TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

FLOODS ON OCONALUFTEE AND TUCKASEGEE RIVERS AND SOCO CREEK IN VICINITY OF CHEROKEE NORTH CAROLINA

Edition of May 1957

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

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REPORT NO. 0-5526

KNOXVILLE TENNESSEE

CONTENTS

Preface i

I. Flood Histories

Tuckasegee River

Summary of Flood History 2
Tuckasegee River Basin 3
Settlement 3
The River and Its Valley 3
Bridges Across the River 4
Flood Data 6
Flood Records 6
Flood Stages and Discharges 6
Flood Occurrences 9
Hydrograph of August 1940 Flood 9
Flooded Area 9
Flood Profiles 10
Flood Descriptions 10

Oconaluftee River

Summary of Flood History 14
Oconaluftee River Basin 15
Settlement 15
The River and Its Valley 16
Bridges Across the River 17
Development of Tourist Facilities 18
Flood Data 18
Flood Records 18
Flood Stages and Discharges 19
Flood Occurrences 19
Hydrograph of January 1946 flood 19
Flooded Area 21
Flood Profiles 21
Valley Cross Sections 21
Flood Descriptions 21

CONTENTS--(Continued)

Soco Creek

Summary of Flood History 23
Soco Creek Basin 24
Settlement 24
The Creek and Its Valley 25
Development of Tourist Facilities 26
Bridges Across the Creek 26
Flood Data 26
Flood Records 26
Flooded Area 28
Flood Profiles 28
Valley Cross Sections 28
Flood Descriptions 28
Acknowledgments 31

II. Maximum Flood of Reasonable Regional Expectancy

Determination of Peak Discharge and Elevations 33
Crest Profiles and Overflow Areas 35
Velocities 36
Frequency 37
Larger Floods Possible 37
Acknowledgments 37

TABLES

Table		
1	Bridge Data Tuckasegee River Miles 12 to 21	5
2	Flood Crest Elevations and Discharges Above Bankfull Stage Tuckasegee River at Bryson City	7
3	Oconaluftee River Bridge Data Miles 0.0 to 10.7	17

TABLES--(Continued)

Table		
4	Flood Crest Elevations and Discharges Oconaluftee River at Cherokee	20
5	Soco Creek Bridge Data Miles 0 to 6.6	27
6	Flood Discharges of Comparable Regional Streams	34

PLATES

Plate		Following Page
1	Watershed of Tuckasegee River	3
2	Floods of Bankfull Stage on Tuckasegee River	9
3	Stage Hydrograph--Flood of late August 1940 on Tuckasegee River	9
4	Flooded Areas--Tuckasegee River	37
5	High Water Profiles, Tuckasegee River	37
6	Floods of Bankfull Stage on Oconaluftee River	20
7	Stage Hydrograph--Flood of January 1946 on Oconaluftee River	20
8	Flooded Areas--Oconaluftee River	37
9	High Water Profiles, Oconaluftee River	37
10	Valley Cross Sections on Oconaluftee River and Soco Creek	37
11	Flooded Areas on Soco Creek	37
12	High Water Profiles, Soco Creek	37

FIGURES

Figure		
1	Late August 1940 Flood at Whittier, North Carolina	12
2	Highway Flooded at Ela in 1940	12
3	Bryson City Business District Flooded	13
4	Everett Street in Bryson City in 1940	13
5	Soco Creek Scours Church Yard in 1953	32
6	Flood Water Lacked a Few Inches of Entering Church	32

PREFACE

Tennessee Valley Authority
Division of Water Control Planning

PREFACE

This is a report on the flood situation along the Tuckasegee and Oconaluftee Rivers and Soco Creek in the vicinity of Cherokee, North Carolina, with particular reference to the portions of these streams that lie within and near the Cherokee Indian Reservation. 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 resource operations throughout the Tennessee Valley. TVA has assembled information on rainfall, runoff, 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 Department of City and Regional Planning of the University of North Carolina. Interest has also been shown in this situation by the Cherokee Historical Association.

Large floods have occurred on the three streams covered by this report during the last 100 or more years, but no single flood is highest on all three streams. On the Tuckasegee River the greatest known flood was that of May 1840. The flood of November 1906 was the highest in the memory of present residents on the Oconaluftee River and also on its tributary, Soco Creek. On the latter stream a flood in March 1913 was practically the same as that of 1906. However, based on the flood experience of other streams and on the magnitude of flood producing storms that might occur on the watersheds of the Tuckasegee and Oconaluftee Rivers and Soco Creek, even greater floods than those known to have occurred in the past may be expected on the three streams in the Cherokee vicinity. Such a flood on

the Tuckasegee River might be 6 to 8 feet higher than the 1840 flood. On the Oconaluftee River and Soco Creek floods might be some 8 to 15 feet higher than those of 1906. Floods of these great magnitudes would be of rare occurrence. However, the possibility of the occurrence of such floods does not preclude the use of the flood plain lands but emphasizes that this should be given appropriate consideration in planning the utilization and development of the flood plain lands.

This report is in two parts--(1) the histories of floods of the past on each of the three streams, the Tuckasegee River, the Oconaluftee River, and Soco Creek, and (2) a discussion of the maximum floods that can reasonably be expected to occur in the future on these streams.

The flood history section of the report brings together as complete a record as possible of past floods on the three streams. Profiles of the largest known floods for which data were available, those of 1840 on the Tuckasegee River, 1906 on Oconaluftee River, and March 1913 on Soco Creek, are presented together with profiles of more recent floods. Maps show the areas actually inundated by known floods. These data are essential to a proper evaluation of the maximum floods of reasonable regional expectancy which are discussed in the second section.

The second section of the report relates to the maximum floods of reasonable regional expectancy. The determination of the maximum floods that may reasonably be expected to occur on the streams in the Cherokee vicinity is based on studies of large storms and large floods that have actually been experienced in the general region of Cherokee, together with those that have occurred outside this locality but which might possibly be transplanted to the Cherokee region. Profiles of the maximum floods of reasonable regional expectancy on the three streams are shown in this report and the areas that these great floods would cover are shown on the maps.

The report does not include plans for the solution of flood problems. Rather, it is intended to provide a basis for further study and planning in arriving at solutions to minimize vulnerability to floods which may involve (1) construction of flood protection works, (2) local planning programs to guide developments by controlling the type of use

made of the flood plain through zoning and subdivision regulations, or (3) combination of the two approaches.

The information given in the report should be useful in planning new developments in the flood plains. The maps in the report show the extent of the flooded areas and the profiles show elevations of high water for locations on the three streams in the Cherokee vicinity. Elevations of the ground are shown by contours on the maps. The accompanying cross sections also show ground elevations along Oconaluftee River and Soco Creek. From these the depth of probable flooding 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 a full recognition of the chance of flooding that is being taken. Probably most large developments will have site maps made by private engineering firms. Such maps would show ground elevations in considerably greater detail than do the 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.

Acknowledgment is made of the assistance of many local people who furnished information regarding floods of the past.

I.

FLOOD HISTORIES

OF

TUCKASEGEE AND OCONALUFTEE RIVERS AND SOCO CREEK

IN VICINITY OF

CHEROKEE, NORTH CAROLINA

TO

MAY 1, 1957

Tennessee Valley Authority
Division of Water Control Planning
Hydraulic Data Branch

I.

FLOOD HISTORIES

This report covers investigations of floods that have occurred in the Tuckasegee River watershed in the vicinity of Cherokee in Swain and Jackson Counties, North Carolina. The streams and reaches investigated were the following:

Tuckasegee River from Bryson City to Whittier, North Carolina, a distance of 9 river miles.

Oconaluftee River from the mouth to Ravensford, North Carolina, a distance of 10.6 river miles.

Soco Creek from the mouth to mile 6.6

Plate 1 shows the watershed of the Tuckasegee River which is the principal tributary of the Little Tennessee River. The Oconaluftee River flows into the Tuckasegee River 4 miles upstream from Bryson City. Soco Creek is a tributary of the Oconaluftee River, entering that stream 5.5 miles above the mouth near the town of Cherokee, North Carolina.

This report discusses separately the flood history of each of these three streams, with special reference to the occurrence of floods within the boundaries of the Cherokee Indian Reservation which adjoins the three streams.

TUCKASEGEE RIVER

Floods on the Tuckasegee River were investigated in the reach extending from Bryson City to Whittier, North Carolina, a distance of 9 river miles.

The U. S. Geological Survey has maintained records of river stages and discharges at Bryson City since July 1896. Field engineers of the Hydraulic Data Branch of TVA in 1937 and 1938 made a search for flood history information on the Little Tennessee River and its major tributaries, including the Tuckasegee River. The search on the Tuckasegee River covered the river from the mouth to the confluence of the East and West Forks at the community of Tuckasegee, North Carolina, a distance of 49 river miles. Field investigations were made following the floods of August 13 and August 30, 1940, and reports of these investigations contain data on this reach of Tuckasegee River. Several other flood investigations made in the last 20 years have been reviewed for data.

SUMMARY OF FLOOD HISTORY

1. The flood of May 1840 was the highest known on Tuckasegee River. A story which has been handed down by the Cherokee Indians tells of a great flood which occurred in the 17th century but no support was found for this legend.

2. Floods in March 1867 and June 1876 were about 3 feet lower than the 1840 flood at Bryson City.

3. The greatest flood in recent years on the Tuckasegee River occurred on August 30, 1940. In the reach covered by this investigation the 1940 flood was 4 to 5 feet lower than the 1840 flood but was the highest in the period since records of streamflow began in 1896.

4. Floods have been most frequent on Tuckasegee River in the months of December through March, but high floods have occurred in all months of the year except July.

5. Large floods cause heavy damage to roads and bridges and to the homes and commercial establishments which have been built on the flood plain. Overflow begins at a stage of 9 feet at the Bryson City gage and becomes general at 12 feet.

6. Four highway bridges and a railroad bridge cross the river in the reach investigated. All except the railroad bridge would be

overtopped by a recurrence of the 1840 flood. Steel truss bridges at Ela and Whittier, both washed out in 1940, have been replaced at elevations lower than the crest level of an 1840 flood.

TUCKASEGEE RIVER BASIN

Settlement

The Tuckasegee River basin is composed of a part of Swain County and all of Jackson County, North Carolina. Cherokee Indians were in possession of the basin when DeSoto passed through it in 1540. The first white settlement was made on Scott Creek in Jackson County in 1790.

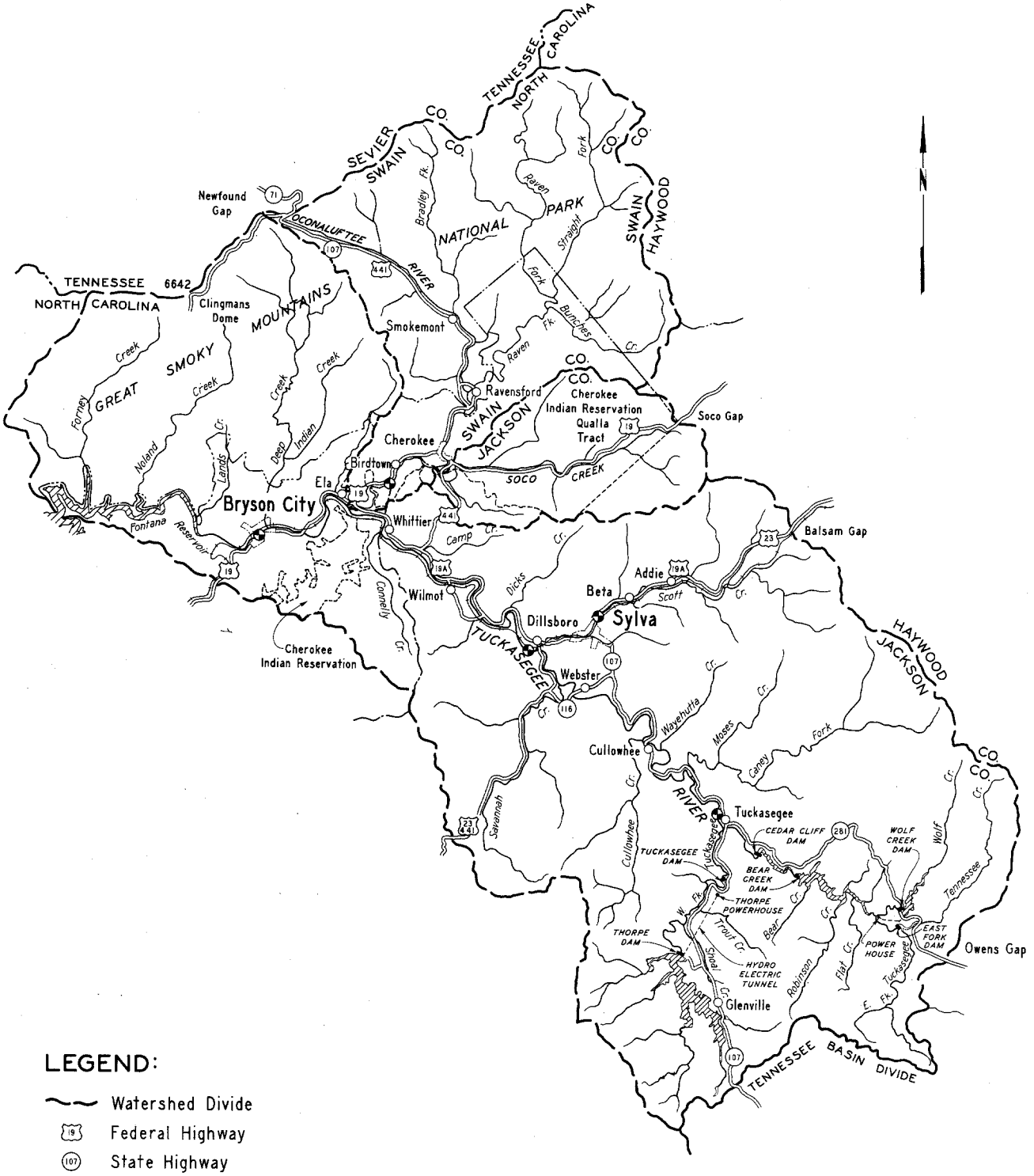
Jackson County was formed in 1851 and named in honor of Andrew Jackson. Swain County was formed in 1871 from a part of Jackson and a part of Macon County, with the county seat at Bryson City.

The River and Its Valley

The Tuckasegee River watershed, shown on Plate 1, has a total drainage area of 734 square miles. The river, which is the largest tributary of Little Tennessee River, has its origin in the Blue Ridge about 20 miles northeast of the source of the Little Tennessee River. From the Blue Ridge the Tuckasegee River flows northwest to Whittier then west to where it joins with the Little Tennessee 10 miles west of Bryson City, at an elevation of 1450 feet above mean sea level. The reservoir impounded by Fontana Dam, built by the TVA in 1942-1945 on Little Tennessee River 16 miles downstream from the mouth of Tuckasegee River, has a normal maximum pool elevation of 1710 and backs up to mile 12 at the lower end of Bryson City. Above Bryson City the drainage area is 655 square miles and above the confluence with Oconaluftee River, at mile 18.3, the drainage area is 401 square miles.

Tuckasegee River is formed by the confluence of the West Fork and East Fork Tuckasegee River at Tuckasegee, North Carolina. West Fork drains 57.8 square miles and heads against the Blue Ridge on the south and the Cowee Mountains on the west. East Fork, with 83.4 square miles of drainage area, heads on the Blue Ridge and on Tennessee Ridge.

PLATE I



LEGEND:

- Watershed Divide
- Federal Highway
- State Highway
- Great Smoky Mountains National Park Boundary
- Indian Reservation Boundary
- Recording Stream Gage

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HYDRAULIC DATA BRANCH

TUCKASEGEE RIVER WATERSHED

Scale 0 2 4 6 8 10 Miles

MARCH 1956

ASF-1311

Elevations around the rim of the basin in general range from 4000 to 5600 feet. Flow from both forks is affected by storage and releases at power dams operated by the Nantahala Power and Light Company. On the West Fork, Thorpe Dam and powerhouse, completed in 1941, develops 1200 feet of head at normal pool level and has 67,000 acre-feet of useful storage. The Tuckasegee project just downstream develops another 120 feet of head. On the East Fork three projects, put in operation in the period 1952 to 1955, develop a total head of more than 900 feet but have relatively little storage.

From Tuckasegee downstream, the fall of the river is quite uniform, averaging 11.5 feet per mile from that point to Bryson City, a distance of 37 river miles. Over the 9-mile reach covered by this investigation the fall is 13 feet per mile. The flood plain varies in width. Through Whittier it is 1000 feet wide. From just below Whittier to the mouth of Oconaluftee River, a distance of 2 miles, the banks rise steeply from the normal water edge. For the $3\frac{1}{2}$ miles from Oconaluftee River to the U. S. Highway 19 bridge at mile 14.7, the flood plain is 1200 to 3000 feet in width with the widest section just below Governors Island at mile 16. From mile 14.7 to the upper end of Bryson City the banks are again steep. The business section of Bryson City is built on a short reach of flood plain which is about 2000 feet wide.

A Federal highway and a railroad follow Tuckasegee River through the reach covered by this investigation. U. S. Highway 19 is located on the left bank through Bryson City and to mile 14.7, then on the right bank to Oconaluftee River above Ela. U. S. Highway 19A runs from Highway 19 near Ela along the right bank of Tuckasegee River through Whittier to Dillsboro and Sylva. The Murphy Branch of the Southern Railway follows the right bank from Bryson City to mile 17 below Ela, then the left bank through Whittier to Dillsboro. The railroad and the highway are on opposite sides of the river except through the wide flood plain from mile 14.7 to mile 17, where both follow the right bank.

Bridges Across the River

Four highway bridges and a railroad bridge cross Tuckasegee River in the reach investigated. Data on these bridges are given in Table 1.

The concrete arch bridge built in 1919-1920 at Bryson City has a floor level 1 foot under the 1840 flood elevation and about 2 feet above the 1940 flood. The U. S. Highway 19 bridge, also a concrete arch bridge built in 1919-1920, has a floor level just under the 1940 flood and 3 feet under the 1840 crest. Both have sides which are solid above the arch openings. Highway 19 bridge was altered in 1954 to widen the roadway and provide a walkway on the downstream side. Steel truss bridges at Ela and at Whittier were both washed out in 1940. They were replaced after the flood to the same elevation. The Southern Railway bridge at mile 16.97 has one steel truss span, five plate girder spans and 340 feet of timber trestle. Top of rail is 2.1 feet over the 1840 flood level at that point.

TABLE 1

BRIDGE DATA

TUCKASEGEE RIVER

MILES 12 TO 21

Mile Above Mouth	Identification and Type	Elevations				
		Floor	Clear-ance	Low Water	1840 Flood	1940 Flood
12.72	Bryson City, concrete arch	1736.3	1733.9	1717.4	1737.3	1734.5
14.71	U. S. Highway 19, concrete arch	1765.8	1762.8	1746.8	1768.8	1766.4
16.97	Southern Railway, steel truss	1793.6(a)	1787.6	1768.8	1791.5	1787.5
17.55	Ela, steel truss	1792.9	1792.0(b)	1774.3	1799.0	1794.7
20.36	Whittier, steel truss	1842.6	1840.2	1825.2	1847.6	1842.4

(a) Elevation of top of rail.

(b) Side span clearance 1790.5.

Development of Tourist Facilities

U. S. Highway 19 carries truck and bus traffic between Chattanooga and Asheville as well as the steadily increasing tourist traffic to the

Great Smoky Mountains National Park, the Cherokee Indian Reservation, and to the mountain area in general. Motor courts and shops have been built along the route to serve this trade with some new facilities opening each year. The principal development in the reach of Tuckasegee River covered by this investigation has been on the right bank at and below the mouth of Oconaluftee River, mile 17 to 18. Other shops are near U. S. Highway 19 bridge, mile 14.7 and from that point to Bryson City. Bryson City has extensive developments of this type.

FLOOD DATA

Flood Records

The U. S. Geological Survey has maintained records of streamflow at Bryson City since November 7, 1897, and at a location 4 miles upstream from July 1896 to March 1897. Until February 3, 1914, the observations were made at a staff gage at the old steel highway bridge at about mile 12.75. From February 4, 1914, to May 17, 1920, the gage was a recorder located 200 feet below the bridge. The present bridge at Bryson City was built in 1919-1920 and from May 18, 1920, to June 27, 1927, records were made at a staff gage at the new bridge. Since June 28, 1927, a recording gage has been in operation 400 feet below the bridge. All records have been made to the same datum or have been corrected to that datum. Staff gage readings were made once daily to 0.05 foot up to September 1912. From September 1912 to February 2, 1914, twice daily readings were made to 0.05 foot. From May 18, 1920, to June 27, 1927, the readings were made to 0.01 foot twice per day.

In the flood history search, local residents were interviewed for any information they could give on dates of floods and flood heights along Tuckasegee River. Newspaper files were searched and reports on flood investigations made by the Hydraulic Data Branch were reviewed.

Flood Stages and Discharges

Table 2 lists stages and discharges for floods which have exceeded the bankfull stage of 9 feet at the Bryson City stream gage. Crest stages

TABLE 2

TUCKASEGEE RIVER AT BRYSON CITY, NORTH CAROLINA

FLOOD CREST ELEVATIONS AND DISCHARGES ABOVE BANKFULL STAGE

1840-1957

The station at Bryson City was established as a staff gage at the bridge upstream from the present site on November 7, 1897, and was observed until February 3, 1914. From that date until May 17, 1920, the gage was a recorder 200 feet downstream. From May 18, 1920, to June 27, 1927, the observations were again on a staff gage at the present bridge, built in 1919-1920. Since June 28, 1927, the gage has been a recorder located on the left bank 400 feet below the bridge. A staff gage 4 miles upstream was observed from July 1896 to March 1897.

This table includes all floods since November 1897 that exceeded bankfull stage of 9 feet, elevation 1725.5. Prior to that time the records are necessarily incomplete. Drainage area at Bryson City - 655 square miles; zero elevation 1716.54, USC&GS 1936 Supplementary Adjustment.

Date of Crest	Gage Heights		Peak Discharge	
	Stage feet	Elevation	Amount cfs	Per Sq. Mile cfs
May 1840	20	1736.5±	90,000	137
Mar. 6, 1867	17	1733.5±	65,000	99
June 1876	17	1733.5±	65,000	99
Oct. 18, 1879	(a)			
Mar. 1886	14	1730.5±	42,000	64
Sep. 1893	(a)			
Mar. 12, 1897	9.3	1725.8	18,000	27
Sep. 3, 1898	12.0	1728.5	30,000	46
Oct. 5, 1898	12.9	1729.4	35,000	53
Feb. 6, 1899	12.1	1728.6	31,000	47
Mar. 15, 1899	11.3	1727.8	26,800	41
Mar. 18, 1899	14.2	1730.7	43,500	66
Feb. 12, 1900	14.0	1730.5	42,200	64
May 21, 1901	11.5	1728.0	27,800	42
Dec. 14, 1901	10.0	1726.5	21,000	32
Dec. 29, 1901	10.8	1727.3	24,500	37
Feb. 28, 1902	12.8	1729.3	34,600	53
Mar. 29, 1902	9.1	1725.6	17,000	26
Feb. 28, 1903	9.4	1725.9	18,000	27
Mar. 22, 1903	11.9	1728.4	29,700	45

TABLE 2--(Continued)

TUCKASEGEE RIVER AT BRYSON CITY, NORTH CAROLINA

FLOOD CREST ELEVATIONS AND DISCHARGES ABOVE BANKFULL STAGE

1840-1957

Date of Crest	Gage Heights		Peak Discharge	
	Stage feet	Elevation	Amount cfs	Per Sq. Mile cfs
Nov. 19, 1906	14.0	1730.5	41,700	64
Mar. 27, 1913	10.0	1726.5	21,000	32
Mar. 4, 1917	12.7	1729.2	37,700	58
Jan. 28, 1918	10.3	1726.8	21,200	32
Dec. 22, 1918	9.5	1726.0	18,000	27
Apr. 2, 1920	12.2	1728.7	35,000	54
Jan. 21, 1922	10.0	1726.5	21,000	32
Aug. 16, 1928	9.15	1725.7	18,300	28
Dec. 28, 1932	9.25	1725.8	18,300	28
Jan. 19, 1936	9.20	1725.7	22,800	35
Apr. 6, 1936	9.67	1726.2	24,800	38
Aug. 13, 1940	9.05	1725.6	22,500	34
Aug. 30, 1940	15.96	1732.5	61,600	94
Jan. 7, 1946	9.72	1726.3	23,800	36
Feb. 10, 1946	9.08	1725.6	21,400	33
Jan. 20, 1947	10.65	1727.2	27,600	42
Feb. 21, 1953	9.38	1725.9	22,500	34
Jan. 31, 1957	11.10	1727.6	29,900	46

(a) Large floods occurred on these dates but crest stages are not known.

for some floods which occurred before stream gage records began have been estimated from high water marks.

Flood Occurrences

Plate 2 shows the crest stage and month of occurrence of known floods on the Tuckasegee River. The 38 floods shown occurred in every month of the year except July, with the greatest frequency in the winter months of December through March. In addition to the winter storms, the upper portion of the Tuckasegee River watershed is subject to intense and heavy summer and fall rainstorms that result in severe floods. These storms may be either of tropical hurricane origin or of summer thunderstorm characteristics. The storm causing the flood of August 13, 1940, was of the former type and the August 30, 1940, flood was caused by rainfall of the latter type.

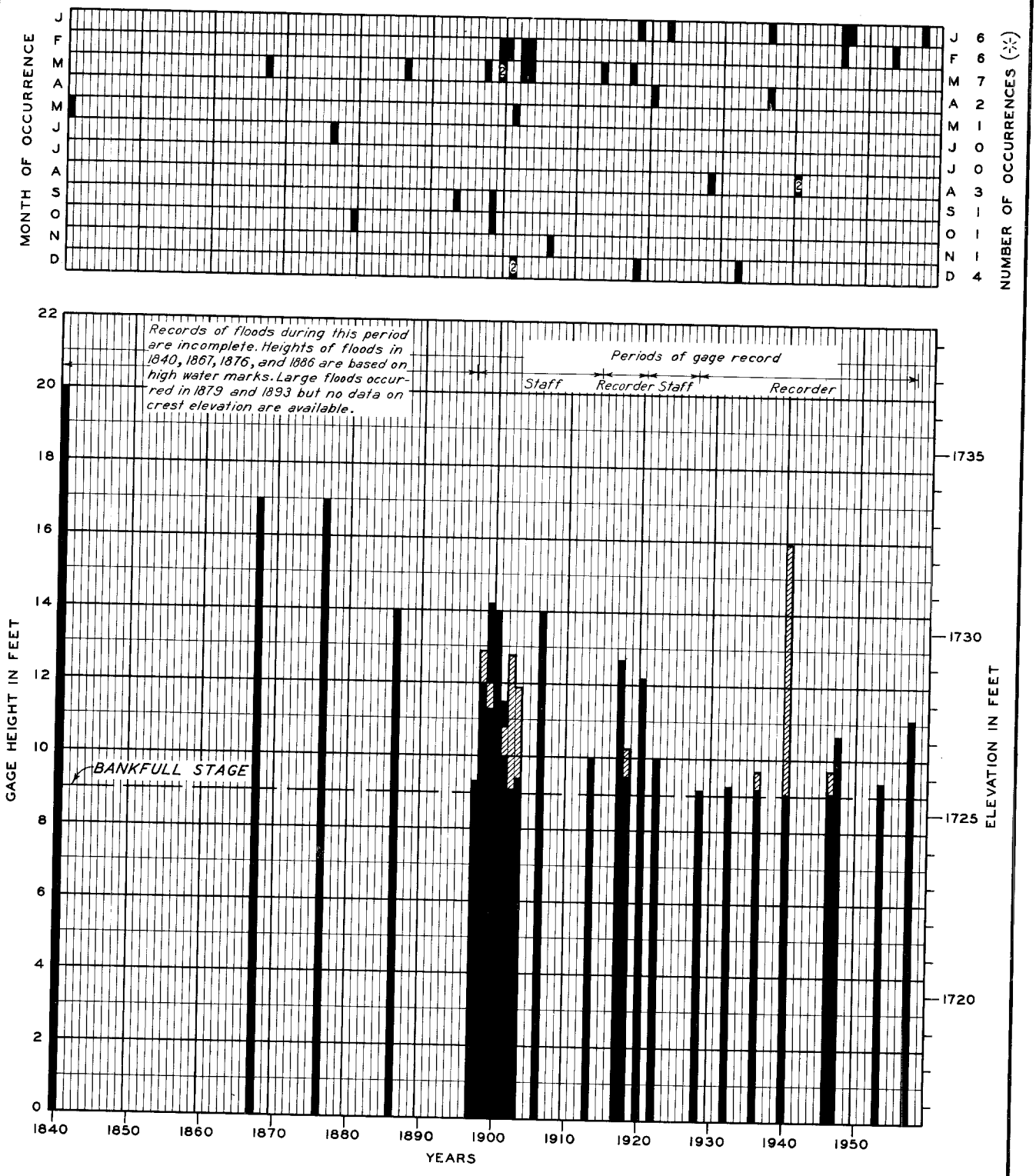
Hydrograph of August 1940 Flood

On Plate 3 is a hydrograph of the flood of late August 1940 which exceeded any other rise in the 60 years of stream gage record at Bryson City. This hydrograph shows the rate of rise and fall and the duration of the flood at the gaging station.

The August 1940 storm rainfall averaged 7.2 inches on the entire watershed above Bryson City. Heaviest amounts occurred on the East and West Forks and on Caney Fork where storm totals ranged up to 13 inches. The heavy rainfall lasted 25 to 30 hours, beginning early on the morning of August 29 and ending before 6 a.m. on August 30. At Bryson City, the Tuckasegee River rose slowly until 9 p.m. on August 29 and then very rapidly to the crest at 9 a.m. on August 30. The rise in this 12-hour period was 13 feet or more than one foot per hour. The recession was rapid and the river was above the bankfull stage of 9 feet or elevation 1725.5 for only 13 hours.

Flooded Area

Plate 4 shows the approximate area that was overflowed in the flood of May 1840. This 1840 overflow area was based partly on the outline of the 1940 flood overflow which was defined in the field at Bryson City



USGS gaging station established at Bryson City November 7, 1897. Gage 4 miles upstream observed from July 1896 to March 1897. During periods of staff gage observations flood crests are estimated from once or twice daily gage readings.

Drainage area at present gage=655 square miles.

Elevation of zero=1716.54 (USC & GS 1936 Suppl. Adj.)

(※) Number of occurrences during 61 years, 1896-1957.

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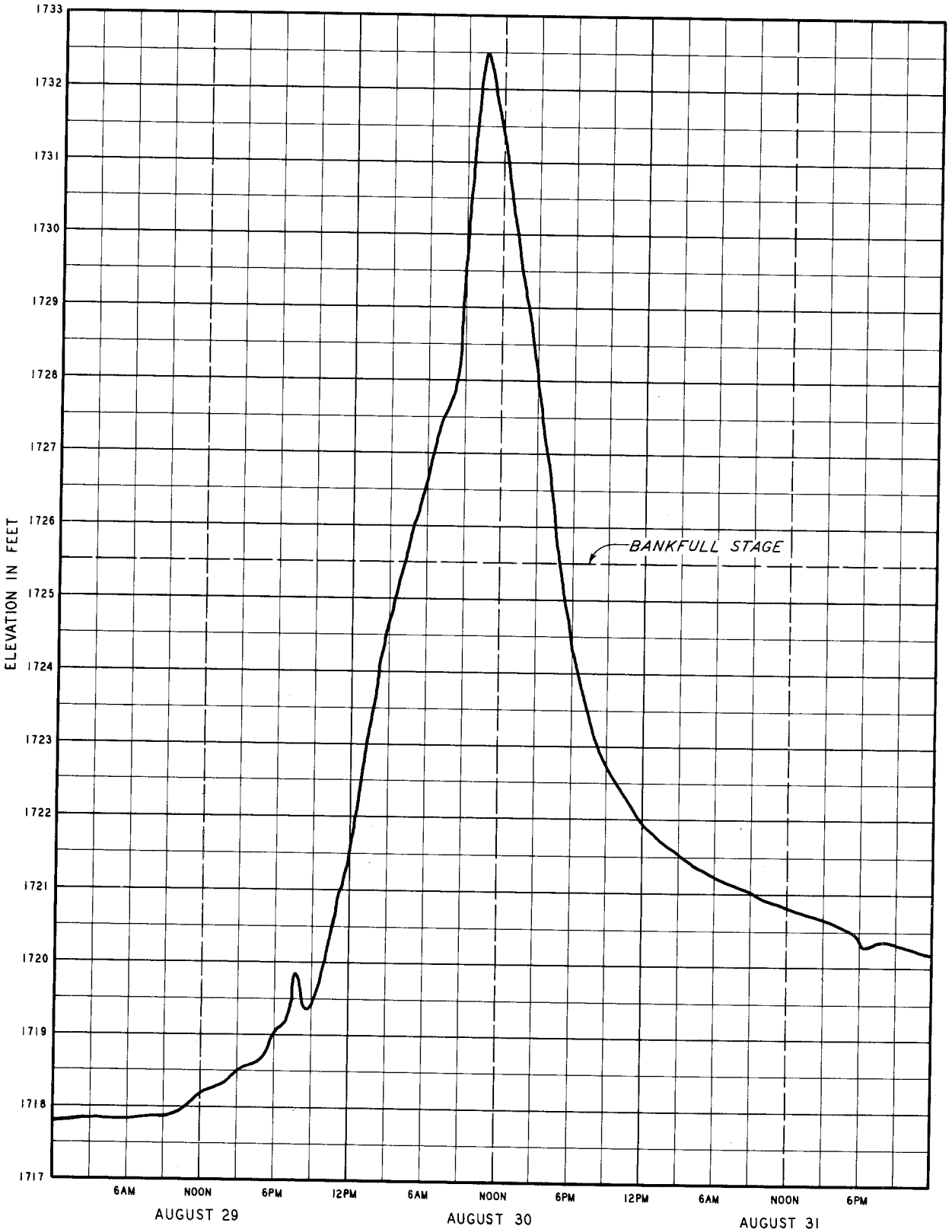
FLOODS ABOVE BANKFULL STAGE

TUCKASEGEE RIVER AT BRYSON CITY, NORTH CAROLINA

MAY 1957



Elevations are based on U. S. Geological Survey water-stage recorder record. Gage is located at river mile 12.64 and 400 feet downstream from bridge in Bryson City. Datum of gage is 1,716.54 feet above mean sea level, datum of 1929, supplementary adjustment of 1936.

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STAGE HYDROGRAPH
FLOOD OF LATE AUGUST 1940
TUCKASEGEE RIVER AT BRYSON CITY, NORTH CAROLINA

MARCH 1956

immediately after that flood and partly on the high water profiles and the topographic data shown on the map. The boundaries of the overflowed area shown on Plate 4 are sufficiently accurate for the intended purpose but the actual limits of overflow on the ground may vary somewhat from that shown on the plate. This is because the contour interval of the map, which is 40 feet, does not permit precise plotting of the flooded area boundaries. To define these limits with a high degree of accuracy would require costly surveys which present purposes do not warrant.

Flood Profiles

Plate 5 shows high water profiles for the floods of May 1840 and August 30, 1940. The 1940 flood was marked by TVA engineers just after the flood. The 1840 profile was drawn through high water marks obtained from contacts with local residents. Also shown is the approximate low water profile for the reach, together with pertinent elevations at bridges and the elevation of the maximum flood of reasonable regional expectancy which is discussed in Section II of this report.

Flood Descriptions

The following descriptions cover several of the larger floods that have occurred on Tuckasegee River:

May 1840--Without doubt the greatest flood on Tuckasegee River since its settlement by white men was the flood of May 1840, known as the "May Fresh." In "A Paper on the Tennessee River and Flood System," written in 1896 by Mr. L. M. Pindell of the Chattanooga office of the U. S. Weather Bureau, the following statement is attributed to Miss Jennie Collins, special rainfall observer at Bryson City: "The oldest inhabitant states that the highest water occurred in 1840. There is a tradition among the Cherokee Indians that at sometime in the 17th century the water reached a height of more than 50 feet, covering all the flat lands."

This is the only reference found to a flood in the 17th century. The height of 50 feet referred to would be 30 feet above the 1840 flood which does not seem credible. Three 1840 marks were found in or within a short distance of the reach covered by this investigation, one at Bryson City and two near Whittier. In each case the mark was based on stories

handed down by older relatives of the person who was contacted, but their plotted position shows a consistent relation to the low water profile and to the profiles of other floods.

March 1886--Four persons between Bryson City and Dillsboro furnished marks for this flood at the time of the flood history search in 1937 and 1938 and said the flood was the highest in the last 60 to 80 years. Data obtained at Bryson City place the flood about 6 feet lower than the 1840 flood.

November 1906--This was a large flood, particularly below the mouth of Oconaluftee River where the flood was the highest in the memory of present residents of the valley. At the stream gage at Bryson City the flood crest stage was 14.0 feet.

August 30, 1940--This was a severe flood on Tuckasegee River, exceeding any previously known above Dillsboro and the highest in the period for which gaging records are available at Bryson City. Through the reach of the river covered by this investigation the August 30, 1940, flood was about 2 feet higher than the November 1906 flood and 3 to 5 feet lower than the great flood of May 1840.

Extremely heavy rain fell on the head of the basin in this storm with numerous slides or waterspouts on the steep mountain slopes. Four persons lost their lives as a result of these slides in the East Fork Tuckasegee River drainage. Wide overflow occurred over the length of the river with heavy damage to property, roads, and bridges. When the flood crest had passed only two highway bridges remained on Tuckasegee River, the concrete structures at mile 12.7, in Bryson City, and at U. S. Highway 19, two miles upstream. The Ela and Whittier steel truss bridges were washed out along with several at points upstream. The TVA report, "Floods of August 1940 in Tennessee River Basin," describes the flood on Tuckasegee River in greater detail.

Figures 1 through 4 show conditions during the August 30, 1940, flood at Whittier, Ela, and Bryson City.

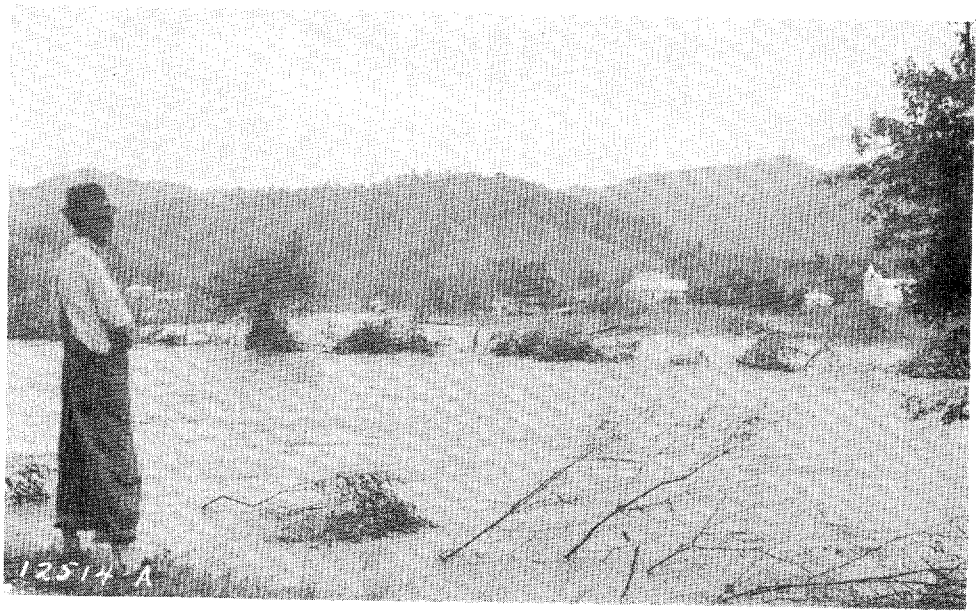


Figure 1.--LATE AUGUST 1940 FLOOD AT WHITTIER, NORTH CAROLINA

The Tuckasegee River had receded somewhat when this picture of the August 1940 flood at Whittier was taken on August 30. Wreckage of the Whittier bridge is lodged on the opposite bank.

Figure 2.--HIGHWAY FLOODED AT ELA IN 1940

U. S. Highway 19 at Ela, North Carolina, was overflowed on August 30, 1940, by the Tuckasegee River. (K. E. Bennett photo)

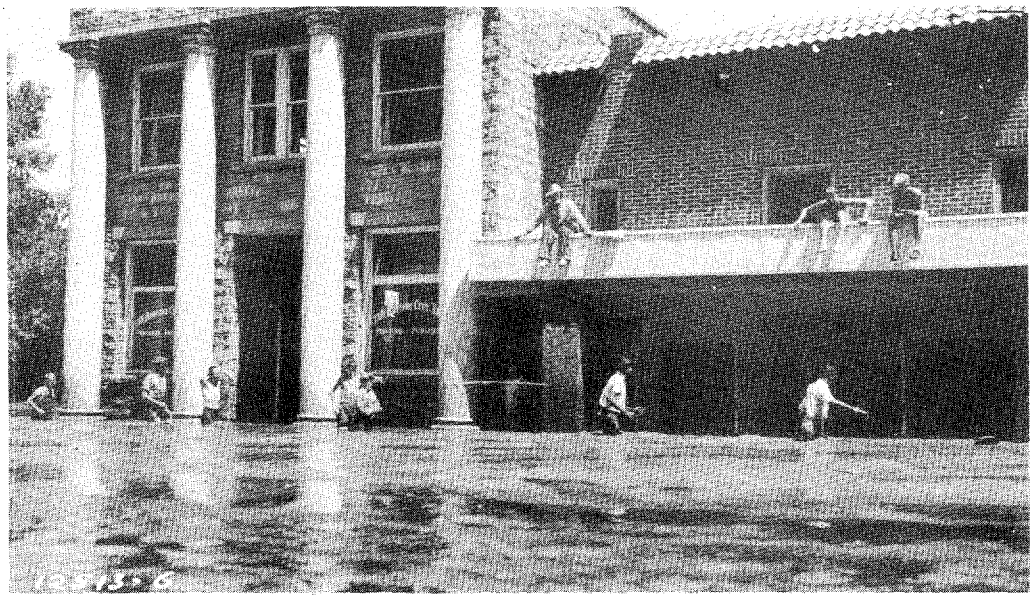


Figure 3.--BRYSON CITY BUSINESS DISTRICT FLOODED

This is Everett Street in downtown Bryson City about one and one-half hours after the Tuckasegee River crest on August 30, 1940.

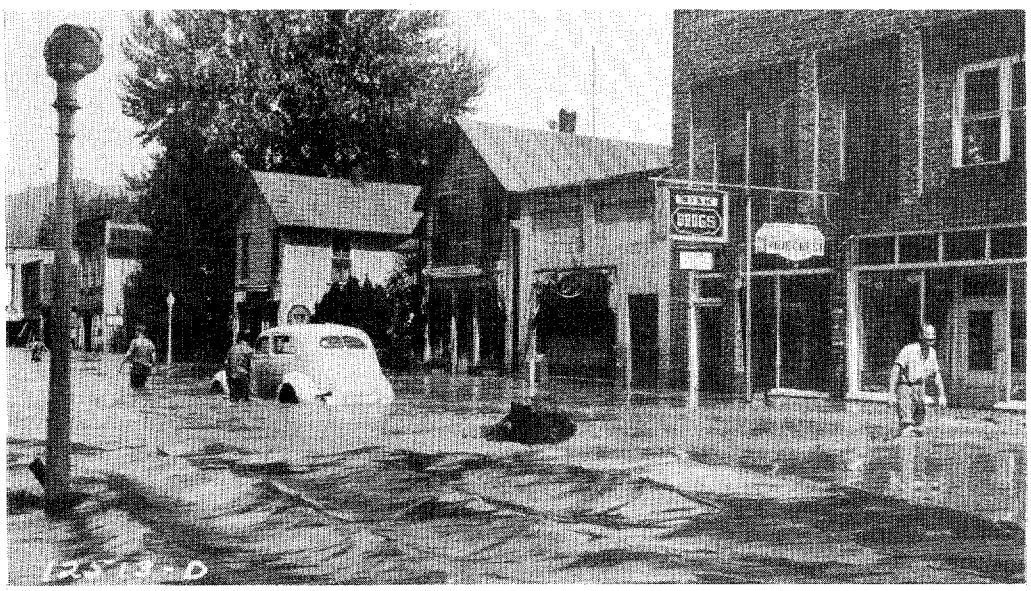


Figure 4.--EVERETT STREET IN BRYSON CITY IN 1940

Tuckasegee River flood water was still knee-deep on Everett Street when this picture was taken soon after noon on August 30, 1940. The crest stage was about 1.5 feet higher.

OCONALUFTEE RIVER

On the Oconaluftee River the investigation of past floods covered the reach from the mouth upstream to mile 10.6 near Ravensford, North Carolina.

Records of stream stages and discharges have been maintained on the Oconaluftee River since January 1921 by the U. S. Geological Survey. Until September 1949 the stream gaging station was located at mile 7.4 near the Cherokee Indian School. Since June 1948 records have been maintained at a station near Birdtown, mile 3.1.

In 1937 and 1938 field engineers of the TVA's Hydraulic Data Branch made a search for flood history information on the Little Tennessee River and its major tributaries, including the Oconaluftee River. Historical works and newspaper files were searched for data but references to floods were few and files were often incomplete. The bulk of the information accumulated came from interviews with residents of the valley. A house-to-house survey was made, and all persons were contacted who were known to have witnessed the larger floods or who could furnish any information regarding them. Many of those contacted have since died, including two Cherokee Indians who were witnesses of the flood of March 1867.

Several of the larger floods in the last 20 years have been investigated by TVA engineers and the reports on these investigations have been reviewed for data on Oconaluftee River.

SUMMARY OF FLOOD HISTORY

1. The flood of November 1906 was the largest in memory of present residents of the Oconaluftee River valley. A flood in March 1867 may have exceeded the November 1906 flood but little information on this flood is available.

2. The flood of March 1913 was next to the 1906 flood over the reach below the mouth of Soco Creek. At Cherokee the two floods were about equal.

3. The flood of January 1946 was 1.5 feet lower than the 1906 flood at Cherokee and was the highest since stream gaging records began in 1921. Floods in April 1936, January 1947, February 1953, July 1955, and January 1957 all reached peak stages which were within about one foot of the 1946 flood crest height at Cherokee.

4. The records show that floods on Oconaluftee River have occurred with the greatest frequency in the months January through March. Large floods have occurred in several other months of the year.

5. Stream banks are 8 feet to 11 feet above low water over most of the reach investigated. Overflow begins at a stage of 9 feet at the Cherokee stream gage and becomes general at 13 feet.

6. The flood plain is less than 500 feet wide at most places. The widest overflow occurs along a two-mile reach above Cherokee, where the flood plain varies from 1,000 feet to 2,000 feet in width.

7. Three bridges cross Oconaluftee River in the reach investigated. Two U. S. Highway bridges have floor levels above the 1906 flood crest height. A flood on the order of either the 1906 or 1913 flood would overtop the secondary road bridge at Birdtown, mile 3.06.

8. Bryson Dam at mile 0.56 is 35 feet high and backs water to mile 2.2 at normal pool level. Built in 1924-1925 to generate power for Bryson City, it is now owned and operated by the Nantahala Power and Light Company.

OCONALUFTEE RIVER BASIN

Settlement

The Oconaluftee River basin, which is part of the Tuckasegee River watershed shown on Plate 1, lies partly within Swain County and partly within Jackson County, North Carolina, in one of the highest and most rugged mountain areas in the eastern United States. Jackson County was formed in 1851. Swain County was formed in 1871 from a part of Jackson County and a part of Macon County.

Oconaluftee River is part of the river system which drains the south slope of the Great Smoky Mountains. The Qualla Tract and the 3200

Acre Tract of the Cherokee Indian Reservation is wholly within the basin. On these Tracts live most of the Eastern Band of the Cherokee Indians under the administration of the U. S. Indian Service. Nearly all the rest of the Oconaluftee River basin is inside the boundary of the Great Smoky Mountains National Park. The only land privately owned is along the lower two miles of the river and in a few small tracts at other points.

There are no residences within the Great Smoky Mountains National Park and the land there is almost 100 percent in forest. Land in the Indian Reservation is more than 90 percent in forest with only the valley bottoms and some of the less steep slopes in cultivation. Along the routes of main travel through the basin there has been rapid development in recent years of facilities which cater to the tourist trade.

The River and Its Valley

The drainage basin of Oconaluftee River is rectangular in shape, extending 12 miles east and west by 16 miles north and south. The total area is 188 square miles at the mouth and above Cherokee 131 square miles. The principal tributary along the lower reach is Soco Creek, with a drainage area of 45.3 square miles. Soco Creek joins the river at mile 5.5.

Above Cherokee the basin is steep with tributaries converging from the high mountain ridges at the north and east sides of the basin, conducive to a rapid concentration of runoff in heavy storms. The northern boundary of the basin is the State line ridge of the Great Smoky Mountains dividing North Carolina from Tennessee. To the east is the Plott Balsam range, joining the State line ridge at Mt. Guyot, 6621 feet above sea level. Lowest points on the rim are Newfound Gap at the northwest corner of the basin, elevation 5200 feet, and Soco Gap near the southeast corner, elevation 4345 feet. Most of the basin rim is above 5500 feet elevation. Raven Fork drains somewhat more than half of the basin above Cherokee and joins Oconaluftee River at mile 10.3 at an elevation of 2000 feet.

The fall of the river averages 23 feet per mile for the 10.6 miles from the Ravensford vicinity to the mouth with no appreciable changes in slope over the reach. The width of the flood plain is irregular but less than 500 feet in most places. The most extensive bottom is from river mile

6.8 to 9.0, above Cherokee, where the width is 1,000 to 2,000 feet. Smaller bottoms are at the mouth of Soco Creek, at Birdtown, and at Goose Creek. The soil along the river has fair to good productivity, good drainage, and few boulders.

The older homes in the valley are built well above flood danger, but many of the newer homes and the commercial developments are at points where they would be affected by high floods.

Bridges Across the River

Three highway bridges and a concrete dam are in the reach investigated. Data on these bridges are given in Table 3 and their location is shown on Plates 8 and 9. The two U. S. Highway bridges have been built since the 1906 flood and have floor levels above the crest height of that flood. The concrete girder bridge at Cherokee, mile 6.76, would probably be overtopped in a recurrence of the 1906 flood because of the effect of an approach fill on the right bank. The concrete arch bridge at mile 0.21 has sides which are solid above the arch openings and also solid guard rails. This bridge would cause considerable heading up if the 1906 flood were to be repeated. The secondary road bridge at mile 3.06 has a floor level which is under the 1906 and the 1913 flood levels at that point.

TABLE 3

OCONALUFTEE RIVER BRIDGE DATA

MILES 0.0 TO 10.7

Miles Above Mouth	Identification and Type	Elevations					
		Floor	Clearance	Low Water	1906 Flood Crest	1913 Flood Crest	1955 Flood Crest
0.21	U. S. Highway 19A, concrete arch	1805.8	1802.8	1784.9	1801	1797.2	1793
3.06	Side road, timber	1855.6	1853.6	1843.7	1861	1856.5	1851.6
6.76	U. S. Highways 19 & 441, concrete deck	1947.0	1943.7	1929.2	1941.5		1937

The dam at mile 0.56 is a concrete multiple-arch structure 35 feet high with two power generating units. It was built in 1924-1925 by the town of Bryson City and was operated as a municipal plant until 1942 when it was acquired by the Nantahala Power and Light Company. It is now a part of their system serving the western counties of North Carolina. Sediment deposits have accumulated in the 30 years since the dam was built, and silt is now about 15 feet deep midway of the reservoir.

Development of Tourist Facilities

Two Federal highways pass through the basin and carry tourist traffic that is increasing yearly. U. S. Highway 441, which is the main route for travel through the Great Smoky Mountains National Park, runs north and south through the basin. U. S. Highway 19, another important tourist route, crosses the basin east to west, intersecting U. S. Highway 441 at Cherokee. U. S. Highway 19 follows the right bank of Oconaluftee River for a short distance near the mouth and from mile 2 to mile 4.8. U. S. Highway 441 follows the left bank from mile 5.7 to Cherokee, then follows the right bank to the head of the basin at Newfound Gap.

Each year sees more shops and motor courts built to cater to the tourist trade. The property along U. S. Highways 19 and 441 in Cherokee is now quite extensively developed. More facilities are along U. S. Highway 441 above the Cherokee Indian School, in the reach from mile 7.3 to mile 8.6. Other developments are along U. S. Highway 19, particularly at Birdtown, mile 3.7, and at Ela, mile 0.2.

FLOOD DATA

Flood Records

The U. S. Geological Survey has maintained a gaging station on Oconaluftee River since January 27, 1921, when a staff gage was established on the river at Cherokee, mile 7.4. A recording gage began operating at the site on May 17, 1934. On June 28, 1948, a recording gage was installed at Birdtown, 4.3 miles downstream from the Cherokee gage, and records have been maintained there continuously since that date. Records at Cherokee were discontinued September 30, 1949.

Local residents have been interviewed for information on flood heights and flood history. Newspaper files have been searched for flood references, and reports on flood investigations made by the Hydraulic Data Branch have been reviewed.

Flood Stages and Discharges

Table 4 lists stages and discharges for floods which have exceeded nine feet at the stream gaging station at Cherokee. For prerecord floods, crest stages have been estimated from high water marks where these were available. For floods occurring after September 1949, when records were discontinued at the Cherokee gage, the stage at Cherokee has been determined from a relationship developed for the Cherokee and Birdtown gaging stations.

Flood Occurrence

Plate 6 shows the crest stage and month of occurrence of known floods on the river. Of the 18 floods shown, 5 occurred in January, 4 in February and 3 in March. Other flood months were April, May, July, November, and December.

Hydrograph of January 1946 Flood

On Plate 7 is a hydrograph for the flood of January 1946, which was the highest flood on the Oconaluftee River at Cherokee during the period of stream gage record. This hydrograph shows the rate of rise and fall and the duration of the flood at the gaging station.

The January 1946 flood resulted from storm rainfall which fell from the afternoon of January 5 to midnight January 7 and averaged 6 inches over the watershed. Nearly 8 inches fell along the top of the Great Smoky Mountains. In addition a large percentage of the watershed was covered with snow which melted during the storm and added another 2 inches of water equivalent to the storm rainfall. At Cherokee the preliminary rainfall on January 5 to 7 caused a slow rise of about 4 feet in 48 hours. At 2 p.m. on January 7 a rapid rise to the crest began, amounting to 3.6 feet in 8 hours, or nearly 6 inches per hour. The river receded as fast as it rose and was above a stage of 9 feet or elevation 1947.4 for only 7 hours.

TABLE 4

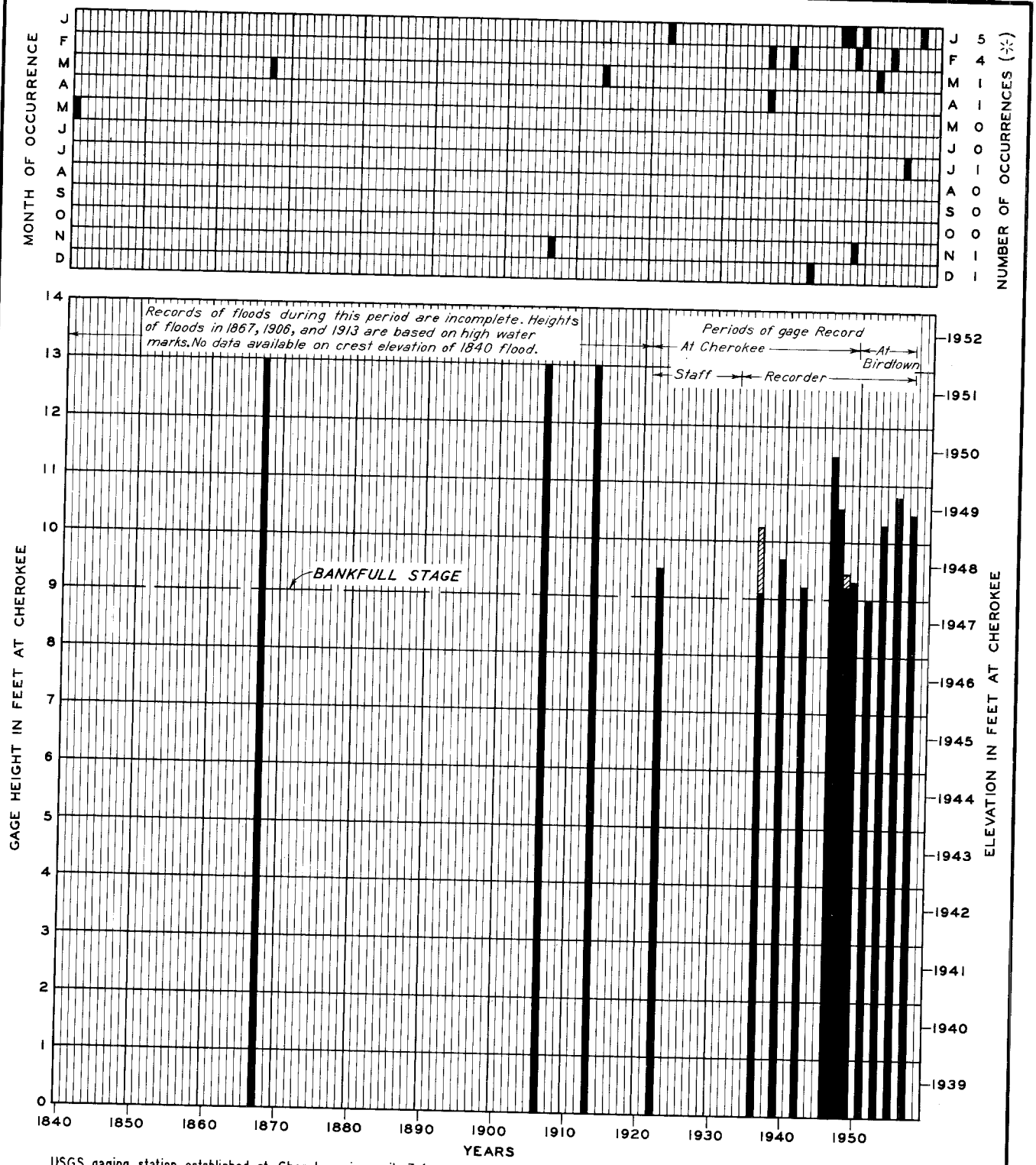
OCONALUFTEE RIVER AT CHEROKEE, NORTH CAROLINA

FLOOD CREST ELEVATIONS AND DISCHARGES

The station at Cherokee, river mile 7.4, was established as a staff gage on January 27, 1921, and as a recording gage on May 17, 1934. The gage was discontinued on September 30, 1949. Since June 28, 1948, records of stage and discharge have been maintained at a stream gage at Birdtown, 4.3 river miles downstream from the Cherokee gage. This table includes all floods since January 1921 that exceeded a stage of 9 feet, elevation 1947.4. Prior to 1921 records are necessarily incomplete. Drainage area at Cherokee gage--131 square miles; zero elevation 1938.37, USC&GS 1936 Supplementary Adjustment.

Date of Crest	Gage Heights		Peak Discharge	
	Stage feet	Elevation	Amount cfs	Per Sq. Mile cfs
May 1840	(a)			
Mar. 1867	13	1951		
Nov. 1906	13	1951		
Mar. 27, 1913	13	1951		
Jan. 21, 1922	9.5	1947.9	7,500	57
Feb. 1936	9.10	1947.5	6,820	52
Apr. 6, 1936	10.25	1948.6	8,760	67
Feb. 3, 1939	9.68	1948.0	7,860	60
Dec. 29, 1942	9.20	1947.6	6,990	53
Jan. 7, 1946	11.50	1949.9	11,200	85
Jan. 20, 1947	10.60	1949.0	9,490	72
Feb. 14, 1948	9.20	1947.6	6,950	53
Nov. 6, 1948	9.45	1947.8	7,400	56
Jan. 5, 1949	9.30	1947.7	7,130	54
Mar. 29, 1951	9.0(b)	1947.4	6,600	50
Feb. 21, 1953	10.3(b)	1948.7	8,900	68
July 9, 1955	10.8(c)	1949.2	8,400	64
Jan. 31, 1957	10.5(b)	1948.5	9,300	71

(a) Stage unknown.
(b) Estimated from Birdtown.
(c) From high water mark.



USGS gaging station established at Cherokee, river mile 7.4, on January 27, 1921 and discontinued September 30, 1949.
Gaging station established at Birdtown, 4.3 miles downstream from Cherokee gage, on June 28, 1948.
During periods of staff gage observations, flood crests are estimated from twice daily gage readings.
1951, 1953, and 1957 flood crests at Cherokee are estimated from the Birdtown gage record. The 1955 flood crest is based on high water mark at Cherokee gage site.

Drainage area at Cherokee gage = 131 square miles
Drainage area at Birdtown gage = 184 square miles
Elevation of Cherokee gage zero = 1938.37 (USC & GS 1936 Suppl. Adj.)

(*) Number of occurrences during 36 years, 1921-1957.

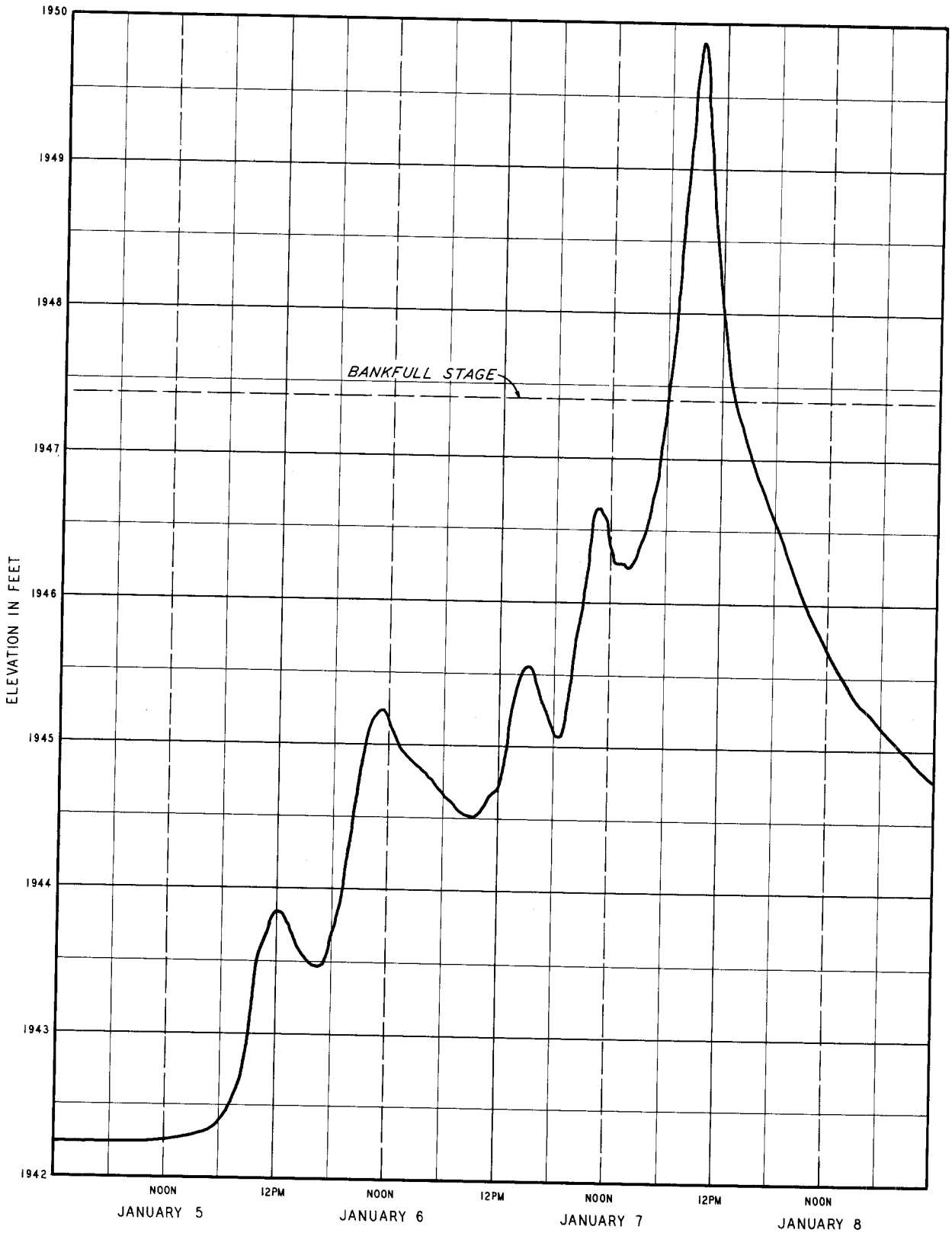
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

FLOODS ABOVE BANKFULL STAGE

OCONALUFTEE RIVER AT CHEROKEE, NORTH CAROLINA

MAY 1957

ASF-1311



Elevations are based on U.S. Geological Survey water-stage recorder record. Gage is located at river mile 7.4. Datum of gage is 1,938.37 feet above mean sea level, datum of 1929, supplementary adjustment of 1936.

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HYDRAULIC DATA BRANCH

STAGE HYDROGRAPH
FLOOD OF JANUARY 1946
OCONALUFTEE RIVER AT CHEROKEE, NORTH CAROLINA

MARCH 1956

Flooded Area

Plate 8 shows the approximate area that was overflowed in November 1906. This area has been outlined from high water profiles, valley cross sections, and topographic data shown on the map. The boundaries of the overflowed area shown on Plate 8 are sufficiently accurate for the intended purpose but the actual limits of overflow on the ground may vary somewhat from that shown on the plate. This is because the contour interval of the map, which is 40 feet, does not permit precise plotting of the flooded area boundaries. To define these limits with a high degree of accuracy would require costly surveys which present purposes do not warrant.

Flood Profiles

Plate 9 shows high water profiles for the floods of November 1906, March 1913, and July 1955. These profiles are based on high water marks pointed out by local residents or marked by TVA field engineers. Also shown are profiles of the right bank of the river and the approximate low water of August 1955, together with pertinent elevations at bridges and dams and the elevation of the maximum flood of reasonable regional expectancy which is discussed in Section II of this report.

Valley Cross Sections

A total of 21 valley cross sections were obtained along Oconaluftee River, extending to 20 feet above low water. A selected group of these cross sections is shown on Plate 10.

Flood Descriptions

The following descriptions cover the larger floods that have occurred on Oconaluftee River:

May 1840--No high water marks were obtained for this flood on Oconaluftee River. However, the 1840 flood was the highest known on Tuckasegee River and it is probable that flood flow of major proportions came from Oconaluftee River. Mr. Gaston Griffin, who witnessed the 1906 flood at Birdtown, said that an old Indian told him at that time that the river was the highest it had been in 65 years or since about 1840.

March 1867--This is the earliest Oconaluftee River flood for which data could be obtained. Field engineers who made the flood history search in 1937 and 1938 interviewed two old Indians who had witnessed the 1867 flood near Birdtown. Mr. Sigley Ned had spent all his 81 years on the river and said the highest flood in that time occurred 3 years after the Civil War. He pointed out a spring at his old home on Gibbs Branch near Birdtown which he said was reached by backwater from the river. Elevation of the point, however, indicates that the mark was for the flood on the branch and was not a true elevation of the Oconaluftee River flood crest.

Mr. John Walkingstick, who also spent all his life on the river and was 85 years of age when interviewed, said a flood in 1867 was the highest in his knowledge and pointed out the place reached in his front yard. This mark is at Birdtown, less than a mile from the mark pointed out by Mr. Ned. No information was obtained referring to this flood at other points along the river.

November 1906--This is the largest flood in the period since white men first settled along the river. Mr. Julius W. Sherrill, who lived near the mouth of Oconaluftee River, said that at the time of the flood old people told him the river was about as high as it had ever been. Mr. Gaston Griffin told about an old Indian who said that the river was the highest it had been in 65 years. Older people talked to along the length of the river described the 1906 flood as the highest they had seen.

March 1913--The next largest flood after November 1906 occurred in March 1913. Three persons who were interviewed in 1938 and who had seen both the 1906 and 1913 floods said that the 1906 was the highest and the 1913 the next highest in their memory. Mr. Taylor Seay saw the floods near the mouth, Mrs. Kate Lambert saw them at Birdtown, and Mr. W. H. Duncan saw them at Cherokee. High water marks put the 1906 about 3 feet higher than the 1913 at the mouth and at Birdtown. A study of the flood profiles indicates, however, that the two floods were probably very nearly equal through Cherokee.

April 1936--Several persons interviewed during the flood history search in 1938 said that this flood was the third highest in a period of 35 to 40 years, ranking next in magnitude to the floods of 1906 and 1913. Enough marks were found to establish the elevation of the flood from the mouth of the river to mile 9.

January 1946--This is the highest flood on Oconaluftee River since 1921, when stream gaging records were begun. The crest stage at the stream gage at Cherokee was 11.50 feet, 1.25 feet higher than the crest stage for the flood of April 1936. A heavy depth of snow in the mountains at the beginning of the storm contributed to the high runoff in the Oconaluftee River basin.

July 1955--This was the second highest flood in the period for which stream gaging records are available. A flood mark showed a peak stage equivalent to 10.8 feet on the old Cherokee gage or 0.7 foot lower than the January 1946 flood crest. The heaviest runoff came from the Raven Fork drainage, where several timber bridges were lost or damaged and roads were washed and scoured. Three swinging footbridges were washed out, including one at the Birdtown Bethabara Church, river mile 4.4. In the Cherokee vicinity water surrounded a number of shops and courts, damaged stored goods, and washed yards and parking areas. A temporary timber footbridge just built at river mile 8.9 was carried away.

SOCO CREEK

The investigation of floods on Soco Creek covered the reach from the mouth, one mile south of Cherokee, North Carolina, to the U. S. Highway 19 bridge at mile 6.6.

No official records of flood elevations or discharges have been maintained on Soco Creek. To obtain flood information local residents have been interviewed and a search has been made of available newspaper files. High water marks have been located for floods occurring in March 1913, April 1936, August 1940, and February 1953.

SUMMARY OF FLOOD HISTORY

1. The flood of November 1906 was the greatest in the memory of any person now living on or near Soco Creek. No specific data could be located as to the height of this flood.

2. The second highest known flood on Soco Creek occurred on March 27, 1913. This flood was almost as high as the one in 1906. The 1913 flood overtopped the creek banks by approximately five feet and covered the flood plain for widths up to 1,200 feet.

3. Floods about two feet lower than the 1913 flood occurred in April 1936 and August 1940. A flood in February 1953 was the highest since 1940.

4. Known floods on Soco Creek have occurred in winter and summer months. Records on the Oconaluftee River indicate that floods in this area occur with greatest frequency in the months of December through March.

5. The creek banks along Soco Creek near Cherokee are overtopped at stages 4 to 8 feet above the stream bed. Above mile 2 the flood plain is wide with a rather uneven surface. Width of the flood plain ranges up to 2,000 feet.

6. Damages caused by known floods of the past have been small in the Soco Creek valley. However, floods as high as those of 1906 and 1913, if they occurred again, would cause considerable damage to commercial developments which have come into the valley since construction of U. S. Highway 19 in 1943.

7. Nine road bridges cross Soco Creek in the reach investigated. The 1953 flood reached floor level on two of these bridges. A recurrence of the 1913 flood would overtop at least four bridges.

SOCO CREEK BASIN

Settlement

The Soco Creek basin is located near the northern edge of Jackson County which was formed in 1851 and named in honor of Andrew Jackson. The first white settlement in the county was made on Scott Creek, a few miles south of Soco Creek, in about 1790. Plate 1 shows the Tuckasegee River basin and the location and shape of Soco Creek basin.

Soco Creek watershed is almost wholly within the Cherokee Indian Reservation. Of the lower 6.6 miles of the creek only the portion between

mile 0.5 and mile 1.6 is in private ownership. Land in the reservation is owned by the Federal Government and administered by the Tribal Council. Individual tracts are leased or assigned to persons who qualify for residence on the reservation. Many tracts have been occupied by the same family for years. The only condition for retaining the use of the land is that the assignees remain on it and continue to use it. Indian families have naturally come to look on this land as their own to use and develop. Where the tracts have become desirable for tourist developments, this has resulted in some complications.

The Creek and Its Valley

The drainage basin of Soco Creek is fan-shaped, roughly nine miles long by five miles wide. The total area at the mouth is 45.3 square miles. Wrights Creek, entering at mile 3.0 and draining less than 10 square miles, is the principal tributary of Soco Creek. Other tributaries drain much smaller areas and the channels drop steeply down the heavily forested mountain slopes at right angles to the main stream.

Headwaters of the creek are on the ridge which divides the Tuckasegee and French Broad River basins. High mountains rim the Soco Creek basin on three sides. The Plott Balsams to the south and southeast are generally above 5,000 feet. Barnett Knob and Soco Bald on the north rim are 4,500 and 5,400 feet above sea level, respectively. Soco Gap, the highway outlet eastward from the basin is at elevation 4,345. The elevation of the mouth of the creek is 1,900 feet above sea level. The rugged watershed is approximately 90 percent forested.

The average fall in the creek in the 6.6 miles covered by the investigation is 61 feet per mile. Some flattening of the slope occurs midway of the reach and the lower three miles has a fall of about 45 feet per mile. The valley floor is quite extensive for a mountain stream, ranging up to 2,000 feet in width in the reach investigated. The surface of the flood plain is rather uneven, probably as a result of scouring by high velocity flow in large floods of the past. The soil is productive and well drained. Boulders are not a serious problem in cultivation.

Development of Tourist Facilities

Prior to 1943 the economy of the Soco Creek valley was tied to farming and timber cutting. In that year U. S. Highway 19, which formerly passed south of Soco Creek through Sylva and Balsams Gap, was rerouted to pass through Cherokee and Soco Gap. The new location follows Soco Creek upstream from mile 2 to the gap.

A large part of the steadily increasing tourist traffic to the Great Smoky Mountains and the Cherokee Indian Reservation travels on Highway 19 through the Soco Creek area. To serve these tourists a number of motels and craft shops have been built along the highway. Those built to date are privately owned by Cherokee Indians or persons in their families. None in the Soco Creek area are tribal owned developments.

The old homes along Soco Creek are built well back from the creek and are out of flood danger. The newer homes and commercial developments, however, are along the highway and would be affected by a high flood.

Bridges Across the Creek

Table 5 lists data on the nine bridges that cross Soco Creek in the reach investigated. The table also shows the elevation of the 1953 flood crest at each bridge and of the 1913 flood crest where this is available. The floors of five bridges are less than 10 feet above low water and none are higher than 15 feet above low water.

FLOOD DATA

Flood Records

No official record of stream stages and discharges has been maintained on Soco Creek. Information on flood heights and dates of occurrence has been obtained largely by interviews with local residents. Files of newspapers at Asheville and Sylva have been searched but no references were found to floods on the creek. The general flood of February 21, 1953, in the Little Tennessee River basin was investigated by field engineers of the Hydraulic Data Branch of TVA, and the report on their investigation contains information on the Soco Creek flood.

TABLE 5

SOCO CREEK BRIDGE DATA

MILES 0 TO 6.6

Mile Above Mouth	Identification and Type	Elevations				
		Floor	Clear-ance	Low Water	1953 Flood Crest	1913 Flood Crest
0.18	Side road, concrete deck	1917.1	1914.5	1906.5	1912.0	1918
0.61	U. S. Highway 441, concrete deck	1934.0	1930.7	1921.4	1926.5	1931
1.84	U. S. Highway 19, concrete arch	1992.4	1987.9	1977.5	1981.5	1986
3.27	Side road, timber	2067.2		2059.1	2066.0	2069
4.09	Side road, timber	2119.7	2118.4	2113.6	2119.7	2122
4.45	Side road, timber	2138.4	2136.6	2130.9	2138.4	
5.07	Side road, timber	2188.8	2186.8	2182.4	2186.0	
6.13	Side road, timber	2268.2	2266.5	2258.8	2263.2	
6.65	U. S. Highway 19, concrete arch	2324.6	2321.6	2311.6	2316±	

Flooded Area

Plate 11 shows the approximate area inundated by the flood of February 21, 1953. The limits of this area are based on information obtained from local people who witnessed the flood, supplemented by data from high water profiles, valley cross sections, and topography.

The overflow in 1953 occurred in relatively narrow channels with shallow flow and low velocities. Crest elevations in these overflow channels probably differed somewhat from the level in the main channel. The boundaries of the overflow area shown on Plate 11 are sufficiently accurate for the intended purpose but the actual limits of overflow on the ground may vary somewhat from that shown on Plate 11. This is because the contour interval of the map, which is 40 feet, does not permit precise plotting of the flooded area boundaries. To define these limits with a high degree of accuracy would require costly surveys which present purposes do not warrant.

Flood Profiles

Plate 12 shows high water profiles for the floods of February 1953 and March 1913, based on high water marks pointed out by local residents. A few marks were located for floods in April 1936 and August 1940 but these were insufficient in number to develop the profiles.

Also shown on Plate 12 are profiles of the left bank of the creek and the approximate low water of December 1954, together with pertinent elevations of bridges, and the elevation of the maximum flood of reasonable regional expectancy which is discussed in Section II of this report.

Valley Cross Sections

A total of 38 valley cross sections were obtained along Soco Creek, extending in elevation up to 15 feet above low water. A selected group of these cross sections is shown on Plate 10.

Flood Descriptions

The following descriptions cover the larger floods that occurred on Soco Creek:

November 1906--Data obtained during the investigation indicates that this flood was the highest known since the settlement of Soco Creek. High water marks obtained along Oconaluftee River showed the 1906 flood to be the highest known on that stream.

Mr. Jarrett Blythe, who is now Chief of the Eastern Band of Cherokee Indians and who has been active in tribal affairs all his life, was the only person found who could recall the 1906 flood. Mr. Blythe lived on Oconaluftee River at the time so could not give a great deal of information on the flood on Soco Creek, but he recalled that a severe flood took place and that it was higher than at any time since. The area was being logged at the time with wood flumes used to bring logs down from the cutting area. These flumes were all washed out, according to Mr. Blythe.

The Reverend Arsene Thompson, who has played a prominent part in the Cherokee drama "Unto These Hills" since its start, has lived at his present home on Soco Creek for 20 years. The former owner, now deceased, showed him a point reached by a flood "many years ago." This point is 1.4 feet higher than the point reached there by the February 1953 flood. It was impossible to determine whether this old mark was for the 1906 flood or the flood of March 1913.

Newspaper files at Sylva and Asheville yielded no useful information on the 1906 flood.

March 27, 1913--One high water mark was found for this flood, putting it about 5 feet above the flood of February 1953. Mr. Tom Tolley, who has lived for 41 years at mile 2.5 on Soco Creek, recalled that a flood about 40 years ago came within a few feet of reaching his barn. He said that water completely covered the creek bottom at that point. Mr. G. George, age 53, who has lived his entire life along Soco Creek and has been at his present home at mile 2.6 for ten years, said that there was a big flood "about 1915" which washed away all the bridges on Soco Creek and was the biggest he remembered. He could not point out any marks, however.

The Jackson County Journal, published in Sylva, North Carolina, described what it called the worst freshet in years on Scott Creek on March 27, 1913. The issue for March 28, 1913, stated:

"Sylva and Jackson County were visited Wednesday night (March 26) with the heaviest rainstorm in years; it practically amounted to a flood.

It rained all day Wednesday and all night until about 12:30 when the flood gates opened and the rain poured in torrents, accompanied by heavy wind and a severe electrical storm.

"Many bridges in different portions of the county were washed away. The lower portions of Sylva and Dillsboro were covered by the raging waters of Scott Creek. The trestle at Sylva was rendered useless and the track between Sylva and Beta was washed away in many places. From reports along the Murphy Division (Southern Railway) the flood seems to have been general throughout this section, and not less than ten trestles have been washed out . . . . At least three of the bridges across Savannah Creek are gone."

Scott Creek adjoins the Soco Creek basin on the south. Savannah Creek enters the Tuckasegee River at Dillsboro, seven miles south of Soco Creek by airline.

April 1936--This flood was about equal to the flood of August 30, 1940, over the upper part of the reach investigated and slightly higher than that flood near the mouth. This flood and the 1940 flood were confused in the minds of a number of persons, but sufficient data were obtained to establish this relation. The 1936 flood exceeded the February 1953 flood by about 2-1/2 feet near the mouth. Farther upstream the difference dropped off to less than one foot.

August 30, 1940--This flood was remembered by most persons because of the severe flood at that time on Tuckasegee River. Little or no damage occurred on Soco Creek. Mr. Jarrett Blythe witnessed both the 1936 and the 1940 floods from his home near Macedonia Church and said that the 1936 was higher at that point. Mrs. Carl Thomasson was raised at mile 1.4 and remembers two floods which got to her house, one obviously the April 1936 flood and the other the flood of August 1940. The highest one of these reached nearly to the floor of the porch. Mrs. Callie Arch said the largest of the two floods at her place at mile 0.3 was in 1936, remembering that as the year her husband returned from Washington, D. C.

February 21, 1953--This flood was fresh in the memory of residents of the valley. Although little damage resulted, most persons could point out where overflow occurred and give some idea of the height reached. Overflow

occurred along narrow strips of shallow flow with relatively low velocity. High water marks taken along these overflow strips usually did not agree with crest elevations along the main channel.

The only damage resulting in the Soco Creek basin was at the Cherokee Indian Methodist Church, at mile 4.0, where shallow overflow washed away newly placed topsoil from the lawn. Figures 5 and 6 show the damage at the church.

ACKNOWLEDGEMENTS

This section of this report covering the flood histories of the Tuckasegee and Oconaluftee Rivers and Soco Creek 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 for this report were made under the direction of James W. Beverage, Head of the Field Investigations Section. Investigations of the flood history of Soco Creek, the flood of July 1955 on Oconaluftee River, and cross sections and other field data on both streams were made by Myron O. Jensen, District Engineer, assisted by James K. Curtis, Area Engineer, and Claude M. Douthit, Engineering Aide. Flood history investigations on the Tuckasegee and Oconaluftee Rivers were made under the supervision of James E. Goddard, who was Head, Field Investigations Section, at the time of the investigations.

Paul C. Spath, Head of the Office Engineering Unit, prepared charts and maps for the report.

The flood information was analyzed and this section of the report was prepared by Myron O. Jensen.

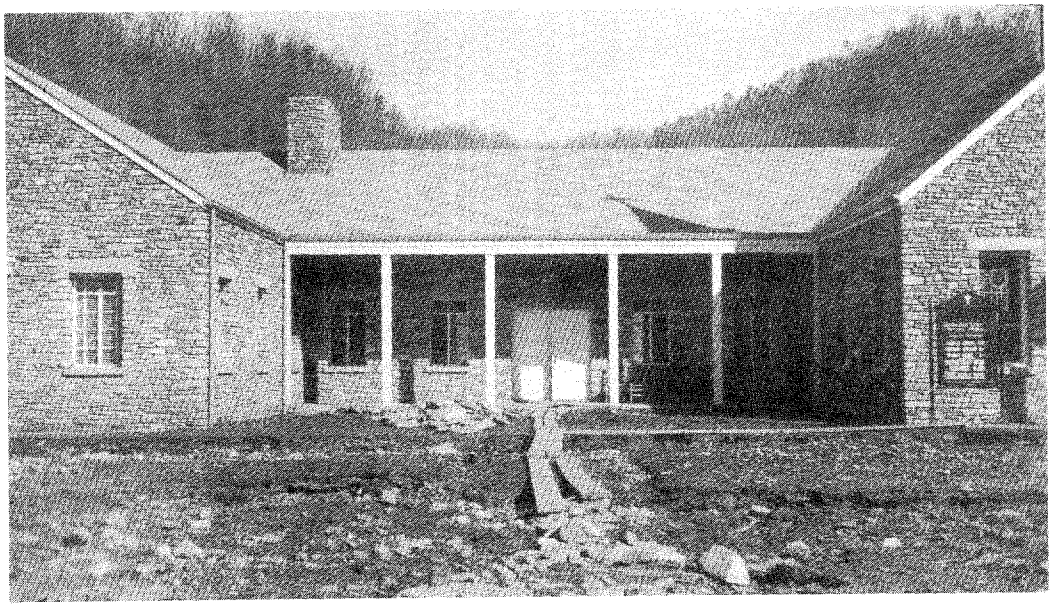


Figure 5.--SOCO CREEK SCOURS CHURCH YARD IN 1953

The shallow but swift overflow of Soco Creek on February 21, 1953, scoured the lawn at the new Cherokee Indian Methodist Church at mile 4.0.

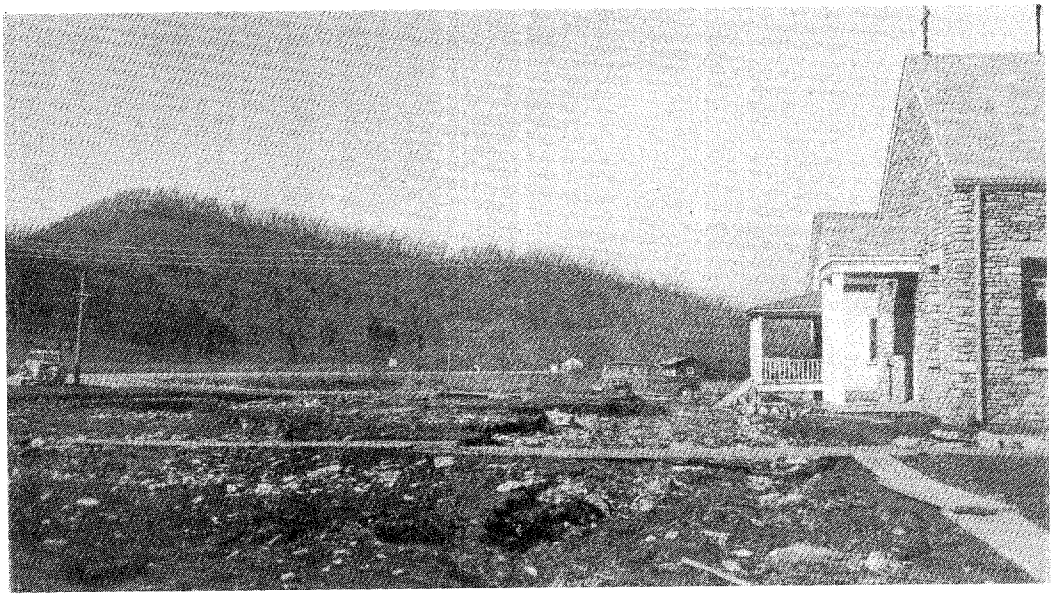


Figure 6.--FLOOD WATER LACKED A FEW INCHES OF ENTERING CHURCH

Soco Creek rose to the concrete porch of the Cherokee Indian Methodist Church but did not enter the building on February 21, 1953.

II.

MAXIMUM FLOOD OF
REASONABLE REGIONAL EXPECTANCY
TUCKASEGEE AND OCONALUFTEE RIVERS
AND SOCO CREEK
IN VICINITY OF
CHEROKEE, NORTH CAROLINA

Tennessee Valley Authority
Division of Water Control Planning

II.

MAXIMUM FLOOD OF REASONABLE REGIONAL EXPECTANCY

The preceding section of this report has presented an account of the floods that have occurred in the Cherokee vicinity during the past 100 or more years. Along with such historical floods, it is important to consider the magnitude of floods that may occur in the future, particularly those that may reasonably be expected to occur on the Tuckasegee and Oconaluftee Rivers and Soco Creek. It is with these maximum floods of reasonable expectancy in the Cherokee vicinity that this section of this report is chiefly concerned. The possibility of floods of this type, even though remote, should be recognized in studies of local flood problems. For these studies, both the magnitude and elevations of the maximum floods of reasonable regional expectancy in the Cherokee vicinity as given in this report are satisfactory for consideration in zoning and similar local problems where no definite factors of safety need be applied. For the design of protective works the failure of which would be disastrous, floods of greater magnitude might be required.

Determination of Peak Discharge and Elevations

Determinations have been made of the peak flood discharges and the elevations of the water surface at the flood crests for floods that may reasonably be expected to occur on the Tuckasegee and Oconaluftee Rivers and Soco Creek in the Cherokee vicinity. In these determinations, consideration has been given to (1) great storms which have already occurred in the general vicinity of Cherokee and that might have occurred over the drainage area of the Tuckasegee River and its tributaries near Cherokee, and (2) the greatest flood discharges that are known to have occurred on streams in the general region of Cherokee. As a result of these studies, the maximum floods of reasonable regional expectancy have been determined to have crest discharges as follows on the three streams:

(a) Tuckasegee River--150,000 cubic feet per second at Bryson City.

(b) Oconaluftee River--69,000 cubic feet per second at Cherokee.

(c) Soco Creek--30,600 cubic feet per second at U. S. Highway 19 bridge near Cherokee.

These discharges are substantially greater than those of maximum known floods of the past on the three streams. On the Tuckasegee River at Bryson City the maximum expected flood crest discharge is nearly 70 percent greater than that of the 1840 flood as given in the flood history section of this report. No accurate data are available on the crest discharges of the 1906 flood on Oconaluftee River and Soco Creek, but the maximum expected floods on these streams might be 4 to 5 times as great as the 1906 peak flows. These maximum floods of reasonable regional expectancy are higher than any known to have occurred in this region, but considering the possible heavy storm precipitation that might occur in the Cherokee vicinity, it is estimated that floods of these large magnitudes might sometime occur. As a basis for comparison of the floods of reasonable expectancy with those that have been experienced, the following known flood discharges on streams in the general region are given:

TABLE 6

FLOOD DISCHARGES OF COMPARABLE REGIONAL STREAMS

Stream	Location	Year	Drainage Area Square Miles	Peak Flood Discharge in Cubic Feet per Second	
				Total	Per Square Mile of Drainage Area
French Broad River	Calvert, N. C.	1916	103	36,000	350
Tuckasegee River	Bryson City, N.C.	1840	655	90,000	137
E. Fk. Tuckasegee River	Tuckasegee, N. C.	1940	80.3	30,000	370
Little River	Walland, Tenn.	1875	192	50,000	260
Valley River	Tomotla, N. C.	1898	104	32,000	308
Caney Fork	E. Laport, N. C.	1940	39.4	21,700	551
Newfound Creek	Leicester, N. C.	1940	34.2	12,000	350
Hominy Creek	Candler, N. C.	1940	28.9	12,400	429

Water surface elevations for floods of the magnitude of those of reasonable expectancy on the three streams were computed by using stream characteristics for selected reaches as determined from topographic maps, valley cross sections, and observed flood profiles.

The flood discharge and elevations for these maximum floods of reasonable regional expectancy should be given appropriate consideration in studies of flood problems, particularly those connected with flood zoning, in the Cherokee vicinity. Developments in an area subject to the probability of such floods should be planned and carried out with due recognition of the losses that could be sustained if the floods should occur.

Crest Profiles and Overflow Areas

The crest profiles computed for the maximum floods of reasonable regional expectancy are shown on Plates 5, 9, and 12. These profiles are based on channel conditions existing in March 1956. Higher elevations would occur during such floods if the channels were allowed to deteriorate from the 1956 conditions.

The limits of the areas along the three streams that would be overflowed by the floods are shown on Plate 4, 8, and 11. Additional ground elevations were obtained in some localities, particularly along the Oconaluftee River and Soco Creek, to define the flood limits more closely. The horizontal area covered by the maximum expectancy flood is considerably greater on Soco Creek than that covered by the 1953 flood, which is also shown on Plate 11. On Oconaluftee River the maximum expectancy flood covers somewhat more area than the 1906 flood except in the gorge reach in the lower 2.5 miles. On the Tuckasegee River there is little difference between the areas flooded in 1840 and those that would be inundated by the maximum flood of reasonable regional expectancy. On this stream the effect of the maximum expected flood would be principally from greater depth of flooding.

While the elevations and areas overflowed shown on Plates 4, 5, 8, 9, 11, and 12 are sufficiently accurate for the intended purpose, actual elevations for floods of the magnitude of those under consideration may vary from those shown on the profiles and maps. The contour interval of the maps is 40 feet which does not permit precise plotting of the boundaries of the

flooded areas, so that the actual positions on the ground of the flooded areas may vary somewhat from those shown on the maps. To determine flood elevations and limits with a higher degree of accuracy would require costly surveys and studies which present purposes do not warrant.

Velocities

Because of the steep slope, averaging about 23 feet per mile, velocities of flow in the main channel of the Oconaluftee River during the maximum flood of reasonable regional expectancy would be as high as 19 feet per second. This velocity would occur in the steep section below Adams Creek. Just below the state highway bridge at Cherokee, North Carolina, the channel velocity would be about 17 feet per second. Velocities in the overflow area of the Oconaluftee River would range up to 7 feet per second, the highest velocities also occurring in the steep section below Adams Creek.

The average slope of Soco Creek is 56 feet per mile. Such a slope would produce flow velocities in the main channel during the maximum flood of reasonable regional expectancy as high as 28 feet per second in a narrow gorge about one-half mile downstream from U. S. Highway 19 bridge. Velocities in the overflow area would range up to 7 feet per second, except in the above-mentioned narrow gorge where the overflow velocity would be about 11 feet per second.

The average slope of Tuckasegee River between Bryson City and Whittier is 14 feet per mile. Velocities of flow in the main channel in the vicinity of Bryson City during the maximum flood of reasonable regional expectancy would range between 13 and 19 feet per second. Just below the Everett Street bridge the main channel velocity would be 16 feet per second. Velocities in the overflow area would range up to 9 feet per second in the Bryson City vicinity, and just below Everett Street bridge would be about 4 feet per second. Similar high velocities would occur upstream to Whittier.

Such flow velocities in all three streams, in combination with the great depths, would create a hazardous situation, particularly if the flood were to occur during the night.

Frequency

The frequency of floods of the magnitude of those of the maximum floods of reasonable regional expectancy is not susceptible of definite determination. These floods would be considerably larger in peak discharge than any known to have occurred in the Cherokee vicinity. They would be some 6 to 15 feet higher than the elevations actually experienced in the highest known floods on the three streams. Over perhaps several centuries of record, these maximum floods of reasonable regional expectancy will occur on the average only at rather long intervals of time, but such floods could occur this year or in any succeeding year.

Larger Floods Possible

Floods larger than those of maximum reasonable regional expectancy are meteorologically possible. However, the combination of meteorological factors that would be necessary to produce such floods would occur at very rare intervals, if at all. While the possibility of floods of this magnitude are 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 rarity and uncertainity of occurrence on a given watershed, usually need be given serious consideration only where dependence is placed on works constructed for protection of valuable property from floods.

Acknowledgements

Determinations of the magnitude of the maximum floods of reasonable regional expectancy were made by the Flood Control and Hydraulic Data Branches of the Division of Water Control Planning under the general direction of Reed A. Elliot, Chief Water Control Planning Engineer, and the immediate supervision of Charles W. Okey, Chief, Flood Control Branch, and Albert S. Fry, Chief, Hydraulic Data Branch. For the Flood Control Branch, flood studies were under the direction of Edward J. Rutter, Head, Project Studies Section, and computation of water surface elevations was under the direction of B. J. Buehler, Head, Operation Studies Section. For the Hydraulic Data Branch, flood studies were under the direction of Alfred J. Cooper, Head, Hydrology Section.

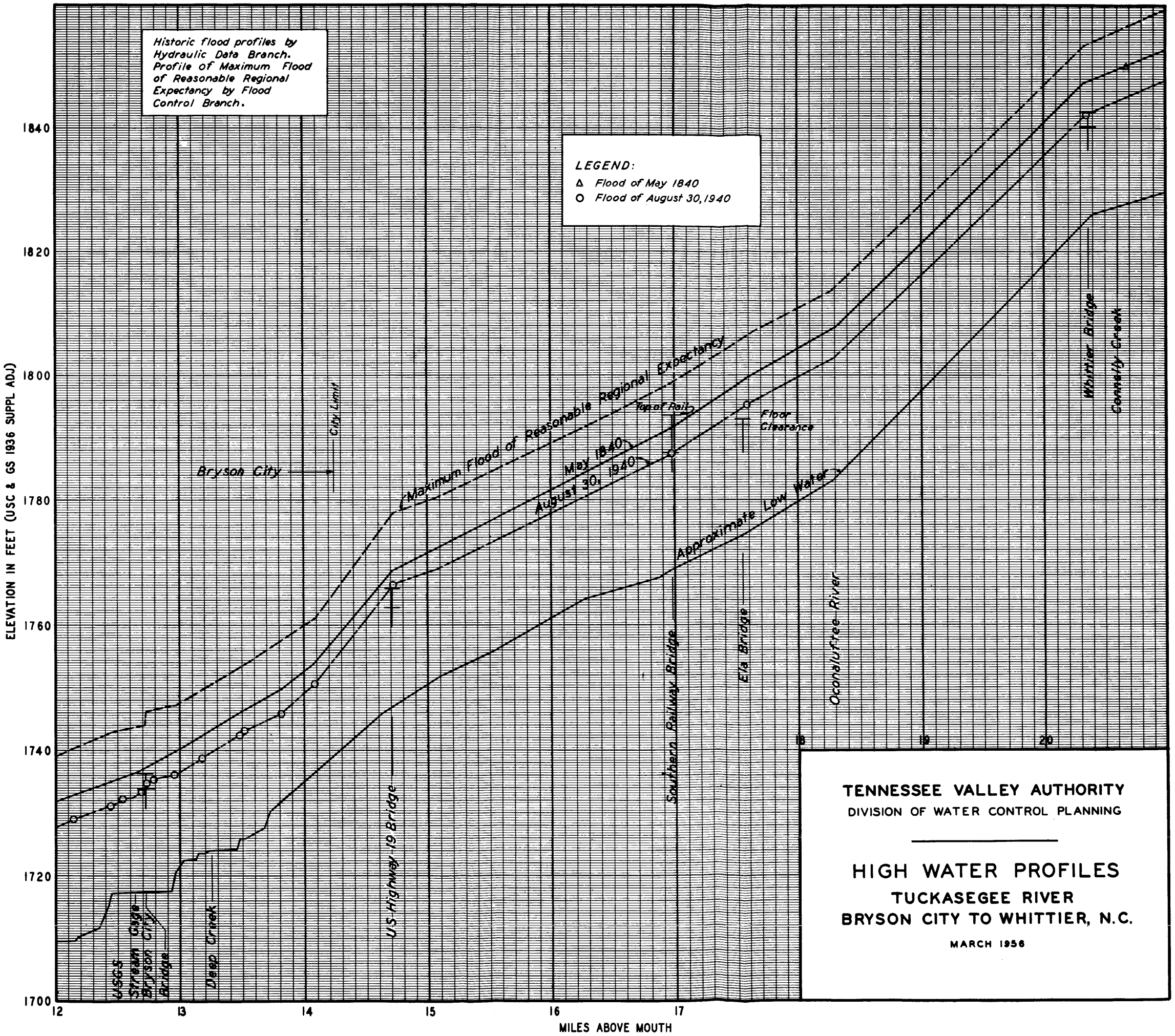
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

FLOODED AREAS
TUCKASEGEE RIVER
VICINITY OF
BRYSON CITY TO WHITTIER, N.C.

Scale 0 1000 2000 3000 Feet

MARCH 1956

PLATE 5

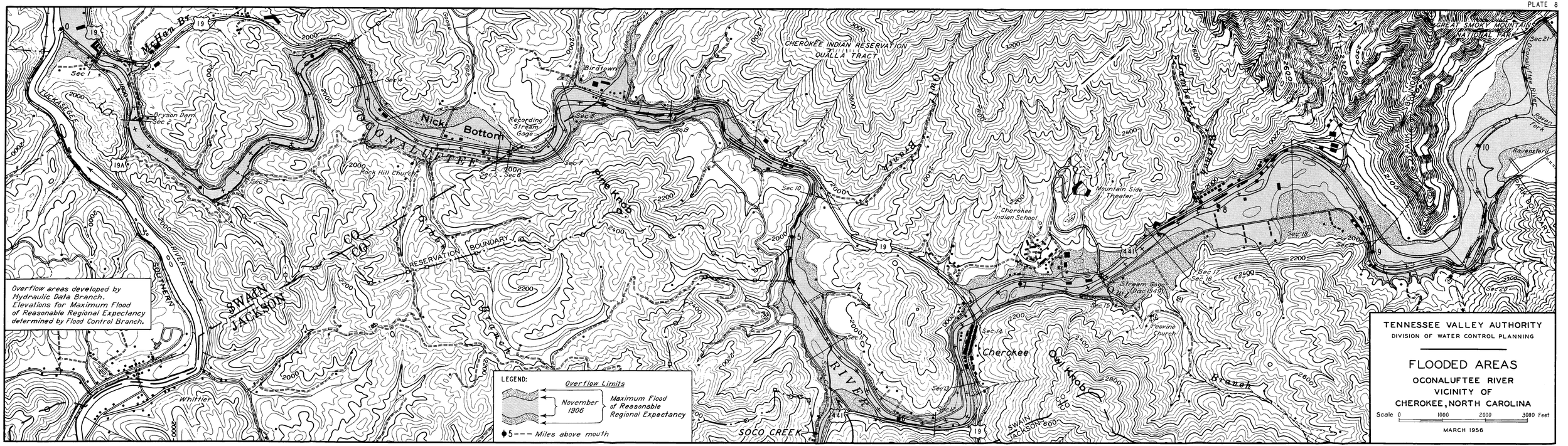


TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

HIGH WATER PROFILES
TUCKASEGEE RIVER
BRYSON CITY TO WHITTIER, N.C.

MARCH 1956

ASF-1311



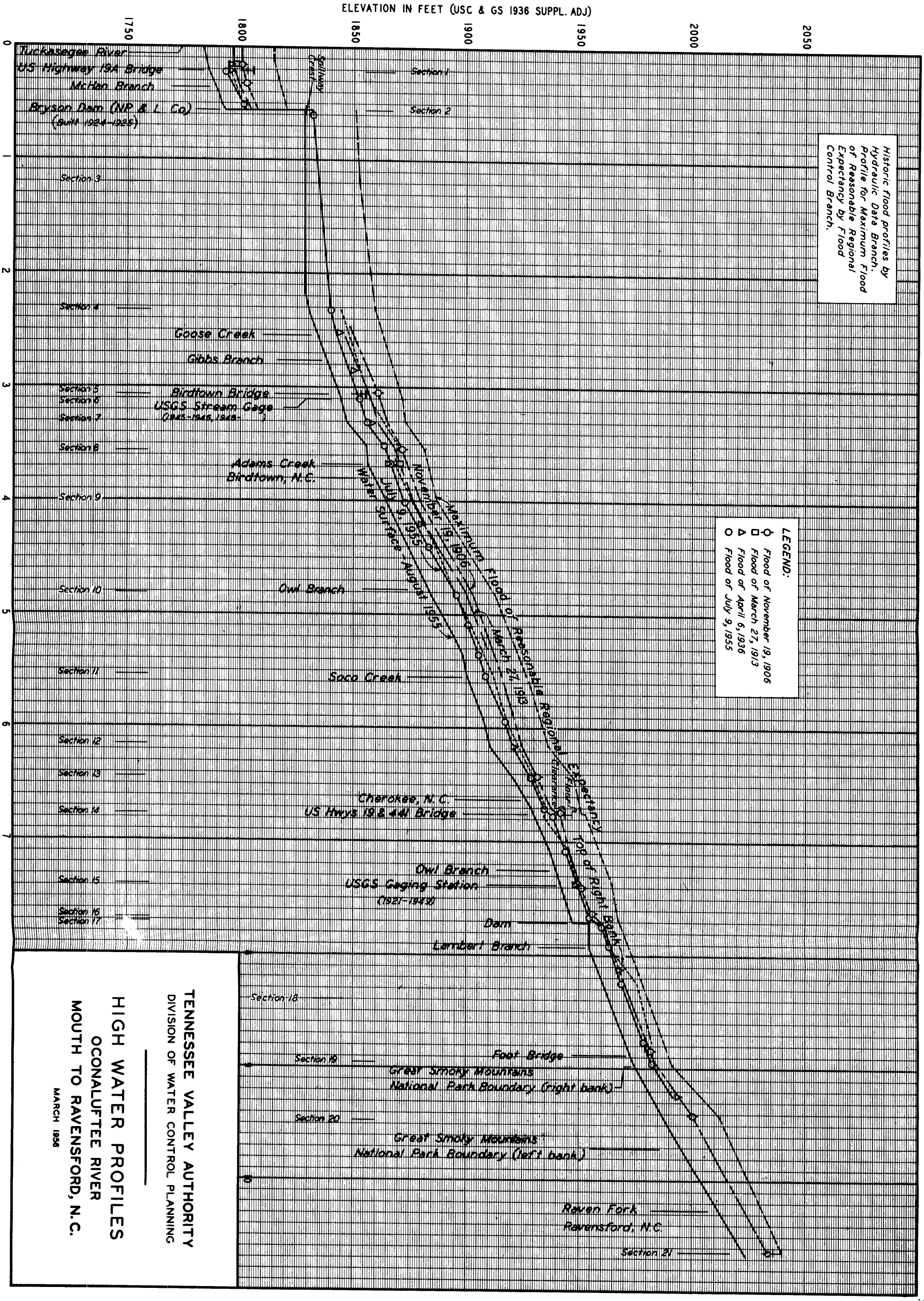
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

FLOODED AREAS
OCONALUFTEE RIVER
VICINITY OF
CHEROKEE, NORTH CAROLINA

Scale 0 1000 2000 3000 Feet

MARCH 1956

ASF-1311

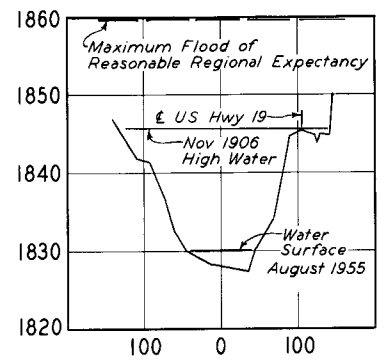


TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

HIGH WATER PROFILES
OCONALUFTEE RIVER
MOUTH TO RAVENSFORD, N.C.

MARCH 1956

PLATE 9



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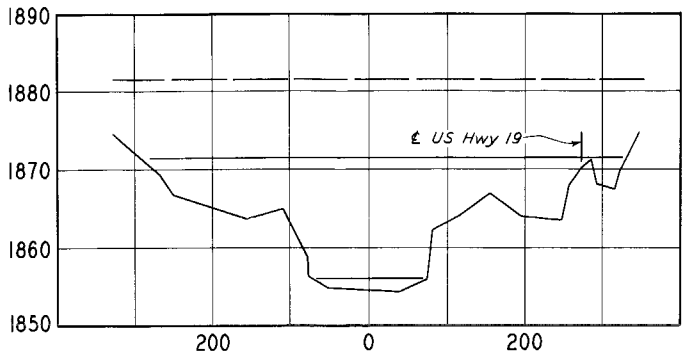

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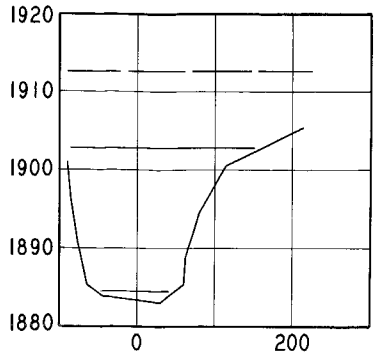

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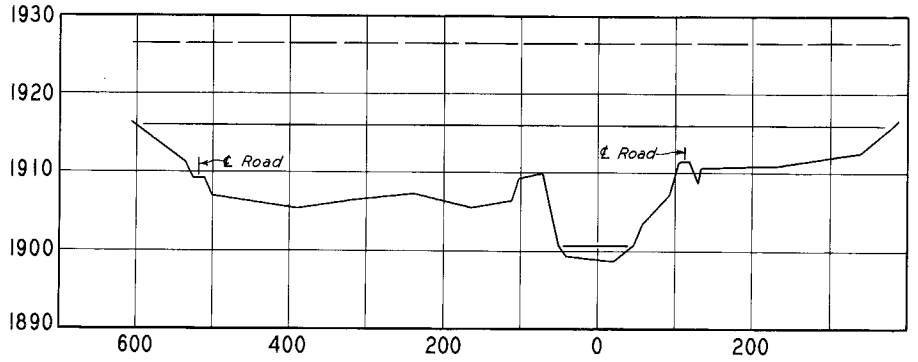

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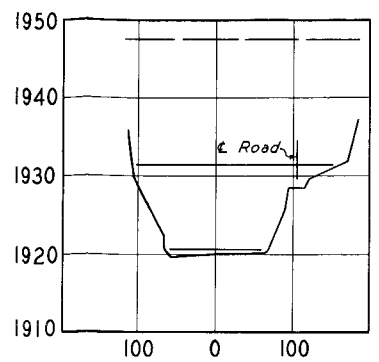


NO. 13 - MILE 6.43

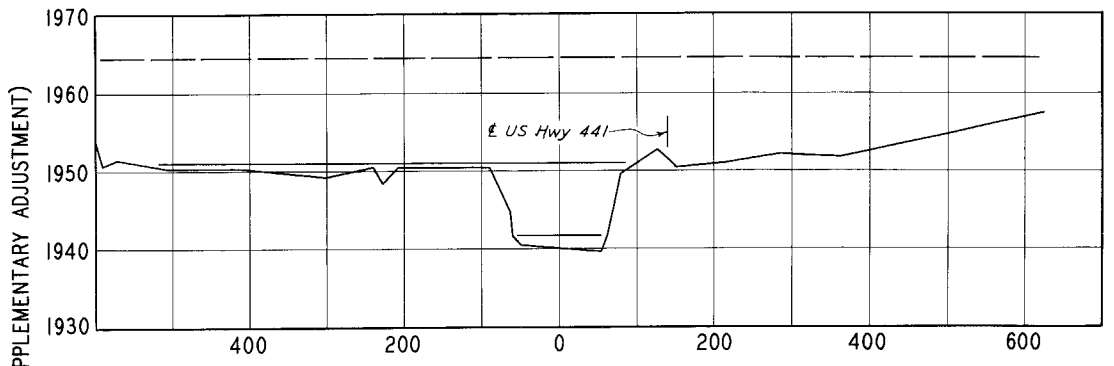
Sections taken looking downstream.

Valley cross sections and historic flood elevations by Hydraulic Data Branch.

Elevations of Maximum Flood of Reasonable Regional Expectancy determined by Flood Control Branch.

Thirteen valley cross sections on Oconaluftee River and thirty valley cross sections on Soco Creek not shown.

ELEVATION IN FEET (USC & GS 1936 SUPPLEMENTARY ADJUSTMENT)



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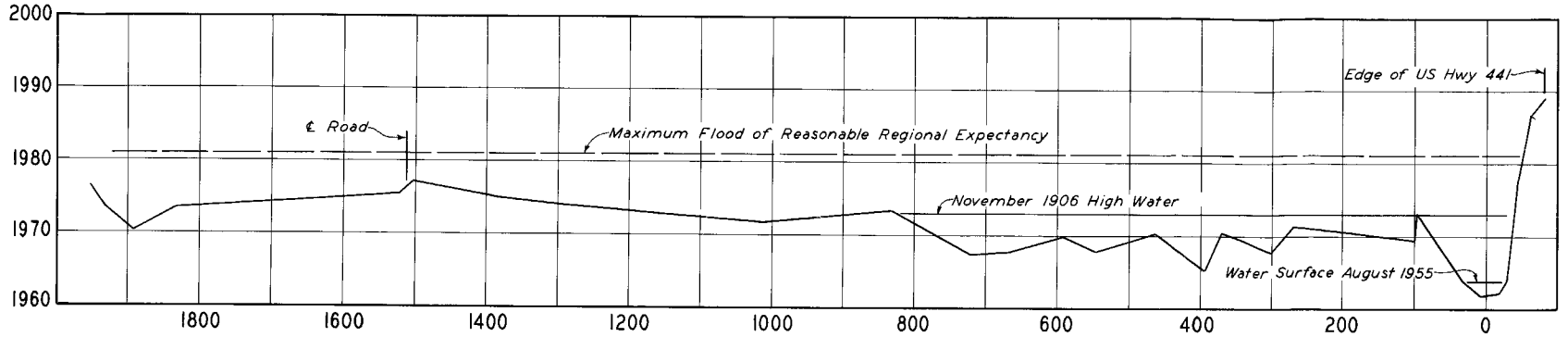

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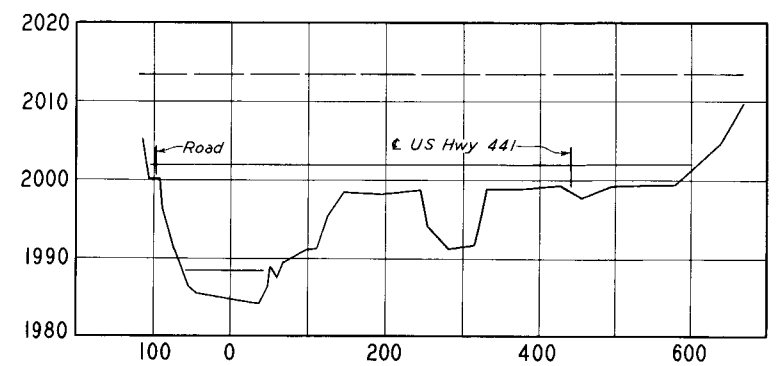
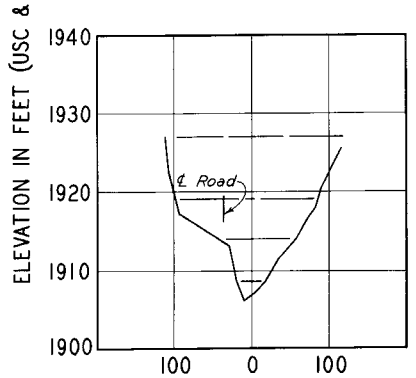


NO. 20 - MILE 9.47

OCONALUFTEE RIVER CROSS SECTIONS



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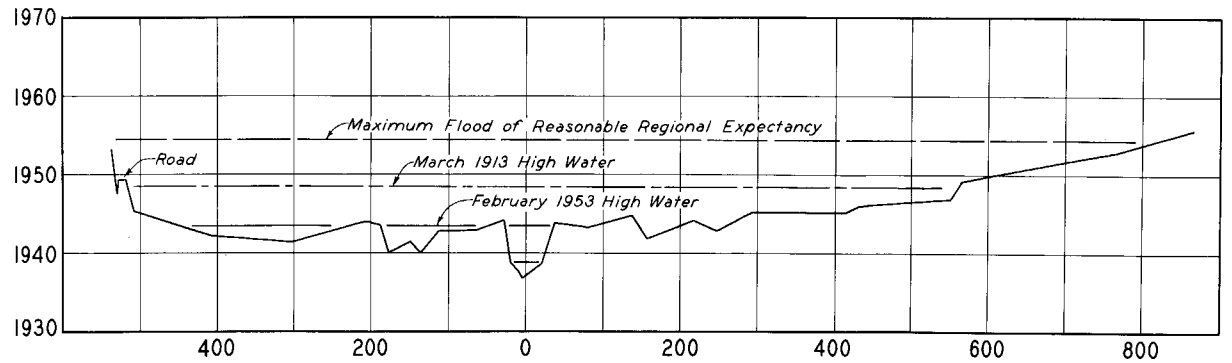

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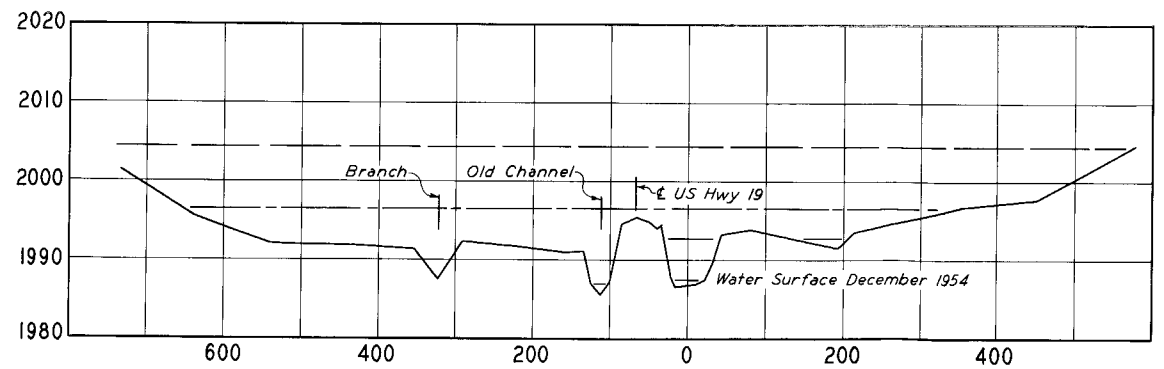

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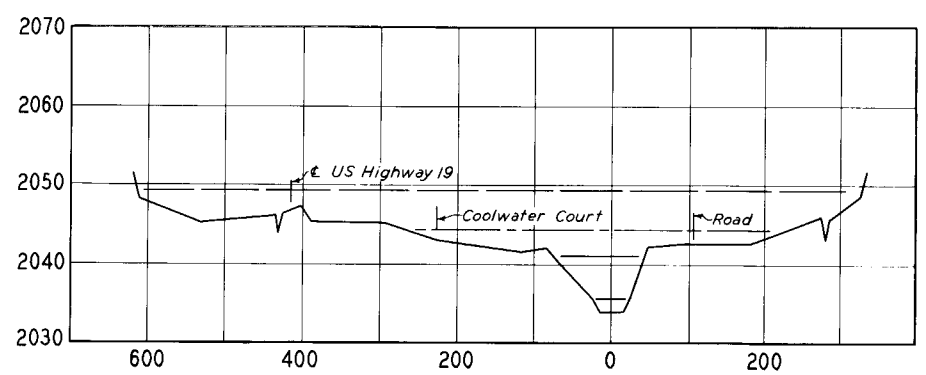

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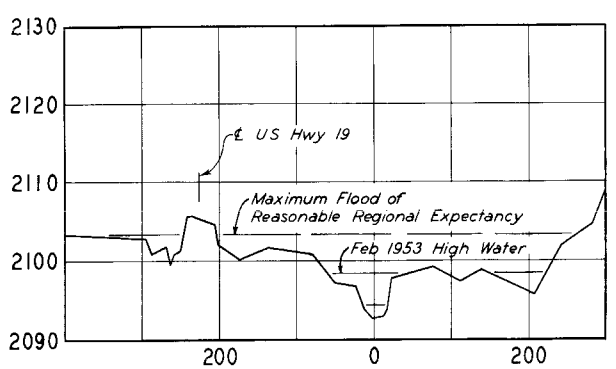

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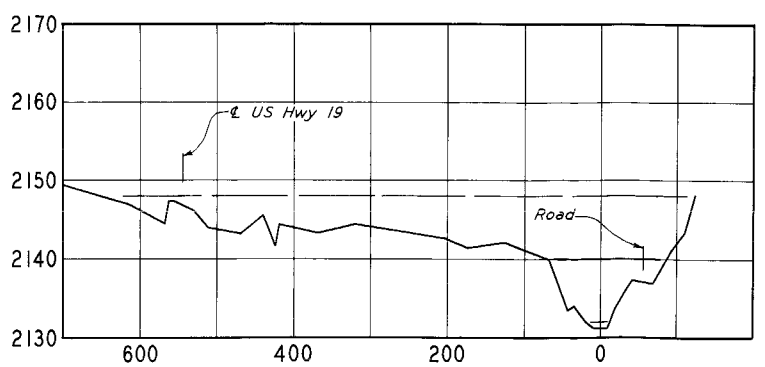

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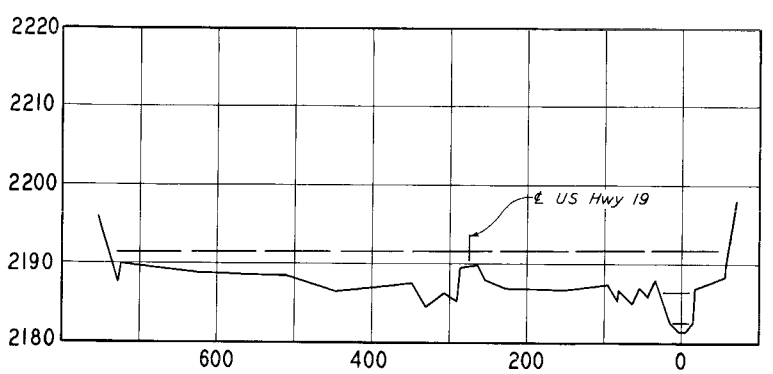

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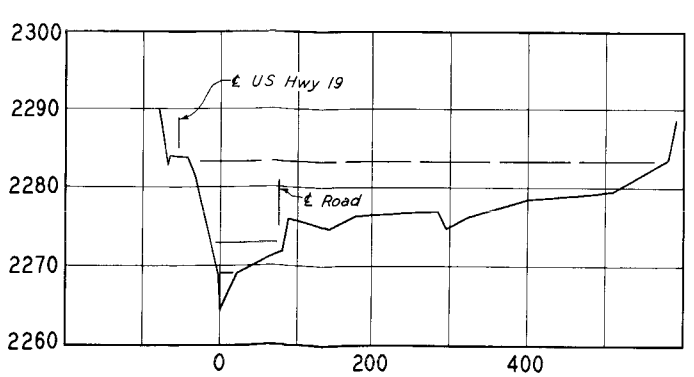

NO. 36 MILE 6.24

SOCO CREEK CROSS SECTIONS

HORIZONTAL DISTANCE IN FEET

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

VALLEY CROSS SECTIONS

OCONALUFTEE RIVER AND SOCO CREEK VICINITY OF CHEROKEE, NORTH CAROLINA

MARCH 1956

ASF-1311


TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
FLOODED AREAS
SOCO CREEK
VICINITY OF
CHEROKEE, NORTH CAROLINA
Scale 0 500 1000 1500 Feet
MARCH 1956
Overflow areas developed by Hydraulic Data Branch. Elevations for Maximum Flood of Reasonable Regional Expectancy determined by Flood Control Branch.
LEGEND:
Overflow Limits
February 1953
Maximum Flood of Reasonable Regional Expectancy
Miles above mouth
CHEROKEE INDIAN RESERVATION
QUALLA TRACT
Cherokee
Soco
Creek
OCONALUFTEE RIVER
SWAIN
JACKSON
RESERVATION BOUNDARY
Wrights Creek
Mee's Indian Village
War Bonnet Crafts
Owl Court
Saloah Shop
Princess Court
Chief Court
Coolwater Court
Rock Spring Church
Methodist Mission
Indian Bill's
Soco School
Macedonia Baptist Ch.
Wesleyan M.E. Church
Blue Wing Church
Sec 1
Sec 5
Sec 6
Sec 9
Sec 13
Sec 15
Sec 16
Sec 17
Sec 18
Sec 19
Sec 20
Sec 21
Sec 22
Sec 23
Sec 24
Sec 25
Sec 26
Sec 27
Sec 28
Sec 29
Sec 30
Sec 31
Sec 32
Sec 33
Sec 35
Sec 36
Sec 38
2000
2200
2400
2600
2800

ELEVATION IN FEET (USC & GS 1936 SUPPL ADJ)

1900 1950 2000 2050 2100 2150 2200 2250 2300

MILES ABOVE MOUTH

0 1 2 3 4 5 6

Oconaluftee River

Secondary Road Bridge

Clearance

U.S. Highway 441 Bridge

Floor

Shoal Creek

March 27, 1913

Foot Bridge

U.S. Highway 19 Bridge

Stillwell Branch

Foot Bridge

Top of Left Bank

Wrights Creek

State Highway Bridge

Maximum Flood of Reasonable Regional Expectancy

Low Water-December 1952

Secondary Road Bridge

Adams Branch

Secondary Road Bridge

Secondary Road Bridge

February 21, 1953

Secondary Road Bridge

Section 1
Section 2
Section 3
Section 4
Section 5
Section 6
Section 7
Section 8
Section 9
Section 10
Section 11
Section 12
Section 13
Section 14
Section 15
Section 16
Section 17
Section 18
Section 19
Section 20
Section 21
Section 22
Section 23
Section 24
Section 25
Section 26
Section 27
Section 28
Section 29
Section 30
Section 31
Section 32
Section 33
Section 34
Section 35
Section 36

Historic Flood profiles by Hydraulic Data Branch. Profile of Maximum Flood of Reasonable Regional Expectancy by Flood Control Branch.

LEGEND:

- ◇ Flood of March 27, 1913
- ● Flood of April 1936
- △ Flood of August 30, 1940
- ○ Flood of February 21, 1953

TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING

HIGH WATER PROFILES
SOCO GULCH DAM
VICINITY OF
CHEROKEE, NORTH CAROLINA

MARCH 1957

ELEVATION IN FEET (USC & GS 1936 SUPPL ADJ)
1900
1950
2000
2050
2100
2150
2200
2250
2300
MILES ABOVE MOUTH
0
1
2
3
4
5
Oconaluftee River
Secondary Road Bridge
Clearance
U.S. Highway 441 Bridge
Floor
Shoal Creek
Section 1
Section 2
Section 3
Section 4
Section 5
Section 6
Section 7
Section 8
Section 9
Foot Bridge
Section 10
Section 11
Section 12
U.S. Highway 19 Bridge
Stillwell Branch
Section 13
Section 14
Section 15
Section 16
Foot Bridge
Top of Left Bank
Section 17
Section 18
Wrights Creek
Section 19
Section 20
State Highway Bridge
Section 21
Section 22
Section 23
Section 24
Secondary Road Bridge
Section 25
Adams Branch
Section 26
Secondary Road Bridge
Section 27
Section 28
Section 29
Section 30
Secondary Road Bridge
Section 31
Section 32
Section 33
Section 34
Section 35
Secondary Road Bridge
Section 36
Washington Creek
Section 37
Section 38
March 27, 1913
Maximum Flood of Reasonable Regional Expectancy
Low Water December 1954
February 21, 1953
Historic flood profiles by Hydraulic Data Branch. Profile of Maximum Flood of Reasonable Regional Expectancy by Flood Control Branch.
LEGEND:
Flood of March 27, 1913
Flood of April 1936
Flood of August 30, 1940
Flood of February 21, 1953
TENNESSEE VALLEY AUTHORITY
DIVISION OF WATER CONTROL PLANNING
HIGH WATER PROFILES
SOCO CREEK
VICINITY OF
CHEROKEE, NORTH CAROLINA
MARCH 1956

PLATE 12