Neuse river and tributaries—Table of power utilized.

Name of stream.	Tributary to what.	State.	County.	Kind of mill.	No. of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Neuse river	Pamlico sound	North Carolina	Wake	Paper	1	17	80
Do	do	do	do	Flour and grist	1	10	20
Do	do	do	do	do	1	8	20
Contentnea creek (Moccasin)	Neuse river	do	Wilson	do	3	23	79
Do	do	do	do	Saw	2	16	60
Do	do	do	do	Cotton-gin	1	6	8
Do	do	do	Johnston	Flour and grist	2	17	107
Do	do	do	do	Saw	1	12	70
All tributaries to	Contentnea creek	do	Greene	Flour and grist	6	63	145
Do	do	do	Wilson	do	6	43	100
Do	do	do	do	Saw	2	16	45
Do	do	do	do	Cotton-gin	3	32	48
Do	do	do	Wayne	Flour and grist	2	17	12
Do	do	do	do	Saw	1	8	18
Do	do	do	Nash	Flour and grist	2	.....	22
Do	do	do	do	Saw	2	.....	22
Little river	Neuse river	do	Johnston	Flour and grist	2	14	77
Do	do	do	do	Saw	2	16	40
Do	do	do	do	Cotton factory	1	10	40
Do	do	do	Wake	Saw	1	14	16
All other tributaries to	do	do	Wayne	Flour and grist	4	50	120
Do	do	do	do	Saw	1	10	10
Do	do	do	do	Woolen	2	.....	.....
Do	do	do	Johnston	Agricult'l implements	1	8	20
Do	do	do	do	Flour and grist	13	133	206
Do	do	do	do	Saw	3	39	36
Do	do	do	Pamlico	Flour and grist	1	8	20
Do	do	do	Jones	do	3	39	70
Do	do	do	Craven	do	1	8	4
Do	do	do	do	Cotton-gin	1	.....	.....
Do	do	do	Lenoir	Flour and grist	3	27	86
Do	do	do	Wake	do	23	309	397
Do	do	do	do	Saw	8	120	133
Do	do	do	do	Woolen	1	.....	15
Do	do	do	Franklin	Flour and grist	1	20	15
Do	do	do	Granville	do	3	49	72
Do	do	do	do	Saw	1	18	30
Flat river and tributaries	do	do	Orange	Flour and grist	4	50	100
Do	do	do	do	Saw	1	12	20
Do	do	do	Person	do	5	61	145
Do	do	do	do	do	5	.....	125
Little river and tributaries	do	do	Orange	do	4	55	48
Do	do	do	do	do	6	86	90
Do	do	do	do	Box	1	.....	6
Do	do	do	do	Cotton factory	1	17	40
Eno river and tributaries	do	do	do	Flour and grist	18	271	358
Do	do	do	do	Saw	4	60	55

V.—THE CAPE FEAR RIVER AND TRIBUTARIES.

THE CAPE FEAR RIVER.

This river, formed by the junction of the Haw and Deep rivers in Chatham county, North Carolina, flows in a southeasterly direction through Harnett, Cumberland, Bladen, and Brunswick counties, and for a short distance between Brunswick and New Hanover, and empties into the Atlantic at Cape Fear. Its length, in a straight line, is about 125 miles, and by the river about 192. The principal towns on the stream are Wilmington, 30 miles from the mouth (population 17,361); Elizabeth, the county-seat of Bladen county; Fayetteville, the county-seat of Cumberland county (population 3,485); Averysboro', and Lillington (the county-seat of Harnett county)—the two latter being small towns of a few hundred inhabitants. Fayetteville is the head of navigation for steamers of light draft, its distance from the sea being 160 miles by the course of the stream. Considerable money has been, and is being, spent by the government for the improvement of the navigation of the river below Wilmington, which is a port of the entry, and present project contemplates the securing of a navigable depth of 12 feet at mean low water up to

that city; but by taking proper advantage of the tides 14½ feet can be carried up to that point. The average range of the tides at Smithville, at the mouth of the river, is about 4 feet. The entrance across the bar to the harbor at Smithville can be made by vessels drawing 17½ feet at spring-tides.

By a series of locks and dams the river was formerly made navigable up to the confluence of the Haw and Deep rivers, and the works were carried for some distance up the Deep river. These old navigation works, like those on the Roanoke, were never successful from a financial point of view, and before long went into disuse, and were abandoned. Some ten years ago, however, a part of the works were again put in order, and navigation again opened between Battle's dam and Carbonton, and kept open for several years successfully. But at present they have again passed into disuse, and although the last company which operated them is still in existence they are practically abandoned so far as navigation is concerned.*

The total area drained by the Cape Fear is about 8,400 square miles, of which the Deep river drains 1,350, the Haw river 1,675, and the Cape Fear proper 5,375. The principal tributaries of the river below the forks are: From the east, in order as the river is ascended, the Northeast Cape Fear river, draining 1,330 square miles, and entering the Cape Fear about 20 miles above its mouth; the Black river, draining about 1,430 square miles, and joining the main stream about 30 miles from its mouth; and from the west, in the same order, Rockfish creek, draining 280 square miles, and emptying 10 miles below Fayetteville; Lower Little river, draining 448 square miles, and emptying about 25 miles above Fayetteville; and Upper Little river, draining about 176 square miles, and emptying about 30 miles above Fayetteville.

The drainage-basin of the Cape Fear proper, without the basins of the Deep and Haw, resembles that of the Roanoke. The river is crossed by the fall-line near Averysboro', about 27 or 28 miles above Fayetteville, giving rise to Smiley's falls, which is yet to be described. The map of the basin will show its form and general dimensions. The elevations of the water-sheds between the Cape Fear and the adjacent rivers are not very great, and the tributaries do not afford much power, except in places where, by damming, the water can be thrown back for considerable distances and considerable storage-room obtained; but the fall of the tributaries is, on the whole, small. As regards soil, vegetation, and building material, the drainage-basin of the Cape Fear resembles that of the Roanoke, and need not be described. The facilities for storage in that part below the junction of the Haw and Deep rivers will probably be found to be not very good on account of the flatness of the country, and, in places, of the porosity of the soil—resembling in this respect, also, the Roanoke. Further up, in the valleys of Deep and Haw rivers, the storage facilities are better. As regards bed, banks, and freshets, the stream very closely resembles the Roanoke, although the bottoms are said to be not quite so extensive as on the latter river. Above Averysboro' the river flows through an alluvial country, with banks generally low, and a width of from 400 to 600 feet. Below Averysboro' the river is narrow, the banks high, and the soil sandy.

The rainfall on the basin of the Cape Fear is about 46 inches—12 in spring, 13 in summer, 10 in autumn, and 11 in winter; but in the valleys of the Deep and Haw rivers, although the total rainfall remains the same, the summer-fall is rather smaller, and that in winter remains about the same. It would seem to follow from these facts that the flow of the Cape Fear becomes proportionately more variable as it is ascended. Another cause which tends to make the flow of the river variable is the fact that the courses of many of its tributaries in Chatham county lie in a slaty and broken region, which sheds the water with great rapidity, so that these streams become almost dry in summer; and this cause also contributes to increase the suddenness and violence of the freshets. The freshets on the Cape Fear, indeed, are said to be more violent than on any other North Carolina river. On the lower part of Deep river the banks are often overflowed, sometimes to a depth of 10 or 12 feet, and much injury is thereby done to the crops. For the upper 30 miles of the Cape Fear the banks are low and the river wide, so that the rise does not

*The Cape Fear Navigation Company was first chartered by the state in 1796, with a capital of $80,000. In 1815 additional privileges were granted, and authority given to increase the capital stock to $100,000. Although the money was expended, no useful result was accomplished, and in 1848-'49 a new company was organized, with a capital of $200,000, which was afterward increased to $350,000, the state subscribing three-fifths of the whole amount. Surveys were made, but the cost of the works which were entered upon exceeded the estimates, and although a steamer did once pass over the whole route between Fayetteville and Carbonton, on Deep river, the company was never able to keep the locks and dams in a condition requisite to secure uninterrupted communication. The failure of these works was partly due to bad engineering in the location of the dams, it being difficult to secure their ends against the action of freshets. The amount expended by the last company was about $350,000. (Annual Report Chief of Engineers, 1873, pp. 743-'4.) The work was finally abandoned when the war broke out, and subsequently the works were in a measure destroyed, in part by natural causes, and in part intentionally. In 1868 the state appropriated the works to the Raleigh and Augusta Air-Line railroad (then Chatham railroad), but they were afterward bought by some parties who organized as the Deep River Manufacturing Company. A little later, the Lobdell Car-wheel Company having bought an interest in the company, and also the Endor furnace, the works were again put in order from Battle's dam up, in the years 1872 to 1874, for the purpose of supplying the Endor furnaces with the Buckhorn ore, for which there was no convenient transportation except by water. Navigation was kept open for several years successfully, and may be said to be still open between Lockville and Carbonton, although the company has carried on no traffic since 1876. In that year the Deep River Manufacturing Company was consolidated with the Cape Fear Iron and Steel Company, under the new name of "The American Iron and Steel Company," which company is still in existence; but the furnaces were stopped, owing to the depression in the iron business, and this, of course, put an end to the navigation, which was confined to that carried on by the company, no local trade having been built up, the single steamboat owned by the company being no more than sufficient for their own wants. Since 1876 the boat has been run whenever a paying trip could be made, but not regularly, and no trips have been made since 1880.

exceed 20 feet; but in the succeeding 75 miles, where the banks are high and the stream narrow, the rise is very great, amounting occasionally to 65 feet at Fayetteville. These freshets constitute a serious disadvantage to the use of water-power on the stream. There is, however, no trouble at all with ice. I could find no gaugings of the river, and am therefore again obliged to resort to estimates regarding flow and power.

The following table shows the declivity of the stream:

Cape Fear river—Table of declivity.

Locality.	Distance from Wilmington.	Elevation above tide.	Distances between points.	Fall between points.	Average fall between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet per mile.*
Junction of Haw and Deep rivers*	172.0	130			
			29.5	61	2.069
Head of Smiley's falls	142.5	69			
			3.5	27	7.710
Foot of Smiley's falls	139.0	42			
			27.0	35	1.259
Fayetteville	112.0	7(?)			
			112.0	7	0.062(?)
Wilmington	0.0	0			

*At crossing of Raleigh and Augusta Air-Line railroad. This and the other elevations on the road are due to Major Winder, general superintendent.

The principal products of the region along the Cape Fear are corn, cotton, peanuts, potatoes, pease, rice, various vegetables and fruits, rye, oats, wheat, and grasses. The whole of this region lies in the cotton-belt.

The mineral resources of this region, especially of the upper part, are very great. Coal and iron are very abundant, but, owing to difficulties of transportation, the mines have been little worked. The coal-fields along the Deep river have been estimated by Emmons to cover an area of 90 square miles, and to contain at least 258,000,000 tons, easily workable. The coal is bituminous, and of superior quality. At Egypt, on Deep river, a shaft was excavated to a depth of 460 feet previous to 1850, but operations were suspended on account of want of transportation. Iron has been found at Ore Knob, about 9 miles from the Gulf, and at Buckhorn, on the east bank of the Cape Fear, 8 miles below the forks; and all the way up through the valleys of the Haw and Deep rivers iron-ore of excellent quality has been found in large quantities. Copper-ore has also been found in the same region, and several mines have been worked.

The basin of the Cape Fear is not very thickly populated, and its population has not increased much since 1870. In that year the population per square mile was 22.7, while now it is only 28.4. (Census Bulletin No. 78, by Mr. Gannett, geographer of the Census.)

I proceed to describe the river more in detail and to discuss its water-powers, commencing at its mouth.

Below Wilmington there is, of course, no power. The country is low and very swampy, and large quantities of rice are raised. The river is, in places, over a mile wide, and at the mouth the width is 3 miles. The country is also swampy for 50 miles above Wilmington; there is no power, and rice is the principal product. Thence up to Fayetteville the banks are from 15 to 40 feet high, the bed entirely sand, and the navigation difficult, on account of shifting sand-bars.

The first dam of the old Navigation Company was at Jones' falls, 7.73 miles above Fayetteville, its height having been about 5 feet. It is not a good site for power.

The second dam was at Silver run, 17.11 miles above Fayetteville, its height having been probably greater, as its crest was 15.64 feet above that of the Jones' falls dam. It was not spoken of as a good site for power.

The third dam was at Williams' fish-trap, 25 miles from Fayetteville. The total fall from the top of the dam to low water at Fayetteville was 25.74 feet. Not a good site.

The fourth dam was at Haw Ridge, 27 miles above Fayetteville; height of crest above Fayetteville (low water), 34.97 feet. Not a good site. None of the dams thus far mentioned are now in existence.

Up to this point the fall of the river is slight, and its general character similar to what it is for some distance below Fayetteville. We now come to the fall-line, where the river passes from the middle to the eastern division over a long shoal known as Smiley's falls. In the table of declivity I have already stated that the fall extends through a length of about 3½ miles, with a total fall of about 27 feet. There were three dams built on these falls, viz: Green Rock, Big Island (Narrow Gap), and Sharpfield, the latter being at the head of the falls, and all of which have been completely carried away. The table following, on page 60, will show their distances from Fayetteville, and the height of their crests above the datum. "At Narrow Gap a ledge of rocks from 4 to 6 feet above the ordinary bed extends nearly across the river, leaving a narrow opening near the left bank, whence comes the name. The whole volume of water, during ordinary stages, passes through this gap."* Smiley's falls, really the first power on the river, none of those below being worth anything as powers, are situated above the mouth of Upper Little river, and about 20 miles from any railroad. The bed is rock, and the facilities for dams and races, as well as for

*Quoted from a report on a survey of the Cape Fear and Deep rivers, by Mr. George H. Elliot, annual report chief of engineers, 1872, p. 742. Much of my information regarding the Cape Fear and Deep rivers has been derived from this report.

building, are said to be good. On account of its inaccessibility I did not visit the place, but I have been informed by good authority that the power is available. The greatest drawback would probably be the heavy freshets to which the river is subject, and which have been already referred to; but the fall is so great at this place that it seems as though this difficulty might be, to a large extent, obviated, if it were not endeavored to utilize the total available fall at low water. There is no power at present in use at the place, or if there is, it is only for some small country grist-mill; but none such were heard of.

The drainage area above this place being about 3,400 square miles, I have estimated the power in the following table:

Table of power available at Smiley's falls (estimated).

State of flow (see pages 18 to 21).	Drainage area.	Rainfall.					Flow, per second.	Horse-power available, gross.		Horse-power utilized.	Per cent. of minimum utilized.
		Spring.	Summer.	Autumn.	Winter.	Year.					
	Sq. ms.	*In.*	*In.*	*In.*	*In.*	*In.*	*Cu. ft.*	*1 ft. fall.*	*27 ft. fall.*		
Minimum	3,400	12	13	10	11	46	620	70.0	1,890	0	0
Minimum low season							820	92.7	2,500	0	0
Maximum, with storage							2,400	272.7	7,360	0	0
Low season, dry years							930	106.0	2,860	0	0

To use the power available with storage is probably altogether impracticable, as already remarked in the case of the Roanoke. For the same reason a concentration of power into less than twenty-four hours would probably be impracticable, except to a very small extent.

This power, one of the finest in this section of the state, is located in a region offering many advantages for manufacturing. Fuel, in the shape of timber and coal, is abundant in the immediate neighborhood. Building materials—fine wood and stone—are also to be had with ease. The principal economic drawback is the inaccessibility of the place, the nearest railroad being the Cape Fear and Yadkin Valley railroad, whose nearest point is 20 miles distant. The products of the neighborhood are corn, cotton, wheat, oats, rye, pease, potatoes, vegetables, and fruits of various kinds. In case of the establishment of a cotton factory, an abundance of the raw material could probably be obtained from wagons. Finally, this part of the state is quite healthy, although not so much so as the western portion, chills and fever being more prevalent.

The next dam above Sharpfield dam was McAllister's, 3 miles above, the present fall in the river between these points being about 8 feet. Then came Fox's Island dam, 3 miles above, the natural fall being now 10 feet. The next was Douglas' falls dam, rather over 8 miles above, and the fall is 9 feet. The bed of the river above Smiley's falls is rock, and the fall considerably greater than below. The next dam above Douglas' falls was Battle's, which is the first dam at present existing on the river, having been, as already mentioned, the lowest dam rebuilt by the last company. The fall between this dam and Douglas' falls, a distance of a little over 3 miles, is 9 feet. Battle's dam is a wooden structure, straight across the river, and about 11 feet high and 500 feet long. It is not used for power, although it might be, as the place is topographically favorable, but the freshets would be a drawback to the use of so small a fall. The dam ponds the water for 2 miles, up to the foot of Buckhorn falls, the most important fall on the river next to Smiley's, and navigation through which is effected by means of a canal. At the head of the falls is a dam, built of wood, like Battle's dam, and about 1,000 feet long and 3 or 4 feet high. It has the shape of a letter V, with the apex up stream, one arm being nearly at right angles to the banks, and it is terminated on the east side by an island, behind which it turns a portion of the water, as into a natural race, which extends for a distance of a mile or so between the bank and a succession of islands, which have been connected by a series of slough-dams. At the end of the mile a slough-dam connects the last of the series of islands with the bank, and the navigation is continued by means of a canal about half a mile long, 40 feet wide at the surface, and 6 feet deep. At its head is a guard-lock, with a lift of about 4 feet, and at its foot two locks, made of crib-work filled with stone, like the guard-lock, with together 17 feet lift, one having 11 and the other 6 feet, making the total fall from the crest of the Buckhorn dam to that of Battle's dam some 22 or 23 feet. A part of the fall has been used by the North Carolina Iron and Steel Works to run machinery connected with their furnaces (blast, etc.), the canal having been extended some 300 yards from a point just above the outlet-locks, so as to utilize the power lower down, nearer the ore-bed. A fall of 12 feet was used, the water being discharged into a small creek having a fall of some 5 feet between the tail-race and the river. Although in freshets the backwater from the river came up to the wheel-pit, full capacity could be secured during the whole year, and no steam-power was used. These works have not been in operation since 1876, it being said that the ore-bed is exhausted, not being so extensive as was supposed, although it is not certain that this is the case.

These falls constitute a most excellent power, very easily available, and with a location perfectly safe. The

existing canal constitutes a race ready for use, and by utilizing the lift of the guard-lock and discharging the water directly into the river at the works a fall of 20 feet could be rendered available, except during very severe freshets, when the works might be obliged to stop, although this would be *very* rare. The canal is in tolerably good condition, and could be made perfect at a very small cost; and, if necessary, it could be easily widened so as to increase its capacity. At its lower end, where the locks are, the land is low for several hundred yards back from the river, and subject to overflow at times; but further back is a hill, on which buildings could be erected with safety, and on which stands the furnace of the iron company.

I have estimated the available power and flow at this point, with the results given in the following table:

Table of available power at Buckhorn falls (estimated).

State of flow (see pages 18 to 21).	Drainage area.	Rainfall.					Flow per second.	Horse-power available, gross.		Horse-power utilized.	Per cent. of minimum utilized.
		Spring.	Summer.	Autumn.	Winter.	Year.					
	Sq. miles.	*In.*	*In.*	*In.*	*In.*	*In.*	*Cu. feet.*	*1 foot fall.*	*20 feet fall.*		
Minimum	3,200	12	13	10	11	46	575	65.4	1,300	0	0
Minimum low-season							765	87.0	1,740	.....	.....
Maximum, with storage							2,240	253.4	5,000	.....	.....
Low season, dry years							875	100.0	2,000	.....	.....

To utilize the whole of the minimum power with a fall of one foot per mile to the canal would require a canal with rather larger dimensions than those given for the present one. With a fall of 2 feet per mile, however, the present one would answer, the banks being composed of earth, with no special precaution to keep them smooth. The present canal, or one 40 feet wide at top, 6 feet deep, and slopes of 45°, would be capable of carrying volumes of water, and of affording power, with different slopes, as per the following table:

Table of power afforded by canal in earth, 40 feet wide, 6 feet deep, sides at 45°, at Buckhorn falls.

Fall of canal.	Capacity per second.	Horse-power available, gross.		Remarks.
	Cubic feet.	*1 foot fall.*	*Total.*	
1 foot per mile	450	51	1,020	Available fall about 20 feet.
2 feet per mile	625	71	1,349	Available fall about 19 feet.
3 feet per mile	790	90	1,620	Available fall about 18 feet.

The estimates of flow in the first table, and in that for Smiley's falls, may seem too low, but the flow of the Cape Fear was stated to be very variable. The available power, with storage, would be found impracticable, I think, although the power due to the ordinary flow of the stream might be considerably increased by constructing storage-reservoirs in the valleys of Deep and Haw rivers.

Buckhorn falls are more accessible than Smiley's, being only about 8 miles from Haywood, at the junction of Haw and Deep rivers, and from the Raleigh and Augusta Air-Line railroad, which crosses both rivers near their junction. As already mentioned, coal and building materials can be obtained in abundance in the vicinity. The locality is healthy, and the climate mild. The property, including land, canals, and dams, is all owned by the Navigation Company.

The width of the Cape Fear at Buckhorn dam is about 700 or 800 feet, and the dam ponds the water with this average width up to the forks, and beyond, or about 8 miles. Buckhorn falls is thus the highest power on the river.

In the following table of power on the Cape Fear river I have only mentioned those powers which may be considered as available practically, viz: Smiley's falls, Battle's dam, and Buckhorn falls. As curiosities simply I have added the theoretical power between certain points.

It will be noticed that there is only one mill in operation on the river, probably because small mills—the only kinds that have ever sought a location in this part of the state—have been more cheaply located on small streams, where there is not such danger from heavy freshets.

Cape Fear river—Summary of power (estimated).

Locality.	Distance from Fayetteville.	Drainage area.	Rainfall.					Total fall.		Horse-power available, gross.*				Total utilized.		Per cent. of minimum unutilized.
			Spring.	Summer.	Autumn.	Winter.	Year.	Height.	Length.	Minimum.	Minimum low season.	Maximum, with storage.†	Low season, dry years.	Fall.	Horse-power, net.	
	Miles.	*Sq. ms.*	*In.*	*In.*	*In.*	*In.*	*In.*	*Feet.*	*Miles.*					*Feet.*		
Smiley's falls	30.5	3,400	12	13	10	11	46	27	3.5	1,890	2,500	7,360	2,860			
Battle's dam	48.0	3,200	12	13	10	11	46	11	0.0	720	950	2,780	1,100			
Buckhorn falls	51.0	3,200	12	13	10	11	46	‡20	1.5	1,300	1,740	5,000	2,060			
Between Fayetteville	0.0	4,250	12	13	10	11	46	35	27.0	2,800	3,650	10,000	4,200	10	15	1–
and foot of Smiley's falls	27.0	3,400														
Between head of Smiley's falls	30.5	3,400	12	13	10	11	46	26	17.5	1,750	2,275	6,800	2,600			
and Battle's dam	48.0	3,200														
Total between Fayetteville	0.0	4,250	12	13	10	11	46	127	60.0	9,000	12,000	36,750	13,700			
and junction of Haw and Deep rivers	60.0	3,025														

* See pages 13 to 21. † Not available practically in all probability. ‡ See description.

Table giving number and location of dams constructed on the Cape Fear and Deep rivers by the Navigation Company, together with a profile of the rivers between Fayetteville and Hancock's dam.

[Taken from a map and profile of the rivers according to a survey by Hamilton Fulton, civil engineer, in the office of the state geologist in Raleigh.]

Name of dam or place.	Distance from Fayetteville bridge.	Elevation of crest or water surface above low-water at Fayetteville.
	Miles.	*Feet.*
Fayetteville bridge	0.00	0.00
Jones' Falls dam	7.73	50.00
Silver Run dam	17.11	20.64
William's fish-trap dam	25.00	25.74
Haw Ridge dam	26.99	34.97
Green Rock dam	28.14	45.47
Big Island dam (Narrow Gap?)	29.37	58.61
Sharpfield dam	30.59	62.56
McAllister's dam	33.65	73.13
Fox's Island dam	36.50	80.46
Douglass' dam	44.76	88.68
Battle's dam	47.97	99.51
Buckhorn falls	50.00	108.47
Buckhorn dam	51.65	122.30
Deep river, near junction with Haw	60.44	127.11
Lockville dam (lower)	.....	151.67
Lockville dam (upper)	62.21	165.02
Gorgas dam (Clegg's)	64.70	172.24
Endor dam (Farish's fish-trap)	71.43	174.36
Gulf dam (Haughton's)	81.37	181.06
Carbonton dam (Evans')	87.27	190.12
Tyser's dam (Hancock's)	99.87	204.64

NOTES ON THIS TABLE.—The height of each dam may be found approximately (a little too large) by subtracting from the height of its crest that of the dam below, except in cases where locks and canals were used, *i. e.*, in the case of the Buckhorn dam, the lower Lockville dam, and the Gorgas dam.

These figures, having reference to the work as originally planned, are not correct for those now in existence, for in some cases these figures were altered when the works were built, and in others they have been altered since.

TRIBUTARIES OF THE CAPE FEAR BELOW THE FORKS.

The first important tributary of the Cape Fear, as we ascend the river, is the Northeast Cape Fear, which rises in the extreme northern part of Duplin county and flows south, through Pender and New Hanover counties, entering the Cape Fear river at Wilmington, some 20 miles from the sea. Lying entirely below the fall-line, it has no water-power of any consequence, flowing mostly through swamps. There are only a few small mills on the stream and its tributaries.

The next important tributary is South river, also from the east, rising, under the name of Black river, in the northeastern part of Harnett county, and flowing south through that county, and between Cumberland, Bladen, and

Brunswick counties on its right, and Sampson and Pender on its left, entering the Cape Fear about 10 miles above Wilmington, after a course, in a straight line, of about 85 or 90 miles. Its drainage area comprises about 1,430 square miles. Although its sources are above the fall-line, the stream is very small where it enters the eastern division, and its water-power is, therefore, of no consequence. Some of the small tributaries near its sources have, as in the case of the Northeastern Cape Fear, small grist-mills, but of no consequence. The South river has one large tributary, the Black River (not the one above mentioned), which enters from the east, after having flowed, from north to south, through the whole length of Sampson county, in the northern part of which its sources lie. Its length is about 50 miles in a straight line, and its drainage area 620 square miles; but as it lies entirely in the eastern division, it possesses no water-power. There are no towns of importance on these streams. They are so swampy that the towns are located some miles from them on higher and more healthy ground.

We next come to Rockfish creek, which rises in the western part of Cumberland county, flows nearly east, forming for about 10 miles the boundary between Cumberland and Robeson counties, and empties into the Cape Fear about 10 miles below Fayetteville, in the former county. Its length, in a straight line, is about 30 miles; following the general course of the stream it is about 35 miles, but taking in all its windings it is considerably more. It drains, in all, an area of 280 square miles, and its principal tributaries are from the north, the largest being the Little Rockfish, draining an area of 77 square miles. There are no towns on the stream.

Rockfish creek is a good sample of a class of streams which I have not yet described in detail, not having had occasion to refer to any particular powers on any of them, although some tributaries of the Neuse and Tar belong to this class. These streams, located generally just below the fall-line, which they sometimes cross, differ very materially in character from the majority of streams in this part of the country. I have alluded to the fact that just below the fall-line there is a belt of sand-hills, some 30 or 40 miles wide, running almost parallel with that line, and sometimes extending above it. The streams of the class referred to rise and flow through this sandy region, and it is to this fact that their character is due. The sand-hill belt consists of broad, flattish swells, well wooded, as a rule, with long-leaf pine, and generally with an undergrowth. The surface deposit of sand varies generally from a foot or two to five or six feet in depth, and is in places 10, 20, and even 100 feet thick. It is underlaid with an impervious stratum of half-compacted grit or clay of the tertiary formation (overlaid at points by a stratum of gravel several feet thick), which is in places very thick, having been bored into to a depth of 66 feet at one place. The smaller streams in the sand-hills have not cut out their beds through the sand, and are often sluggish, stagnant, and marshy; but the larger creeks, and the rivers, have cut away the sand entirely and worn out their beds in the impervious stratum beneath, which sheds into the water-courses all the water which reaches it by percolation.

The rapidity with which the sand-hills absorb the rain which falls upon them, thus removing it from the direct action of the sun, has the effect of diminishing the evaporation, while their large thickness in places enables them to absorb considerable water, and to give it out gradually, as it reaches and flows along the impervious stratum beneath, thus enabling them to act as storage-reservoirs, and to regulate the flow to a remarkable degree. Thus there is considerable difference in the sand-hill streams, according to the depth of the sand on their drainage-basins, and by no means are all these streams good sources of power. Sand and gravel in general, although they absorb water rapidly, give it out rapidly also, unless occurring in sufficient masses to be able to store up considerable water without becoming saturated. Hence the depth of the sand-hills acts very beneficially, and when the sand is deep the streams of the class referred to not only discharge a large proportion of the rainfall on their drainage basins, but discharge it very uniformly, their flow being remarkably constant. The power which can be obtained from these small streams is sometimes remarkable, and we shall see further on that it is one of them which is the principal manufacturing stream in the state of South Carolina. Their value is also increased by the fact that the topography of the sand-hill region is such that large ponds can be obtained easily, and storage-room sufficient, not only to regulate the flow to a considerable extent during the year, but also to permit of the concentration of the entire flow of the stream into working hours, thus rendering it possible to double the power due to the natural flow if the mills are only worked 12 hours. Those streams which have cut deep channels for themselves through the sand down to and into the impervious stratum of hard pan flow considerably below the general surface of the country, often 50 or 60 feet. The banks of the Big Rockfish, for example, are almost 100 feet high near the Cape Fear, and well wooded. These sand-hill streams are, of course, not subject to such heavy freshets as ordinary streams. Big Rockfish has been known to rise 14 feet, but 10 feet is a very large rise, while Little Rockfish rises only 6 or 7 feet. There is, however, not much land overflowed. The smaller streams, however, are sometimes bordered by wet grounds, heavily wooded and overgrown, nearer the general surface of the ground, and lying high above the beds of the main streams. Though the sand-hills are, as a rule, well wooded, the woods have in parts been cut down to a considerable extent, and it is stated, and doubtless truly, that the flow of the streams in these sections is more variable than formerly.

Regarding available power on these streams it was difficult to obtain much information, owing to the fact that the streams have a uniform declivity, with no falls, so that power may, as a rule, be obtained at almost any point where the banks are favorable for the location of a dam and buildings.

The drainage-basin of Rockfish creek lies below the fall-line; and the stream has no falls, but a gradual declivity.

The map shows the general form and position of the basin. Like the others of this class, it has no lakes, but the facilities for constructing reservoirs are tolerably good. The banks are moderately high, and seldom overflowed; the rise in freshets is small, the flow very constant and strong, and the fall rapid. The rainfall is about 46 inches, 12 in spring, 13 in summer, 10 in autumn, and 11 in winter—a distribution which, of itself, would tend to render the flow constant. The stream is used for rafting, and there are no mills on it for 15 miles from its mouth, although formerly there were one or two saw-mills below the mouth of Little Rockfish, and above that are a few small country saw- and grist-mills, herein tabulated. Of the available power of this stream a very small proportion is utilized. Some of its tributaries, however, are well utilized. The most important is Little Rockfish creek, which is the same in general character as the main stream, which it enters about 7 miles, in a straight line, from the Cape Fear. The first power on this stream is an unimproved site formerly occupied by Murphy's paper-mill, with 18 feet fall, and an available power, at all seasons, of at least 100 horse-power net (with good wheels), judging by the power used at the other mills on the stream. This power is one-fourth of a mile from the mouth of the stream, with no important tributaries below it. The drainage area above is therefore about 77 square miles.

About 1½ miles above this site is the Hope mill of the Rockfish Manufacturing Company (T. Campbell Oakman, president*), a cotton-mill, with grist- and saw-mill attached, using a power of about 130 horse-power, with a fall of 23½ feet. The dam is of wood, 53 feet long and 20 feet high, rebuilt in 1872 at a cost of about $2,000, and ponding the water over about 200 acres to a depth of 7 feet. A race 300 feet long leads to the wheel. No steam is used for power, and by storing the water during the night full capacity may be obtained at all seasons, the factory being run during 12 hours. Mr. Oakman has carefully measured the water used by his wheels, and states it to be 89.7 cubic feet per second, saving the water at night; *i. e.*, the natural flow of the stream is never less than 44.5 cubic feet per second. The drainage area above the mill being about 70 square miles, the stream discharges at its minimum 0.63 cubic foot per second per square mile—a remarkable discharge.

A mile and a half above Hope mill is the Bluff mill (H. & E. J. Lilly), a cotton factory, with a fall of 9 feet, using 57 horse-power. The dam is earth, 900 feet long, 10 feet high, built in 1872, and costing $5,000, and the pond covers 75 acres to an average depth of 8 feet. Full capacity can be secured the whole year. The drainage area above being about 55 square miles, the discharge of the stream should be very nearly 0.63 cubic foot per second per square mile to give the power stated if the water is stored at night.

The only other power worth mentioning specially is the Beaver Creek mill (H. & E. J. Lilly), just above the Bluff mill, situated on Beaver creek, a tributary of the Little Rockfish—a cotton-mill, using 111 horse-power and a fall of 14 feet. The dam is earth, 1,500 feet long, 14 feet high, built in 1841, and ponding the water over 200 acres to a depth of 12 feet. A race 100 feet long leads to the mill. Full capacity can be secured the entire year. A calculation, on these data, gives the discharge of the stream so great that I am inclined to think that some of the figures must be erroneous. In fact, the amount of machinery run in the mill is not much greater than in the Bluff mill, according to the "Hand-book of the Department of Agriculture".

Above the Bluff mill the Little Rockfish and its tributaries are well utilized by a number of small saw- and grist-mills.

Above the Rockfish there are a number of smaller streams belonging to the same class which flow into the Cape Fear, two of which empty almost in the town of Fayetteville, and on which there were four factories before the war, but the powers are small—not over 20 or 30 horse-power probably. There are some small grist-mills on all these streams, generally running two pair of stones. About 7 miles above Fayetteville there is a small tributary (Carver's creek) which, near its mouth, falls over a ledge of hard pan and soft rock a distance of 18 or 20 feet, but in dry weather there is hardly any water in the stream. The next important stream above Rockfish is Lower Little river, which rises in Moore county and flows east through Cumberland, and between Cumberland and Harnett, emptying into the Cape Fear below Averysboro'. Its length is 45 miles in a straight line, and its drainage area about 448 square miles. The principal town on the stream is Manchester, a very small place. This stream, with its tributaries, may be classed among the sand-hill streams, but its basin lies near the upper limit of the sand-hill belt, and so the general character of the sand-hill streams (like the Rockfish) is not so pronounced here, the flow being not quite so constant and the freshets rather more violent, the water rising some 15 feet. The banks are high and well wooded, and the bed of the stream the same as has been described; the country, as a whole, is not so sandy. The fall of the stream is uniform, and at the rate of 3½ feet per mile.† I have estimated the flow as follows:

Place.	Drainage area.	Flow per second.		Horse-power, gross.		Utilized.		Gross horse-power available, with fall used.
		Minimum.	Ordinary summer.	Minimum.	Ordinary summer.	Horse-power, net.	Fall.	
	Square miles.	*Cubic feet.*	*Cubic feet.*	*Per foot fall.*	*Per foot fall.*		*Feet.*	
At mouth	448	224	336	25.4	38.2	100+	12.0	304
At Manchester	329	164	246	18.6	28.0	20	3.5	65

* I am indebted to Mr. Oakman for most of my information regarding the streams in this vicinity.

†The elevation above tide at crossing of Raleigh and Augusta Air-Line railroad is about 221 feet, and at mouth say 31 feet. Length, measured from map, is about 55 miles.

In the foregoing estimate 0.5 cubic foot per second per square mile was assumed as the minimum flow, and 0.75 cubic foot per second per square mile as the ordinary low-water flow. These figures are very high—perhaps too high—but a series of gaugings only can serve as a correct guide.

The power of the stream is utilized by one cotton factory and a number of saw- and grist-mills. The first mill is 2½ miles from the mouth, with a fall of 12 feet, not subject to interruption, except sometimes for a day or two by backwater from the Cape Fear. At Manchester is the cotton- and woolen-mill of the Linwood Manufacturing Company, using a fall of 3½ feet and about 20 horse-power. The Manchester mill, a cotton factory of about the same size, uses power from a small tributary. There are doubtless many places on Lower Little river where dams might be located and excellent power obtained.

Upper Little river is a stream similar to Lower Little river, except that it is still less of a sand-hill stream, and said to be not so bold or so reliable as the latter. It is only used for saw- and grist-mills, and there are, no doubt, sites not used. Each of these streams is about 100 feet wide at its mouth. The length of Upper Little river is about 32 miles, measured in a straight line, its drainage area 176 square miles, and its fall, from the crossing of the Raleigh and Augusta Air-Line railroad to its mouth, about 290 feet, or perhaps at the rate of 6 feet or over to the mile.

Above Upper Little river there are no tributaries to the Cape Fear which are worth mentioning specially, although there are some small creeks which afford good small powers, and are utilized for grist- and saw-mills.

HAW RIVER.

This river rises in Rockingham and Guilford counties, North Carolina, pursues a general southeasterly course through Alamance, a corner of Orange, and Chatham counties, and in the southeastern corner of the latter unites with the Deep river to form the Cape Fear, which has just been discussed. The length of the stream, following its general course, is about 80 miles, but considerably more if all its windings are followed. Near the northwest corner of Alamance county the river forks, the north fork going by the name of Haw river, while the south fork is known as the Reedy fork of Haw river. The Reedy fork, as well as the north fork in its upper parts, flows nearly east, but the course of the stream below the junction of the two is nearly southeast. There are no large towns on the river, but Graham, the county-seat of Alamance county, is only a mile or so distant.

The drainage area of the Haw river comprises about 1,675 square miles, and the stream receives two important tributaries: the New Hope creek, from the east, draining about 317 square miles, entering about 3 miles above the junction of Haw and Deep rivers, and Alamance creek, from the west, draining about 237 square miles, and enters the Haw river about 4 miles south of Graham. The Reedy fork receives as its principal tributary Buffalo creek, from the south, draining about 128 square miles, and the north fork receives Troublesome creek, from the north, with a drainage area of about 88 square miles. The map shows the position of all these streams.

Haw river flows through a fertile country lying in the center of the cotton-belt, and the productions of which are about the same as along the upper part of the Cape Fear, viz: corn, cotton, wheat, oats, rye, tobacco, grasses, a great variety of vegetables, and fruits. It is tolerably well wooded, although not enough care is taken to preserve the forests. Topographically, the region, especially in the lower part, is more broken than the drainage-basins of the Neuse, the Tar, or the Roanoke rivers. The mineral resources of the basin are very great, iron being found in various places in large quantities, and of very fine quality. Copper has also been found, but the mines have been little worked. Building-stone of good quality is found all through the basin. In fact, in regard to building-stone in the middle and western divisions of the southern Atlantic water-shed, as Professor Kerr has remarked, "it would be tedious to particularize, as granite and gneiss are everywhere."

The bed of the stream is generally rock, covered in places with deposits of sand, gravel, or clay, but affording almost everywhere excellent foundations for dams. The banks on the lower part of the stream are tolerably high, in some places very steep, and the bottoms are narrow and not much subject to overflow, while in the upper part of the stream, where the country is not so broken, the banks are, in places, low. In the upper parts of Alamance and Guilford counties the country is much flatter than in Chatham county. The stream is subject to very heavy freshets, and there are no lakes serving to restrain their violence; but the stream is rarely frozen over, and the mills suffer no trouble with ice. Some of the tributaries of the stream rise in a region where the prevailing rock is a slate, which is covered with a thin soil and sometimes with none at all; and from this region the rain-water is shed very rapidly, so that these streams are nearly dry in summer. But Haw river is less affected in this way than Deep river, because only a few of its tributaries rise in this region, in consequence of which the latter stream is said to be more variable in flow and more subject to freshets than the former. The facilities for the construction of storage-reservoirs are said to be good in the upper part of the stream, though I do not know that any surveys or examinations have ever been made with a view to determining this point accurately.

The rainfall in the valley of the Haw river is about 45 inches, distributed as follows: spring, 12; summer, 12; autumn, 11; winter, 10; its distribution throughout the year being quite uniform, judging from the chart published by the Smithsonian Institution.

The fall of the stream between different points will be seen from the following table, which gives the elevation at several points; and it will be remarked that the fall of the stream is quite large for one not rising in the mountains, being much larger than that of any stream, or of any part of a stream, which we have yet considered, which lies in the middle division:

Table of declivity—Haw River.

Place.	Distance from mouth.*	Elevation above tide.	Distance between points.	Fall between points.	Fall between points per mile.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
At confluence with Deep river	0	130			
At crossing of North Carolina railroad†	50	450	50	320	6.4
Reedy fork, at crossing of Piedmont Air-Line	80	676	30	226	7.5
Haw river (North Fork), at crossing of Piedmont Air-Line	77	647	27	197	7.3

*Distances based on measurements from a map, made to follow the windings as closely as was practicable.
†Based on a rough estimate of the height of the railroad bridge above water.

The flow of the stream in different seasons is not known with accuracy. Professor Kerr states the flow at its mouth to be 1,760 cubic feet per second, but as this is not low-water, and probably more nearly the average flow, it is of no value for our computations.* I am therefore forced to base my figures, as usual, on estimates from drainage area and rainfall.

Haw river (crossed almost at right angles by three railroads) is not very accessible. Especially is this the case with that part of the river below the crossing of the North Carolina railroad at Haw river, in Alamance county, while above that point the stream is, on the average, about 8 miles from the railroad, to which the Reedy fork runs nearly parallel. A railroad has been projected to run from the junction of Haw and Deep rivers up the valley of the Haw, starting from Moncure, following the river to a point about 6 miles above the crossing of the North Carolina railroad, and then passing, via Yanceyville, Caswell county, to Danville, Virginia. The charter has been obtained, but no surveys have yet been made; and although subscription-books have been opened, there has not yet been a meeting to organize.

The foregoing general sketch shows that the Haw river ought to afford a great deal of water-power on account of its rapid fall and the fact that it crosses the ledges of rock at large angles, and the following account of the power on the stream will show that this is the case, and that the Haw river is well fitted, in some respects, to become a large manufacturing stream, and indeed it is at the present time one of the principal manufacturing streams of the state.

Commencing at the mouth of the river, the water-powers met with, in ascending the stream, will now be described.

The first power is situated 3 miles from the junction, and just below the mouth of New Hope river. It is utilized by a mill belonging to the American Iron and Steel Company, and known as the "Bland mill". The banks on the east are favorable for building, and not often subject to overflow, while on the west rises a rocky bluff to a height of over a hundred feet. Diagonally across and up the river from the east bank to this rocky bluff extends the dam, a wooden structure, 300 feet long, 7 feet high, vertical in front, but sloping downward on the up-stream side, and throwing the water back for over a mile, with an average width of 200 feet, the river not being thrown out of its banks. At the east end of the dam is the mill, a grist-mill, running two pair of stones, with 7 feet fall, and using perhaps 20 horse-power net. This mill can run during eleven months of the year, but during the remaining month is troubled with backwater on account of the small fall. There is at all times, of course, a great excess of water. In the summer of 1880 about 80 feet of the dam at the western extremity was undermined and carried away by a freshet, but has since been rebuilt. The dam as it stands would probably cost some $2,000. The river here is about 250 feet wide, and the water rises very high in freshets, sometimes 30 or 40 feet, but there is no trouble with ice. The drainage area above this power being about 1,675 square miles, I have estimated the power as in the following table:

Table of power at the Bland mill.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available gross.	
	Sq. miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*7 feet fall.*
Minimum	1,675	7	280	32.3	225
Minimum low season			335	38.6	270
Maximum, with storage			1,340	152.0	1,050
Low season, dry years			380	43.5	300

*Professor Kerr's statement is that the river affords 200 horse-power per foot of fall at its mouth. (Geol. Rep., p. 39.)

The effect of the uniform distribution of the rainfall is to render the flow more variable and to decrease the minimum flow, while at the same time the total amount of power or flow available, with storage, is increased beyond what it would be were the summer-fall greater. It was stated to me as a fact that the flow of this stream is very variable. The maximum flow given as available, with storage, would require the construction of storage-reservoirs with a capacity in all of at least 900,000,000 cubic feet, which would require, for instance, if only one reservoir were used, one of say 2 miles square and between 8 and 9 feet deep. Such a large amount of storage would, of course, be very expensive. The pond at the Bland mill is, of course, not large enough to furnish any appreciable storage, or to allow of the concentration of the available power into working hours. The site is not an especially good one for large establishments on account of the small fall and the trouble resulting from backwater. It is, however, very favorably located within a few miles of the Raleigh and Augusta Air-Line railroad, and in a healthy part of the state.

The next power above this is situated about 2 miles further up the stream, and is not improved. It is known as Hartsaw's site, and it is said that the available fall amounts to 6 feet. Being above the mouth of the New Hope, the drainage area amounts to about 1,320 square miles, and the power available will be about 0.67 of that at the Bland mill, or as follows:

Power at Hartsaw's site.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.	
	Sq. miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*6 feet fall.*
Minimum	1,320	6	218	24.7	150
Minimum low season			264	30.0	180
Maximum, with storage			1,060	120.0	720
Low season, dry years			300	34.0	200

The next power is Moore's mill, improved and in use, situated some 3 miles above Hartsaw's. There is no dam, but a race some 200 yards long leads to the mill—a grist-mill, with 2 or 3 run of stones, together with a saw-mill, cotton-gin, and foundry, using a fall of some 10 feet (?) and a small amount of power. The shoal is about a mile long, and the total fall is said by good judges to be about 22 feet; but I did not examine the place, and am not able to vouch for this statement. In dry weather a rough dam of stone turns the water into the race, but this is disturbed in freshets, and in ordinary times is not necessary. The power used I am unable to state exactly; that available, assuming the fall to be 22 feet, is estimated in the following table:

Power at Moore's mill.

State of flow (see pages 18 to 21).	Drainage area.	Fall assumed.	Flow per second.	Horse-power available, gross.	
	Sq. miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*22 feet fall.*
Minimum	1,320	22	214	24.0	525
Minimum low season			260	30.0	660
Maximum, with storage			1,040	118.0	2,600
Low season, dry years			295	33.7	740

This site, one of the best on Haw river, is quite easily accessible, being only about six miles from the Raleigh and Augusta Air-Line railroad, and about the same distance from Pittsboro', the county-seat of Chatham county. It is well worthy of the attention of capitalists desiring to locate in this vicinity.

The next power above Moore's is about 2 miles above, an unimproved site, with a fall said to amount to 8 feet. The power here will be a very little over one-third of that at Moore's, and is given in the table beyond, with a summary of all the others.

Next comes a second unimproved site, known as the Seven Island shoal, where the fall is said to be 7 feet. It is 2 miles above the one last mentioned, and the power is tabulated beyond.

Next comes the mill and site of Stephen Henley,* about 1½ miles above Seven Islands, and just about on the road from Pittsboro' to Raleigh, and 12 or 13 miles from the mouth of the stream. A wing-dam 500 feet long and 3½ feet high extends across to an island and serves to turn the water into the race, which carries it about 100 yards, affording a fall at the mill of 8 feet. The dam was built in 1874 and 1875 at a cost of some $500, and is of rock, planked over, and backs the water some 600 feet. The mill is a grist-mill, and uses about 50 horse-power. It is situated on the west bank, but the principal channel of the river is on the east side of the island above referred to,

*To Mr. Henley I am indebted for the greater part of my information regarding this part of the Haw river. Mr. Henley is thoroughly acquainted with the water-power in this vicinity.

which is about half a mile long. Mr. Henley estimates the fall at this place at about 16 feet. Taking this estimate as correct (though I cannot vouch for it), the available power at this place may be estimated as follows:

Table of power at Henley's mill.

State of flow (see pages 18 to 21).	Drainage area.	Fall assumed.	Flow per second.	Horse-power available, gross.	
	Sq. miles.	*Feet.*	*Cubic feet.*	1 *foot fall.*	16 *feet fall.*
Minimum	1,285	16	200	22.7	360
Minimum low season			260	30.0	480
Maximum, with storage			1,040	118.0	1,888
Low season, dry years			295	33.7	540

The next power is Brown's mill, where there is said to be about 7 or 8 feet. I have no further particulars regarding this place. It is about 1½ miles above Henley's, and the power is tabulated beyond. The power is said to be not in use at present.

The next is an unimproved fall of some 8 feet, belonging to the Bynum Manufacturing Company, formerly used, but now altogether abandoned. The estimated power is given in the table.

We next come to the cotton-mill of the Bynum Manufacturing Company, about 4 miles above Henley's mill. The dam is of wood, built in 1860 at a cost of $500, and is 475 feet long and 3 feet high, ponding the water over 10 (?) acres. A race 600 yards long leads to the mill, where the fall is 16 feet, and 80 horse-power is used. The mill is run night and day, and water always wastes. The following table gives my estimate of flow and power:

Table of power at mill of Bynum Manufacturing Company.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.	
	Sq. miles.	*Feet.*	*Cubic feet.*	1 *foot fall.*	16 *feet fall.*
Minimum	1,250	16	200	23.4	375
Minimum low season			250	28.4	450
Maximum, with storage			1,000	113.6	1,825
Low season, dry years			280	32.4	518

One mile or less above Bynum's is R. J. Powell's mill-site, the mill having been recently burnt. The dam is of wood and stone, and extends entirely across the river, and a fall of about 7 feet was used.

Less than a mile above Powell's is Burnett's unimproved site, where the available fall is said to be about 6 feet.

A short distance above this is Pace's mill. The dam is 300 feet long, from which a race 450 feet long leads to the mill, where a fall of 12 feet is used. Mr. Pace has a flour- and corn-mill, with four pair of stones, a saw-mill, wagon-shop, and blacksmith-shop. He writes that upon his property, which extends for three-quarters of a mile along the river, there are two sites not used—one below the mill, with 10 feet fall, and another above, with 13 feet fall—available, with a dam 4 feet high, 600 feet long, and a race 600 feet long.

Table of power at Pace's mill.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.	
	Sq. miles.	*Feet.*	*Cubic feet.*	1 *foot fall.*	12 *feet fall.*
Minimum	1,209	12	192	21.8	260
Minimum low season			287	27.0	325
Maximum, with storage			980	111.3	1,335
Low season, dry years			273	31.0	370

The next mill above Pace's is Love's, about three miles above, but between the two it is said that there are several sites not used. The river is said to be quite rapid at this point of its course. At Love's mill there is a dam across the river 700 feet long, and the fall at the mill is said to be 11 feet, the mill being a grist- and saw-mill.

Table of power at Love's mill.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.	
	Sq. miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*11 feet fall.*
Minimum	1,155	11	184	29.9	330
Minimum low season			250	26.1	280
Maximum, with storage			975	110.8	1,220
Low season, dry years			260	29.5	320

Above Love's mill we come to several unimproved sites, among which mention was made of Jeanes' and Stephen Robinson's, but the first improved power above is some ten miles farther up, in Alamance county, near the Orange line. Before leaving Chatham county it may be said that, according to the foregoing, it is clear that Haw river offers a very large amount of power in its course through the county, very little of which is utilized, but a large proportion of which is available. The bed and banks are almost everywhere good, the country hilly, but not mountainous, and the climate healthy. A disadvantage in the use of the small falls which have been mentioned lies in the sudden and large rise to which the river is subject on account of the narrowness of the bottoms. Although in some places the fall is considerable in a short distance, yet on the whole the declivity of the stream seems to be tolerably uniform, while the width of the stream seems to be on an average some 400 feet or more. I desire to expressly state here, however, that none of the data given regarding Haw river, except the facts regarding the Bland mill, were derived from personal examination, for, on account of their inaccessibility, I did not visit any sites except the one mentioned.

The next power above Love's mill is Saxapahaw factory, near Saxapahaw. The dam extends entirely across the stream, and is about 375 feet long and 3 feet high, built of wood in 1878 and 1879, and backing the water about a mile, with an average width of 350 feet. A race half a mile long leads to the factory, where 45 horse-power is used, with 19 feet fall. The mill is a cotton-mill, run night and day. Estimates of the power will be found in sufficient detail in the table giving the summary. This mill being above the mouth of the Big Cane and several other creeks, the stream is considerably smaller than at Love's.

The next power above Saxapahaw is Newlin's grist-mill. The dam is of wood and stone, 600 feet long and 6 feet high, built in 1875 at a cost of $3,500; and from it leads a race, 485 yards long and 10 feet wide, conducting the water to the mill, where the fall is 10 feet, the power used being probably some 40 horse-power net, with three turbine-wheels. The pond covers some 30 or 40 acres, with an average depth of 6 feet or over, but the stream is not thrown out of its banks. This power is located near the town of Cedar Cliffs, Alamance county, and this property, with 350 acres of land, is for sale. I have estimated the power in the table on page 68.

The next power is an unimproved site belonging to the Falls of Neuse Manufacturing Company, where there is said to be 10 feet fall. A grist-mill was formerly located here.

The next mill is the cotton factory of the Falls of Neuse Manufacturing Company, at Swepsonville, Alamance county. The dam is of wood, 550 feet long, 5½ feet high, built in 1876 at a cost of about $3,000, and from it a race 450 feet long leads to the mill, where the fall is 13 feet, and the power used 150 horse-power. Full capacity can be obtained all the time. The factory is run night and day. Connected with it is a grist- and a saw-mill. The factory was burned in June, 1881, but is being rebuilt.

We next come to the Granite cotton-mills of T. M. Holt, at Haw river, just above the crossing of the North Carolina railroad. The dam was built in 1857, and is constructed of crib-work filled with rock. Its length is 350 feet, and its height about 10 feet; and it backs the water some 2 miles, but does not throw the river out of its banks to any extent. The factory is located directly at the dam, on the east side of river, and the power used is 100 horse-power, with a fall of 11½ feet, there never being any scarcity of water. My estimate of the power is given in the summary.

At the head of Mr. Holt's pond is Seller's mill, a site not now used, and owned by the Falls of Neuse Manufacturing Company; said to have about 12 feet fall.

At Big Falls, 3 miles from Graham station, on the North Carolina railroad, Mr. G. W. Swepson, of Raleigh, is building a cotton factory, to use 13 feet fall, and expecting to get 150 horse-power all the time. If my estimates given in the summary are correct, this will be obtained only part of the time unless the pond is large. There was formerly a cotton-mill at this place, but it was burned down.

About half a mile above Big Falls are the Carolina cotton-mills (J. H. & W. E. Holt & Co.). The dam was built in 1868, and is a frame dam, with stone abutments, about 240 feet long and 4 feet high, making a pond of 3 acres, and giving a fall of 15 feet at the mills, three-fourths of a mile below. A power is used of 110 horse-power, which can be obtained all the time, and without drawing down the water in the pond much in the 12 hours during which the mill is run.

Half a mile above a cotton factory, to be called Glencoe mills, is being built by J. H. Holt & Bro., on a site formerly occupied by the Company mills (cotton). The dam, constructed of stone and logs, was built long ago, and

is about 250 feet long and 8 feet high, giving a fall of 13½ feet, with a race 400 yards long. It is expected to obtain 152 horse-power at all times, but according to my estimates I doubt if this can be done unless the pond is large.

Two and a half miles north of the company's shops, on the North Carolina railroad, is an old grist-mill (Ireland's), not now used, although the fall is said to be 10 or 12 feet.

The highest power on the river is about 5 miles from Gibsonville station, on the North Carolina railroad. Although there was a mill there long ago, the power has for some time been lying idle, but has been recently improved by Messrs. Gant & Davidson, who have a cotton factory, flour- and saw-mill there, using a fall of 15 feet, with 150 horse-power, which can be obtained for eight months of the year, and averaging 75 horse-power during the remaining four. The dam is 250 yards above the mill, and is about 200 feet long and 4½ feet high, backing the water only a few hundred yards. It was built about forty years ago, and is constructed of rock. It is stated that the fall at this place could be increased to some 20 feet.

From the above sketch it will be seen that the water-power on Haw river is quite extensively used, especially on the upper parts, where the stream is more accessible. Haw and Deep rivers are, in fact, the principal manufacturing streams of North Carolina, together with the south fork of the Catawba, yet to be described.

Summary of power of Haw river.

Locality.	Distance from mouth.	Drainage area.	Rainfall.					Total fall.		Horse-power available, gross.*				Utilized.			Remarks.
			Spring.	Summer.	Autumn.	Winter.	Year.	Height.	Length.	Minimum.	Minimum low season.	Maximum, with storage.	Low season, dry years.	Horse-power, net.	Fall.	Per cent. of minimum utilized.	
	Miles.	*Sq. miles.*	*In.*	*In.*	*In.*	*In.*	*In.*	*Feet.*	*Feet.*						*Feet.*		
Bland mill	3.0	1,675	12	12	11	10	45	7.0	.....	225	270	1,050	300	20	7.0	13	Mill at dam.
Hartsaw's site	5.0	1,320	12	12	11	10	45	6.0	.....	150	180	720	200	.....	.....	.....	Not improved.
Moore's mill	8.0	1,300±	12	12	11	10	45	22.0	5,280	525	660	2,600	750	⁄50	10.0	⁄14	
Unimproved site	10.0	1,295±	12	12	11	10	45	8.0	.....	190	240	940	270	.....	.....	.....	
Seven Island shoal	12.0	1,200±	12	12	11	10	45	7.0	.....	170	210	825	240	.....	.....	.....	Unimproved.
Henley's mill	13.5	1,285	12	12	11	10	45	16.0	.....	360	480	1,888	540	50	8.0	19	
Brown's mill	15.0	1,275±	12	12	11	10	45	7.0	.....	165	200	800	230	?	?	?	Said to be not in use.
Bynum's site	16.5	1,260±	12	12	11	10	45	8.0	.....	190	230	900	260	.....	.....	.....	
Bynum's factory	17.5	1,250	12	12	11	10	45	16.0	.....	375	450	1,825	510	80	16.0	29	
Powell's site	18.0±	1,240±	12	12	11	10	45	7.0	.....	155	190	780	220	.....	.....	.....	Mill burnt; dam still there.
Burnett's site	18.5±	1,230±	12	12	11	10	45	6.0	.....	130	165	670	190	.....	.....	.....	Not improved.
Pace's mill	20.0±	1,209	12	12	11	10	45	12.0	.....	260	325	1,335	370	75±	12.0	39±	
Several unimproved sites	.....	.....	12	12	11	10	45	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Love's mill	22.0±	1,155+	12	12	11	10	45	11.0	.....	230	280	1,220	320	?	?	?	Probably not over 50 horse-power used.
Saxapahaw factory	38.0±	967	12	12	11	10	45	19.0	.....	310	400	1,800	460	45	19.0	19	
Newlin's mill	41.0±	935±	12	12	11	10	45	10.0	.....	160	200	940	280	40	10.0	34	
Unimproved site of Falls of Neuse Manufacturing Co.	.....	.....	12	12	11	10	45	10.0	.....	.....	.....	.....	.....	.....	.....	.....	
Factory of Falls of Neuse Manufacturing Company.	45.0±	670±	12	12	11	10	45	13.0	.....	140	190	870	220	150	13.0	136	† See description.
Granite cotton-mills	50.0±	585	12	12	11	10	45	11.5	.....	110	150	670	170	100	11.5	117	† See description.
Seller's mill	52.0±	.....	12	12	11	10	45	12.0	.....	.....	.....	.....	.....	.....	.....	.....	
Big Falls factory	55.0±	494	12	12	11	10	45	13.0	.....	95	130	640	150	.....	.....	.....	Being built; expect 150 horse-power.
Carolina mills	55.0±	490±	12	12	11	10	45	15.0	.....	110	150	740	175	110	15.0	125	
Glencoe mills	56.0±	475±	12	12	11	10	45	13.5	.....	100	140	640	160	.....	.....	.....	Being built; expect 152 horse-power.
Ireland site	.....	460±	12	12	11	10	45	10.0	.....	60	90	460	110	.....	.....	.....	
Gant & Davidson's mills	.....	450(?)	12	12	11	10	45	15.0	.....	95	130	675	150	150	15.0	210	

*For explanation of powers estimated see introduction, pages 18 to 21. Power much larger than in last column during nine months of the year.

THE TRIBUTARIES OF HAW RIVER.

The first considerable tributary met with in ascending the river is New Hope river, which enters from the west, after flowing through Orange and Chatham counties, and draining an area of some 317 square miles. The substance of what I could learn regarding this stream is that it is generally sluggish, flowing through a level country, and without water-power of any importance, the only mills being a few small local grist-mills. The power used is tabulated farther on.

The succeeding tributaries of the Haw river are small and unimportant until we reach Cane creek, which enters from the west, at the extreme southwest corner of Orange county. It rises in the extreme west of Alamance

county, with some tributaries from Chatham, and flows very nearly due east and only a mile or so from the county-line, but without leaving Alamance. It has more fall than the streams entering Haw river from the east, but is specially mentioned chiefly on account of its having one factory, the Clover Orchard cotton factory, which is situated some 6 miles from its mouth. The length of the stream, in a straight line, is about 17 miles, and its drainage area 73 square miles. The factory above referred to, with which is connected a grist-mill, uses a fall of 23 feet and 50 horse-power, which can be obtained during nine months of the year, the average during the remaining three months being 25 horse-power, during which period auxiliary steam-power is used. The mill being run only during 12 hours, and there being no waste at night in dry seasons, the natural flow of the stream would afford only, say, 10 horse-power in low seasons, and probably much less when at its lowest. The dam is of rock, 120 feet long and 17 feet high, and backs the water about a mile; the factory is 300 yards below.

The next important tributary is Alamance creek, which rises in the eastern part of Guilford county, pursues a general direction nearly due east, emptying into Haw river about 4 miles below the railroad crossing. Its length is in the neighborhood of 25 miles, and its drainage area about 237 square miles. It receives as tributaries two creeks called Little Alamance, from the north, and Stinking Quarter creek, from the south. There are only two powers on the stream worth mentioning, viz: Alamance cotton factory (E. M. Holt's Sons) and Bellemont cotton-mills (L. B. & L. Holt). The Alamance factory uses a fall of 12½ feet and 50 horse-power, which can be obtained during nine months of the year, while the latter uses a fall of 12 feet and 175 horse-power, which can be obtained for six or seven months, the power sinking in low seasons to 20 horse-power, and steam-power to the extent of 80 horse-power being used during dry weather.

The Reedy fork of Haw river, and the other tributaries and forks in the upper part of the drainage-basin, offer some power, utilized to some extent by saw- and grist-mills, but have no power worthy of special mention. The country is quite flat in the upper part of the basin, and there are no falls in the streams.

THE DEEP RIVER.

This stream rises in the western part of Guilford county, North Carolina, near the sources of the Haw river, flows in a southeasterly direction through Randolph county and into Moore, where it bends quite abruptly, and flows a little north of east into Chatham county, where it joins the Haw to form the Cape Fear. Its length is about the same as that of the Haw river, and its drainage area is 1,350 square miles. It has only one important tributary, Rocky river, from the north, which enters Deep river about 4 miles above Lockville, and drains an area of 205 square miles, all in Chatham county. The most important towns on Deep river are Lockville, near the mouth, Franklinsville, Cedar Falls, and Randleman's Mills, in Randolph county.

The drainage-basin of Deep river resembles that of Haw river so closely that it is not necessary to describe it in detail. In its lower part the river flows, with a tortuous course, through a narrow valley with abrupt banks, and, in a few cases, perpendicular and overhanging cliffs some 100 feet high.

The rainfall on the basin is a little greater than on that of Haw river, with rather more rain in winter, as will be seen from the maps in the Smithsonian publications. The flow of the river is rather more variable, owing probably to the fact that a greater number of its tributaries rise in the slate country and become nearly dry in summer. For the same reason, the freshets are, on the whole, more violent, and the river rises oftener above its banks, overflowing the bottoms on the lower part to a depth of 10 or 12 feet. On the upper part of the river there are probably sites for reservoirs, although Guilford and the neighboring counties are, on the whole, not very favorable for their construction, being too flat.

The following are some elevations on the stream, with distances measured from the map, and resulting declivities:

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Difference of elevation.	Fall per mile between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Mouth, or confluence with Haw	0	133			
			14	80	5.7
Near Egypt mine*	14	213			
			74	412	5.6
Northern part of Randolph county	88	625			
			12	137	11.4
Crossing of Piedmont Air-Line railroad†	100	762±			

* I think there is some error in this elevation, or in that at the mouth, and that the fall between the two is not so great.

† For this elevation I am again indebted to Mr. T. M. R. Talcott, general manager of the road, who took particular pains to obtain it.

From this it appears that the fall of the stream is not much different from that of Haw river, though greater in its upper part.

There are no records of continuous gaugings of the river.

As will be seen from the map, the river is very inaccessible, there being no railroad within easy reach except at the extreme lower and upper parts. Nevertheless, a number of manufacturing establishments have been located at various points, especially in Randolph county, shipping their products by the Piedmont Air-Line railroad.

The following are the mills and sites, so far as I have been able to learn them:

The first power on the river is at Lockville, about 2 miles from the mouth of the river. The falls, known as Pullin's falls, were overcome by the Navigation Company, and navigation established around them by means of 2 dams and a canal leading down the river from the lower one, with an outlet-lock into the river at the lower end of the town, with a single lift of 24 feet. The lower dam is 600 or 700 feet long, 11 feet high, built of crib-work filled with stone, with a vertical back, and a face sloping down to about 1 foot above low water, the base being 30 feet wide, up and down stream. It is said to have cost about $14,000. It does not extend straight across the river, but has the shape of a letter V, with the apex up stream, and backs the water half a mile, with an average width of about 700 feet, to the upper Lockville dam. The foundation is rock, and the dam is not, to any great extent, liable to injury by freshets. The canal which leads from the dam is less than half a mile long, with a guard-lock at its head having a lift of a foot or so, and the high lock at its outlet below. All along this canal are magnificent sites for mills, which could use a fall varying between 11 and 24 feet, with perfectly safe locations. The following are the mills now in use, all owned by the Navigation Company, viz: 1 cotton-gin, 14 feet fall; 1 saw-mill, 16 feet; 1 grist-mill, 16 feet; 1 foundry, 18 feet; 1 grist-mill, 18 feet; 1 machine-shop, 18 feet; all on the canal, fed directly from it, and discharging the water into the river. The aggregate power used by these mills is not exactly known, but is, perhaps, in the neighborhood of 150 horse-power. There is always a waste of water, and there are about 15 days in the year when there is trouble with backwater, the river at the outlet-lock being probably less than 300 feet wide. In high freshets the water rises 5 feet on the dam. The canal is 40 feet wide, and originally 6 feet deep. With a fall of a foot to the mile it could probably carry the entire flow of the stream at low water; so that the entire power at this place is really at present available, except that the wood-work of all the dams of the company is in bad condition, badly rotten, and there is considerable leakage.

The drainage area above this place being about 1,350 square miles, I have estimated the flow and power as in the following table:

Table of power available at Lockville.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.		Utilized.		Percentum of minimum utilized.
						Horse-power, net.	Fall.	
	Square miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*24 feet fall.*		*Feet.*	
Minimum	1,350	24	216	24.5	590	150±	14-18	25
Minimum low season			256	29.1	700			
Maximum, with storage			1,080	122.7	2,950			
Low seasons, dry years			203	33.3	800			

I think that in low water the reservoir-room would be sufficient to allow of the concentration of power into 12 hours to such an extent as to increase the minimum power by 50 per cent. at least.

This power is an excellent one in all respects. A branch of the Raleigh and Augusta Air-Line railroad leads directly to the mills. There is an abundance of fine building-stone in the neighborhood. There is no trouble with ice, and little with high water. The river is navigable up to Carbonton, so that the copper deposits near Egypt, the coal-beds, and the iron-ores of the valley are easy of access. The location is healthy, and indeed there seems to be no reason why a large amount of power should not be utilized at this place.

The second Lockville dam, half a mile above the first one, is of similar construction, and extends straight across the river, its length being about 700 feet, its height 16 feet, and its pond 2 miles in length, up to the Gorgas canal, with an average width of about 600 feet. It would probably cost some $12,000 to build it now. It is in bad condition, the timbers rotted and the stones gone, but could easily be put in order. The lock at its north end is 115 feet long, 18 feet wide, with a lift of 16 feet. The banks between this dam and the one below are steep and rocky on the north side and shelving on the south. The available power here could best be used on the south side, unless it were desired to use it at Lockville, in which case a canal or flume should be built on the north side. A canal 20 feet wide and 6 feet deep would probably suffice to carry the minimum flow, with a fall of 1½ feet per mile. During the war there was a grist-mill on the right bank, but the dam was not sufficiently secured, and it was washed around at this end. It was rebuilt in 1874, when the last company put the works in order, and 150 or 200 feet of the south part were put in, at a cost of $10,000, several accidents happening during the work. The power at this dam is easily available, although there have been no steps taken to utilize it. The amount of water is the same as at the lower dam, and the available power less in proportion to the fall, *i. e.*, two-thirds of that in the last table. In this case, too, the reservoir-room would, I think, be ample to allow of the concentration of power and to render double the low-season flow available during 12 hours.

Two and a half miles above the second Lockville dam is the Gorgas dam, just below the mouth of Rocky river, extending straight across the river, about 600 feet long and 7 feet high, built of cribs filled with stone, vertical on

both sides, and with a width of 6 or 8 feet, and backing the water up to the Endor dam, a distance of about 7 miles or a little less, with an average width of about 500 feet. This dam is at the head of a canal half a mile long, the third of the navigation canals, with guard- and outlet-locks, at the latter of which is a grist-mill taking water from the canal, using 7 to 8 feet fall and perhaps 20 or 25 horse-power, with 2 run of stones. Full capacity can be secured all the time, except for about 15 days in the year, when the river is high. The location is a very favorable one for building, and all the available power could easily be utilized along the canal, which is of ample capacity to carry the dry-weather flow. The drainage area above this place is about 1,300 square miles, and the amount of water and power less than at Lockville. I have estimated it as in the following table. The pond being 7 miles long, there is no doubt that the low-season flow could be concentrated into 12 hours, so that the power given in the table would be doubled with a small diminution of head. Although this place is not quite so conveniently located as Lockville, it is easy of access from that place, as well as from Eygpt, on the Cape Fear and Yadkin Valley railroad:

Table of power at Gorgas dam.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.		Utilized.		Per cent. of minimum utilized.
						Horse-power, net.	Fall.	
	Square miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*7 feet fall.*		*Feet.*	
Minimum	1,300	7	208	23.6	165	20	7	18
Minimum low season			247	28.1	200			
Maximum, with storage			1,040	118.2	830			
Low season, dry years			282	32.1	225			

The Endor dam is about 400 feet long and 4 feet high, crossing the river in the shape of a V, with a vertical face and inclined back half way across, and an inclined face and vertical back for the remaining distance. It is built of wood, and ponds the water back to the Gulf dam, a distance of 10 miles. As far as the location goes, it could be used for power, but the fall is so small that it would not be advisable. It is not necessary to consider it further. The estimated power is as follows:

Table of power at Endor dam.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.		Utilized.		Per cent. of minimum utilized.
						Horse-power, net.	Fall.	
	Square miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*4 feet fall.*		*Feet.*	
Minimum	1,075	4	160	18.3	70	0	0	0
Minimum low season			200	22.6	90			
Maximum, with storage			900	102.9	400			
Low season, dry years			225	25.6	100			

The Gulf dam is a crib-dam, with vertical face and sloping back, extending straight across the river, about 400 feet long, 8 feet high, and backing the water up to the Carbonton dam, 6 miles above, with an average width of pond of, say 300 feet. At one end is a grist-mill with 4 run of stones, using 8 feet fall and about 40 horse-power. The following table gives estimated flow and power, and, as in the former cases, it is probable that the power might, in low seasons, be increased to a considerable extent by drawing down the water in the pond during working hours:

Table of power at Gulf dam.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.		Utilized.		Per cent. of minimum utilized.
						Horse-power, net.	Fall.	
	Square miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*8 feet fall.*		*Feet.*	
Minimum	1,047	8	157	17.8	140	40	8	94±
Minimum low season			194	22.0	175			
Maximum, with storage			900	102.0	820			
Low season, dry years			222	25.0	200			

Carbonton dam is partly a frame dam, constructed of triangular wooden frames, set lengthwise up and down the river, and planked over, and partly a crib-dam, and is 300 or 400 feet long and 9 or 10 feet high, extending straight across the stream, and ponding the water for 6 miles, the average width being about 200 feet. The power is utilized for a grist-mill, saw-mill and cotton-gin, using about 35 horse-power and 10 feet fall. The available power is given in the table.

The last of the navigation dams is Hancock's, now called Tyser's, 12½ miles above Carbonton. It is of wood, 300 feet long and 10 feet high, with a pond 3 miles long and 200 to 300 feet wide. The power is used by a grist- and saw-mill and cotton-gin—a mill at each end of the dam—using 12 feet fall, and a total of some 60 or 70 horse-power. The available power is given below:

Table of power at Carbonton dam.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.		Utilized.		Per cent. of minimum utilized.
						Horse-power, net.	Fall.	
	Square miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*10 feet fall.*		*Feet.*	
Minimum	1,010	10±	150	17.0	170	35	10	28
Minimum low season			180	20.5	200			
Maximum, with storage			880	100.0	1,000			
Low season, dry years			200	33.5	235			

Table of power at Tyser's dam.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.		Utilized.		Per cent. of minimum utilized.
						Horse-power, net.	Fall.	
	Square miles.	*Feet.*	*Cubic feet.*	*1 foot fall.*	*10 feet fall.*		*Feet.*	
Minimum	314	10±	123	14.0	140	60±	12†	57
Minimum low season			147	16.7	170			
Maximum, with storage			710	81.4	800			
Low season, dry years			168	19.1	190			

Carbonton is the head of navigation. The foundation of a lock was put in there, but the lock was never completed, so that boats never ascended into the pool of the Carbonton dam. I will now briefly mention and describe in order the remaining powers on the river, referring to the summary of power for estimates:*

1st. At Prosperity, Moore county, E. N. Moffitt's grist-mill; fall, 8 feet; 30 horse-power; dam, wood and stone, 275 feet long, 10 feet high.

2d. Big falls (belonging to N. D. Woody, Shaw's Mills, Guilford county), in Moore county, about 3 miles above Prosperity; unimproved. Said to be an excellent site, 12 miles from the proposed line of the Cape Fear and Yadkin Valley railroad and 23 miles from the Raleigh and Augusta Air-Line railroad. The fall has been estimated at 18 feet, with a 2-foot dam at head; length of shoal, three-eighths of a mile. The bed is rock, banks favorable; width of stream, about 350 feet.

3d. Unimproved privilege belonging to Elias Ritter, esq., Carter's Mills, Moore county. Fall unknown.

4th. Howard & Moffitt's grist- and saw-mill, Moore county, near the Randolph line. Stone dam, 310 feet long, 10 feet high, backing the water 3 miles. Fall utilized, 12 feet, and 30 horse-power at all times.

5th. Unimproved power, Randolph county; said to be 12 to 15 feet.

6th. Enterprise Manufacturing Company's mills, at Faust's Mills, Randolph county; stone dam, 300 feet long, 3 feet high, built in 1858 at a cost of $300, ponding about 18 acres. Head-race, 672 feet; fall utilized, 15 feet; horse-power used, 40. The company have a cotton-mill, saw-mill, and flour-mill. They say that they have an additional fall of 5 feet available, making 20 feet in all. There is always a waste of water.

7th. Unimproved site, 2 or 3 miles above Enterprise mills, known as the Cox falls, supposed to have a fall of 12 or 14 feet.

8th. Unimproved site, 4 miles farther up, known as the Allen falls, supposed to be 12 to 20 feet available, about 8 miles from the Cape Fear and Yadkin Valley railroad. Length of fall, about half a mile; rock bed and good banks.

*It may be stated here that most of the information regarding Deep river, in Randolph county, is due to the Hon. A. S. Horney, who furnished a long list of powers.

9th. Columbia Manufacturing Company (formerly Deep River Manufacturing Company). The dam is of stone, about 350 feet long and 12 feet high, built about 1850 at a cost of $2,000, backing the water 1¾ miles, with an average width of 300 feet. Head-race, 1,200 feet long; fall used, 12 feet at mills and 14 at factory, and about 100 horse-power in all. The company have a cotton factory, grist- and saw-mills, cotton-gin, and wool-cards, all driven from same dam and canal, the factory using about 70 horse-power. Water always wastes.

10th. Randolph Manufacturing Company, Franklinsville, 2 miles above Columbia Manufacturing Company. Dam of wood and stone, about 350 feet long, 8 feet high, giving a fall of 12½ feet, with a race of 450 feet; utilized power, 50 horse-power, which can be secured at all times. The mill is a cotton factory. In low water the water is drawn down below the crest of the dam, the mill being run during 12 hours.

11th. Franklinsville Manufacturing Company (cotton-bag factory, grist- and saw-mills, wool-carding machine, and cotton-gin). The dam is of stone, 350 feet long, 6 feet high; length of head-race 2,000 feet; fall utilized, 19 feet; power, 80 horse-power, which can be secured at all times by drawing down the water in the pond in dry seasons.

12th. Unimproved site, a mile or less farther up stream, said to have 15 to 20 feet available within a distance of rather over half a mile. Good location for a dam, with rock bottom and banks, known as the Reuben Aldred site. All accounts agree in stating this to be a valuable privilege.

13th. Grist-mill of Cedar Falls Manufacturing Company, about a mile above No. 12. Dam of stone and wood, 250 feet long, 8 feet high, ponding 2 acres, built in 1851 at a cost of about $6,000 (?). Length of head-race, 500 feet; fall utilized, 14½ feet; power used, some 20 to 30 horse-power; water always wasting.

14th. Cedar Falls Manufacturing Company's cotton factory, half a mile above grist-mill. Dam of stone and wood, 200 feet long, 6 feet high, built in 1836, costing $1,000. Pond, 1 acre; head-race, one-eighth of a mile; fall used, 25½ feet, and 60 horse-power at all seasons.

15th. Unimproved site, 1 mile above. Said to be 12 or 15 feet available.

16th. Central Falls Manufacturing Company's cotton factory, now building, 2 miles above No. 15. Fall said to be 12 feet.

17th. Cotton factory now building 2½ miles above No. 16; fall about 14 feet.

18th. Naomi Falls Manufacturing Company's cotton factory and grist-mill, 2 miles farther up. Fall about 10 or 11 feet; power used not stated; some steam used for power.

19th. Randleman Manufacturing Company. Three cotton factories, all from one dam, half a mile above No. 18. Dam is of stone, cemented and planked, 272 feet long and 10 feet high, built in 1878, costing $2,200. The pond is 2 miles long and 200 feet wide. Fall used, 11 feet; 125 horse-power obtained during 9 months by drawing down the water in the pond. Steam used to supplement water in low seasons.

20th. Unimproved site, called Island Ford, 2 miles above last power. Said to be 10 or 12 feet.

21st. Walker's grist-mill and saw-mill, 1 mile farther up. Dam of wood, 258 feet long, 8 feet high; fall used, 12 feet; power used said to be 20 to 25 horse-power.

22d. Unimproved site 5 miles above; said to be 10 to 12 feet.

23d. Coltrain's grist- and saw-mill.

24th. Freeman's grist- and saw-mill. Fine cemented rock dam; fall, 12 feet.

The powers above this are small, generally grist- and saw-mills, with one cotton factory at Jamestown, the Oakdale Manufacturing Company, using 19 feet fall and 70 horse-power during 10 months. During the remaining two months about 50 to 55 horse-power can be obtained by drawing down the water in the pond during the night, the mill being run 12 hours. The natural flow of the stream affords, therefore, about 2 horse-power per foot (gross) during the dry season of ordinary years, or the flow is about 17 cubic feet per second, and probably about 40 to 50 during nine months of the year. There are several sites not used, one of about 8 feet fall just below the cotton factory, and another of about the same several miles farther down.

Summary of power of Deep river.

[N. B.—The powers given in this table may, in most cases, be increased to a large extent, and perhaps doubled, if the mills are run only 12 hours and the water drawn down in the ponds at night.]

Locality.	Distance from mouth.	Drainage area.	Rainfall.					Total fall.		Horse-power available, gross.†				Utilized.		Per cent. of minimum utilized.	Remarks.
			Spring.	Summer.	Autumn.	Winter.	Year.	Height.	Length.	Minimum.	Minimum low season.	Maximum, with storage.	Low season, dry year.	Horse-power, net.	Fall.		
	Miles.	*Sq. miles.*	*In.*	*In.*	*In.*	*In.*	*In.*	*Feet.*	*Feet.*						*Feet.*		
Lockville, lower dam	2.0	1,350	12	12	11	11	46	24.0	2,000	590	700	2,950	800	150±	14–18	25±	Dam 11 feet.
Lockville, upper dam	2.5	1,350	12	12	11	11	46	16.0	.....	390	470	1,950	525	.....	.....	.....	Dam 16 feet.
Gorgas dam	5.0	1,300	12	12	11	11	46	7.0	.....	165	200	825	225	20	7.0	18	Dam 7 feet.
Ender dam	11.7	1,075±	12	12	11	11	46	4.0	.....	70	90	400	100	.....	.....	.....	Dam 4 feet.
Gulf dam	21.7	1,047	12	12	11	11	46	8.0	.....	140	175	820	200	40	8.0	34	Dam 8 feet.
Carbonton dam	27.7	1,010	12	12	11	11	46	10.0	.....	170	200	1,000	235	35	10.0	28	Dam 10 feet.
Tyser's dam	40.2	814	12	12	11	11	46	10.0	.....	140	170	800	190	60	12.0	57	Dam 10 feet
Prosperity mill	47.0	784	12	12	11	11	46	10.0	.....	125	155	780	180	30	8.0	30	Dam 10 feet.
Big falls	50.0	746	12	12	11	11	46	18±	2,000	210	250	1,340	285	0	.....	.....	
Unimproved site	.....	.....	12	12	11	11	46	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fall not known.
Howard & Moffitt's mill	53.0	665	12	12	11	11	46	12.0	.....	118	150	800	170	30	12.0	32	Dam 10 feet.
Unimproved power	.....	.....	12	12	11	11	46	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Enterprise factory	63.0	453	12	12	11	11	46	20.0	.....	112	150	925	170	40	15.0	42	Dam 3 feet.
Unimproved site	65.0	440±	12	12	11	11	46	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Unimproved site	68.0	425±	12	12	11	11	46	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Columbia Manufacturing Company.	69.0	420±	12	12	11	11	46	14.0	.....	70	100	600	115	60–100	12–14	.....	Dam 12 feet; information conflicts.
Randolph Manufacturing Company.	71.0	408	12	12	11	11	46	12.5	.....	55	70	500	80	50	12.5	130	Dam 8 feet; water drawn down in pond.
Franklinsville Manufacturing Company.	71.5	408	12	12	11	11	46	19.0	.....	85	110	800	125	80	19.0	130	Dam 6 feet; water drawn down in pond.
Unimproved site	72.5	400±	12	12	11	11	46	15+	3,000+	70	90	600	105	0	.....	.....	
Cedar Falls Manufacturing Company.	73.5	341	12	12	11	11	46	14.5	.....	.....	.....	.....	.....	20–30	14.5	.....	Dam 8 feet.
Cedar Falls Manufacturing Company.	74.0	341	12	12	11	11	46	25.5	.....	.....	.....	.....	.....	60	25.5	.....	Dam 6 feet.
Unimproved site	75.0	.....	12	12	11	11	46	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Central Falls Manufacturing Company.	77.0	300±	12	12	11	11	46	12±	.....	.....	.....	.....	.....	.....	.....	.....	Being improved.
Factory being built	79.5	300±	12	12	11	11	46	14±	.....	.....	.....	.....	.....	.....	.....	.....	Being improved.
Naomi Falls Manufacturing Company.	81.5	257	12	12	11	11	46	10±	.....	.....	.....	.....	.....	(*)	10±	.....	
Randleman Manufacturing Company.	82.0	257	12	12	11	11	46	11.0	.....	.....	.....	.....	.....	125	11.0	.....	Dam 10 feet; full capacity 9 months.

*Not stated.

†See pages 18 to 21.

TRIBUTARIES OF DEEP RIVER.

The tributaries of Deep river are of small consequence, and only one of them is worthy of special mention, viz: Rocky river, which rises in the northwestern part of Chatham county and flows southeast, joining Deep river just above Gorgas dam. The stream is utilized to a considerable extent by small saw- and grist-mills, but, like other streams in the vicinity, it is subject to great variations in flow, owing to its course lying in the slate region. The drainage area of the stream is about 205 square miles, and its length, in a straight line, about 25 miles; yet during the dry season the flow is not sufficient to afford more than 20 or 25 horse-power, with a fall of 20 feet. There are 12 mills on the river, with falls of from 8 to 25 feet, but some sites are still unimproved.

The other tributaries above Rocky river are utilized for small grist- and saw-mills, but are not of much importance. Some of them are nearly dry in summer.

Table of utilized power on Cape Fear river and tributaries.

Name of stream.	Tributary to what.	State.	County.	Kind of mill.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Cape Fear river	Atlantic	North Carolina	Cumberland		1	10.0	15
Northeast Cape Fear	Cape Fear	do	Pender	Flour and grist	1	7.0	10
Do	do	do	do	Saw	1	7.0	20
	Northeast Cape Fear	do	Duplin	Flour and grist	16	144.0	153
	Do	do	do	Saw	3	29.0	36
	Do	do	do	Cotton-gin	2	20.0	.....
South river	Cape Fear	do	Sampson	Flour and grist	1	7.0	8
Do	do	do	Pender	do	2	16.0	13
Black river	South river	do	Sampson	do	2	17.0	11
Do	do	do	do	Cotton-gin	1	9.0	6
	Do	do	do	do	5	50.0	27
	Do	do	do	Flour and grist	11	115.0	98
	Do	do	do	Saw	1	.....	10
All other tributaries to	Cape Fear	do	Bladen	Flour and grist	2	22.0	19
Do	do	do	do	Cotton-gin	1	8.0	3
Do	do	do	Cumberland	Flour and grist	10	95.0	150
Do	do	do	do	Saw	4	29.0	122
Do	do	do	do	Cotton-gin	3	.....	.....
Do	do	do	do	Agricultural implements	1	20.0	12
Do	do	do	do	Cotton factory	5	72.0	348
Do	do	do	do	Woolen	3	.....	.....
Do	do	do	Harnett	Flour and grist	13	155.5	158
Do	do	do	do	Saw	2	21.0	35
Do	do	do	Wake	Flour and grist	6	99.0	62
Do	do	do	do	Saw	1	11.0	18
Do	do	do	do	Cotton-gin	4	78.0	42
Do	do	do	Chatham	Flour and grist	2	30.0	30
Do	do	do	Moore	do	11	132.0	130
Do	do	do	do	Saw	6	88.5	118
Haw river	do	do	Chatham	Flour and grist	7	64.0	142
Do	do	do	do	Saw	2	14.0	35
Do	do	do	do	Wheelwrighting	1	7.0	10
Do	do	do	do	Cotton factory	1	16.0	80
Do	do	do	Alamance	Flour and grist	6	69.5	202
Do	do	do	do	Saw	2	25.5	46
Do	do	do	do	Blacksmith shop	1	11.5	30
Do	do	do	do	Cotton factory	5	73.5	505
Do	do	do	do	do*	2	26.5	.....
Do	do	do	Guilford	Flour and grist	2	27.0	21
Do	do	do	do	Saw	1	12.0	5
Do	do	do	Rockingham	Flour and grist	2	36.0	40
Do	do	do	do	Saw	1	18.0	20
Tributaries of	Haw river	do	Chatham	Flour and grist	13	179.0	176
Do	do	do	do	Saw	3	29.0	60
Do	do	do	do	Wheelwrighting	1	12.0	10
Do	do	do	do	Cotton gin	3	.....	.....
Do	do	do	Orange	Flour and grist	8	161.0	188
Do	do	do	do	Saw	6	85.0	134
Do	do	do	do	Cotton-gin	1	.....	20
Do	do	do	do	Millwrighting	1	14.0	12
Do	do	do	Alamance	Cotton factory	3	47.5	275
Do	do	do	do	Flour and grist	17	209.0	294
Do	do	do	do	Saw	4	52.0	77
Do	do	do	do	Cotton-gin	1	11.0	6
Do	do	do	do	Foundry	1	15.0	25
Do	do	do	do	Agricultural implements	1	16.0	8
Do	do	do	Guilford	Flour and grist	24	344.0	379
Do	do	do	do	Saw	6	79.5	93
Do	do	do	do	Woolen	1	12.0	.....
Do	do	do	Randolph	Flour and grist	1	19.0	10
Do	do	do	Rockingham	do	6	105.0	100
Do	do	do	do	Saw	3	54.0	48
Deep river	Cape Fear	do	Chatham	Flour and grist	4	41.0	112
Do	do	do	do	Saw	2	24.0	30
Do	do	do	do	Agricultural implements	1	16.0	15

*Being built.

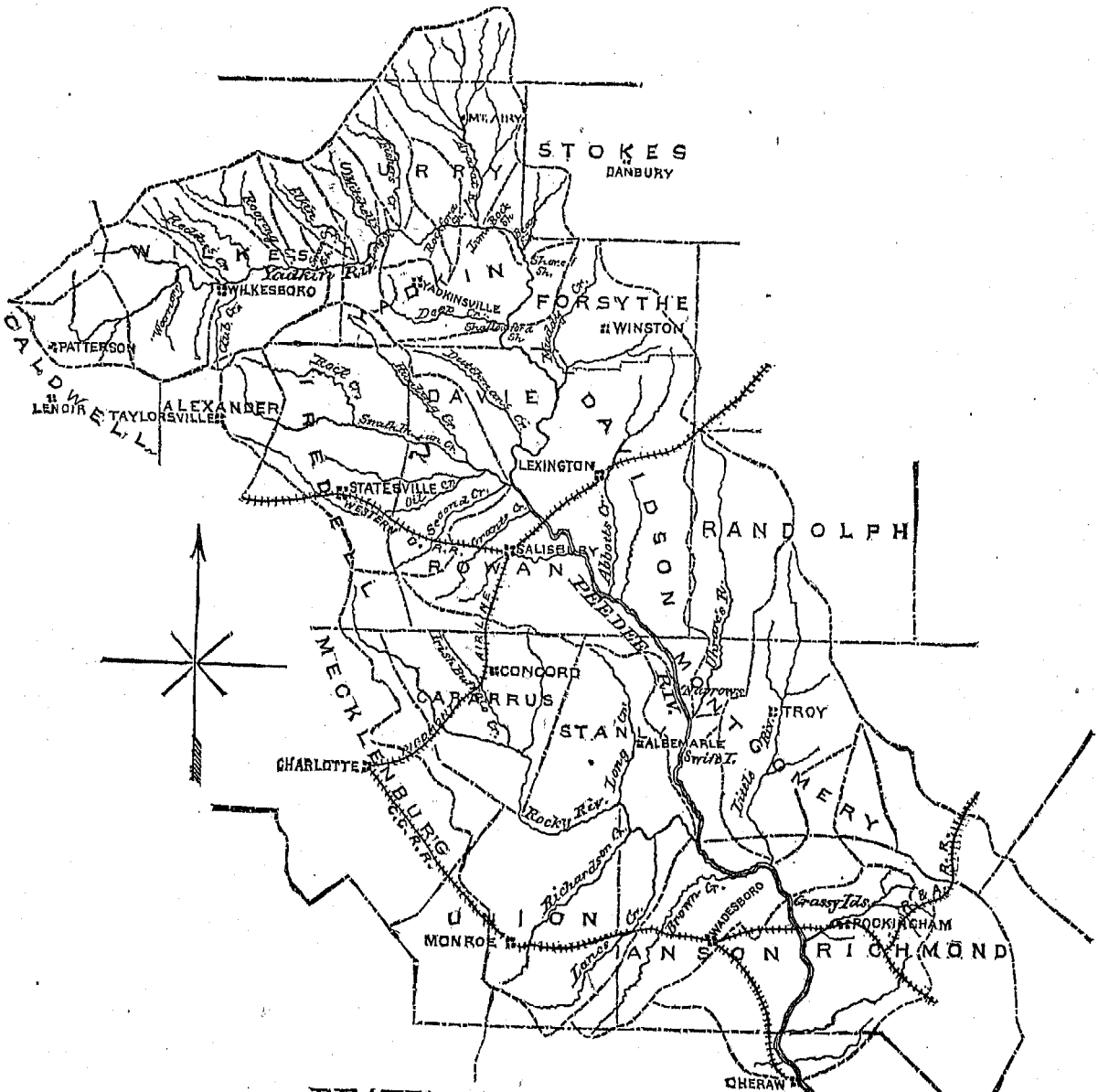
Table of utilized power on Cape Fear river and tributaries—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill.	Number of mills.	Total fall used.	Total horse-power used, not.
						Feet.	
Deep River	Cape Fear	North Carolina	Chatham	Foundry	1	18.0	.....
Do	do	do	do	Machine-shop	1	18.0	.....
Do	do	do	do	Cotton-gin	1	14.0	.....
Do	do	do	Moore	Flour and grist	3	32.0	120
Do	do	do	Randolph	Cotton factory	7	107.0	475
Do	do	do	do	do*	2	26.0	.....
Do	do	do	do	Flour and grist	7	100.0	250
Do	do	do	do	Saw	1	12.0	12
Do	do	do	do	Woolen	2	.....	50
Do	do	do	do	Furniture (?)	1	3.0	4
Do	do	do	Guilford	Flour and grist	7	92.5	124
Do	do	do	do	Cotton factory	1	19.0	70
Do	do	do	do	Saw	1	24.0	25
Do	do	do	do	Carriages	1	17.0	20
Do	do	do	do	Woolen	1	7.0	15
Tributaries of	Deep river	do	Chatham	Flour and grist	17	225.0	258
Do	do	do	do	Saw	3	45.0	60
Do	do	do	do	Agricult'l implements	1	9.0	10
Do	do	do	do	Leather	1	12.0	6
Do	do	do	Moore	Flour and grist	8	86.0	135
Do	do	do	do	Saw	4	42.0	74
Do	do	do	Randolph	Flour and grist	23	331.0	361
Do	do	do	do	Woolen	1	8.5	.....
Do	do	do	do	Saw	8	106.0	128
Do	do	do	Guilford	Flour and grist	5	79.0	56
Do	do	do	do	Woolen	1	16.0	.....

*Being built.

Table of drainage areas of Cape Fear river and tributaries.

	Square miles.
Cape Fear river at mouth	8,400
Northeast Cape Fear river at mouth	1,330
South river at mouth	1,430
Black river at mouth	620
Cape Fear river at Fayetteville	4,250
Cape Fear river at Jones' falls	4,170
Cape Fear river at Silver run	3,660
Cape Fear river at Smiley's falls	3,400
Cape Fear river at Buckhorn falls	3,200
Cape Fear river at forks	3,025
Haw river at mouth	1,675
Haw river at Bynum's	1,250
Haw river at North Carolina railroad	585
Haw river at Reedy fork	173
New Hope river at mouth	317
Alamance creek at mouth	237
Reedy fork of Haw at mouth	281
Deep river at mouth	1,350
Deep river at Lockville	1,340
Deep river at Gorgas	1,300
Deep river at Gulf	1,047
Deep river at Carbonton	1,010
Deep river at Tyser's	814
Deep river at Franklinsville	408
Deep river at Unionville	257
Rocky river at mouth	205
Rockfish creek at mouth	280
Little Rockfish creek at mouth	77
Little Rockfish creek at factory	55
Lower Little river at mouth	448
Lower Little river at Manchester	329
Upper Little river	176



DRAINAGE BASIN.
OF THE
PEE DEE RIVER,
ABOVE CHERAW.

Scale 10 0 10 20 30 Miles

VI.—THE GREAT PEE DEE RIVER (AND YADKIN) AND TRIBUTARIES.

THE GREAT PEE DEE RIVER.

The Great Pee Dee river takes its rise on the eastern slope of the Blue Ridge, in Caldwell and Watauga counties, North Carolina. It flows first a little north of east through Caldwell and Wilkes and between Surry and Yadkin counties, when it bends abruptly to the right, and flows a little east of south, forming the boundary between the counties of Forsyth, Davidson, Montgomery, and Richmond on its left, and Yadkin, Davie, Rowan, Stanley, and Anson on its right, passing into South Carolina, and continuing in the same general direction between Marlborough and Marion counties on its left, and Chesterfield, Darlington, Williamsburg, and Georgetown on its right, emptying into Winyah bay just at the town of Georgetown, after flowing for some distance through the county of the same name. The river is known as the Great Pee Dee only in that part of its course below the mouth of the Uwharrie river, in Montgomery county, North Carolina, being called the Yadkin above that point. Following the general course of the stream, the distance from its source to its mouth is between 275 and 300 miles, but following all its windings it is much greater—as nearly as I can estimate by measurement on the map, some 400 miles or more, and I think that it will be found in fact to be greater still.

There are no towns of great importance on that part of the river where there are any facilities for water-power. Georgetown, at the mouth of the stream, has a population of 2,557, and Cheraw, the head of navigation, 918. In North Carolina there are no towns on the river with more than a few hundred inhabitants, the principal one being Wilkesboro', the county-seat of Wilkes county.

The head of navigation on the river is Cheraw, South Carolina, about 149 miles above the mouth. By the act of Congress of June 14, 1880, the sum of $7,000 was appropriated to the work of improving the navigation on this part of the river, and it is hoped to secure 9 feet of water as high as Smith's Mills, 46 miles from the mouth, and 3½ feet at the lowest stage as far as Cheraw, the estimated cost of the whole improvement being $25,520. There is considerable trade upon the river as high as Smith's Mills, and vessels drawing 9 feet reach that place at a fair stage of the water. The principal shipments are cotton, lumber, and naval stores. There is at present a navigable depth of 3 feet in favorable stages of the water as high as Cheraw, and two steamers run regularly upon the river, ascending as high as this place when practicable. An examination of the river between Cheraw and the mouth of the Uwharrie, a distance of 67 miles, has also been made, and it is found practicable to render the river navigable as high as this point by locks and dams, but no appropriation has yet been made for the work. Above the mouth of the Uwharrie the "Narrows" form an insurmountable obstacle to navigation, but above them, between the North Carolina railroad bridge and Wilkesboro', the river has been surveyed, and an appropriation of $20,000 made March 3, 1879, the object being to secure a navigable depth of 2½ to 3 feet as high as the foot of Bean's shoal, a distance of 64.8 miles. There are some mill-owners in this distance with whom it has thus far been impossible to effect an arrangement "whereby the United States might be protected from claims for damages resulting from the prosecution of the improvement".* A second appropriation for this work of $20,000 was made June 14, 1880. The cost of the improvement is estimated at $82,000, and is to be effected without locks and dams.

The Great Pee Dee drains a total area of about 17,000 square miles, of which about 9,700 lie in North Carolina and 7,300 in South Carolina. The principal tributaries to the river are the Waccamaw river, from the north, draining about 1,200 square miles; the Black river, from the west, draining about 1,500 square miles; the Little Pee Dee river, from the north, with a drainage area of some 3,000 square miles; Lynch's creek, from the west, draining about 1,350 square miles; Black creek, from the west, draining about 450 square miles; Little river, from the east, draining 400 square miles; Rocky river, from the west, draining 1,400 square miles; Uwharrie river, from the east, draining 317 square miles; the South Yadkin, from the west, draining 820 square miles; and the Ararat river, from the north, draining about 315 square miles, besides numberless smaller streams and creeks affording fine water-power, especially in the upper part of the drainage-basin.

The Great Pee Dee crosses the fall-line a little above Cheraw. The fall is not so pronounced as in the case of the Tar and the Roanoke, consisting of a series of rapids extending over a number of miles, with no very great fall at any one place, or within any short distance. The drainage-basin of the river below the fall-line will be understood sufficiently well from the general description which has been already given of the eastern division, and of the lower parts of the Cape Fear and other rivers, while its general shape and dimensions may be seen from the accompanying map. Neither does that part of its drainage-basin lying above the fall-line differ in any essential particulars from that of the Cape Fear or the Roanoke, except that it reaches farther west (and into the mountains) than that of the Cape Fear. Below the great bend, where the river turns so abruptly to the south, its valley averages 50 miles wide, and at many points the river is bordered by wide and fertile bottoms, subject to overflow at times, and forming some of the best farming lands in the state, while at others the hills close in upon the river, leaving no bottoms at all, and

* Annual Report Chief of Engineers, U. S. A., 1880, App. H.

sometimes confining the river between steep and rocky banks on each side. In one case the river flows through a regular ravine, confined in a very narrow channel by bold and abrupt banks for a distance of several miles, forming the noted "narrows". Above the great bend the valley is narrower (only 15 to 20 miles wide), and the divides which separate the basin of the Yadkin from those adjacent are much higher, so that the tributary streams in the vicinity have a very large fall. The level land along the stream, however, is seldom in this part of its course over a mile wide, interjected between the spurs of the parallel ranges of mountains which form the divides, and forming in places extremely picturesque little valleys, surrounded on almost all sides by high mountains. Even in this part of its course the river rises above its banks in high water, although the grounds subject to overflow are not very extensive. Near Yadkinville the river passes through a gap in the mountains, and above that point its valley is flanked on the north by the Blue Ridge and on the south by the Brushy mountains, the divides having elevations of from 1,500 feet upward, and from these come pouring down many mountain-streams and torrents. The upper part of the valley of the Yadkin is very well wooded, and the mountains not being bare, the streams are more constant in flow than would be expected.

The facilities for the construction of storage-reservoirs are good on some of the tributaries, and on the main stream in the very upper part of its course. Below, they would, of course, be impracticable.

The products of the Yadkin valley are cotton, tobacco, corn, rice, wheat, oats, rye, clover and grasses, sorghum cane, vegetables, and fruits in the lower part, and principally grain, vegetables, and fruits in the upper part. Between the cool slopes of the Blue Ridge on the north and the low and hot plains of the eastern division on the south the range of production—as in the case of the Roanoke—is very large, the mountains being well adapted to grazing, the bottom-lands of the valleys to the raising of cereals, grasses, vegetables, fruits, and tobacco, and the low country along the lower part of the stream to the production of cotton and rice.

The river is subject to freshets, but I learned of no peculiarities concerning them. They are said not to be so violent, as a rule, as on the Cape Fear, Neuse, or Tar, probably because of the character of the upper part of the basin; and, although there are no lakes to regulate the flow, the extensive woods and the mountains, well covered with soil, serve to restrain their violence. Neither are the freshets so violent as on the Roanoke, the cause in this case being, probably, the fact that the rainfall in the upper valleys of the Yadkin is perhaps, on the whole, more uniformly distributed throughout the year than on the Dan and Staunton. At any rate, the highest flood ever known at Wilkesboro' occurred in September, 1878, yet the rise was only 23 feet above low water; and at Langenhour & Neason's mill the extreme high-water mark is at 22.9 feet. The floods are short, generally subsiding in from 36 to 48 hours. It is said that twenty-five years ago high floods very rarely occurred, and their frequent occurrence now is accounted for by the clearing of the hills and the removal of obstructions from the river.* The low grounds adjacent to the river are more frequently overflowed than formerly, and more damage is done to the crops.

The river sometimes brings down a good deal of ice, so that it cannot be ferried; still there is not very much difficulty on this account. The rise is sudden, the water sometimes rising, it is said, 2 feet in 20 minutes at Kirk's ferry (mouth of the Uwharrie).

The annual rainfall in the valley varies from 44 inches near the coast to 50 inches between Cheraw and the "narrows", and 44 to 50 above the latter point. The table on pages 82 and 83 gives more detailed information regarding the rainfall above the important powers, and of its distribution through the year.

The following table gives the elevations of the various points on the stream, distances, and declivity:

Table of declivity of Yadkin river.

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Fall between points.	Fall between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet per mile.*
Mouth			149	65	0.44
Cheraw, South Carolina	149	65	20	40	2.00
Crossing of Carolina Central railroad	169	105	47	280	5.96
Foot of "narrows", mouth of Uwharrie†	216	385	4	105	26.25
Head of "narrows"‡	220	490	36	101	2.81
Crossing of Piedmont Air-Line railroad§	256	591	65	131	2.01
Foot of Bean's shoal‖	321	722	4	39	9.75
Head of Bean's shoal‖	325	761	53	167	3.15
Wilkesboro'‖	378	928	32	322	10.06
Patterson¶	410	1,250			

* Annual Report Chief of Engineers, 1879, p. 628.

† Report of Chief of Engineers, 1879, p. 725.

‡ From barometric observations.

§ From Professor Kerr's Geological Report.

‖ Report of Chief of Engineers, 1879, p. 626.

¶ For elevation at Patterson I am indebted to Maj. C. S. Dwight, chief engineer Chester and Lenoir railroad, and to L. C. Jones, Esq., chief engineer and superintendent of the Cape Fear and Yadkin Valley railroad.

I have only one measurement of the flow of the river, viz: that of Professor Kerr,* who states the flow (at low water) to be 2,586 cubic feet per second near the crossing of the Piedmont Air-Line railroad. But as the drainage area above this place is only 3,202 square miles, it seems impossible that this can be anything near the minimum, but probably nearer the ordinary flow. I have therefore had recourse to estimation of the flow.

One of the greatest drawbacks to the utilization of water-power on the Yadkin is the inaccessibility of the river. It is crossed in its water-power portion by only two railroads, and even these cross it almost at right angles, so that, as the map shows, hardly any portion of the river is of easy access. Various railroads have been projected along the river, and at present two are in course of construction or survey which will do much to open up the river and develop its resources. The Cape Fear and Yadkin Valley railroad, which at present extends only from Fayetteville to Egypt, on Deep river, will before long be extended, passing through Greensboro', and striking the Yadkin river some 10 or 12 miles southeast of Pilot mountain, near the southeast corner of Surry county, whence it will follow the valley of the Yadkin up to Wilkesboro' and beyond. The Chester and Lenoir railroad, now being built, runs from Chester, South Carolina, through Lincolnton and Lenoir, striking the Yadkin valley near Patterson, and will be continued across the Blue Ridge to Elizabethton, in eastern Tennessee. A road has also been spoken of up the valley of the Yadkin in the lower part of its course in North Carolina, passing the "narrows"; but I do not know that any steps have yet been taken toward obtaining a charter.

I proceed to describe the river more in detail, with its various water-powers, in order, commencing at its mouth.

Below Cheraw there is, of course, no power, and the river has the same general character as the Cape Fear below Fayetteville, so that it need not be described here.

Between Cheraw and the crossing of the Carolina Central railroad, a distance of 20 miles, the fall is at the rate of 2 feet per mile,† and the width of the river 350 to 500 feet. There are 11 shoals in this distance, but none of much importance, and none in themselves available for power, although, by the construction of a long canal, power might be secured. Such a plan would not, however, be advisable. At Cheraw the river is only 350 feet wide, and the greatest rise in freshets is 34 feet. The bed is generally rock and bowlders.

Between the Carolina Central railroad crossing and the mouth of Little river, a distance of 16 miles, there are two shoals which might be utilized. The first is Bluitt's falls, perhaps 5 miles above the railroad. A dam with a height of 9 feet is considered practicable here, and sufficient to render the stream navigable, so that 9 feet may be considered the available fall. This shoal is used by a small grist-mill and cotton-gin in Richmond county, using 6½ feet fall and some 12 horse-power. The dam is a primitive wing-dam. The second shoal is at Grassy islands, 10 miles above the railroad. This is really the first fall of importance on the river, and is probably at the crossing with the fall-line. The river is very wide and dotted with islands, and the banks are said to be favorable for the utilization of the power. In the engineer's report above referred to it is proposed to overcome the fall by four locks and dams, with 9 feet lift each, or 36 feet in all, but the distance in which this fall occurs is not stated. This shoal is utilized by a small grist-mill, using probably some 10 or 15 horse-power and a small fall. Three miles or thereabouts farther up is another similar mill. The total fall in the river between the railroad and Little river is estimated at 100 feet, and the width varies from 554 to 627 feet. The greatest rise on record at Little river is 19.77 feet. Between Little river and Rocky river, 11 miles, the fall is said to be about 60 feet, and there are several shoals, though their falls are unknown. Between Rocky river and Shankle's mill, 11 miles, the fall is about 65 feet, with several shoals. Thence to the mouth of the Uwharrie river, 9 miles, the fall is 55 feet; and in this section are two shoals, Swift Island shoal and Greenville's shoals, the former being 1 mile and the latter 2 miles in length. Swift Island shoal is the first place on the river where power has been used to any considerable extent, a cotton-mill, with 8 or 9 feet fall, being located here. The dam is of rock, 4 or 5 feet high, extending across the river in the form of a $\wedge$, and a head-race about half a mile long leads to the factory, which is on the east side of the river, while on the west side was a grist-mill, run from the same dam, but burned a short time ago. There is also a grist-mill on the east side near the factory. Mills have been in operation here for 50 or 75 years. At present about 40 horse-power is used, and the mills are stopped by high water about 12 days in the year. The entire property is for sale. This place is about 8 miles east of Albemarle, the county-seat of Stanley county, and is about 27 miles from the nearest railroad station, Concord, on the Piedmont Air-Line. Before proceeding farther, it is to be remarked that, as the table of utilized power will show, there are various other small grist-mills on the river below Swift island with small falls and power.

At Gunsmith's shoal, just below the mouth of the Uwharrie, on the east side of the river, is Dr. Kron's grist-mill, using 4 or 5 feet fall, with a wing-dam. At the mouth of the Uwharrie the river is 1,155 feet wide, and the greatest rise is 12 feet.

Four miles above the mouth of the Uwharrie is, perhaps, the most remarkable power in the state, the "Narrows of the Yadkin." At the upper end, before entering the "narrows", the river is nearly or quite 1,000 feet

* Geological Report, page 40.

† Annual report of the Chief of Engineers, 1879, p. 725. From this report, on an examination of the river between Cheraw and the mouth of the Uwharrie, most of the following notes on that portion of the river have been taken.

wide, from which it suddenly contracts, entering a narrow ravine between the hills, which rise abruptly on either side with rocky and almost perpendicular banks, and through which it pours with great violence, preserving for a distance of over a quarter of a mile an average width of not over 75 feet, while in some places the width is only 30 feet. No description can do justice to this place, which is one of the most wonderful spots that can be found in the south. In the "narrows" proper—the quarter of a mile referred to above—the river has cut out its channel in the solid rock, the banks being almost perpendicular for a height of 5 to 15 feet above low water, when they retreat nearly horizontally, but very broken and rough, and with projecting points of rock, alternating with holes and crevasses, so that it is difficult and tiresome to make one's way along, for a distance of about 100 to 150 yards from the immediate channel, where the hills rise very steeply. Thus the average width of the ravine is in the neighborhood of 250 yards, or rather less, while the single channel of the river, through which its whole volume pours in low water, is 75 feet, and in places 30, in which the water is said to be very deep. The stream overflows its banks in freshets and fills the whole ravine, although it is very seldom that it covers all the projecting rocks. Below the "narrows" proper the stream widens to a width of 150 or 200 feet, and flows for the succeeding 2½ miles through a narrow gorge, the banks on either side being very steep and rocky all the way, except at one or two places, where small lateral valleys diverge, and where there is sometimes place to put a single mill. The real foot of the "narrows" is at the extremity of this 2½ miles, at which a small creek enters the river, and where the fall, which is very large all the way from the head of the "narrows", comes to an end. This place—the foot of the "narrows"—is called Little falls. Just below it comes a long and narrow stretch called the "Lake", the river being still confined between rocky and almost vertical banks, but the fall being very small, and the width of the stream only about 100 to 150 feet, the depth is very great. The banks slope down at a large angle straight into the river, and are of solid rock. At the lower end of the lake, which is between a quarter and a half mile long, the river widens, at a place called the Terrapin Hole, and thence down to the mouth of the Uwharrie, a distance of three-quarters of a mile or thereabouts, it is interspersed with rocks and islands, with banks 10 to 20 feet high on each side, and behind them flat lands for some hundred yards. Above the head of the "narrows" the banks on either side are moderately high, and behind them are fertile bottom-lands and hills. The fall at the "narrows" has never been accurately measured, and it was, of course, not possible for me to make any such measurements. In fact, it is said to be a difficult and tedious undertaking to attempt to follow the river from the head of the "narrows" to the lake. But through Professor Kerr, to whom I have already acknowledged my great indebtedness on various occasions, I was enabled to take some barometric readings at various points. Unfortunately, however, the barometer was in a state of rapid change when I was at the "narrows", and although I took measurements of the fall on two different days they agree poorly with each other. According to the best estimate I can make, the total fall between the head of the "narrows" and the mouth of the Uwharrie, a distance of 4 miles, is about 105 feet, and I am inclined to consider this result too small, rather than too great. This fall is distributed about as follows: At the entrance of the "narrows" there is a fall of 5 or 6 feet in about 150, according to measurements with a pocket-level; in the succeeding quarter of a mile—the "narrows" proper—the fall is not less than 30 feet, according to the barometer and the pocket-level; for the next 2 miles the rapids continue with a pretty uniform fall of about 50 feet in all; then comes Little falls, where the fall is 5 or 6 feet in 500 and 14 or 15 in 1,000, from the top of a mill-dam above the falls; at the falls the river is almost as narrow as at the "narrows", or about 60 feet in one place; below them comes the lake, etc., the fall down to the mouth of the Uwharrie being, perhaps, 5 or 10 feet.

According to what has been said, it will be seen that this magnificent power is, unfortunately, not available, or only to a very small extent. A dam could be built on the river above the "narrows", and the water carried along by a flume, the mills being located on the rocks; but while such a use of the power would be perfectly practicable, no one would think of locating a large establishment right in a gorge of the mountains, in such an inaccessible place and on the rocky banks of a river, where it is liable to overflow in times of high water. A canal could not be cut along the "narrows" except at very large cost; neither could it be carried around the hills, except with great difficulty. Below the "narrows" proper there is no horizontal bank, as there is at the former place; but the channel is wider and the banks slope down to the water's edge, so that to canal, or even to flume, around this part of the fall would be difficult. There are a few places, where lateral ravines make down to the river, at which the banks are not so abrupt, and where there is room for a single mill; and, in fact, one small grist-mill is situated in this part of the "narrows", near Little falls, being run from a small wing-dam, and using a fall of 6 or 7 feet; but there are no facilities for the location of a manufacturing town, or even of a large mill. There are no low grounds between the head of the "narrows" and the mouth of the Uwharrie. The rock in the "narrows" is a solid metamorphic conglomerate, very hard, almost impossible to fracture by ordinary blows, and certainly difficult to blast. Some power might be obtained by damming the river at the Terrapin Hole and throwing the water up over Little falls, or at Little falls itself a mill could be established; but a very small proportion of the total power at this place is practically available. When it is added that the site is 30 miles from Salisbury, the nearest railroad point, it will easily be concluded that it will be a long time before any endeavor is made to utilize the power to any large extent.

I have estimated the theoretically available power, with the result, in the following table, taking the fall at 105 feet. Of this total power probably not over 500 horse-power would be practically available without great cost, and even that, for the present at least, not economical, and only profitable for grist-mills:

Table of power on the "narrows" of the Yadkin.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.	
	Square miles.	*Feet.*	*Cubic feet.*	1 *foot fall.*	105 *feet fall.*
Minimum	3,940	*105±	866	98.4	10,330
Minimum low season			1,190	125.0	13,125
Maximum, with storage			3,350	380.7	39,973
Low season, dry years			1,250	142.0	14,910

*See description.

Between the "narrows" and the railroad bridge there are several shoals, some of which are said to afford good power and considerable fall. They are used by small grist- and saw-mills, with wing-dams (Nash & Kirk's mill, west side; Redwine & Pemberton's mill, west side; Snotherly & Cooper's grist-, saw-, and wood-turning mill, east side), and in one case, at Milledgeville, by a cotton factory, together with a grist-mill, using, in all, some 40 horse-power. The dam at this place is of rock, about 600 feet long, and only a wing. On the opposite side of the river are a saw-mill, grist-mill, cotton-gin, and wool-carding machine, also run from a small wing-dam across to an island. The stoppage by backwater is from six to ten days in the year.

Above Milledgeville there are still several shoals and mills, viz: Mott's falls, not used; Reed's and Bald Mountain mills, on opposite sides; a mill on each side at Bringle's ferry; St. John's mill, 1 mile below the bridge. In regard to all these I have no particulars. They are tabulated in the table of utilized power, and it will be seen that the falls are small as a rule, though there is one fall of 28 feet put down in Montgomery county. But as I have no other mention of such a fall, I am inclined to think it must be on some tributary.

As showing the topography of this region, and how the Yadkin descends from an elevated plateau, while one of its tributaries, the Uwharrie, flows along the base of the same, it may be mentioned that according to a railroad survey (the line of which crossed both rivers) the elevation of the Yadkin at Stokes' ferry, about 10 or 11 miles above the mouth of the Uwharrie, was 190 feet greater than that of the latter stream at about the same distance from its mouth, so that the fall of the Yadkin must be at least 200 feet within the distance mentioned.

Above the railroad bridge the river has been surveyed in detail by Mr. S. T. Abert, United States civil engineer, to whose report, published in the *Annual Report of the Chief of Engineers*, 1879, pp. 626–648, I must refer for more detailed information regarding the stream, which I did not visit in this section. Mr. Abert's survey extended as far up as Wilkesboro', and the shoals in that distance are tabulated farther on. The following notes regarding them are taken principally from his report:

Below Bean's shoal there are several small grist-mills on the stream, using very primitive wheels and little power; and several other mills, not mentioned in the table of power, have been operated at different times. The first mill of much importance is Langenhour & Neason's, and the dam is the first one which extends entirely across the river, except Swicegood's, about 20 miles below—a low wing-dam of stone. It is built of wooden frames planked over, and the foundation is rock.

At Shallow Ford shoal there is a grist-mill on the right bank, with a wing-dam.

The principal shoal on this part of the river is Bean's shoal, the fall in 4 miles being over 39 feet. The most rapid descent is at the head, being nearly 17 feet in a mile. The bed of the stream is very ragged, of stratified rock, which rises in sharp points and ridges at right angles to the course of the river, forming in some places natural dams, extending nearly across, and the channel is much obstructed and cut up with rocks and islands. Between 1820 and 1835 "the Yadkin Navigation Company did considerable work at these shoals, with a view to rendering the river navigable. A dam was built at the head of the shoals, and a canal commenced along the northern side of the river. The only trace of the dam now to be seen is the abutment at the entrance to the canal. The canal was completed for a little more than a mile from the head of the shoals, and was 15 to 45 feet wide at the bottom. Where the cliff forms one wall the minimum width is 15 feet. At 2,000 feet from the head of the canal are the ruins of a guard-lock 12 feet wide. The canal walls are of earth, except along the foot of the cliffs. Here a very good retaining-wall was built of *stone quarried on the spot*. The upper wall, 700 feet in length, was built of headers and stretchers, neatly pinned with small stone, and is in good condition. The outer face has a batter of 2¾ inches to the foot rise. The inner face was left rough, and covered with gravel and earth. No cement was used in its construction. The dimensions are: height, 6 to 20 feet; top width, 2.5 feet; bottom width, about 7 feet. The lower

wall, about 400 feet in length, is of the same general character, but in some places has been torn down to obtain stone for the construction of fish-dams. The canal has been filled in by the floods, and where it runs through the woods is overgrown with trees and bushes. No water flows through it".

The other shoals mentioned call for no special remark. The bed of the stream is everywhere rock, overlaid sometimes with gravel, and is most favorable to the construction of dams. Beside the shoals mentioned in the table there are many others with smaller falls, but which might equally well be used for power. As regards the amount of power available, there is no doubt that it is very large indeed, and that almost every one of these shoals might be utilized to a greater or less extent. Bean's shoals would seem to offer the most excellent site in this part of the state, and it having been considered practicable to build a canal around the whole shoal it would seem to follow that the power might be utilized without much difficulty. While the estimates of power given in the table are only to be regarded as rough approximations, it is believed that they will serve to give some idea of the amount of power which might be obtained. But until larger establishments seek a location in this vicinity, and until the means of transportation are improved, the water-power of the smaller tributary streams will be preferred to that of the main river, on account of the smaller cost, the (in general) safer location, and the diminished liability to stoppage by high water. But when large amounts of power are wanted, and money is at hand to develop it, the Yadkin will, no doubt, be found to afford a large supply.

Above Wilkesboro' the fall of the river continually increases, and there are some sites for power, but regarding them I could procure no detailed information. The only power utilized is at Patterson, Caldwell county, where Gwyn, Harper & Co. have a cotton-mill, using, as they estimate it, 50 horse-power and a fall of 25 feet. The dam is of rock, 130 feet long and 20 feet high, built in 1850 at a cost of $500, and backing the water a quarter of a mile, without throwing the river out of its banks; and from it a race 630 feet long leads to the mill. There is no trouble with scarcity of water, and there is waste at night even at low water, the mill running 12 hours; so that the capacity of the stream here is at all times at least 2 horse-power to the foot fall, if the above data have been correctly reported. But as the drainage area above this place is very small, according to the map only 30 or 40 square miles, I should estimate the capacity of the stream at only about 1 horse-power, net, per foot fall. If the data returned are correct, it must be that there are large springs in the upper part of the basin, rendering the flow very large.

Above this the stream is rapid—a mountain stream, with very little, if any, power used.

It may be remarked that there are only three dams extending entirely across the river, all above the "narrows".

The estimates of power given in the following table are liable to large error, and it is impossible to check them. All of the powers used seem large in comparison with the drainage areas above them, as in the case of the one at Patterson, and it seems probable that the streams in the upper part of the basin are fed by large springs, which render the flow comparatively constant. I have therefore made my estimates larger than I should do in ordinary cases, and they may be found too large. It is to be remarked, however, that powers are often overstated, and that turbine-wheels are rated very high as regards efficiency. A power of 50 horse-power at Patterson, with a fall of 25 feet, would correspond to a flow at all times of 0.6 cubic feet per second per square mile. In the *Hand-book of North Carolina*, published by the Department of Agriculture, it is stated that the factory there has 18 looms and 960 spindles.

Summary of power of the Yadkin river.

Locality.	Distance from mouth.	Drainage area.	Rainfall.					Total fall.		Horse-power available, gross.†				Utilized.		Per cent. of minimum utilized.	Remarks.
			Spring.	Summer.	Autumn.	Winter.	Year.	Height.	Length.	Minimum.	Minimum low season.	Maximum, with storage.	Low season, dry years.	Horse-power, net.	Fall.		
	Miles.	*Sq. m.*	*In.*	*In.*	*In.*	*In.*	*In.*	*Feet.*	*Feet.*						*Feet.*		
Bluitt's falls	174.0	6,650	12	12	11	13	48	9.00	.....	1,500	1,900	5,780	2,170	15—	6.50	1.2—	
Grassy Island shoal	180.0	6,624	12	12	11	13	48	36.00	.....	5,070	7,600	23,000	8,680	25—	.....	0.5—	
Swift Island shoal	212.0	4,323	12	13	11	14	50	9.00	*1	970	1,240	3,760	1,400	40	8–9	6.0±	
Narrows	220.0	5,038	12	13	11	14	50	105.00	*4	10,330	13,125	39,073	14,010	60—	6–7	0.6—	Not available.
Douthet's mill	291.5	1,805	13	14	10	14	51	3.86	1,600	190	245	720	280	25—	3.86	14.0—	Rock bottom.
Langenhour & Neason's dam	298.5	1,827	13	14	10	14	51	4.57	.....	220	280	840	325	20—	5.00	15.0—	Do.
Shallow Ford shoal	305.0	1,812	13	14	10	14	51	7.89	5,500	375	485	1,440	550	6	11(?)	4.0—	Rock and gravel bottom.
Shoal above Shore's island	315.2	1,633	13	14	10	14	51	7.73	9,662	330	430	1,260	490	.....	.....	.....	Do.
Bean's shoal (head)	324.7	1,521	13	14	10	14	51	39.17	*4	1,560	2,030	5,960	2,320	25—	.....	3.0—	Rock bottom.
Lime Rock shoal	329.3	1,165	13	14	10	14	51	10.62	*2.59	325	425	1,240	490	.....	.....	.....	Do.
Shoal below Rockford	335.8	1,097	13	14	10	14	51	8.38	4,500	240	320	920	360	.....	.....	.....	Do.
Seven Island shoal	337.6	1,063	13	14	10	14	51	4.62	2,630	112	145	425	165	.....	.....	.....	Do.

*Miles. †See pages 18 to 21.

Summary of power of the Yadkin river—Continued.

Locality.	Distance from mouth.	Drainage area.	Rainfall.					Total fall.		Horse-power available, gross †				Utilized.			Remarks.
			Spring.	Summer.	Autumn.	Winter.	Year.	Height.	Length.	Minimum.	Minimum low season.	Maximum, with storage.	Low season, dry years.	Horse power, net.	Fall.	Per cent. of minimum utilized.	
	Miles.	*Sq. m.*	*In.*	*In.*	*In.*	*In.*	*In.*	*Feet.*	*Feet.*						*Feet.*		
Long shoal	342.0	949	13	14	10	14	51	11.18	*1.61	205	335	1,140	385	.....	.....	.....	Rock bottom.
Woodruff's Fish-trap shoal	345.0	925	13	14	10	14	51	4.55	1,800	105	134	450	155	.....	.....	.....	Do.
Mitchell's Island shoal	346.0	925	13	14	10	14	51	4.00	2,740	90	115	400	135	.....	.....	.....	Gravel bottom.
Swan Creek shoal	356.7	739	13	14	10	14	51	5.40	3,160	100	125	450	145	.....	.....	.....	Rock bottom.
Reeve's Island shoal	366.5	540	13	14	10	14	51	2.86	2,700	50	65	240	75	.....	.....	.....	Rock and gravel bottom.
Blair's Island shoal	376.5	420	13	14	10	14	51	3.44	1,700	36	46	170	53	.....	.....	.....	Gravel bottom.
Total between—									*Miles.*								
Cheraw	149.0	7,175	12	12	11	13	48	220.00	67	44,500	56,500	170,000	64,600	300±	.....	1.0—	
and mouth of Uwharrie	216.0	3,938															
Total between—																	
Mouth of Uwharrie	216.0	3,938	12	13	11	14	50	206.00	40	18,000	23,000	69,500	26,300	200—	.....	1.5—	
and railroad bridge	256.0	3,202															
Total between—																	
Railroad bridge	256.0	3,202	13	14	10	14	51	131.00	65	6,675	8,700	25,500	10,000	200—	.....	5.6—	
and foot of Bean's shoal	321.0	1,500															
Total between—																	
Foot of Bean's shoal	321.0	1,500	13	14	10	14	51	206.00	57	4,600	5,900	20,000	6,750	40—	.....	1.5—	
and Wilkesboro'	378.0	372															
Total between—																	
Wilkesboro'	378.0	372	13	14	10	14	51	322.00	22	1,000	1,925	8,000	2,200	.....	.....	.....	
and Patterson	410.0	30															
Total on river between—																	
Cheraw, South Carolina	149.0	7,175	.....	.....	.....	.....	.....	1,185.00	261	75,375	96,025	293,000	109,250	736	.....	1.4—	
and Patterson, North Carolina.	410.0	30															

* Miles. † See pages 18 to 21.

TRIBUTARIES OF THE YADKIN.

The lower tributaries of the Great Pee Dee, viz: the Waccamaw, the Black, and the Little Pee Dee rivers, scarcely call for a detailed description. Lying entirely below the fall-line, their general character will be sufficiently clear from what has been already said regarding similar streams, and regarding the eastern division, as a whole, in the introduction. The Waccamaw rises in Waccamaw lake, Columbus county, North Carolina, not over 25 miles from the Atlantic, and flows for a distance of 244 (?) miles nearly parallel to the coast, joining the Great Pee Dee at its mouth. It is navigable for light-draught steamers for 163 miles, and for boats drawing 3 feet of water up to the lake. Its water-power, and that of its tributaries, does not amount to much. The Black river, which has its sources in Kershaw and Sumter counties, South Carolina, is similar in character, and has no water-power, except a little in the upper part, among the sand-hills. The Little Pee Dee, which unites with the Great Pee Dee 23½ miles above its mouth, is more important. Rising in Richmond county, North Carolina, it flows in a general southerly course, as will be seen from the map, its length along its general course being about 75 miles, but much greater by the river, which is quite crooked, like all the streams in the low region near the coast. The total drainage area of the river is about 3,000 square miles, and it receives one tributary larger than itself, the Lumber river, from the east and north, which drains nearly 1,800 square miles. The sources of the Little Pee Dee are just about on, or a little below, the fall-line, in the sand-hills; and they therefore afford some power, their general character being the same as that of the sand-hill tributaries of the Cape Fear, which has been described on page 61. Their declivities being uniform, no sites could be specified. Gum Swamp creek will serve as a sample of these streams. There is a cotton factory, saw- and grist-mill at Laurel Hill, on this stream, the fall being 8½ feet, and the power for the factory 44 horse-power, and in all, perhaps, 60 or 65 horse-power, which can be obtained all the time by drawing down the water in the pond, which covers 200 acres, during working hours. The dam is of dirt and timber, 7 feet high, and the head-race 1½ miles long. As already mentioned, the constant flow of these streams, and the large ponds possible, render them valuable for power.

The Lumber river has its sources higher up than those of the Little Pee Dee, in Montgomery and Moore counties, North Carolina, but reaching little, if at all, above the fall-line. Its character resembles that of the Little Pee Dee, and on its upper part it probably belongs to the class of sand-hill streams. There are no mills, except small saw- and grist-mills, on the main stream, or on any of its tributaries.

Lynch's river rises in the extreme southern part of Union county, North Carolina, and flows in a southeasterly direction through South Carolina, between the counties of Lancaster, Kershaw, Sumter, and Clarendon, on its right, and Chesterfield and Darlington, on its left; thence through Williamsburg, to join the Great Pee Dee, about 16 miles in a straight line, above the mouth of the Little Pee Dee. It has its sources a considerable distance above the fall-line. The stream is about 120 miles long, following its general course, but probably twice as long by the river, and its drainage area comprises some 1,350 square miles. In its lower parts the banks are low and swampy, and it is only in that part which lies above Sumter county that the stream is worth anything for power. But although its sources lie above the fall-line, I was unable to learn of any important shoals on the stream, and the utilized power is quite insignificant, consisting only of that used for a few grist- and saw-mills. Between Kershaw and Chesterfield counties the stream crosses the sand-hill belt, and many of its tributaries in those counties afford good small powers, the principal affluent being Little Lynch's creek, from the west, taking its rise in Lancaster and joining the main stream in Kershaw county, after draining an area of about 170 square miles, and being utilized for a few small grist-mills. The beds of these streams are of rock down to the fall-line, or about the lower end of Lancaster county, below which they are sand and alluvium. The mills on these streams have sometimes as many as four run of stones, but in summer they are often obliged to run a smaller number. The dams are generally wooden triangular frames, set lengthwise up and down stream, and planked over. Lynch's river is navigable for a considerable distance from its junction with the Pee Dee. The freshets on these streams are not very heavy, and there is no trouble in keeping dams in order.

The Great Pee Dee receives in South Carolina several other tributaries resembling Lynch's river, such as Black creek, which rises in Chesterfield county and joins the river in Darlington; Crooked creek, from Marlborough county; and a creek from Chesterfield county, which empties a few miles below Cheraw. These streams need not be described, because they resemble, in every particular, the streams below the fall-line, which have already been referred to. In the upper parts of their courses they flow on the sand-hill belt, and afford, as a rule, good constant powers, but with no natural falls, and with a uniform declivity, all the power used being obtained by damming.

The first tributary worth mentioning in North Carolina is Hitchcock's creek, although there are several streams below it which are also favorable for power. Hitchcock's creek flows entirely in Richmond county, and has a length, in a straight line, of only about 16 or 20 miles, draining an area of some 102 square miles. It receives one tributary from the south—Falling creek—worth mentioning on account of its utilized power, although it is a small stream, with a drainage area of only about 12 square miles. At the junction of these two streams is the town of Rockingham, the county-seat of Richmond county, with a population of about 1,600. These streams are true sand-hill streams, so that for their general character we may refer to page 61. Falling creek, however, differs from the ordinary sand-hill streams by having a large natural fall near its mouth, which may be its crossing with the same ledge of rocks which forms the fall-line. Both streams are used to a considerable extent to drive saw- and grist-mills, as will be seen from the table of utilized power. They are principally remarkable, however, as running two of the largest cotton factories in the state, and they thus offer a good example of the large amount of power which may be obtained from these unpretending little sand-hill streams. The factory of the Pee Dee Manufacturing Company is located on Hitchcock's creek at Rockingham, and uses 168 horse-power, with a fall of 17 feet. The dam was built in 1875, at a cost of $3,000, and is of wood for 80 feet of its length and of earth for the remaining 100 feet. It is 17 feet high, and ponds the water over 100 acres to an average depth of 14 feet, affording reservoir-room sufficient to allow of the water being drawn down during working hours without diminishing the head much, and thus allowing of the concentration into working hours of the whole daily capacity of the stream. Full capacity can be secured all the time, except for a few weeks in summer, when the available power is only about 112 horse-power. The wheel used is a Hercules turbine (Holyoke Manufacturing Company).

On Falling creek is located the factory of the Great Falls Manufacturing Company, using 112 horse-power and a fall of 43 feet. The dam was first built in 1869, rebuilt in 1879, costing about $2,000, and is of wood, 100 feet long and 16 feet high, ponding the water over 10 or 12 acres to a depth of 10 feet. A wooden race, 75 feet long, leads the water to the wheels. As in the case of the other factory, the water is stored during the night. Full capacity can be secured for ten months, and two-thirds capacity during the remaining two months. During dry summers between two and three weeks are lost on account of want of water, and sometimes as much as four or five weeks.

It is interesting to calculate the amount of water which may be depended upon from these sand-hill streams, as was done in the case of the tributaries of the Cape Fear, but the inaccuracy of the available maps renders the result liable to error to an uncertain extent. The drainage area of Hitchcock's creek above the factory is, according to the map, about 86 square miles. If we assume that in the low season of dry years 100 horse-power (gross) may be obtained with a fall of 17 feet during 12 hours, or 50 with the natural flow of the stream, then the flow will be about 0.3 cubic foot per second per square mile. If we assume that 224 horse-power (gross) can be obtained at ordinary stages of the stream by drawing down the water at night, then the flow will be 0.7 cubic foot per second per square mile. For Falling creek, if we take the capacity at low seasons at 70 horse-power (gross) during 12 hours, we find the corresponding flow to be over half a cubic foot per second per square mile, or more than in the case of

Hitchcock's creek; and if the capacity in ordinary seasons be taken at 150 horse-power (gross) during 12 hours, we obtain a flow of over 1 cubic foot per second per square mile. It would therefore seem that these sand-hill streams discharge from one-third to 1 cubic foot per second per square mile of drainage area, except during freshets. (Compare the remarks on pages 64 and 65.)

Below Rockingham there have been four mills on the creek, two of which (Wall's and Acock's) are not in operation. There is also one other site not used just below Acock's mill, and above Rockingham there are three others. On Falling creek there are no mills of importance except the factory. The fall of the stream from the foot of the Great Falls dam, on Falling creek, to the Pee Dee, a distance of 5¼ miles, is 41 feet, or about 8 feet to the mile. The pond of the Great Falls factory is about 187 feet above tide, and the mouth of the creek 103 feet. The fall is said to be just as great for several miles above Rockingham.

The tributaries to the Pee Dee from Anson county are not of much value for water-power, as they appear to lie above the sand-hill belt, and are said to be very variable in flow. They are used only for small grist- and saw-mills, which often have to stop in dry weather. Little river, which rises in the southern part of Randolph county and flows south through Montgomery and into Richmond, joining the Pee Dee above Grassy Island shoal, is the next tributary worthy of mention, although its water-power is not of much importance. The length of the stream is about 40 miles in a straight line, and it drains an area of about 400 square miles. None of its tributaries are of any importance. It passes within a mile or so of Troy, the county-seat of Montgomery county, but there are no large towns directly on its course. Its fall is not large, and its flow is said to be very variable—very much more so than that of the sand-hill streams just discussed—and it is much more subject to freshets. There are only a few small saw- and grist-mills on the stream, and although it was said that there are some sites for power, especially on its upper parts, none of them are of importance. The mills in use have 2 or 3 pair of stones and falls of from 6 to 10 feet, generally with a dam of about the same height. I would estimate the flow of the stream at about 50 cubic feet per second at a minimum, and 90 or 100 in the low season of *ordinary* years. The rainfall is about 46 inches, 12 in each season, except autumn.

The next important tributary is Rocky river, which rises in the southern part of Iredell county, flows in a general southeasterly direction, making, however, several abrupt bends, and passing through Mecklenburg and Cabarrus counties, and then between Stanley on the north and Union and Anson on the south, its total length along its general course being about 75 miles, and its drainage area 1,405 square miles. The stream receives a number of considerable tributaries, viz: from the south and west, Lane's creek (140 square miles), Richardson's creek (199 square miles), and other smaller ones; and from the north, Long creek (158 square miles), Irish Buffalo creek, Coddle creek, and others. There are no towns of importance on the stream. As the drainage-basin lies entirely above the fall-line, the stream offers some power. The bed is rock, and in freshets the stream often rises over its banks. The power utilized is for small saw- and grist-mills and a cotton factory. The grist-mills have generally 2 run of stones, which they can run almost all the time, although the flow of the stream is said to be quite variable. The cotton factory, which is located not far from Concord, uses probably not over 25 horse-power with a fall of 13 feet, and can run all the time. I visited no particular sites on the river, none having been brought to my notice. The information which I was able to collect is very meager, but it seems probable that there is not very much power on the stream. I would estimate the flow at its mouth at between 400 and 500 cubic feet per second in the low season of ordinary years. The rainfall is about 50 inches.

The Uwharrie river, which enters the Yadkin in Montgomery county just below the "narrows", rises in the northwestern part of Randolph county, and pursues a course nearly due south through that county and Montgomery, its length in a straight line being about 37 miles, and its drainage area 317 square miles. It passes by no important towns, and has no large tributaries. Its water-power is not considered valuable, and is only used for country saw- and grist-mills, having generally 2 run of stones. The bed is rock, and the banks generally tolerably high on the lower part, though the low grounds are more extensive on the upper parts. There are no falls on the stream, and all the power has to be obtained by damming. The stream is, on the whole, rather sluggish, having a small fall, and crossing the ledges of rock at small angles, as has been noticed when speaking of the "narrows" of the Yadkin. Its flow is exceedingly variable—in fact, the stream is said to become nearly dry in summer—due, perhaps, to the fact that it comes out of the slaty region, which has been referred to when speaking of the Deep river. On this account its water-power is of small value, and the mills have often to stop in summer. The lowest mill is about 6 miles from the Yadkin, below which the fall is very small. A short distance above it is an old site, now not used, but probably not of much value. The freshets are heavy and sudden, as is to be expected in the case of a stream from the slate region.

Above the Uwharrie there are several small streams in Rowan and Davidson counties, but they are hardly worthy of special mention, being utilized only by saw- and grist-mills, and are, as a rule sluggish, with no fall or available power of much importance.

The next important affluent is the South Yadkin river, which rises in the southern slope of the Brushy mountains, in Alexander county, and flows a little south of east through Iredell, and between Davie and Rowan counties, joining the Yadkin a little above the railroad bridge, its total length in a straight line being about 42 miles, and its drainage area 820 square miles. Two of its tributaries from the north are worth naming, viz:

Hunting and Rocky creeks, which drain respectively 146 and 94 square miles. The bed of the stream is rock, overlaid in places by detritus; the banks moderately high, although overflowed in places in times of freshet; the fall considerable, and the flow more constant than in the case of any of the tributaries thus far mentioned above the sand-hill belt. The power of the stream and of its tributaries is utilized to a considerable extent by saw- and grist-mills and a few cotton factories, as will be seen by the table of utilized power. The first mill on the stream is 4 miles from its mouth, at South river (Foard & Lindsay's), and has a fall of 6 feet, with a dam of the same height and about 240 feet long. About 30 horse-power is utilized, but the available power is much greater. The drainage area above being about 800 square miles, I would estimate the capacity at perhaps 18 horse-power per foot fall in very dry seasons, and at 27 to 30 in the low seasons of ordinary years. This mill is sometimes troubled with backwater. The dam backs the water about 3 miles, nearly up to the foot of the next power above, Hairston's or Perkins' shoal. This shoal is the most important one on the stream, and is some 12 miles from Salisbury, and above the mouth of Third creek. The stream has, with a dam 3½ feet high, a fall of 15 or 16 feet in a quarter of a mile, but the principal part is at the upper end, being 13 or 14 feet in 200 yards. There was at one time a race cut on the north bank to the foot of the shoal, a quarter of a mile long, and along it were a foundry, a woolen-mill, and a grist-mill. At present there is a race 200 yards long, at the end of which is a grist-mill, with a fall of 13 feet, and there is also a saw-mill 50 yards from the dam with a fall of 12 feet. The power used is probably not over 40 horse-power. The dam, which extends entirely across the stream, is 250 feet long, 3½ feet high, built of wood about eleven years ago at a cost of $1,250, and backing the water for a mile or so, it is said. The location is an excellent one—safe, and with good facilities for canals and buildings. The practically available fall being taken at about 13 feet, and the drainage area above being in the neighborhood of 591 square miles, I would estimate the power about as follows:

Table of power at Hairston's Falls, South Yadkin river.

State of flow (see pages 18 to 21).	Drainage area.	Fall.	Flow per second.	Horse-power available, gross.	
	Square miles.	*Feet.*	*Cubic feet.*	1 *foot fall.*	18 *feet fall.*
Minimum	591	13	118	13.4	176
Minimum low season			148	16.8	220
Maximum, with storage			560	63.6	825
Low season, dry years			168	19.1	250

Above this shoal there are no mills for a long distance, and there are no important powers. On the upper part of the stream there are small mills, but none worth mentioning.

The tributaries to the South Yadkin afford some very good small powers. Second, Third, Fourth, and Fifth creeks, from the south, are all utilized to a greater or less extent by small mills, but are not very favorable; and Bear, Hunting, Rocky, and Snow creeks, from the north, are also used. Hunting creek has a cotton factory at Eagle Mills with a fall of 18 feet and 60 horse-power, it is said, the dam being 3½ feet high, and the race 400 feet long. This stream is said to offer a number of sites not used, and it is probable that the tributaries from the north all have a much greater fall than those from the south. Hunting creek drains an area of about 146 square miles, and the area above the factory is about 100. I would estimate the power at the factory at between 2 and 3 horse-power gross per foot fall in low seasons of ordinary years—nearer 3 than 2—or perhaps 40 horse-power net, with 18 feet fall and a good motor. The amount of power actually used in the factory is uncertain. Rocky creek has also a cotton factory at Turnersburg, using a fall of 19 feet and about 80 horse-power during ten months, and 60 during the remaining two. The drainage area is about 88 square miles above the factory and 94 at the mouth of the stream. This stream is similar in character to Hunting creek.

The tributaries to the Yadkin from Forsyth, Davie, and Yadkin counties are not worthy of special mention, as they are small, and in some cases very sluggish, offering no powers of importance. In Surry and Wilkes counties we come to a number of streams which rise in the Blue Ridge and pursue a southerly course to the river, draining a country very well wooded and having a very considerable fall. In Wilkes county there are also a few streams of this class which rise on the south, on the northern slope of the Brushy mountains, and flow nearly north. All of these streams are said to afford numerous excellent sites for power, only a few of which are at present utilized. They flow over rocky beds, with banks generally favorable for the construction of dams, and their flow is said not to be very variable. They are bordered with fertile and cultivated bottom-lands. Their drainage areas are given in the table on page 87, and as I was unable to visit this part of the state on account of its inaccessibility I cannot present much detailed information regarding them. The brief notes which follow below comprise all that I was able to collect. The rainfall over all this upper part of the Yadkin valley is about 51 inches—13 in spring, 14 in summer, 10 in autumn, and 14 in winter. As regards the flow of the streams, I do not present any detailed estimates, because they are liable to be too far out of the way. According to all the information which could be obtained regarding power utilized, the flow must be large compared with other streams of similar drainage area

thus far considered. I would be inclined, however, to estimate the flow in the low season of ordinary years at between 0.20 and 0.35 cubic foot per second per square mile of drainage area, varying between these figures for drainage areas between 30 and 300 square miles in area.

The first of these streams met with is the Little Yadkin, which flows south from Stokes county, and is not very important. The next, and the largest of them all, is Ararat river, which has its source in Patrick county, Virginia, and flows south through Surry, draining 315 square miles. It is said to be a very fine stream for power, and is utilized for saw- and grist-mills, and for a cotton factory at Mount Airy, with a fall of 13 feet and 20 or 30 horse-power. On its tributaries there are also a few woolen-mills, and there are said to be numerous sites not utilized. The remaining tributaries in Surry county are Fisher's and Mitchell's rivers. Elkin creek, which flows for the greater part of its course in Wilkes county, is used at Elkin for a woolen and a cotton factory (Elkin Manufacturing Company), with a fall of 22 feet, and using 70 horse-power during nine months and about 50 during the remaining time. Gwyn & Chatham have also a woolen-mill and a flour- and grist-mill at the same place, but from a different dam, the fall used being 15 feet; 35 horse-power is used in the flour-mill. Elkin creek is said to be a very good stream for power, there being numerous falls not used. Three miles above Gwyn & Chatham's factory is a site known as Carter's falls, said to be a very fine power, with a large fall in a short distance. The banks of these streams being generally tolerably high, dams can be built without doing much damage by overflow, so that almost the entire fall of the streams is said to be practically available for power, and there seems no doubt that a large amount of power could be utilized. It is to be added that this part of the state is remarkable for its healthy and salubrious climate. The principal drawback at present is its inaccessibility, the Elkin factory, for example, being 40 miles from the nearest railroad station. The other streams belonging to this class need not be referred to in detail, as I am able to present no particulars regarding them beyond what has already been given. They offer numerous sites for good small powers, but in all probability none of them would afford more than 2 or 3 horse-power per foot fall in dry seasons. Sites can be found on them, however, where falls of 20 or 30 feet can be obtained.

The following table will give in a more connected form a view of the drainage areas of the various streams tributary to the Yadkin and Great Pee Dee:

Drainage areas of the tributaries of the Yadkin and Great Pee Dee rivers.

Stream.	Tributary to what.	Place.	Drainage area.
			Sq. miles.
Waccamaw river	Great Pee Dee	Mouth	1,295
Do	do	In North Carolina	782
Do	do	In South Carolina	513
Black river	do	Mouth	1,510
Little Pee Dee river	do	do	3,022
Do	do	In South Carolina	1,080
Do	do	In North Carolina	1,942
Do	do	Mouth of Lumber river	415
Lumber river	Little Pee Dee	Mouth	1,790
Lynch's river	Great Pee Dee	do	1,358
Little Lynch's creek	Lynch's river	do	170
Black creek	Great Pee Dee	do	457
Jones' creek	do	do	96
Hitchcock's creek	do	do	102
Do	do	At mouth of Falling creek	86
Falling creek	Hitchcock's creek	Mouth	12
Little river	Great Pee Dee	do	400
Brown's creek	do	do	206
Uwharrie river	do	do	317
Rocky river	do	do	1,405
Do	do	At Garmen's mills	522
Long creek	Rocky river	Mouth	158
Richardson's creek	do	do	199
Lane's creek	do	do	140
Crane creek	Yadkin	do	103
Grant's creek	do	do	84
South Yadkin river	do	do	820
Do	do	Hairston's falls	591
Third creek	South Yadkin	Mouth	215
Fourth creek	Third creek	do	98
Bear creek	South Yadkin	do	40
Dutchman's creek	do	do	18
Hunting creek	do	do	140
Do	do	Factory	100
Rocky river	do	Mouth	94
Do	do	Factory	88
			747

Drainage areas of the tributaries of the Yadkin and Great Pee Dee rivers—Continued.

Stream.	Tributary to what.	Place.	Drainage area.
Second creek	South Yadkin	Mouth	108
Muddy creek	Yadkin	do	179
Abbott's creek	do	do	198
Dutchman's creek	do	do	97
Deep creek	do	do	106
Little Yadkin river	do	do	58
Ararat river	do	do	315
Do.	do	Mount Airy	60
Stewart's creek	Ararat	Mouth	51
Loving's creek	do	do	52
Elkin creek	Yadkin	do	63
Fisher's river	do	do	90
Mitchell's river	do	do	81
Roaring river	do	do	89
Mulberry creek	do	do	56
Reddie's river	do	do	47
Cub creek	do	do	37
Moravian creek	do	do	31
Warrior creek	do	do	33
Buffalo creek	do	do	41

Table of power utilized on the Yadkin (Pee Dee) river.

Name of stream.	Tributary to what.	State.	County.	Kind of mill.	Number of mills.	Total fall utilized.	Total horse-power utilized.
						Feet.	
Pee Dee river	Atlantic ocean	North Carolina	Richmond	Flour and grist	1	6.5	8
Do	do	do	do	Cotton-gin	1	6.5	4
Do	do	do	Anson	Flour and grist	2	.....	24
Do	do	do	Montgomery	do	4	.....	49
Do	do	do	do	Cotton factory	1	8.0	30
Yadkin river	do	do	do	do	1	.....	30
Do	do	do	do	Flour and grist	3	.....	120
Do	do	do	do	Saw	1	7.0	16
Do	do	do	Stanley	do	1	7.5	12
Do	do	do	do	Flour and grist	3	22.5	120
Do	do	do	Rowan	do	3	14.0	84
Do	do	do	Davidson	do	7	36.0	99
Do	do	do	do	Saw	2	18.0	26
Do	do	do	Forsyth	Flour and grist	1	4.0	40
Do	do	do	Yadkin	do	1	18.0	10
Do	do	do	do	Saw	2	29.0	26
Do	do	do	Caldwell	Cotton factory	1	25.0	50
Waccamaw and tributaries	Great Pee Dee	South Carolina	Horry	Flour and grist	2	13.0	22
Do	do	North Carolina	Brunswick	do	1	9.5	6
Do	do	do	do	Saw	1	9.0	12
Black river and tributaries	do	South Carolina	Clarendon	Flour and grist	5	.....	136
Do	do	do	Sumter	do	8	67.0	96
Little Pee Dee river and tributaries	do	do	Marion	do	12	81.5	128
Do	do	do	do	Saw	4	28.5	60
Do	do	do	Marlborough	Flour and grist	5	35.0	65
Do	do	North Carolina	Columbus	do	3	23.5	20
Do	do	do	do	Cotton-gin	3	24.0	.....
Do	do	do	Robeson	Flour and grist	27	195.0	259
Do	do	do	do	Saw	10	68.0	134
Do	do	do	Richmond	Cotton factory	1	8.5	44
Do	do	do	do	Agricultural implements	1	5.0	6
Do	do	do	do	Flour and grist	8	61.0	74
Do	do	do	do	Saw	2	10.0	18
Lynch's river and tributaries	do	South Carolina	Williamsburgh	Flour and grist	6	61.0	63
Do	do	do	Sumter	do	3	20.0	19
Do	do	do	do	Saw	2	.....	31
Do	do	do	Darlington	Flour and grist	6	.....	88
Do	do	do	do	Rice	1	6.0	25

Table of power utilized on the Yadkin (Pee Dee) river—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill.	Number of mills.	Total fall utilized.	Total horse-power utilized.
						Feet.	
Lynch's river and tributaries	Great Pee Dee	South Carolina	Chesterfield	Flour and grist	2	27.0	70
Do	do	do	Kershaw	Saw	1	7.0	10
Do	do	do	Lancaster	do	1	12.0	20
Do	do	do	do	Flour and grist	4	52.0	46
Other tributaries of	do	do	Marion	do	4	.....	53
Do	do	do	Darlington	Saw	2	.....	34
Do	do	do	do	Flour and grist	11	.....	200
Do	do	do	Marlborough	do	12	87.0	154
Do	do	do	do	Cotton-gin	2	12.0	16
Do	do	do	Chesterfield	Flour and grist	4	.....	38
Do	do	do	do	Saw	3	25.0	62
Do	do	do	do	Tar and turpentine	1	.....	40
Hitchcock's creek and tributaries	do	North Carolina	Richmond	Cotton factory	2	60.0	280
Do	do	do	do	Saw	1	10.0	40
Little river	do	do	Montgomery	do	2	27.0	42
Do	do	do	do	Flour and grist	7	77.0	127
Rocky river and tributaries	do	do	Anson	do	3	21.0	45
Do	do	do	do	Saw	2	14.0	22
Do	do	do	Stanley	Flour and grist	12	85.0	258
Do	do	do	do	Saw	4	28.0	80
Do	do	do	Marion	do	1	10.0	20
Do	do	do	do	Flour and grist	8	72.0	122
Do	do	do	Cabarrus	do	20	220.0	321
Do	do	do	do	Saw	3	.....	60
Do	do	do	do	Cotton-gin	3	34.0	55
Do	do	do	Mecklenburg	Flour and grist	2	38.0	27
Do	do	do	Rowan	do	6	92.0	42
South Yadkin river and tributaries	Yadkin river	do	do	do	11	124.0	148
Do	do	do	Davie	do	8	101.0	171
Do	do	do	do	Saw	3	37.0	38
Do	do	do	Iredell	do	6	97.0	109
Do	do	do	do	Leather	1	15.0	10
Do	do	do	do	Cotton-gin	3	56.0	31
Do	do	do	do	Flour and grist	30	456.0	480
Do	do	do	do	Cotton factory	2	37.0	140
Do	do	do	Alexander	do	4	60.0	92
Do	do	do	do	Saw	1	12.0	15
Do	do	do	do	Furniture	1	7.0	10
Do	do	do	do	Blacksmithing	1	7.0	4
Other tributaries of	do	do	Richmond	Flour and grist	3	50.0	54
Do	do	do	do	Cotton-gin	1	10.0	20
Do	do	do	Montgomery	Flour and grist	9	.....	92
Do	do	do	do	Saw	1	8.0	15
Do	do	do	Randolph	do	6	52.0	66
Do	do	do	do	Flour and grist	13	206.0	192
Do	do	do	Davidson	do	28	240.0	446
Do	do	do	do	Saw	12	80.0	154
Do	do	do	do	Cotton-gin	1	9.0	4
Do	do	do	Forsyth	Flour and grist	13	227.0	188
Do	do	do	Stokes	do	5	70.0	58
Do	do	do	do	Saw	3	.....	73
Do	do	do	Anson	do	2	23.0	36
Do	do	do	do	Flour and grist	7	125.0	137
Do	do	do	Mecklenburg	do	2	38.0	27
Do	do	do	Rowan	do	13	.....	132
Do	do	do	Davie	do	7	.....	75
Do	do	do	do	Saw	1	9.0	8
Do	do	do	Yadkin	Flour and grist	12	.....	171
Ararat and tributaries	do	do	Surry	Cotton and woolen factory	4	53.0	95
Do	do	do	do	Flour and grist	8	112.0	133
Do	do	do	do	Saw	5	69.0	96
Other tributaries of	do	do	do	do	4	53.0	37
Do	do	do	do	Flour and grist	11	163.0	110
Do	do	do	do	Cotton and wool	2	37.0	.....
Do	do	do	Wilkes	Flour and grist	12	140.0	102
Do	do	do	do	Saw	2	12.0	14
Do	do	do	do	Woolen	1	.....	.....
							749