IV.—THE COAST STREAMS OF NEW HAMPSHIRE.

None of the streams which flow into the Atlantic between the Merrimack and the Piscataqua are of any importance as sources of power, being all very small, and lying in the flat eastern district, subject to great variations in flow, and with very little fall. The Piscataqua, which is formed by the union of the Cocheco and the Salmon Falls rivers, forms for its entire length the boundary between the states of Maine and New Hampshire, and is tidal and navigable for its entire length, which is only 11 miles. About 7 miles from its mouth it receives the waters of Great bay, a wide tidal basin covering about 9 square miles, and receiving the waters of several rivers, whose drainage basins are contiguous to that of the Merrimack. The total area in New Hampshire draining into the Atlantic, either through the Piscataqua or, directly, by some of the small streams between Great bay and the coast, is about 825 square miles. (*a*) The total area drained by the Piscataqua in Maine and New Hampshire is about 550 square miles. (*b*) It comprises a region for the most part level, about one-third covered with forest, (*b*) crossed by numerous railroads, and showing a few considerable water-powers. The tributaries of the Piscataqua will be described in their order, commencing at the south.

THE EXETER RIVER.

The Exeter river takes its rise in the eastern part of Rockingham county, and pursues a general easterly course for about 17 miles, measured in a straight line, flowing then nearly north for about 6 miles, passing the town of Exeter, and emptying into Great bay. The head of tide and of navigation is Exeter, where the tide rises 4 or 5 feet, and up to which place boats of 80 tons ascend. The stream is separated from the Merrimack by a comparatively low water-shed, and drains a total area of about 113 square miles, above Exeter, comprising a flat country, with scarcely any lakes or reservoirs, though there are, no doubt, facilities for storage. Its basin is very full of drift. The stream is narrow and very crooked, the bed is generally clay, sand, or gravel, and the banks are generally high enough to prevent overflow. Phillips pond, at the head of the stream, covers about 160 acres, and is 215 feet above the sea; and as the stream is probably 40 or 50 miles long, if all its windings are followed, its declivity is probably not over 4 or 5 feet per mile. Its flow is so variable, being almost nothing in the summer-time, that the stream is of little value as a source of power.

The first power is at Exeter, where a wooden dam 11 feet high ponds the water for 5 or 6 miles, and, with a race of 800 feet in length, affords a fall at low water of 21 feet, and at high water of 17 feet, at the cotton-mill of the Exeter Manufacturing Company. A power of 250 horse-power is used during eight months, while during the remaining four months the power is very small, there being sometimes, for several weeks at a time, only enough water for the boilers. Steam-power is used to the extent of 300 horse-power. Nine miles above this point, by the course of the river, is a grist-mill, with a fall of 12 feet. Above that is an unutilized privilege, with a fall of 10 feet, once used by a paper-mill; but it is only good during about eight months of the year. Still farther up, but only a mile or so above the grist-mill, is a second unutilized privilege, known as the "Pickpocket" site, abandoned two years ago because the power was so small. The fall is 11 feet, and it was occupied by a paper-mill. Above this are a number of other small powers, not worthy of special mention; they are of some value during about eight months of the year, but during the rest of the time the power is not worth utilizing.

THE LAMPREY RIVER.

The Lamprey river, the next tributary of Great bay, resembles in general character the Exeter, except that it is more favorably circumstanced as regards storage. Rising in the northwestern part of Rockingham county, it pursues a devious course, and empties into Great bay at a point about 18 miles from its source, in a direction a little south of east. It is navigable and tidal as far as the town of Newmarket, about 14 miles from Portsmouth, the rise of the tides being about 4 feet. At this place are situated the mills of the Newmarket Manufacturing Company, where, with a wooden dam 20 feet high and 115 feet long, founded on a ledge, and backing the water about 2 miles, a fall of from 22 to 26 feet is utilized, according to the state of the tide. A short rectangular canal extends on either side of the river to the mills, and the power used is 400 horse-power, which can, however, only be obtained during about six months. Like the Exeter, the stream is very variable in flow, and in the summer time it almost dries up, notwithstanding the artifical storage. After the reservoirs are emptied, the natural flow of the stream, in dry seasons, would not afford over 50 horse-power during working hours. The mills use, in all, 1,000 horse-power in steam-power, part of which is running all the time. The reservoirs referred to, and which are controlled by the Newmarket Company, are two in number, viz, Mendam's pond and Pawtuccaway pond. The

a Geology of New Hampshire, Vol. I, p. 313. *b* Wells: *Water Power of Maine*. 111

former covers 250 acres when full, and is dammed to a height of 28 feet, all of which can be drawn off. The watershed of the pond, however, is small, and it is seldom full. Pawtuccaway pond covers some 3,000 acres when full, and has two outlets, both of which are dammed by stone dams, one 20 feet high, from which an outlet runs south, entering the Lamprey at West Epping, and the other 10 feet high, from which an outlet flows east, entering the Lamprey below Epping. Before a depth of 10 feet is drawn from the pond, it divides into two. These ponds are the only ones in the basin which are of any importance, but the facilities for storage are tolerably good, and others could be made, if necessary. Jones' pond, in Raymond, covers about 160 acres, and is 258 feet above the sea.

The total area drained by the Lamprey above Newmarket measures about 210 square miles. Above that place there are no powers of much importance. The first is an unimproved power, known as Packerd's falls, belonging to the Newmarket Company, and situated just at the head of its pond, with an available fall of 20 feet and a power of probably 350 horse-power net during about six months; then a paper-mill, with a fall of 10 feet; then an unutilized site known as Long falls, 5 miles above Newmarket, with a fall of some 6 feet; then a saw- and grist-mill, with a fall of 10 feet or so, just below where the outlet of Mendam's pond comes in. Above this are various small mills not worthy of special mention.

THE OYSTER RIVER.

This, the next tributary of Great bay, is not worth describing. It is a very small stream, tidal to Durham, where there is a saw-mill, and with one small pond tributary to it called Wheelwright's pond, covering about 250 acres, and lying at an elevation of 131 feet above the sea.

THE BELLAMY RIVER.

This, the only remaining tributary of Great bay, is a small stream, but quite a good one for power. The principal site is at the head of tide, near Dover, where are situated Sawyer's woolen-mills, with three dams in succession. The lowest affords a fall of 20 feet, with 80 horse-power; the next two a fall of 12 feet each, with 50 horse-power. These amounts of power may be secured during the entire year. A reservoir in Barrington, called Dodge's pond, covering 445 acres, and dammed to a height of 13 feet, serves to hold considerable water in store. At Sawyer's mills all the water is held except during about two months of the year, when water runs over the dam. At the head of Sawyer's pond is a grist-mill, and nearly 3 miles above an unutilized site, where the available fall is said to be 20 feet. The stream is rather sluggish and affords little power above this. One other pond, known as Swain's pond, covers about 160 acres.

THE COCHECO RIVER.

The Cocheco river, which, with the Salmon Falls, forms the Piscataqua, takes its rise in the extreme northern part of Strafford county, near Merrymeeting lake, from which it is separated by a divide only about 70 feet above the surface of lake Winnipiseogee. It flows in a southeasterly direction by the towns of Farmington, Rochester, Gonic, and Dover, its total length in a straight line being about 25 miles, and its drainage area above Dover, which is the head of tide and of navigation, about 183 square miles. Its drainage basin is not very well wooded, and comprises a considerable extent of flat and sandy country, through which the river flows with a sluggish current. Abrupt descents over ledges of rock interrupt its course at places, however, affording some good powers. The fall of the stream is very rapid above Farmington, being said to be nearly 200 feet in 3 miles. As soon as the river reaches, however, the flat and sandy plain on which Rochester is situated, its current becomes sluggish, until, at Rochester, it descends suddenly over a rocky ledge, to fall again at Gonic and Dover. The banks of the stream are generally firm and high, and very few areas are subject to overflow, though the freshets are quite severe. The flow, however, is by far more constant than that of the streams thus far described, so that the stream is much better adapted for power. It is more extensively reservoired, too, there being the following ponds on the stream and its tributaries:

1. Bow pond, on the Isinglass river, in Strafford, lying at an elevation of 515 feet above the sea, and covering about 1,000 acres. It is dammed to a height of 20 feet, all of which can be drawn off.

2. Ayer's pond, in Barrington, also tributary to the Isinglass, covering about 380 acres, and dammed to a height of 12 feet.

3. Nippo pond, in Barrington, covering about 125 acres, and dammed to a height of 6 feet.

4. Round and Long ponds, tributary to the Isinglass, and covering each about 125 acres, neither being dammed.

5. Reservoir in Middleton, covering about 300 acres, and dammed to a height of 18 feet, 16 feet of which can be drawn off.

6. New Durham reservoir, or Marsh's ponds, comprising two ponds, with, together, about 150 acres, dammed to a height of 12 feet, of which 11 may be drawn off.

7. Coldrain pond, covering 40 acres, and not controlled.

The stream is very easily accessible, being followed by a railroad for its entire length.

The first power is at Dover, at the head of tide. A stone dam 15 feet high and 130 feet long ponds the water for 2 miles, and affords a fall of 36 feet, with scarcely any race, at the cotton-mills of the Cocheco Manufacturing

Company. The bed of the stream is solid rock. The power used is about 1,000 horse-power net, but this can only be obtained during about nine months of the year, steam being in reserve to the extent of 800 horse-power. In the summer time there is no waste whatever, even at night. The company controls Bow pond, Ayer's pond, and Nippo pond, and also has two dams on the river below the mouth of the Isinglass, which serve simply to regulate the flow, being opened every morning and closed every night. One of these dams is 12 feet high and the other 5 feet.

The only other power below the mouth of the Isinglass river is that used by a small grist- or saw-mill. About 2 or 3 miles below Rochester, and a short distance below Gonic, is a fall not used, amounting, it is said, to over 8 feet. A little above is a saw-mill with a fall of 15 feet, capable of being increased to 19 or 20 feet, it is said, by raising the dam. At Gonic a fall of 19½ feet, with 120 horse-power, is used by the woolen-mill of the Gonic Manufacturing Company, with a wooden dam 9 feet high. This power can be obtained all the time by storing the water at night, so that if we take the minimum power of the stream in twenty-four hours at 4 horse-power per foot fall, its minimum flow is about 35 cubic feet per second, or 0.39 cubic feet per second per square mile, the drainage area being 90 square miles.

The next power above is at Rochester, where there are three dams. The lowest supplies a saw- and grist-mill, with a fall of 9 feet. The next supplies one of the woolen-mills of the Norway Plains Manufacturing Company, with a fall of 18 feet on one wheel, 15 feet on another, and 23 feet on another, the total power being about 275 horse-power. Some steam is in reserve, as full capacity can only be secured during eight months. The upper dam supplies another mill of the same company, the fall being 8 feet, and 60 horse-power being used. The bed of the stream at this place is solid rock, and the facilities for the use of power good. The Norway Plains Company controls the reservoirs at Middleton and New Durham.

Above Rochester there are no mills of importance on the stream. At Farmington there are a couple of mills with quite large falls, and above that place, on the two headwaters of the Cocheco, the Ela and Walden, there is considerable fall, but little power, probably none worth developing except for local mills.

The principal tributary of the Cocheco is the Isinglass river, which comes in about 3 miles below Rochester, and on which are the reservoirs of the Cocheco Manufacturing Company. The stream, however, is of small value for power, being an insignificant stream, and its flow being controlled by the above-named company. It has a few small powers.

SALMON FALLS RIVER.

This river, which, with the Cocheco, forms the Piscataqua, takes its rise in Great East pond, which lies partly in Maine and partly in New Hampshire, at an elevation of about 499 feet above the sea. Thence the river pursues a course in a southerly and southeasterly direction, forming for its entire length the boundary between the two states, and flowing by the towns of Milton, East Rochester, Great Falls, Salmon Falls, and South Berwick. Its total length, from its source to its junction with the Cocheco, is 28 miles in a straight line, and its drainage area measures about 334 square miles, of which 215 lie in New Hampshire and 119 in Maine. The stream is navigable to the head of tide-water, at South Berwick, Maine, at which place the first power on the stream is situated. The drainage basin is similar in character to that of the Cocheco, except that it is probably rather more hilly and broken; not one-third of the basin is wooded. The bed of the stream is often solid rock, alternating with gravel, sand, and clay. The banks are generally high, and only small areas are overflowed in freshets. The fall is very considerable, and is broken by the ledges of rock into cataracts and rapids, affording excellent water-powers, many of which are improved. The stream is quite well reservoired, and its flow more constant than that of any stream in the basin we are considering. During the past few years extensive improvements have been made in the reservoirs on the upper waters, by which the power below has been greatly improved. The freshets are not violent enough to cause any trouble or damage. The principal lakes and reservoirs on the stream and its tributaries are the following, the areas being given for full pond:

1. Great East pond, at the head of the stream, covering 1,817 acres, and lying at a height of 499 feet above the sea. It is dammed to a height of 21 feet, nearly all of which may be drawn off.

2. Horn pond, into which the stream flows after leaving Great East pond, covers 224 acres, and is dammed so that a depth of 6 feet may be drawn off. Its elevation is about 478 feet above the sea.

3. Garvin's pond, tributary to Horn pond, covers 285 acres, and is not dammed.

4. Milton Three ponds, comprising South pond, with an area of 390 acres; North pond, with 180 acres, and Northeast pond, with 920 acres, making in all 1,490 acres. The lowest of these ponds, which are all connected with each other, is dammed to a height of 16 feet, so that this depth may be drawn from nearly the whole area. These ponds are on the main stream, 9 miles from Great East pond, and their elevation above the sea is 400 feet.

5. Cook's pond, covering 272 acres, from which 12 feet may be drawn, situated on Branch river, a tributary of the main stream.

6. Lovell's pond, covering 581 acres, from which 16 feet may be drawn, lying on the same stream.

7. Cate's pond, covering 300 acres, from which 6 feet may be drawn, also on Branch river. This pond is entirely artificial.

Besides these ponds, there are other smaller ones. The total number of ponds in the basin of the Piscataqua, according to Wells, is 22, covering a total area of 16 square miles, or one thirty-fourth of the area of the basin. The facilities for storage in the basin are remarkably good, and numerous sites could no doubt be found for additional reservoirs, should they be desired. All of the ponds named above are controlled by the Great Falls Manufacturing Company, of Great Falls, New Hampshire.

The fall of the stream may be seen approximately from the following table:

Declivity of Salmon Falls river.

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Mouth	0	0	6	166	27.7
Great Falls, top of dam	6	*a*166	6	34	5.7
East Rochester	12	*a*200±	7	200	28.6
Three ponds, Milton	19	*a*400	8	78	9.7
Horn pond, Wakefield	27	478	1	21	2.1
Great East pond, Wakefield	28	*a*499			

a Geology of New Hampshire, Vol. I, p. 313.

The average fall of the stream is, therefore, nearly 18 feet per mile, a very large fall. This, together with the constancy of the flow (a rise of 3 feet in the spring freshets being an unusual occurrence), makes the stream an excellent one for power. It offers a good example of what may be done by careful and scientific improvement of the natural advantages. The maximum power available with storage is probably approached more nearly in the case of this stream than in that of any stream of equal size which we have yet discussed, on the Atlantic slope, excepting the Winnipiseogee river. The rainfall over the basin is about 44 inches, very evenly distributed through the year. The stream is accessible at all points, being nowhere more than a few miles from a railroad.

The first power, as the stream is ascended, is at South Berwick, Maine, at the head of tide, at what is known as "Quamphegan falls". A timber dam, about 14 feet high and about 250 feet long, founded on solid ledge, and built in 1861 at a cost of $5,000, backs the water a mile, and affords, with a penstock several hundred feet in length, a fall of 18 feet at high tide at the Portsmouth Company's cotton-mill. The power used is stated at 158 horse-power, which can always be obtained, no steam-power being necessary. Water always wastes during the day-time, when the large mills above are running, but during the night-time there is scarcely any waste. The power here might probably be increased to 500 or 600 horse-power at all times during working hours.

One mile above are the two dams of the Salmon Falls Manufacturing Company, at Salmon Falls, New Hampshire. The upper is of wood, 9½ feet high, and about 300 feet along, and ponds the water about 2½ miles. A canal 200 feet long, 16 feet wide, and 12 feet deep leads to mill No. 2, where the fall is 20 feet, and the power used 500 horse-power net, which can be obtained at all times. The lower dam is 9 feet high, and from it a canal 350 feet long, 16 feet wide, and 10 feet deep leads to mill No. 1, where the fall is 24 feet and the power 500 horse-power. There is said to be always a waste of water over these dams during the day-time, so that the power could perhaps be increased to some extent. No steam-power is used.

The next power is 2½ miles above and 1 mile below Great Falls. The dam is a rough stone dam, 26 feet high, and ponding the water about a mile. The fall is 30 feet, with no canal, and it is said that by carrying a canal a few hundred feet down-stream it might be increased to 34 feet. The power is owned by the Great Falls Manufacturing Company, and leased to parties running a woolen-mill, and using a small amount of power, with always a waste of water. The site is a fine one, and the power could probably be increased to about 1,000 horse-power during working hours, judging from that used at the next privilege above.

The next power is the most important one on the river, and is occupied by the Great Falls Manufacturing Company, at Great Falls, New Hampshire. There are two dams: The upper, built of cut-stone in cement, founded on ledge, and built in 1872 at a cost of $13,000, is about 6 feet high and 375 feet long. It ponds the water 2 miles, with an average width of 125 feet, and from it a rectangular canal 2,000 feet long, 36 feet wide, and 7 feet deep leads to the mills. The fall is 31 feet, and the power used is 600 horse-power at mill No. 1, and 800 horse-power at mill No. 2, besides 50 horse-power at a grist-mill and spool factory. This power, however, cannot be obtained all the time, and in mill No. 1 there is steam-power to the extent of 440 horse-power in reserve. The second dam is of rough stone without cement, with a vertical face, and is about 24 feet high and 140 feet long. It is founded on a ledge, and was rebuilt in 1845. It ponds the water nearly up to the upper dam. A canal 600 feet long, rectangular in section, 24 feet wide and 11 feet deep, carries the water to mill No. 3 and to the bleachery, the fall being 31 feet, and the power 900 horse-power at the mill and 175 at the bleachery. No steam-power is used in these mills, but full capacity can generally be obtained all the time, by drawing on the pond, so that there is no waste at all except at high water. Less than one-eighth of the basin above this point is wooded.

Two miles above Great Falls the Great Falls Company has a reservoir known as Mast Point pond, formed by damming the main stream by a wooden dam 7 feet high, which ponds the water about 4 miles, with an average width of perhaps 100 feet. It is not used for power, but for regulating the flow, and holds one day's storage. The water can be entirely drawn out, and the gates are shut every night and opened every morning, so that no water is wasted during the night.

Two miles below East Rochester there is a fall not used, known as Stair's falls, but since the construction of the Mast Point dam it is said that the fall is small, not over 5 feet.

At East Rochester is the next improved power on the river, that of the Cocheco Woolen Manufacturing Company. The dam is of wood, 10½ feet high, founded on ledge, ponding the water only about 1,400 feet, to the dam above. The fall used is 10½ feet at mill No. 3, situated at the dam, and using 50 horse-power, while at mills No. 1 and No. 2, to which the water is led by a canal 700 feet long and 20 feet wide, the fall is 16½ feet and the power some 150 (?) horse-power. Full capacity can be secured at all times excepting sometimes on Saturday, when the Great Falls Company shut the reservoirs above, in which case mill No. 3 is run by steam. Water generally runs over the dam day and night.

At the head of the pond last mentioned is a second privilege owned by the same company, with a wooden dam 8 feet high, ponding the water 2 miles, and affording power for a saw- and grist-mill, with a fall of 8 feet. The further development of this power is talked of.

A short distance above this privilege is the site of a woolen-mill which was burned in 1882. The fall was 8 feet, with a canal a third of a mile long.

The next power is a saw- and grist-mill, 1½ mile below Milton, the fall being 11 feet, with a dam 8 feet high. Between this power and the one below there is said to be a small fall once used, but now idle. It is probably of no importance.

Between the last power and Milton Three ponds is the largest fall on the river, amounting probably to not less than 120 feet in 1½ mile, and some 200 feet in 3 miles. (*a*) The fall is continuous, over ledges of solid rock, the banks being also very rocky and sometimes steep. This entire fall is controlled by the Great Falls Manufacturing Company, and is only utilized by a small mill at the outlet of the ponds. Of this large fall a considerable portion could be utilized, though it is impossible to say how much. As regards building dams, no difficulty would be experienced, but it might sometimes be difficult to find good locations for mills and canals, on account of the roughness of the banks. At the "flume" there is a fall of about 15 feet in 100 feet, the width of the stream being very small; and above it there is an equal fall in as short a distance. A short distance above, the Great Falls company has erected a dam and a mill, the dam being of wood, about 16 feet high, and only about 30 or 40 feet long, between cliffs of rock. The mill has never been used, and no wheel has been put in. The fall is 16 feet. Above the dam there is a fall of 15 feet, or thereabout, to the foot of the dam at the outlet of the ponds, which is 16 feet high. The fall here is used by a small excelsior-mill a short distance below the dam, using a fall of 14 feet when the ponds are full, with about 25 horse-power, and only running about ten months.

Any estimate of the power available at this place is very uncertain, because it depends entirely upon the manner in which the reservoirs are operated by the Great Falls Company. To judge from the amount of power used below, I should say that a power of 12 horse-power per foot fall could be depended upon at all times, if it could be all used during working hours. The reservoirs, however, are often closed on Saturday, so that they may partly fill up, and the supply is drawn from Mast Point pond during that day, the reservoirs being opened again on Monday morning. If mills should be located, therefore, on this fall, they might not be able to run on Saturday, while at other times the supply of water would be excessive. Similar disadvantages are always experienced by mills located near reservoirs which are controlled in the interest of mills situated far below. Not only would there probably be a lack of water on Saturday, but during other days there would always be a waste at night, for while the ponds are open they are allowed to flow night and day; and as there are no facilities for storing water at night within the distance occupied by the fall referred to, there would be no possibility of concentrating the power into working hours. These or similar considerations have perhaps been those which have prevented the utilization of the power, which is favorably situated, within easy reach of the railroad, and with building materials close at hand.

The next power above Milton Three ponds is at Milton mills, where there are several dams, and above which the fall is rapid all the way to the source of the river. The lowest dam is owned by the Waumbeck Manufacturing Company, and the power is leased, being used by a woolen-mill and a felt-mill, one with a fall of 8 feet and 36 horse-power, and the other with a fall of 10 feet and 60 horse-power. Full capacity can only be obtained during about nine or ten months, as the water is drawn from Great East pond in such a way as to cause a lack of water during a few months. The next dam is that supplying the woolen-mill of the Waumbeck Company. It is 14 feet high, the fall is 14 feet, and the power 75 horse-power, steam-power being in reserve. The next dam is of stone, 15 feet high, with flash-boards, and supplies Buffum's felt-mill, the fall being 15 feet and the power being 60 horse-power, steam-power being in reserve to the same extent. Above this is a reservoir belonging to the Waumbeck Company, the dam (called the Hooper dam) being of stone and from 15 to 18 feet high. The reservoir holds about

(*a*) *Geology of New Hampshire*, Vol. III, p. 150.

one day's supply. The next above is an unutilized privilege, called the "Jewett" privilege, once used by a small mill. The fall was about 12 feet, but it is said that 18 feet or more could be obtained. Above it is a second reservoir of the Waumbeck Company, the dam being of stone, 8 feet high, and the pond (known as Roe pond) holding about twenty-four hours' storage. Above it are some saw-mills, one at the dam at the outlet of Horn pond. There is no fall not utilized on this part of the stream, excepting that at the Jewett privilege. The mills, however, are obliged to have steam-power in reserve, on account of the intermittent flow from the reservoirs.

The tributaries of the Salmon Falls river are not of much consequence. Of those from New Hampshire the only one to be mentioned is Branch river, which rises in Cook's pond and empties into Three Ponds. At Union Village there are four mills on this stream running all the year. Of the tributaries from Maine the only one to be mentioned is Great Works river, which empties just below South Berwick, at the head of tide-water. It is a small stream, draining only about 92 square miles, and its flow is not very constant. It has one artificial reservoir, known as Bonny Bigg pond, covering about 500 acres—according to Wells, 1,600 acres—from which 8 or 10 feet may be drawn. At the mouth of the river is a saw- and grist-mill, with a dam 12 feet high, using a fall of 14 feet. The power available is probably about 65 horse-power net at its minimum during eleven hours. Less than a mile above this site there was formerly a dam, with a fall of about 18 feet, the privilege being now idle. It belongs to the Newichawanick Company, which owns the mills just above, and it would probably afford a power of 80 horse-power net during working hours, when the flow is at its minimum, and considerably more during the greater part of the year. Just above, or about a mile above the mouth of the stream, at Newichawanick falls, are the two dams of the Newichawanick Company, one 22 feet high, affording a fall of 29 feet, with 90 horse-power all the time, and the other 13 feet high, affording a fall of 17 feet, with 80 horse-power. These powers are excellent in almost every respect, and are in close proximity to several railroads. The gross power available during the low season of dry years is probably not less than 7 or 8 horse-power per foot fall, and during ordinary years 10 or over. During nine months probably twice as much could be utilized. Above this there are no powers worth describing.

The following tables give the power utilized on the coast streams of New Hampshire, compiled from the returns, and the drainage areas of the principal streams:

Table of drainage areas of the coast streams of New Hampshire.

Stream.	Tributary to what.	Above what point.	Drainage area.
			Sq. miles.
Exeter river	Great bay	Exeter	113
Lamprey river	do	Newmarket	210
Oyster river	do	Mouth	20
Bellamy river	do	do	30
Cocheco river	Piscataqua river	Dover	183
Do	do	Gonic	90
Do	do	Rochester	72
Salmon Falls river	do	Berwick	242
Do	do	Salmon Falls	240
Do	do	Great Falls	231
Do	do	East Rochester	140
Do	do	Milton Three ponds	123
Do	do	Milton mills	94
Little river	Salmon Falls river	Mouth	60
Great Works river	do	do	92
Salmon Falls river	Piscataqua river	Berwick	*a* 123
Do	do	do	*b* 119

a In Maine. *b* In New Hampshire.

Table of powers utilized on the coast streams of New Hampshire.

Stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall.	Total horse-power used, net.
						Feet.	
Exeter river	Great bay	New Hampshire	Rockingham	Cotton	1	17–21	250
Do	do	do	do	Flour and grist	2	15	105
Do	do	do	do	Saw	5	46	104
Tributaries of the	Exeter river	do	do	Boxes	3	24	56
Do	do	do	do	Carriage materials	1	10	42
Do	do	do	do	Flour and grist	3	27	56
Do	do	do	do	Saw	21	* 190+	562
Do	do	do	do	Paper	1	9	200
Lamprey river	Great bay	do	do	Cotton	1	22–26	400
Do	do	do	do	Woolen	1	10	25
Do	do	do	do	Box	1	9	30
Do	do	do	do	Flour and grist	4	43	149
Do	do	do	do	Saw	9	106	226
Do	do	do	Strafford	Flour and grist	1	12	75
Do	do	do	do	Saw	1	12	35
Do	do	do	do	Tannery	1	10	12
Do	do	do	do	Paper	1	10	70
Tributaries of the	Lamprey river	do	Rockingham	Hosiery	1	6	25
Do	do	do	do	Cotton	1	14	45
Do	do	do	do	Box	2	17	45
Do	do	do	do	Bolts, nuts, etc	1	14	24
Do	do	do	do	Flour and grist	3	33	138
Do	do	do	do	Saw	10	86	253
Do	do	do	do	Wheelwrighting	1	5	5
Do	do	do	Strafford	Flour and grist	1	11	25
Do	do	do	do	Woolen	1	44	180
Bellamy river	Great bay	do	do	Flour and grist	1	.....	.....
Do	do	do	do	Cotton	1	30	1,000
Cocheco river	Piscataqua river	do	do	Woolen	2	50	455
Do	do	do	do	Saw	3	52	105
Do	do	do	do	Flour and grist	2	18	46
Do	do	do	do	Cutlery	1	25	27
Tributaries of the	Cocheco river	do	do	Woolen	1	8	35
Do	do	do	do	Blacksmithing	1	9	4
Do	do	do	do	Saw	6	77	306
Do	do	do	Rockingham	do	1	12	12
Do	do	do	Strafford	Boxes	1	11	10
Salmon Falls river	Piscataqua river	do	do	Flour and grist	2	33	100
Do	do	do	do	Saw	1	10	15
Do	do	do	do	Cotton	2	106	3,475
Do	do	do	do	Woolen	1	18	100
Do	do	do	do	Felt	1		
Do	do	do	do	Woolen	3	60	335
Do	do	Maine	York	do	1	7	12
Do	do	do	do	Cotton	1	18–20	160
Do	do	do	do	Felt	1	15	60
Do	do	do	do	Excelsior	1	14	25
Do	do	do	do	Saw	1	12	25
Do	do	New Hampshire	Carroll	Excelsior	1	11	20
Do	do	do	do	Furniture	1	13	25
Do	do	do	do	Saw	6	60	136
Tributaries of the	do	do	Strafford	do	2	19	62
Do	do	do	do	Flour and grist	1	13	50
Do	do	do	do	Machinery	1	30	15
Do	do	do	Carroll	Felt	1	11	60
Do	do	Maine	York	Woolen	3	60	260
Do	do	do	do	Agricultural implements	1	16	25
Do	do	do	do	Flour and grist	2	32	85
Do	do	do	do	Saw	13	140+	639
Do	do	do	Strafford	do	2	24	65
Other tributaries of the	Atlantic ocean	New Hampshire	Rockingham	Box	2	12+	44
Do	do	do	do	Tannery	1	4–6	10
Do	do	do	do	Flour and grist	7	55	161
Do	do	do	do	Saw	11	98	125
Do	do	do	do	Wheelwrighting	1	5	5
Do	do	do	do	Vinegar	1	.....	4
Do	do	do	do				

V.—THE RIVERS OF MAINE.

The general characteristics of the streams of Maine have been described in the introduction to this report. A detailed report on their water-power was made in 1869 by Walter Wells, and was published by the state; and as time did not permit of a detailed examination of the state for the purposes of this report, the pages which follow are mainly condensed from that of Wells, the statistics being brought up to date, and measurements of the drainage basins, with other data, added. The streams will be considered in their order as we proceed along the coast from south to north.

THE PISCATAQUA RIVER.

This stream, which, with the Salmon Falls river, forms the boundary-line between Maine and New Hampshire, has already been considered, as one of the coast streams of New Hampshire, and all the powers on the Salmon Falls river have been fully described. The tributaries to that river from Maine are not of much consequence, and need no further description.

As we proceed along the coast we find a few tide-mills, and in the town of York, the outlet of Chase's pond, which covers 350 acres, has a rapid fall, and runs two mills, with falls of 19 and 35 feet respectively; but the power is small and not reliable all the year.

THE MOUSAM RIVER.

The Mousam river takes its rise near the middle of York county, and pursues a southeasterly course to the sea, its length being about 30 miles in a straight line, and its drainage area measuring about 157 square miles. Its basin is level or gently undulating, the soil sand, gravel, and loam, the rock granite, and the forests are mostly removed. The fall of the stream is quite large, probably in the neighborhood of 10 feet per mile. The rainfall is about 44 inches—11 in spring and in summer, 12 in autumn, and 10 in winter. The flow of the stream is said to be quite constant. The following lakes and ponds are connected with the river: Shaker's pond, 250 acres, with a storage of 2 feet; Bunganut pond, 320 acres, with a storage of several feet; Mousam pond, 1,760 acres, with a storage of several feet; Square pond, 640 acres; and Loon pond, 130 acres. These ponds suffice to regulate the flow to a considerable extent. In the absence of gaugings I have roughly estimated the flow and power of the Mousam at Kennebunk about as follows:

Estimate of flow of the Mousam river at Kennebunk.

State of flow (see pages 8–10).	Drainage area.	Flow per second.	Horse-power available (gross) continuously.	
	Sq miles.	*Cubic feet.*	*1 foot fall.*	*40 feet fall.*
Minimum	150	26	3	120
Minimum low season		31	3.5	140
Maximum, with storage		100	11.4	456
Low season, dry years		35	4	160

Could the flow be controlled and confined to working hours the above powers would be about doubled.

The Mousam river is crossed at Kennebunk and at Springvale by railroads, so that every part is quite easily accessible.

As the stream is ascended, the first power is at the head of tide and 2½ miles from the sea. The total fall is 40 feet, in three pitches, only a portion being utilized, and the total power used being probably in the neighborhood of 350 horse-power. That available is estimated in the above table, and could probably be increased in this case. Two miles above are Lord's cotton-mills, with 11 feet fall and 75 horse-power; a mile above is a saw-mill with 9 or 10 feet; then Varney's falls, with 12 feet; then Great Falls, fall 45 feet, making a total fall of about 118 feet in Kennebunk. In the town of Sanford, Wells mentions sixteen powers on the river, with a total fall of about 200 feet, and in the towns above the slope is probably even larger. The table of power utilized shows that the total fall used on the river is not over 186 feet, and probably much less, because in the table the fall at each mill is counted, whether several are run from the same dam or not. There must be, therefore, a large amount of fall and of power still unutilized on the stream. The bed and the banks are said to be everywhere favorable, and the facilities for storage good. No accurate data are at hand regarding the tributaries of the stream, but they afford good and, in some cases, very constant powers.

The Kennebunk river, which empties into the ocean very near the mouth of the Mousam, is a small stream, draining about 50 square miles. It is fed by Kennebunk pond, covering about 540 acres, and capable of being drawn down 4 feet, and by Swan pond, covering about 480 acres. The stream affords a few small powers.

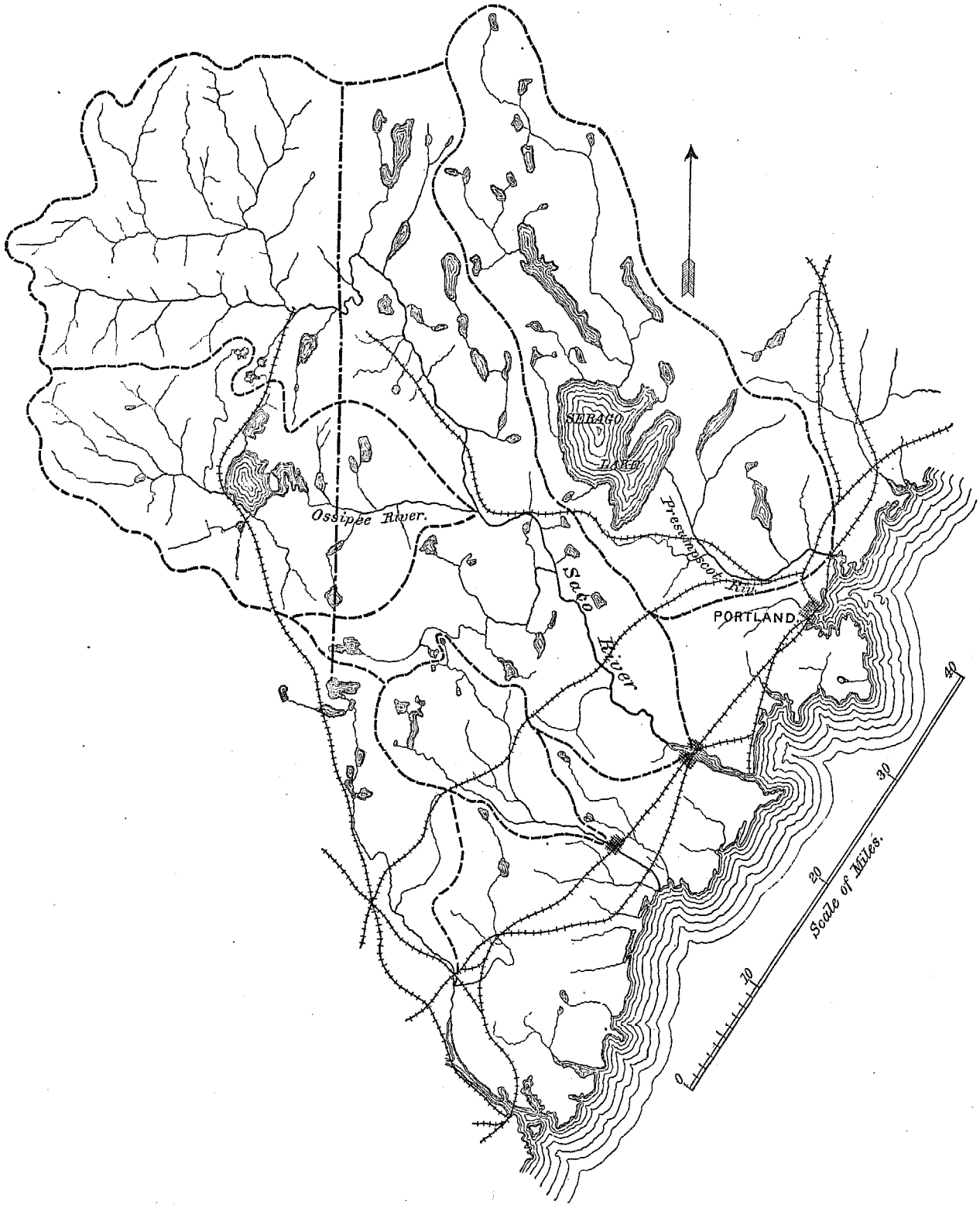

Fig. 19. MAP OF THE DRAINAGE BASIN OF THE SACO RIVER.

THE SACO RIVER.

The Saco river has its source in a small pond lying 1,300 feet southeast of the Crawford house, in the White mountains, New Hampshire, at an elevation of 1,880 feet above the sea. From this point the stream flows in a general southeasterly direction, crossing the state line and passing into Maine at a distance of about 34 miles from its source, measured along its course. In Maine its general course is southeast, first in Cumberland county, and in its lower part forming the boundary between Cumberland and York counties, and its length in the state is about 70 miles, following its course. The total area drained by the river is about 1,750 square miles, of which nearly exactly half is in Maine and half in New Hampshire. From its source the stream falls very rapidly for a few miles, following for 11 miles a narrow valley, with high hills on each side, extending to the water's edge. Below this point it flows through intervales, and is bordered on each side by alluvial lands, many of which are sometimes overflowed. The following table shows its slope:

Table of declivity of the Saco river.

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Source of river	104	1,880			
			12.5	1,135	90.8
Western boundary of Bartlett	91.5	745			
			6.5	185	28.4
Mouth of Rocky branch	85	560			
			2	49	24.5
Mouth of Ellis river	83	511			
Portsmouth, Great Falls, and Conway Railroad crossing	78	446			
			38	168	4.42
Railroad crossing, Conway Centre	73	412			
Head of Great falls	45	343			
			0.3±	72	240
Foot of Great falls	44.7	271			
Mouth of Ossipee river	40	266			
			40	266	6.65
Mouth	0	0			

Its bed is rocky almost everywhere, the prevailing rocks being granite and gneiss. The rainfall is about the same as on the Mousam. The flow is very variable, on account of the large proportion of mountain country drained by the stream and the small size of the lakes. Especially in the upper or mountainous part is this the case, the stream diminishing to almost a mere rivulet in summer, and being heavily swollen in the spring. The number of lakes in the basin, in Maine, is 75, while in New Hampshire there are about 34. None of them, however, are very large. Those in Maine have a total area of 55 square miles, and those in New Hampshire 29 square miles, making 84 square miles in all, or about 1 square mile to each 21 square miles of basin. Many of these ponds are dammed, and some are used only for regulating, while in the case of many of them additional storage is feasible. The storage facilities in the basin, in a word, may be said to be excellent, though at present not made use of to a very great extent. No accurate data regarding the flow are at hand, but the range of water, between high and low water, seldom exceeds 14 feet at any point, so that the flow is evidently much more constant than that of most streams in the southern and western states. The river is quite easily accessible by rail, being followed for almost its whole length by the Portland and Ogdensburg railroad.

As the stream is ascended, the first power met with is at the head of tide, at Biddeford and Saco, about 4 miles from the mouth. Vessels drawing 11 feet can come up to the foot of the falls, and the river is open to navigation for eight or nine months of the year, rendering transportation by sea easy. The fall is about 40 feet at low tide, the bed is solid trap-rock, and the banks were originally very rough, rugged, and high, but have been cut down as the manufactures have developed. The power has been used since 1750, but until about 1830 only for saw-mills. At present the upper dam, with a fall of 6½ feet, is only used for a saw-mill, but the lower fall of 32 or 33 feet is used by three cotton-manufacturing corporations and a grist-mill. The river is here divided into two arms, both of which are dammed. The York Manufacturing Company, situated on the island between the arms, uses a fall varying with the tide from 30 to 34 feet, while on the south bank the Pepperell Manufacturing Company uses a fall of about 16 feet, and below it the Laconia Manufacturing Company uses the remainder of the fall to tide, or about 16 feet, with a second dam. The upper of these two dams is partly of wood and partly of stone, about 335 feet long, and from 3 to 16 feet high, with 1 foot of flash-boards. The lower one, south of the island, is of stone, about 200 feet long, and from 3 to 7 feet high. The power is owned by the Saco Water-Power Company, controlled by the Pepperell and Laconia Manufacturing Companies, and the low-water flow is completely utilized. The York Company owns the right to 11 mill-powers, a mill-power being defined as the right to draw 25 cubic feet of water per second on a fall of 30 feet. Increase in quantity is allowed as the fall becomes less than 30 feet; if it

is over 30 feet, the mills obtain the benefit of it, the quantity being undiminished. With a fall of 30 feet a quantity of water equal to 25 cubic feet per second affords a gross power of 85.23 horse-power, as at Lowell, so that the York Company owns 937 gross horse-power. The remainder of the flow, or all in excess of the 11 mill-powers reserved for the York Company, and which can be obtained at all times, is owned by the Pepperell and Laconia companies, in the proportion of $\frac{4}{7}$ to the former and $\frac{3}{7}$ to the latter. The Pepperell Company uses at times water-power to the extent of 2,000 horse-power, but can only obtain it during about eight months, being sometimes unable to obtain over 300 or 400 horse-power; and it has steam-power to the extent of 1,500 horse-power. The Laconia Company can use all the water passing the wheels of the Pepperell Company, together with what goes over the dam, but only uses about 1,600 horse-power, and in dry weather is limited, like the Pepperell, to 300 or 400. It has steam-power equal to 1,000 horse-power. The York Company uses 1,100 or 1,200 horse-power when running all its wheels at full capacity, but generally limits the water-power used, to the 11 mill-powers using steam-power, to the extent of 400 horse-power continually. Surplus power may be used if desired, the price charged being $3 per mill-power per day for every mill-power above the 11 mill-powers owned. Measurements of the quantity of water used by the York Company are made by the Water-Power Company, by observing daily the height of water in penstock and wheel-pit, and the height of gate, thence determining, by means of wheel-tables or diagrams, the quantity used. Flume measurements are also made at intervals, to determine whether any change has occurred in the running of the wheels. No measurements are made of the quantity used by the Laconia Company. On the other arm of the river the lower fall is used by a grist-mill, the power being small.

The York Company uses continuously, for eleven hours every day, a quantity of water equal to 275 cubic feet per second. The minimum quantity used by the Pepperell Company is perhaps 200 cubic feet per second; making in all, on both sides of the river, during working hours, say, 500 cubic feet per second. The ponds of the dams at Saco are of small capacity, but those farther up the stream, and which will soon be referred to, are sufficient to control the flow, rendering it possible to save the whole of it in a dry time. During eight months there is a waste, but during the remaining four months there is little or no waste. The minimum flow of the stream, during twenty-four hours, is, therefore, probably not far from 250 cubic feet per second. The following estimate will give some idea of the power, and enable those farther up the stream to be judged of:

Estimate of power of the Saco river at Saco and Biddeford.

State of flow (see pages 8–10).	Drainage area.	Flow per second.	Horse-power available (gross) during twenty-four hours.		
	Sq. miles.	*Cubic feet.*	*1 foot fall.*	*32 feet fall.*	*40 feet fall.*
Minimum	1,734	250	28.4	909	1,136
Minimum low season		325	36.9	1,181	1,476
Maximum, with storage		1,000	113.6	3,635	4,544
Low season, dry years		375	42.6	1,363	1,704

The range of the water is given by Wells as from 8 to 10 feet. No trouble is experienced on account of freshets or ice.

The Saco Water-Power Company controls several reservoirs on the stream and tributaries, as follows:

1. Little Ossipee pond, in Waterborough, covering about 525 acres, and dammed to a height of 9 feet. 2. Moose pond, covering 1,648 acres, from which 8 feet may be drawn. 3. Kezar pond, 2,065 acres, with a dam 5 feet high. 4. Watchic pond, 425 acres, range, 4 feet. 5. Horn pond, 150 acres; range, 7 feet. 6. Great Ossipee pond, in New Hampshire, 3,809 acres; range of 3 feet controlled. 7. Silver lake, about 400 acres; range, 4 feet.

Other ponds, not belonging to the company, are dammed and contribute to render the flow constant. According to Wells, nine ponds connected with the Little Ossipee river, a tributary of the Saco, aggregate 8.3 square miles in area; twelve ponds connected with Great Ossipee river aggregate 15.25 square miles; and twenty or more other ponds connected with the Saco aggregate 24.25 square miles. Many of the above are dammed, and others easily could be.

Above Saco the next power is at Union falls, 12 miles distant by the river. It is owned by the Saco Water-Power Company, which built a stone dam there in 1856, and uses it simply as a reservoir. The fall is 15 feet, and is entirely unoccupied. The gates are shut every night to save the water. The drainage area above measures about 1,677 square miles, and the minimum power during twenty-four hours would probably be not less than 400 horse-power on a fall of 15 feet. In the low season of ordinary years the power would probably be about 750 horse-power on the same fall. Below the dam the fall continues for half a mile, the fall in that distance being 8 or 9 feet. The pond is about 2 miles long, at the head of which is Salmon Falls, the next power. A wooden dam 20 feet high once stood here, but has been destroyed, and no power is now utilized. The fall is 62 feet in about 3,500 feet, over a narrow bed of solid rock. I should roughly estimate the power about as follows:

Estimate of power at Salmon Falls.

State of flow (see pages 8–10).	Drainage area.	Flow per second.	Horse-power available (gross) during twenty-four hours.		
	Sq. miles.	*Cubic feet.*	1 *foot fall.*	20 *feet fall.*	62 *feet fall.*
Minimum	1,628	235	26.7	534	1,655
Minimum low season		300	34.1	682	2,114
Maximum, with storage		975	110.8	2,216	6,870
Low season, dry years		340	38.6	772	2,393

The facilities for the utilization of this power are said to be excellent, and a large supply of good granite is within 2 miles. The falls are 15 miles from Portland, and within 1¼ mile of the Portland and Rochester railroad.

The next power is at Bar Mills falls, 1⅓ mile by the river above the last power, where the fall is 18 feet in 1,000 feet, of which about 12 feet are used by saw-mills. The available power per foot fall is about the same as at the falls below, for which see the previous table. The facilities for utilization are good and the location is excellent. The railroad crosses the river near the falls, which are 15 miles from Portland and 10 miles from Saco.

Five miles up the river is the next site, Moderation falls, at West Buxton village. The fall is 14 feet in 600 feet, the bed being rock and the banks very favorable. The power is partially improved, and is used by two woolen factories and some other mills. I estimate the power available about as follows:

Estimate of power at Moderation and Bonny Eagle falls.

State of flow (see pages 8–10).	Drainage area.	Flow per second.	Horse-power available (gross) during twenty-four hours.		
	Sq. miles.	*Cubic feet.*	1 *foot fall.*	14 *feet fall.*	48 *feet fall.*
Minimum	1,578	225	25.6	358	1,229
Minimum low season		290	33.0	462	1,584
Maximum, with storage		950	108.0	1,512	5,184
Low season, dry years		325	37.0	518	1,776

These falls are 18 miles from Portland, 14 miles from Saco, and 5 miles from the nearest station on the Portland and Ogdensburg railroad.

The next power is 1¼ mile above, at Bonny Eagle falls. The fall here is 48½ feet in a distance of half a mile, and 25 feet within 800 feet. "The water of the river divides at the head of the falls, and runs in two channels to the foot of the falls, forming an island containing about 60 acres. By the main or western channel the water descends through a narrow passage bounded by rocks, in a succession of falls and rapids, while by the other or eastern channel the descent, though rapid, is continuous." The banks are favorable for the construction of canals and mills, and the power is partially improved by saw-mills. That available is estimated in the previous table. These falls are 6 miles from the nearest railroad station.

The next power is about 5 miles above, and known as Limington falls. The fall is 65 feet in about 1,800 feet, and the width of the stream 250 feet. The falls are partially improved. One mile above are Union falls, 26 feet in a quarter of a mile. Just above are the Steep falls, 40 feet in three-quarters of a mile, partially improved. At these three falls, which naturally belong together, we may estimate the power about as follows:

Estimate of power at Steep falls.

State of flow (see pages 8–10).	Drainage area.	Flow per second.	Horse-power available (gross) during twenty-four hours.				
	Sq. miles.	*Cubic feet.*	1 *foot fall.*	65 *feet fall.*	26 *feet fall.*	40 *feet fall.*	15 *feet fall.*
Minimum	1,375	206	23.4	1,520	608	936	351
Minimum low season		264	30.0	1,950	780	1,200	450
Maximum, with storage		825	93.7	6,090	2,436	3,748	1,405
Low season, dry years		300	34.1	2,216	887	1,364	511

Four miles above are Highland rips, 15 feet fall in 40 rods. This site was unimproved at the time of Wells report. The power may be estimated by comparing with the above table, as the quantity of water is about the same. The next large power is in Hiram and Baldwin, where there is a heavy fall. Two and a half miles below Hiram bridge are the Great falls, where the total fall is 72 feet in 55 rods, the bed and banks being solid rock The facilities for utilization are said to be good. The falls are above the mouth of the Great Ossipee river, and the flow is consequently more variable than below. Above the falls the country is flat, and a very large reservoir could easily be formed, for a dam 6 feet high at the head of the falls would, it is said, deaden the current for nearly 15

miles. There are also 15 or 20 square miles of lake or swamp surface above this point, which could, if desired, be used as reservoirs to a much greater extent than they now are. The falls belong to the Saco Water-Power Company, and are unimproved. The available power may be estimated about as follows:

Estimate of power at Great Falls.

State of flow (see pages 8-10).	Drainage area.	Flow per second.	Horse-power available (gross) during twenty-four hours.	
	Sq. miles	*Cubic feet.*	*1 foot fall.*	*72 feet fall.*
Minimum	859	100	11.3	814
Minimum low season		120	13.6	979
Maximum, with storage		440	50.0	3,600
Low season, dry years		135	15.3	1,100

Half a mile below the foot of Great falls is a fall known as "Great Falls' Wife", amounting to 8 or 10 feet in half a mile, and unimproved.

The next power is Swan's falls, in Fryeburg, with a fall of 8 feet. Above this point, in its course through New Hampshire, the Saco is a rapid mountain stream, flowing over a rocky or gravelly bed, bordered in places by extensive alluvial lands. Numerous sites for power could be found, but the chief objection to the use of power is the very variable flow of the river, which is a torrent at times, and at times a mere brook. It supplies no power in this part of its course.

The first important tributary of the Saco river is the Little Ossipee, which enters between Bonny Eagle and Limington falls. Some tributaries below have large falls and run small powers, but are not permanent. Little Ossipee river has its source in Balch pond, partly in Maine and partly in New Hampshire, and flows in an easterly direction, draining about 158 square miles, its length being about 30 miles. It has tributary to it a number of ponds, the nine principal ones having an aggregate area of 8.3 square miles, and three of them being dammed. Considerable additional storage is feasible. The stream has a number of good sites:

1. Chase's falls, 35 feet in 40 rods, near the mouth, and partially improved.
2. Nason falls, 3 miles above, 60 feet in 1,320 feet, partly improved.
3. Some rapids in Limerick and Waterborough, partly improved. Above these are a number of falls, some utilized by mills of various kinds. The flow of the stream is quite constant, and its power excellent. Balch pond, at the head, which covers 2½ square miles, is dammed, and can be drawn down 8 feet.

The next tributary is Great Ossipee river, which has its source in Ossipee lake, in Carroll county, New Hampshire, at an elevation of 408 feet above the sea. From this lake, which covers about 3,809 acres, and is dammed to a height of 3 feet, the river flows eastward, its length being about 15 miles in a straight line, and its drainage area measuring about 470 square miles, of which about 370 square miles lie in New Hampshire. Its drainage basin is largely level and sandy, especially that part lying in New Hampshire. The total fall of the stream, however, is 142 feet, as will be seen by comparing with the table on page 71. A number of lakes, besides the one mentioned, are tributary to the river, twelve of the principal ones (including Great Ossipee) having a total area of 15.25 square miles (Wells), and seven of them being dammed to heights varying from 3 to 12 feet. The flow is consequently quite uniform, and the freshets not severe. The stream is accessible at both ends by two railroads.

Great Ossipee offers a number of good powers. Half a mile above the mouth a fall of 10 feet is available; at Warren's mill is a similar fall; between this and Kezar falls are two sites, with 12 feet each, and at Kezar falls the fall is 50 feet in a mile, partially improved. At French's falls a fall of 9 feet occurs, and at South River falls there is one of 8 feet. There are probably other available sites, but none are mentioned by Wells.

Judging from the facts at my command, I should estimate that the minimum flow of the stream at its mouth would be about 70 cubic feet per second, affording about 8 gross horse-power per foot fall. In ordinary years the flow in the dry season, however, would be much in excess of this figure.

No very important tributaries enter above the Ossipee. Some outlets of ponds in Denmark and Fryeburg afford excellent sites, with very constant power and large fall, for the details of which we must refer to Wells' report. The tributaries in New Hampshire, like the main stream, although having very large falls, are unreliable on account of their variable flow.

It is evident from the above that the Saco, in its lower parts, is a very good stream for power, offering almost every advantage that could be desired.

THE PRESUMPSCOT RIVER.

This river, which will be found to resemble in many respects the Winnipiseogee river in New Hampshire, is the outlet of Sebago lake, a beautiful sheet of water, covering an area of some 50 square miles, in Cumberland county, and lying at an elevation of 251 feet above the sea. From this lake the stream flows in a southeasterly direction, entering Casco bay about 4 miles north of Portland, its length being about 22 miles, and its drainage area measuring about 726 square miles. It receives no very important tributaries, and the principal towns it passes are Westbrook, Saccarappa, and Cumberland Mills. The fall of the stream is, according to the above, 251 feet in 22 miles, or 11.4 feet per mile. The drainage area of the lake measures about 500 square miles, and the upper part of the basin has an elevation of 800 or 900 feet, sloping gradually toward the south. The northern part is well wooded, while the southern part is mostly cleared. The bed and banks of the stream are in every way favorable for power, but its greatest advantage is its very constant flow. The following reservoirs are given by Wells as tributary to the river:

Reservoirs of the Presumpscot.

Name.	Approximate area.	Storage (1869).	Additional storage feasible.
	Sq. miles.	*Feet.*	*Feet.*
Sebago lake	50	(In 1882) 6	.....
Trickey pond	0.75	.....	.....
Peabody pond	1.50	.....	.....
Brandy pond	1.25	.....	.....
Long pond	12	Dam	(*a*)
Pleasant pond	2.25	.....	.....
Panther's pond	2.75	.....	(*b*)
Rattlesnake (two ponds)	2.75	.....	.....
Little Sebago pond	5	7	5
Crotched pond	2.75	5	2
Adams' pond	0.30	4	2
Holt's pond	0.30	Dam	.....
Stearns' pond	1	.....	4
Anonymous pond	0.75	Dam	.....
Wood's pond	1.50	6	(*c*)
Thomas pond	1.15	Dam	.....
Long pond, Waterford	1	.....	.....
Bear pond	0.75	1	4
Moose pond	0.75	.....	.....
Songo pond	0.85	.....	.....
Stone (two ponds)	1.10	.....	.....

a Several feet. *b* High dam feasible. *c* Outlet can be lowered 3 feet.

The total number of lakes is 45, with a total area of 97 square miles, or 1 square mile to every 7.5 square miles of basin. The 23 named above aggregate 90.45 square miles in area. No large stream that we have yet met with, except the Winnipiseogee river, has so large a proportion of its basin taken up by lake surface. The flow is therefore very constant, the extreme range of water on the dams at Westbrook being only 4 or 5 feet; and the natural constancy of the flow is much increased by the artificial storage, especially that on lake Sebago. A stone dam 20 feet high, built in 1878 and 1879, raises the level of the lake 6 feet, that depth being, therefore, under control, and the dam being used only for regulating the flow. This dam is controlled by the mill-owners below, under the name of the Presumpscot Water-Power Company. A depth of 6 feet over 50 square miles is probably sufficient to render available the maximum flow permanently possible, so that in the case of this river the "maximum with storage" is reached. Following the river downward, the powers on it are as follows:

The dam at the outlet could easily be used as a source of power, the fall varying from 20 to 14 feet. Eel Weir falls, below, have a fall of 12 feet; Hubble falls, lower down, have 8 feet; Steep falls, 12 feet; Hardon's falls, 11 feet 1 mile from the lake; Great falls, 1 mile below, 16 feet utilized; Whitney's falls, half a mile below, 14 feet; Island falls, half a mile below, 10 feet; Dundee falls, nearly a mile below, 18 feet; Leavitt's falls, nearly a mile below, 12 feet; Gambo falls, a mile below, 16 feet; Little falls, a mile below, 17 feet; Mallison falls, half a mile below, 18 feet.

Of these falls some are partially improved, but the entire power available is used in few cases, if any.

The next power is at Saccarappa, where there are two dams. The uppermost is of wood, 150 to 200 feet long and 9 feet high, ponding the water for 5 miles. The fall is 12 feet, and the power is used on both sides of the river. On one side is the Westfield Manufacturing Company's cotton-mill, with about 300 horse-power, and on the other are two cotton-mills and two saw-mills, using in all about 400 horse-power. Full capacity is always to be had. The

lower dam is of wood, about 400 feet long and 12 feet high, making a pond of only a few hundred feet. The fall is 19 feet, and on the left bank the Westfield Manufacturing Company uses 500 horse-power, while on the opposite side are a number of small mills of various kinds, using, it is said, about 800 horse-power. This power is excellent in all respects.

The next power is at Cumberland Mills, 5 miles from Portland and a mile below Saccarappa. A dam of wood and stone, 12 feet high and 250 feet long, affords a fall of 20 feet, used at the paper-mills of S. D. Warren & Co., where the power in use is 2,000 horse-power. This power can be obtained about nine months of the year, and during the rest of the time steam-power to the extent of 750 horse-power is used. In dry weather there is no waste, as the mills run night and day.

Below this power there is one other, at the head of tide, known as Presumpscot Lower falls, owned by S. D. Warren & Co., but it is not used. It is 7 or 8 miles below, and the fall is said to be about 15 feet at high tide. Formerly this site was utilized.

As regards the power available at these sites, it may be regarded as practically about the same in a dry season from the lake to the mouth of the river, for the small tributaries which come in between those points, though carrying large quantities of water at times, are in dry weather often mere brooks. The power available in a dry season is, therefore, that derived from the storage on the lake, and in estimating it we have only to consider how much water can be collected from the water-shed of the lake. The annual rainfall on this water-shed is, on the average, about 44 inches; the minimum probably about 27 inches. The observations on lake Cochituate, near Boston, show that on that water-shed about 40 per cent. of the rainfall can be collected. From the character of the drainage basin of lake Sebago I should think that about the same proportion could be collected there, so that, if this is true, the minimum quantity available during an entire year would be about 11 inches. Probably this is all that could be permanently depended upon, though for a number of years in succession a considerably greater quantity could be collected. In order to insure the uniform discharge of this quantity from the lake, the latter must be capable of storing 3 or 4 inches on the water-shed. The storage depth of 6 feet would probably be sufficient for this purpose, unless the banks are very flat. Taking, then, 11 inches as the maximum with storage, we have a discharge of 0.8 cubic foot per second per square mile, or a total discharge, uniformly through the year, of about 400 cubic feet per second. This quantity would afford a gross power of about 45 horse-power per foot fall, from which the power at the different falls can be calculated. Could the flow for twenty-four hours be discharged during the eleven working hours, the power would be increased in the proportion of 24 to 11.

It is evident from the previous pages that few streams offer the advantages for power that the Presumpscot affords. The total fall of the river being 251 feet, the total power available in its course would be 11,295 horse-power continuously, or 24,631 horse-power during eleven hours. Of this only about 6,000 horse-power are now used.

The tributaries of the river are not of much importance, but some of them are outlets of ponds and have considerable fall, thus affording excellent constant powers, though small. Others are variable in flow and of little value. Little Sebago pond is dammed, and on its outlet are several good powers. Among the tributaries of the lake, similar streams are found; but to enumerate all of them, and name the powers upon them, would require more time and space than are available. Suffice it to say, that numerous streams are found—small ones, to be sure—which afford storage facilities quite sufficient to render almost the maximum with storage available. The longest and largest tributary of the lake is Crooked river, which is "estimated to be 42 miles long", and which affords considerable power. Adding up the falls on it which are mentioned by Wells, the total is 109 feet, only part of which is used. Its most important site is near its mouth, at Edes falls, where the fall is 36 feet.

THE ANDROSCOGGIN RIVER.

The Androscoggin river has its sources partly in Maine and partly in New Hampshire. The river is entitled to its name really only southward from the confluence of the Magalloway river (which has its source in the extreme northwestern corner of Maine, almost on the New Hampshire and Canada lines), and the outlet of the range of lakes which, commencing with lake Umbagog, extends in a northeasterly direction for 30 miles in Maine. The junction of the two streams referred to is about a mile from Umbagog lake, in Coos county, New Hampshire, and from this point the Androscoggin pursues a general southerly course for about 28 miles, measured in a straight line, or 38 miles along its course, when it bends to the left, and flows nearly east for about 20 miles, entering Oxford county, Maine. It then deflects toward the north, and flows north of east for over 30 miles, when, in the southern corner of Franklin county, just above Livermore falls, it bends sharply toward the right, and for over 30 miles flows almost directly south, traversing Androscoggin county. For the rest of its course for about 24 miles it flows southeast, emptying into Merrymeeting bay, after forming for several miles the boundary between Cumberland and Sagadahoc counties. The total length of the stream proper, along its course, is probably about 160 miles, but

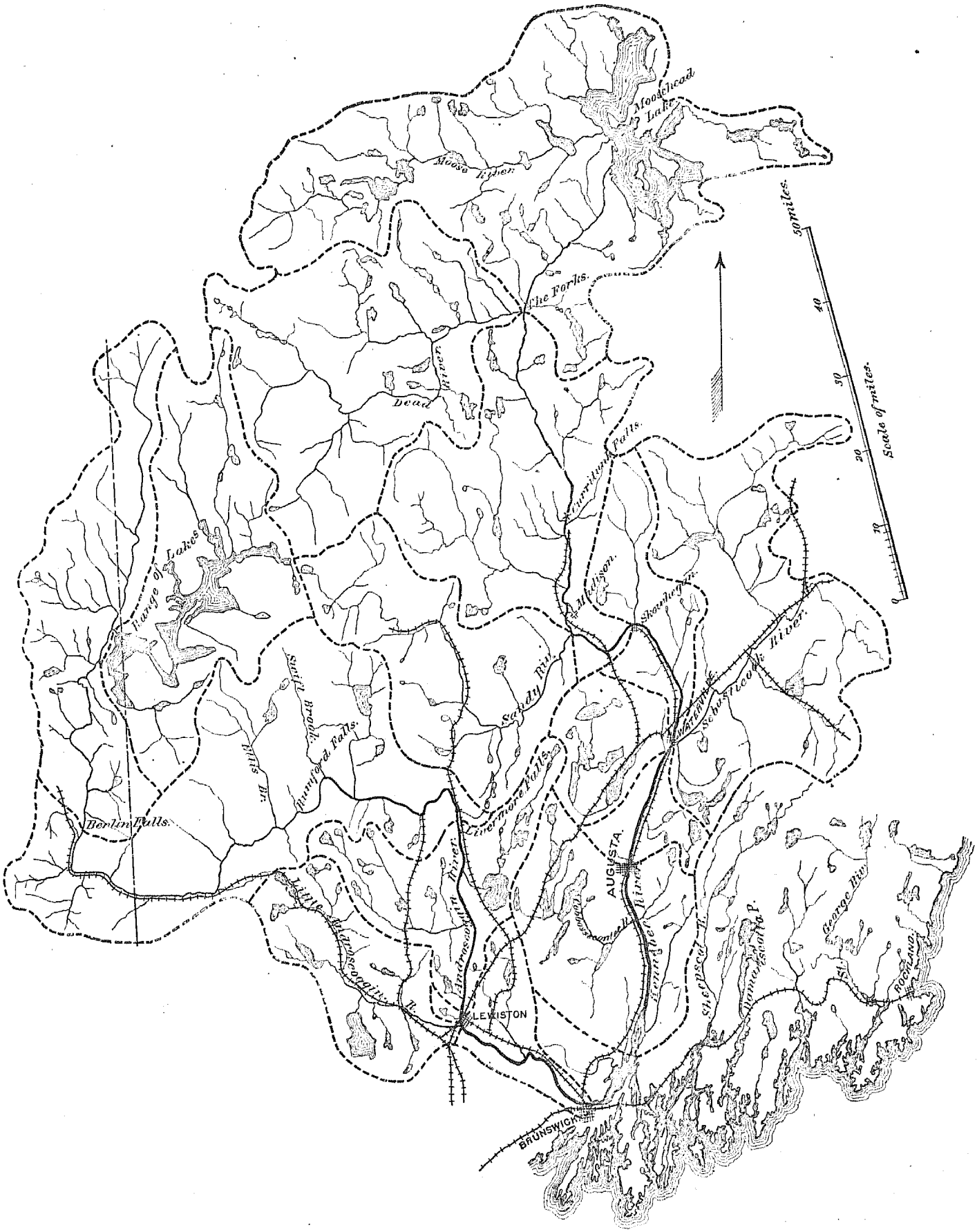

Fig. 20. MAP OF THE DRAINAGE BASINS OF THE ANDROSCOGGIN AND KENNEBEC RIVERS.

from the remotest sources of the Magalloway the distance is 200 miles. The basin is about 110 miles long, with a maximum width of 70 miles. The total area drained measures 3,698 square miles, of which 2,967 lie in Maine and 731 in New Hampshire. The principal tributaries are given in the following table:

Name of stream.	Where received.	BASIN.			Length of stream. (a)
		Length. (a)	Breadth. (a)	Area.	
		Miles.	*Miles.*	*Sq. miles.*	*Miles.*
Little Androscoggin river (from right bank)	Auburn	30	15	381	40
Twenty-Mile river (from the right bank)	Turner	19	13	189	25
Sabattus river (from the left bank)	Lisbon	16	7	100±	
Dead river (from the left bank)	Leeds	22	5	138±	28
Webb's river (from the left bank)	Dixfield	17	11	169	23
Swift river (from the left bank)	Mexico	22	8		24
Ellis river (from the left bank)	Rumford	18	13	175	25
Magalloway river (headwaters)		37	18	416	50
Outlet of lakes		50	20	760	53

a Wells.

The drainage basin of the Androscoggin is, as a whole, probably more elevated than any other hydrographic basin on the Atlantic coast, the sources of the Magalloway lying at elevations of from 2,600 to 2,900 feet, while the Umbagog lakes are from 1,256 to 1,511 feet above the sea. The upper part of the basin is very broken and mountainous, and very thickly wooded. In its course in New Hampshire the stream flows almost directly toward the highest and most massive range of the White mountains, approaching within 10 miles of the summit of Mount Washington, but at Gorham this barrier turns the stream abruptly toward the east. Toward the lower part of the basin the mountainous character of the country is lost, and the forests become less extensive. The fall of the stream, however, is everywhere large, averaging for the stream proper about 7.85 feet per mile, or larger than that of any large stream on the Atlantic coast which we have yet considered. The following table shows the slope more in detail:

Slope of the Androscoggin river.

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Mouth	0	0			
			75	600	8 0
Head of Rumford falls	75	600±			
			25	20	0.8
Bethel	100	620			
			14	70	5.0
State line	114	690			
			14	358	25.6
Head of Berlin falls	128	1,048			
			32	208	6.5
Head of river proper	160	1,256			
			26	344	13.2
Parmachene lake	186	1,600			
			13	625	48.1
Magalloway lake	199	2,225			

The bed of the river, like that of all the streams on the southern slope of Maine, is generally rock at the places where falls occur. The banks are generally high, there being few low grounds subject to inundation. The intervales are narrow. The flow of the stream is quite variable, on account of the mountainous character of the upper two-thirds of the basin, but the great reservoirs connected with it have of late years been considerably improved, and its flow therefore rendered much more constant than it formerly was. The extreme range from high to low water is 10 feet at Brunswick, 8 feet at Lewiston, 20 at Rumford falls, and 28 at Bethel, showing clearly the increasing variability toward the mountain region.

The number of lakes in the basin is 148, of which 133 are in Maine and 15 in New Hampshire. The following tables have been copied from Wells' report, and the numbers have been liable to change since that report was written:

Principal reservoirs of the Androscoggin river and its tributaries.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Taylor pond	Little Androscoggin river.	2.00	4	.....
Upper Range pond	....do	0.85	4	.....
Middle Range pond	....do	0.55	4	.....
Lower Range pond	....do	0.50	4	.....
Tripp pond	....do	1.25	No dam.	4
Thompson pond	....do	8.00	6	.....
Hogan and Green ponds	....do	1.40	Dam	.....
Saturday pond	....do	0.75	9	.....
Moose pond	....do	0.80	No dam.	10
Matthews pond	....do	0.25	.....	.....
Great Pennessewassa pond	....do	2.50	12	.....
North pond	....do	0.30	.....	15
Little Pennessewassa pond	....do	0.30	No dam.	10
Sand pond	....do	0.30	15	.....
Moose (Paris) pond	....do	0.35	No dam.	(a)
Mud and Hicks ponds	....do	0.55	...do	(a)
Bryant's pond	....do	0.60	Dam	(?)
Indian pond	....do	0.30	...do	.....
Twitchell pond	....do	0.35	...do	.....
Twenty-one ponds		21.90	.....	.....
Pleasant pond	Twenty-Mile river	0.60	.....	.....
Brettun's pond	....do	0.30	Dam	.....
Bear pond	....do	1.05	...do	.....
South pond	....do	0.55	.....	.....
North pond	....do	0.75	.....	.....
Bungermuck pond	....do	0.80	8	.....
Labrador (two) ponds	....do	0.35	4	(?)
Pleasant (Sumner) pond	....do	0.25	3	.....
Nine ponds		4.65	.....	.....
Androscoggin pond	Dead river	5.75	.....	*b* 6
Wing's pond	....do	1.00	6 to 8	*c* 2 to 4
Lovejoy's pond	....do	1.00	6 to 8	*c* 2 to 4
Pond above Lovejoy's	....do	0.20	6 to 8	*c* 2 to 4
Crotched pond	....do	2.25	4	*a* 2 to 4
Parker's pond	....do	3.10	3	4
David's pond	....do	0.80	Dam	.....
Tilton's pond	....do	0.25	.....	.....
Flying pond	Dead river	1.25	8	.....
Kimball's pond	....do	0.25	.....	.....
Mount Vernon pond	....do	0.35	Dam	(a)
Eleven ponds		16.20	.....	.....
Webb's pond	Webb's river	3.00	.....	9
Swift River ponds (three)	Swift river	2.25	.....	.....
Ellis pond	Ellis river	1.25	Dam	.....
Little Ellis pond	....do	0.85	...do	.....
Six ponds		7.35	.....	.....
Sabattus pond	Androscoggin river.	4.00	Dam	.....
Wilson pond	....do	3.00	8	2 or 3
Little Wilson pond	....do	0.20	Dam	.....
Bates pond	....do	0.30	.....	.....
Long pond	....do	0.35	4 to 5	2
Round pond	....do	0.25	4 to 5	2
Moosehill pond	....do	0.25	.....	.....
Whitney pond	....do	1.00	Dam	(?)
Forest pond	....do	0.25	...do	.....
Worthley pond	....do	2.00	3	5
Concord (two) ponds	....do	0.65	.....	(a)
North pond	... do	0.85	.....	4
South pond	....do	0.80	.....	.....
Burnside pond	....do	1.50	.....	.....
Umbagog lake	....do	18.00	14	.....
Welokenebacook lake and the pond below.	....do	11.15	20½	.....
Molechunkemunk lake	....do	10.00	77	.....
Mooselucmaguntic lake	....do	21.00	14	.....
Capsuptic lake	....do	3.00	14	.....
Rangeley lake	....do	14.00	10	.....
Quimby pond	....do	0.40	.....	4
Gull (two) ponds	....do	0.80	.....	.....
Long pond	....do	1.00	.....	10
Various small ponds	....do	1.00	.....	.....
Parmachene lake	Magalloway river	3.50	.....	.....
John's pond	Kennebago river	1.50	.....	.....
Kennebago pond	....do	4.00	.....	(a)
Thirty-six ponds		105.85	.....	.....

a Several feet. *b* With large damage. *c* By cutting down outlet.

The foregoing 83 principal ponds cover 156.25 square miles, but the aggregate number of lakes is 148, and the area of lake surface is about 213 square miles, or one-seventeenth of the area of the basin.

No detailed data are at hand regarding the various reservoirs, except for the large lakes at the head of the river. The following table is from Wells' report:

Name.	Distance from the preceding lake.	Height above tide.	Difference of level.
	Miles.	*Feet.*	*Feet.*
Umbagog	.....	1,256	.....
Richardson (*a*)	5	1,456	200
Mooselucmaguntic	1	1,486	30
Rangeley	2	1,511	25

a Molechunkemunk and Welokenebacook are sometimes classed together as Richardson lake.

These lakes have long been used for log-driving, but the storage on them is now controlled by the Union Water-Power Company, of Lewiston. The upper dam, between Rangeley and the lake below, was built in 1881, and is known as the "Rangeley" dam. It is 10 feet high, and 10 feet can be drawn from the lake. The next dam,

known as the "upper" dam, is below Mooselucmaguntic lake, and was built 20 years ago, or thereabout. It is 1,435 feet long and about 20 feet high, controlling 14 feet on the lake. The next dam is just above Umbagog lake, and is known as the "middle" dam. It was built about the year 1879, and is 600 or 700 feet long. It is said to control a depth of 20½ feet over the lake. The lowest dam is at Errol, New Hampshire, below the mouth of the Magalloway, and is 14 feet high, controlling that depth on lake Umbagog. No power is used at these dams except a small saw-mill at the upper dam, and a grist- and saw-mill at the Errol dam. The drainage area of the outlet stream from these lakes measures about 760 square miles. It seems probable that the capacity of the lakes is more than sufficient to render available the maximum with storage over this area, and it is clear that they are of immense benefit to all the mills below. Assuming that they render available the maximum with storage over their drainage basin, and taking this as corresponding to 15 inches of rainfall, on account of the dense forests with which they are encircled, they would allow of the uniform discharge, throughout the year, of 836 cubic feet per second, a quantity which would afford, taking account of losses by evaporation, on the total fall of 1,256 feet to tide-water, a gross power of 107,000 horse-power, and at Lewiston alone over 4,000 horse-power. These figures might be varied greatly according to the manner of controlling the flow. The facilities, then, for storage in the basin of the Androscoggin are exceptionally fine, and the effect of the reservoirs is to offset to a great extent that of the mountainous character of the country.

The mean annual rainfall over the basin is about 46 inches, of which 11 fall in spring, 11 in summer, 14 in autumn, and 10 in winter. This distribution is in itself favorable to constancy of flow, and unfavorable to a large discharge, but it is evident that in view of the dense forests covering the upper part of the basin, and its very mountainous character, a larger proportion than usual—I should think 50 per cent. or over—will nevertheless be discharged by the stream. The estimates given beyond may seem high to some, but they may be explained by these remarks.

The Androscoggin is quite easily accessible at most points, being followed, as the map shows, by various railroads.

From its mouth to the foot of the falls at Brunswick, a distance of 6 miles, the river is tidal and navigable, the rise of the tide at that point being 2½ feet, and the navigable depth at high water 5½ feet. At Brunswick there are two dams. The upper is principally of wood, but partly formed of the natural rock, and is 15 feet high, ponding the water about 700 feet. The fall is 16 feet, used only on the Brunswick side by the Cabot Manufacturing Company's cotton-mill, with 800 horse-power. Full capacity can always be obtained, and there is always a waste. The lower dam, a few rods below, is also about 15 feet high, and power is used on both sides, the fall varying with the tide from about 11 to 14 feet. On the left bank (in Topsham) the Bowdoin Paper Manufacturing Company uses perhaps 750 horse-power, and a small amount of power is used by a grist-mill, a saw-mill, and a sash, door, and blind factory. The method of distributing and owning the power is crude and indefinite. There is sometimes a lack of full capacity, on account of the water being held back by the mills above Brunswick, and during three months of the year there is no waste in the day-time, except what leaks through the dam, which is old and defective. On the Brunswick side are the Androscoggin Pulp Company, two saw-mills, a box-mill, and a grist-mill. Full capacity is obtained during about nine months. During the rest of the year there is lack of water during the day-time, but excess at night.

The falls at Brunswick are known as the "Pejepscot" falls, and include, besides the two pitches just described, a third, about 2,000 feet above the lower one, the fall there being between 11 and 12 feet, once used by saw-mills, but now unutilized. The total fall is therefore about 40 feet. Wells states that by raising a dam at the upper falls, which could be done without causing much flowage, the fall at the upper site could be increased to 25 feet, making the whole fall 54 or 55 feet. The amount of power available depends on how it is used at Lewiston, the next large power above. Probably the minimum flow during eleven hours, if it could be concentrated into that time, would be not less than 2,800 cubic feet per second, affording a gross power of 318 horse power per foot fall. It seems probable that during ordinary years the flow during working hours would always be as much as 3,000 cubic feet per second, equal to 410 gross horse-power per foot. The power is an excellent one in all respects, and if a large enough pond could be obtained would probably afford, on a fall of 55 feet, say, 22,000 horse-power at all times in ordinary years. Three miles above Brunswick is a site where a small fall could be used, but which may become important as a site for a dam to be used for storage. The topography at Brunswick is in every way favorable for a more extensive utilization of the power.

The next power above Brunswick is at Lisbon falls, 11 miles below Lewiston. There are two falls, the total descent being, according to Wells, 33 feet in 1,800 feet. A dam is built at the foot of the upper falls, and is 10 feet high. The fall used is 13 feet at the woolen-mill of the Worumbo Manufacturing Company, where a power of about 400 horse-power is utilized, with a waste at all times. At the lower falls there is now no dam, and no power is utilized. The topography is in every way favorable for the complete utilization of the power. The minimum power available continuously may be estimated at about 142 horse-power per foot fall, or 4,686 horse-power on a fall of 33 feet; while during ordinary years about 180 horse-power per foot fall could be obtained, or 5,940 horse-power on a fall of 33 feet. Whether a pond could be obtained sufficient to store the water at night I am unable to say. This power, with that at Brunswick, will compare favorably with any powers we have yet met with, and they deserve further examination. Excellent building materials may be obtained in close proximity to both places.

The next power is 2 miles below Lewiston falls, known as the "Lewiston Lower Power", not improved. The fall available is not stated by Wells.

The next power, and the most important one on the river, is at Lewiston, 40 miles by the river from the ocean, and just above the mouth of the Little Androscoggin. The bed is solid rock, and the natural fall is 38 feet in a distance of 600 feet, but a dam at the head of the falls, with an average height of 12 feet, makes the available fall about 50 feet. The pond is short—only about 1½ mile in length—and is not sufficient, even with those above, to store all the water at night in dry weather. Power is used on the left bank, the fall being used on two levels. The fall from the upper to the lower is about 28 feet, and is used by the following mills:

1. Lincoln mills, owned by the Franklin Company; cotton-mills; 265 cubic feet of water per second; 840 gross horse-power.
2. Bates Manufacturing Company's cotton-mill; 698 cubic feet per second; 2,160 gross horse-power.
3. Hill Manufacturing Company's cotton-mill; 544 cubic feet per second; 1,685 gross horse-power.
4. Saw-mill; 27 feet fall; 50 horse-power.

In addition, the following two mills take water from the upper level, but do not discharge into the lower level:

5. Androscoggin cotton-mills; 37 feet fall; 387 cubic feet per second; 1,628 gross horse-power.
6. Lewiston bleachery and dye-works; 34.74 feet fall; 131 cubic feet per second; 516 gross horse-power.

The water from 5 and 6 is used by the following two:

7. Androscoggin cotton-mill (lower mill); 12.50 feet fall, 483 cubic feet per second; 686 gross horse-power.
8. Cumberland woolen-mill; 12.50 feet fall; 40 (?) cubic feet per second; 57 gross horse-power.

The fall from the lower level to the river is about 22 feet, and is used by the following mills:

9. Lewiston cotton-mills; 20.9 feet fall; 445 cubic feet per second; 1,059 gross horse-power.
10. Continental cotton-mills; 21.77 feet fall; 951 cubic feet per second; 2,353 gross horse-power.

These last mills, however, do not receive the water from the Lincoln mill, which goes directly to the following:

11. Home Manufacturing Company's woolen-mill; 17.7 feet fall; 90 cubic feet per second; 181 gross horse-power.
12. D. Cowan & Co.'s woolen-mill; 18.4 feet fall; 95 cubic feet per second; 199 gross horse-power.

There is also, on the lower level, a mill belonging to the water-power company, in which small amounts of power are leased, nominally at so much per horse-power, but no measurements of quantity are made. A new mill is also being built on the upper level, to use a fall of 50 feet, and about 100 horse-power.

13. Finally, the city of Lewiston derives its water-supply from the river, taking the water from above the dam, and pumping, by water-power, "so much water every twenty-four hours as 600 horse-power with a head of 25 feet will pump, to a height of 220 feet, twelve hours in every twenty-four." The water from the wheels is discharged into the river. If the 600 horse-power refers to net power, the quantity of water which can be pumped, according to the above, will be 19 or 20 cubic feet per second during twelve hours; and the quantity of water used for pumping would be about 282 cubic feet per second, making in all some 300 cubic feet per second.

The power at Lewiston is controlled by the Union Water-Power Company, organized September 18, 1878, and succeeding the Franklin Company in the ownership of the canals and water-privileges. The old water-power company was incorporated in 1849, and the first improvements were begun in 1850. The dam is a substantial stone structure, extending in a zigzag direction from rock to rock. The upper level of the canal is about 4,200 feet long, the lower level, 1,600. The company leases power by the horse-power, rates varying, according to circumstances, from $2 50 to $12 50 per horse-power per annum, being cheaper for the original corporations. These prices are for the net power on the shafts, being reckoned in all cases as 75 per cent. of the gross power due to the quantity of water and the fall. Measurements are not made regularly, but have lately been made, once for all, to determine the quantity of water used by each mill. Before these were made, the power used was only guessed at. The company obtained control of the lakes at the head of the river in 1877, and has since improved them, their only use previously having been for log-driving purposes. Before their purchase by the company the mills were sometimes short of water in dry seasons, but now full capacity is secured the year round, though in dry weather there is no waste during the day-time. No steam is used in the mills which have been named. They run eleven hours a day.

It will be seen from the above that the total quantity of water taken from the upper level is in the neighborhood of 2,350 cubic feet per second, or would be if the city were to pump all it is entitled to. The daily consumption of water in Lewiston for the year 1881 was 1,016,260 gallons, or about 135,500 cubic feet, or, supposing this pumped in twelve hours, about 3½ cubic feet per second, thus requiring a total quantity of water equal to about 50 cubic feet per second. The total quantity of water taken from the upper level is thus, at present, about 2,100 cubic feet per second during about eleven hours; and this may be taken as the minimum flow of the stream, affording a gross power of about 238 horse-power per foot fall, or, on a total fall of 50 feet, 11,900 horse-power during eleven hours. This power is, of course, not realized, as the total fall is not completely utilized, but over 11,000 gross horse-power are now in use. Were the pond of greater capacity, the power available during working hours would be still more increased. No trouble is experienced with freshets, the range of water on the dam being but 8 feet. The drainage area above Lewiston is 3,120 square miles, and the rainfall is about the same as given on page 79. The city is within 6½ hours of Boston and 1½ hour of Portland, and the power is, no doubt, one of the finest in New England.

Two miles up the river, at Deer rips, there is an unimproved power, stated by Wells as equal to 2,500 horse-power.

Ten miles above Lewiston are Turner Centre falls, with 12 feet fall and good location, but unimproved. The minimum power during twenty-four hours is probably not less than 100 horse-power per foot.

Sixteen miles above Lewiston are North Turner falls, where the fall is 13 feet, and the bed and banks are favorable. The minimum power during twenty-four hours is probably about 97 horse-power per foot, or 1,261 horse-power on a fall of 13 feet. Wells estimates it as 950 horse-power.

The next power is at Livermore Falls, where the natural fall is 22 feet in 30 rods. A dam at the head of the falls raises the water some 7 feet, making the total fall 29 feet; and Wells states that it may be raised 7 feet higher, making the total fall 36 feet. At present only a fall of 14 feet is used, for mills of various kinds, using only a small fraction of the power. The minimum power available during twenty-four hours is probably not less than 80 horse-power per foot fall. The power is said to be a very fine one, and to merit further development.

Half a mile above Livermore Falls are Otis falls, with a fall of 14 feet in 100 feet, altogether unimproved; and a mile and a half above are French's falls, with 10 feet, unimproved. The quantity of water at both is nearly the same as at Livermore Falls.

Three miles above Livermore Falls are Jay Bridge falls. Wells does not state the exact fall, but estimates on 30 feet. The bed and banks are of solid rock, and the location is said to be unsurpassed. The minimum power is about the same as at Livermore Falls. At present a fall of 12 feet is used, but this can no doubt be greatly increased.

At Capen's rips, in Canton, a fall of from 6 to 10 feet occurs in 160 feet, now unutilized, though the site is said to be a good one.

In Rumford we encounter the largest fall on the river, the descent being 162 feet in about a mile. The river is but 90 feet wide, the bed and banks are rock, but the latter suitable for building. A small fraction of the power is used. The drainage area above the falls is about 2,223 square miles, and in the following table I have estimated roughly the power available:

Estimate of power at Rumford Falls.

State of flow (see pages 8–10).	Drainage area.	Flow per second.	Horse-power available (gross), continuously.	
	Sq. miles.	*Cubic feet.*	*1 foot fall.*	*162 feet fall.*
Minimum	2,223	550	62.5	10,135
Minimum low season		620	70.0	11,340
Maximum, with storage		1,500	170.5	27,621
Low season, dry years		720	81.8	13,252

Wells estimates the power at 21,546 gross horse-power during working hours. This fall is about 75 miles from tide, and its head is about 600 feet above the sea. Wells estimates the low-season gross power from this point to tide at 85,200 horse-power during eleven hours, which is probably not too large, and a large proportion of which is no doubt available, owing to the favorable condition of the bed and banks. The falls are, unfortunately, 15 miles from the Grand Trunk railway, and therefore rather inaccessible.

The Androscoggin has some falls in New Hampshire, the principal one being Berlin falls, where the river falls nearly 200 feet in a mile. Little power, if any, is used at this place, though the available power is very large. From the state line up to these falls, in fact, there are continuous rapids, affording numerous sites; the stream, however, is much more variable here than lower down, and very little of its power is used.

It is evident from the foregoing that a large number of excellent powers are afforded by the Androscoggin river. If we compare it with the Merrimack we find its elevation, at the junction of its two headwaters, is over four times that of the Merrimack at Franklin, while its drainage area at that point is about the same. Its drainage area at its mouth is but little smaller than that of the Merrimack. Its theoretical power must therefore be considerably greater, and with prudent development there seems no reason why this river should not become one of the principal manufacturing streams of New England. Its reservoirs are not so extensive, nor so completely controlled as are those on the Merrimack, but its available storage is much larger than that used, so that the flow could no doubt be made more uniform were it considered expedient to go to the expense of doing so.

The first tributary of the Androscoggin which is met with as the river is ascended is Sabattus river, which empties from the left bank in Lisbon. It is the outlet of Sabattus pond, and has a large fall, but is not much utilized. The pond covers 4 square miles, and is dammed, so that the flow of the stream is quite constant. Wells mentions falls on this stream aggregating 130 feet, and states that at the lower site a power of 175 horse-power is used, with a fall of 10 feet. The stream seems an excellent one, though comparatively small.

The Little Androscoggin, which enters the Androscoggin from the west, just below Lewiston falls, is an important tributary. It takes its rise in Oxford county, and flows in a southeasterly direction for nearly 30 miles in a straight line, draining a total area of about 381 square miles. Its fall is large, and connected with it are a number of lakes and ponds, of which 21, with a total surface of 21.9 square miles, have been named on page 78. Many of these

being dammed, and used for regulating, its flow is therefore quite constant, and it is considered an excellent water-power stream. It is accessible at all points, being followed by the Grand Trunk railway for its entire length. The first power is at its mouth, the fall within three-quarters of a mile from the Androscoggin river being stated at 70 feet. A dam 10 feet high at the head of the falls affords a fall of 12 or 15 feet at a saw-mill, only a small amount of power being used. Half a mile below, a wooden dam, 30 feet high, affords a fall of 35 feet at a cotton-mill, using 400 horse-power, which can always be obtained. The power and mill are owned by the Little Androscoggin Water-Power Company. Of the total fall, from 10 to 20 feet are lost at times of extreme freshet in the Androscoggin, at which times an engine is run. Judging from the drainage area and the power above, the minimum available power during twenty-four hours would be about 500 net horse-power on a fall of 35 feet.

Wells estimates a minimum flow of 366 cubic feet per second during working hours, or 165 during twenty-four hours, the latter corresponding to a gross power of 18.75 horse-power per foot, 656 horse-power on a fall of 35 feet, and 1,312 horse-power on a fall of 70 feet, and the former corresponding to 1,431 horse-power on 35 feet, and 2,862 horse-power on 70 feet. If this is really the minimum power, the stream is a remarkably constant one.

Two miles above is Rynson's privilege, with an available fall of 20 feet. Wells gives the power as 840 horse-power during eleven hours.

At Mechanics' Falls, about 12 miles, by the river, from its mouth, occurs the next power, there being three dams, and the total fall being about 37 feet in a distance of 950 feet. At the head of the falls a stone dam, 12 feet high, affords a fall of 14 feet, and below are two wooden dams, affording falls of 12 and 8 feet. The power is all used at the paper-mills of the Denison Manufacturing Company. At the upper fall 275 horse-power are obtained during nine months, falling at times to 175 horse-power or below, and a steam-engine being run during about three months. There being no waste in summer, the minimum power is below 175 net horse-power continuously, or the flow is below 150 cubic feet per second. Wells states the flow as 20,000 cubic feet per minute during ordinary working hours (meaning about eleven hours), or 154 cubic feet per second continuously. I think it probable, however, that this is too great for the minimum flow.

Next above is Page's mill, with a fall of 14 feet, then Hackett's mills, 13 feet, and at Minot Corner, 13 feet. There are numerous powers above this, but the stream is small; it is evident, however, that it is a most excellent one in all respects.

Two and a half miles above Lewiston Wilson pond empties into the river. It covers 2,200 acres, and is owned by the Union Water-Power Company, of Lewiston, which has a dam at the outlet 13 feet high, and uses the pond as a reservoir, drawing over 5 feet from it in dry weather.

Twenty-Mile river, which enters from the west, in Turner, affords considerable power, but is a small stream, and cannot be described in detail. It drains about 189 square miles.

Webb's river, which enters from the north, in Dixfield, drains about 169 square miles. At its mouth is a fall of 29 feet in a distance of 200 feet, partially utilized, and 5 miles above it is a fall of 6 feet, unoccupied. The stream is the outlet of Webb's pond, and is said to be a good one for power. The lake covers 3 square miles, and can be made to afford a storage of 9 feet, thus much improving the power below. The stream has many rapids and falls, mostly unimproved.

Swift river, emptying from the north, in Mexico, is an unimportant stream. Not far from the mouth is a fall of 50 feet in half a mile, and above it are Walker's narrows, with 16 feet in 15 rods, and Weeks' falls, with 18 feet in 15 rods. The stream has few ponds connected with it, however, unlike most of the streams in the vicinity, and is therefore exceedingly variable in its flow, so that the powers are not of great value. As its name implies, the stream has a rapid descent, and affords numerous falls and rapids, but little of its power is utilized.

Ellis river, which also enters from the north, about 10 miles above the mouth of Swift river, is a more constant stream, being fed by several ponds. It also has a very rapid fall, Wells enumerating five falls on the main stream and its two branches aggregating 85 feet. The stream drains about 175 square miles, and affords many sites besides those named by Wells. Little of its power is improved.

Wild river, which rises in New Hampshire and flows northeast, entering the Androscoggin in Gilead (Maine), is, as its name implies, an uncontrollable stream. Its freshets are very violent, and, although it has abundant fall, it is little used. It is a true mountain stream. The same may be said of many of the remaining tributaries from New Hampshire, which are variable in flow and little used. Some, however, like Clear stream, which rises in Dixville, near Dixville notch, and flows in a southerly and easterly direction, are bordered by low and sandy plains. In general, then, the power of these tributaries is of no value.

Of the two headwaters of the Androscoggin, the outlet of the lakes affords no power, except at the dams which have been described. The lakes are allowed to flow constantly during the dry season, and at all times a certain minimum quantity must be allowed to pass. A considerable amount of power is available at these dams, but the power in this region will not be much utilized until the means of communication are better than they are now. Above Berlin falls the railroad leaves the river, and the headwaters of the latter flow through an almost unexplored wilderness, covered with virgin forests, and only inhabited by hunters and lumbermen. Little is known regarding their water-power. Between Umbagog and Richardson lakes the fall is 200 feet (see page 78), the stream connecting the two being known as Rapid river, only 5 miles in length. The bed and banks are good, and a very large power

could no doubt be rendered constantly available here. At all the storage dams large powers could be utilized; and some of the tributaries of the lakes also afford sites for power, notably Kennebago river, the outlet of Kennebago pond.

The Magalloway river has its sources in the northwestern corner of Maine, at elevations of from 2,600 to 3,000 feet. Lake Magalloway, near its source, at an elevation of 2,225 feet, covers 320 acres, and at its outlet occurs a cascade some 20 feet in height. The stream is rapid for some distance from the lake, but then becomes very sluggish, and in some parts of its course offers no power for long distances. Its length is 33 miles in a straight line, or 39 following the principal bends. The principal power mentioned on the river is near its mouth, at Ariscoos falls, which extend for nearly two miles along the river. The total fall is said to be in the neighborhood of 100 feet, and a dam 8 feet high at the head of the falls would back the water over 20 miles, thus affording ample storage. The river drains about 416 square miles. No power is utilized upon it.

THE KENNEBEC RIVER.

The Kennebec river, whose basin bounds that of the Androscoggin on the east, has its source in Moosehead lake, the largest sheet of water in the state of Maine, covering an area of 120 square miles, and lying partly in Somerset and partly in Piscataquis county, at an elevation of about 1,023 feet above the sea. From this lake the river pursues its course in a general southerly direction, its mouth, in Merrymeeting bay, lying almost directly south of the outlet of the lake, and about 115 miles distant in a straight line. The stream flows through Somerset, Kennebec, and Sagadahoc counties, and past the towns and cities of Skowhegan, Waterville, Augusta, and Gardiner. Its total length, from the outlet of the lake to the ocean, is 155 miles; from the sources of Moose river, the principal tributary of the lake, 227 miles; from the lake to Augusta, the head of tide and of navigation, 112 miles. The river drains a total area of about 6,400 square miles, and the map shows the form and dimensions of the basin. The principal tributaries are the following:

Name of stream.	Where received.	From which side.	Length. (a)	Drainage area.
			Miles.	*Sq. miles.*
Cobbosseecontee river	Gardiner	Right.	36	292
Emerson river	Waterville	Right.	42	a185
Sandy river	Starks	Right.	60	666
Carrabasset river	Anson	Right.	43	306
Dead river	Bowtown	Right.	64	1,021
Moose river	Moosehead lake	Right.	70	a650
Sebasticook river	Winslow	Left.	59	1,088
Wesserunsett river	Skowhegan	Left.	25	167

a Wells.

The greater part of the drainage basin lies to the west of the river, and is hilly for 60 miles northward from the sea. Above that, in Somerset county, the hills subside into low undulations, but about the confluence of Dead river, mountains close in upon the river and cover the whole breadth of the basin, while in the vicinity of Moosehead lake the mountains recede or disappear, and the valley opens into a broad plain country. The northwest part of the basin is very rough, being covered with the easterly offsets of the White mountains. The soil is gravel, sand, clay, and loam; the prevailing rocks, gneiss and mica-schist, and good building stones are abundant. Parts of the basin are very thickly wooded, and it was estimated in 1869 that two-thirds of the basin was covered by forests. The elevation of the basin is, on the whole, less than that of the Androscoggin, owing to its greater distance from the White Mountain highlands. Some isolated mountains occur, however, which number among the loftiest peaks in Maine. The following table gives some idea of the slope of the river:

Slope of the Kennebec river.

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Mouth, Merrymeeting bay	0	0			
			26	0	0
Augusta	26±	0			
			22	91	4.1
Head of Kendall's Mills rips	48±	91			
			18	47	2.6
Norridgewock	66±	138			
			13	95	7.3
Top of dam, Madison bridge	79±	233			
			11	83	7.5
Head of Caratunk falls	90±	316			
			48	707	14.7
Moosehead lake	138±	1,023±			

The average fall of the stream from the lake to Augusta is 9.1 feet per mile, or greater than that of the Androscoggin.

The bed and banks of the river, below the mouth of Dead river, are in every way favorable for power. Between that point and the lake, in which distance the fall is stated as in the neighborhood of 500 feet, the distance being about 28 miles, the river is for the most part "a torrent, walled in by steep precipices of rock from 20 to 50 feet in height", so that only a part of the power could be put to use without excessive outlay.

The rainfall over the basin is about 43 inches, of which 11 fall in spring, 10 in summer, 12 in autumn, and 10 in winter. The flow of the stream is tolerably constant, and could be made much more so by the systematic improvement of the reservoirs connected with it. The average range from lowest to highest water is 7 feet at Augusta, 8 at Waterville, 12 at Skowhegan, above the falls, and 18 below, and from 15 to 20 feet at points above Skowhegan. The variability of the flow is chiefly due to the mountainous character of the upper part of the drainage basin.

The following tables, from Wells, give the principal reservoirs of the Kennebec and its tributaries:

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Snow pond	Emerson stream	5.15	4 to 5	*a* 4
Long pond	do	4.85	1 to 2	.....
Great pond	do	0.00	Dam	.....
Richmond pond	do	0.85	.....	.....
McGrath pond	do	0.75	.....	.....
Little pond	do	0.35	.....	.....
East pond	do	2.50	8	.....
North and Little ponds	do	4.00	.....	.....
Nine ponds		27.45	.....	.....
Big pond	Sandy river	1.00	.....	.....
Clearwater pond	do	1.75	8	3
Norcross pond	do	0.35	.....	.....
Chesterville (six small ponds)	do	2.00	Dam	4 or 5
Wilson's pond	do	1.25	7	5
North pond	do	1.00	Dam	(?)
Taylor pond	do	0.20	.....	.....
Sandy river (four ponds)	do	1.00	2	(*b*)
Lufkin pond	do	1.25	.....	5
Sylvester pond	do	0.30	Dam	.....
Eighteen ponds		10.10	.....	.....
Fahi pond	Carrabasset river	0.60	4	4
Sandy pond	do	0.40	.....	.....
Embden pond	do	3.50	4	12
Hancock pond	do	1.00	4	(*b*)
Spruce pond	do	0.35	.....	.....
Rowe pond	do	0.70	.....	8
Gilman's pond	do	0.50	Dam	.....
Judkin's pond	do	0.75	.....	.....
Butler pond	do	0.40	.....	.....
Porter's pond	do	1.00	Dam	4
Tuft's pond	do	0.50	.....	(*b*)
Dutton pond	do	0.20	8	(*b*)
Jerusalem pond	do	0.30	Dam	(*b*)
Middle Carrying-place pond	do	0.30	Dam	(*b*)
Fourteen ponds		10.20	.....	.....
Spencer pond	Dead river	5.00	8	4
Pond in No. 5, R. 7	do	0.50	.....	6
Great pond	do	4.00	.....	(*c*)
King & Bartlett pond	do	1.00	.....	.....
Long pond	do	2.00	.....	5
Flag-staff pond	do	3.00	5 to 6	(?)
Carrying-place pond	do	2.00	.....	5
"Jim" pond in No. 1, R. 5, F. C	do	1.00	8	2

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Timbrook pond, in No. 2, R. 4	Dead river	1.25	9	.....
Chain (three ponds)	do	5.00	8	2
Twelve ponds		24.75	.....	.....
Brassua lake	Moose river	6.00	No dam.	5
Misery pond, in No. 2, R. 7	do	1.50	2+	(?)
Parlin pond	do	2.75	*d* 5	3
Long pond	do	8.00	No dam.	8
Wood pond	do	3.00	No dam.	8
Little and Big Wood ponds	do	1.35	7	.....
Attean pond	do	5.00	No dam.	8
Holeb pond	do	3.00	No dam.	(?)
Thorndike (two ponds)	do	1.00	*e* 6	*f* 6
Eleven ponds		31.60	.....	.....
China pond	Sebasticook river	6.30	6	.....
Patte's pond	do	0.85	.....	.....
Lovejoy's pond	do	0.70	.....	.....
Sandy pond	do	0.95	6	.....
Twenty-five-mile pond	do	4.25	2	2
Carlton Bog pond	do	1.75	.....	4
Plymouth pond	do	3.00	10	.....
Skinner's pond	do	0.70	.....	.....
Stetson pond	do	2.50	.....	(*b*)
Newport pond	do	7.50	4	4
Corinna pond	do	0.60	.....	.....
Dexter pond	do	3.00	8	.....
Palmyra (two ponds)	do	0.60	.....	.....
Stuart's pond	do	0.80	.....	.....
Indian pond	do	2.50	Dam	.....
Little Indian pond	do	0.35	.....	.....
Weymouth pond	do	0.40	.....	.....
Rogers pond	do	0.90	.....	(*c*)
Mill pond	do	1.10	.....	.....
Moose pond	do	9.50	4	*g* 10
Stafford pond	do	0.35	.....	.....
Starbird pond	do	0.35	.....	.....
Barker's pond	do	0.35	.....	.....
Twenty-four ponds		48.30	.....	.....
Madison pond	Wesserunsett river	3.00	7	3
Wentworth pond	do	1.00	No dam.	10
Baker's pond	do		No dam.	(?)
Wyman pond	do	0.75	No dam.	9
Weeks' pond	do	0.60	6	.....
Five ponds		5.35	.....	.....

a With large flowage. *b* Several feet. *c* Considerable. *d* Formerly. *e* On one pond. *f* On other pond. *g* Or more.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
Webber pond	Kennebec river	2.10	6	.....	Pierce pond	Kennebec river	3.50	10	.....
Three-mile pond	do	2.00	8	.....	Lower Carrying-place pond	do	1.00	.....	(b)
Sibley & Morrill pond	do	2.00	.....	a 10	Cold Stream pond	do	1.25	.....	12
Long pond	do	0.95	.....	.....	Chase's Stream pond	do	0.60	.....	.....
Austin (five ponds)	do	3.20	.....	(?)	Indian pond	do	6.00	12	.....
Robinson's pond	do	0.75	.....	.....	Moosehead lake	do	120.00	8	c 4
Pleasant pond	do	3.15	4	8	Lower Roach pond	do	5.00	8	4
Mores Bog Stream pond	do	.....	.....	.....	Middle Roach pond	do	2.50	.....	.....
Otter (two ponds)	do	0.50	.....	.....	Upper Roach pond	do	3.00	Dam	.....
Chase (three ponds)	do	1.00	.....	.....	Tombegan pond	do	0.75	No dam.	6
Mosquito pond	do	1.00	.....	12	Spencer pond	do	1.50	4	.....
Moxie pond	do	7.00	6	3	Western outlet (three ponds)	do	1.25	.....	.....
Lower Baker pond	do	1.00	.....	.....	Thirty-six ponds	.....	173.25	.....	.....
Black stream, lower pond	do	1.25	8	2					
Black stream, upper pond	do	0.59	7	2					

a On Morrill pond. *b* High dam. *c* By cutting down outlet.

The above are all tributary to the river above the head of tide; the following empty below that point:

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
Pleasant pond	Cobbosseecontee river.	1.50	4	6	Sanborn's pond	Cobbosseecontee river.	0.30	.....	(?)
First Purgatory pond	do	0.70	3	8	Desert pond	do	0.30	.....	.....
Second Purgatory pond	do	0.50	Dam	8	Jimmy's pond	do	0.30	.....	.....
Third Purgatory pond	do	0.20	.....	8	Fifteen ponds	.....	20.90	.....	.....
Cochnewagan pond	do	1.00	7	.....					
Wilson's pond	do	0.90	4	(?) 0	Nequasset pond	Kennebec river	0.80	.....	.....
Cobbosseecontee Great pond	do	8.00	4	6	Worromontogus pond	do	1.75	Dam	10
Narrows pond	do	0.90	.....	.....	Small ponds in Augusta	do	1.50	.....	.....
South pond	do	1.95	3	3	Great swamp in Dresden	do	0.90	.....	.....
North pond	do	3.00	.....	.....	Eight ponds	.....	4.95	.....	.....
Carleton pond	do	0.40	.....	.....					
Greely pond	do	0.85	.....	.....					

The foregoing 152 principal ponds have a total area of 357.15 square miles. The total number of ponds in the basin is 311, with a total area of 450 square miles, or 1 square mile to every 14.2 square miles of basin. Moosehead lake, the principal reservoir, at the head of the stream, has a drainage area of about 1,296 square miles. A dam raises the water about 8 feet, and by cutting down the outlet a storage of 10 or 12 feet can be had. The present storage of 8 feet, however, is probably sufficient to render available the maximum power possible permanently, although a greater storage would be advantageous in most years. The lake is at present not controlled at all for manufacturing purposes, but only by lumbermen, for log-driving. Its value, however, as a regulator of flow is very great.

It may not be uninteresting to insert here a table showing the principal features of the great reservoirs we have hitherto met with, and the relation they bear to the streams they feed. In studying this table, it must be remembered that only the *principal* reservoirs of the large streams are named, and that they have numerous smaller ponds which have considerable influence on the flow of the stream at its lower parts. This is the case with the Merrimack, Androscoggin, Kennebec, and Kennebasis. Other things equal, a stream is more favorable the smaller the distance from the reservoir to the lowest power. The greater the ratio of the capacity of the reservoir to its drainage area, the more favorable the stream in its upper part, and if this ratio is over 0.35, it is probable that the maximum with storage is available at the outlet of the reservoir. (*a*) The greater the numbers in the last two columns the better the stream. It will be seen from this table that few streams are superior to the Kennebec as regards reservoir capacity. It is fully equal to the Merrimack, as shown by the numbers in columns 10 and 12, and only surpassed by some smaller streams whose reservoirs are larger in proportion:

a It is not certain, because the storage capacity is not exactly known.

Table comparing reservoir capacity of some New England streams.

[NOTE.—The figures in the last four columns are in most cases only approximations.]

Name of stream.	Principal reservoirs.	Area of reservoirs.	Elevation above tide.	Drainage area of reservoirs.	Drainage area of stream above lowest power.	Distance from reservoir to lowest power.	Depth controlled on reservoir.	Ratio of area of reservoir to drainage area of reservoir.	Ratio of capacity of reservoir to drainage area of reservoir.	Ratio of area of reservoirs to drainage area of stream.	Ratio of capacity of reservoir to drainage area of stream.
		Sq. m.	*Feet.*	*Sq. m.*	*Sq. m.*	*Miles.*	*Feet.*		*Feet.*		*Feet.*
Merrimack river	Lake Winnipiscogee, etc	83.93	500	400	4,599	a 122.00±	2.5—	0.210	0.534	0.0225	0.069
	New Found lake	7.80	597	90			3.0	0.087	0.260		
	Squam lake	11.75	510	47			3.5	0.250	0.875		
Winnipiscogee river	Lake Winnipiscogee	71.75	500	357	480	13.65	2.5	0.201	0.502	0.1750	0.445
	Smith's pond	4.85	540	.....		.....	4.0	.....	.....		
	Great bay, etc	7.33	478	400		7.31	2.0	0.028	0.037		
New Found river	New Found lake	7.80	597	90	95	3.00	3.0	0.087	0.260	0.0820	0.246
Squam river	Squam lake	11.75	510	47	67	2.50	3.5	0.250	0.875	0.1750	0.614
Salmon Falls river	Great East pond	2.84	499	16	242	28.00	10.0	0.178	1.770	0.0230	0.200
	Horn pond	0.35	478	22		27.00	3.0	0.016	0.048		
	Milton Three ponds	2.33	400	123		19.00	8.0	0.019	0.151		
	Other ponds	.....	.....	.....		.....	.....	.....	.....		
Presumpscot river	Sebago lake	50.00	251	498	725	22.00	6.0	0.100	0.400±	0.0690	0.276±
Androscoggin river	Umbagog lake	18.00	1,256	760	3,098	157.00	14.0	0.101	1.010±	0.0210	0.210±
	Richardson lake	21.15	1,456				14–20.0				
	Mooselucmaguntic lake	21.00	1,486				14.0				
	Cupsuptic lake	3.00	.....				14.0				
	Rangeley lake	14.00	1,511				10.0				
Kennebec river	Moosehead lake	120.00	1,023	1,296	5,007	112.00	8.0—	0.093	0.558±	0.0200	0.120
Kennebasis river	Big lake	14.00	189	580	766	10.00	Small	0.053	0.200±	0.0400	0.150±
	Grand lake	17.00	271			23.00	8.0				
Chiputneticook river	Chiputneticook Lower lake	27.00	383	400±	634	35.00	15.0	0.130	0.900±	0.0820	0.570±
	Chiputneticook Grand lake	25.00	444			74.00	6.0				

a Distance from Lawrence to Franklin: 110.1 miles; length of Winnipiscogee river: 12 miles; in all, 122 miles ±.

The flow of the Kennebec, though now quite variable, might be rendered much more uniform by the systematic improvement of its reservoirs.

As regards accessibility, the stream is navigable to Augusta for small vessels, and even to Waterville, boats being locked over the Augusta dam. The stream is easily accessible by rail as far up as Caratunk falls, but above that point it is difficult of access, the nearest railroad points being North Anson and Blanchard, the former over 40 miles from the lake, the latter over 20 miles from lake and river.

As the stream is ascended, the first power is met at Augusta. A crib-dam with sloping face, 17 feet high and 956 feet long, ponds the water for 17 miles to Waterville, the average width of the pond being, perhaps, 500 or 600 feet. The old dam, built a good many years ago, was carried away by an ice-freshet in the spring of 1870, and was at once rebuilt. From the dam a canal about 1,000 feet long extends along the west bank of the stream, where the mills are situated. The fall varies a little with the tide, which is said to rise 2 feet, but the level of the water can be raised a foot by flash-boards, and the average fall is about 17 feet.

The power is owned by the Edwards Manufacturing Company, recently organized, but it formerly belonged to the A. & W. Sprague Manufacturing Company, of Rhode Island. Power is used by two cotton-mills belonging to the company, using together in the neighborhood of 500 horse-power, and a number of small mills of various kinds—grist-mills, box factories, sash, door, and blind factories, etc.—the buildings and wheels all belonging to the company, and power being rented at special rates, according to circumstances. The total power used on the west bank is perhaps about 700 horse-power, while on the east bank a saw-mill uses about 200 horse-power. The cotton-mills were not running in 1882, but it was expected to start them at the end of that year. No steam is in use in any of these mills, and, except in heavy freshets, there is always a very large excess of water-power. In freshets the fall is sometimes reduced considerably. In 1878 the water is said to have risen 13 feet on the dam and 20 feet below the dam, but such rises are very rare. In the ice-freshet of 1870, when the old dam was carried away, the water was dammed up below the city, rising some 25 feet below the dam.

The drainage area above Augusta measures about 5,900 square miles. Wells states that in the summer of 1866 the flow was found to be, at a time when the stream was lowest, 2,167 cubic feet per second continuously, but adds that the summer rainfall was large in that year, and estimates the minimum flow at 1,300 cubic feet per second. Estimates are liable to considerable error in the absence of gaugings, but I should judge the power at Augusta to be, at its minimum, not less than that given by Wells, and probably greater.

If we assume the flow as 1,500 cubic feet per second continuously, the gross power would be 170 horse-power per foot, or about 2,900 horse-power on a fall of 17 feet. In the low season of ordinary years the power would probably be 20 or 25 per cent. greater. The pond is large enough, moreover, to allow of the power being considerably increased during working hours.

Augusta is very favorably situated as regards accessibility, both by sea and by land, being only eight hours from Boston. The river is open up to the city during about eight months of the year to vessels drawing 10 feet. The power is an excellent one, and merits more attention than it has hitherto received.

The next power is at Waterville, at the head of the Augusta pond. The falls at this place, known as the "Ticonic falls", amount to 13 feet in a few rods, over a ledge of hard slate. A dam 750 feet long, built in 1869, raises the water 7 feet, and affords a fall of 20 feet, with a race 1,000 feet long. A power of about 2,000 horse-power is used at two cotton-mills and a grist-mill, belonging to the Lockwood Company, full capacity being obtained all the time. The drainage area above the dam is about 4,475 square miles, and I should estimate the minimum power roughly at about 135 horse-power (gross) per foot fall during twenty-four hours, or 2,700 horse-power on a fall of 20 feet. This power would be greatly exceeded in ordinary years. The available power is thus about the same as at Augusta, and both sites are entitled to rank among the best on the river. The pond of the Waterville dam, however, is only 40 rods long, so that the storage is not sufficient to allow of the concentration of the power into working hours.

The next fall above is known as College rapids, where the natural fall is 10 feet in as many rods, capable of being increased to 20 feet by a dam. This site is entirely unimproved, but the figures above enable an idea to be formed of the power available. The two sites together would probably afford a minimum power of at least 5,000 horse-power continuously, and were all the reservoirs tributary to the stream systematically improved and operated, not less than 8,000 horse-power. The topography is said to be singularly favorable for the utilization of the power, and the facilities for transportation are excellent.

At Kendall's Mills, in Fairfield, a dam across the river gives a fall of 22 feet in three-quarters of a mile, the power being owned at the time of Wells' report by the Kendall's Mills Water-Power Company. At Somerset Mills, a short distance up the river, a fall of 12 feet is afforded by a dam, the power being partially utilized. The power at these two places is about the same per foot fall as at Waterville.

The next power is at Skowhegan falls, in the town of Skowhegan. The total fall is 28 feet in half a mile, capable of being increased by a dam, and a considerable fall being in one pitch. The bed and banks are rock, but the topography is only moderately favorable for the location of mills, and the power is only partially improved. The town is accessible by rail. The drainage area above the dam is about 4,176 square miles, and the minimum power may be roughly estimated as about 120 horse-power (gross) per foot fall, or 3,360 horse-power on a fall of 28 feet during twenty-four hours.

The next power is in Norridgewock, 3 miles above the bridge, at Bombazee rips, the natural fall being 8 feet, capable of being increased to 12 feet by a dam. The available power is large, the quantity of water being nearly as great as at Skowhegan.

We next come to the Madison Bridge falls, in Anson and Madison, the largest fall on the river, the descent amounting to 87 feet in 2½ miles. The fall consists of two principal pitches, with swift water between. At the upper pitch a small amount of power is used, and the facilities are said to be remarkably good, the bed and banks being rock. The minimum power available may be estimated at about 100 horse-power (gross) per foot, or 8,700 on the entire fall during twenty-four hours, only a small fraction of which is utilized. In the dry season of an ordinary year the power would probably be at least 60 per cent. greater, or 160 horse-power (gross) per foot, and during working hours, if the water could be stored, this power would be doubled. This magnificent site, which is easily accessible by rail, is worthy of further investigation.

The next power is Caratunk falls, in Embden and Solon, where the descent is 20 feet in one pitch, capable of being increased to 30 feet by a dam. The topography is very favorable, and the minimum power is perhaps about 85 horse-power (gross) per foot fall continuously. The next power is Stand-up rips, a mile above the forks, with 20 feet fall in 100 feet; then comes Moxie rips, 3 miles above the forks, or mouth of Dead river, the fall being 15 feet in 20 rods. Four miles above, at the Black Brook rips, there is a fall of 20 feet in 30 rods. Two miles above this the rapids commence, "extending 9 miles, and in the whole distance the river is a violent torrent, foaming and boiling; the fall being judged not less than 300 feet in this distance. The shores are bold, in part precipitous, and rising to a height of 100 feet on either side". No part of this large power is improved, and probably a large portion of it could not be utilized except at great cost. This power is the last on the river, being only a few miles below the lake.

It is evident from the above enumeration that the powers on the Kennebec are numerous and excellent.

TRIBUTARIES OF THE KENNEBEC RIVER.—The first important tributary of the Kennebec is the *Cobbosseecontee river*, which enters from the west, in Gardiner, draining about 292 square miles. It is the outlet of a chain of lakes covering over 21 square miles, and rendering the stream an excellent one for power, for its fall is large and the ponds are sufficient to render the flow quite constant. Within a mile of the mouth of the river the stream falls 133 feet to low tide in the Kennebec, and the site, known as the Cobbosseecontee falls, is utilized by a number of mills. The total minimum power has been estimated, according to Wells, at 1,200 horse-power, and at the time of his report there were eight dams at this place. Above this point there are other powers on the river, of which two are in West Gardiner, each with a fall of 16 feet. The stream is an excellent one for power.

In Hallowell the *Vaughan stream* enters from the west, and near its mouth falls 188 feet in about 1,600 feet, a part of the power being used. The stream is small, and its flow is very variable, being unconnected with reservoirs.

Messalouskee or *Emerson's stream*, which joins the Kennebec in Waterville, is an excellent stream, being the outlet of reservoirs covering over 27 square miles, quite sufficient to render the flow very constant, and probably the maximum with storage is available. The length of the stream, from the lowest pond to its mouth, is only about 5 miles, but the total fall in that distance is not less than 164 feet, the greater part of which is utilized in Waterville and West Waterville by mills of various kinds. The greatest fall occurs at the "Cascade", and amounts to 44 feet in 8 rods. The power is excellent. There are other privileges on the upper parts of the stream, between the ponds feeding it, but none of importance.

The next tributary of importance is the *Sebasticook river* which has its sources in Penobscot and Piscataquis counties, and flows in a southwesterly direction, joining the Kennebec at Waterville, and draining about 1,088 square miles. Though a number of ponds are tributary to it, covering in all some 50 square miles, the area of lake surface does not bear such a large proportion to the area of the basin as in the case of some of the smaller streams we have considered, so that its flow is probably more variable. Its fall is considerable, being over 170 feet between Moose pond and its mouth, a distance of some 45 miles, and it affords a number of good powers. In a distance of 5 miles from its mouth the fall is 22½ feet, and a fine power is said to be possible. A mile above this are Lower falls, with 12 feet in half a mile; then Upper falls, 10 feet in a mile; and then Nine-Mile rips, 8 to 12 feet in a mile, part of this power being improved. Then comes Hunter's mills, 7 feet fall, capable of being increased to 10 feet or over; then Ferguson's rips, with 10 feet in 15 rods, in Burnham and Clinton Gore townships; then Eel Weir rips, 8 feet in 80 rods, in Burnham and Pittsfield; and a little above, Thirty-Mile rips, with 35 feet in a mile and a half. This last power is the most important on the river, and is said to be favorably situated, with good facilities for utilization.

The tributaries of the Sebasticook also afford considerable power. In Vassalboro' some power is obtained from the outlet of China pond, which covers an area of 4,000 acres and is 201 feet above tide. Its surface is raised 6 feet by a dam, and the fall of its outlet stream is 160 feet in its course of 6⅛ miles. The maximum with storage is probably available in this case, but the drainage area is small. Wells gives the low-season flow as 145 cubic feet per second during eleven hours, and this, on a fall of 160 feet, would afford a gross power of 2,637 horse-power. A considerable proportion of the total fall is utilized. The West branch of the Sebasticook, which joins the other, or East branch, a little above Thirty-Mile rips, in Detroit township, is the outlet of Moose pond, which covers about 9½ square miles and lies at an elevation of 244 feet above tide. Wells mentions the following falls on this branch: Douglass ledge, 14 feet in 150 rods; Hathorn's mill, 14 feet in 40 rods; Call rips, 17 feet in 200 rods, these three being in Pittsfield; Upper Sebasticook falls, 1 mile from the lake, 30 feet in 75 rods, in Hartland; besides others above Moose pond. In Detroit, at the "Rips", there is a fall of 30 or 40 feet in a quarter of a mile, probably on the East or main branch of the river; and farther up this stream, and especially on its tributaries, there are numerous powers in the towns of Newport, Plymouth, Stetson, Corinna, and others. The valley of the Sebasticook is followed by the Maine Central railroad, so that all the water-powers on the stream are easily accessible.

The *Wesserunsett river*, which enters the Kennebec in Skowhegan, from the north, drains about 167 square miles, and is a rapid stream, affording numerous sites, many of which are unimproved. The flow, however, is not very constant.

The next important tributary is *Sandy river*. This stream takes its rise in the western part of Franklin county, near Rangeley lake, at an elevation of 1,868 feet above the sea, and flows first in a southeasterly direction for about 32 miles, when it bends abruptly and flows northeast for about 17 miles in a straight line, entering the Kennebec above Bombazee rips; it drains about 666 square miles. Although fed by a few ponds, the storage capacity of the stream is small, so it is probable that its flow is quite variable. Its fall is large, not less than 1,700 feet from source to mouth, but the greater portion of this occurs where the stream is very small and of little value for power. Nevertheless it offers a number of sites. At Dickerson's rips, in Mercer and Starks, about 8 miles from the mouth, there is a small fall of 8 feet. The minimum power would be probably in the neighborhood of 10 horse-power (gross) per foot fall continuously. In New Sharon, at New Sharon falls, the fall is 10 feet, and is partially improved, while at several other rapids below considerable power is available, though but little is used. At Farmington falls, in Chesterville and Farmington, the fall is 16 feet, only partially used. In Strong there are several powers, and as the upper parts of the stream are approached the fall becomes very rapid, but the river seems to possess no remarkably good sites, those on the lower parts having small falls, while in the upper parts, where a power could be created almost anywhere, the flow is very variable. One remarkable fall in the town of Phillips, only a few miles from the source of the stream, may be mentioned, where, in a distance of 3½ miles, the fall amounts, it is said, to not less than 300 feet.

The *Carrabasset* or *Seven-Mile river*, which enters the Kennebec at Anson, above the Madison Bridge falls, drains about 366 square miles, and has a rapid fall, but its reservoir system is not extensive, and its flow, like that of Sandy river, is quite variable. Near its mouth is a fall of 50 feet in 100 rods, the head of the fall being above the outlet of the largest pond tributary to the stream. Four and a half miles up the stream are Upper Carrabasset falls, said to be a good site, but only partially improved. Numerous sites occur above this, but the freshets are quite severe, and it is said that the mills are sometimes unable to operate more than half the year. Were the reservoirs connected with the stream improved more extensively, the power would probably be much benefited.

Numerous tributaries between this point and the lake empty into the Kennebec from both sides, with very steep descents. Thus, in the town of Pleasant Ridge, the Houston stream is a torrent for nearly 2 miles, the total

fall being estimated at 300 feet. *Fall brook*, in Solon, falls 100 feet in a quarter of a mile, and the *Austin stream*, in Moscow, falls 100 feet in half a mile. These streams are generally very variable in flow, but some of them are connected with ponds, which, if improved, would add greatly to the value of their power.

Dead river, the next and last important affluent of the Kennebec, has its rise in the extreme north of Franklin county, almost on the state line. Its general course is toward the east, and it enters the Kennebec at the forks, or about 22 miles below the lake. The following powers are mentioned by Wells: Dead River rapids, extending from the forks to Grand falls, a distance of 12 miles; Grand falls, in township No. 3, range 4, Somerset county, with 40 feet fall, nearly perpendicular, said to be an excellent site; Long falls, in the same township, a mile long, total fall 30 feet, and a large pond above site for dam; Ledge falls, 12 feet, and Swampscott falls, 10 feet, both unimproved, in township No. 1, range 5, Franklin county, and with a large storage, due to the dam just above, at the outlet of Chain pond, which covers 5 square miles.

The *outlet of Moxie lake*, which enters the Kennebec just above the forks, from the east, has a fall of over 166 feet in a distance of about 5 miles, one fall of 95 feet being perpendicular. The pond affords considerable storage, being commanded by a dam 6 feet high, and the power is doubtless excellent, though comparatively small. Some of the tributaries of Moosehead lake afford power, but little is known regarding them. The principal one is Moose river, which rises at an elevation of over 3,000 feet, and consequently has a fall of about 2,000 feet in its course of a little over 50 miles. It offers numerous powers, mostly unimproved.

The power available on the Kennebec and its tributaries is evidently very large. Wells estimates the power on the main stream alone, between Caratunk falls and tide-water, during a dry season, as 101,000 horse-power during eleven hours; but such estimates are not of great value. It is clear, however, that only a very small fraction of the power available on the main stream is at present utilized.

THE SHEEPSCOT, SAINT GEORGE, ETC.

The area lying along the coast between the basins of the Kennebec and the Penobscot, and comprising about 800 square miles, is drained by a few small streams, which merit a brief notice.

The *Sheepscot river* takes its rise in the extreme west of Waldo county, and flows south into Lincoln, its length being about 37 miles, and its drainage area measuring 248 square miles above tide-water. The *Damariscotta river* is the outlet of the pond of the same name, and, although draining only about 46 square miles above the lowest fall, is of considerable importance on account of its constant flow, the storage on its ponds being probably sufficient to render available the maximum with storage. The *Medomac river* is about 21 miles long, and drains about 118 square miles, above the lowest falls, in Waldo, Knox, and Lincoln counties. Finally, the *Saint George river* is about 35 miles long, and drains, above the lowest falls, about 228 square miles, principally in Waldo and Knox counties.

These streams have generally not a large fall, but their power is quite well utilized, being near the coast; and their reservoirs are so improved as to render their flow quite constant. The whole number of lakes in the district is seventy-two, covering 50 square miles, or 1 square mile to every 50 square miles of drainage area. The following table (from Wells) gives the principal of these lakes and ponds:

Principal reservoirs of the Sheepscot, Saint George, etc.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Place.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
South pond	Saint George river.	1.15	.....	.....	Medomac pond	Medomac river	0.75	.....	.....
North pond	do	0.50	.....	.....	Little Medomac pond	do	0.25	.....	.....
Seven-Tree pond	do	1.10	.....	(a)	Washington pond	do	1.25	.....	.....
Crawford's pond	do	1.05	Dam	(a)	Clark's pond	do	0.50	.....	10
Round pond	do	0.35	.....	(a)	Damariscotta pond	Damariscotta river	10.00	6	.....
Western pond	do	0.30	.....	.....	Muscongus pond	Muscongus river	0.50	Dam	(a)
Senebeck pond	do	1.15	.....	(a)	Biscay pond	Pemaquid river	1.00	.....	.....
Quantabacook pond	do	2.00	.....	(b)	Pemaquid pond	do	2.00	.....	6
True's pond	do	0.30	6	.....	Duck pond	do	0.30	.....	.....
Saint George's pond	do	2.00	Dam	.....	Dyer's Long pond	Dyer's river	1.20	6	4
Stevens' pond	do	0.75	Dam	.....	Dyer's pond	do	0.20	.....	.....
The "lake"	do	2.00	4	2	Pleasant pond	Sheepscot river	1.10	.....	4 to 6
Lermond pond	do	0.50	8	0	Travel pond	do	0.60	.....	6
Hobbs pond	do	0.25	4	2	Patricktown pond	do	1.00	.....	10
Southern Hobbs pond	do	0.75	0	2	James pond	do	0.30	(a)	(a)
Fish ponds	do	0.40	6	1	Sheepscot Great pond	do	1.50	Dam	6
Sixteen ponds	...	14.35	.....	.....	Sixteen ponds	.....	22.45	.....	.....

a Several feet. *b* Considerable.

On the Sheepscot river the first power is a tide-power at Sheepscot falls. Five miles above, at the head of tide, a fall of 10 feet is used. At the "Rapids", the head of which is 2 miles farther up, there is a fall of 25 feet in a mile, with steep banks on both sides; and above this there are several small powers.

At the outlet of Damariscotta pond the Damariscotta river falls 52 feet in 20 rods, and the power is excellent, though small, being rendered constant by the storage on the pond.

In the town of Bristol the Pemaquid river falls 50 feet in the first 500 feet from tide, and the power, being fed by ponds above, is said to be good, though very small.

On the Medomac river there are eight powers in the town of Waldoboro', with a total fall of about 80 feet, while other falls occur above.

On the Saint George river there is a woolen-mill in the village of Warren, and also a site known as "Knox falls", just above. In the town of Union the stream has considerable fall, and several powers are in use, while in its upper part the fall is still greater.

None of the powers on these streams are of great importance, being all small. They are valuable, however, on account of their constancy.

THE PENOBSCOT RIVER.

This mighty stream, the largest in the state, is divided in its upper parts into several so-called branches, but the West branch, which is properly the main stream, has its sources in the extreme western part of Somerset county, its water-shed on the west being nearly coincident with the state boundary. From the junction of the so-called North and South branches, which unite to form the West branch, the latter stream pursues for about 80 miles, measured in a straight line, a course toward the east and a little southward, passing through Piscataquis and into Penobscot counties and flowing through a chain of lakes. It then bends toward the south and flows for nearly the same distance in a straight line a little west of south, passing the city of Bangor and emptying into Penobscot bay, this part of its course lying almost entirely in Penobscot county. The length of the stream, along its course, from the junction of the North and South branches, is about 170 miles, and its drainage area above its mouth at Sandy point measures about 8,785 square miles, all within the state of Maine. The map of the basin shows that its greatest length is about 160 miles and its greatest breadth about 115 miles. "It is mountainous from the sea to the head of tide, at Bangor, and above; thence northward it is gently undulating up to and throughout the region of the East and Mattawamkeag branches. On the main stream, above Nicatou, it is more broken, and is singularly diversified with lakes, ponds, swamps, streams, hills, valleys, and detached peaks. The Katahdin mountains, the highest in Maine, affording a prospect characteristic and sublime, from the vast breadth of level country overlooked, lie upon the left bank. Farther west the valley becomes merged with that of the Kennebec on the south and the Allaguash on the north, and terminates on the northwest at the highland boundaries of the state, and in the swamps and lagoons which form the common reservoir of the Saint John and the Penobscot. As a whole the valley is uniform in its topographical features." A large proportion of the basin is still covered with forests. The soil is gravel, clay, and loam, and the rocks granite, mica-schist, and clay-slate. The basin is, as a whole, less elevated above the sea than that of the Kennebec or the Androscoggin, although the northern portion is quite elevated, the divide having, according to Wells, a mean height of 1,085 feet, while the headwaters of the West branch are at an elevation of from 1,600 to 2,000 feet. The following table will give some idea of the slope of the river:

Slope of the Penobscot river.

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Mouth	0	0.0			
Bangor, head of tide	27	0.0	27	0	0.0
Foot of Corporation dam, Veazie		5.4			
Crest of Corporation dam, Veazie		20.8			
Foot of Ayer's falls, Orono		27.2			
Head of Ayer's falls, Orono		35.4			
Foot of Great Works falls, Oldtown		57.5	12	92	7.7
Head of Great Works falls, Oldtown		68.6			
Foot of falls at Dwinal's mills, Oldtown		71.8			
Head of falls at Dwinal's mills, Oldtown		78.3			
Foot of falls at Dwinal's mills, Milford		80.7			
Head of falls at Dwinal's mills, Milford	39	92.3			
Mouth of Passadumkeag		106.0			
Mouth of Mattanawcook		172.0	45	98	2.2
Mouth of Mattawamkeag	84	190.0			
Twin lakes (about)		500.0	36	710	19.7
Chesuncook lake	120	900.0			
Northeast of Moosehead lake		1,000.0	80±	609	7.6±
Penobscot lake	200±	1,509.0			

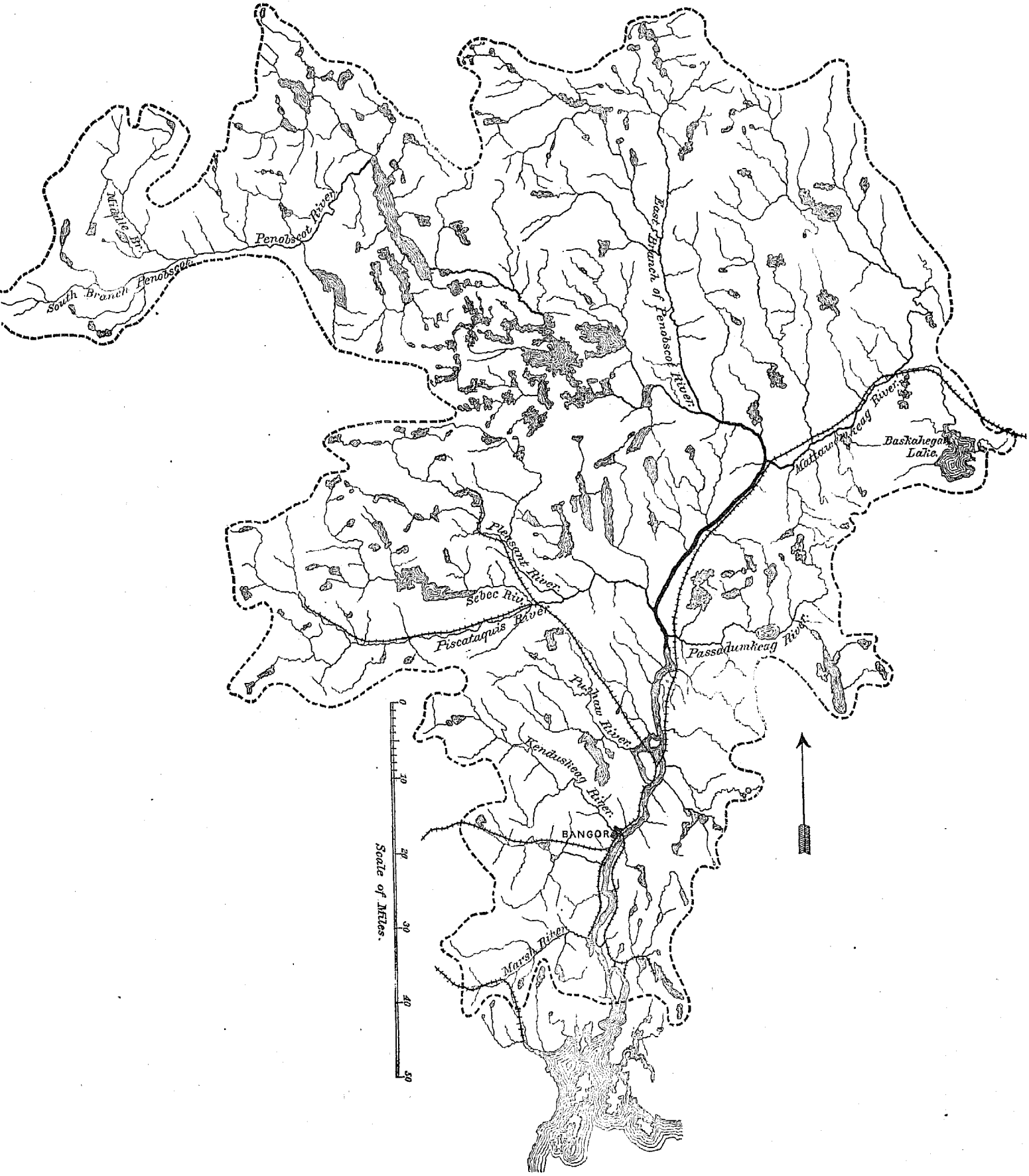

Fig. 21. MAP OF THE DRAINAGE BASIN OF THE PENOBSCOT RIVER.

The slope of the river, from its remotest sources to tide, is a little less than 9 feet to the mile. In its principal water-power section, between lake Chesuncook and Bangor, the fall is 900 feet in 120 miles, or 7.5 feet per mile. From the Mattawamkeag to tide, 57 miles, the slope is 3.3 feet per mile. Within 12 miles above Bangor the fall is 92 feet, or 7.7 feet per mile.

The principal tributaries of the Penobscot are the following:

Name of stream.	Where received.	From which side.	Length.	Drainage area.
			Miles.	*Sq. miles.*
Kenduskeag river	Bangor	Right.	34	229
Pushaw river	Oldtown	Right.	26	231
Piscataquis river	Howland	Right.	71	1,541
Passadumkeag river	Passadumkeag	Left.	35	402
Mattawamkeag river	Mattawamkeag	Left.	85	1,533
Mattagamon (East branch)	Nicatou	Left.	63	922

The flow of the Penobscot is naturally quite constant. The total number of lakes in its basin is 467, with a total area of 585 square miles, or one-fifteenth of the area of the basin. These lakes, however, are generally small, and the stream has no reservoirs as large or as easily commanded as the large reservoirs of the Androscoggin and Kennebec. Artificial storage is therefore more expensive, and the full capacity of the main river will not be realized until the numerous smaller lakes in the basin shall have been improved and converted into storage reservoirs, by manufacturers on the tributary streams. It is said that the basin in its upper parts affords unusual facilities for the construction of artificial reservoirs, though accompanied by the flowage of considerable areas, so that the flow of the river may be rendered very much more constant should the expense be justified. The disadvantage of the river as regards natural reservoirs is, however, counterbalanced to a great degree by its immense extent of forests, its large drainage area, the uniformity of its topography, and the absence of a mountain region. Large freshets are not common, the range from lowest to highest water being only 12 feet at Bangor, and in 1864 and 1865, during a very dry season, the discharge at Bangor was estimated at about 2,438 cubic feet per second continuously, (*a*) or 0.31 cubic feet per second per square mile, which is not small.

The following table is from Wells:

Principal reservoirs of the Penobscot and tributaries.

Name of reservoir.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Name of reservoir.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
Little Seeboosis lake	Piscataquis river	1.40			Cold Stream pond	Passadumkeag river.	6	Dam	10
Endless lake	do	4.25							
Pond north of Endless	do	1.10			Second Cold Stream pond	do	0.95	8	
Pond northeast of Endless	do	1.20			Clear Water pond	do	0.80	8	
Schoodic lake	do	16		8	Escutassis (two) ponds	do	1.40	Both 8	
Seboois lake	do	12			Saponac pond	do	1.30		
Dover pond	do	0.70	6	(*b*)	Madagascal pond	do	1.70	7	
Harlow (two) ponds	do	0.50	6	(*b*)	Two ponds above Madagascal	do	0.25	*e* 6	
Kingsbury pond	do	3	10	(*b*)	Spring pond	do	0.20		
Sangerville ponds	do	0.90	Dams		No. 3 pond	do	1		
Piper pond	do	1.25		(*b*)	First Pistol lake	do	1	6	
Upper Piper pond	do	0.35		(*b*)	Second, Third, and Fourth Pistol lakes.	do	0.50	8	
Spectacle pond	do	1.10	Dam	10	Porter pond	do	0.20		
Lower Ebeeme pond	do	2.25			Nicatous lake	do	10	10	
Upper Ebeeme pond	do	1.25			Abamgamook or West lake	do	2	7	
Sebec lake	do	14	6	4	Duck lake	do	2	9	
Long pond	do	1		4	Garbeus lake	do	1	6	
Ship pond	do	3	Dam	10	Coombs lake	do	0.15	5	
Hebron pond	do	2	do		Ware pond	do	0.80		
Monson pond	do	0.40		(*b*)	Twenty-two ponds		31.25		
Bowdoin College (three) ponds	do	2							
Wilson pond	do	2.25	7	(*b*)	Mattakeunk pond	Mattawamkeag river.	1.50	Dam	(*d*)
Houston pond	do	3							
Pond in B., R. 11	do	1			Mud pond	do	0.60		
Bald Mountain pond	do	2	4	4	Molunkus pond	do	3		
Shirley bogs	do	8	*c* 7	(*d*)	Benedicta pond	do	0.75		
					Mackwacook pond	do	1		
Thirty ponds or more		85.90			Wytopitlock pond	do	3.25		(*d*)

a *Wells' Report*, page 105. *b* Several feet. *c* On 2 square miles. *d* Considerable. *e* The larger.

Principal reservoirs of the Penobscot and tributaries—Continued.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
South pond, in No. 3, R. 4	Mattawamkeag river.	0.75		
Hot Brook pond, in No. 3, R. 4	do	3.50		
Easkahegan lake	do	18		
Pond in No. 3, R. 3	do	1		
Mattawamkeag lake	do	5.50	12	
Caribou pond	do	1.50		
Pond	do	1		
Pleasant lake	do	3.50		(*a*)
Sketicook lake	do	1.25		
Spaulding's lake	do	2.50		
Rockabema lake	do	2.25	5	(*b*)
Mud lake, above Rockabema	do	1.25	8	
Small ponds in Rockabema	do	2.50		
Twenty-one ponds		53.35		
Salmon Stream pond	Mattagamon river.	2		
Katahdin pond	do	0.65		
Pond in No. 4, R. 7	do	1.50		
Bowlin pond	do	1.10		(*b*)
Upper Bowlin (two) ponds	do	0.85		(*b*)
Mattagamon lake	do	5	10	
Mattagamonsis lake	do	2.25	10	
Third lake	do	1.75	6	
Fourth Lake	do	0.90	Dam, 12	
Flowage above Fourth lake	do	1	(*b*)	
Snake pond, in No. 7, R. 11	do	1	Dam, 7	
Big Leadbetter pond	do	0.80	Dam, 10	
Lower Shin pond	do	2.25		
Upper Shin pond	do	1.30		12–20
Pond in No. 5, R. 7	do	1		
First lake	do	1.10	5 to 6	
Second lake	do	1.10	5 to 6	
Schoois lake	do	4.75	5 to 6	
Five ponds in No. 6, R. 8	do	3		
Scraggly lake	do	3		
Wassattiquoick pond	do	1.50		
Webster lake	do	3	10	
Hudson and Wadleigh Brook reservoirs.	do	1.50	(*b*)	
Twenty-eight ponds		42.30		
Pushaw lake	Penobscot river	8		6
Boyd lake	do	1.75		
Little Pushaw pond	do	0.90		
Mud pond	do	0.75		
Pickerel pond, in Alton	do	0.50	Dam	*c* 3
Nichols pond	do	3		
Davis pond	do	0.90		
Holbrook's pond	do	0.90		
Mattanaweook pond	do	1.30	Dam	
Crooked pond	do	0.70	Dam	
Folsom pond	do	0.40	Dam	
Upper pond	do	1.20	Dam	
Pond in Nos. 2 and 3, east of Chester.	do	4.50		
Mattamiscontis pond	do	2		
Lower Mattamiscontis pond	do	0.90		
Cambolasse pond	do	0.65	Dam	
Long pond	do	1	Dam	
Caribou pond	Penobscot river	0.85	Dam	
Centre pond	do	0.30	Dam	
Madunkeunk pond	do	1		
Nollesemic pond	do	2.50		
Quakish lake	do	1.75		(*d*)
Shad lake	do	0.75		
South Twin lake	do	3	(*b*)	3
North Twin lake	do	3.25	Dam, 16	3
Mattaconnk lake	do	2.50		
Jo-Mary upper lake	do	3		
Jo-Mary middle lake	do	2.50		
Jo-Mary lower lake	do	3		
Pemedunkeook lake	do	16	(*b*)	3
Milinoket lake	do	18		10–12
Katahdin pond, in No. 2, R. 7	do	2		
First pond, in No. 2, R. 10	do	0.75		
Second pond, in No. 2, R. 10	do	1		
Third pond, in No. 2, R. 10	do	2.50		
Nahmakanta lake	do	3	8	
Unsuntabunt lake	do	3.75	4 to 6	
Sourdnahunk lake	do	3.75		4
Five ponds in A, R. 11	do	4.75	(*e*)	
Penobscot pond, in No. 1, R. 11	do	1		
Three ponds west of Namakanta lake.	do	2.50	(*f*) 4 to 6	
Ripogenus lake	do	2		
Ripogenus pond	do	4		
Caribou lake	do	6.50		
Upper Caribou lake	do	1		
Ragged lake	do	4		
Chesuncook lake	do	22	12 to 13	
Duck pond	do	2	(*b*)	
Cusabexis lake	do	2	5 to 6	
Umbazooksus lake	do	2.25		
Longley pond, in No. 6, R. 13	do	1.50	Dam, 7	
Black pond	do	1		
Shallow lake	do	2.50	6	
Poland lake	do	0.75		
Cauquomgomoc pond	do	10		(*b*)
Portage pond	do	1.25		
Daggett pond	do	1		
Pond above Daggett	do	0.75		
Loon pond	do	3		(*g*)
Two ponds above Loon	do	1.25		
Hurd (two) ponds	do	1.50		
Wadleigh pond	do	0.75		
Pine Stream (two) ponds	do	1		
Lobster pond	do	6		
Russell pond	do	1	5 to 6	
Luther pond	do	0.90		
Nulhedus pond	do	1		
Two ponds, in No. 3, R. 3	do	1.25		
Two ponds in Bald Mountain township.	do	1.50		
Penobscot lake	do	1.50		
Two ponds in No. 3, north of Hammond township.	do	1.50		
Eighty-four ponds		182.40		
One hundred and eighty-five ponds.		595.20		

a Many feet. *b* Several feet. *c* Over 1.75 square mile. *d* 12-foot dam feasible. *e* Dammed in part. *f* On two ponds. *g* Dam feasible.

In addition to the above, 9 ponds, covering 39 square miles, which naturally belong to the Allaguash system, have been added to the Penobscot system by means of dams, canals, etc.; and over 30 ponds, covering over 31 square miles, are tributary to thestream below its lowest fall.

The Penobscot river is accessible by rail up to the mouth of the Mattawamkeag, or 57 miles from tide-water. Above that point no railroad approaches within many miles of it, and its headwaters are among the pathless forests of the northern part of the state. The rainfall over the basin is about 44 inches, of which 11 fall in spring, 10 in summer, 13 in autumn, and 10 in winter.

The head of tide and of navigation on the Penobscot is at Bangor, where Treat's falls prevent the further ascent of the river. These falls, one mile above the harbor proper, are flowed at high tide, but a dam extending to a height of 15 feet above mean high tide has been proposed, which, with the storage on the pond, and with flash-boards 2 feet high in dry seasons, it is estimated will afford a gross power of 9,000 horse-power during working hours of the driest day, or over 13,000 horse-power by the aid of reservoirs up the river. The bed of the river is ledge, and the facilities for location are said to be excellent. The minimum flow available for power has been estimated at 1,950 cubic feet per second continuously, affording 3,224 gross horse-power on a fall of 15 feet, the increase to 9,000 horse-power being due to the storage on the pond, the use of flash-boards, and the additional fall at low tide. This does not include a considerable amount of water used for the passage of rafts, estimated as at least 25 per cent. of that available for power, thus making the total minimum flow of the river at least 2,440 cubic feet per second.

Within the next 12 miles above Bangor the fall of the river, according to the table on page 90, is not less than 92 feet, or, deducting the 15 feet or more available at Treat's falls, say 70 feet available for power between that place and Milford. This fall comprises a number of separate sites, mentioned by Wells, but not very clearly distinguished, on account of the fact that the river divides and flows in two channels, with large islands between, and there being falls, of course, on both arms. This fact, too, precludes an estimate of the power at each site, as the quantity of water flowing in each of the two arms is not known. It must, therefore, suffice to say, that in all probability the average quantity of water flowing within the 12 miles referred to, when at its minimum, will be not less than 2,250 cubic feet per second, affording, on a fall of 70 feet, a total gross power of nearly 18,000 horse-power continuously, or very much more if the water could be stored during the night and reservoirs constructed up the river. The total power available on the fall of 92 feet, from Milford to tide, is probably not less than 23,000 gross horse-power continuously, or over 50,000 horse-power during eleven hours. The long tract of dead water above Milford would afford a pond sufficient to store a large amount of water during the night, thus rendering certain a large increase of power above that which could be used continuously. The facilities for the utilization of this immense power are said to be very good, the bed of the stream being generally rock, and the banks favorable for the secure location of mills and canals. A railroad follows the river along the entire distance, and navigation is open to Bangor during about eight months of the year. The amount of power now used on this part of the river is very small.

The next power above Milford is in Edinburg and Passadumkeag, at Passadumkeag rapids, where the fall is 7 feet and the bed of the river solid ledge. The power is unimproved. The next site is in Enfield and Howland, at Piscataquis falls, where the river is 900 feet wide, and the fall about 22 feet. The minimum available power is probably between 2,000 and 3,000 horse-power (gross) continuously. Next comes Island rapids, in Chester and Winn, where the fall is not less than 15 feet in 100 rods, capable of being increased by a dam, the minimum available power being probably several thousand horse-power continuously.

Between Chesuncook lake and the mouth of the Mattawamkeag the descent of the Penobscot is more rapid than in any other part of its course, being not less than 700 feet, or about 19 or 20 feet per mile. This portion of its course, too, seems to be especially favorable for power, combining with a large fall the presence of extensive reservoirs close at hand. The descent is broken by numerous falls and rapids, of which the following may be named: In Indian Purchase township, Grand falls, Island falls, Rhine's pitch, and others, aggregating many feet fall, almost the entire stream in this township being rapid, with several pitches of 15 or 20 feet; in Nicatou township, Salmon Stream falls, 20 feet in 75 rods; Jo-Mary rips, 8 or 10 feet; Rockabema rips, just above the mouth of the East branch, and others; in township A, range 7, Rocky rips; Dolby rips, 8 feet; Ledge falls, 12 or 15 feet, and several miles of quite rapid water; in township No. 2, range 10, above Twin lakes, a number of excellent falls; in township No. 3, range 11, several falls, the principal being Ripogenus falls, where the whole fall is 215 feet in about 3 miles; in township No. 5, range 13, Pine Stream rapids, above Chesuncook lake, 12 or 15 feet in 100 rods; and other smaller powers above.

It is evident from these facts that the Penobscot will compare favorably with any stream in the state as regards amount of power available and facilities for utilization. At the same time, probably a smaller proportion of that power is actually used than in the case of any other large stream yet described.

TRIBUTARIES OF THE PENOBSCOT RIVER.—The first tributary to be mentioned is *Marsh river*, which enters from the west, in Waldo county, after draining about 156 square miles. It offers a number of powers, of which Plummer's mills (25 feet), Boyd's mill (15 feet), and Tapley's mill (15 feet), are near the mouth. There are a number of privileges above, many unimproved, but the stream is not very constant in flow, and many of the mills cannot operate all the year.

The *Sowadabscook river*, from the west, is a somewhat similar stream, though rather more constant in flow, and draining 166 square miles. It has a number of powers, but none of much importance. Were its natural reservoirs improved by storage, its power would be much increased in value, and the mills would be able to operate all the year.

The *Kenduskeag river* from the west, in Bangor, is a larger stream, draining 229 square miles, and much more valuable for power. In Bangor, the stream falls some 75 feet, and a considerable portion of the power is improved, while in the townships above there are many mills, as the table on page 107 shows. This stream, like the two just described, is naturally quite variable in flow.

Great Works river, from the east, affords a number of powers, partly utilized.

Pushaw river from the west, is a stream very like the Kenduskeag, which it adjoins. No important powers on it, however, are mentioned by Wells.

The *Passadumkeag river* from the east, drains about 400 square miles, and is much more favorably situated as regards storage than any of the tributaries thus far, as shown by the table on page 91. Its fall is quite rapid, and in the town of Lowell, Wells mentions four privileges aggregating 48 feet fall. In township No. 3, Hancock county, at Grand falls, the river falls 100 feet in 200 rods, affording, according to Wells, a series of most excellent powers, asregards facilities for utilization. On the outlet stream of Nicatous lake, a tributary of the Passadumkeag, there is a fall of 40 feet in half a mile, and as there is a dam at the outlet of the lake, giving a storage depth of 10 feet, the flow could be rendered quite constant were the storage used for other than log-driving purposes.

The Piscataquis river, which enters the Penobscot from the west, in the town of Howland, is the principal tributary of the latter stream. Its sources lie in the southwestern part of Piscataquis county, and partly in Somerset, and its course is nearly due east for a distance of about 55 miles, its drainage area measuring 1,541 square miles. It is well supplied with reservoirs, which, with systematic improvement, would render the flow quite constant. The stream is about 250 feet wide for 25 miles from its mouth. As regards accessibility, the stream is greatly favored, being followed closely by a railroad from the mouth of the Sebec, about 20 miles from its mouth, to near its headwaters, at Blanchard. The fall of the river in the lower 20 miles of its course, below the mouth of the Sebec, is about 140 feet, or 7 feet per mile; in the next 15 miles it falls about 100 feet, while above that point its descent is probably more rapid still. At the mouth of the river are Howland falls, with a fall of 20 feet, produced by a dam, and once utilized by saw-mills. The minimum available power is probably not less than 600 horse-power (gross) on a fall of 20 feet, continuously, and very much more were the reservoirs improved. Moreover, the dam ponds the water back for 6 miles or more, thus allowing of a large increase of power during working hours, so that the privilege is an excellent one. In Maxfield the river has two sites, McIntosh's and Whitney's falls, each with 8 feet available, but rather less water than below, the Seboois river, the outlet of Seboois lake, entering between. The latter stream has no power of note, but its lake is valuable for storage. In Medford, Piscataquis county, the Piscataquis has Schoodic falls, just below the mouth of the Schoodic river, with 15 feet in 100 rods, and Little falls, 10 feet in 30 rods. The outlet of Schoodic lake has a fall of 22 feet in 35 rods, and its lake is valuable for storage. The next power on the Piscataquis is in Foxcroft and Dover, where, at Dover village, there is a fall of 23½ feet at Dover Great falls, utilized by various mills. There is also a fall of 6 feet 100 rods below, a dam 9 feet high at Dover Lower Village falls, at East Dover, a fall of 12 feet at Foxcroft dam, used by a number of mills, and a nearly equal fall at Pratt's rips, making in all, in the two townships referred to, a total fall of over 60 feet available. The drainage area above these falls is about 387 square miles, but the minimum power available is probably small, on account of the absence of lakes above, perhaps not over 6 horse-power per foot fall continuously. In Guilford several sites are in use, and in Blanchard the river falls 200 to 300 feet in a mile at Grand falls, but only a part of this is available, and the stream is small and inconstant. Other and smaller falls above need no mention.

The Sebec river, the outlet of Sebec lake, is a quite constant stream, and has a fall of 9 feet at Sebec falls, in Milo; a second, of 25 feet in half a mile, 2 miles below the lake; and a third, of 18 feet, at the foot of the lake. The lake covers about 14 square miles, and is very valuable as a storage reservoir. Pleasant river, also a tributary of the Piscataquis, is a larger but probably more variable stream, though its reservoirs would be sufficient, if improved, to regulate its flow to a large extent. Its powers are not of great importance, at least such as are mentioned by Wells.

The next important tributary of the Penobscot is the Mattawamkeag river, which enters from the east at Mattawamkeag. It has its sources in Aroostook county, and flows south and west, draining about 1,533 square miles. It has a number of ponds connected with it, and is probably similar in character to the Piscataquis, though perhaps not so constant in flow. The fall of the stream is rapid, and within a few miles of the mouth, in the towns of Mattawamkeag and Winn, are a number of powers, the exact fall of which cannot be stated. Other sites exist on the upper part of the stream, but few details are at hand regarding them. In Island Falls plantation a fall of 20 feet is used by a few mills, but the power used on the stream is small. Some of its tributaries have rapid descents and good sites. Mattakeunk river falls 100 feet in 2½ miles, but the stream is very small; lower down, in Winn, there is a fall of 50 feet in 100 rods at Upper Mattakeunk falls, and 15 feet in 125 rods at Lower Mattakeunk falls. The Molunkus, Baskahegan, and other tributaries afford abundant power, but no details can be given.

The East branch of the Penobscot, or Mattagamon river, has a rapid fall, its source, lake Mattagamon, lying at an elevation of about 850 feet, or 660 feet above the Penobscot at the mouth of the Mattawamkeag, much the greater part of which descent occurs on the East branch. Few sites, however, are mentioned by Wells, the principal being in township No. 5, range 8, Penobscot county, where, at Bowlin falls, the fall is 8 feet, at Hulling

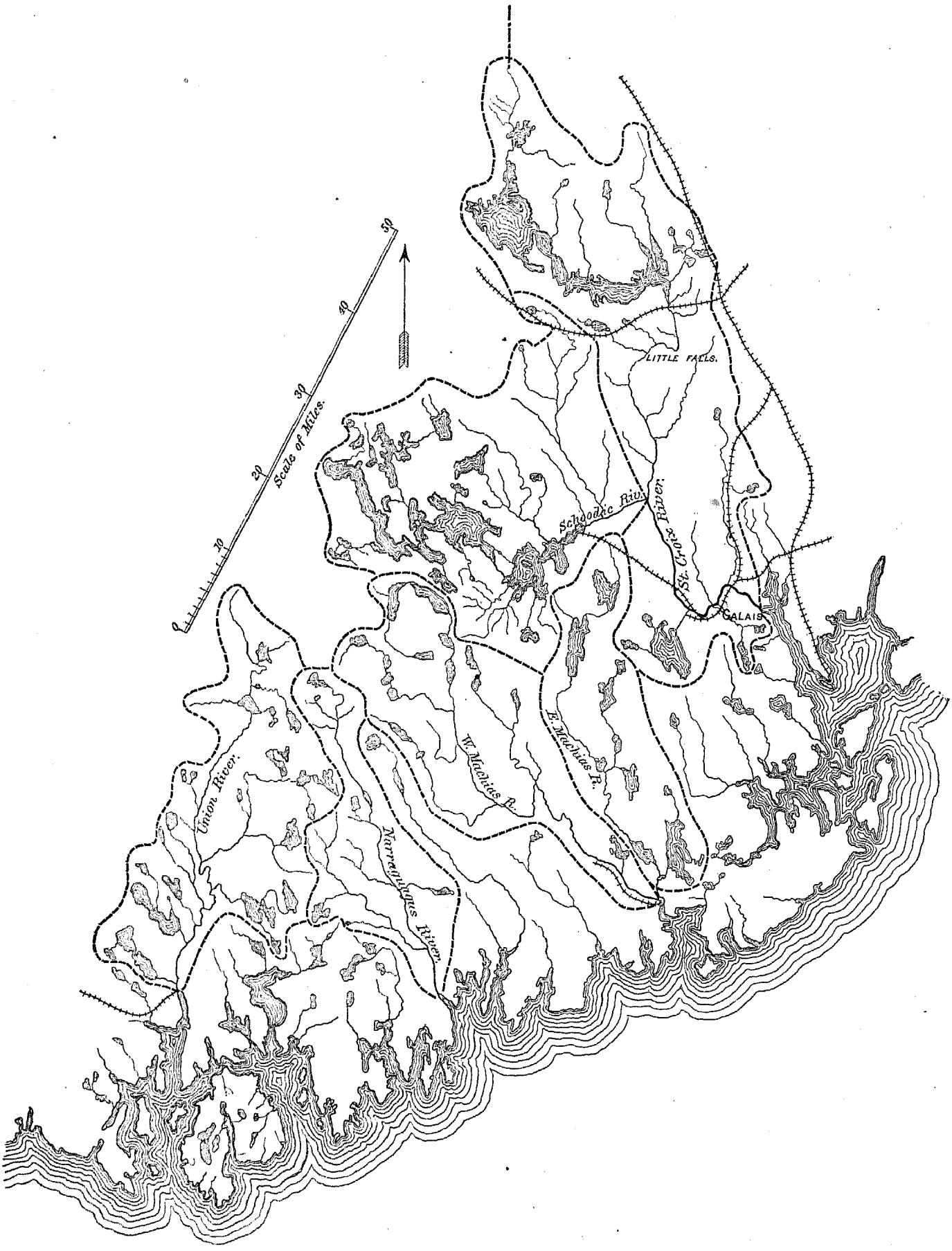

Fig. 22. MAP OF THE STREAMS OF EASTERN MAINE.

Machine falls 12 feet, and at Grand falls 20 feet. There are similar falls in township No. 6, range 8. The power of the stream is little used, but its storage facilities are good, and the flow could be regulated to a considerable extent.

The various small upper tributaries of the Penobscot have considerable power, but are little used. Were they easily accessible, and their reservoirs improved, their power would be valuable.

THE UNION RIVER AND OTHERS.

Between the Penobscot and the Saint Croix rivers are a number of smaller streams, which merit a short notice.

THE UNION RIVER.

This stream is comprised almost entirely within the limits of Hancock county, rising near its northern boundary and pursuing its course southward through a distance of about 45 miles, draining a total area of about 584 square miles above the head of tide-water, at Ellsworth Falls. Its valley is narrow and its tributaries short. The headwaters of the stream lie at elevations of from 225 to 250 feet above the sea, and the interior of the basin is a strongly-defined valley, of a rolling surface, encompassed on nearly all sides by rugged highlands. A large proportion of the basin is covered with forests, and the lakes are sufficient in number to render the flow quite constant, though not yet systematically improved. The extreme range of water at Ellsworth is 7 feet. The following table (from Wells) gives the principal reservoirs connected with the stream:

Name.	Approximate area.	Present storage (1869).	Additional storage feasible.
	Sq. miles.	*Feet.*	*Feet.*
Branch pond	3.75	10	10
Rocky pond, in Orland	0.35	10	10
Reed's pond	4.25	6	14
Beech Hill pond	1.85	6	14
Mountain pond	1.25	6	14
Hat Case pond	0.50	.....	.....
Molasses pond	2.25	10	2
Scammon pond	1	.....	.....
Abram's pond	0.80	10	.....
Webb's pond	1.75	10	.....
Spectacle pond	2.10	8	3
Rocky pond	0.40	10	5
Rocky pond, in No. 22	1.15	.....	.....
Two Lead Mountain ponds	2	6 and 8	3 and 4
Brandy pond	1.60	6	.....
Great pond	1.50	13	10
Long pond	1	8	5
Alligator pond	1.80	6	5
Morrison's pond	0.35	8	.....
Middle Branch pond, upper	1.25	6	5
Middle Branch pond, lower		5	5
Flood's pond	1	9	5
Springy pond	0.60	9	5
Hopkins' pond	1.75	No dam	5
George's pond	0.90	.....	.....
Twenty-six ponds	34.85	.....	.....

The total number of ponds above Ellsworth is 43, with a total area of 60 square miles, or 1 square mile to every 9.7 square miles of basin. The mean annual rainfall is about 48 inches, 12 in spring, 10 in summer, 14 in autumn, and 12 in winter, a distribution very favorable to constant flow. The slope of the stream may be seen from the fact that the lake in the northern part of the basin lies at an elevation of 205 feet, making the average fall of the river to tide-water about 4 feet per mile, or considerably smaller than that of the larger streams of Maine.

The first power on the stream is at Ellsworth Falls, at the head of tide and of navigation, the river being closed to navigation below this point during about four months of the year. The total fall is stated at 85 feet in about 2 miles, or 100 feet in $2\frac{1}{4}$ miles, and a part of the power is utilized by mills of various kinds, but principally saw-mills, the storage on the ponds above being used principally for log-driving purposes (Wells). The upper dam ponds the water for 12 or 15 miles, thus creating a reservoir large enough to allow of the concentration of power into working hours. No measurements of the power available are at hand, but I should judge the minimum power to be about 12 horse-power per foot fall continuously, or 24 during twelve hours, which would probably be practicable. This would, therefore, amount to 2,400 horse-power (gross) on the entire fall of 100 feet. The site is accessible by rail, and the facilities for development are said to be good. The power estimated could of course be largely increased, probably more than doubled, were the reservoirs systematically improved.

There are no important powers above this, though some sites are named by Wells on the upper branches of the river. Some of the tributaries afford good constant powers, though small.

There are in Hancock county a number of tidal powers, but no others of importance, the Union river being the only considerable stream in the county.

THE NARRAGUAGUS RIVER.

This is a small stream, draining about 260 square miles in Hancock and Washington counties, and flowing in a nearly southerly direction, its length being about 50 miles. It has a number of ponds connected with it, and its flow is not very variable, but none of its powers are very important. At the head of tide-water are the Cherryfield falls, where six privileges exist, with a total fall of 52 feet, affording an excellent power, with a reservoir above sufficient to allow of the concentration of the flow into working hours. At the Great falls, in Deblois, there is a second fall of about 50 feet in half a mile, and the power is said to be a fine one. The minimum power of the river, at its mouth, may be roughly estimated at about 5 horse-power per foot fall continuously.

The Pleasant river, Chandler's river, and Tunk river are small streams near the coast, almost all of which have several sites where the fall is considerable, but the power is small.

THE EAST AND WEST MACHIAS RIVERS.

The West Machias river, confined almost entirely within Washington county, drains an area of about 458 square miles, flowing in a southerly and easterly direction, its length being some 45 miles, measured in a straight line. Its fall is considerable, the elevation of its headwaters being some 400 feet, and its slope being about 5.8 feet per mile, according to Wells. Its flow is not very variable, being regulated to a considerable extent by a number of lakes and ponds, and a considerable portion of its drainage basin being wooded. The total area of lake surface in its basin is 32 square miles, or 1 square mile to 14 square miles of basin. Seventeen lakes have a total area of 30.55 square miles, and a number of them are dammed, though used principally for log-driving purposes. Being situated near the headwaters of the river, their drainage areas are small, and their importance less than would be expected from their size.

The river offers a number of good privileges. At the head of tide and of navigation, 6 miles from the mouth of the stream and 3 miles above where it joins the East Machias, there is a fall of 33 feet (?) to high tide, utilized to some extent. In the absence of gaugings, I should roughly estimate the minimum power as about 10 horse-power (gross) per foot fall continuously. It is stated as greater, but on what authority I do not know. The power is apparently a good one. At Middle falls, in Whitney, there is a fall of 10 feet; and at Great falls, 5 miles above, in Centreville, a fall of 20 feet, with excellent facilities for improvement. In Northfield there is a fall of 28 feet at Holmes' falls, and there are a number of smaller powers above, which need not be mentioned. Any one may estimate the power available by comparison with the data given on pages 8 to 10.

The East Machias river is a stream similar to that just described, but is more constant in its flow. It is entirely confined to Washington county, and pursues a course nearly south, draining about 345 square miles, and with 38 square miles of lake and pond surface, or one-ninth of the area of the basin. The lakes are not all situated near the headwaters of the stream, but are more equally distributed over the basin, thus rendering the flow of the stream quite uniform, though the lakes are said to be used principally for log-driving.

The principal power on the stream is at the head of tide, where the fall is 47 feet in 3 miles, and is used in four privileges. The minimum power is probably not far from that on the West Machias, or, say, 10 horse-power per foot fall continuously, and very much more if the reservoirs were fully improved, as, in fact, they may have been since Wells' report was made. The site is no doubt a good one, though the power cannot be stated more accurately. Other powers exist above, as the fall of the stream is nearly as great as that of the West Machias, but little of the power available is utilized, and no details need be given.

A few other streams exist west of the Saint Croix, viz, the Dennys, Pemaquan, and others, but they are so small as to merit no particular description. Being regulated by a number of lakes, their flow is quite uniform, and their fall being tolerably rapid, they offer some excellent small powers, many of which are to some extent improved. None of them, however, require further notice here.

THE SAINT CROIX RIVER IN MAINE.

The Saint Croix river, the last of the proper coast streams of Maine, is formed by the union of two branches, "the Northern or Eastern, called the Upper Saint Croix or Chiputneticook river, the outlet of the Chiputneticook lakes; and the Western, called the Kennebasis river, which discharges the Kennebasis lakes". The course of the stream is southeast, and its length, from the junction of the two branches to tide, is about 20 miles. The Chiputneticook, and the main stream below it, form the boundary between the state of Maine on the west and the province of New Brunswick on the east. Of that part of the basin lying in Maine, almost the whole is comprised in Washington county, and only this part of the basin is here to be considered. From tide-water at Calais to the head of North lake, the source of the Chiputneticook, the distance is about 97 miles, by the course of the river, while the Kennebasis river is about 42 miles long from its extreme headwaters to the Chiputneticook, and 62 miles to tide. The drainage basin is undulating and hilly, but not mountainous, and a large proportion is still covered with

forests. It comprises a total area of about 1,674 square miles above the head of tide at Calais, of which about 1,100 are in Maine and the rest in New Brunswick, the Chiputneticook draining about 634 square miles, and the Kennebasis about 766 square miles. The basin, as a whole, is less elevated than that of any large stream of Maine which we have yet considered, but the slope of the stream is, nevertheless, quite large, as is shown by the following table:

Declivity of the Saint Croix river.

Place.		Distance from Calais.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
		Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Head of tide at Calais		0	0	20	166	8.3
Junction of two branches		20	166	35	217	6.2
Foot of Chiputneticook (Schoodic) lake	East branch.	55	383	20	.....	.....
Head of Chiputneticook (Schoodic) lake	East branch.	75	383	21	61	2.9
North lake, head of stream	East branch.	96	444			
Junction of two branches		20	166	9	20	2.2
Just below Big lake	West branch.	29	186	11	3	0.3
Head of Big lake	West branch.	40	189	3	82	27.3
Grand lake, foot	West branch.	43	271	12	.....	.....
Grand lake, head	West branch.	55	271			

The average slope of the East branch is about 3.7 feet per mile, and of the West branch, below Grand lake, about 4.6 feet per mile. From Chiputneticook lake to tide the fall averages 7 feet per mile, and from Grand lake to tide 6.3 feet per mile.

The flow of the stream is naturally very constant, and, on account of the extensive forests and the large area of lake surface, might be made more uniform, it is said, than that of any other large river in the state, excepting the Presumpscot and the Fish rivers. The total number of lakes in the basin is 61, covering a total area of 150 square miles, or 1 square mile to every 11 square miles of basin. The following table gives the principal of these reservoirs:

Principal reservoirs of the Saint Croix river.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Lewey's lake	Kennebasis branch	0.85	Slight	8
Long lake	do	1.25	do	6
Big lake	do	*a*14	do	10
Grand lake	do	17	8	(*a*)
Pocumpus lake	do	2.50	*b*6	.....
Machias lake	do	2	3	.....
Sysledobsis lake	do	7	8	.....
Sysledobsissis lake	do	4	3	.....
Horseshoe lake	do	0.75	5	.....
Oxbrook lake	do	1	3	.....
Shaw lake	do	1.75	.....	.....
Junior lake	do	6	.....	.....
Mill-privilege lake	do	0.75	6	.....
Scraggly lake	do	3	.....	.....
Pleasant lake	do	2	4	6
Duck lake	do	0.75	4	4
Chain (two lakes)	do	1.50	4	.....
Little River lake	do	0.80	3	.....
West Musquash lake	do	3	4	.....
Musquash lake	do	1.25	7	.....
Farrer's lake	do	0.75	4	.....
Tomah (three lakes)	do	2	Dam	.....
Clifford (four lakes)	do	2	5	.....
Twenty-two lakes		75.00	.....	.....
Chiputneticook lower lake	Chiputneticook branch	27	15	.....
Chiputneticook Grand lake	do	25	6	.....
North lake	do	3.50	3	.....
Lambert's lake	do	2	4	.....
Enoch's lake	do	0.75	Slight	.....
Five lakes		58.25	.....	.....

a Several feet. *b* By Grand Lake dam.

Besides those named, there are others in New Brunswick. Were these reservoirs all improved to their full capacity the flow of the river would be very constant; as it is, the greatest range of water is stated at only about 8 feet, and the freshets are comparatively harmless. Artificial reservoirs are also said to be particularly feasible, there being considerable areas of low ground along the river capable of being flowed, and, in fact, subject to overflow during high freshets. The storage on the lake was, at the time of Wells' report, only used for log-driving purposes. The rainfall over the basin is about 10 inches in spring, summer, and winter, and 14 in autumn, or 44 inches annually, on the average.

The stream is accessible by rail, without much difficulty, up to the junction of the two branches; above that it is more difficult of access, the East branch especially.

The first power met with is at the head of tide, at Calais, the rise and fall of the tide being about 8 feet. The first fall, known as "Salt Water falls", amounts to 10 feet, but the power is not valuable, on account of interruption at high tide, and is little utilized. At Union falls, about half a mile above, a dam extends across the river, and the power is partially utilized. The fall is not stated. At Salmon falls, a mile still farther up, some power is also used; and at Milltown there is also power in use, there being two dams. The total fall in Calais is said to amount to 72 feet, and the facilities for its complete utilization to be excellent. The minimum power cannot be given very accurately, but is probably not less than about 40 or 50 horse-power (gross) per foot fall continuously, or about double that amount during working hours. If we call it 45 horse-power continuously, the total power is over 3,000 horse-power continuously, or nearly 7,000 horse-power during working hours. This could be still further increased, and by a considerable amount, were the lakes better improved.

The next power is at Baring mills, 3 miles above Milltown. A dam crosses the river, giving a fall of 10 feet, and the power is partially utilized. The width of the river is about 500 feet from this place to tide, and for 4 or 5 miles above.

Five miles above the Baring mills we come to Sprague's falls, where the fall is 25 feet, affording one of the best powers on the stream. The minimum power continuously is probably not less than 40 horse-power (gross) per foot fall, or 1,000 horse-power on a fall of 25 feet, or about double this amount during working hours. Were the reservoirs improved to their full capacity the available power here and below would probably be increased to 125 horse-power per foot fall continuously, and during ordinary years it probably does not fall below 60 horse-power per foot fall, or 1,500 horse-power on a fall of 25 feet continuously.

At Enoch's rips, half a mile above Sprague's falls, the fall is 9 feet, and the quantity of water about the same as at the latter privilege.

The last fall below the junction of the two branches of the river is Grand falls, 6 miles above Enoch's rips, and just below the junction. The falls consist of two pitches, about half a mile apart, each pitch having a descent of about 18 feet. The privilege is one of the finest on the river. The drainage area measures about 1,400 square miles, and the minimum power is probably in the neighborhood of 40 horse-power (gross) per foot fall continuously, or 1,440 horse-power on a fall of 36 feet. With complete utilization of the reservoirs, so as to render available the maximum with storage, the power could be probably increased to from 110 to 120 horse power per foot continuously. The extent to which the power on this stream may be improved, by the improvement of its reservoir facilities, renders it remarkable among the rivers of the state.

The West branch, or Kennebasis river, also known as the Schoodic river, drains an area of about 766 square miles, and includes a large extent of lake surface. Its flow is therefore very uniform, and its powers are excellent. Between its mouth and Big lake, a distance of about 10 miles, the fall is about 20 feet, including several rapids and one improved privilege, with a fall of 8 feet. The storage on the lakes is used only for log-driving, but if used for regulating would improve the powers very much. The principal fall on the stream occurs between Big lake and Grand lake, amounting to 82 feet in a distance of about 3 miles. At the head of the fall a dam was built in 1867 by the Saint Croix Log-Driving Company, to hold a depth of about 8 feet on Grand lake. The privilege is said to be a most excellent one, and the power would be unfailing on account of the large storage above. There are other good powers in the neighborhood, mostly unimproved; thus the East and West Musquash streams, outlets of lakes of the same names, fall 100 and 60 feet respectively in their course to Big lake, the outlet of Wawbawsoos or Machias lake falls 40 feet in a short distance, and the outlet of Upper Chain lake falls 30 feet to lake Sysledobsis. All of these powers are comparatively constant.

The Chiputneticook, or East branch of the Saint Croix, has likewise a number of good privileges, of which Wells names the following: Grand Chiputneticook falls, 2 miles above mouth, 21 feet fall in three-quarters of a mile; Canoose rips, 10 miles above mouth, 11 feet fall in half a mile; Haycock rips, 13¼ miles from mouth, 6 feet fall in half a mile; Meeting-House rips, 15 miles from mouth, 8 feet fall in a mile; Rocky rips, 3 miles long, the foot being 16 miles above mouth, 25 feet fall; Mile rips, 1 mile long, the foot 30 miles from mouth, 23 feet fall; Kill-me-quick rips, 34 miles from mouth, 10 feet fall in half a mile. These are all below Chiputneticook lake, at the outlet of which the Saint Croix Log-Driving Company has erected a dam holding a storage of 15 feet on the lake. Between the latter and Grand lake, in a distance of about 3 miles, there is a fall of about 60 feet, the upper lake being also controlled by a dam. This power is said to be a good one.

It is evident that the Saint Croix, like all the other streams of Maine yet described, offers a number of good sites, and the table of utilized power shows that the amount of power at present in use is small.

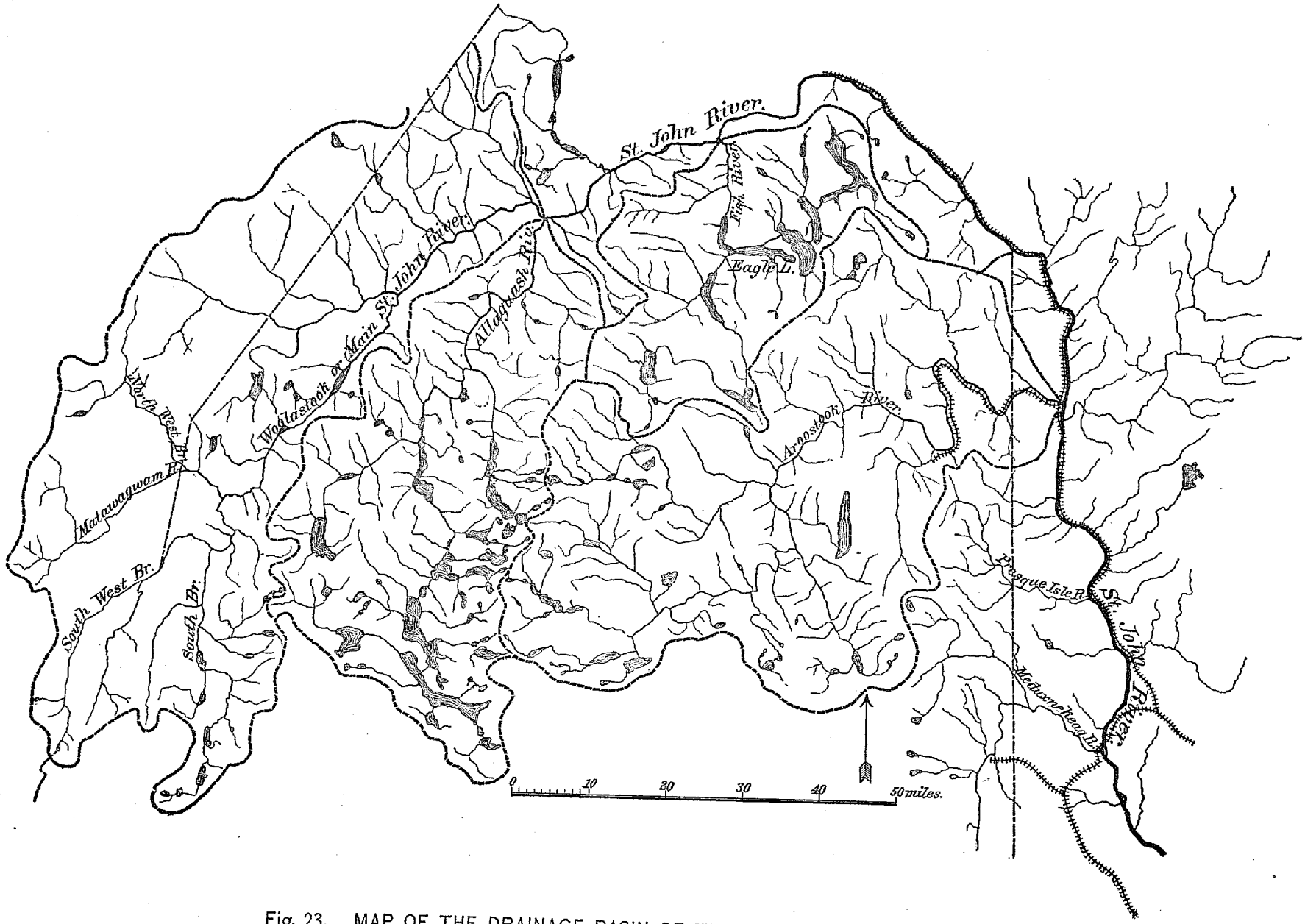

Fig. 23. MAP OF THE DRAINAGE BASIN OF THE ST. JOHN RIVER IN MAINE.

THE SAINT JOHN RIVER IN MAINE.

This stream, the last to be considered in this report, drains the northern slope of the state of Maine, comprising all the area included between its northern, eastern, and western boundaries, and the drainage basins of the streams which have been described in the previous pages. The course of the river is circuitous. The main stream is formed almost on the northern boundary of Somerset county by the union of several branches, the Northwest branch rising in Canada and flowing southeast; the Southwest branch flowing in a northeasterly direction and forming for almost its entire length the western boundary of the state; and the South branch, rising in Somerset county and flowing north. From the junction of these branches the stream, known in the upper part of its course as the Woolastook, flows first northeast to the northern boundary of the state, then east and southeast, passing into New Brunswick and bending toward the south, only to bend once more and flow nearly eastward to the sea. According to Wells, "the total length of the Saint John, in Maine, is estimated as not far from 211 miles, including the more important meanderings", while "its total length, from its remotest sources to the sea, is about 450 miles". According to the same authority, "the area of the whole Saint John basin is 26,000 square miles", while that part in Maine measures 7,400 square miles. My own measurement of the Maine basin gave its area as about 8,000 square miles. As no map of Canada was at hand, I have not been able to measure the total drainage basin of the stream above certain points, but on account of the small amount of power on the river this is not important. Next to the basin of the Androscoggin, that of the Saint John is the most elevated in Maine, but its height, as Wells remarks, is due to a considerable altitude over its whole extent, rather than to an extreme elevation in any part. "It is, therefore, indicative and productive of less fall and power on the streams than are found upon equal areas of the southern slope." "The elevation of the river above tide at the eastern boundary of the state is 419 feet, and at the mouth of the Saint Francis, 606 feet. The distance being about 70 miles, the mean slope is at the rate of 2.7 feet per mile." At the junction of the three branches the elevation of the stream is probably about 750 feet; the mean slope from this point to the eastern state boundary is, therefore, about 2.1 feet per mile, and to the mouth of the Saint Francis, 88 miles according to Wells, about 1.6 feet per mile. The slope is therefore much less than that of any stream of large size in Maine, and the river is of comparatively little value as a source of power. Wells states that it is navigable for its whole length in Maine.

The drainage basin of the stream in Maine is almost entirely covered by unbroken forests, and is topographically very uniform in character. "In the eastern or lower portion, bordering the river, the face of the country is very nearly level, and at a distance from it gradually becomes undulating and moderately hilly, until it subsides into and is merged in the flat country bordering the Aroostook river. Highlands of low elevation diversify its aspect in the mid-district about the mouth of the Saint Francis and Allaguash rivers. Beyond the confluence of these streams the valley of the upper Saint John is quite level nearly to the boundary highlands on the west and southwest. Accordingly, large portions of it are swampy, the pitch of the water-sheds not being sufficient to throw off the surplus water into the drainage channels." "Rock is less exposed than on the southern slope, and building stone less easily procurable."

In regard to the flow of the stream, although no measurements, or even observations, have been made, it would seem to follow, from the immense forests, the uniform topography, and the numerous lakes, that the minimum flow must be large; while, on the other hand, the rise in freshets, on account of the small slope of the stream, may be also quite large. The following table, from Wells, gives the lakes in the basin:

Principal reservoirs of the Saint John river in Maine.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
Chapman Plantation lake	Aroostook river	1			Three ponds above Mansungun lake	Aroostook river	1.50		
Squawpan lake	do	10		5	Pond north of Mansungun lake	do	1.10		
Saint Croix Lake, in No. 8, R. 4	do	2.50	4		Goddard's pond	do	0.90		
Two ponds in No. 8, R. 3	do	1.50			Mooseleuk lake, in No. 9, R. 8	do	3		
Tracy pond, No. 7, R. 4	do	1.30			Big Machias lake	do	2	Dam, 12.	
Umcolcus pond	do	3			Pond south of Big Machias lake	do	1		
Pond in No. 7, R. 6	do	1.25			Lake in No. 11, R. 8	do	3		
Sapompeag ponds (two)	do	2.50			Lake in No. 11, R. 9	do	1.10		
Millinokett lake	do	5		12	Nashville Plantation pond	do	1		
Little Millinokett lake	do	3.50			Salmon Brook lake	do	1		
No. 7 pond, above Millinokett	do	1			Madawska lake	do	4		
Pond in No. 7, R. 10	do	1.10							
Pond in Nos. 7 and 8, R. 10	do	1.20			Thirty ponds		59.95		
Mansungun lake	do	5							
Pond below Mansungun lake	do	1							

Principal reservoirs of the Saint John river in Maine—Continued.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Keeobscus pond, upper	Allaguash river	1		
Keeobscus pond, lower	do	1.15		
Pataquongomis lake	do	2.75		
The Five lakes	do	11		
The Long lakes	do	10		
Lake in No. 10, R. 13	do	3		Many.
Chemquasabamtic lake	do	8		
Heron or Harrow lake, in No. 10	do	2.75		
Churchill lake	do	8		(a)
Heron lake, in No. 8	do	4		(b)
Pomgocwahem lake	do	11		(b)
Indian lake	do	3	Dam, 6	
Spider lake	do	4	Dam, 5	
Pleasant lake	do	4		
Super flowage and pond	do	2	Dam, 10	
Smith brook flowage	do	3	Dam, 12	
Pomgocquamoc lake	do	3	Dam	(c)
Pillsbury pond	do	1.50	Dam, 8	(c)
Mad pond, in No. 9, R. 12	do	1.50	Dam, 8	
Russell stream (three ponds)	do	2.25		
Four ponds above Spider lake	do	3		
Twenty-eight ponds		84.90		
Meduxnakeag lake	Meduxnakeag river	3.75	Dam	4
New Limerick (three ponds)	do	1.50	Dams	
Caldwell lake	do	1		
Spalding's lake	do	2.25		
No. 9 lake	do	1		
B. lake	do	1		
Eight lakes		10.50		
Cleaveland, or Long lake	Fish river	19		
Second, or Bear lake	do	2		
Cross, or Preble lake	do	6		
Square, or Sedgwick lake	do	15		
Eagle, or Winthrop lake	do	22		
Saint Froid, or Long lake	do	5.50		
Portage lake	do	8.50		
Fish River lake	do	7		
Ponds northwest of Spruce lake	do	1		
The Long ponds in No. 17, R. 6	do	1.25		
Five ponds above Fish River lake	do	2.75		
Fifteen lakes		89.00		
Three ponds in No. 15, R. 7	Saint John river	1.50		
Glazier's lake	do	3	6	(c)
Beau lake	do	5	4	(c)
Pohenagamook lake	do	4.50		(c)
Cascade Brook lake	do	2.75		
Cascade Brook upper lake	do	1		
Chimenticook lake	do	4.50		
Depot lake	do	3.50		
Ishaeganalshegeck lake	do	1.75		
Baker lake	do	4	Dam	
Francis lake	do	0.90		
Lake north of Francis lake	do	1		
Turner brook lake	do	1.10		
Woboostook lake	do	2.50		
Upper Woboostook lake	do	1		
Two lakes in No. 4, R. 17	do	2.25		
Nineteen lakes		36.65		

a Formerly a 21-foot dam. *b* Formerly several feet. *c* Several feet.

The foregoing one hundred principal lakes and ponds cover 278 square miles. The total number of lakes in the basin is 206, covering 350 square miles. It has already been remarked that some 36 square miles of lake surface naturally belonging to the Saint John have, by artificial means, been made tributary to the Penobscot. It is, however, probable that a number of small lakes and ponds in the wild parts of the basin are not represented on any map, so that the area of lake surface is, perhaps, even greater than stated above.

The rainfall over the basin of the Saint John in Maine averages about 38 inches, 10 in every season except spring, when the fall is only about 8 inches.

The greater part of the valley of the Saint John is exceedingly inaccessible, lying far removed from roads or railroads. The main river is followed quite closely by a railroad from Fredericton, New Brunswick, up to Edmunston, on the northern boundary of Maine, but with this exception no railroad penetrates the basin. The water-powers are therefore little known and will be long undeveloped, and a bare mention of the more important ones will be quite sufficient for the purposes of this report.

The census returns show but one mill in Maine on the river; there are, however, a few falls which may be named: Fish River rapids, about a mile below the mouth of the Fish river, is said to be a good site, a fall of 16 feet being available, and the bed and banks favorable for utilization. No other site is mentioned below the mouth of the Saint Francis, but above that point several are named. There are said to be two in township No. 13, range 14; one in No. 14, range 14; two in No. 12, range 15; one in No. 13, range 15; several in No. 11, range 16; and three in No. 12, range 16. These powers are unimproved, inaccessible, little known, and of small value at the present time.

TRIBUTARIES OF THE SAINT JOHN RIVER.—Of the tributaries of the Saint John, the first which offers any power in Maine is the *Meduxnekeag river*, which drains about 427 square miles in Maine, and affords a number of sites, improved only to a small extent.

The *Presque Isle river* drains 209 square miles in Maine, and also affords some powers, partially improved.

The principal tributary of the Saint John in Maine is the *Aroostook river*, which drains about 2,550 square miles in all, and about 2,500 in Maine. Rising at an elevation of about 1,050 feet, the stream falls, in its course of about 117 miles, to an elevation of 345 feet at the state line, making an average fall of about 6 feet per mile, or much greater than that of the Saint John. The stream affords a number of powers, of which Wells mentions several,

but none of great importance. The census returns show no power utilized on the stream. Its tributaries likewise afford many powers, mostly unutilized. In accordance with the general character of the country, none of the falls are extensive or precipitous, but are generally rapids, extending over some distance.

The *Fish river*, the outlet of an extensive chain of lakes, affords at Fish River mills, 1 mile above its mouth, a fall of 18 feet. The extensive reservoirs above make this stream one of the best in the whole drainage basin, and its power could be much improved. There are other powers on the river, notably two in Wallagras plantation, one with a fall of 20 feet, and the other at the outlet of Eagle lake, a little above, where a dam could be built, raising the lake.

The *Allaguash river* is the second largest tributary of the Saint John in Maine, draining about 1,650 square miles. Rising in the northern part of Piscataquis county, in Chamberlain lake, it flows nearly northward for a distance of about 60 miles, measured in a straight line, falling 308 feet, or, according to Wells, a little over 3 feet per mile. A number of powers occur about its headwaters, possessing at least the merit of constancy. Chamberlain lake is dammed to a height of 12 feet, forming a considerable reservoir, while above the lake, in township No. 8, range 13, are several precipitous falls, one of 15 feet and others smaller, the stream, however, being small. In township No. 10, range 12, there is a series of rapids on the main stream, with a total fall of 45 feet in a mile or less. No other falls are mentioned in the remainder of the course of the stream, or for 45 miles in a straight line. The census returns show no power used on the river.

The *Saint Francis river*, which enters the Saint John from the north, and forms the remainder of the northern boundary of the state of Maine, is said to afford a good power at its mouth, with an available fall of 30 feet.

The *Woonastook*, by which name the Saint John is known above its confluence with the Saint Francis, is a stream similar to the Allaguash, and its powers have already been noticed. On many of its tributaries are found rapids, but no powers of much value, for the present at least.

It is evident, from what has preceded, that the power in the basin of the Saint John is smaller in amount and less in value than that in any other large drainage basin of the state. Not only are the streams comparatively sluggish and the ledges of rock little exposed, but the inaccessibility of the district alone is sufficient to render almost valueless any powers which may exist. The day may come when these streams may be developed as sources of power, and a large amount of power could be obtained from them, and power which would be reliable throughout the year, but many years must elapse before any industries, except the lumbering, seek this region.

In regard to the state of Maine as a whole, one cannot fail to realize that the resources of the state are remarkable as regards both the amount and the constancy of its power. As its industries develop, its water-power must receive increased attention.

Summary of drainage areas of the rivers of Maine.

Stream.	Tributary to what.	Above what place.	Drainage area.	Stream.	Tributary to what.	Above what place.	Drainage area.
			Sq. m.				*Sq. m.*
Mousam river	Atlantic ocean	Mouth	157	Androscoggin river	Atlantic ocean	Rumford Falls	2,223
Do	do	Kennebunk	150	Do	do	Gorham	1,529
Saco river	do	Mouth	1,753	Do	do	Berlin falls	1,477
Do	do	Saco and Biddeford	1,734	Little Androscoggin river	Androscoggin river.	Mouth	381
Do	do	Union Falls	1,677	Do	do	Mechanics' Falls	270
Do	do	Salmon Falls	1,628	Twenty-Mile river	do	Mouth	189
Do	do	Bonny Eagle Falls	1,578	Sabattus river	do	do	100±
Do	do	Highland rips	1,366	Dead river	do	do	138±
Do	do	Great Falls	856	Webb's river	do	do	169
Do	do	Fryeburg	439	Swift river	do	do	.....
Little Ossipee river	Saco river	Mouth	158	Ellis river	do	do	175
Great Ossipee river	do	do	470	Wild river	do	do	66
Do	do	Kezar Falls	430	Outlet of chain of lakes	do	do	760
Do	do	Effingham falls	340	Magalloway river	do	do	416
Bear Camp river	Great Ossipee river	Mouth	157	Kennebec river	Atlantic ocean	do	6,404
Upper Kezar river	Saco river	do	129	Do	do	Augusta	5,907
East branch of	do	do	39	Do	do	Waterville (without Sebasticook).	4,475
Presumpscot river	Atlantic ocean	do	726a	Do	do	Kendall's Mills	4,467
Do	do	Saccarappa	646	Do	do	Somerset Mills	4,459
Do	do	Outlet of lake	498	Do	do	Skowhegan	4,176
Yarmouth river	do	Mouth	164	Do	do	Norridgewock	4,137
Androscoggin river	do	Brunswick	3,698	Do	do	Madison	3,439
Do	do	Lisbon	3,659	Do	do	Caratunk falls	2,970
Do	do	Lewiston	3,120	Do	do	Moxie rips	1,453
Do	do	Turner Centre falls	3,070	Do	do	Outlet of Moosehead lake.	1,296
Do	do	Turner	2,856	Cobbosseecontee river	Kennebec river	Mouth	292
Do	do	Livermore Falls	2,689	Emerson stream	do	do	a185
Do	do	Jay falls	2,664				
Do	do	Capen's rips	2,635				

a Wells.

Summary of drainage areas of the rivers of Maine—Continued.

Stream.	Tributary to what.	Above what place.	Drainage area.
			Sq. m.
Sandy river	Kennebec river	Mouth	666
Do	do	Dickerson's rips	603
Do	do	North Sharon	577
Do	do	Farmington Falls	482
Carrabasset river	do	Mouth	366
Dead river	do	do	1,021
Wesserunsett river	do	do	167
Sebasticook river	do	do	1,088
Do	do	Lower falls	906
Do	do	Hunter's Mills	887
(No name)	Sebasticook river	Mouth	186
Do	do	do	376
Sheepscot river	Atlantic ocean	do	248
Damariscotta river	do	do	46
Medomac river	do	do	118
Saint George river	do	do	228
Penobscot river	do	do	8,785
Do	do	Bangor	7,898
Do	do	Orono	7,840
Do	do	Oldtown	7,329
Do	do	Mouth of Passadumkeag	7,166
Do	do	Mouth of Piscataquis	5,202
Do	do	Island rips	4,962
Do	do	Grand Falls	3,375
Do	do	Rippogenus falls	1,512
Do	do	Pine Stream rips	835
Marsh river	Penobscot river	Mouth	150
Sowadabscook river	do	do	166
Kenduskeag river	do	do	229
Pushaw river	do	do	231
Passadumkeag river	do	do	402
Piscataquis river	do	do	1,541
Do	do	Maxfield	1,359
Do	do	Medford	1,251
Do	do	Mouth of Pleasant river	792
Do	do	Dover village	387
Seboois river	Piscataquis river	Mouth	175
Outlet of Schoodic lake	do	do	58
Pleasant river	do	do	434
Sebec river	do	do	208
Do	do	do	270
Mattawamkeag river	Penobscot river	do	1,533
Do	do	Slugunda falls	1,446
Molunkus river	Mattawamkeag river	Mouth	273
Baskahegan river	do	do	214
North branch of	do	do	183
South branch of	Mattawamkeag river	Mouth	328
Salmon river	Penobscot river	do	116
East branch of	do	do	922
Outlet of Seboois lakes	East branch Penobscot river	do	304
Millinoket river	Penobscot river	do	171
Cancomgomock river	do	do	234
Middle branch of	do	do	244
South branch of	do	do	206
Union river	Atlantic ocean	do	584
North branch of	Union river	do	214
South branch of	do	do	145
Narraguagus river	Atlantic ocean	do	260
Pleasant river	do	do	196
West Machias river	do	do	458
Do	do	Whitney	436
Do	do	Centreville	419
Do	do	Northfield	402
East Machias river	do	Mouth	345
Denny's river	do	do	158
Saint Croix river	do	Calais (Union falls)	1,074
Do	do	Baring	1,511
Do	do	Sprague's Falls	1,496
Do	do	Junction of two branches	1,400
Chiputneticook river	Saint Croix river	do	634
Do	do	Rocky rips	518
Do	do	Vanceborough	437
Saint Croix river	Atlantic ocean	In Maine, above Calais	1,102
Do	do	In New Brunswick, above Calais	572
Schoodic or Kennebasis river	Saint Croix river	Mouth	766
Do	do	Mouth of Long lake	583
Saint John river	Atlantic ocean	In Maine	7,998
Meduxnekeag river	Saint John river	Mouth	562
Do	do	In Maine	427
Presque Isle river	do	do	209
Aroostook river	do	Mouth	2,556
Do	do	In Maine	2,498
Do	do	Mesardis	926
Little Madawaska river	Aroostook river	Mouth	232
Great Machias river	do	do	378
Fish river	Saint John river	do	938
Do	do	Fish River mills	910
Do	do	Outlet of Eagle lake	815
Allaguash river	do	Mouth	1,648
Woonastook river	do	Total above mouth of Little Black river.	2,741

Table of power utilized on the coast streams of Maine.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horsepower used, net.
						Feet.	
Mousam river	Atlantic ocean	Maine	York	Woolen	2	24	210
Do	do	do	do	Cotton	2	28	225
Do	do	do	do	Boots and shoes	1	17	30
Do	do	do	do	Boot and shoe findings	1	24	200
Do	do	do	do	Sash, door, and blind	1	10	52
Do	do	do	do	Flour and grist	3	32	90
Do	do	do	do	Saw	5	53	196
Tributaries of the	Mousam river	do	do	Flour and grist	2	41	100
Do	do	do	do	Saw	5	21	285
Kennebunk river	Atlantic ocean	do	do	do	8	32	104

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Saco river	Atlantic ocean	Maine	York	Cotton	3	64	4,000
Do	do	do	do	Woolen	1	10	50
Do	do	do	do	Foundery	1	6	12
Do	do	do	do	Flour and grist	3	30	150
Do	do	do	do	Saw	11	145	750
Do	do	do	do	Cotton and woolen machinery	1	16	100
Do	do	do	Cumberland	Flour and grist	1	12	50
Do	do	do	do	Saw	2	24	145
Do	do	do	Oxford	do	1	9	50
Do	do	do	do	Wheelwrighting	1	11	6
Little Ossipee river	Saco river	do	York	Foundery	1	10	30
Do	do	do	do	Leather-board	1	18	100
Do	do	do	do	Flour and grist	2	18	88
Do	do	do	do	Saw	5	49	200
Do	do	do	do	Woolen	1	12	120
Great Ossipee river	do	do	do	Flour and grist	1	8	45
Do	do	do	do	Saw	3	34	80
Do	do	New Hampshire	Carroll	Blacksmithing	1	11	12
Do	do	do	do	Woolen	1	9	30
Do	do	do	do	Flour and grist	1	7	40
Do	do	do	do	Saw	4	35	120
Other tributaries	Atlantic ocean	Maine	York	Furniture	1	16	30
Do	do	do	do	Tannery	1	14	14
Do	do	do	do	Wheelwrighting	2	22	17
Do	do	do	do	Carriages and wagons	1	10	5
Do	do	do	do	Flour and grist	5	73	104
Do	do	do	do	Saw	23	261	599
Do	do	do	do	Woolen	2	.....	78
Tributaries of the	Saco river	New Hampshire	Carroll	Woolen	4	.....	48
Do	do	do	do	Boxes	1	10	8
Do	do	do	do	Carriages and wagons	1	7	20
Do	do	do	do	Excelsior	2	21	55
Do	do	do	do	Furniture	2	37	48
Do	do	do	do	Planing	2	64	40
Do	do	do	do	Tannery	1	8	25
Do	do	do	do	Flour and grist	4	61	145
Do	do	do	do	Saw	24	368	806
Do	do	do	do	Paper	1	11	30
Do	do	do	do	Sash, door, and blind	1	11	12
Do	do	do	do	Spool and bobbin	3	38	79
Do	do	do	do	Wheelwrighting	2	29	85
Presumpscot river	Atlantic ocean	Maine	Cumberland	Silk	1	18	30
Do	do	do	do	Cotton	4	55	(?)1,000
Do	do	do	do	Flour and grist	1	16	50
Do	do	do	do	Saw	4	57	200
Do	do	do	do	Leather-board	1	16	50
Do	do	do	do	Wood-pulp	2	26	1,500
Do	do	do	do	Machinery	2	32	100
Do	do	do	do	Gunpowder	1	18	500
Do	do	do	do	Paper	1	20	2,000
Androscoggin river	do	do	do	Flour and grist	1	15	30
Do	do	do	do	Saw	2	28	375
Do	do	do	do	Wood-pulp	1	14	150
Do	do	do	do	Machinery	1	15	4
Do	do	do	do	Cotton	1	16	800
Do	do	do	Sagadahoc	Paper	1	15	750
Do	do	do	do	Saw	1	14	40
Do	do	do	do	Flour and grist	1	14	60
Do	do	do	do	Sash, door, and blind	1	14	.....
Do	do	do	Androscoggin	Wood-turning	2	27	150
Do	do	do	do	Leather-board	1	16	166
Do	do	do	do	Pulp	1	12	350
Do	do	do	do	Cotton and woolen machinery	1	.....	2
Do	do	do	do	Shirts	2	.....	10
Do	do	do	do	Bobbins and spools	1	.....	12
Do	do	do	do	Lasts	1	.....	10

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Androscoggin river	Atlantic ocean	Maine	Androscoggin	Printing and publishing	2	.....	8
Do	....do	....do	....do	Belting, etc	2	.....	100
Do	....do	....do	....do	City water-works	1	25	.....
Do	....do	....do	....do	Planing	2	.....	80
Do	....do	....do	....do	Flour and grist	4	.....	225
Do	....do	....do	....do	Saw	2	24	145
Do	....do	....do	....do	Woolen	4	61	727
Do	....do	....do	....do	Cotton	6	175	7,800
Do	....do	....do	....do	Bleachery	1	35	387
Do	....do	....do	Oxford	Coffins, etc	1	11	13
Do	....do	....do	....do	Flour and grist	1	15	15
Do	....do	....do	....do	Saw	1	15	15
Do	....do	....do	....do	Wheelwrighting	1	12	12
Do	....do	New Hampshire	Coos	Saw	2	24	710
Do	....do	....do	....do	Wood-pulp	1	24	230
Sabattus river	Androscoggin river	Maine	Androscoggin	Excelsior	1	14	18
Do	....do	....do	....do	Flour and grist	2	27	95
Do	....do	....do	....do	Woolen	4	59	226
Do	....do	....do	....do	Saw	3	39	135
Do	....do	....do	....do	Cotton	1	80	300
Little Androscoggin river	....do	....do	....do	Wooden boxes	1	14	40
Do	....do	....do	....do	Paper	1	34	.....
Do	....do	....do	....do	Flour and grist	2	36	90
Do	....do	....do	....do	Saw	2	23	130
Do	....do	....do	....do	Cotton	1	35	400
Do	....do	....do	Oxford	Woolen	1	9	40
Do	....do	....do	....do	Wooden-ware	1	8	25
Do	....do	....do	....do	Paper-box board	1	24	175
Do	....do	....do	....do	Saw	2	18	60
Twenty-Mile river	....do	....do	Androscoggin	Wheelwrighting	1	9	20
Do	....do	....do	....do	Flour and grist	2	26	80
Do	....do	....do	....do	Saw	3	33	78
Do	....do	....do	....do	Woolen	1	9	33
Do	....do	....do	Oxford	Saw	1	9	35
Webb's river	....do	....do	....do	Wood-turning	1	14	45
Do	....do	....do	....do	Brick and tile	1	.....	2
Do	....do	....do	....do	Flour and grist	1	16	40
Do	....do	....do	Franklin	....do	1	9	17
Do	....do	....do	....do	Saw	2	24	125
Do	....do	....do	....do	Wooden boxes	1	9	25
Swift river	....do	....do	Oxford	Saw	1	16	60
Ellis river	....do	....do	....do	Starch	2	21	38
Do	....do	....do	....do	Flour and grist	1	12	18
Do	....do	....do	....do	Saw	1	12	15
Other tributaries of the	Coast streams of Maine	....do	Cumberland	Flour and grist	18	217	755
Do	....do	....do	....do	Saw	51	689	1,579
Do	....do	....do	....do	Boots and shoes	1	.....	23
Do	....do	....do	....do	Wooden-ware	1	12	45
Do	....do	....do	....do	Washing machines and clothes wringers.	1	12	12
Do	....do	....do	....do	Stone and earthen ware	1	6	8
Do	....do	....do	....do	Wood-pulp	1	19	80
Do	....do	....do	....do	Carriage and wagon material	1	16	30
Do	....do	....do	....do	Wooden boxes	2	17	30
Do	....do	....do	....do	Machinery	1	14	23
Do	....do	....do	....do	Cooperage	4	75	117
Do	....do	....do	....do	Furniture	1	22	90
Do	....do	....do	....do	Woolen	5	41+	247
Do	....do	....do	....do	Cotton	3	.....	176
Do	....do	....do	Androscoggin	Cooperage	1	30	25
Do	....do	....do	....do	Machinery	1	.....	30
Do	....do	....do	....do	Carriages and wagons	1	10	25
Do	....do	....do	....do	Flour and grist	9	125	276
Do	....do	....do	....do	Saw	10	230	564
Do	....do	....do	....do	Furniture	1	10	20
Do	....do	....do	....do	Woolen	2	.....	30

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Other tributaries of the	Coast streams of Maine	Maine	Oxford	Woolen	6		
Do	do	do	do	Agricultural implements	2	19	60
Do	do	do	do	Boot and shoe findings	1	11	30
Do	do	do	do	Wooden boxes	2	21	50
Do	do	do	do	Carpentering	1	9	60
Do	do	do	do	Coffins, etc	1	13	40
Do	do	do	do	Cooperage	2	18	20
Do	do	do	do	Flour and grist	16	215	579
Do	do	do	do	Furniture	5	51	58
Do	do	do	do	Chairs	1	9	18
Do	do	do	do	Wooden handles	4	46	133
Do	do	do	do	Iron castings	1	12	45
Do	do	do	do	Leather goods	1	10	150
Do	do	do	do	Tanneries	2	25	32
Do	do	do	do	Saw	61	760	1,762
Do	do	do	do	Sash, door, and blind	1	15	15
Do	do	do	do	Wheelbarrow	1	20	30
Do	do	do	do	Wheelwrighting	4	36	53
Do	do	do	do	Wood-turning	1	12	12
Do	do	do	do	Wooden ware	2	24	37
Do	do	New Hampshire	Coos	Saw	1	10	20
Do	do	do	do	Flour and grist	4	39	80
Kennebec river	Atlantic ocean	Maine	Kennebec	Cotton	2	37	(?)2,500
Do	do	do	do	Furniture	1	15	200
Do	do	do	do	Flour and grist	1	22	150
Do	do	do	do	Saw	1	16	200
Do	do	do	Somerset	Woolen	1	13	84
Do	do	do	do	Wooden boxes	1	7	80
Do	do	do	do	Cutlery	4		135
Do	do	do	do	Coffins	1		13
Do	do	do	do	Flour and grist	4	50	250
Do	do	do	do	Wooden handles	1	13	20
Do	do	do	do	Kaolin, etc	1	12	55
Do	do	do	do	Furniture	1	7	100
Do	do	do	do	Planing	1	7	80
Do	do	do	do	Saw	10	104	1,045
Do	do	do	do	Machinery	1	8	18
Do	do	do	do	Wheelwrighting	1	15	35
Do	do	do	do	Paper	1	10	100
Do	do	do	do	Sash, door, and blind	4	43	125
Do	do	do	do	Starch	1	9	25
Do	do	do	do	Wooden ware	2		100
Do	do	do	do	Wood-pulp	1	9	83
Do	do	do	do	Wood-turning	1		6
Cobbosseecontee river	Kennebec river	do	Kennebec	Paper boxes	1	16	45
Do	do	do	do	Carpentering	1	14	19
Do	do	do	do	Furniture	2	28	40
Do	do	do	do	Flour and grist	2	27	105
Do	do	do	do	Tanneries	2	18	32
Do	do	do	do	Foundery	1	11	15
Do	do	do	do	Machinery	2	21	34
Do	do	do	do	Paper, wrapping	1	13	300
Do	do	do	do	Paper, printing	1	17	225
Do	do	do	do	Paper, colored	1	16	480
Do	do	do	do	Saw	6	74	720
Do	do	do	do	Steel springs	1	15	100
Do	do	do	do	Sash, door, and blind	2	30	44
Do	do	do	do	Wood-turning	1	15	38
Do	do	do	do	Woolen	1	11	50
Emerson stream	do	do	do	Agricultural implements	4	50	605
Do	do	do	do	Carpentering	1	8	90
Do	do	do	do	Chairs	1	8	15
Do	do	do	do	Flour and grist	1	8	40
Do	do	do	do	Wooden handles	1	8	25
Do	do	do	do	Tanneries	2	18	68
Do	do	do	do	Matches	1	8	10

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, use.
						Feet.	
Emerson stream	Kennebec river	Maine	Kennebec	Machinery	1	8	60
Do	do	do	do	Saw	1	12	50
Do	do	do	do	Sash, door, and blind	2	22	140
Do	do	do	do	Wheelwrighting	1	8	10
Sebasticook river	do	do	do	Boot and shoe findings	1	10	24
Do	do	do	do	Flour and grist	1	7	200
Do	do	do	do	Tannery	1	12	12
Do	do	do	do	Saw	4	38	337
Do	do	do	do	Wood-pulp	1	16	270
Do	do	do	Somerset	Blacksmithing	3	12	20
Do	do	do	do	Flour and grist	2	18	90
Do	do	do	do	Furniture	1	10	20
Do	do	do	do	Saw	6	45	150
Do	do	do	do	Tanneries	2	20	100
Do	do	do	do	Wheelwrighting	1	7	10
Do	do	do	do	Woolen	3	26	115
Do	do	do	Waldo	Saw	1	14	20
Do	do	do	Penobscot	Flour and grist	2	23	62
Do	do	do	do	Saw	4	42	156
Do	do	do	do	Machinery	1	10	25
Sandy river	do	do	Franklin	Flour and grist	2	25	75
Do	do	do	do	Saw	4	50	125
Do	do	do	do	Wooden handles	1	7	20
Do	do	do	do	Upholstering materials	1	8	25
Do	do	do	do	Wood-turning	1	8	20
Do	do	do	do	Furniture	1	7	12
Seven-Mile (or Carrabasset) river	do	do	do	Flour and grist	1	8	10
Do	do	do	do	Saw	3	25	90
Do	do	do	do	Agricultural implements	1	11	10
Do	do	do	Somerset	Flour and grist	1	50	90
Do	do	do	do	Saw	4	94	320
Do	do	do	do	Tannery	1	8	8
Do	do	do	do	Woolen	1	10	25
Dead river	do	do	do	Flour and grist	1	10	12
Do	do	do	do	Saw	1	8	6
Do	do	do	Franklin	Flour and grist	1	12	24
Do	do	do	do	Saw	1	10	33
Sheepscot river	Atlantic ocean	do	Lincoln	Woolen	1	8	24
Do	do	do	do	Flour and grist	5	59	202
Do	do	do	do	Saw	12	120±	357
Do	do	do	Waldo	do	4	30+	53
Damariscotta river	do	do	Lincoln	Flour and grist	1	15	40
Do	do	do	do	Saw	1	10	40
Medomac river	do	do	do	Flour and grist	3	.....	44
Do	do	do	do	Foundery	1	.....	8
Do	do	do	do	Marble and stone work	1	.....	8
Do	do	do	do	Saw	4	47	65
Do	do	do	do	Planing	1	25	25
Do	do	do	do	Woolen	1	5	8
Saint George river	do	do	Knox	do	1	10	40
Do	do	do	do	Carriages and wagons	1	8	25
Do	do	do	do	Flour and grist	2	21	42
Do	do	do	do	Saw	4	42	51
Do	do	do	do	Tanneries	2	24	90
Do	do	do	do	Wheelwrighting	2	.....	16
Do	do	do	Waldo	Woolen	1	12	15
Do	do	do	do	Tanneries	2	28	50
Do	do	do	do	Foundery	1	10	6
Do	do	do	do	Wood-turning	1	12	10
Do	do	do	do	Cutlery	1	8	15
Do	do	do	do	Flour and grist	2	33	40
Do	do	do	do	Saw	9	97	181
Do	do	do	do	Sash, door, and blind	1	6	15
Penobscot river	do	do	Penobscot	Flour and grist	2	24	65
Do	do	do	do	Saw	21	223	5,719
Do	do	do	do	Machinery	1	8	30

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Marsh river	Penobscot river	Maine	Waldo	Flour and grist	5	68	154
Do	do	do	do	Woolen	1	10	28
Do	do	do	do	Saw	6	75	153
Sowadabscook river	do	do	Penobscot	Paper, printing	1	12	75
Do	do	do	do	Paper, wrapping	1	18	120
Do	do	do	do	Woolen	1	9	8
Kenduskeag river	do	do	do	Wood-turning	1	12	40
Do	do	do	do	Wheelwrighting	1	10	40
Do	do	do	do	Flour and grist	7	79	310
Do	do	do	do	Saw	10	163	606
Do	do	do	do	Salt, ground	2	18	85
Do	do	do	do	Plaster, ground	2	18	85
Great Works river	do	do	do	Saw	1	12	40
Pushaw river	do	do	do	Furniture	1	7	15
Do	do	do	do	Saw	1	7	50
Piscataquis river	do	do	Piscataquis	Agricultural implements	1	10	15
Do	do	do	do	Blacksmithing	1	8	3
Do	do	do	do	Furniture	1	12	15
Do	do	do	do	Foundery	1	10	15
Do	do	do	do	Flour and grist	4	58	225
Do	do	do	do	Tannery	1	12	20
Do	do	do	do	Saw	8	94	553
Do	do	do	do	Sash, door, and blind	1	10	15
Do	do	do	do	Wheelwrighting	3	31	19
Do	do	do	do	Woolen	4	56	186
Sebec river	Piscataquis river	do	do	Flour and grist	2	22	45
Do	do	do	do	Woolen	1	10	24
Do	do	do	do	Tannery	1	14	25
Do	do	do	do	Woolen	1	10	15
Do	do	do	do	Saw	3	40	92
Do	do	do	do	Wheelwrighting	1	6	6
Pleasant river	do	do	do	Flour and grist	1	12	22
Do	do	do	do	Saw	1	12	30
Do	do	do	do	Wheelwrighting	1	12	6
Do	do	do	do	Wood-turning	1	9	12
Do	do	do	do	Blast-furnace	1	14	185
Mattawamkeag river	Penobscot river	do	Aroostook	Saw	1	6	20
Union river	Atlantic ocean	do	Hancock	Tannery	1	14	20
Do	do	do	do	Saw	14	139	1,900
Narraguagus river	do	do	Washington	Furniture	1	7	25
Do	do	do	do	Sash, door, and blind	1	7	20
Do	do	do	do	Flour and grist	1	7	20
Do	do	do	do	Saw	5	53	435
East and West Machias rivers	do	do	do	do	10	89	820
Saint Croix river	do	do	do	Machinery	1	8	30
Do	do	do	do	Woolen	1	6	12
Do	do	do	do	Saw	3	32	320
Do	do	do	do	Tannery	1	8	200
Kennebasis river	Saint Croix river	do	do	do	2	.....	135
Do	do	do	do	Saw	1	10	75
Saint John river	Atlantic ocean	do	Aroostook	do	1	12	9
Meduxnekeag river	Saint John river	do	do	Flour and grist	3	33	173
Do	do	do	do	Saw	9	89	480
Do	do	do	do	Starch	1	8	10
Do	do	do	do	Sash, door, and blind	1	10	20
Do	do	do	do	Plaster	1	10	20
Do	do	do	do	Furniture	1	10	15
Do	do	do	do	Tannery	1	11	75
Fish river	do	do	do	Flour and grist	1	18	30
Do	do	do	do	Saw	1	18	30
Other streams	Atlantic ocean	do	Sagadahoc	Fertilizers	1	6	15
Do	do	do	do	Flour and grist	1	6	15
Do	do	do	do	Kaolin and ground earths	1	12	28
Do	do	do	do	Plaster, ground	1	6	15
Do	do	do	do	Saw	22	173	660
Do	do	do	Franklin	Flour and grist	5	72	94

Table of power utilized on the coast streams of Maine—Continued.

Stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Other streams	Atlantic ocean	Maine	Franklin	Saw	28	329	626
Do	do	do	do	Carriages and wagons	1	10	20
Do	do	do	do	Agricultural implements	2	30	120
Do	do	do	do	Wooden handles	1	12	20
Do	do	do	do	Planing	1	7	15
Do	do	do	do	Upholstering materials	1	8	10
Do	do	do	do	Woolen	2	25	95
Do	do	do	do	Wood-turning	2	21	120
Do	do	do	do	Tanneries	2	12	40
Do	do	do	do	Boots and shoes	2	12	20
Do	do	do	do	Wheelwrighting	1	15	8
Do	do	do	Kennebec	Agricultural implements	7	102	624
Do	do	do	do	Blacksmithing	1	6	15
Do	do	do	do	Paper boxes	2	.....	8
Do	do	do	do	Wooden boxes	1	6	50
Do	do	do	do	Boot and shoe findings	1	11	25
Do	do	do	do	Coffins, etc	1	18	20
Do	do	do	do	Flour and grist	18	215	663
Do	do	do	do	Wooden handles	1	11	30
Do	do	do	do	Tanneries	4	61	70
Do	do	do	do	Foundries	3	44	44
Do	do	do	do	Machinery	2	27	28
Do	do	do	do	Paper	2	27	555
Do	do	do	do	Saw	29	337	1,400
Do	do	do	do	Upholstering materials	2	23	55
Do	do	do	do	Sheddy	1	12	20
Do	do	do	do	Sash, door, and blind	1	10	12
Do	do	do	do	Wood-turning	2	17	90
Do	do	do	do	Woolen	3	65	421
Do	do	do	do	Cotton	1	7	60
Do	do	do	Knox	Agricultural implements	1	15	15
Do	do	do	do	Bread, crackers, etc	1	5	10
Do	do	do	do	Cooperage	1	16	70
Do	do	do	do	Coffins	1	11	25
Do	do	do	do	Furniture	1	11	18
Do	do	do	do	Flour and grist	7	80	228
Do	do	do	do	Gunpowder	1	12	15
Do	do	do	do	Founderies	2	27	85
Do	do	do	do	Iron anchors and chains	1	9	25
Do	do	do	do	Saw	16	216	430
Do	do	do	do	Tannery	1	15	20
Do	do	do	do	Machinery	2	19	35
Do	do	do	do	Marble and stone works	2	17	70
Do	do	do	do	Musical instruments	1	12	20
Do	do	do	do	Sash, door, and blind	1	14	70
Do	do	do	do	Wheelwrighting	1	11	15
Do	do	do	do	Woolen	1	13	35
Do	do	do	Lincoln	Flour and grist	2	23	115
Do	do	do	do	Saw	14	152	337
Do	do	do	do	Woolen	1	.....	5
Do	do	do	Waldo	Agricultural implements	1	12	10
Do	do	do	do	Tanneries	2	22	65
Do	do	do	do	Plaster, ground	2	40	90
Do	do	do	do	Cutlery	2	17	110
Do	do	do	do	Leather-board	1	14	100
Do	do	do	do	Flour and grist	6	75	158
Do	do	do	do	Saw	22	260	700
Do	do	do	do	Sash, door, and blind	1	7	30
Do	do	do	do	Woolen	1	12	20
Do	do	do	Somerset	Blacksmithing	3	20	27
Do	do	do	do	Wooden boxes	1	10	40
Do	do	do	do	Flour and grist	12	159	382
Do	do	do	do	Wooden handles	2	16	52
Do	do	do	do	Hardware	1	6	24
Do	do	do	do	Saw	40	445	1,230
Do	do	do	do	Tanneries	3	28	78

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Other streams	Atlantic ocean	Maine	Somerset	Sash, door, and blind	1	8	15
Do	do	do	do	Toys and games	1	14	20
Do	do	do	do	Wheelwrighting	6	30+	109
Do	do	do	do	Woolen	3	20	60
Do	do	do	Hancock	Flour and grist	11	132	239
Do	do	do	do	Tanneries	2	19	72
Do	do	do	do	Wood-turning	1	.....	20
Do	do	do	do	Woolen	7	.....	108
Do	do	do	do	Saw	42	476	979
Do	do	do	Washington	Plaster, ground	1	26	160
Do	do	do	do	Marble and stone work	1	17	100
Do	do	do	do	Flour and grist	8	69	178
Do	do	do	do	Saw	26	222	1,165
Do	do	do	do	Tannery	1	14	15
Do	do	do	do	Rolling	1	30	500
Do	do	do	do	Woolen	1	14	5
Do	do	do	Penobscot	Blacksmithing	2	28	9
Do	do	do	do	Marble and stone work	1	.....	3
Do	do	do	do	Furniture	3	.....	40
Do	do	do	do	Men's clothing	1	.....	20
Do	do	do	do	Printing	3	.....	14
Do	do	do	do	Bread, crackers, etc	1	.....	4
Do	do	do	do	Sash, door, and blind	2	20	27
Do	do	do	do	Wheelwrighting	1	10	15
Do	do	do	do	Carriages and wagons	1	10	4
Do	do	do	do	Flour and grist	13	164	398
Do	do	do	do	Saw	47	462	1,600
Do	do	do	do	Foundery	1	12	12
Do	do	do	do	Tanneries	4	53	345
Do	do	do	do	Brass foundery	1	.....	3
Do	do	do	do	Machinery	1	.....	1
Do	do	do	do	Locksmithing	1	.....	3
Do	do	do	do	Planing	1	11	15
Do	do	do	do	Wooden boxes	1	14	12
Do	do	do	do	Wooden-ware	1	10	47
Do	do	do	do	Woolen	6	.....	93
Do	do	do	Piscataquis	Cooperage	1	12	50
Do	do	do	do	Flour and grist	4	51	65
Do	do	do	do	Saw	20	238	561
Do	do	do	do	Woolen	1	13	65
Do	do	do	Aroostook	Flour and grist	16	174	319
Do	do	do	do	Saw	38	464	1,504
Do	do	do	do	Starch	5	60	136
Do	do	do	do	Sash, door, and blind	2	22	30
Do	do	do	do	Planing	1	12	20
Do	do	do	do	Plaster	1	12	36
Do	do	do	do	Furniture	1	.....	10
Do	do	do	do	Woolen	1	.....	50

lower dam is of wood, about 400 feet long and 12 feet high, making a pond of only a few hundred feet. The fall is 19 feet, and on the left bank the Westfield Manufacturing Company uses 500 horse-power, while on the opposite side are a number of small mills of various kinds, using, it is said, about 800 horse-power. This power is excellent in all respects.

The next power is at Cumberland Mills, 5 miles from Portland and a mile below Saccarappa. A dam of wood and stone, 12 feet high and 250 feet long, affords a fall of 20 feet, used at the paper-mills of S. D. Warren & Co., where the power in use is 2,000 horse-power. This power can be obtained about nine months of the year, and during the rest of the time steam-power to the extent of 750 horse-power is used. In dry weather there is no waste, as the mills run night and day.

Below this power there is one other, at the head of tide, known as Presumpscot Lower falls, owned by S. D. Warren & Co., but it is not used. It is 7 or 8 miles below, and the fall is said to be about 15 feet at high tide. Formerly this site was utilized.

As regards the power available at these sites, it may be regarded as practically about the same in a dry season from the lake to the mouth of the river, for the small tributaries which come in between those points, though carrying large quantities of water at times, are in dry weather often mere brooks. The power available in a dry season is, therefore, that derived from the storage on the lake, and in estimating it we have only to consider how much water can be collected from the water-shed of the lake. The annual rainfall on this water-shed is, on the average, about 44 inches; the minimum probably about 27 inches. The observations on lake Cochituate, near Boston, show that on that water-shed about 40 per cent. of the rainfall can be collected. From the character of the drainage basin of lake Sebago I should think that about the same proportion could be collected there, so that, if this is true, the minimum quantity available during an entire year would be about 11 inches. Probably this is all that could be permanently depended upon, though for a number of years in succession a considerably greater quantity could be collected. In order to insure the uniform discharge of this quantity from the lake, the latter must be capable of storing 3 or 4 inches on the water-shed. The storage depth of 6 feet would probably be sufficient for this purpose, unless the banks are very flat. Taking, then, 11 inches as the maximum with storage, we have a discharge of 0.8 cubic foot per second per square mile, or a total discharge, uniformly through the year, of about 400 cubic feet per second. This quantity would afford a gross power of about 45 horse-power per foot fall, from which the power at the different falls can be calculated. Could the flow for twenty-four hours be discharged during the eleven working hours, the power would be increased in the proportion of 24 to 11.

It is evident from the previous pages that few streams offer the advantages for power that the Presumpscot affords. The total fall of the river being 251 feet, the total power available in its course would be 11,295 horse-power continuously, or 24,631 horse-power during eleven hours. Of this only about 6,000 horse-power are now used.

The tributaries of the river are not of much importance, but some of them are outlets of ponds and have considerable fall, thus affording excellent constant powers, though small. Others are variable in flow and of little value. Little Sebago pond is dammed, and on its outlet are several good powers. Among the tributaries of the lake, similar streams are found; but to enumerate all of them, and name the powers upon them, would require more time and space than are available. Suffice it to say, that numerous streams are found—small ones, to be sure—which afford storage facilities quite sufficient to render almost the maximum with storage available. The longest and largest tributary of the lake is Crooked river, which is "estimated to be 42 miles long", and which affords considerable power. Adding up the falls on it which are mentioned by Wells, the total is 109 feet, only part of which is used. Its most important site is near its mouth, at Edes falls, where the fall is 36 feet.

THE ANDROSCOGGIN RIVER.

The Androscoggin river has its sources partly in Maine and partly in New Hampshire. The river is entitled to its name really only southward from the confluence of the Magalloway river (which has its source in the extreme northwestern corner of Maine, almost on the New Hampshire and Canada lines), and the outlet of the range of lakes which, commencing with lake Umbagog, extends in a northeasterly direction for 30 miles in Maine. The junction of the two streams referred to is about a mile from Umbagog lake, in Coos county, New Hampshire, and from this point the Androscoggin pursues a general southerly course for about 28 miles, measured in a straight line, or 38 miles along its course, when it bends to the left, and flows nearly east for about 20 miles, entering Oxford county, Maine. It then deflects toward the north, and flows north of east for over 30 miles, when, in the southern corner of Franklin county, just above Livermore falls, it bends sharply toward the right, and for over 30 miles flows almost directly south, traversing Androscoggin county. For the rest of its course for about 24 miles it flows southeast, emptying into Merrymeeting bay, after forming for several miles the boundary between Cumberland and Sagadahoc counties. The total length of the stream proper, along its course, is probably about 160 miles, but

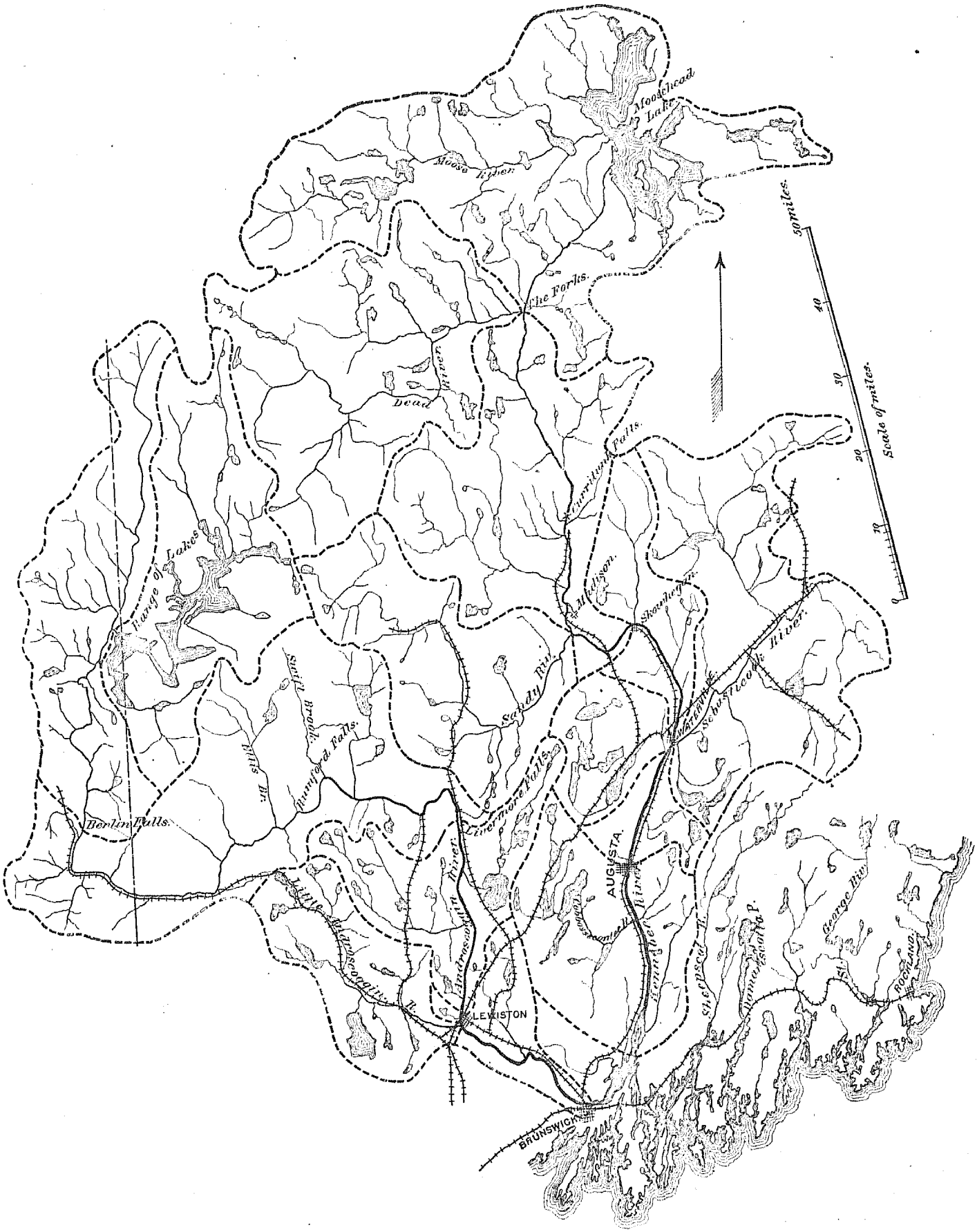

Fig. 20. MAP OF THE DRAINAGE BASINS OF THE ANDROSCOGGIN AND KENNEBEC RIVERS.

from the remotest sources of the Magalloway the distance is 200 miles. The basin is about 110 miles long, with a maximum width of 70 miles. The total area drained measures 3,698 square miles, of which 2,967 lie in Maine and 731 in New Hampshire. The principal tributaries are given in the following table:

Name of stream.	Where received.	BASIN.			Length of stream. (a)
		Length. (a)	Breadth. (a)	Area.	
		Miles.	*Miles.*	*Sq. miles.*	*Miles.*
Little Androscoggin river (from right bank)	Auburn	30	15	381	40
Twenty-Mile river (from the right bank)	Turner	19	13	189	25
Sabattus river (from the left bank)	Lisbon	16	7	100±	
Dead river (from the left bank)	Leeds	22	5	138±	28
Webb's river (from the left bank)	Dixfield	17	11	169	23
Swift river (from the left bank)	Mexico	22	8		24
Ellis river (from the left bank)	Rumford	18	13	175	25
Magalloway river (headwaters)		37	18	416	50
Outlet of lakes		50	20	760	53

a Wells.

The drainage basin of the Androscoggin is, as a whole, probably more elevated than any other hydrographic basin on the Atlantic coast, the sources of the Magalloway lying at elevations of from 2,600 to 2,900 feet, while the Umbagog lakes are from 1,256 to 1,511 feet above the sea. The upper part of the basin is very broken and mountainous, and very thickly wooded. In its course in New Hampshire the stream flows almost directly toward the highest and most massive range of the White mountains, approaching within 10 miles of the summit of Mount Washington, but at Gorham this barrier turns the stream abruptly toward the east. Toward the lower part of the basin the mountainous character of the country is lost, and the forests become less extensive. The fall of the stream, however, is everywhere large, averaging for the stream proper about 7.85 feet per mile, or larger than that of any large stream on the Atlantic coast which we have yet considered. The following table shows the slope more in detail:

Slope of the Androscoggin river.

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Mouth	0	0			
			75	600	8 0
Head of Rumford falls	75	600±			
			25	20	0.8
Bethel	100	620			
			14	70	5.0
State line	114	690			
			14	358	25.6
Head of Berlin falls	128	1,048			
			32	208	6.5
Head of river proper	160	1,256			
			26	344	13.2
Parmachene lake	186	1,600			
			13	625	48.1
Magalloway lake	199	2,225			

The bed of the river, like that of all the streams on the southern slope of Maine, is generally rock at the places where falls occur. The banks are generally high, there being few low grounds subject to inundation. The intervales are narrow. The flow of the stream is quite variable, on account of the mountainous character of the upper two-thirds of the basin, but the great reservoirs connected with it have of late years been considerably improved, and its flow therefore rendered much more constant than it formerly was. The extreme range from high to low water is 10 feet at Brunswick, 8 feet at Lewiston, 20 at Rumford falls, and 28 at Bethel, showing clearly the increasing variability toward the mountain region.

The number of lakes in the basin is 148, of which 133 are in Maine and 15 in New Hampshire. The following tables have been copied from Wells' report, and the numbers have been liable to change since that report was written:

Principal reservoirs of the Androscoggin river and its tributaries.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Taylor pond	Little Androscoggin river.	2.00	4	.....
Upper Range pond	....do	0.85	4	.....
Middle Range pond	....do	0.55	4	.....
Lower Range pond	....do	0.50	4	.....
Tripp pond	....do	1.25	No dam.	4
Thompson pond	....do	8.00	6	.....
Hogan and Green ponds	....do	1.40	Dam	.....
Saturday pond	....do	0.75	9	.....
Moose pond	....do	0.80	No dam.	10
Matthews pond	....do	0.25	.....	.....
Great Pennessewassa pond	....do	2.50	12	.....
North pond	....do	0.30	.....	15
Little Pennessewassa pond	....do	0.30	No dam.	10
Sand pond	....do	0.30	15	.....
Moose (Paris) pond	....do	0.35	No dam.	(a)
Mud and Hicks ponds	....do	0.55	...do	(a)
Bryant's pond	....do	0.60	Dam	(?)
Indian pond	....do	0.30	...do	.....
Twitchell pond	....do	0.35	...do	.....
Twenty-one ponds		21.90	.....	.....
Pleasant pond	Twenty-Mile river	0.60	.....	.....
Brettun's pond	....do	0.30	Dam	.....
Bear pond	....do	1.05	...do	.....
South pond	....do	0.55	.....	.....
North pond	....do	0.75	.....	.....
Bungermuck pond	....do	0.80	8	.....
Labrador (two) ponds	....do	0.35	4	(?)
Pleasant (Sumner) pond	....do	0.25	3	.....
Nine ponds		4.65	.....	.....
Androscoggin pond	Dead river	5.75	.....	*b* 6
Wing's pond	....do	1.00	6 to 8	*c* 2 to 4
Lovejoy's pond	....do	1.00	6 to 8	*c* 2 to 4
Pond above Lovejoy's	....do	0.20	6 to 8	*c* 2 to 4
Crotched pond	....do	2.25	4	*a* 2 to 4
Parker's pond	....do	3.10	3	4
David's pond	....do	0.80	Dam	.....
Tilton's pond	....do	0.25	.....	.....
Flying pond	Dead river	1.25	8	.....
Kimball's pond	....do	0.25	.....	.....
Mount Vernon pond	....do	0.35	Dam	(a)
Eleven ponds		16.20	.....	.....
Webb's pond	Webb's river	3.00	.....	9
Swift River ponds (three)	Swift river	2.25	.....	.....
Ellis pond	Ellis river	1.25	Dam	.....
Little Ellis pond	....do	0.85	...do	.....
Six ponds		7.35	.....	.....
Sabattus pond	Androscoggin river.	4.00	Dam	.....
Wilson pond	....do	3.00	8	2 or 3
Little Wilson pond	....do	0.20	Dam	.....
Bates pond	....do	0.30	.....	.....
Long pond	....do	0.35	4 to 5	2
Round pond	....do	0.25	4 to 5	2
Moosehill pond	....do	0.25	.....	.....
Whitney pond	....do	1.00	Dam	(?)
Forest pond	....do	0.25	...do	.....
Worthley pond	....do	2.00	3	5
Concord (two) ponds	....do	0.65	.....	(a)
North pond	... do	0.85	.....	4
South pond	....do	0.80	.....	.....
Burnside pond	....do	1.50	.....	.....
Umbagog lake	....do	18.00	14	.....
Welokenebacook lake and the pond below.	....do	11.15	20½	.....
Molechunkemunk lake	....do	10.00	77	.....
Mooselucmaguntic lake	....do	21.00	14	.....
Capsuptic lake	....do	3.00	14	.....
Rangeley lake	....do	14.00	10	.....
Quimby pond	....do	0.40	.....	4
Gull (two) ponds	....do	0.80	.....	.....
Long pond	....do	1.00	.....	10
Various small ponds	....do	1.00	.....	.....
Parmachene lake	Magalloway river	3.50	.....	.....
John's pond	Kennebago river	1.50	.....	.....
Kennebago pond	....do	4.00	.....	(a)
Thirty-six ponds		105.85	.....	.....

a Several feet. *b* With large damage. *c* By cutting down outlet.

The foregoing 83 principal ponds cover 156.25 square miles, but the aggregate number of lakes is 148, and the area of lake surface is about 213 square miles, or one-seventeenth of the area of the basin.

No detailed data are at hand regarding the various reservoirs, except for the large lakes at the head of the river. The following table is from Wells' report:

Name.	Distance from the preceding lake.	Height above tide.	Difference of level.
	Miles.	*Feet.*	*Feet.*
Umbagog	.....	1,256	.....
Richardson (*a*)	5	1,456	200
Mooselucmaguntic	1	1,486	30
Rangeley	2	1,511	25

a Molechunkemunk and Welokenebacook are sometimes classed together as Richardson lake.

These lakes have long been used for log-driving, but the storage on them is now controlled by the Union Water-Power Company, of Lewiston. The upper dam, between Rangeley and the lake below, was built in 1881, and is known as the "Rangeley" dam. It is 10 feet high, and 10 feet can be drawn from the lake. The next dam,

known as the "upper" dam, is below Mooselucmaguntic lake, and was built 20 years ago, or thereabout. It is 1,435 feet long and about 20 feet high, controlling 14 feet on the lake. The next dam is just above Umbagog lake, and is known as the "middle" dam. It was built about the year 1879, and is 600 or 700 feet long. It is said to control a depth of 20½ feet over the lake. The lowest dam is at Errol, New Hampshire, below the mouth of the Magalloway, and is 14 feet high, controlling that depth on lake Umbagog. No power is used at these dams except a small saw-mill at the upper dam, and a grist- and saw-mill at the Errol dam. The drainage area of the outlet stream from these lakes measures about 760 square miles. It seems probable that the capacity of the lakes is more than sufficient to render available the maximum with storage over this area, and it is clear that they are of immense benefit to all the mills below. Assuming that they render available the maximum with storage over their drainage basin, and taking this as corresponding to 15 inches of rainfall, on account of the dense forests with which they are encircled, they would allow of the uniform discharge, throughout the year, of 836 cubic feet per second, a quantity which would afford, taking account of losses by evaporation, on the total fall of 1,256 feet to tide-water, a gross power of 107,000 horse-power, and at Lewiston alone over 4,000 horse-power. These figures might be varied greatly according to the manner of controlling the flow. The facilities, then, for storage in the basin of the Androscoggin are exceptionally fine, and the effect of the reservoirs is to offset to a great extent that of the mountainous character of the country.

The mean annual rainfall over the basin is about 46 inches, of which 11 fall in spring, 11 in summer, 14 in autumn, and 10 in winter. This distribution is in itself favorable to constancy of flow, and unfavorable to a large discharge, but it is evident that in view of the dense forests covering the upper part of the basin, and its very mountainous character, a larger proportion than usual—I should think 50 per cent. or over—will nevertheless be discharged by the stream. The estimates given beyond may seem high to some, but they may be explained by these remarks.

The Androscoggin is quite easily accessible at most points, being followed, as the map shows, by various railroads.

From its mouth to the foot of the falls at Brunswick, a distance of 6 miles, the river is tidal and navigable, the rise of the tide at that point being 2½ feet, and the navigable depth at high water 5½ feet. At Brunswick there are two dams. The upper is principally of wood, but partly formed of the natural rock, and is 15 feet high, ponding the water about 700 feet. The fall is 16 feet, used only on the Brunswick side by the Cabot Manufacturing Company's cotton-mill, with 800 horse-power. Full capacity can always be obtained, and there is always a waste. The lower dam, a few rods below, is also about 15 feet high, and power is used on both sides, the fall varying with the tide from about 11 to 14 feet. On the left bank (in Topsham) the Bowdoin Paper Manufacturing Company uses perhaps 750 horse-power, and a small amount of power is used by a grist-mill, a saw-mill, and a sash, door, and blind factory. The method of distributing and owning the power is crude and indefinite. There is sometimes a lack of full capacity, on account of the water being held back by the mills above Brunswick, and during three months of the year there is no waste in the day-time, except what leaks through the dam, which is old and defective. On the Brunswick side are the Androscoggin Pulp Company, two saw-mills, a box-mill, and a grist-mill. Full capacity is obtained during about nine months. During the rest of the year there is lack of water during the day-time, but excess at night.

The falls at Brunswick are known as the "Pejepscot" falls, and include, besides the two pitches just described, a third, about 2,000 feet above the lower one, the fall there being between 11 and 12 feet, once used by saw-mills, but now unutilized. The total fall is therefore about 40 feet. Wells states that by raising a dam at the upper falls, which could be done without causing much flowage, the fall at the upper site could be increased to 25 feet, making the whole fall 54 or 55 feet. The amount of power available depends on how it is used at Lewiston, the next large power above. Probably the minimum flow during eleven hours, if it could be concentrated into that time, would be not less than 2,800 cubic feet per second, affording a gross power of 318 horse power per foot fall. It seems probable that during ordinary years the flow during working hours would always be as much as 3,000 cubic feet per second, equal to 410 gross horse-power per foot. The power is an excellent one in all respects, and if a large enough pond could be obtained would probably afford, on a fall of 55 feet, say, 22,000 horse-power at all times in ordinary years. Three miles above Brunswick is a site where a small fall could be used, but which may become important as a site for a dam to be used for storage. The topography at Brunswick is in every way favorable for a more extensive utilization of the power.

The next power above Brunswick is at Lisbon falls, 11 miles below Lewiston. There are two falls, the total descent being, according to Wells, 33 feet in 1,800 feet. A dam is built at the foot of the upper falls, and is 10 feet high. The fall used is 13 feet at the woolen-mill of the Worumbo Manufacturing Company, where a power of about 400 horse-power is utilized, with a waste at all times. At the lower falls there is now no dam, and no power is utilized. The topography is in every way favorable for the complete utilization of the power. The minimum power available continuously may be estimated at about 142 horse-power per foot fall, or 4,686 horse-power on a fall of 33 feet; while during ordinary years about 180 horse-power per foot fall could be obtained, or 5,940 horse-power on a fall of 33 feet. Whether a pond could be obtained sufficient to store the water at night I am unable to say. This power, with that at Brunswick, will compare favorably with any powers we have yet met with, and they deserve further examination. Excellent building materials may be obtained in close proximity to both places.

The next power is 2 miles below Lewiston falls, known as the "Lewiston Lower Power", not improved. The fall available is not stated by Wells.

The next power, and the most important one on the river, is at Lewiston, 40 miles by the river from the ocean, and just above the mouth of the Little Androscoggin. The bed is solid rock, and the natural fall is 38 feet in a distance of 600 feet, but a dam at the head of the falls, with an average height of 12 feet, makes the available fall about 50 feet. The pond is short—only about 1½ mile in length—and is not sufficient, even with those above, to store all the water at night in dry weather. Power is used on the left bank, the fall being used on two levels. The fall from the upper to the lower is about 28 feet, and is used by the following mills:

1. Lincoln mills, owned by the Franklin Company; cotton-mills; 265 cubic feet of water per second; 840 gross horse-power.
2. Bates Manufacturing Company's cotton-mill; 698 cubic feet per second; 2,160 gross horse-power.
3. Hill Manufacturing Company's cotton-mill; 544 cubic feet per second; 1,685 gross horse-power.
4. Saw-mill; 27 feet fall; 50 horse-power.

In addition, the following two mills take water from the upper level, but do not discharge into the lower level:

5. Androscoggin cotton-mills; 37 feet fall; 387 cubic feet per second; 1,628 gross horse-power.
6. Lewiston bleachery and dye-works; 34.74 feet fall; 131 cubic feet per second; 516 gross horse-power.

The water from 5 and 6 is used by the following two:

7. Androscoggin cotton-mill (lower mill); 12.50 feet fall, 483 cubic feet per second; 686 gross horse-power.
8. Cumberland woolen-mill; 12.50 feet fall; 40 (?) cubic feet per second; 57 gross horse-power.

The fall from the lower level to the river is about 22 feet, and is used by the following mills:

9. Lewiston cotton-mills; 20.9 feet fall; 445 cubic feet per second; 1,059 gross horse-power.
10. Continental cotton-mills; 21.77 feet fall; 951 cubic feet per second; 2,353 gross horse-power.

These last mills, however, do not receive the water from the Lincoln mill, which goes directly to the following:

11. Home Manufacturing Company's woolen-mill; 17.7 feet fall; 90 cubic feet per second; 181 gross horse-power.
12. D. Cowan & Co.'s woolen-mill; 18.4 feet fall; 95 cubic feet per second; 199 gross horse-power.

There is also, on the lower level, a mill belonging to the water-power company, in which small amounts of power are leased, nominally at so much per horse-power, but no measurements of quantity are made. A new mill is also being built on the upper level, to use a fall of 50 feet, and about 100 horse-power.

13. Finally, the city of Lewiston derives its water-supply from the river, taking the water from above the dam, and pumping, by water-power, "so much water every twenty-four hours as 600 horse-power with a head of 25 feet will pump, to a height of 220 feet, twelve hours in every twenty-four." The water from the wheels is discharged into the river. If the 600 horse-power refers to net power, the quantity of water which can be pumped, according to the above, will be 19 or 20 cubic feet per second during twelve hours; and the quantity of water used for pumping would be about 282 cubic feet per second, making in all some 300 cubic feet per second.

The power at Lewiston is controlled by the Union Water-Power Company, organized September 18, 1878, and succeeding the Franklin Company in the ownership of the canals and water-privileges. The old water-power company was incorporated in 1849, and the first improvements were begun in 1850. The dam is a substantial stone structure, extending in a zigzag direction from rock to rock. The upper level of the canal is about 4,200 feet long, the lower level, 1,600. The company leases power by the horse-power, rates varying, according to circumstances, from $2 50 to $12 50 per horse-power per annum, being cheaper for the original corporations. These prices are for the net power on the shafts, being reckoned in all cases as 75 per cent. of the gross power due to the quantity of water and the fall. Measurements are not made regularly, but have lately been made, once for all, to determine the quantity of water used by each mill. Before these were made, the power used was only guessed at. The company obtained control of the lakes at the head of the river in 1877, and has since improved them, their only use previously having been for log-driving purposes. Before their purchase by the company the mills were sometimes short of water in dry seasons, but now full capacity is secured the year round, though in dry weather there is no waste during the day-time. No steam is used in the mills which have been named. They run eleven hours a day.

It will be seen from the above that the total quantity of water taken from the upper level is in the neighborhood of 2,350 cubic feet per second, or would be if the city were to pump all it is entitled to. The daily consumption of water in Lewiston for the year 1881 was 1,016,260 gallons, or about 135,500 cubic feet, or, supposing this pumped in twelve hours, about 3½ cubic feet per second, thus requiring a total quantity of water equal to about 50 cubic feet per second. The total quantity of water taken from the upper level is thus, at present, about 2,100 cubic feet per second during about eleven hours; and this may be taken as the minimum flow of the stream, affording a gross power of about 238 horse-power per foot fall, or, on a total fall of 50 feet, 11,900 horse-power during eleven hours. This power is, of course, not realized, as the total fall is not completely utilized, but over 11,000 gross horse-power are now in use. Were the pond of greater capacity, the power available during working hours would be still more increased. No trouble is experienced with freshets, the range of water on the dam being but 8 feet. The drainage area above Lewiston is 3,120 square miles, and the rainfall is about the same as given on page 79. The city is within 6½ hours of Boston and 1½ hour of Portland, and the power is, no doubt, one of the finest in New England.

Two miles up the river, at Deer rips, there is an unimproved power, stated by Wells as equal to 2,500 horse-power.

Ten miles above Lewiston are Turner Centre falls, with 12 feet fall and good location, but unimproved. The minimum power during twenty-four hours is probably not less than 100 horse-power per foot.

Sixteen miles above Lewiston are North Turner falls, where the fall is 13 feet, and the bed and banks are favorable. The minimum power during twenty-four hours is probably about 97 horse-power per foot, or 1,261 horse-power on a fall of 13 feet. Wells estimates it as 950 horse-power.

The next power is at Livermore Falls, where the natural fall is 22 feet in 30 rods. A dam at the head of the falls raises the water some 7 feet, making the total fall 29 feet; and Wells states that it may be raised 7 feet higher, making the total fall 36 feet. At present only a fall of 14 feet is used, for mills of various kinds, using only a small fraction of the power. The minimum power available during twenty-four hours is probably not less than 80 horse-power per foot fall. The power is said to be a very fine one, and to merit further development.

Half a mile above Livermore Falls are Otis falls, with a fall of 14 feet in 100 feet, altogether unimproved; and a mile and a half above are French's falls, with 10 feet, unimproved. The quantity of water at both is nearly the same as at Livermore Falls.

Three miles above Livermore Falls are Jay Bridge falls. Wells does not state the exact fall, but estimates on 30 feet. The bed and banks are of solid rock, and the location is said to be unsurpassed. The minimum power is about the same as at Livermore Falls. At present a fall of 12 feet is used, but this can no doubt be greatly increased.

At Capen's rips, in Canton, a fall of from 6 to 10 feet occurs in 160 feet, now unutilized, though the site is said to be a good one.

In Rumford we encounter the largest fall on the river, the descent being 162 feet in about a mile. The river is but 90 feet wide, the bed and banks are rock, but the latter suitable for building. A small fraction of the power is used. The drainage area above the falls is about 2,223 square miles, and in the following table I have estimated roughly the power available:

Estimate of power at Rumford Falls.

State of flow (see pages 8–10).	Drainage area.	Flow per second.	Horse-power available (gross), continuously.	
	Sq. miles.	*Cubic feet.*	*1 foot fall.*	*162 feet fall.*
Minimum	2,223	550	62.5	10,135
Minimum low season		620	70.0	11,340
Maximum, with storage		1,500	170.5	27,621
Low season, dry years		720	81.8	13,252

Wells estimates the power at 21,546 gross horse-power during working hours. This fall is about 75 miles from tide, and its head is about 600 feet above the sea. Wells estimates the low-season gross power from this point to tide at 85,200 horse-power during eleven hours, which is probably not too large, and a large proportion of which is no doubt available, owing to the favorable condition of the bed and banks. The falls are, unfortunately, 15 miles from the Grand Trunk railway, and therefore rather inaccessible.

The Androscoggin has some falls in New Hampshire, the principal one being Berlin falls, where the river falls nearly 200 feet in a mile. Little power, if any, is used at this place, though the available power is very large. From the state line up to these falls, in fact, there are continuous rapids, affording numerous sites; the stream, however, is much more variable here than lower down, and very little of its power is used.

It is evident from the foregoing that a large number of excellent powers are afforded by the Androscoggin river. If we compare it with the Merrimack we find its elevation, at the junction of its two headwaters, is over four times that of the Merrimack at Franklin, while its drainage area at that point is about the same. Its drainage area at its mouth is but little smaller than that of the Merrimack. Its theoretical power must therefore be considerably greater, and with prudent development there seems no reason why this river should not become one of the principal manufacturing streams of New England. Its reservoirs are not so extensive, nor so completely controlled as are those on the Merrimack, but its available storage is much larger than that used, so that the flow could no doubt be made more uniform were it considered expedient to go to the expense of doing so.

The first tributary of the Androscoggin which is met with as the river is ascended is Sabattus river, which empties from the left bank in Lisbon. It is the outlet of Sabattus pond, and has a large fall, but is not much utilized. The pond covers 4 square miles, and is dammed, so that the flow of the stream is quite constant. Wells mentions falls on this stream aggregating 130 feet, and states that at the lower site a power of 175 horse-power is used, with a fall of 10 feet. The stream seems an excellent one, though comparatively small.

The Little Androscoggin, which enters the Androscoggin from the west, just below Lewiston falls, is an important tributary. It takes its rise in Oxford county, and flows in a southeasterly direction for nearly 30 miles in a straight line, draining a total area of about 381 square miles. Its fall is large, and connected with it are a number of lakes and ponds, of which 21, with a total surface of 21.9 square miles, have been named on page 78. Many of these

being dammed, and used for regulating, its flow is therefore quite constant, and it is considered an excellent water-power stream. It is accessible at all points, being followed by the Grand Trunk railway for its entire length. The first power is at its mouth, the fall within three-quarters of a mile from the Androscoggin river being stated at 70 feet. A dam 10 feet high at the head of the falls affords a fall of 12 or 15 feet at a saw-mill, only a small amount of power being used. Half a mile below, a wooden dam, 30 feet high, affords a fall of 35 feet at a cotton-mill, using 400 horse-power, which can always be obtained. The power and mill are owned by the Little Androscoggin Water-Power Company. Of the total fall, from 10 to 20 feet are lost at times of extreme freshet in the Androscoggin, at which times an engine is run. Judging from the drainage area and the power above, the minimum available power during twenty-four hours would be about 500 net horse-power on a fall of 35 feet.

Wells estimates a minimum flow of 366 cubic feet per second during working hours, or 165 during twenty-four hours, the latter corresponding to a gross power of 18.75 horse-power per foot, 656 horse-power on a fall of 35 feet, and 1,312 horse-power on a fall of 70 feet, and the former corresponding to 1,431 horse-power on 35 feet, and 2,862 horse-power on 70 feet. If this is really the minimum power, the stream is a remarkably constant one.

Two miles above is Rynson's privilege, with an available fall of 20 feet. Wells gives the power as 840 horse-power during eleven hours.

At Mechanics' Falls, about 12 miles, by the river, from its mouth, occurs the next power, there being three dams, and the total fall being about 37 feet in a distance of 950 feet. At the head of the falls a stone dam, 12 feet high, affords a fall of 14 feet, and below are two wooden dams, affording falls of 12 and 8 feet. The power is all used at the paper-mills of the Denison Manufacturing Company. At the upper fall 275 horse-power are obtained during nine months, falling at times to 175 horse-power or below, and a steam-engine being run during about three months. There being no waste in summer, the minimum power is below 175 net horse-power continuously, or the flow is below 150 cubic feet per second. Wells states the flow as 20,000 cubic feet per minute during ordinary working hours (meaning about eleven hours), or 154 cubic feet per second continuously. I think it probable, however, that this is too great for the minimum flow.

Next above is Page's mill, with a fall of 14 feet, then Hackett's mills, 13 feet, and at Minot Corner, 13 feet. There are numerous powers above this, but the stream is small; it is evident, however, that it is a most excellent one in all respects.

Two and a half miles above Lewiston Wilson pond empties into the river. It covers 2,200 acres, and is owned by the Union Water-Power Company, of Lewiston, which has a dam at the outlet 13 feet high, and uses the pond as a reservoir, drawing over 5 feet from it in dry weather.

Twenty-Mile river, which enters from the west, in Turner, affords considerable power, but is a small stream, and cannot be described in detail. It drains about 189 square miles.

Webb's river, which enters from the north, in Dixfield, drains about 169 square miles. At its mouth is a fall of 29 feet in a distance of 200 feet, partially utilized, and 5 miles above it is a fall of 6 feet, unoccupied. The stream is the outlet of Webb's pond, and is said to be a good one for power. The lake covers 3 square miles, and can be made to afford a storage of 9 feet, thus much improving the power below. The stream has many rapids and falls, mostly unimproved.

Swift river, emptying from the north, in Mexico, is an unimportant stream. Not far from the mouth is a fall of 50 feet in half a mile, and above it are Walker's narrows, with 16 feet in 15 rods, and Weeks' falls, with 18 feet in 15 rods. The stream has few ponds connected with it, however, unlike most of the streams in the vicinity, and is therefore exceedingly variable in its flow, so that the powers are not of great value. As its name implies, the stream has a rapid descent, and affords numerous falls and rapids, but little of its power is utilized.

Ellis river, which also enters from the north, about 10 miles above the mouth of Swift river, is a more constant stream, being fed by several ponds. It also has a very rapid fall, Wells enumerating five falls on the main stream and its two branches aggregating 85 feet. The stream drains about 175 square miles, and affords many sites besides those named by Wells. Little of its power is improved.

Wild river, which rises in New Hampshire and flows northeast, entering the Androscoggin in Gilead (Maine), is, as its name implies, an uncontrollable stream. Its freshets are very violent, and, although it has abundant fall, it is little used. It is a true mountain stream. The same may be said of many of the remaining tributaries from New Hampshire, which are variable in flow and little used. Some, however, like Clear stream, which rises in Dixville, near Dixville notch, and flows in a southerly and easterly direction, are bordered by low and sandy plains. In general, then, the power of these tributaries is of no value.

Of the two headwaters of the Androscoggin, the outlet of the lakes affords no power, except at the dams which have been described. The lakes are allowed to flow constantly during the dry season, and at all times a certain minimum quantity must be allowed to pass. A considerable amount of power is available at these dams, but the power in this region will not be much utilized until the means of communication are better than they are now. Above Berlin falls the railroad leaves the river, and the headwaters of the latter flow through an almost unexplored wilderness, covered with virgin forests, and only inhabited by hunters and lumbermen. Little is known regarding their water-power. Between Umbagog and Richardson lakes the fall is 200 feet (see page 78), the stream connecting the two being known as Rapid river, only 5 miles in length. The bed and banks are good, and a very large power

could no doubt be rendered constantly available here. At all the storage dams large powers could be utilized; and some of the tributaries of the lakes also afford sites for power, notably Kennebago river, the outlet of Kennebago pond.

The Magalloway river has its sources in the northwestern corner of Maine, at elevations of from 2,600 to 3,000 feet. Lake Magalloway, near its source, at an elevation of 2,225 feet, covers 320 acres, and at its outlet occurs a cascade some 20 feet in height. The stream is rapid for some distance from the lake, but then becomes very sluggish, and in some parts of its course offers no power for long distances. Its length is 33 miles in a straight line, or 39 following the principal bends. The principal power mentioned on the river is near its mouth, at Ariscoos falls, which extend for nearly two miles along the river. The total fall is said to be in the neighborhood of 100 feet, and a dam 8 feet high at the head of the falls would back the water over 20 miles, thus affording ample storage. The river drains about 416 square miles. No power is utilized upon it.

THE KENNEBEC RIVER.

The Kennebec river, whose basin bounds that of the Androscoggin on the east, has its source in Moosehead lake, the largest sheet of water in the state of Maine, covering an area of 120 square miles, and lying partly in Somerset and partly in Piscataquis county, at an elevation of about 1,023 feet above the sea. From this lake the river pursues its course in a general southerly direction, its mouth, in Merrymeeting bay, lying almost directly south of the outlet of the lake, and about 115 miles distant in a straight line. The stream flows through Somerset, Kennebec, and Sagadahoc counties, and past the towns and cities of Skowhegan, Waterville, Augusta, and Gardiner. Its total length, from the outlet of the lake to the ocean, is 155 miles; from the sources of Moose river, the principal tributary of the lake, 227 miles; from the lake to Augusta, the head of tide and of navigation, 112 miles. The river drains a total area of about 6,400 square miles, and the map shows the form and dimensions of the basin. The principal tributaries are the following:

Name of stream.	Where received.	From which side.	Length. (a)	Drainage area.
			Miles.	*Sq. miles.*
Cobbosseecontee river	Gardiner	Right.	36	292
Emerson river	Waterville	Right.	42	a185
Sandy river	Starks	Right.	60	666
Carrabasset river	Anson	Right.	43	306
Dead river	Bowtown	Right.	64	1,021
Moose river	Moosehead lake	Right.	70	a650
Sebasticook river	Winslow	Left.	59	1,088
Wesserunsett river	Skowhegan	Left.	25	167

a Wells.

The greater part of the drainage basin lies to the west of the river, and is hilly for 60 miles northward from the sea. Above that, in Somerset county, the hills subside into low undulations, but about the confluence of Dead river, mountains close in upon the river and cover the whole breadth of the basin, while in the vicinity of Moosehead lake the mountains recede or disappear, and the valley opens into a broad plain country. The northwest part of the basin is very rough, being covered with the easterly offsets of the White mountains. The soil is gravel, sand, clay, and loam; the prevailing rocks, gneiss and mica-schist, and good building stones are abundant. Parts of the basin are very thickly wooded, and it was estimated in 1869 that two-thirds of the basin was covered by forests. The elevation of the basin is, on the whole, less than that of the Androscoggin, owing to its greater distance from the White Mountain highlands. Some isolated mountains occur, however, which number among the loftiest peaks in Maine. The following table gives some idea of the slope of the river:

Slope of the Kennebec river.

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Mouth, Merrymeeting bay	0	0			
			26	0	0
Augusta	26±	0			
			22	91	4.1
Head of Kendall's Mills rips	48±	91			
			18	47	2.6
Norridgewock	66±	138			
			13	95	7.3
Top of dam, Madison bridge	79±	233			
			11	83	7.5
Head of Caratunk falls	90±	316			
			48	707	14.7
Moosehead lake	138±	1,023±			

The average fall of the stream from the lake to Augusta is 9.1 feet per mile, or greater than that of the Androscoggin.

The bed and banks of the river, below the mouth of Dead river, are in every way favorable for power. Between that point and the lake, in which distance the fall is stated as in the neighborhood of 500 feet, the distance being about 28 miles, the river is for the most part "a torrent, walled in by steep precipices of rock from 20 to 50 feet in height", so that only a part of the power could be put to use without excessive outlay.

The rainfall over the basin is about 43 inches, of which 11 fall in spring, 10 in summer, 12 in autumn, and 10 in winter. The flow of the stream is tolerably constant, and could be made much more so by the systematic improvement of the reservoirs connected with it. The average range from lowest to highest water is 7 feet at Augusta, 8 at Waterville, 12 at Skowhegan, above the falls, and 18 below, and from 15 to 20 feet at points above Skowhegan. The variability of the flow is chiefly due to the mountainous character of the upper part of the drainage basin.

The following tables, from Wells, give the principal reservoirs of the Kennebec and its tributaries:

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Snow pond	Emerson stream	5.15	4 to 5	*a* 4
Long pond	do	4.85	1 to 2	.....
Great pond	do	0.00	Dam	.....
Richmond pond	do	0.85	.....	.....
McGrath pond	do	0.75	.....	.....
Little pond	do	0.35	.....	.....
East pond	do	2.50	8	.....
North and Little ponds	do	4.00	.....	.....
Nine ponds		27.45	.....	.....
Big pond	Sandy river	1.00	.....	.....
Clearwater pond	do	1.75	8	3
Norcross pond	do	0.35	.....	.....
Chesterville (six small ponds)	do	2.00	Dam	4 or 5
Wilson's pond	do	1.25	7	5
North pond	do	1.00	Dam	(?)
Taylor pond	do	0.20	.....	.....
Sandy river (four ponds)	do	1.00	2	(*b*)
Lufkin pond	do	1.25	.....	5
Sylvester pond	do	0.30	Dam	.....
Eighteen ponds		10.10	.....	.....
Fahi pond	Carrabasset river	0.60	4	4
Sandy pond	do	0.40	.....	.....
Embden pond	do	3.50	4	12
Hancock pond	do	1.00	4	(*b*)
Spruce pond	do	0.35	.....	.....
Rowe pond	do	0.70	.....	8
Gilman's pond	do	0.50	Dam	.....
Judkin's pond	do	0.75	.....	.....
Butler pond	do	0.40	.....	.....
Porter's pond	do	1.00	Dam	4
Tuft's pond	do	0.50	.....	(*b*)
Dutton pond	do	0.20	8	(*b*)
Jerusalem pond	do	0.30	Dam	(*b*)
Middle Carrying-place pond	do	0.30	Dam	(*b*)
Fourteen ponds		10.20	.....	.....
Spencer pond	Dead river	5.00	8	4
Pond in No. 5, R. 7	do	0.50	.....	6
Great pond	do	4.00	.....	(*c*)
King & Bartlett pond	do	1.00	.....	.....
Long pond	do	2.00	.....	5
Flag-staff pond	do	3.00	5 to 6	(?)
Carrying-place pond	do	2.00	.....	5
"Jim" pond in No. 1, R. 5, F. C	do	1.00	8	2

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Timbrook pond, in No. 2, R. 4	Dead river	1.25	9	.....
Chain (three ponds)	do	5.00	8	2
Twelve ponds		24.75	.....	.....
Brassua lake	Moose river	6.00	No dam.	5
Misery pond, in No. 2, R. 7	do	1.50	2+	(?)
Parlin pond	do	2.75	*d* 5	3
Long pond	do	8.00	No dam.	8
Wood pond	do	3.00	No dam.	8
Little and Big Wood ponds	do	1.35	7	.....
Attean pond	do	5.00	No dam.	8
Holeb pond	do	3.00	No dam.	(?)
Thorndike (two ponds)	do	1.00	*e* 6	*f* 6
Eleven ponds		31.60	.....	.....
China pond	Sebasticook river	6.30	6	.....
Patte's pond	do	0.85	.....	.....
Lovejoy's pond	do	0.70	.....	.....
Sandy pond	do	0.95	6	.....
Twenty-five-mile pond	do	4.25	2	2
Carlton Bog pond	do	1.75	.....	4
Plymouth pond	do	3.00	10	.....
Skinner's pond	do	0.70	.....	.....
Stetson pond	do	2.50	.....	(*b*)
Newport pond	do	7.50	4	4
Corinna pond	do	0.60	.....	.....
Dexter pond	do	3.00	8	.....
Palmyra (two ponds)	do	0.60	.....	.....
Stuart's pond	do	0.80	.....	.....
Indian pond	do	2.50	Dam	.....
Little Indian pond	do	0.35	.....	.....
Weymouth pond	do	0.40	.....	.....
Rogers pond	do	0.90	.....	(*c*)
Mill pond	do	1.10	.....	.....
Moose pond	do	9.50	4	*g* 10
Stafford pond	do	0.35	.....	.....
Starbird pond	do	0.35	.....	.....
Barker's pond	do	0.35	.....	.....
Twenty-four ponds		48.30	.....	.....
Madison pond	Wesserunsett river	3.00	7	3
Wentworth pond	do	1.00	No dam.	10
Baker's pond	do		No dam.	(?)
Wyman pond	do	0.75	No dam.	9
Weeks' pond	do	0.60	6	.....
Five ponds		5.35	.....	.....

a With large flowage. *b* Several feet. *c* Considerable. *d* Formerly. *e* On one pond. *f* On other pond. *g* Or more.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
Webber pond	Kennebec river	2.10	6	.....	Pierce pond	Kennebec river	3.50	10	.....
Three-mile pond	do	2.00	8	.....	Lower Carrying-place pond	do	1.00	.....	(b)
Sibley & Morrill pond	do	2.00	.....	a 10	Cold Stream pond	do	1.25	.....	12
Long pond	do	0.95	.....	.....	Chase's Stream pond	do	0.60	.....	.....
Austin (five ponds)	do	3.20	.....	(?)	Indian pond	do	6.00	12	.....
Robinson's pond	do	0.75	.....	.....	Moosehead lake	do	120.00	8	c 4
Pleasant pond	do	3.15	4	8	Lower Roach pond	do	5.00	8	4
Mores Bog Stream pond	do	.....	.....	.....	Middle Roach pond	do	2.50	.....	.....
Otter (two ponds)	do	0.50	.....	.....	Upper Roach pond	do	3.00	Dam	.....
Chase (three ponds)	do	1.00	.....	.....	Tombegan pond	do	0.75	No dam.	6
Mosquito pond	do	1.00	.....	12	Spencer pond	do	1.50	4	.....
Moxie pond	do	7.00	6	3	Western outlet (three ponds)	do	1.25	.....	.....
Lower Baker pond	do	1.00	.....	.....	Thirty-six ponds	.....	173.25	.....	.....
Black stream, lower pond	do	1.25	8	2					
Black stream, upper pond	do	0.59	7	2					

a On Morrill pond. *b* High dam. *c* By cutting down outlet.

The above are all tributary to the river above the head of tide; the following empty below that point:

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
Pleasant pond	Cobbosseecontee river.	1.50	4	6	Sanborn's pond	Cobbosseecontee river.	0.30	.....	(?)
First Purgatory pond	do	0.70	3	8	Desert pond	do	0.30	.....	.....
Second Purgatory pond	do	0.50	Dam	8	Jimmy's pond	do	0.30	.....	.....
Third Purgatory pond	do	0.20	.....	8	Fifteen ponds	.....	20.90	.....	.....
Cochnewagan pond	do	1.00	7	.....					
Wilson's pond	do	0.90	4	(?) 0	Nequasset pond	Kennebec river	0.80	.....	.....
Cobbosseecontee Great pond	do	8.00	4	6	Worromontogus pond	do	1.75	Dam	10
Narrows pond	do	0.90	.....	.....	Small ponds in Augusta	do	1.50	.....	.....
South pond	do	1.95	3	3	Great swamp in Dresden	do	0.90	.....	.....
North pond	do	3.00	.....	.....	Eight ponds	.....	4.95	.....	.....
Carleton pond	do	0.40	.....	.....					
Greely pond	do	0.85	.....	.....					

The foregoing 152 principal ponds have a total area of 357.15 square miles. The total number of ponds in the basin is 311, with a total area of 450 square miles, or 1 square mile to every 14.2 square miles of basin. Moosehead lake, the principal reservoir, at the head of the stream, has a drainage area of about 1,296 square miles. A dam raises the water about 8 feet, and by cutting down the outlet a storage of 10 or 12 feet can be had. The present storage of 8 feet, however, is probably sufficient to render available the maximum power possible permanently, although a greater storage would be advantageous in most years. The lake is at present not controlled at all for manufacturing purposes, but only by lumbermen, for log-driving. Its value, however, as a regulator of flow is very great.

It may not be uninteresting to insert here a table showing the principal features of the great reservoirs we have hitherto met with, and the relation they bear to the streams they feed. In studying this table, it must be remembered that only the *principal* reservoirs of the large streams are named, and that they have numerous smaller ponds which have considerable influence on the flow of the stream at its lower parts. This is the case with the Merrimack, Androscoggin, Kennebec, and Kennebasis. Other things equal, a stream is more favorable the smaller the distance from the reservoir to the lowest power. The greater the ratio of the capacity of the reservoir to its drainage area, the more favorable the stream in its upper part, and if this ratio is over 0.35, it is probable that the maximum with storage is available at the outlet of the reservoir. (*a*) The greater the numbers in the last two columns the better the stream. It will be seen from this table that few streams are superior to the Kennebec as regards reservoir capacity. It is fully equal to the Merrimack, as shown by the numbers in columns 10 and 12, and only surpassed by some smaller streams whose reservoirs are larger in proportion:

a It is not certain, because the storage capacity is not exactly known.

Table comparing reservoir capacity of some New England streams.

[NOTE.—The figures in the last four columns are in most cases only approximations.]

Name of stream.	Principal reservoirs.	Area of reservoirs.	Elevation above tide.	Drainage area of reservoirs.	Drainage area of stream above lowest power.	Distance from reservoir to lowest power.	Depth controlled on reservoir.	Ratio of area of reservoir to drainage area of reservoir.	Ratio of capacity of reservoir to drainage area of reservoir.	Ratio of area of reservoirs to drainage area of stream.	Ratio of capacity of reservoir to drainage area of stream.
		Sq. m.	*Feet.*	*Sq. m.*	*Sq. m.*	*Miles.*	*Feet.*		*Feet.*		*Feet.*
Merrimack river	Lake Winnipiscogee, etc	83.93	500	400	4,599	a 122.00±	2.5—	0.210	0.534	0.0225	0.069
	New Found lake	7.80	597	90			3.0	0.087	0.260		
	Squam lake	11.75	510	47			3.5	0.250	0.875		
Winnipiscogee river	Lake Winnipiscogee	71.75	500	357	480	13.65	2.5	0.201	0.502	0.1750	0.445
	Smith's pond	4.85	540	.....		.....	4.0	.....	.....		
	Great bay, etc	7.33	478	400		7.31	2.0	0.028	0.037		
New Found river	New Found lake	7.80	597	90	95	3.00	3.0	0.087	0.260	0.0820	0.246
Squam river	Squam lake	11.75	510	47	67	2.50	3.5	0.250	0.875	0.1750	0.614
Salmon Falls river	Great East pond	2.84	499	16	242	28.00	10.0	0.178	1.770	0.0230	0.200
	Horn pond	0.35	478	22		27.00	3.0	0.016	0.048		
	Milton Three ponds	2.33	400	123		19.00	8.0	0.019	0.151		
	Other ponds	.....	.....	.....		.....	.....	.....	.....		
Presumpscot river	Sebago lake	50.00	251	498	725	22.00	6.0	0.100	0.400±	0.0690	0.276±
Androscoggin river	Umbagog lake	18.00	1,256	760	3,098	157.00	14.0	0.101	1.010±	0.0210	0.210±
	Richardson lake	21.15	1,456				14–20.0				
	Mooselucmaguntic lake	21.00	1,486				14.0				
	Cupsuptic lake	3.00	.....				14.0				
	Rangeley lake	14.00	1,511				10.0				
Kennebec river	Moosehead lake	120.00	1,023	1,296	5,007	112.00	8.0—	0.093	0.558±	0.0200	0.120
Kennebasis river	Big lake	14.00	189	580	766	10.00	Small	0.053	0.200±	0.0400	0.150±
	Grand lake	17.00	271			23.00	8.0				
Chiputneticook river	Chiputneticook Lower lake	27.00	383	400±	634	35.00	15.0	0.130	0.900±	0.0820	0.570±
	Chiputneticook Grand lake	25.00	444			74.00	6.0				

a Distance from Lawrence to Franklin: 110.1 miles; length of Winnipiscogee river: 12 miles; in all, 122 miles ±.

The flow of the Kennebec, though now quite variable, might be rendered much more uniform by the systematic improvement of its reservoirs.

As regards accessibility, the stream is navigable to Augusta for small vessels, and even to Waterville, boats being locked over the Augusta dam. The stream is easily accessible by rail as far up as Caratunk falls, but above that point it is difficult of access, the nearest railroad points being North Anson and Blanchard, the former over 40 miles from the lake, the latter over 20 miles from lake and river.

As the stream is ascended, the first power is met at Augusta. A crib-dam with sloping face, 17 feet high and 956 feet long, ponds the water for 17 miles to Waterville, the average width of the pond being, perhaps, 500 or 600 feet. The old dam, built a good many years ago, was carried away by an ice-freshet in the spring of 1870, and was at once rebuilt. From the dam a canal about 1,000 feet long extends along the west bank of the stream, where the mills are situated. The fall varies a little with the tide, which is said to rise 2 feet, but the level of the water can be raised a foot by flash-boards, and the average fall is about 17 feet.

The power is owned by the Edwards Manufacturing Company, recently organized, but it formerly belonged to the A. & W. Sprague Manufacturing Company, of Rhode Island. Power is used by two cotton-mills belonging to the company, using together in the neighborhood of 500 horse-power, and a number of small mills of various kinds—grist-mills, box factories, sash, door, and blind factories, etc.—the buildings and wheels all belonging to the company, and power being rented at special rates, according to circumstances. The total power used on the west bank is perhaps about 700 horse-power, while on the east bank a saw-mill uses about 200 horse-power. The cotton-mills were not running in 1882, but it was expected to start them at the end of that year. No steam is in use in any of these mills, and, except in heavy freshets, there is always a very large excess of water-power. In freshets the fall is sometimes reduced considerably. In 1878 the water is said to have risen 13 feet on the dam and 20 feet below the dam, but such rises are very rare. In the ice-freshet of 1870, when the old dam was carried away, the water was dammed up below the city, rising some 25 feet below the dam.

The drainage area above Augusta measures about 5,900 square miles. Wells states that in the summer of 1866 the flow was found to be, at a time when the stream was lowest, 2,167 cubic feet per second continuously, but adds that the summer rainfall was large in that year, and estimates the minimum flow at 1,300 cubic feet per second. Estimates are liable to considerable error in the absence of gaugings, but I should judge the power at Augusta to be, at its minimum, not less than that given by Wells, and probably greater.

If we assume the flow as 1,500 cubic feet per second continuously, the gross power would be 170 horse-power per foot, or about 2,900 horse-power on a fall of 17 feet. In the low season of ordinary years the power would probably be 20 or 25 per cent. greater. The pond is large enough, moreover, to allow of the power being considerably increased during working hours.

Augusta is very favorably situated as regards accessibility, both by sea and by land, being only eight hours from Boston. The river is open up to the city during about eight months of the year to vessels drawing 10 feet. The power is an excellent one, and merits more attention than it has hitherto received.

The next power is at Waterville, at the head of the Augusta pond. The falls at this place, known as the "Ticonic falls", amount to 13 feet in a few rods, over a ledge of hard slate. A dam 750 feet long, built in 1869, raises the water 7 feet, and affords a fall of 20 feet, with a race 1,000 feet long. A power of about 2,000 horse-power is used at two cotton-mills and a grist-mill, belonging to the Lockwood Company, full capacity being obtained all the time. The drainage area above the dam is about 4,475 square miles, and I should estimate the minimum power roughly at about 135 horse-power (gross) per foot fall during twenty-four hours, or 2,700 horse-power on a fall of 20 feet. This power would be greatly exceeded in ordinary years. The available power is thus about the same as at Augusta, and both sites are entitled to rank among the best on the river. The pond of the Waterville dam, however, is only 40 rods long, so that the storage is not sufficient to allow of the concentration of the power into working hours.

The next fall above is known as College rapids, where the natural fall is 10 feet in as many rods, capable of being increased to 20 feet by a dam. This site is entirely unimproved, but the figures above enable an idea to be formed of the power available. The two sites together would probably afford a minimum power of at least 5,000 horse-power continuously, and were all the reservoirs tributary to the stream systematically improved and operated, not less than 8,000 horse-power. The topography is said to be singularly favorable for the utilization of the power, and the facilities for transportation are excellent.

At Kendall's Mills, in Fairfield, a dam across the river gives a fall of 22 feet in three-quarters of a mile, the power being owned at the time of Wells' report by the Kendall's Mills Water-Power Company. At Somerset Mills, a short distance up the river, a fall of 12 feet is afforded by a dam, the power being partially utilized. The power at these two places is about the same per foot fall as at Waterville.

The next power is at Skowhegan falls, in the town of Skowhegan. The total fall is 28 feet in half a mile, capable of being increased by a dam, and a considerable fall being in one pitch. The bed and banks are rock, but the topography is only moderately favorable for the location of mills, and the power is only partially improved. The town is accessible by rail. The drainage area above the dam is about 4,176 square miles, and the minimum power may be roughly estimated as about 120 horse-power (gross) per foot fall, or 3,360 horse-power on a fall of 28 feet during twenty-four hours.

The next power is in Norridgewock, 3 miles above the bridge, at Bombazee rips, the natural fall being 8 feet, capable of being increased to 12 feet by a dam. The available power is large, the quantity of water being nearly as great as at Skowhegan.

We next come to the Madison Bridge falls, in Anson and Madison, the largest fall on the river, the descent amounting to 87 feet in 2½ miles. The fall consists of two principal pitches, with swift water between. At the upper pitch a small amount of power is used, and the facilities are said to be remarkably good, the bed and banks being rock. The minimum power available may be estimated at about 100 horse-power (gross) per foot, or 8,700 on the entire fall during twenty-four hours, only a small fraction of which is utilized. In the dry season of an ordinary year the power would probably be at least 60 per cent. greater, or 160 horse-power (gross) per foot, and during working hours, if the water could be stored, this power would be doubled. This magnificent site, which is easily accessible by rail, is worthy of further investigation.

The next power is Caratunk falls, in Embden and Solon, where the descent is 20 feet in one pitch, capable of being increased to 30 feet by a dam. The topography is very favorable, and the minimum power is perhaps about 85 horse-power (gross) per foot fall continuously. The next power is Stand-up rips, a mile above the forks, with 20 feet fall in 100 feet; then comes Moxie rips, 3 miles above the forks, or mouth of Dead river, the fall being 15 feet in 20 rods. Four miles above, at the Black Brook rips, there is a fall of 20 feet in 30 rods. Two miles above this the rapids commence, "extending 9 miles, and in the whole distance the river is a violent torrent, foaming and boiling; the fall being judged not less than 300 feet in this distance. The shores are bold, in part precipitous, and rising to a height of 100 feet on either side". No part of this large power is improved, and probably a large portion of it could not be utilized except at great cost. This power is the last on the river, being only a few miles below the lake.

It is evident from the above enumeration that the powers on the Kennebec are numerous and excellent.

TRIBUTARIES OF THE KENNEBEC RIVER.—The first important tributary of the Kennebec is the *Cobbosseecontee river*, which enters from the west, in Gardiner, draining about 292 square miles. It is the outlet of a chain of lakes covering over 21 square miles, and rendering the stream an excellent one for power, for its fall is large and the ponds are sufficient to render the flow quite constant. Within a mile of the mouth of the river the stream falls 133 feet to low tide in the Kennebec, and the site, known as the Cobbosseecontee falls, is utilized by a number of mills. The total minimum power has been estimated, according to Wells, at 1,200 horse-power, and at the time of his report there were eight dams at this place. Above this point there are other powers on the river, of which two are in West Gardiner, each with a fall of 16 feet. The stream is an excellent one for power.

In Hallowell the *Vaughan stream* enters from the west, and near its mouth falls 188 feet in about 1,600 feet, a part of the power being used. The stream is small, and its flow is very variable, being unconnected with reservoirs.

Messalouskee or *Emerson's stream*, which joins the Kennebec in Waterville, is an excellent stream, being the outlet of reservoirs covering over 27 square miles, quite sufficient to render the flow very constant, and probably the maximum with storage is available. The length of the stream, from the lowest pond to its mouth, is only about 5 miles, but the total fall in that distance is not less than 164 feet, the greater part of which is utilized in Waterville and West Waterville by mills of various kinds. The greatest fall occurs at the "Cascade", and amounts to 44 feet in 8 rods. The power is excellent. There are other privileges on the upper parts of the stream, between the ponds feeding it, but none of importance.

The next tributary of importance is the *Sebasticook river* which has its sources in Penobscot and Piscataquis counties, and flows in a southwesterly direction, joining the Kennebec at Waterville, and draining about 1,088 square miles. Though a number of ponds are tributary to it, covering in all some 50 square miles, the area of lake surface does not bear such a large proportion to the area of the basin as in the case of some of the smaller streams we have considered, so that its flow is probably more variable. Its fall is considerable, being over 170 feet between Moose pond and its mouth, a distance of some 45 miles, and it affords a number of good powers. In a distance of 5 miles from its mouth the fall is 22½ feet, and a fine power is said to be possible. A mile above this are Lower falls, with 12 feet in half a mile; then Upper falls, 10 feet in a mile; and then Nine-Mile rips, 8 to 12 feet in a mile, part of this power being improved. Then comes Hunter's mills, 7 feet fall, capable of being increased to 10 feet or over; then Ferguson's rips, with 10 feet in 15 rods, in Burnham and Clinton Gore townships; then Eel Weir rips, 8 feet in 80 rods, in Burnham and Pittsfield; and a little above, Thirty-Mile rips, with 35 feet in a mile and a half. This last power is the most important on the river, and is said to be favorably situated, with good facilities for utilization.

The tributaries of the Sebasticook also afford considerable power. In Vassalboro' some power is obtained from the outlet of China pond, which covers an area of 4,000 acres and is 201 feet above tide. Its surface is raised 6 feet by a dam, and the fall of its outlet stream is 160 feet in its course of 6⅛ miles. The maximum with storage is probably available in this case, but the drainage area is small. Wells gives the low-season flow as 145 cubic feet per second during eleven hours, and this, on a fall of 160 feet, would afford a gross power of 2,637 horse-power. A considerable proportion of the total fall is utilized. The West branch of the Sebasticook, which joins the other, or East branch, a little above Thirty-Mile rips, in Detroit township, is the outlet of Moose pond, which covers about 9½ square miles and lies at an elevation of 244 feet above tide. Wells mentions the following falls on this branch: Douglass ledge, 14 feet in 150 rods; Hathorn's mill, 14 feet in 40 rods; Call rips, 17 feet in 200 rods, these three being in Pittsfield; Upper Sebasticook falls, 1 mile from the lake, 30 feet in 75 rods, in Hartland; besides others above Moose pond. In Detroit, at the "Rips", there is a fall of 30 or 40 feet in a quarter of a mile, probably on the East or main branch of the river; and farther up this stream, and especially on its tributaries, there are numerous powers in the towns of Newport, Plymouth, Stetson, Corinna, and others. The valley of the Sebasticook is followed by the Maine Central railroad, so that all the water-powers on the stream are easily accessible.

The *Wesserunsett river*, which enters the Kennebec in Skowhegan, from the north, drains about 167 square miles, and is a rapid stream, affording numerous sites, many of which are unimproved. The flow, however, is not very constant.

The next important tributary is *Sandy river*. This stream takes its rise in the western part of Franklin county, near Rangeley lake, at an elevation of 1,868 feet above the sea, and flows first in a southeasterly direction for about 32 miles, when it bends abruptly and flows northeast for about 17 miles in a straight line, entering the Kennebec above Bombazee rips; it drains about 666 square miles. Although fed by a few ponds, the storage capacity of the stream is small, so it is probable that its flow is quite variable. Its fall is large, not less than 1,700 feet from source to mouth, but the greater portion of this occurs where the stream is very small and of little value for power. Nevertheless it offers a number of sites. At Dickerson's rips, in Mercer and Starks, about 8 miles from the mouth, there is a small fall of 8 feet. The minimum power would be probably in the neighborhood of 10 horse-power (gross) per foot fall continuously. In New Sharon, at New Sharon falls, the fall is 10 feet, and is partially improved, while at several other rapids below considerable power is available, though but little is used. At Farmington falls, in Chesterville and Farmington, the fall is 16 feet, only partially used. In Strong there are several powers, and as the upper parts of the stream are approached the fall becomes very rapid, but the river seems to possess no remarkably good sites, those on the lower parts having small falls, while in the upper parts, where a power could be created almost anywhere, the flow is very variable. One remarkable fall in the town of Phillips, only a few miles from the source of the stream, may be mentioned, where, in a distance of 3½ miles, the fall amounts, it is said, to not less than 300 feet.

The *Carrabasset* or *Seven-Mile river*, which enters the Kennebec at Anson, above the Madison Bridge falls, drains about 366 square miles, and has a rapid fall, but its reservoir system is not extensive, and its flow, like that of Sandy river, is quite variable. Near its mouth is a fall of 50 feet in 100 rods, the head of the fall being above the outlet of the largest pond tributary to the stream. Four and a half miles up the stream are Upper Carrabasset falls, said to be a good site, but only partially improved. Numerous sites occur above this, but the freshets are quite severe, and it is said that the mills are sometimes unable to operate more than half the year. Were the reservoirs connected with the stream improved more extensively, the power would probably be much benefited.

Numerous tributaries between this point and the lake empty into the Kennebec from both sides, with very steep descents. Thus, in the town of Pleasant Ridge, the Houston stream is a torrent for nearly 2 miles, the total

fall being estimated at 300 feet. *Fall brook*, in Solon, falls 100 feet in a quarter of a mile, and the *Austin stream*, in Moscow, falls 100 feet in half a mile. These streams are generally very variable in flow, but some of them are connected with ponds, which, if improved, would add greatly to the value of their power.

Dead river, the next and last important affluent of the Kennebec, has its rise in the extreme north of Franklin county, almost on the state line. Its general course is toward the east, and it enters the Kennebec at the forks, or about 22 miles below the lake. The following powers are mentioned by Wells: Dead River rapids, extending from the forks to Grand falls, a distance of 12 miles; Grand falls, in township No. 3, range 4, Somerset county, with 40 feet fall, nearly perpendicular, said to be an excellent site; Long falls, in the same township, a mile long, total fall 30 feet, and a large pond above site for dam; Ledge falls, 12 feet, and Swampscott falls, 10 feet, both unimproved, in township No. 1, range 5, Franklin county, and with a large storage, due to the dam just above, at the outlet of Chain pond, which covers 5 square miles.

The *outlet of Moxie lake*, which enters the Kennebec just above the forks, from the east, has a fall of over 166 feet in a distance of about 5 miles, one fall of 95 feet being perpendicular. The pond affords considerable storage, being commanded by a dam 6 feet high, and the power is doubtless excellent, though comparatively small. Some of the tributaries of Moosehead lake afford power, but little is known regarding them. The principal one is Moose river, which rises at an elevation of over 3,000 feet, and consequently has a fall of about 2,000 feet in its course of a little over 50 miles. It offers numerous powers, mostly unimproved.

The power available on the Kennebec and its tributaries is evidently very large. Wells estimates the power on the main stream alone, between Caratunk falls and tide-water, during a dry season, as 101,000 horse-power during eleven hours; but such estimates are not of great value. It is clear, however, that only a very small fraction of the power available on the main stream is at present utilized.

THE SHEEPSCOT, SAINT GEORGE, ETC.

The area lying along the coast between the basins of the Kennebec and the Penobscot, and comprising about 800 square miles, is drained by a few small streams, which merit a brief notice.

The *Sheepscot river* takes its rise in the extreme west of Waldo county, and flows south into Lincoln, its length being about 37 miles, and its drainage area measuring 248 square miles above tide-water. The *Damariscotta river* is the outlet of the pond of the same name, and, although draining only about 46 square miles above the lowest fall, is of considerable importance on account of its constant flow, the storage on its ponds being probably sufficient to render available the maximum with storage. The *Medomac river* is about 21 miles long, and drains about 118 square miles, above the lowest falls, in Waldo, Knox, and Lincoln counties. Finally, the *Saint George river* is about 35 miles long, and drains, above the lowest falls, about 228 square miles, principally in Waldo and Knox counties.

These streams have generally not a large fall, but their power is quite well utilized, being near the coast; and their reservoirs are so improved as to render their flow quite constant. The whole number of lakes in the district is seventy-two, covering 50 square miles, or 1 square mile to every 50 square miles of drainage area. The following table (from Wells) gives the principal of these lakes and ponds:

Principal reservoirs of the Sheepscot, Saint George, etc.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Place.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
South pond	Saint George river.	1.15	.....	.....	Medomac pond	Medomac river	0.75	.....	.....
North pond	do	0.50	.....	.....	Little Medomac pond	do	0.25	.....	.....
Seven-Tree pond	do	1.10	.....	(a)	Washington pond	do	1.25	.....	.....
Crawford's pond	do	1.05	Dam	(a)	Clark's pond	do	0.50	.....	10
Round pond	do	0.35	.....	(a)	Damariscotta pond	Damariscotta river	10.00	6	.....
Western pond	do	0.30	.....	.....	Muscongus pond	Muscongus river	0.50	Dam	(a)
Senebeck pond	do	1.15	.....	(a)	Biscay pond	Pemaquid river	1.00	.....	.....
Quantabacook pond	do	2.00	.....	(b)	Pemaquid pond	do	2.00	.....	6
True's pond	do	0.30	6	.....	Duck pond	do	0.30	.....	.....
Saint George's pond	do	2.00	Dam	.....	Dyer's Long pond	Dyer's river	1.20	6	4
Stevens' pond	do	0.75	Dam	.....	Dyer's pond	do	0.20	.....	.....
The "lake"	do	2.00	4	2	Pleasant pond	Sheepscot river	1.10	.....	4 to 6
Lermond pond	do	0.50	8	0	Travel pond	do	0.60	.....	6
Hobbs pond	do	0.25	4	2	Patricktown pond	do	1.00	.....	10
Southern Hobbs pond	do	0.75	0	2	James pond	do	0.30	(a)	(a)
Fish ponds	do	0.40	6	1	Sheepscot Great pond	do	1.50	Dam	6
Sixteen ponds	...	14.35	.....	.....	Sixteen ponds	.....	22.45	.....	.....

a Several feet. *b* Considerable.

On the Sheepscot river the first power is a tide-power at Sheepscot falls. Five miles above, at the head of tide, a fall of 10 feet is used. At the "Rapids", the head of which is 2 miles farther up, there is a fall of 25 feet in a mile, with steep banks on both sides; and above this there are several small powers.

At the outlet of Damariscotta pond the Damariscotta river falls 52 feet in 20 rods, and the power is excellent, though small, being rendered constant by the storage on the pond.

In the town of Bristol the Pemaquid river falls 50 feet in the first 500 feet from tide, and the power, being fed by ponds above, is said to be good, though very small.

On the Medomac river there are eight powers in the town of Waldoboro', with a total fall of about 80 feet, while other falls occur above.

On the Saint George river there is a woolen-mill in the village of Warren, and also a site known as "Knox falls", just above. In the town of Union the stream has considerable fall, and several powers are in use, while in its upper part the fall is still greater.

None of the powers on these streams are of great importance, being all small. They are valuable, however, on account of their constancy.

THE PENOBSCOT RIVER.

This mighty stream, the largest in the state, is divided in its upper parts into several so-called branches, but the West branch, which is properly the main stream, has its sources in the extreme western part of Somerset county, its water-shed on the west being nearly coincident with the state boundary. From the junction of the so-called North and South branches, which unite to form the West branch, the latter stream pursues for about 80 miles, measured in a straight line, a course toward the east and a little southward, passing through Piscataquis and into Penobscot counties and flowing through a chain of lakes. It then bends toward the south and flows for nearly the same distance in a straight line a little west of south, passing the city of Bangor and emptying into Penobscot bay, this part of its course lying almost entirely in Penobscot county. The length of the stream, along its course, from the junction of the North and South branches, is about 170 miles, and its drainage area above its mouth at Sandy point measures about 8,785 square miles, all within the state of Maine. The map of the basin shows that its greatest length is about 160 miles and its greatest breadth about 115 miles. "It is mountainous from the sea to the head of tide, at Bangor, and above; thence northward it is gently undulating up to and throughout the region of the East and Mattawamkeag branches. On the main stream, above Nicatou, it is more broken, and is singularly diversified with lakes, ponds, swamps, streams, hills, valleys, and detached peaks. The Katahdin mountains, the highest in Maine, affording a prospect characteristic and sublime, from the vast breadth of level country overlooked, lie upon the left bank. Farther west the valley becomes merged with that of the Kennebec on the south and the Allaguash on the north, and terminates on the northwest at the highland boundaries of the state, and in the swamps and lagoons which form the common reservoir of the Saint John and the Penobscot. As a whole the valley is uniform in its topographical features." A large proportion of the basin is still covered with forests. The soil is gravel, clay, and loam, and the rocks granite, mica-schist, and clay-slate. The basin is, as a whole, less elevated above the sea than that of the Kennebec or the Androscoggin, although the northern portion is quite elevated, the divide having, according to Wells, a mean height of 1,085 feet, while the headwaters of the West branch are at an elevation of from 1,600 to 2,000 feet. The following table will give some idea of the slope of the river:

Slope of the Penobscot river.

Place.	Distance from mouth.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
	Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Mouth	0	0.0			
Bangor, head of tide	27	0.0	27	0	0.0
Foot of Corporation dam, Veazie		5.4			
Crest of Corporation dam, Veazie		20.8			
Foot of Ayer's falls, Orono		27.2			
Head of Ayer's falls, Orono		35.4			
Foot of Great Works falls, Oldtown		57.5	12	92	7.7
Head of Great Works falls, Oldtown		68.6			
Foot of falls at Dwinal's mills, Oldtown		71.8			
Head of falls at Dwinal's mills, Oldtown		78.3			
Foot of falls at Dwinal's mills, Milford		80.7			
Head of falls at Dwinal's mills, Milford	39	92.3			
Mouth of Passadumkeag		106.0			
Mouth of Mattanawcook		172.0	45	98	2.2
Mouth of Mattawamkeag	84	190.0			
Twin lakes (about)		500.0	36	710	19.7
Chesuncook lake	120	900.0			
Northeast of Moosehead lake		1,000.0	80±	609	7.6±
Penobscot lake	200±	1,509.0			

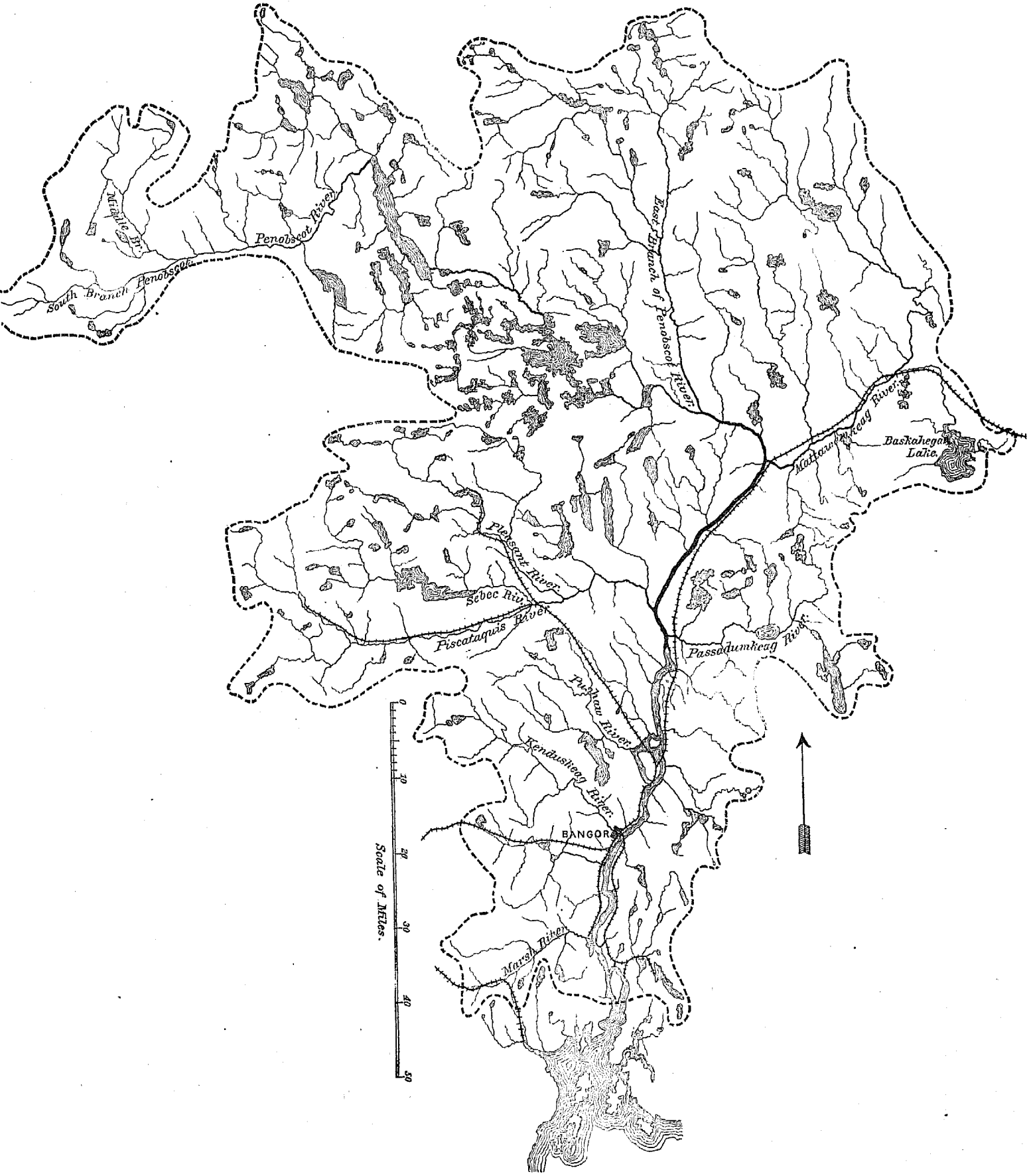

Fig. 21. MAP OF THE DRAINAGE BASIN OF THE PENOBSCOT RIVER.

The slope of the river, from its remotest sources to tide, is a little less than 9 feet to the mile. In its principal water-power section, between lake Chesuncook and Bangor, the fall is 900 feet in 120 miles, or 7.5 feet per mile. From the Mattawamkeag to tide, 57 miles, the slope is 3.3 feet per mile. Within 12 miles above Bangor the fall is 92 feet, or 7.7 feet per mile.

The principal tributaries of the Penobscot are the following:

Name of stream.	Where received.	From which side.	Length.	Drainage area.
			Miles.	*Sq. miles.*
Kenduskeag river	Bangor	Right.	34	229
Pushaw river	Oldtown	Right.	26	231
Piscataquis river	Howland	Right.	71	1,541
Passadumkeag river	Passadumkeag	Left.	35	402
Mattawamkeag river	Mattawamkeag	Left.	85	1,533
Mattagamon (East branch)	Nicatou	Left.	63	922

The flow of the Penobscot is naturally quite constant. The total number of lakes in its basin is 467, with a total area of 585 square miles, or one-fifteenth of the area of the basin. These lakes, however, are generally small, and the stream has no reservoirs as large or as easily commanded as the large reservoirs of the Androscoggin and Kennebec. Artificial storage is therefore more expensive, and the full capacity of the main river will not be realized until the numerous smaller lakes in the basin shall have been improved and converted into storage reservoirs, by manufacturers on the tributary streams. It is said that the basin in its upper parts affords unusual facilities for the construction of artificial reservoirs, though accompanied by the flowage of considerable areas, so that the flow of the river may be rendered very much more constant should the expense be justified. The disadvantage of the river as regards natural reservoirs is, however, counterbalanced to a great degree by its immense extent of forests, its large drainage area, the uniformity of its topography, and the absence of a mountain region. Large freshets are not common, the range from lowest to highest water being only 12 feet at Bangor, and in 1864 and 1865, during a very dry season, the discharge at Bangor was estimated at about 2,438 cubic feet per second continuously, (*a*) or 0.31 cubic feet per second per square mile, which is not small.

The following table is from Wells:

Principal reservoirs of the Penobscot and tributaries.

Name of reservoir.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Name of reservoir.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
Little Seeboosis lake	Piscataquis river	1.40			Cold Stream pond	Passadumkeag river.	6	Dam	10
Endless lake	do	4.25							
Pond north of Endless	do	1.10			Second Cold Stream pond	do	0.95	8	
Pond northeast of Endless	do	1.20			Clear Water pond	do	0.80	8	
Schoodic lake	do	16		8	Escutassis (two) ponds	do	1.40	Both 8	
Seboois lake	do	12			Saponac pond	do	1.30		
Dover pond	do	0.70	6	(*b*)	Madagascal pond	do	1.70	7	
Harlow (two) ponds	do	0.50	6	(*b*)	Two ponds above Madagascal	do	0.25	*e* 6	
Kingsbury pond	do	3	10	(*b*)	Spring pond	do	0.20		
Sangerville ponds	do	0.90	Dams		No. 3 pond	do	1		
Piper pond	do	1.25		(*b*)	First Pistol lake	do	1	6	
Upper Piper pond	do	0.35		(*b*)	Second, Third, and Fourth Pistol lakes.	do	0.50	8	
Spectacle pond	do	1.10	Dam	10	Porter pond	do	0.20		
Lower Ebeeme pond	do	2.25			Nicatous lake	do	10	10	
Upper Ebeeme pond	do	1.25			Abamgamook or West lake	do	2	7	
Sebec lake	do	14	6	4	Duck lake	do	2	9	
Long pond	do	1		4	Garbeus lake	do	1	6	
Ship pond	do	3	Dam	10	Coombs lake	do	0.15	5	
Hebron pond	do	2	do		Ware pond	do	0.80		
Monson pond	do	0.40		(*b*)	Twenty-two ponds		31.25		
Bowdoin College (three) ponds	do	2							
Wilson pond	do	2.25	7	(*b*)	Mattakeunk pond	Mattawamkeag river.	1.50	Dam	(*d*)
Houston pond	do	3							
Pond in B., R. 11	do	1			Mud pond	do	0.60		
Bald Mountain pond	do	2	4	4	Molunkus pond	do	3		
Shirley bogs	do	8	*c* 7	(*d*)	Benedicta pond	do	0.75		
					Mackwacook pond	do	1		
Thirty ponds or more		85.90			Wytopitlock pond	do	3.25		(*d*)

a *Wells' Report*, page 105. *b* Several feet. *c* On 2 square miles. *d* Considerable. *e* The larger.

Principal reservoirs of the Penobscot and tributaries—Continued.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
South pond, in No. 3, R. 4	Mattawamkeag river.	0.75		
Hot Brook pond, in No. 3, R. 4	do	3.50		
Easkahegan lake	do	18		
Pond in No. 3, R. 3	do	1		
Mattawamkeag lake	do	5.50	12	
Caribou pond	do	1.50		
Pond	do	1		
Pleasant lake	do	3.50		(*a*)
Sketicook lake	do	1.25		
Spaulding's lake	do	2.50		
Rockabema lake	do	2.25	5	(*b*)
Mud lake, above Rockabema	do	1.25	8	
Small ponds in Rockabema	do	2.50		
Twenty-one ponds		53.35		
Salmon Stream pond	Mattagamon river.	2		
Katahdin pond	do	0.65		
Pond in No. 4, R. 7	do	1.50		
Bowlin pond	do	1.10		(*b*)
Upper Bowlin (two) ponds	do	0.85		(*b*)
Mattagamon lake	do	5	10	
Mattagamonsis lake	do	2.25	10	
Third lake	do	1.75	6	
Fourth Lake	do	0.90	Dam, 12	
Flowage above Fourth lake	do	1	(*b*)	
Snake pond, in No. 7, R. 11	do	1	Dam, 7	
Big Leadbetter pond	do	0.80	Dam, 10	
Lower Shin pond	do	2.25		
Upper Shin pond	do	1.30		12–20
Pond in No. 5, R. 7	do	1		
First lake	do	1.10	5 to 6	
Second lake	do	1.10	5 to 6	
Schoois lake	do	4.75	5 to 6	
Five ponds in No. 6, R. 8	do	3		
Scraggly lake	do	3		
Wassattiquoick pond	do	1.50		
Webster lake	do	3	10	
Hudson and Wadleigh Brook reservoirs.	do	1.50	(*b*)	
Twenty-eight ponds		42.30		
Pushaw lake	Penobscot river	8		6
Boyd lake	do	1.75		
Little Pushaw pond	do	0.90		
Mud pond	do	0.75		
Pickerel pond, in Alton	do	0.50	Dam	*c* 3
Nichols pond	do	3		
Davis pond	do	0.90		
Holbrook's pond	do	0.90		
Mattanaweook pond	do	1.30	Dam	
Crooked pond	do	0.70	Dam	
Folsom pond	do	0.40	Dam	
Upper pond	do	1.20	Dam	
Pond in Nos. 2 and 3, east of Chester.	do	4.50		
Mattamiscontis pond	do	2		
Lower Mattamiscontis pond	do	0.90		
Cambolasse pond	do	0.65	Dam	
Long pond	do	1	Dam	
Caribou pond	Penobscot river	0.85	Dam	
Centre pond	do	0.30	Dam	
Madunkeunk pond	do	1		
Nollesemic pond	do	2.50		
Quakish lake	do	1.75		(*d*)
Shad lake	do	0.75		
South Twin lake	do	3	(*b*)	3
North Twin lake	do	3.25	Dam, 16	3
Mattaconnk lake	do	2.50		
Jo-Mary upper lake	do	3		
Jo-Mary middle lake	do	2.50		
Jo-Mary lower lake	do	3		
Pemedunkeook lake	do	16	(*b*)	3
Milinoket lake	do	18		10–12
Katahdin pond, in No. 2, R. 7	do	2		
First pond, in No. 2, R. 10	do	0.75		
Second pond, in No. 2, R. 10	do	1		
Third pond, in No. 2, R. 10	do	2.50		
Nahmakanta lake	do	3	8	
Unsuntabunt lake	do	3.75	4 to 6	
Sourdnahunk lake	do	3.75		4
Five ponds in A, R. 11	do	4.75	(*e*)	
Penobscot pond, in No. 1, R. 11	do	1		
Three ponds west of Namakanta lake.	do	2.50	(*f*) 4 to 6	
Ripogenus lake	do	2		
Ripogenus pond	do	4		
Caribou lake	do	6.50		
Upper Caribou lake	do	1		
Ragged lake	do	4		
Chesuncook lake	do	22	12 to 13	
Duck pond	do	2	(*b*)	
Cusabexis lake	do	2	5 to 6	
Umbazooksus lake	do	2.25		
Longley pond, in No. 6, R. 13	do	1.50	Dam, 7	
Black pond	do	1		
Shallow lake	do	2.50	6	
Poland lake	do	0.75		
Cauquomgomoc pond	do	10		(*b*)
Portage pond	do	1.25		
Daggett pond	do	1		
Pond above Daggett	do	0.75		
Loon pond	do	3		(*g*)
Two ponds above Loon	do	1.25		
Hurd (two) ponds	do	1.50		
Wadleigh pond	do	0.75		
Pine Stream (two) ponds	do	1		
Lobster pond	do	6		
Russell pond	do	1	5 to 6	
Luther pond	do	0.90		
Nulhedus pond	do	1		
Two ponds, in No. 3, R. 3	do	1.25		
Two ponds in Bald Mountain township.	do	1.50		
Penobscot lake	do	1.50		
Two ponds in No. 3, north of Hammond township.	do	1.50		
Eighty-four ponds		182.40		
One hundred and eighty-five ponds.		595.20		

a Many feet. *b* Several feet. *c* Over 1.75 square mile. *d* 12-foot dam feasible. *e* Dammed in part. *f* On two ponds. *g* Dam feasible.

In addition to the above, 9 ponds, covering 39 square miles, which naturally belong to the Allaguash system, have been added to the Penobscot system by means of dams, canals, etc.; and over 30 ponds, covering over 31 square miles, are tributary to thestream below its lowest fall.

The Penobscot river is accessible by rail up to the mouth of the Mattawamkeag, or 57 miles from tide-water. Above that point no railroad approaches within many miles of it, and its headwaters are among the pathless forests of the northern part of the state. The rainfall over the basin is about 44 inches, of which 11 fall in spring, 10 in summer, 13 in autumn, and 10 in winter.

The head of tide and of navigation on the Penobscot is at Bangor, where Treat's falls prevent the further ascent of the river. These falls, one mile above the harbor proper, are flowed at high tide, but a dam extending to a height of 15 feet above mean high tide has been proposed, which, with the storage on the pond, and with flash-boards 2 feet high in dry seasons, it is estimated will afford a gross power of 9,000 horse-power during working hours of the driest day, or over 13,000 horse-power by the aid of reservoirs up the river. The bed of the river is ledge, and the facilities for location are said to be excellent. The minimum flow available for power has been estimated at 1,950 cubic feet per second continuously, affording 3,224 gross horse-power on a fall of 15 feet, the increase to 9,000 horse-power being due to the storage on the pond, the use of flash-boards, and the additional fall at low tide. This does not include a considerable amount of water used for the passage of rafts, estimated as at least 25 per cent. of that available for power, thus making the total minimum flow of the river at least 2,440 cubic feet per second.

Within the next 12 miles above Bangor the fall of the river, according to the table on page 90, is not less than 92 feet, or, deducting the 15 feet or more available at Treat's falls, say 70 feet available for power between that place and Milford. This fall comprises a number of separate sites, mentioned by Wells, but not very clearly distinguished, on account of the fact that the river divides and flows in two channels, with large islands between, and there being falls, of course, on both arms. This fact, too, precludes an estimate of the power at each site, as the quantity of water flowing in each of the two arms is not known. It must, therefore, suffice to say, that in all probability the average quantity of water flowing within the 12 miles referred to, when at its minimum, will be not less than 2,250 cubic feet per second, affording, on a fall of 70 feet, a total gross power of nearly 18,000 horse-power continuously, or very much more if the water could be stored during the night and reservoirs constructed up the river. The total power available on the fall of 92 feet, from Milford to tide, is probably not less than 23,000 gross horse-power continuously, or over 50,000 horse-power during eleven hours. The long tract of dead water above Milford would afford a pond sufficient to store a large amount of water during the night, thus rendering certain a large increase of power above that which could be used continuously. The facilities for the utilization of this immense power are said to be very good, the bed of the stream being generally rock, and the banks favorable for the secure location of mills and canals. A railroad follows the river along the entire distance, and navigation is open to Bangor during about eight months of the year. The amount of power now used on this part of the river is very small.

The next power above Milford is in Edinburg and Passadumkeag, at Passadumkeag rapids, where the fall is 7 feet and the bed of the river solid ledge. The power is unimproved. The next site is in Enfield and Howland, at Piscataquis falls, where the river is 900 feet wide, and the fall about 22 feet. The minimum available power is probably between 2,000 and 3,000 horse-power (gross) continuously. Next comes Island rapids, in Chester and Winn, where the fall is not less than 15 feet in 100 rods, capable of being increased by a dam, the minimum available power being probably several thousand horse-power continuously.

Between Chesuncook lake and the mouth of the Mattawamkeag the descent of the Penobscot is more rapid than in any other part of its course, being not less than 700 feet, or about 19 or 20 feet per mile. This portion of its course, too, seems to be especially favorable for power, combining with a large fall the presence of extensive reservoirs close at hand. The descent is broken by numerous falls and rapids, of which the following may be named: In Indian Purchase township, Grand falls, Island falls, Rhine's pitch, and others, aggregating many feet fall, almost the entire stream in this township being rapid, with several pitches of 15 or 20 feet; in Nicatou township, Salmon Stream falls, 20 feet in 75 rods; Jo-Mary rips, 8 or 10 feet; Rockabema rips, just above the mouth of the East branch, and others; in township A, range 7, Rocky rips; Dolby rips, 8 feet; Ledge falls, 12 or 15 feet, and several miles of quite rapid water; in township No. 2, range 10, above Twin lakes, a number of excellent falls; in township No. 3, range 11, several falls, the principal being Ripogenus falls, where the whole fall is 215 feet in about 3 miles; in township No. 5, range 13, Pine Stream rapids, above Chesuncook lake, 12 or 15 feet in 100 rods; and other smaller powers above.

It is evident from these facts that the Penobscot will compare favorably with any stream in the state as regards amount of power available and facilities for utilization. At the same time, probably a smaller proportion of that power is actually used than in the case of any other large stream yet described.

TRIBUTARIES OF THE PENOBSCOT RIVER.—The first tributary to be mentioned is *Marsh river*, which enters from the west, in Waldo county, after draining about 156 square miles. It offers a number of powers, of which Plummer's mills (25 feet), Boyd's mill (15 feet), and Tapley's mill (15 feet), are near the mouth. There are a number of privileges above, many unimproved, but the stream is not very constant in flow, and many of the mills cannot operate all the year.

The *Sowadabscook river*, from the west, is a somewhat similar stream, though rather more constant in flow, and draining 166 square miles. It has a number of powers, but none of much importance. Were its natural reservoirs improved by storage, its power would be much increased in value, and the mills would be able to operate all the year.

The *Kenduskeag river* from the west, in Bangor, is a larger stream, draining 229 square miles, and much more valuable for power. In Bangor, the stream falls some 75 feet, and a considerable portion of the power is improved, while in the townships above there are many mills, as the table on page 107 shows. This stream, like the two just described, is naturally quite variable in flow.

Great Works river, from the east, affords a number of powers, partly utilized.

Pushaw river from the west, is a stream very like the Kenduskeag, which it adjoins. No important powers on it, however, are mentioned by Wells.

The *Passadumkeag river* from the east, drains about 400 square miles, and is much more favorably situated as regards storage than any of the tributaries thus far, as shown by the table on page 91. Its fall is quite rapid, and in the town of Lowell, Wells mentions four privileges aggregating 48 feet fall. In township No. 3, Hancock county, at Grand falls, the river falls 100 feet in 200 rods, affording, according to Wells, a series of most excellent powers, asregards facilities for utilization. On the outlet stream of Nicatous lake, a tributary of the Passadumkeag, there is a fall of 40 feet in half a mile, and as there is a dam at the outlet of the lake, giving a storage depth of 10 feet, the flow could be rendered quite constant were the storage used for other than log-driving purposes.

The Piscataquis river, which enters the Penobscot from the west, in the town of Howland, is the principal tributary of the latter stream. Its sources lie in the southwestern part of Piscataquis county, and partly in Somerset, and its course is nearly due east for a distance of about 55 miles, its drainage area measuring 1,541 square miles. It is well supplied with reservoirs, which, with systematic improvement, would render the flow quite constant. The stream is about 250 feet wide for 25 miles from its mouth. As regards accessibility, the stream is greatly favored, being followed closely by a railroad from the mouth of the Sebec, about 20 miles from its mouth, to near its headwaters, at Blanchard. The fall of the river in the lower 20 miles of its course, below the mouth of the Sebec, is about 140 feet, or 7 feet per mile; in the next 15 miles it falls about 100 feet, while above that point its descent is probably more rapid still. At the mouth of the river are Howland falls, with a fall of 20 feet, produced by a dam, and once utilized by saw-mills. The minimum available power is probably not less than 600 horse-power (gross) on a fall of 20 feet, continuously, and very much more were the reservoirs improved. Moreover, the dam ponds the water back for 6 miles or more, thus allowing of a large increase of power during working hours, so that the privilege is an excellent one. In Maxfield the river has two sites, McIntosh's and Whitney's falls, each with 8 feet available, but rather less water than below, the Seboois river, the outlet of Seboois lake, entering between. The latter stream has no power of note, but its lake is valuable for storage. In Medford, Piscataquis county, the Piscataquis has Schoodic falls, just below the mouth of the Schoodic river, with 15 feet in 100 rods, and Little falls, 10 feet in 30 rods. The outlet of Schoodic lake has a fall of 22 feet in 35 rods, and its lake is valuable for storage. The next power on the Piscataquis is in Foxcroft and Dover, where, at Dover village, there is a fall of 23½ feet at Dover Great falls, utilized by various mills. There is also a fall of 6 feet 100 rods below, a dam 9 feet high at Dover Lower Village falls, at East Dover, a fall of 12 feet at Foxcroft dam, used by a number of mills, and a nearly equal fall at Pratt's rips, making in all, in the two townships referred to, a total fall of over 60 feet available. The drainage area above these falls is about 387 square miles, but the minimum power available is probably small, on account of the absence of lakes above, perhaps not over 6 horse-power per foot fall continuously. In Guilford several sites are in use, and in Blanchard the river falls 200 to 300 feet in a mile at Grand falls, but only a part of this is available, and the stream is small and inconstant. Other and smaller falls above need no mention.

The Sebec river, the outlet of Sebec lake, is a quite constant stream, and has a fall of 9 feet at Sebec falls, in Milo; a second, of 25 feet in half a mile, 2 miles below the lake; and a third, of 18 feet, at the foot of the lake. The lake covers about 14 square miles, and is very valuable as a storage reservoir. Pleasant river, also a tributary of the Piscataquis, is a larger but probably more variable stream, though its reservoirs would be sufficient, if improved, to regulate its flow to a large extent. Its powers are not of great importance, at least such as are mentioned by Wells.

The next important tributary of the Penobscot is the Mattawamkeag river, which enters from the east at Mattawamkeag. It has its sources in Aroostook county, and flows south and west, draining about 1,533 square miles. It has a number of ponds connected with it, and is probably similar in character to the Piscataquis, though perhaps not so constant in flow. The fall of the stream is rapid, and within a few miles of the mouth, in the towns of Mattawamkeag and Winn, are a number of powers, the exact fall of which cannot be stated. Other sites exist on the upper part of the stream, but few details are at hand regarding them. In Island Falls plantation a fall of 20 feet is used by a few mills, but the power used on the stream is small. Some of its tributaries have rapid descents and good sites. Mattakeunk river falls 100 feet in 2½ miles, but the stream is very small; lower down, in Winn, there is a fall of 50 feet in 100 rods at Upper Mattakeunk falls, and 15 feet in 125 rods at Lower Mattakeunk falls. The Molunkus, Baskahegan, and other tributaries afford abundant power, but no details can be given.

The East branch of the Penobscot, or Mattagamon river, has a rapid fall, its source, lake Mattagamon, lying at an elevation of about 850 feet, or 660 feet above the Penobscot at the mouth of the Mattawamkeag, much the greater part of which descent occurs on the East branch. Few sites, however, are mentioned by Wells, the principal being in township No. 5, range 8, Penobscot county, where, at Bowlin falls, the fall is 8 feet, at Hulling

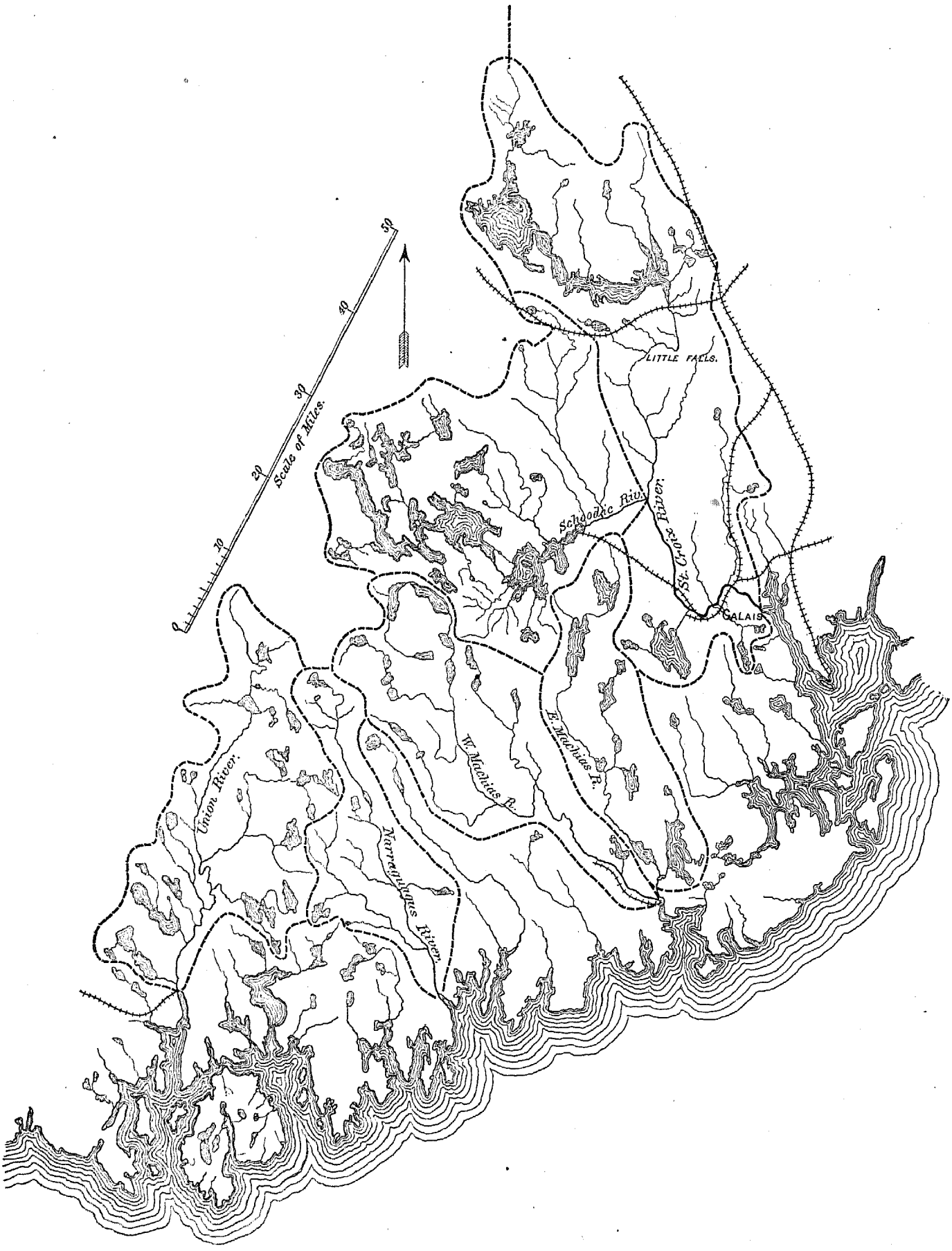

Fig. 22. MAP OF THE STREAMS OF EASTERN MAINE.

Machine falls 12 feet, and at Grand falls 20 feet. There are similar falls in township No. 6, range 8. The power of the stream is little used, but its storage facilities are good, and the flow could be regulated to a considerable extent.

The various small upper tributaries of the Penobscot have considerable power, but are little used. Were they easily accessible, and their reservoirs improved, their power would be valuable.

THE UNION RIVER AND OTHERS.

Between the Penobscot and the Saint Croix rivers are a number of smaller streams, which merit a short notice.

THE UNION RIVER.

This stream is comprised almost entirely within the limits of Hancock county, rising near its northern boundary and pursuing its course southward through a distance of about 45 miles, draining a total area of about 584 square miles above the head of tide-water, at Ellsworth Falls. Its valley is narrow and its tributaries short. The headwaters of the stream lie at elevations of from 225 to 250 feet above the sea, and the interior of the basin is a strongly-defined valley, of a rolling surface, encompassed on nearly all sides by rugged highlands. A large proportion of the basin is covered with forests, and the lakes are sufficient in number to render the flow quite constant, though not yet systematically improved. The extreme range of water at Ellsworth is 7 feet. The following table (from Wells) gives the principal reservoirs connected with the stream:

Name.	Approximate area.	Present storage (1869).	Additional storage feasible.
	Sq. miles.	*Feet.*	*Feet.*
Branch pond	3.75	10	10
Rocky pond, in Orland	0.35	10	10
Reed's pond	4.25	6	14
Beech Hill pond	1.85	6	14
Mountain pond	1.25	6	14
Hat Case pond	0.50	.....	.....
Molasses pond	2.25	10	2
Scammon pond	1	.....	.....
Abram's pond	0.80	10	.....
Webb's pond	1.75	10	.....
Spectacle pond	2.10	8	3
Rocky pond	0.40	10	5
Rocky pond, in No. 22	1.15	.....	.....
Two Lead Mountain ponds	2	6 and 8	3 and 4
Brandy pond	1.60	6	.....
Great pond	1.50	13	10
Long pond	1	8	5
Alligator pond	1.80	6	5
Morrison's pond	0.35	8	.....
Middle Branch pond, upper	1.25	6	5
Middle Branch pond, lower		5	5
Flood's pond	1	9	5
Springy pond	0.60	9	5
Hopkins' pond	1.75	No dam	5
George's pond	0.90	.....	.....
Twenty-six ponds	34.85	.....	.....

The total number of ponds above Ellsworth is 43, with a total area of 60 square miles, or 1 square mile to every 9.7 square miles of basin. The mean annual rainfall is about 48 inches, 12 in spring, 10 in summer, 14 in autumn, and 12 in winter, a distribution very favorable to constant flow. The slope of the stream may be seen from the fact that the lake in the northern part of the basin lies at an elevation of 205 feet, making the average fall of the river to tide-water about 4 feet per mile, or considerably smaller than that of the larger streams of Maine.

The first power on the stream is at Ellsworth Falls, at the head of tide and of navigation, the river being closed to navigation below this point during about four months of the year. The total fall is stated at 85 feet in about 2 miles, or 100 feet in $2\frac{1}{4}$ miles, and a part of the power is utilized by mills of various kinds, but principally saw-mills, the storage on the ponds above being used principally for log-driving purposes (Wells). The upper dam ponds the water for 12 or 15 miles, thus creating a reservoir large enough to allow of the concentration of power into working hours. No measurements of the power available are at hand, but I should judge the minimum power to be about 12 horse-power per foot fall continuously, or 24 during twelve hours, which would probably be practicable. This would, therefore, amount to 2,400 horse-power (gross) on the entire fall of 100 feet. The site is accessible by rail, and the facilities for development are said to be good. The power estimated could of course be largely increased, probably more than doubled, were the reservoirs systematically improved.

There are no important powers above this, though some sites are named by Wells on the upper branches of the river. Some of the tributaries afford good constant powers, though small.

There are in Hancock county a number of tidal powers, but no others of importance, the Union river being the only considerable stream in the county.

THE NARRAGUAGUS RIVER.

This is a small stream, draining about 260 square miles in Hancock and Washington counties, and flowing in a nearly southerly direction, its length being about 50 miles. It has a number of ponds connected with it, and its flow is not very variable, but none of its powers are very important. At the head of tide-water are the Cherryfield falls, where six privileges exist, with a total fall of 52 feet, affording an excellent power, with a reservoir above sufficient to allow of the concentration of the flow into working hours. At the Great falls, in Deblois, there is a second fall of about 50 feet in half a mile, and the power is said to be a fine one. The minimum power of the river, at its mouth, may be roughly estimated at about 5 horse-power per foot fall continuously.

The Pleasant river, Chandler's river, and Tunk river are small streams near the coast, almost all of which have several sites where the fall is considerable, but the power is small.

THE EAST AND WEST MACHIAS RIVERS.

The West Machias river, confined almost entirely within Washington county, drains an area of about 458 square miles, flowing in a southerly and easterly direction, its length being some 45 miles, measured in a straight line. Its fall is considerable, the elevation of its headwaters being some 400 feet, and its slope being about 5.8 feet per mile, according to Wells. Its flow is not very variable, being regulated to a considerable extent by a number of lakes and ponds, and a considerable portion of its drainage basin being wooded. The total area of lake surface in its basin is 32 square miles, or 1 square mile to 14 square miles of basin. Seventeen lakes have a total area of 30.55 square miles, and a number of them are dammed, though used principally for log-driving purposes. Being situated near the headwaters of the river, their drainage areas are small, and their importance less than would be expected from their size.

The river offers a number of good privileges. At the head of tide and of navigation, 6 miles from the mouth of the stream and 3 miles above where it joins the East Machias, there is a fall of 33 feet (?) to high tide, utilized to some extent. In the absence of gaugings, I should roughly estimate the minimum power as about 10 horse-power (gross) per foot fall continuously. It is stated as greater, but on what authority I do not know. The power is apparently a good one. At Middle falls, in Whitney, there is a fall of 10 feet; and at Great falls, 5 miles above, in Centreville, a fall of 20 feet, with excellent facilities for improvement. In Northfield there is a fall of 28 feet at Holmes' falls, and there are a number of smaller powers above, which need not be mentioned. Any one may estimate the power available by comparison with the data given on pages 8 to 10.

The East Machias river is a stream similar to that just described, but is more constant in its flow. It is entirely confined to Washington county, and pursues a course nearly south, draining about 345 square miles, and with 38 square miles of lake and pond surface, or one-ninth of the area of the basin. The lakes are not all situated near the headwaters of the stream, but are more equally distributed over the basin, thus rendering the flow of the stream quite uniform, though the lakes are said to be used principally for log-driving.

The principal power on the stream is at the head of tide, where the fall is 47 feet in 3 miles, and is used in four privileges. The minimum power is probably not far from that on the West Machias, or, say, 10 horse-power per foot fall continuously, and very much more if the reservoirs were fully improved, as, in fact, they may have been since Wells' report was made. The site is no doubt a good one, though the power cannot be stated more accurately. Other powers exist above, as the fall of the stream is nearly as great as that of the West Machias, but little of the power available is utilized, and no details need be given.

A few other streams exist west of the Saint Croix, viz, the Dennys, Pemaquan, and others, but they are so small as to merit no particular description. Being regulated by a number of lakes, their flow is quite uniform, and their fall being tolerably rapid, they offer some excellent small powers, many of which are to some extent improved. None of them, however, require further notice here.

THE SAINT CROIX RIVER IN MAINE.

The Saint Croix river, the last of the proper coast streams of Maine, is formed by the union of two branches, "the Northern or Eastern, called the Upper Saint Croix or Chiputneticook river, the outlet of the Chiputneticook lakes; and the Western, called the Kennebasis river, which discharges the Kennebasis lakes". The course of the stream is southeast, and its length, from the junction of the two branches to tide, is about 20 miles. The Chiputneticook, and the main stream below it, form the boundary between the state of Maine on the west and the province of New Brunswick on the east. Of that part of the basin lying in Maine, almost the whole is comprised in Washington county, and only this part of the basin is here to be considered. From tide-water at Calais to the head of North lake, the source of the Chiputneticook, the distance is about 97 miles, by the course of the river, while the Kennebasis river is about 42 miles long from its extreme headwaters to the Chiputneticook, and 62 miles to tide. The drainage basin is undulating and hilly, but not mountainous, and a large proportion is still covered with

forests. It comprises a total area of about 1,674 square miles above the head of tide at Calais, of which about 1,100 are in Maine and the rest in New Brunswick, the Chiputneticook draining about 634 square miles, and the Kennebasis about 766 square miles. The basin, as a whole, is less elevated than that of any large stream of Maine which we have yet considered, but the slope of the stream is, nevertheless, quite large, as is shown by the following table:

Declivity of the Saint Croix river.

Place.		Distance from Calais.	Elevation above tide.	Distance between points.	Fall between points.	Fall per mile between points.
		Miles.	*Feet.*	*Miles.*	*Feet.*	*Feet.*
Head of tide at Calais		0	0	20	166	8.3
Junction of two branches		20	166	35	217	6.2
Foot of Chiputneticook (Schoodic) lake	East branch.	55	383	20	.....	.....
Head of Chiputneticook (Schoodic) lake	East branch.	75	383	21	61	2.9
North lake, head of stream	East branch.	96	444			
Junction of two branches		20	166	9	20	2.2
Just below Big lake	West branch.	29	186	11	3	0.3
Head of Big lake	West branch.	40	189	3	82	27.3
Grand lake, foot	West branch.	43	271	12	.....	.....
Grand lake, head	West branch.	55	271			

The average slope of the East branch is about 3.7 feet per mile, and of the West branch, below Grand lake, about 4.6 feet per mile. From Chiputneticook lake to tide the fall averages 7 feet per mile, and from Grand lake to tide 6.3 feet per mile.

The flow of the stream is naturally very constant, and, on account of the extensive forests and the large area of lake surface, might be made more uniform, it is said, than that of any other large river in the state, excepting the Presumpscot and the Fish rivers. The total number of lakes in the basin is 61, covering a total area of 150 square miles, or 1 square mile to every 11 square miles of basin. The following table gives the principal of these reservoirs:

Principal reservoirs of the Saint Croix river.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Lewey's lake	Kennebasis branch	0.85	Slight	8
Long lake	do	1.25	do	6
Big lake	do	*a*14	do	10
Grand lake	do	17	8	(*a*)
Pocumpus lake	do	2.50	*b*6	.....
Machias lake	do	2	3	.....
Sysledobsis lake	do	7	8	.....
Sysledobsissis lake	do	4	3	.....
Horseshoe lake	do	0.75	5	.....
Oxbrook lake	do	1	3	.....
Shaw lake	do	1.75	.....	.....
Junior lake	do	6	.....	.....
Mill-privilege lake	do	0.75	6	.....
Scraggly lake	do	3	.....	.....
Pleasant lake	do	2	4	6
Duck lake	do	0.75	4	4
Chain (two lakes)	do	1.50	4	.....
Little River lake	do	0.80	3	.....
West Musquash lake	do	3	4	.....
Musquash lake	do	1.25	7	.....
Farrer's lake	do	0.75	4	.....
Tomah (three lakes)	do	2	Dam	.....
Clifford (four lakes)	do	2	5	.....
Twenty-two lakes		75.00	.....	.....
Chiputneticook lower lake	Chiputneticook branch	27	15	.....
Chiputneticook Grand lake	do	25	6	.....
North lake	do	3.50	3	.....
Lambert's lake	do	2	4	.....
Enoch's lake	do	0.75	Slight	.....
Five lakes		58.25	.....	.....

a Several feet. *b* By Grand Lake dam.

Besides those named, there are others in New Brunswick. Were these reservoirs all improved to their full capacity the flow of the river would be very constant; as it is, the greatest range of water is stated at only about 8 feet, and the freshets are comparatively harmless. Artificial reservoirs are also said to be particularly feasible, there being considerable areas of low ground along the river capable of being flowed, and, in fact, subject to overflow during high freshets. The storage on the lake was, at the time of Wells' report, only used for log-driving purposes. The rainfall over the basin is about 10 inches in spring, summer, and winter, and 14 in autumn, or 44 inches annually, on the average.

The stream is accessible by rail, without much difficulty, up to the junction of the two branches; above that it is more difficult of access, the East branch especially.

The first power met with is at the head of tide, at Calais, the rise and fall of the tide being about 8 feet. The first fall, known as "Salt Water falls", amounts to 10 feet, but the power is not valuable, on account of interruption at high tide, and is little utilized. At Union falls, about half a mile above, a dam extends across the river, and the power is partially utilized. The fall is not stated. At Salmon falls, a mile still farther up, some power is also used; and at Milltown there is also power in use, there being two dams. The total fall in Calais is said to amount to 72 feet, and the facilities for its complete utilization to be excellent. The minimum power cannot be given very accurately, but is probably not less than about 40 or 50 horse-power (gross) per foot fall continuously, or about double that amount during working hours. If we call it 45 horse-power continuously, the total power is over 3,000 horse-power continuously, or nearly 7,000 horse-power during working hours. This could be still further increased, and by a considerable amount, were the lakes better improved.

The next power is at Baring mills, 3 miles above Milltown. A dam crosses the river, giving a fall of 10 feet, and the power is partially utilized. The width of the river is about 500 feet from this place to tide, and for 4 or 5 miles above.

Five miles above the Baring mills we come to Sprague's falls, where the fall is 25 feet, affording one of the best powers on the stream. The minimum power continuously is probably not less than 40 horse-power (gross) per foot fall, or 1,000 horse-power on a fall of 25 feet, or about double this amount during working hours. Were the reservoirs improved to their full capacity the available power here and below would probably be increased to 125 horse-power per foot fall continuously, and during ordinary years it probably does not fall below 60 horse-power per foot fall, or 1,500 horse-power on a fall of 25 feet continuously.

At Enoch's rips, half a mile above Sprague's falls, the fall is 9 feet, and the quantity of water about the same as at the latter privilege.

The last fall below the junction of the two branches of the river is Grand falls, 6 miles above Enoch's rips, and just below the junction. The falls consist of two pitches, about half a mile apart, each pitch having a descent of about 18 feet. The privilege is one of the finest on the river. The drainage area measures about 1,400 square miles, and the minimum power is probably in the neighborhood of 40 horse-power (gross) per foot fall continuously, or 1,440 horse-power on a fall of 36 feet. With complete utilization of the reservoirs, so as to render available the maximum with storage, the power could be probably increased to from 110 to 120 horse power per foot continuously. The extent to which the power on this stream may be improved, by the improvement of its reservoir facilities, renders it remarkable among the rivers of the state.

The West branch, or Kennebasis river, also known as the Schoodic river, drains an area of about 766 square miles, and includes a large extent of lake surface. Its flow is therefore very uniform, and its powers are excellent. Between its mouth and Big lake, a distance of about 10 miles, the fall is about 20 feet, including several rapids and one improved privilege, with a fall of 8 feet. The storage on the lakes is used only for log-driving, but if used for regulating would improve the powers very much. The principal fall on the stream occurs between Big lake and Grand lake, amounting to 82 feet in a distance of about 3 miles. At the head of the fall a dam was built in 1867 by the Saint Croix Log-Driving Company, to hold a depth of about 8 feet on Grand lake. The privilege is said to be a most excellent one, and the power would be unfailing on account of the large storage above. There are other good powers in the neighborhood, mostly unimproved; thus the East and West Musquash streams, outlets of lakes of the same names, fall 100 and 60 feet respectively in their course to Big lake, the outlet of Wawbawsoos or Machias lake falls 40 feet in a short distance, and the outlet of Upper Chain lake falls 30 feet to lake Sysledobsis. All of these powers are comparatively constant.

The Chiputneticook, or East branch of the Saint Croix, has likewise a number of good privileges, of which Wells names the following: Grand Chiputneticook falls, 2 miles above mouth, 21 feet fall in three-quarters of a mile; Canoose rips, 10 miles above mouth, 11 feet fall in half a mile; Haycock rips, 13¼ miles from mouth, 6 feet fall in half a mile; Meeting-House rips, 15 miles from mouth, 8 feet fall in a mile; Rocky rips, 3 miles long, the foot being 16 miles above mouth, 25 feet fall; Mile rips, 1 mile long, the foot 30 miles from mouth, 23 feet fall; Kill-me-quick rips, 34 miles from mouth, 10 feet fall in half a mile. These are all below Chiputneticook lake, at the outlet of which the Saint Croix Log-Driving Company has erected a dam holding a storage of 15 feet on the lake. Between the latter and Grand lake, in a distance of about 3 miles, there is a fall of about 60 feet, the upper lake being also controlled by a dam. This power is said to be a good one.

It is evident that the Saint Croix, like all the other streams of Maine yet described, offers a number of good sites, and the table of utilized power shows that the amount of power at present in use is small.

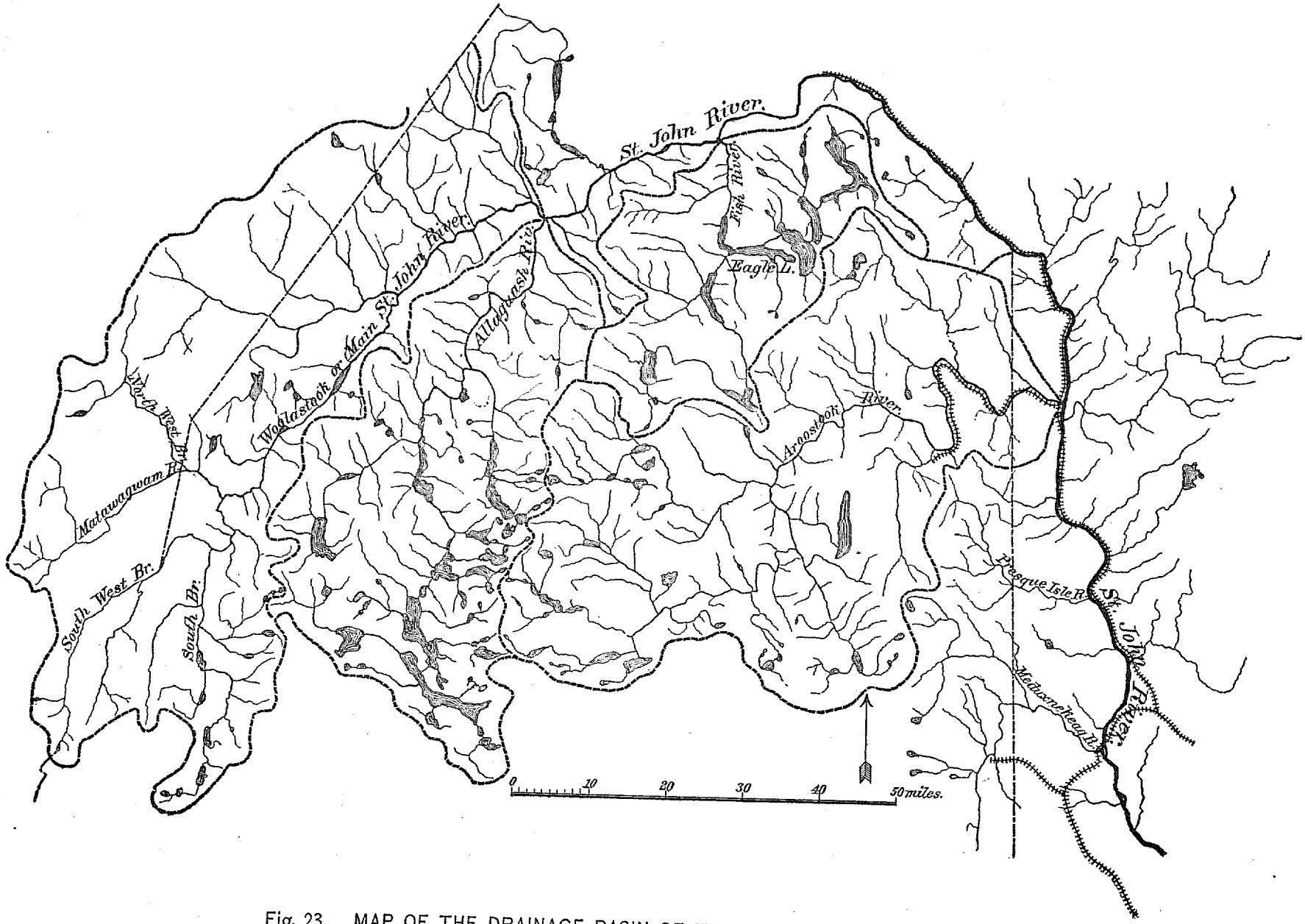

Fig. 23. MAP OF THE DRAINAGE BASIN OF THE ST. JOHN RIVER IN MAINE.

THE SAINT JOHN RIVER IN MAINE.

This stream, the last to be considered in this report, drains the northern slope of the state of Maine, comprising all the area included between its northern, eastern, and western boundaries, and the drainage basins of the streams which have been described in the previous pages. The course of the river is circuitous. The main stream is formed almost on the northern boundary of Somerset county by the union of several branches, the Northwest branch rising in Canada and flowing southeast; the Southwest branch flowing in a northeasterly direction and forming for almost its entire length the western boundary of the state; and the South branch, rising in Somerset county and flowing north. From the junction of these branches the stream, known in the upper part of its course as the Woolastook, flows first northeast to the northern boundary of the state, then east and southeast, passing into New Brunswick and bending toward the south, only to bend once more and flow nearly eastward to the sea. According to Wells, "the total length of the Saint John, in Maine, is estimated as not far from 211 miles, including the more important meanderings", while "its total length, from its remotest sources to the sea, is about 450 miles". According to the same authority, "the area of the whole Saint John basin is 26,000 square miles", while that part in Maine measures 7,400 square miles. My own measurement of the Maine basin gave its area as about 8,000 square miles. As no map of Canada was at hand, I have not been able to measure the total drainage basin of the stream above certain points, but on account of the small amount of power on the river this is not important. Next to the basin of the Androscoggin, that of the Saint John is the most elevated in Maine, but its height, as Wells remarks, is due to a considerable altitude over its whole extent, rather than to an extreme elevation in any part. "It is, therefore, indicative and productive of less fall and power on the streams than are found upon equal areas of the southern slope." "The elevation of the river above tide at the eastern boundary of the state is 419 feet, and at the mouth of the Saint Francis, 606 feet. The distance being about 70 miles, the mean slope is at the rate of 2.7 feet per mile." At the junction of the three branches the elevation of the stream is probably about 750 feet; the mean slope from this point to the eastern state boundary is, therefore, about 2.1 feet per mile, and to the mouth of the Saint Francis, 88 miles according to Wells, about 1.6 feet per mile. The slope is therefore much less than that of any stream of large size in Maine, and the river is of comparatively little value as a source of power. Wells states that it is navigable for its whole length in Maine.

The drainage basin of the stream in Maine is almost entirely covered by unbroken forests, and is topographically very uniform in character. "In the eastern or lower portion, bordering the river, the face of the country is very nearly level, and at a distance from it gradually becomes undulating and moderately hilly, until it subsides into and is merged in the flat country bordering the Aroostook river. Highlands of low elevation diversify its aspect in the mid-district about the mouth of the Saint Francis and Allaguash rivers. Beyond the confluence of these streams the valley of the upper Saint John is quite level nearly to the boundary highlands on the west and southwest. Accordingly, large portions of it are swampy, the pitch of the water-sheds not being sufficient to throw off the surplus water into the drainage channels." "Rock is less exposed than on the southern slope, and building stone less easily procurable."

In regard to the flow of the stream, although no measurements, or even observations, have been made, it would seem to follow, from the immense forests, the uniform topography, and the numerous lakes, that the minimum flow must be large; while, on the other hand, the rise in freshets, on account of the small slope of the stream, may be also quite large. The following table, from Wells, gives the lakes in the basin:

Principal reservoirs of the Saint John river in Maine.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.	Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*			*Sq. miles.*	*Feet.*	*Feet.*
Chapman Plantation lake	Aroostook river	1			Three ponds above Mansungun lake	Aroostook river	1.50		
Squawpan lake	do	10		5	Pond north of Mansungun lake	do	1.10		
Saint Croix Lake, in No. 8, R. 4	do	2.50	4		Goddard's pond	do	0.90		
Two ponds in No. 8, R. 3	do	1.50			Mooseleuk lake, in No. 9, R. 8	do	3		
Tracy pond, No. 7, R. 4	do	1.30			Big Machias lake	do	2	Dam, 12.	
Umcolcus pond	do	3			Pond south of Big Machias lake	do	1		
Pond in No. 7, R. 6	do	1.25			Lake in No. 11, R. 8	do	3		
Sapompeag ponds (two)	do	2.50			Lake in No. 11, R. 9	do	1.10		
Millinokett lake	do	5		12	Nashville Plantation pond	do	1		
Little Millinokett lake	do	3.50			Salmon Brook lake	do	1		
No. 7 pond, above Millinokett	do	1			Madawska lake	do	4		
Pond in No. 7, R. 10	do	1.10							
Pond in Nos. 7 and 8, R. 10	do	1.20			Thirty ponds		59.95		
Mansungun lake	do	5							
Pond below Mansungun lake	do	1							

Principal reservoirs of the Saint John river in Maine—Continued.

Name.	Connected with—	Approximate area.	Storage (1869).	Additional storage feasible.
		Sq. miles.	*Feet.*	*Feet.*
Keeobscus pond, upper	Allaguash river	1		
Keeobscus pond, lower	do	1.15		
Pataquongomis lake	do	2.75		
The Five lakes	do	11		
The Long lakes	do	10		
Lake in No. 10, R. 13	do	3		Many.
Chemquasabamtic lake	do	8		
Heron or Harrow lake, in No. 10	do	2.75		
Churchill lake	do	8		(a)
Heron lake, in No. 8	do	4		(b)
Pomgocwahem lake	do	11		(b)
Indian lake	do	3	Dam, 6	
Spider lake	do	4	Dam, 5	
Pleasant lake	do	4		
Super flowage and pond	do	2	Dam, 10	
Smith brook flowage	do	3	Dam, 12	
Pomgocquamoc lake	do	3	Dam	(c)
Pillsbury pond	do	1.50	Dam, 8	(c)
Mad pond, in No. 9, R. 12	do	1.50	Dam, 8	
Russell stream (three ponds)	do	2.25		
Four ponds above Spider lake	do	3		
Twenty-eight ponds		84.90		
Meduxnakeag lake	Meduxnakeag river	3.75	Dam	4
New Limerick (three ponds)	do	1.50	Dams	
Caldwell lake	do	1		
Spalding's lake	do	2.25		
No. 9 lake	do	1		
B. lake	do	1		
Eight lakes		10.50		
Cleaveland, or Long lake	Fish river	19		
Second, or Bear lake	do	2		
Cross, or Preble lake	do	6		
Square, or Sedgwick lake	do	15		
Eagle, or Winthrop lake	do	22		
Saint Froid, or Long lake	do	5.50		
Portage lake	do	8.50		
Fish River lake	do	7		
Ponds northwest of Spruce lake	do	1		
The Long ponds in No. 17, R. 6	do	1.25		
Five ponds above Fish River lake	do	2.75		
Fifteen lakes		89.00		
Three ponds in No. 15, R. 7	Saint John river	1.50		
Glazier's lake	do	3	6	(c)
Beau lake	do	5	4	(c)
Pohenagamook lake	do	4.50		(c)
Cascade Brook lake	do	2.75		
Cascade Brook upper lake	do	1		
Chimenticook lake	do	4.50		
Depot lake	do	3.50		
Ishaeganalshegeck lake	do	1.75		
Baker lake	do	4	Dam	
Francis lake	do	0.90		
Lake north of Francis lake	do	1		
Turner brook lake	do	1.10		
Woboostook lake	do	2.50		
Upper Woboostook lake	do	1		
Two lakes in No. 4, R. 17	do	2.25		
Nineteen lakes		36.65		

a Formerly a 21-foot dam. *b* Formerly several feet. *c* Several feet.

The foregoing one hundred principal lakes and ponds cover 278 square miles. The total number of lakes in the basin is 206, covering 350 square miles. It has already been remarked that some 36 square miles of lake surface naturally belonging to the Saint John have, by artificial means, been made tributary to the Penobscot. It is, however, probable that a number of small lakes and ponds in the wild parts of the basin are not represented on any map, so that the area of lake surface is, perhaps, even greater than stated above.

The rainfall over the basin of the Saint John in Maine averages about 38 inches, 10 in every season except spring, when the fall is only about 8 inches.

The greater part of the valley of the Saint John is exceedingly inaccessible, lying far removed from roads or railroads. The main river is followed quite closely by a railroad from Fredericton, New Brunswick, up to Edmunston, on the northern boundary of Maine, but with this exception no railroad penetrates the basin. The water-powers are therefore little known and will be long undeveloped, and a bare mention of the more important ones will be quite sufficient for the purposes of this report.

The census returns show but one mill in Maine on the river; there are, however, a few falls which may be named: Fish River rapids, about a mile below the mouth of the Fish river, is said to be a good site, a fall of 16 feet being available, and the bed and banks favorable for utilization. No other site is mentioned below the mouth of the Saint Francis, but above that point several are named. There are said to be two in township No. 13, range 14; one in No. 14, range 14; two in No. 12, range 15; one in No. 13, range 15; several in No. 11, range 16; and three in No. 12, range 16. These powers are unimproved, inaccessible, little known, and of small value at the present time.

TRIBUTARIES OF THE SAINT JOHN RIVER.—Of the tributaries of the Saint John, the first which offers any power in Maine is the *Meduxnekeag river*, which drains about 427 square miles in Maine, and affords a number of sites, improved only to a small extent.

The *Presque Isle river* drains 209 square miles in Maine, and also affords some powers, partially improved.

The principal tributary of the Saint John in Maine is the *Aroostook river*, which drains about 2,550 square miles in all, and about 2,500 in Maine. Rising at an elevation of about 1,050 feet, the stream falls, in its course of about 117 miles, to an elevation of 345 feet at the state line, making an average fall of about 6 feet per mile, or much greater than that of the Saint John. The stream affords a number of powers, of which Wells mentions several,

but none of great importance. The census returns show no power utilized on the stream. Its tributaries likewise afford many powers, mostly unutilized. In accordance with the general character of the country, none of the falls are extensive or precipitous, but are generally rapids, extending over some distance.

The *Fish river*, the outlet of an extensive chain of lakes, affords at Fish River mills, 1 mile above its mouth, a fall of 18 feet. The extensive reservoirs above make this stream one of the best in the whole drainage basin, and its power could be much improved. There are other powers on the river, notably two in Wallagras plantation, one with a fall of 20 feet, and the other at the outlet of Eagle lake, a little above, where a dam could be built, raising the lake.

The *Allaguash river* is the second largest tributary of the Saint John in Maine, draining about 1,650 square miles. Rising in the northern part of Piscataquis county, in Chamberlain lake, it flows nearly northward for a distance of about 60 miles, measured in a straight line, falling 308 feet, or, according to Wells, a little over 3 feet per mile. A number of powers occur about its headwaters, possessing at least the merit of constancy. Chamberlain lake is dammed to a height of 12 feet, forming a considerable reservoir, while above the lake, in township No. 8, range 13, are several precipitous falls, one of 15 feet and others smaller, the stream, however, being small. In township No. 10, range 12, there is a series of rapids on the main stream, with a total fall of 45 feet in a mile or less. No other falls are mentioned in the remainder of the course of the stream, or for 45 miles in a straight line. The census returns show no power used on the river.

The *Saint Francis river*, which enters the Saint John from the north, and forms the remainder of the northern boundary of the state of Maine, is said to afford a good power at its mouth, with an available fall of 30 feet.

The *Woonastook*, by which name the Saint John is known above its confluence with the Saint Francis, is a stream similar to the Allaguash, and its powers have already been noticed. On many of its tributaries are found rapids, but no powers of much value, for the present at least.

It is evident, from what has preceded, that the power in the basin of the Saint John is smaller in amount and less in value than that in any other large drainage basin of the state. Not only are the streams comparatively sluggish and the ledges of rock little exposed, but the inaccessibility of the district alone is sufficient to render almost valueless any powers which may exist. The day may come when these streams may be developed as sources of power, and a large amount of power could be obtained from them, and power which would be reliable throughout the year, but many years must elapse before any industries, except the lumbering, seek this region.

In regard to the state of Maine as a whole, one cannot fail to realize that the resources of the state are remarkable as regards both the amount and the constancy of its power. As its industries develop, its water-power must receive increased attention.

Summary of drainage areas of the rivers of Maine.

Stream.	Tributary to what.	Above what place.	Drainage area.	Stream.	Tributary to what.	Above what place.	Drainage area.
			Sq. m.				*Sq. m.*
Mousam river	Atlantic ocean	Mouth	157	Androscoggin river	Atlantic ocean	Rumford Falls	2,223
Do	do	Kennebunk	150	Do	do	Gorham	1,529
Saco river	do	Mouth	1,753	Do	do	Berlin falls	1,477
Do	do	Saco and Biddeford	1,734	Little Androscoggin river	Androscoggin river.	Mouth	381
Do	do	Union Falls	1,677	Do	do	Mechanics' Falls	270
Do	do	Salmon Falls	1,628	Twenty-Mile river	do	Mouth	189
Do	do	Bonny Eagle Falls	1,578	Sabattus river	do	do	100±
Do	do	Highland rips	1,366	Dead river	do	do	138±
Do	do	Great Falls	856	Webb's river	do	do	169
Do	do	Fryeburg	439	Swift river	do	do	.....
Little Ossipee river	Saco river	Mouth	158	Ellis river	do	do	175
Great Ossipee river	do	do	470	Wild river	do	do	66
Do	do	Kezar Falls	430	Outlet of chain of lakes	do	do	760
Do	do	Effingham falls	340	Magalloway river	do	do	416
Bear Camp river	Great Ossipee river	Mouth	157	Kennebec river	Atlantic ocean	do	6,404
Upper Kezar river	Saco river	do	129	Do	do	Augusta	5,907
East branch of	do	do	39	Do	do	Waterville (without Sebasticook).	4,475
Presumpscot river	Atlantic ocean	do	726a	Do	do	Kendall's Mills	4,467
Do	do	Saccarappa	646	Do	do	Somerset Mills	4,459
Do	do	Outlet of lake	498	Do	do	Skowhegan	4,176
Yarmouth river	do	Mouth	164	Do	do	Norridgewock	4,137
Androscoggin river	do	Brunswick	3,698	Do	do	Madison	3,439
Do	do	Lisbon	3,659	Do	do	Caratunk falls	2,970
Do	do	Lewiston	3,120	Do	do	Moxie rips	1,453
Do	do	Turner Centre falls	3,070	Do	do	Outlet of Moosehead lake.	1,296
Do	do	Turner	2,856	Cobbosseecontee river	Kennebec river	Mouth	292
Do	do	Livermore Falls	2,689	Emerson stream	do	do	a185
Do	do	Jay falls	2,664				
Do	do	Capen's rips	2,635				

a Wells.

Summary of drainage areas of the rivers of Maine—Continued.

Stream.	Tributary to what.	Above what place.	Drainage area.
			Sq. m.
Sandy river	Kennebec river	Mouth	666
Do	do	Dickerson's rips	603
Do	do	North Sharon	577
Do	do	Farmington Falls	482
Carrabasset river	do	Mouth	366
Dead river	do	do	1,021
Wesserunsett river	do	do	167
Sebasticook river	do	do	1,088
Do	do	Lower falls	906
Do	do	Hunter's Mills	887
(No name)	Sebasticook river	Mouth	186
Do	do	do	376
Sheepscot river	Atlantic ocean	do	248
Damariscotta river	do	do	46
Medomac river	do	do	118
Saint George river	do	do	228
Penobscot river	do	do	8,785
Do	do	Bangor	7,898
Do	do	Orono	7,840
Do	do	Oldtown	7,329
Do	do	Mouth of Passadumkeag	7,166
Do	do	Mouth of Piscataquis	5,202
Do	do	Island rips	4,962
Do	do	Grand Falls	3,375
Do	do	Rippogenus falls	1,512
Do	do	Pine Stream rips	835
Marsh river	Penobscot river	Mouth	150
Sowadabscook river	do	do	166
Kenduskeag river	do	do	229
Pushaw river	do	do	231
Passadumkeag river	do	do	402
Piscataquis river	do	do	1,541
Do	do	Maxfield	1,359
Do	do	Medford	1,251
Do	do	Mouth of Pleasant river	792
Do	do	Dover village	387
Seboois river	Piscataquis river	Mouth	175
Outlet of Schoodic lake	do	do	58
Pleasant river	do	do	434
Sebec river	do	do	208
Do	do	do	270
Mattawamkeag river	Penobscot river	do	1,533
Do	do	Slugunda falls	1,446
Molunkus river	Mattawamkeag river	Mouth	273
Baskahegan river	do	do	214
North branch of	do	do	183
South branch of	Mattawamkeag river	Mouth	328
Salmon river	Penobscot river	do	116
East branch of	do	do	922
Outlet of Seboois lakes	East branch Penobscot river	do	304
Millinoket river	Penobscot river	do	171
Cancomgomock river	do	do	234
Middle branch of	do	do	244
South branch of	do	do	206
Union river	Atlantic ocean	do	584
North branch of	Union river	do	214
South branch of	do	do	145
Narraguagus river	Atlantic ocean	do	260
Pleasant river	do	do	196
West Machias river	do	do	458
Do	do	Whitney	436
Do	do	Centreville	419
Do	do	Northfield	402
East Machias river	do	Mouth	345
Denny's river	do	do	158
Saint Croix river	do	Calais (Union falls)	1,074
Do	do	Baring	1,511
Do	do	Sprague's Falls	1,496
Do	do	Junction of two branches	1,400
Chiputneticook river	Saint Croix river	do	634
Do	do	Rocky rips	518
Do	do	Vanceborough	437
Saint Croix river	Atlantic ocean	In Maine, above Calais	1,102
Do	do	In New Brunswick, above Calais	572
Schoodic or Kennebasis river	Saint Croix river	Mouth	766
Do	do	Mouth of Long lake	583
Saint John river	Atlantic ocean	In Maine	7,998
Meduxnekeag river	Saint John river	Mouth	562
Do	do	In Maine	427
Presque Isle river	do	do	209
Aroostook river	do	Mouth	2,556
Do	do	In Maine	2,498
Do	do	Mesardis	926
Little Madawaska river	Aroostook river	Mouth	232
Great Machias river	do	do	378
Fish river	Saint John river	do	938
Do	do	Fish River mills	910
Do	do	Outlet of Eagle lake	815
Allaguash river	do	Mouth	1,648
Woonastook river	do	Total above mouth of Little Black river.	2,741

Table of power utilized on the coast streams of Maine.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horsepower used, net.
						Feet.	
Mousam river	Atlantic ocean	Maine	York	Woolen	2	24	210
Do	do	do	do	Cotton	2	28	225
Do	do	do	do	Boots and shoes	1	17	30
Do	do	do	do	Boot and shoe findings	1	24	200
Do	do	do	do	Sash, door, and blind	1	10	52
Do	do	do	do	Flour and grist	3	32	90
Do	do	do	do	Saw	5	53	196
Tributaries of the	Mousam river	do	do	Flour and grist	2	41	100
Do	do	do	do	Saw	5	21	285
Kennebunk river	Atlantic ocean	do	do	do	8	32	104

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Saco river	Atlantic ocean	Maine	York	Cotton	3	64	4,000
Do	do	do	do	Woolen	1	10	50
Do	do	do	do	Foundery	1	6	12
Do	do	do	do	Flour and grist	3	30	150
Do	do	do	do	Saw	11	145	750
Do	do	do	do	Cotton and woolen machinery	1	16	100
Do	do	do	Cumberland	Flour and grist	1	12	50
Do	do	do	do	Saw	2	24	145
Do	do	do	Oxford	do	1	9	50
Do	do	do	do	Wheelwrighting	1	11	6
Little Ossipee river	Saco river	do	York	Foundery	1	10	30
Do	do	do	do	Leather-board	1	18	100
Do	do	do	do	Flour and grist	2	18	88
Do	do	do	do	Saw	5	49	200
Do	do	do	do	Woolen	1	12	120
Great Ossipee river	do	do	do	Flour and grist	1	8	45
Do	do	do	do	Saw	3	34	80
Do	do	New Hampshire	Carroll	Blacksmithing	1	11	12
Do	do	do	do	Woolen	1	9	30
Do	do	do	do	Flour and grist	1	7	40
Do	do	do	do	Saw	4	35	120
Other tributaries	Atlantic ocean	Maine	York	Furniture	1	16	30
Do	do	do	do	Tannery	1	14	14
Do	do	do	do	Wheelwrighting	2	22	17
Do	do	do	do	Carriages and wagons	1	10	5
Do	do	do	do	Flour and grist	5	73	104
Do	do	do	do	Saw	23	261	599
Do	do	do	do	Woolen	2	.....	78
Tributaries of the	Saco river	New Hampshire	Carroll	Woolen	4	.....	48
Do	do	do	do	Boxes	1	10	8
Do	do	do	do	Carriages and wagons	1	7	20
Do	do	do	do	Excelsior	2	21	55
Do	do	do	do	Furniture	2	37	48
Do	do	do	do	Planing	2	64	40
Do	do	do	do	Tannery	1	8	25
Do	do	do	do	Flour and grist	4	61	145
Do	do	do	do	Saw	24	368	806
Do	do	do	do	Paper	1	11	30
Do	do	do	do	Sash, door, and blind	1	11	12
Do	do	do	do	Spool and bobbin	3	38	79
Do	do	do	do	Wheelwrighting	2	29	85
Presumpscot river	Atlantic ocean	Maine	Cumberland	Silk	1	18	30
Do	do	do	do	Cotton	4	55	(?)1,000
Do	do	do	do	Flour and grist	1	16	50
Do	do	do	do	Saw	4	57	200
Do	do	do	do	Leather-board	1	16	50
Do	do	do	do	Wood-pulp	2	26	1,500
Do	do	do	do	Machinery	2	32	100
Do	do	do	do	Gunpowder	1	18	500
Do	do	do	do	Paper	1	20	2,000
Androscoggin river	do	do	do	Flour and grist	1	15	30
Do	do	do	do	Saw	2	28	375
Do	do	do	do	Wood-pulp	1	14	150
Do	do	do	do	Machinery	1	15	4
Do	do	do	do	Cotton	1	16	800
Do	do	do	Sagadahoc	Paper	1	15	750
Do	do	do	do	Saw	1	14	40
Do	do	do	do	Flour and grist	1	14	60
Do	do	do	do	Sash, door, and blind	1	14	.....
Do	do	do	Androscoggin	Wood-turning	2	27	150
Do	do	do	do	Leather-board	1	16	166
Do	do	do	do	Pulp	1	12	350
Do	do	do	do	Cotton and woolen machinery	1	.....	2
Do	do	do	do	Shirts	2	.....	10
Do	do	do	do	Bobbins and spools	1	.....	12
Do	do	do	do	Lasts	1	.....	10

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Androscoggin river	Atlantic ocean	Maine	Androscoggin	Printing and publishing	2	.....	8
Do	....do	....do	....do	Belting, etc	2	.....	100
Do	....do	....do	....do	City water-works	1	25	.....
Do	....do	....do	....do	Planing	2	.....	80
Do	....do	....do	....do	Flour and grist	4	.....	225
Do	....do	....do	....do	Saw	2	24	145
Do	....do	....do	....do	Woolen	4	61	727
Do	....do	....do	....do	Cotton	6	175	7,800
Do	....do	....do	....do	Bleachery	1	35	387
Do	....do	....do	Oxford	Coffins, etc	1	11	13
Do	....do	....do	....do	Flour and grist	1	15	15
Do	....do	....do	....do	Saw	1	15	15
Do	....do	....do	....do	Wheelwrighting	1	12	12
Do	....do	New Hampshire	Coos	Saw	2	24	710
Do	....do	....do	....do	Wood-pulp	1	24	230
Sabattus river	Androscoggin river	Maine	Androscoggin	Excelsior	1	14	18
Do	....do	....do	....do	Flour and grist	2	27	95
Do	....do	....do	....do	Woolen	4	59	226
Do	....do	....do	....do	Saw	3	39	135
Do	....do	....do	....do	Cotton	1	80	300
Little Androscoggin river	....do	....do	....do	Wooden boxes	1	14	40
Do	....do	....do	....do	Paper	1	34	.....
Do	....do	....do	....do	Flour and grist	2	36	90
Do	....do	....do	....do	Saw	2	23	130
Do	....do	....do	....do	Cotton	1	35	400
Do	....do	....do	Oxford	Woolen	1	9	40
Do	....do	....do	....do	Wooden-ware	1	8	25
Do	....do	....do	....do	Paper-box board	1	24	175
Do	....do	....do	....do	Saw	2	18	60
Twenty-Mile river	....do	....do	Androscoggin	Wheelwrighting	1	9	20
Do	....do	....do	....do	Flour and grist	2	26	80
Do	....do	....do	....do	Saw	3	33	78
Do	....do	....do	....do	Woolen	1	9	33
Do	....do	....do	Oxford	Saw	1	9	35
Webb's river	....do	....do	....do	Wood-turning	1	14	45
Do	....do	....do	....do	Brick and tile	1	.....	2
Do	....do	....do	....do	Flour and grist	1	16	40
Do	....do	....do	Franklin	....do	1	9	17
Do	....do	....do	....do	Saw	2	24	125
Do	....do	....do	....do	Wooden boxes	1	9	25
Swift river	....do	....do	Oxford	Saw	1	16	60
Ellis river	....do	....do	....do	Starch	2	21	38
Do	....do	....do	....do	Flour and grist	1	12	18
Do	....do	....do	....do	Saw	1	12	15
Other tributaries of the	Coast streams of Maine	....do	Cumberland	Flour and grist	18	217	755
Do	....do	....do	....do	Saw	51	689	1,579
Do	....do	....do	....do	Boots and shoes	1	.....	23
Do	....do	....do	....do	Wooden-ware	1	12	45
Do	....do	....do	....do	Washing machines and clothes wringers.	1	12	12
Do	....do	....do	....do	Stone and earthen ware	1	6	8
Do	....do	....do	....do	Wood-pulp	1	19	80
Do	....do	....do	....do	Carriage and wagon material	1	16	30
Do	....do	....do	....do	Wooden boxes	2	17	30
Do	....do	....do	....do	Machinery	1	14	23
Do	....do	....do	....do	Cooperage	4	75	117
Do	....do	....do	....do	Furniture	1	22	90
Do	....do	....do	....do	Woolen	5	41+	247
Do	....do	....do	....do	Cotton	3	.....	176
Do	....do	....do	Androscoggin	Cooperage	1	30	25
Do	....do	....do	....do	Machinery	1	.....	30
Do	....do	....do	....do	Carriages and wagons	1	10	25
Do	....do	....do	....do	Flour and grist	9	125	276
Do	....do	....do	....do	Saw	10	230	564
Do	....do	....do	....do	Furniture	1	10	20
Do	....do	....do	....do	Woolen	2	.....	30

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Other tributaries of the	Coast streams of Maine	Maine	Oxford	Woolen	6		
Do	do	do	do	Agricultural implements	2	19	60
Do	do	do	do	Boot and shoe findings	1	11	30
Do	do	do	do	Wooden boxes	2	21	50
Do	do	do	do	Carpentering	1	9	60
Do	do	do	do	Coffins, etc	1	13	40
Do	do	do	do	Cooperage	2	18	20
Do	do	do	do	Flour and grist	16	215	579
Do	do	do	do	Furniture	5	51	58
Do	do	do	do	Chairs	1	9	18
Do	do	do	do	Wooden handles	4	46	133
Do	do	do	do	Iron castings	1	12	45
Do	do	do	do	Leather goods	1	10	150
Do	do	do	do	Tanneries	2	25	32
Do	do	do	do	Saw	61	760	1,762
Do	do	do	do	Sash, door, and blind	1	15	15
Do	do	do	do	Wheelbarrow	1	20	30
Do	do	do	do	Wheelwrighting	4	36	53
Do	do	do	do	Wood-turning	1	12	12
Do	do	do	do	Wooden ware	2	24	37
Do	do	New Hampshire	Coos	Saw	1	10	20
Do	do	do	do	Flour and grist	4	39	80
Kennebec river	Atlantic ocean	Maine	Kennebec	Cotton	2	37	(?)2,500
Do	do	do	do	Furniture	1	15	200
Do	do	do	do	Flour and grist	1	22	150
Do	do	do	do	Saw	1	16	200
Do	do	do	Somerset	Woolen	1	13	84
Do	do	do	do	Wooden boxes	1	7	80
Do	do	do	do	Cutlery	4		135
Do	do	do	do	Coffins	1		13
Do	do	do	do	Flour and grist	4	50	250
Do	do	do	do	Wooden handles	1	13	20
Do	do	do	do	Kaolin, etc	1	12	55
Do	do	do	do	Furniture	1	7	100
Do	do	do	do	Planing	1	7	80
Do	do	do	do	Saw	10	104	1,045
Do	do	do	do	Machinery	1	8	18
Do	do	do	do	Wheelwrighting	1	15	35
Do	do	do	do	Paper	1	10	100
Do	do	do	do	Sash, door, and blind	4	43	125
Do	do	do	do	Starch	1	9	25
Do	do	do	do	Wooden ware	2		100
Do	do	do	do	Wood-pulp	1	9	83
Do	do	do	do	Wood-turning	1		6
Cobbosseecontee river	Kennebec river	do	Kennebec	Paper boxes	1	16	45
Do	do	do	do	Carpentering	1	14	19
Do	do	do	do	Furniture	2	28	40
Do	do	do	do	Flour and grist	2	27	105
Do	do	do	do	Tanneries	2	18	32
Do	do	do	do	Foundery	1	11	15
Do	do	do	do	Machinery	2	21	34
Do	do	do	do	Paper, wrapping	1	13	300
Do	do	do	do	Paper, printing	1	17	225
Do	do	do	do	Paper, colored	1	16	480
Do	do	do	do	Saw	6	74	720
Do	do	do	do	Steel springs	1	15	100
Do	do	do	do	Sash, door, and blind	2	30	44
Do	do	do	do	Wood-turning	1	15	38
Do	do	do	do	Woolen	1	11	50
Emerson stream	do	do	do	Agricultural implements	4	50	605
Do	do	do	do	Carpentering	1	8	90
Do	do	do	do	Chairs	1	8	15
Do	do	do	do	Flour and grist	1	8	40
Do	do	do	do	Wooden handles	1	8	25
Do	do	do	do	Tanneries	2	18	68
Do	do	do	do	Matches	1	8	10

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, use.
						Feet.	
Emerson stream	Kennebec river	Maine	Kennebec	Machinery	1	8	60
Do	do	do	do	Saw	1	12	50
Do	do	do	do	Sash, door, and blind	2	22	140
Do	do	do	do	Wheelwrighting	1	8	10
Sebasticook river	do	do	do	Boot and shoe findings	1	10	24
Do	do	do	do	Flour and grist	1	7	200
Do	do	do	do	Tannery	1	12	12
Do	do	do	do	Saw	4	38	337
Do	do	do	do	Wood-pulp	1	16	270
Do	do	do	Somerset	Blacksmithing	3	12	20
Do	do	do	do	Flour and grist	2	18	90
Do	do	do	do	Furniture	1	10	20
Do	do	do	do	Saw	6	45	150
Do	do	do	do	Tanneries	2	20	100
Do	do	do	do	Wheelwrighting	1	7	10
Do	do	do	do	Woolen	3	26	115
Do	do	do	Waldo	Saw	1	14	20
Do	do	do	Penobscot	Flour and grist	2	23	62
Do	do	do	do	Saw	4	42	156
Do	do	do	do	Machinery	1	10	25
Sandy river	do	do	Franklin	Flour and grist	2	25	75
Do	do	do	do	Saw	4	50	125
Do	do	do	do	Wooden handles	1	7	20
Do	do	do	do	Upholstering materials	1	8	25
Do	do	do	do	Wood-turning	1	8	20
Do	do	do	do	Furniture	1	7	12
Seven-Mile (or Carrabasset) river	do	do	do	Flour and grist	1	8	10
Do	do	do	do	Saw	3	25	90
Do	do	do	do	Agricultural implements	1	11	10
Do	do	do	Somerset	Flour and grist	1	50	90
Do	do	do	do	Saw	4	94	320
Do	do	do	do	Tannery	1	8	8
Do	do	do	do	Woolen	1	10	25
Dead river	do	do	do	Flour and grist	1	10	12
Do	do	do	do	Saw	1	8	6
Do	do	do	Franklin	Flour and grist	1	12	24
Do	do	do	do	Saw	1	10	33
Sheepscot river	Atlantic ocean	do	Lincoln	Woolen	1	8	24
Do	do	do	do	Flour and grist	5	59	202
Do	do	do	do	Saw	12	120±	357
Do	do	do	Waldo	do	4	30+	53
Damariscotta river	do	do	Lincoln	Flour and grist	1	15	40
Do	do	do	do	Saw	1	10	40
Medomac river	do	do	do	Flour and grist	3	.....	44
Do	do	do	do	Foundery	1	.....	8
Do	do	do	do	Marble and stone work	1	.....	8
Do	do	do	do	Saw	4	47	65
Do	do	do	do	Planing	1	25	25
Do	do	do	do	Woolen	1	5	8
Saint George river	do	do	Knox	do	1	10	40
Do	do	do	do	Carriages and wagons	1	8	25
Do	do	do	do	Flour and grist	2	21	42
Do	do	do	do	Saw	4	42	51
Do	do	do	do	Tanneries	2	24	90
Do	do	do	do	Wheelwrighting	2	.....	16
Do	do	do	Waldo	Woolen	1	12	15
Do	do	do	do	Tanneries	2	28	50
Do	do	do	do	Foundery	1	10	6
Do	do	do	do	Wood-turning	1	12	10
Do	do	do	do	Cutlery	1	8	15
Do	do	do	do	Flour and grist	2	33	40
Do	do	do	do	Saw	9	97	181
Do	do	do	do	Sash, door, and blind	1	6	15
Penobscot river	do	do	Penobscot	Flour and grist	2	24	65
Do	do	do	do	Saw	21	223	5,719
Do	do	do	do	Machinery	1	8	30

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Marsh river	Penobscot river	Maine	Waldo	Flour and grist	5	68	154
Do	do	do	do	Woolen	1	10	28
Do	do	do	do	Saw	6	75	153
Sowadabscook river	do	do	Penobscot	Paper, printing	1	12	75
Do	do	do	do	Paper, wrapping	1	18	120
Do	do	do	do	Woolen	1	9	8
Kenduskeag river	do	do	do	Wood-turning	1	12	40
Do	do	do	do	Wheelwrighting	1	10	40
Do	do	do	do	Flour and grist	7	79	310
Do	do	do	do	Saw	10	163	606
Do	do	do	do	Salt, ground	2	18	85
Do	do	do	do	Plaster, ground	2	18	85
Great Works river	do	do	do	Saw	1	12	40
Pushaw river	do	do	do	Furniture	1	7	15
Do	do	do	do	Saw	1	7	50
Piscataquis river	do	do	Piscataquis	Agricultural implements	1	10	15
Do	do	do	do	Blacksmithing	1	8	3
Do	do	do	do	Furniture	1	12	15
Do	do	do	do	Foundery	1	10	15
Do	do	do	do	Flour and grist	4	58	225
Do	do	do	do	Tannery	1	12	20
Do	do	do	do	Saw	8	94	553
Do	do	do	do	Sash, door, and blind	1	10	15
Do	do	do	do	Wheelwrighting	3	31	19
Do	do	do	do	Woolen	4	56	186
Sebec river	Piscataquis river	do	do	Flour and grist	2	22	45
Do	do	do	do	Woolen	1	10	24
Do	do	do	do	Tannery	1	14	25
Do	do	do	do	Woolen	1	10	15
Do	do	do	do	Saw	3	40	92
Do	do	do	do	Wheelwrighting	1	6	6
Pleasant river	do	do	do	Flour and grist	1	12	22
Do	do	do	do	Saw	1	12	30
Do	do	do	do	Wheelwrighting	1	12	6
Do	do	do	do	Wood-turning	1	9	12
Do	do	do	do	Blast-furnace	1	14	185
Mattawamkeag river	Penobscot river	do	Aroostook	Saw	1	6	20
Union river	Atlantic ocean	do	Hancock	Tannery	1	14	20
Do	do	do	do	Saw	14	139	1,900
Narraguagus river	do	do	Washington	Furniture	1	7	25
Do	do	do	do	Sash, door, and blind	1	7	20
Do	do	do	do	Flour and grist	1	7	20
Do	do	do	do	Saw	5	53	435
East and West Machias rivers	do	do	do	do	10	89	820
Saint Croix river	do	do	do	Machinery	1	8	30
Do	do	do	do	Woolen	1	6	12
Do	do	do	do	Saw	3	32	320
Do	do	do	do	Tannery	1	8	200
Kennebasis river	Saint Croix river	do	do	do	2	.....	135
Do	do	do	do	Saw	1	10	75
Saint John river	Atlantic ocean	do	Aroostook	do	1	12	9
Meduxnekeag river	Saint John river	do	do	Flour and grist	3	33	173
Do	do	do	do	Saw	9	89	480
Do	do	do	do	Starch	1	8	10
Do	do	do	do	Sash, door, and blind	1	10	20
Do	do	do	do	Plaster	1	10	20
Do	do	do	do	Furniture	1	10	15
Do	do	do	do	Tannery	1	11	75
Fish river	do	do	do	Flour and grist	1	18	30
Do	do	do	do	Saw	1	18	30
Other streams	Atlantic ocean	do	Sagadahoc	Fertilizers	1	6	15
Do	do	do	do	Flour and grist	1	6	15
Do	do	do	do	Kaolin and ground earths	1	12	28
Do	do	do	do	Plaster, ground	1	6	15
Do	do	do	do	Saw	22	173	660
Do	do	do	Franklin	Flour and grist	5	72	94

Table of power utilized on the coast streams of Maine—Continued.

Stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Other streams	Atlantic ocean	Maine	Franklin	Saw	28	329	626
Do	do	do	do	Carriages and wagons	1	10	20
Do	do	do	do	Agricultural implements	2	30	120
Do	do	do	do	Wooden handles	1	12	20
Do	do	do	do	Planing	1	7	15
Do	do	do	do	Upholstering materials	1	8	10
Do	do	do	do	Woolen	2	25	95
Do	do	do	do	Wood-turning	2	21	120
Do	do	do	do	Tanneries	2	12	40
Do	do	do	do	Boots and shoes	2	12	20
Do	do	do	do	Wheelwrighting	1	15	8
Do	do	do	Kennebec	Agricultural implements	7	102	624
Do	do	do	do	Blacksmithing	1	6	15
Do	do	do	do	Paper boxes	2	.....	8
Do	do	do	do	Wooden boxes	1	6	50
Do	do	do	do	Boot and shoe findings	1	11	25
Do	do	do	do	Coffins, etc	1	18	20
Do	do	do	do	Flour and grist	18	215	663
Do	do	do	do	Wooden handles	1	11	30
Do	do	do	do	Tanneries	4	61	70
Do	do	do	do	Foundries	3	44	44
Do	do	do	do	Machinery	2	27	28
Do	do	do	do	Paper	2	27	555
Do	do	do	do	Saw	29	337	1,400
Do	do	do	do	Upholstering materials	2	23	55
Do	do	do	do	Sheddy	1	12	20
Do	do	do	do	Sash, door, and blind	1	10	12
Do	do	do	do	Wood-turning	2	17	90
Do	do	do	do	Woolen	3	65	421
Do	do	do	do	Cotton	1	7	60
Do	do	do	Knox	Agricultural implements	1	15	15
Do	do	do	do	Bread, crackers, etc	1	5	10
Do	do	do	do	Cooperage	1	16	70
Do	do	do	do	Coffins	1	11	25
Do	do	do	do	Furniture	1	11	18
Do	do	do	do	Flour and grist	7	80	228
Do	do	do	do	Gunpowder	1	12	15
Do	do	do	do	Founderies	2	27	85
Do	do	do	do	Iron anchors and chains	1	9	25
Do	do	do	do	Saw	16	216	430
Do	do	do	do	Tannery	1	15	20
Do	do	do	do	Machinery	2	19	35
Do	do	do	do	Marble and stone works	2	17	70
Do	do	do	do	Musical instruments	1	12	20
Do	do	do	do	Sash, door, and blind	1	14	70
Do	do	do	do	Wheelwrighting	1	11	15
Do	do	do	do	Woolen	1	13	35
Do	do	do	Lincoln	Flour and grist	2	23	115
Do	do	do	do	Saw	14	152	337
Do	do	do	do	Woolen	1	.....	5
Do	do	do	Waldo	Agricultural implements	1	12	10
Do	do	do	do	Tanneries	2	22	65
Do	do	do	do	Plaster, ground	2	40	90
Do	do	do	do	Cutlery	2	17	110
Do	do	do	do	Leather-board	1	14	100
Do	do	do	do	Flour and grist	6	75	158
Do	do	do	do	Saw	22	260	700
Do	do	do	do	Sash, door, and blind	1	7	30
Do	do	do	do	Woolen	1	12	20
Do	do	do	Somerset	Blacksmithing	3	20	27
Do	do	do	do	Wooden boxes	1	10	40
Do	do	do	do	Flour and grist	12	159	382
Do	do	do	do	Wooden handles	2	16	52
Do	do	do	do	Hardware	1	6	24
Do	do	do	do	Saw	40	445	1,230
Do	do	do	do	Tanneries	3	28	78

Table of power utilized on the coast streams of Maine—Continued.

Name of stream.	Tributary to what.	State.	County.	Kind of mill or manufacture.	Number of mills.	Total fall used.	Total horse-power used, net.
						Feet.	
Other streams	Atlantic ocean	Maine	Somerset	Sash, door, and blind	1	8	15
Do	do	do	do	Toys and games	1	14	20
Do	do	do	do	Wheelwrighting	6	30+	109
Do	do	do	do	Woolen	3	20	60
Do	do	do	Hancock	Flour and grist	11	132	239
Do	do	do	do	Tanneries	2	19	72
Do	do	do	do	Wood-turning	1	.....	20
Do	do	do	do	Woolen	7	.....	108
Do	do	do	do	Saw	42	476	979
Do	do	do	Washington	Plaster, ground	1	26	160
Do	do	do	do	Marble and stone work	1	17	100
Do	do	do	do	Flour and grist	8	69	178
Do	do	do	do	Saw	26	222	1,165
Do	do	do	do	Tannery	1	14	15
Do	do	do	do	Rolling	1	30	500
Do	do	do	do	Woolen	1	14	5
Do	do	do	Penobscot	Blacksmithing	2	28	9
Do	do	do	do	Marble and stone work	1	.....	3
Do	do	do	do	Furniture	3	.....	40
Do	do	do	do	Men's clothing	1	.....	20
Do	do	do	do	Printing	3	.....	14
Do	do	do	do	Bread, crackers, etc	1	.....	4
Do	do	do	do	Sash, door, and blind	2	20	27
Do	do	do	do	Wheelwrighting	1	10	15
Do	do	do	do	Carriages and wagons	1	10	4
Do	do	do	do	Flour and grist	13	164	398
Do	do	do	do	Saw	47	462	1,600
Do	do	do	do	Foundery	1	12	12
Do	do	do	do	Tanneries	4	53	345
Do	do	do	do	Brass foundery	1	.....	3
Do	do	do	do	Machinery	1	.....	1
Do	do	do	do	Locksmithing	1	.....	3
Do	do	do	do	Planing	1	11	15
Do	do	do	do	Wooden boxes	1	14	12
Do	do	do	do	Wooden-ware	1	10	47
Do	do	do	do	Woolen	6	.....	93
Do	do	do	Piscataquis	Cooperage	1	12	50
Do	do	do	do	Flour and grist	4	51	65
Do	do	do	do	Saw	20	238	561
Do	do	do	do	Woolen	1	13	65
Do	do	do	Aroostook	Flour and grist	16	174	319
Do	do	do	do	Saw	38	464	1,504
Do	do	do	do	Starch	5	60	136
Do	do	do	do	Sash, door, and blind	2	22	30
Do	do	do	do	Planing	1	12	20
Do	do	do	do	Plaster	1	12	36
Do	do	do	do	Furniture	1	.....	10
Do	do	do	do	Woolen	1	.....	50

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