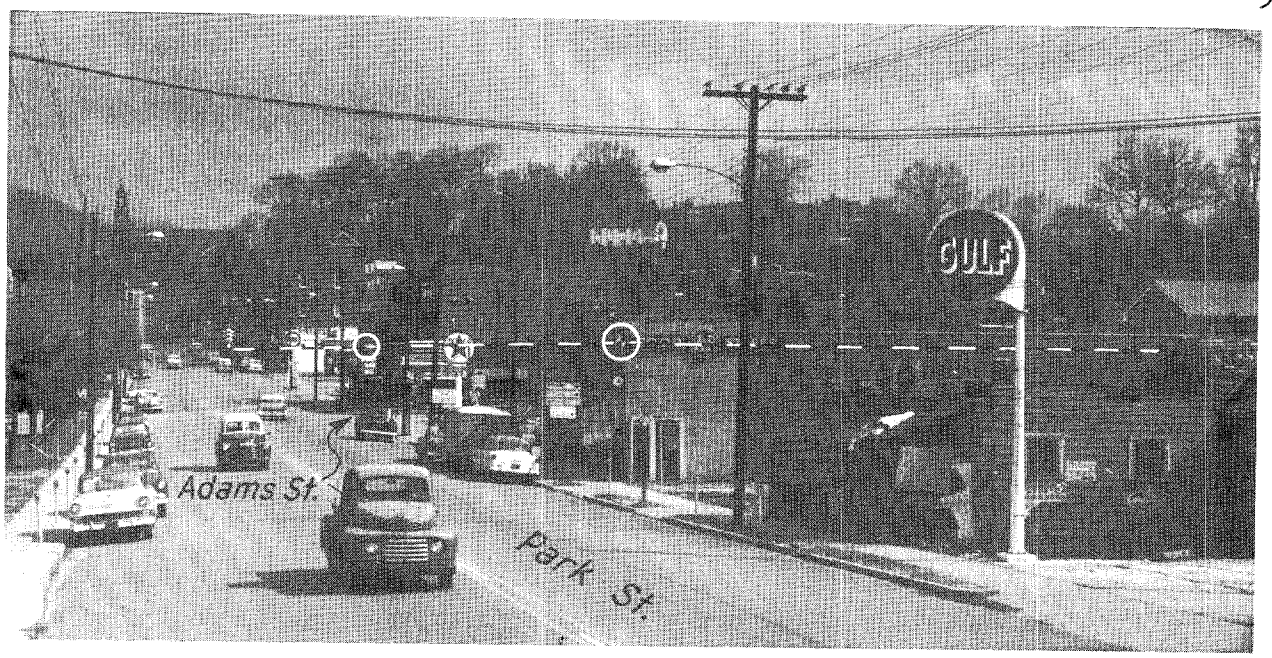


Figure 6.--PARK STREET, CANTON, COULD BE DEEPLY FLOODED

This view east from Pigeon River bridge along U. S. Highways 19 & 23 (Park Street) shows the depth to which the Maximum Probable Flood could inundate this part of Canton. The rod targets indicating the height of such a flood are in the centers of the white circles on photograph.

(Figures 6 through 11 courtesy of Mr. James M. Deaton, The Champion Paper and Fibre Company)

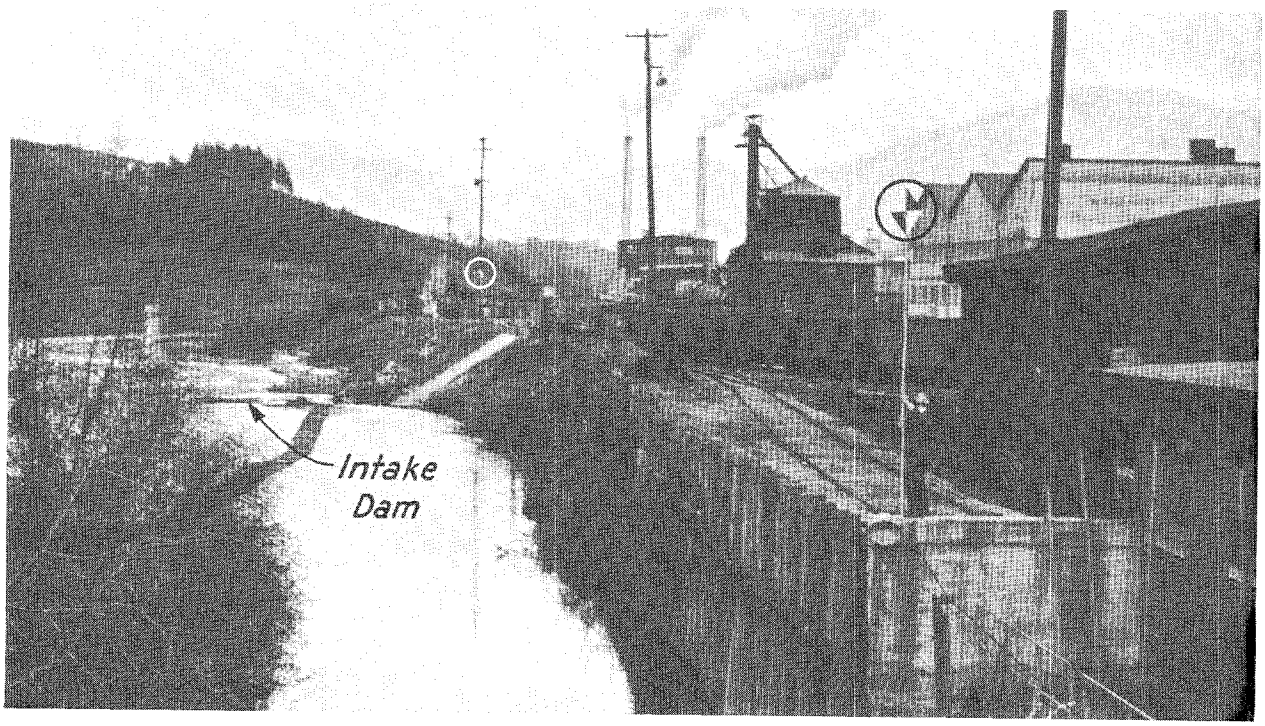


Figure 7.--WATERFRONT OF THE CHAMPION PAPER AND FIBRE COMPANY

Downstream from the Southern Railway bridge, the height of the Maximum Probable Flood would range from 12 to 10 feet above the spur tracks, as shown by the rod targets. The levee built along the right bank after the 1940 floods can be seen in left center of photograph.

Figure 8.--WATER STREET, CANTON, IS WELL NAMED

View east from riverbank along Water Street from the end, toward intersection of Main Street in background. Camera was about 5 feet below the level of the Maximum Probable Flood, which is indicated by encircled targets.

Figure 9.--CEILINGS IN FIBREVILLE COULD BE SUBMERGED

Northbound view of Fibreville Street at intersection of Terrace Road. The Maximum Probable Flood level, which is about 5 feet above the edges of these porch roofs, is shown by the targets. The distant target is just beyond Avenue A.

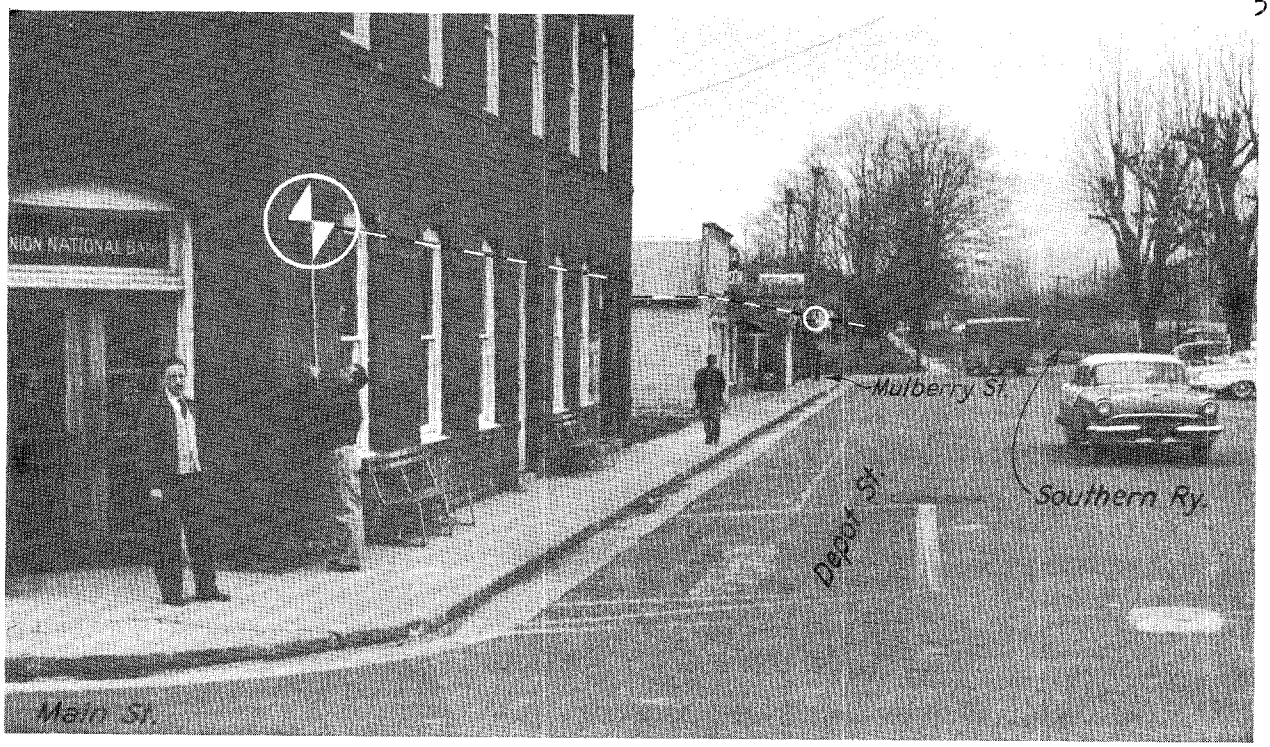


Figure 10.--DEPOT STREET IN CLYDE, LOOKING EAST

Height of the Maximum Probable Flood at Clyde is shown by the line connecting the rod targets. The town offices and the fire station are at the end of the block near the distant rod.

Figure 11.--PIGEON RIVER FLOWS BETWEEN CLYDE SCHOOL AND ITS GYMNASIUM

These school buildings are accessible from each other by a footbridge concealed in background. Maximum Probable Flood lines are drawn through rod targets encircled in white against the gymnasium, across the river, and in black against the schoolhouse.

Deep, moving flood water in the overflow areas is most likely to affect people and buildings. Moderate stream velocities in combination with rapid rate of rise and deep flow would create a hazardous situation. Even low velocities combined with the buoyancy of deep flooding can be destructive.

ACKNOWLEDGMENTS

This section was prepared by the Flood Control Branch of the Division of Water Control Planning under the general direction of Reed A. Elliot, Chief Water Control Planning Engineer, and the immediate direction of Edward J. Rutter, Chief, Flood Control Branch. Basic hydraulic data were furnished by the Hydraulic Data Branch. Flood studies were under the supervision of B. J. Buehler, Head, Operation Studies Section. The flood discharges were determined by Donald W. Newton and the profiles were computed by Logan A. Gillett and Bevan W. Brown, Jr.

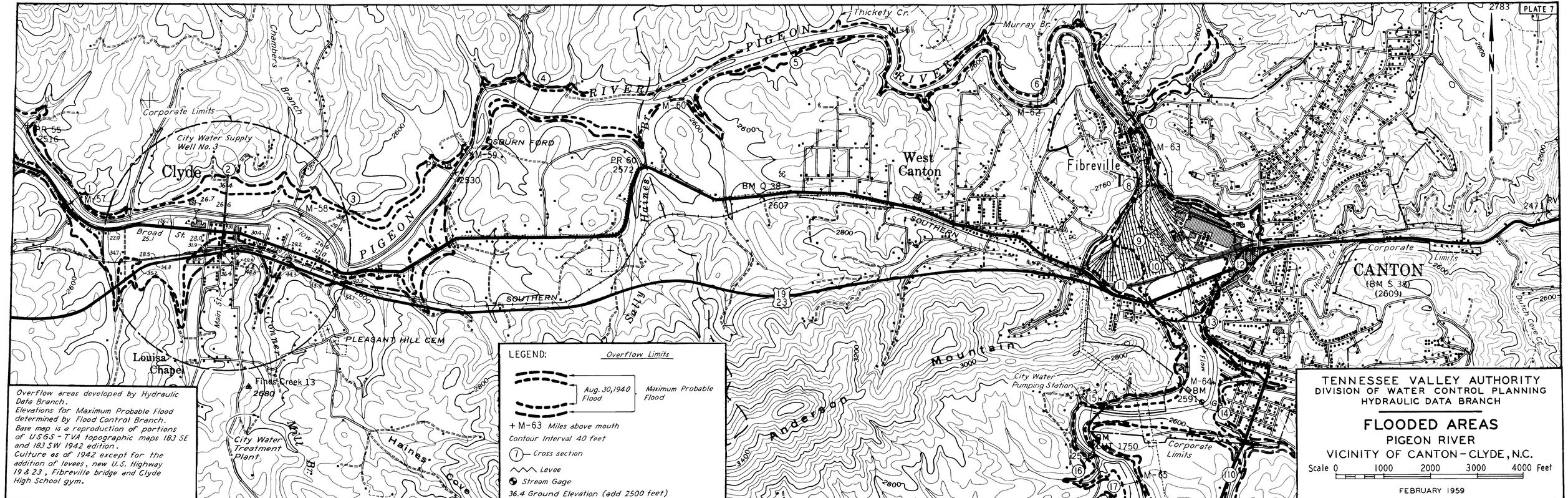
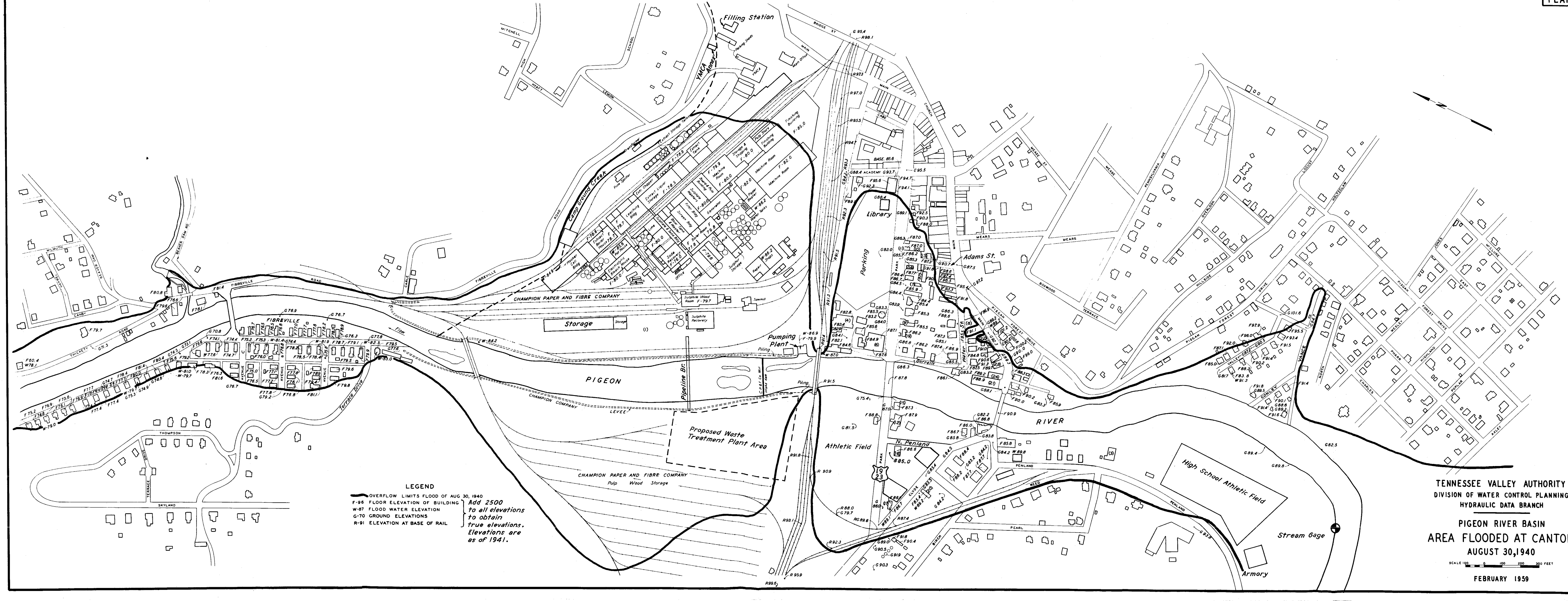


PLATE 7
2783
2471 RM
PIGEON RIVER
Thickety Cr.
Murray Br.
Chambers Branch
Corporate Limits
City Water Supply Well No. 3
PR 55
2516
Clyde
M-57
M-58
M-59
M-60
M-62
M-63
M-64
M-65
PR 59
2530
PR 60
2572
OSBURN FORD
Haines Br.
BM Q 38
2607
West Canton
Fibreville
Campground Br.
Hominy Cr.
CANTON
(BM S 38)
(2609)
Corporate Limits
Dutch Cove Cr.
SOUTHERN
19
23
Broad St.
Flow
Main St.
Conner
Louisa Chapel
PLEASANT HILL CEM
Fines Creek 13
2680
City Water Treatment Plant
Mill Br.
Haines Cove
Sally
Mountain
Anderson
City Water Pumping Station
BM
2591
BM
MT 1750
2516
Corporate Limits
Overflow areas developed by Hydraulic Data Branch.
Elevations for Maximum Probable Flood determined by Flood Control Branch.
Base map is a reproduction of portions of U.S.G.S. - T.V.A. topographic maps 183 SE and 183 SW 1942 edition.
Culture as of 1942 except for the addition of levees, new U.S. Highway 19 & 23, Fibreville bridge and Clyde High School gym.
LEGEND:
Overflow Limits
Aug. 30, 1940 Flood
Maximum Probable Flood
+M-63 Miles above mouth
Contour Interval 40 feet
(7) Cross section
Levee
Stream Gage
36.4 Ground Elevation (add 2500 feet)
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH
FLOODED AREAS
PIGEON RIVER
VICINITY OF CANTON - CLYDE, N.C.
Scale 0 1000 2000 3000 4000 Feet
FEBRUARY 1959

ASF-1311

PLATE 8



LEGEND

- OVERFLOW LIMITS FLOOD OF AUG 30, 1940
- F-96 FLOOR ELEVATION OF BUILDING
- W-87 FLOOD WATER ELEVATION
- G-70 GROUND ELEVATIONS
- R-91 ELEVATION AT BASE OF RAIL

Add 2500 to all elevations to obtain true elevations. Elevations are as of 1941.

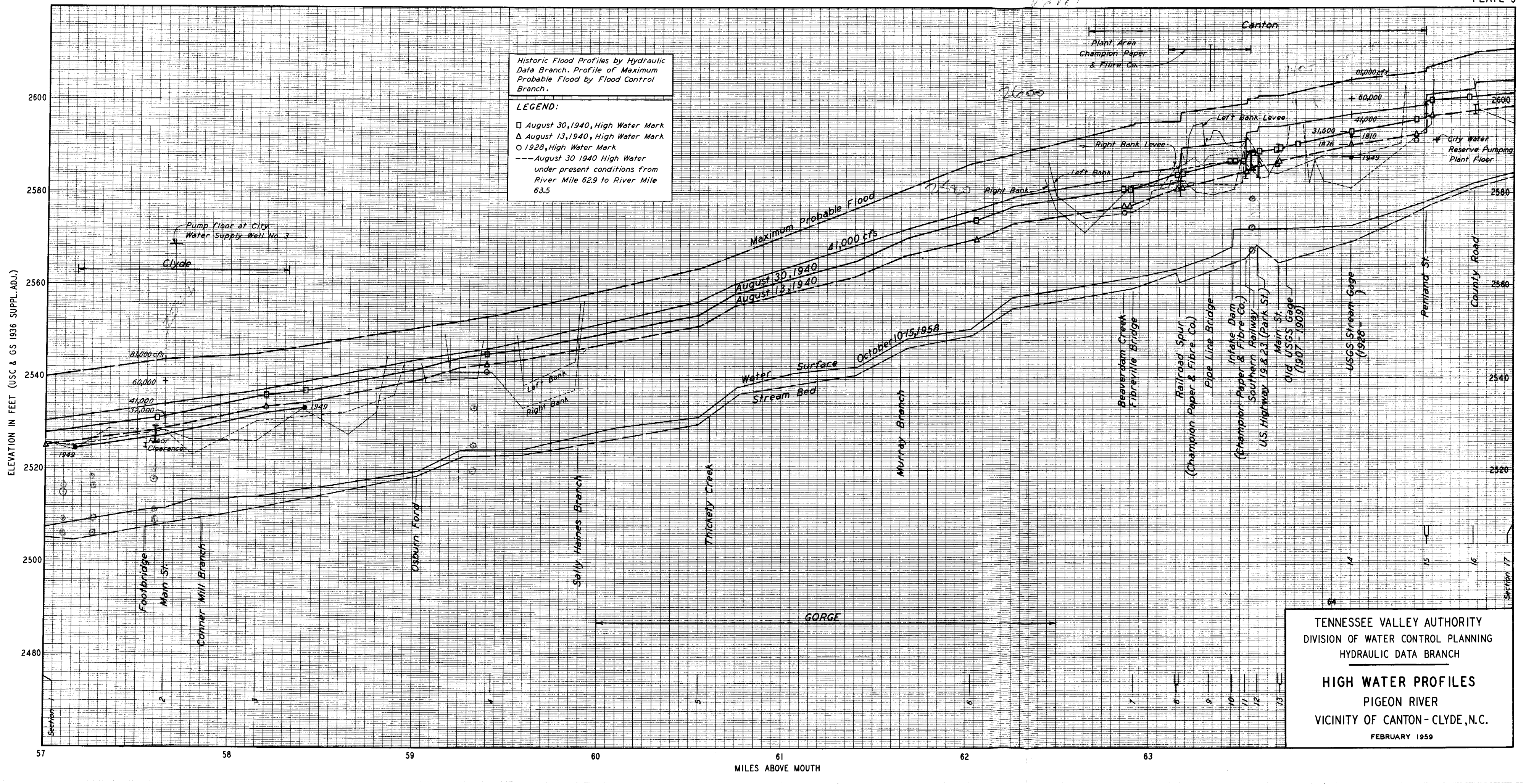
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

PIGEON RIVER BASIN
AREA FLOODED AT CANTON
AUGUST 30, 1940

SCALE 100 0 100 200 300 FEET

FEBRUARY 1959

PLATE 9



TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

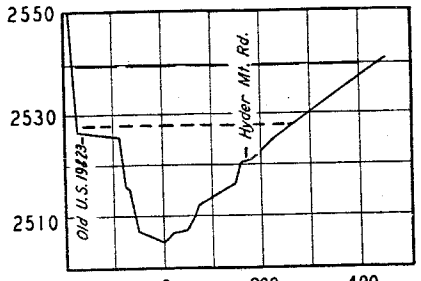
HIGH WATER PROFILES

PIGEON RIVER
VICINITY OF CANTON - CLYDE, N.C.

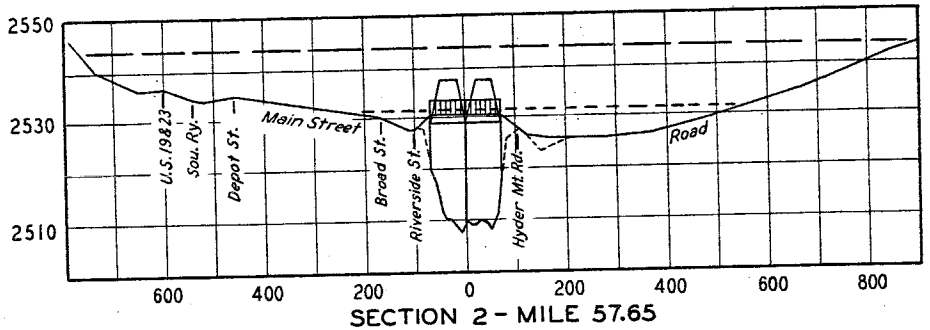
FEBRUARY 1959

ASF-1311

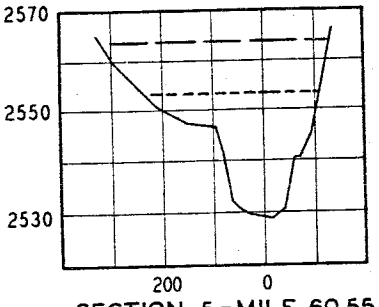
ASF-1311



SECTION 1 - MILE 57.00

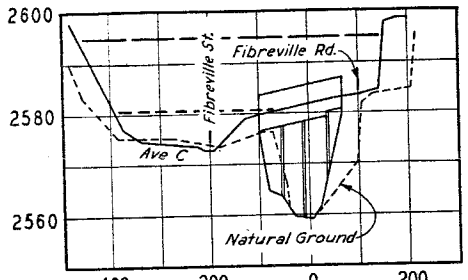


SECTION 2 - MILE 57.65

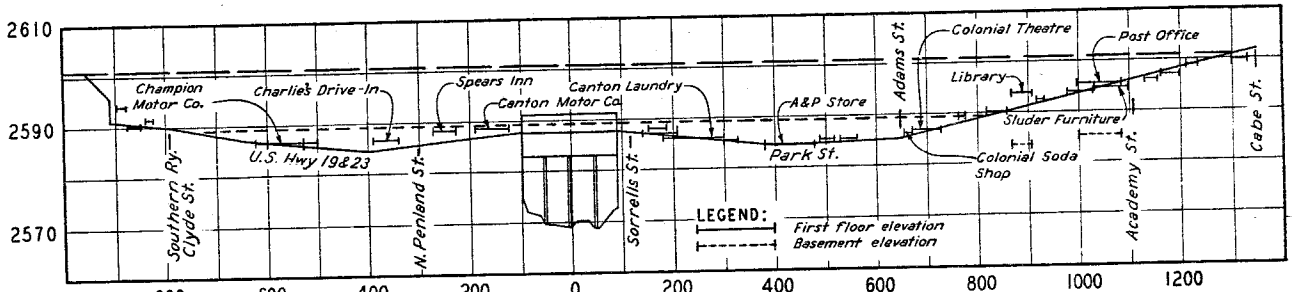


SECTION 5 - MILE 60.55

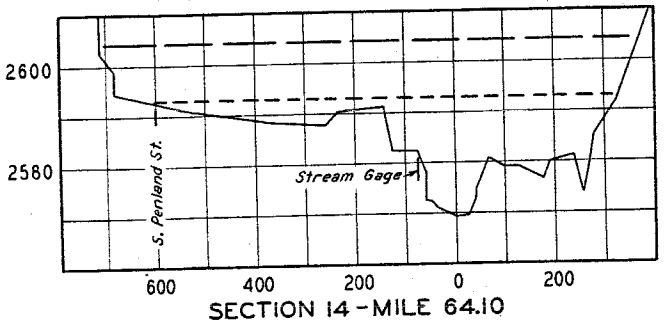
ELEVATION IN FEET (USC & GS 1936 SUPPL. ADJ.)



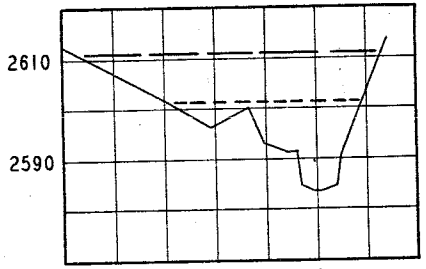
SECTION 7 - MILE 62.92



SECTION 12 - MILE 63.59



SECTION 14 - MILE 64.10



SECTION 17 - MILE 65.00

LEGEND:

——— Maximum Probable Flood

- - - - - - - August 30,1940 Flood

Sections taken looking downstream.

10 sections not shown.

Elevations of Maximum Probable Flood determined by Flood Control Branch.

Sections and August 30,1940 Flood elevations by Hydraulic Data Branch.

HORIZONTAL DISTANCE IN FEET

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

VALLEY CROSS SECTIONS

PIGEON RIVER
VICINITY OF CANTON - CLYDE, N.C.
FEBRUARY 1959

PLATE 10