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STATE OF MAINE.

FIRST ANNUAL REPORT

State Water Storage Commission

JANUARY, 1911.

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MAINE STATE WATER STORAGE COMMISSION.

Augusta, Maine, January 15, 1911.

To the Honorable Senate and House of Representatives in Legislature assembled:—

In accordance with the provisions of Chapter 212, of Public Laws of 1909, we beg to submit the 1st annual report of the State Water Storage Commission.

For the details of the investigation on the water resources of the State, you are respectfully referred to the attached report of our engineer, Mr. Cyrus C. Babb.

While this State may properly claim to be a pioneer in the conservation of its water powers, this Commission does not wish to recommend too radical legislation along these lines. At the same time we still wish to keep in the forefront with beneficial legislation and at least keep step with such states as New York, Pennsylvania and Oregon. Our recommendations below have largely been adopted by these states as shown in detail on pages 19 and 21 of this report.

Complying with the request of the Legislature to report a plan, and the necessary steps that should be taken by the State to increase and conserve the water powers of the State, we recommend that the State Water Storage Commission be given authority along the following lines:

First—To require every person, firm, or corporation, contemplating the construction of a dam for the storage of water or the development of water power in the State, to submit their plans to the Commission and obtain the approval of the Commission before beginning construction.

Second—To require every person, firm or corporation applying for a charter for the development of storage or water power, to submit their plans to the Commission for approval before beginning construction; to provide for practically the same requirements in the case of agreements for the merger or consolidation of two or more corporations for the same purpose; to require the approval of the Commission in all cases of sale, assignment, disposition or transfer of any franchise of a company formed for the development of storage or water power.

Third—To assess and collect fees annually for all franchises of water power which may be granted hereafter by the State, the amount of assessment being on a sliding scale and based either on the gross receipts of the company, or on the horsepower proposed to be developed.

Fourth—To assume control and regulation of all reservoirs now built or that will be built by private parties on lands in part or in whole controlled by the State, known as public lots or State lands, and on all great ponds and lakes of the State, taking care in such legislation not to injuriously affect vested rights. For a suggested plan for the administrative control of reservoirs, reference should be made to page 26. Briefly stated, it contemplates the formation of river districts with district superintendents in charge of the regulation of reservoirs; said district superintendents to be appointed by the water users, approved by the Water Storage Commission, and reporting to the engineer of said Commission.

Respectfully submitted,

Bert M. Fernald, Governor.
Chairman.

Edgar E. Ring, Land Agent.

Edward P. Ricker.

J. M. McNulty.

E. C. Jordan.
Commissioners.

Augusta, Maine, December 31, 1910.

To the State Water Storage Commission, Augusta, Maine.

GENTLEMEN:—In accordance with the agreement dated December 1, 1909, between the Director of the U. S. Geological Survey, the Chairman of the State Survey Commission and the Chairman of the State Water Storage Commission, I herewith submit a report on the investigation of the water resources of the State of Maine.

This agreement provides for a co-operative survey of the natural resources of the State; that said survey shall include the continuation of topographic mapping, the determination of the amount and availability of water resources, their present development, and the best methods of their further utilization, also, the further determination of geologic resources.

The agreement further provides that the hydrographic work shall be under the immediate charge of a duly appointed employee of the Director of the U. S. Geological Survey, designated as District Engineer, and that said District Engineer shall make reports to the State organizations as they may demand, for publicaton or such other use as they may find necessary or desirable.

The investigations have been made in accordance with the regulations of and under the general supervision of Mr. M. O. Leighton, Chief Hydrographer, U. S. Geological Survey.

Acknowledgement is made for valuable information furnished by a number of water power companies, and individual hydraulic engineers, and also to Mr. F. E. Pressey, Assistant Engineer, who, on account of his engineering experience and familiarity with the State, has materially assisted the District Engineer in this work.

Very respectfully,

Cyrus C. Babb,
District Engineer.

WATER RESOURCES OF MAINE.

BY CYRUS C. BABB,

District Engineer.

PART I.

The Legislature of Maine, in the creation of the State Water Storage Commission, took an advanced step in the investigation of its natural resources, especially its predominant one, its magnificent water resources. It there gave its stamp of approval to the national movement of conserving for the public benefit and use, one of the greatest assets of the nation and state, its water powers.

The act creating said Commission is as follows:

Chapter 212. Laws of 1909.

An act to create a State Water Storage Commission.

Be it enacted by the People of the State of Maine, as follows:

Section 1. The governor, with the advice and consent of the council, is authorized to appoint three citizens of the state, who, together with the governor and the state land agent, shall constitute a commission to be known as the state water storage commission, of which the governor shall be chairman. As members of said commission, they shall receive no salaries but shall be paid their actual and necessary expenses incurred in the performance of their duties, and may employ a competent engineer. The office of the commission shall be at the state house in the city of Augusta. The commission may appoint a secretary who shall be paid a salary not to exceed six hundred dollars per annum, who shall work in conjunction with the land agent.

Section 2. The commission shall proceed at once to collect information relating to the water powers of the state, the flow of rivers and their drainage area, the location, nature and size of the lakes and ponds in the state and their respective value and capacity as storage reservoirs, and such other hydrographic data as they may deem of value in devising the best methods for the improvement of the natural storage basins of the state, and the creation of new storage reservoirs, with a view to conserving and increasing the capacity of the water powers of the state.

Section 3. The commission shall, so far as possible, work in conjunction with the state survey commission, and with such state survey commission join with the United States geological survey in making a topographical survey of the state in so far as it relates to the collection of data bearing on the water powers and water storage reservoirs of the state. The state survey commission shall place at the disposal of the state water storage commission all information, and copies of reports, maps and plans collected by them and bearing on the hydrography of the state.

Section 4. Every person, firm or corporation before commencing the erection of a dam for the purpose of developing any water power in this state, or the creation or improvement of a water storage basin or reservoir for the purpose of controlling the waters of any of the lakes or rivers of the state, shall file with said commission for its information and use copies of plans for the construction of any such dam or storage basin or reservoir, and a statement giving the location, height and nature of the proposed dam and appurtenant structures and the estimated power to be developed thereby, and in case a dam is to be constructed solely for the purpose of water storage and not for the development of a water power at its site, plans and statements shall be filed with the commission showing the extent of the land to be flowed, the estimated number of cubic feet of water that may be stored and the estimated effect upon the flow of the stream or streams to be affected thereby. Every person, firm or corporation shall, as soon as practicable, after this act takes effect, file similar plans, reports and estimates in relation to any dam or storage basin or reservoir then in process of construction by them.

Section 5. The commission shall present to the legislature on or before the fifteenth day of January in the year of our Lord nineteen hundred and eleven, a report showing the progress made in its investigations, and, if practicable, shall complete its investigations to such an extent before January first, in the year of our Lord nineteen hundred and eleven, as will enable it to present in its report a comprehensive and practical plan for the improvement and creation of such water storage basins and reservoirs as will tend to develop and conserve the water powers of the state. The commission shall also report so far as its investigation will permit on the present development of the water powers in the state with reference to the general plan proposed so that the legislature may have before it a comprehensive summary of the possibilities that lie in the development of the water powers in the state, as a natural resource and the necessary steps that should be taken by the state to further increase and conserve them.

Section 6. So far as any proposed plan devised by the commission for the improvement and increase of water storage basins or reservoirs shall include the construction of a dam or dams upon or at the head waters of any river or water course, the commission shall ascertain and report as nearly as may be the water storage capacity in cubic feet of the reservoir to be created, the recorded rainfall on the water shed above such proposed dam, and the maximum, minimum and average flow of water per second in cubic feet during each month in the year in said river or water course. They shall as nearly as practicable estimate the increased power that would be developed by such proposed dam in the rivers or streams to be affected thereby.

Section 8. The commission shall ascertain what townships or parts of townships of land can be purchased by the state and the cost thereof, with all the necessary data for a correct understanding of their value as a forest reserve or for conserving the water powers of the state, or for reforestation, and shall further investigate the question of denuded, burnt over or barren lands in the state, their extent and value with a view to their purchase by the state for reforestation.

Section 9. The sum of five thousand dollars for the year nineteen hundred and nine and five thousand dollars for the year nineteen hundred and ten, or so much thereof as may be necessary, is hereby appropriated out of any fund in the treasury of the state, not otherwise appropriated, to carry out the provisions of this act.

(Approved April 2, 1909.)

The Law especially requires a number of direct actions on the part of the Commission.

1. The Commission shall proceed at once to collect information relative to the water powers of the State, the flow of rivers and their drainage areas, the location, nature and size of the lakes and ponds in the State, and their respective value and capacity as storage reservoirs, and such other hydrographic data as they may deem of value.

2. The Commission shall report a comprehensive and practical plan for the improvement and creation of such water storage basins and reservoirs as will tend to develop and conserve the water powers of the State.

3. The Commission shall also report, so far as its investigations will permit, on the present development of the water powers of the State, and the necessary steps that should be taken by the State to further increase and conserve them.

4. The Commission, if it devises a plan for the improvement and increase of the water storage of any basin or reservoir, contemplating the construction of any dam, is required to give full hydrographic data for the basin, including the capacity of the reservoir, the recorded rainfall on the water shed, the maximum, minimum, and average flow of the river.

They shall further, as nearly as practicable, make an estimate of the increased power that would be developed by such proposed dam in the rivers or streams to be affected thereby.

5. The Commission shall ascertain what townships or parts of townships can be purchased by the State, and the cost thereof for use as a forest reserve or for conserving the water powers of the State.

6. The Commission shall investigate the question of denuded, burnt over or barren lands in the State, their extent and value with a view to their purchase by the State for reforestation.

A total amount of $5000 a year for the two years was appropriated for the work. This amount was wholly insufficient for the tasks set forth and especially to comply with the request of the legislature to present by January 15, 1911, a report showing a comprehensive and practical plan for the improvement and creation of water storage basins and reservoirs as will tend to conserve the water powers of the State.

The act in question for the State of Maine was based on a similar act of the legislature of New York. That State first appropriated $35,000. In words of its eminent consulting engineer, Mr. John R. Freeman, "The appropriation was insufficient and the time too short. The entire appropriation and the entire time allowed are smaller than I (Mr. Freeman) have sometimes found it necessary to expend on the surveys and studies for a single project of water power development."

The Maine act in some particulars asks for more work than the New York act calls for. Your engineer, on assuming his duties December 15, 1909, was almost a total stranger to the State, at least in so far as the water powers and general hydrographic conditions were concerned, although it was his native State.

Fortunately a large amount of work has previously been done in the State, or during the last decade, on general hydrographic and topographic investigations.

The State Survey Commission has been working in cooperation with the U. S. Geological Survey since 1899 along the lines mentioned above. Their appropriations have been small for such work in such a large State as Maine, but, fortunately, all their money has been spent on actual field work and little on reports. In this way a large amount of data has been made available, a portion of which only, has appeared in print, in the publications, especially the Water Supply Papers, of the U. S. Geological Survey.

The State Survey Commission believed first in getting actual engineering field results. Their purely hydrographic work, showing the amount of water passing down the streams of the State every day in the year, is an indispensable preliminary to any study of water storage.

The U. S. Reclamation Service was able to start construction on large irrigation projects within two years of its organization due to the fact of the early stream gaging work of the Hydrographic, or as it is now known, the Water Resources Branch, of the U. S. Geological Survey. If it had not been for this earlier work, construction would have been delayed a number of years longer.

Furthermore, many private water companies have been keeping records of rainfall, stream flow and related data, that if compiled and presented in a report, will be of great value to the State in its discussion and consideration of a State policy of conservation of its water powers.

The following individuals and organizations have furnished special and valuble data to this office: Water Resources Branch, U. S. Geological Survey; Walter H. Sawyer, Union Water Power Co.; H. S. Ferguson, Great Northern Paper Co.; Charles A. Mixer, Rumford Falls Power Co.; S. D. Warren & Co.; Hollingsworth & Whitney Co.; Bangor Railway & Electric Co.; Portland Electric Co.; Saco Water Power Co.; and Prof. H. S. Boardman, University of Maine.

It would seem that the Legislature, in its creation of the Water Storage Commission, believed that the time had come to make an engineering study of the hydraulic data that it had authorized to be collected in the past, to be used in a report as to how best to conserve and increase the water powers of the State, a source of possible future State revenue.

Let us see what the State has done in the past along conservation lines.

EARLY INVESTIGATIONS.

Maine has always been in the forefront in the investigation and conservation of its resources. Thirty years before the national government authorized its first geological investigations and over forty years before the Federal Geological Survey was established, the State of Maine had made such a survey.

By act of the State Legislature, March 28, 1836, a geological survey of the State was authorized under the direction of Dr. Charles T. Jackson, State Geologist. The investigation was continued for three years. The results of this geological survey, considering the difficulties of transportation at that time and the non-existence of accurate maps, are interesting.

A detailed survey and report on the Natural History and geology of the State was made in 1861 and 1862 by Ezekiel Holmes, naturalist, and C. H. Hitchcock, geologist. Reports were made on the zoology and botany of the State but the most interesting and detailed reports treated of the geological resources.

A hydrographic survey of the State was authorized by the legislature as early as 1867. The resulting report of Mr. Walter Wells is considered as authority even to the present day. He noted that over 1500 lakes and ponds are located in the State, covering 2200 square miles of water surface, and not including the innumerable number of little ponds of an acre or two in area that are located in all directions. There are in the State one lake to each 20 square miles of territory and one square mile of lake surface to each 14.3 square miles of territorial area.

STATE SURVEY COMMISSION.

This organization was created by act of the State legislature March 16, 1899. Its powers were subsequently amended and enlarged by an act approved March 23, 1905.

The following are the acts in question:

Chapter 99, Laws of 1899.

An act to authorize a topographic survey of the State in co-operation with the United States Geological Survey.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Section 1. That the governor be and is hereby authorized to appoint a commission, to consist of three citizens of this state, qualified by education and experience for such service, to confer with the director or the representative of the United States Geological Survey and to accept its co-operation with this state in the preparation and completion of a contour topographic survey and map of this state, which is hereby authorized to be made. Said commission shall serve without pay, but all its necessary expenses shall be approved by the governor and paid out of the state treasury. Said commission shall have power to arrange with the director or representative of the United States Geological Survey concerning this survey and map, its scale, method of execution, form and all details of the work, in behalf of this state, and may accept or reject the work executed by the United States Geological Survey. And it is hereby provided that said map shall accurately show the outlines of all townships, counties and extensive wooded areas, in this state, as existing on the ground at the time of the execution of these surveys; the location of all roads, railroads, streams, canals, lakes and rivers, and the location and height of all dams; and shall show by contour lines the elevation and depression of the surface of the country.

Section 2. Said commission may expend for the prosecution of this survey a sum equal to that to be expended upon the same work by the United States Geological Survey, not to exceed at the rate of twenty-five hundred dollars annually, for the years eighteen hundred ninety-nine and nineteen hundred and the governor is hereby authorized to draw his orders on the state treasury for such portions thereof as may be required from time to time, from moneys not otherwise appropriated, upon receipt of vouchers signed by not less than two members of the commission.

Section 3. For the purpose of making the surveys hereinbefore provided for, it shall be lawful for the persons employed in making the same to enter upon all lands within the boundaries of this state, but this act shall not be construed as authorizing any unnecessary interference with private rights.

(Approved March 16, 1899.)

CHAPTER 144, LAWS OF 1905.

An act to amend an Act authorizing a Topographic Survey of the State.

Be it enacted by the Senate and House of Representatives in Legislature assembled, as follows:

Section 1. The commission directed with the execution of this work shall hereafter be known as the State Survey Commission, the chairman of which shall be the State geologist, and shall include in its work the topographic, hydrographic and geological surveys of the state as provided by acts and resolves of preceding legislatures.

Section 2. Said commission is authorized to distribute without charge, for the use of public libraries, and for other educational purposes, such maps and reports relating to the work of the commission as may become available.

Section 3. Said commission shall make report, biennially, to the governor and council, showing work accomplished, together with a detailed account of expenditures, and shall be authorized to print and distribute, from time to time, such reports and bulletins as may, in the judgment of said commissioners, be immediately useful and profitable to the people of the state, the expense thereof to be chargable to, and paid out of, the appropriation herein made.

Section 4. Said commission shall be reimbursed for all necessary expenses as approved by the governor and council, and, in addition, the chairman shall be paid an annual salary of six hundred dollars and the remaining members of the commission, each three hundred dollars, annually.

Section 5. It is further provided that there shall be and hereby is appropriated for the work of said commission, including all expenses, the sum of ten thousand dollars for the year nineteen hundred and five and a like sum for the year nineteen hundred and six.

Section 6. All acts and parts of acts inconsistent herewith are herebe repealed.

(Approved March 23, 1905.)

STATE WATER STORAGE COMMISSION.

This organization was created by act of the Legislature April 2, 1909. The act in question is given on page 4.

THE AGREEMENT OF DECEMBER 1, 1909.

In order to co-ordinate and direct to the greatest use, the work of the State Survey Commission, the State Water Storage Commission, as well as that of the Federal Bureau of the U. S. Geological Survey, the following agreement was drawn up, signed and put into execution.

THIS AGREEMENT, made and entered into this first day of December in the year one thousand nine hundred and nine, by and between GEORGE OTIS SMITH, DIRECTOR, for and on behalf of the UNITED STATES GEOLOGICAL SURVEY, party of the first part, FRANKLIN C. ROBINSON, CHAIRMAN, for and on behalf of the MAINE STATE SURVEY COMMISION, party of the second part, and BERT M. FERNALD, CHAIRMAN, for and on behalf of the MAINE STATE WATER STORAGE COMMISSION, party of the third part, WITNESSETH:

1.—That there shall be maintained, in compliance with the provisions of Federal and State acts establishing said parties and defining their powers and duties, within the State of Maine for a period of thirteen

(13) months from the date hereof a co-operative survey of natural resouces; that said survey shall include the continuation of topographic mapping, the determination of the amount and availability of water resources, their present development, and the best methods of their further utilization, also, the further determination of geologic resources;

2.—That the parties hereto shall contribute toward the maintenance of the work herein specified amounts from the several appropriations designated, as follows:

By the party of the first part:

From the appropriation for:		
Topographic surveys	$4,000 00	
Water-resources investigations	3,000 00	
Geologic surveys	1,000 00	$8,000 00
By the party of the second part		8,000 00
By the party of the third part		7,000 00

3.—That, in case of approval by the United States Congress of an estimate submitted by the Honorable The Secretary of the Interior providing for an increase of $100,000 in the appropriation for the investigation of water resources, the party of the first part shall allot therefrom, in favor of the investigations herein provided, the further sum of $3,000.00.

4.—That the investigations herein provided shall be under the joint direction of the parties hereto; that the methods of investigation shall by those usually followed in similar work by the party of the first part; that the specific location and priority of the work shall be jointly agreed upon by said parties; that all the hydrographic work herein provided shall be under the immediate charge of a duly appointed employee of the party of the first part, who shall be designated District Engineer, who shall establish headquarters at the State Capitol at Augusta, Maine, who shall be engaged in no other work than that herein provided, and whose compensation shall be fixed and apportioned from the several allotments by mutual agreement of the parties hereto.

5.—That said district engineer shall be provided with the engineering and clerical assistance necessary to the satisfactory execution of the work herein provided, the compensation therefor to be paid from the several allotments in accordance with specific services rendered to each party hereto, EXCEPT THAT, the sum of $600 provided by law for the annual employment of clerical services by the party of the third part and not included within the contribution of said party for the purposes of this agreement, shall be applied to the salary of a clerk, who shall render equivalent services to said party and to said district engineer.

6.—That the traveling and subsistence expenses, together with the cost of all supplies and equipment necessary to the proper execution of the work herein provided shall be apportioned to and paid from the several allotments hereto, and the final adjustment of these and of all other charges shall be such as to represent the equivalent of the actual services rendered to each party hereto.

7.—That the original notes, maps, and other data resulting from the investigations herein provided shall be deposited with and become the property of the party of the first part; that certified copies thereof shall be furnished to the other parties hereto on demand; that the results of said investigations shall be published by the party of the first part, according to law in such case provided, but that said district engineer shall make reports to the other parties as they may demand, for publication or such other use as they may find necessary or desirable.

8.—That, during the progress of the work, all notes, data, and other information shall at all times be open to inspection by all parties hereto.

9.—That the obligations of the party of the first part herein provided shall become void in the event that the Congress of the United States shall fail to make provision for the continuation of any or all of the investigations of said party included herein.

IN WITNESS WHEREOF, we have hereunto set our hands and seals the day and year first herein written.

Signed: *George Otis Smith*
Director
for and on behalf of the
United States Geological Survey,
PARTY OF THE FIRST PART.

Signed: *Franklin C. Robinson*
Chairman,
for and on behalf of the
Maine State Survey Commission,
PARTY OF THE SECOND PART.

Signed: *Bert M. Fernald*
Chairman,
for and on behalf of the
Maine State Water Storage Commission,
PARTY OF THE THIRD PART.

LINES OF INVESTIGATION.

The Water Storage Act provided for very comprehensive engineering studies of the various hydrographic basins of the State. On account of the limited funds available, preventing the employment of a sufficient engineering force to make such detailed office engineering studies from the data available, to say nothing of the lack of funds for much field work, it was decided to restrict the work this year, largely to the compilation of such data as were found available, in order that they might be used, not only by the State in the future, but also by the people in the State or others who might be contemplating water power developments within the State.

Briefly the year's work may be classed under the following heads:

1. Compilation of hydrographic data.
2. Census of existing water power developments.
3. Supervision of stream gaging work.
4. Supervision of river and lake surveys.
5. Compilation of Base map of State.
6. Engineering studies.

1. The object of this compilation has been previously mentioned.

2. In order to comply with one of the direct provisions of the Water Storage act, a census of the existing water power developments was started. In order to make such a census thorough, each development should be personally visited. A considerable portion of the users, to whom blanks were sent out, have not yet favored the office with replies. Funds were not available to detail any engineers exclusively on this work, to visit the different plants, and to thus obtain information first hand. There are a great many old developments in the State, and many owners, undoubtedly, had no means of estimating correctly their horsepower. Furthermore, collection of such, entirely by correspondence, is never satisfactory. Your district engineer personally visited many plants. He would have liked to visit them all but time was not sufficient for it.

3. Under the terms of the agreement of December 1, 1909, the district engineer has had general supervision of the very important division of stream gaging, the continuation of the

work of the U. S. Geological Survey and the State Survey Commission. Mr. Frank E. Pressey, Assistant Engineer, U. S. G. S., has had immediate charge of this branch of the work.

In the words of the Consulting Engineer of the New York Water Supply Commission:

Accurate measurements of the stream flow or run-off and of the precipitation to determine the water yield of a given territory are the indispensible preliminaries to all study of regulation by water storage and constitute the foundation of the entire structure of computations and estimates which determine in every case to what extent the construction of reservoirs can be justified on engineering and economic grounds.

4. For the past several years, besides the regular topographic mapping work, resulting in the standard quadrangles of the U. S. Geological Survey, this Federal Bureau and the State Survey Commission have been making special river and lake surveys. The resulting river maps, generally on a scale of 1 inch equals 2,000 feet, show the plan as well as the profile of the streams. The lake maps are plans and show usually 5-foot contour lines to heights that the lakes might be raised; often soundings of the lakes are shown, as well as 5-foot subcontours or lines of equal elevations below the present shore lines. These lake maps are of especial use in computing the capacity, say in cubic feet, that the lakes would hold when used as reservoirs. Both river and lake maps are used in water power computations. The district engineer has had supervision of this work in the State during the past year.

5. When the district engineer first took up the work for the Commission, he immediately felt the need of a good map of the State on some working scale. The compilation of such a map was started on a scale of 1 inch equals 3 miles. The best available data were used. The standard quadrangles of the U. S. Geological Survey were used as far as they went. They only cover about one third of the area of the State. Some of the larger mill owners and some of the timber owners very kindly furnished the Commission with detailed maps from recent surveys of their township holdings. Various private maps, as well as the valuable series of maps in the office of the State Assessors, have been used. Many townships, especially in the

northern portion of the State, never have been surveyed and it is impossible to get accurate maps of them.

This map is presented to the public with a great deal of hesitancy as it is realized that many errors occur in it, but with its imperfections, it is believed that it will fill a want through the State. Its use as a base map in the office for the Commission is of extreme value.

6. Various engineering studies have been made in the office, including the distribution of rainfall, the run-off of streams and the relation between the two; also studies of probable power developments and storage possibilities, especially in the Dead River basin.

FEDERAL AND STATE CONTROL OF WATER POWERS.

Eminent authorities on conservation are informing us that the time has been reached when both the Federal and State governments should assume authority and control over the waters and water powers of the country. It will be interesting to examine the opinions of some of the speakers at the 2nd National Conservation Congress held at St. Paul, Minn., September 5-8, 1910, on this subject.

President Taft covered five different subjects; agricultural, mineral, forest, coal, oil and gas and phosphate lands, and water powers. It should be borne in mind, that on the latter subject, he was referring more especially to water powers on government lands in the west.

"It has been thought that there was danger of combination (of hydro-electric companies) to obtain possession of all the power sites and to unite them under one control. Whatever the evidence of this, or lack of it, at present we have had enough experience to know that combination would be profitable, and the control of a great number of power sites would enable the holders or owners to raise the price of power at will within certain sections, and the temptation would promptly attract investors, and the danger of monopoly would not be a remote one.

"However this may be, it is the plain duty of the government to see to it that in the utilization and development of all this immense amount of power, conditions shall be imposed that will prevent monopoly and will prevent extortionate charges, which are the accompaniment of monopoly."

Hon. Herbert Knox Smith, U. S. Commissioner of Corporations, advanced the following ideas:

Effective restraint imposed by competition on the control of water power is becoming more and more improbable. There has been a marked concentration of water power control in private hands, and this process is advancing rapidly. Public regulation of water power, the only other alternative, therefore, becomes a necessity.

Consolidation of water powers within a market area has certain practical and economic advantages. In some cases it is an actual conservation of power.

Suppose there are two independant power plants in two neighboring communities where the demand in one community is mainly for power during the daytime and in the other at night. These plants can advantageously combine throwing the surplus of their joint power by day to one place and by night to the other, thus bringing their normal load in each case up nearer the peak. Similarly, such coupling up is obviously advantageous in two neighboring water sheds where the excess water power occurs at different times.

We have no reason to oppose such combinations of varying conditions if it is accomplished by fair methods. We must simply be prepared to regulate such monopolistic power as may result therefrom.

The situation in the hydro-electric industry is in brief, as follows:

First. It deals with the basic necessity and its importance inevitably increases as the fixed supply of sources of other power decreases.

Second. Substantial control of mechanical power means the exercise of a function that is governmental in its effect on the public.

Third. Driven by underlying economic and financial forces, concentration of control of water power in private hands has proceeded very rapidly. It is doubtful if anything can arrest this process, and a swift advance to a far higher degree of concentration is entirely possible.

Fourth. Any chance, then, of restraint by competition is rapidly disappearing, certainly over given sections, and public reguations therefore, are an imminent necessity.

The nation and the state will have to use their full powers to meet the water power situation. The most effective time to use them is before, not after, private rights accrue. The one certain method is for the state or federal government, to retain its interest, or impose its conditions, at the inception, as a part of the grant. Then public control and private rights go together, as they must if we are to safeguard the public interest in water power.

Let there be no unnecessary hampering of hydro-electric development, but let the public be in on the ground floor at the start, for at the start the public must grant the power and for all time the public will be the party chiefly interested in its use.

Specifically:

First—The status quo of powers still controlled by the nation or state should be maintained until we know what we have, and can act intelligently thereon.

Second—No grant should be made except for a fixed period, with at least the reserved right to readjust terms at the end thereof. That period, however, should be long enough to permit adequate financing and complete development.

Third—Complete publicity of accounts and transactions should be required as well as a record of cost, and the real relation of investment of stock and bond issue.

Fourth—Power to revoke the grant for breach of conditions should be lodged in a specified authority. Otherwise there will always be the possibility of protracted litigation to determine the status.

Fifth—So far as is possible, direct provision should be made against excessive charges and monopolistic abuse.

Sixth—Public authorities should reserve such constitutional compensation or rental as will establish the principle of underlying public interest.

Seventh—All public easements of navigation, fisheries, etc., should be safeguarded.

Eighth—In the case of new grants, all these provisions should be made conditions of the grant.

Finally, the purpose and probable effect on the public of any grant should first be fully ascertained and carefully considered, in order to determine whether public interest justifies beyond a reasonable doubt the surrender by the public of even a part of its power over this great public resource. Where reasonable doubt exists, the status quo should be maintained.

Dr. Frank LeRond McVey, President of the University of North Dakota, and formerly a member of the Minnesota Tax Commission, brought out the following features:

The first step in any adequate system of taxing of water powers must be their survey. This means listing, locating and measuring. It means, too, that the legislature should assume at the beginning, all water powers belonging to the State, and that the acquirement of them must be through lease. Several plans have been suggested for the taxation of water powers. One is the measurement of the water flowing over the dam, and another is the taxation of the actual horsepower developed. The latter plan is subject to many criticisms. It would be far better to measure the capacity of the dam under proper engineering authority and determine a fair rate for the amount of power produced by the water passing over the dam. For the State to receive no compensation of any kind for the utilization of such a great wealth producer is to bring into existence the greatest possible factor of injustice in the matter of taxation.

The State of New York has taken the most advanced stand on State control of its water powers, and has had large appropriations for several years to pursue its investigations. The law directs the State Water Supply Commission to devise plans for the progressive development of the water powers of the State for public uses under state ownership and control. Detailed plans and designs have been prepared for the construction by the State of several storage reservoirs. The cost of construction, to be first met by a bond issue, is eventually to be paid by the power companies benefited, through an annual rental per horse-power.

Pennsylvania has a water supply commission with extensive power along certain lines. The act provides that no applications for the charter of a corporation for supplying water to the public or for the development of storage or transportation of water power for commercial and manufacturing purposes shall be approved until the same has received the approval of the water supply commission. The act also places restrictions on merger of water companies.

Oregon has taken an advanced position on the granting of franchises of water power by the State and collecting fees therefor. The act provides:

> That every person, firm or corporation, except municipal corporations, who shall appropriate water after the passage of this act for the purpose of applying the same to the development of power, shall, during the life of such appropriation as fixed herein, pay to the State of Oregon not less than 25 cents or not more than $2 per annum in advance on or before the 2nd day of January of each year, for each and every horsepower represented by said appropriation. The amount of payment shall be determined by the board of control and adjusted from time to time, based upon the percentage of power appropriated which is put to beneficial use.

The legislature of the State of Wisconsin, at the regular 1909 session, appointed a joint committee to investigate the subject of the control of the water power by the State and the conditions upon which franchises should be granted, and the expediency of imposing a charge therefor. It was the understanding that a special session of the legislature would be called to enact water power legislation along the lines recommended by its special committee.

At the end of a detailed report, a proposed bill was submitted embodying the following features:

Declaring the use of water for power purposes to be a public use and subject to the control of the State for the greatest public good;

Repealing all water power franchises, subject to repeal, granted prior to the passage of the act, and providing for their reissue under the new act;

All new water power franchises to be subject to approval of the commission who make report to the legislature before the latter grant of the franchise;

Providing for sale of surplus power developed;

All holders of new franchises to pay to the State an annual fee based on the franchise value of the horsepower put to beneficial use at a rate of not less than 10 cents nor more than $2 per annum;

No franchise to hold longer than for a period of 40 years; rights then to revert to the State exclusive of physical property which may be removed or condemned;

Providing for forfeiture of franchise if annual fees are not paid, failure to develop power, or failure to comply with terms of franchise:

On the termination of the franchise, the State reserves the right to acquire the water powers by purchase, lease or condemnation proceedings, and further reserves the right to manage, regulate and control the use and distribution of the power and the rates at which the power is sold.

In transmitting the report of the Commission to the Wisconsin Legislature, the Governor recommended:

First—That a general act be passed providing that the granting of such franchises (for water power) be placed in the hands of some state authority.

Second—That the powers of corporations receiving such franchises be carefully defined.

Third—That the conditions upon which franchises may be granted by the state for such purposes be provided.

Fourth—That a small privilege or franchise tax be imposed on each horsepower utilized, payable annually so long as the power granted is used.

Fifth—That all acts granting franchises to build or maintain dams on navigable streams heretofore granted be amended so as to provide for their expiration at a fixed date in the future, with a provision that all persons and corporations exercising or holding such rights may comply with the general law in respect thereto, and thus bring all such franchise privileges under one general system taking care in such legislation not to affect injuriously vested rights.

In 1907 Wisconsin granted a charter to the Wisconsin Valley Improvement Co. that contained extensive privileges for the company and at the same time safeguarding the interests of the State to a considerable extent.

The company was allowed to construct reservoirs for storage purposes. They were given the right of eminent domain and the authority to collect tolls for the passage of boats through and over their works, and on logs, timbers, driven or floated on the streams the company might improve. They also can charge and collect tolls from owners of improved and operated water powers that may be benefited by the storage of water in reservoirs created by the company.

One provision of the act reads as follows:

No dam or reservoir not now in existence or heretofore authorized shall be constructed or created until plan therefor showing the form and location of the dam and a description of the lands to be overflowed thereby be first submitted to the state board and approved thereby, after first giving reasonable notice and opportunity to be heard to all persons interested, by publication in one or more newspapers most likely to give such notice, or such other notice as the board shall deem advisable; nor shall any petition be filed for the condemnation of any property for the purposes of this act without first having attached thereto the approval in writing of said board. Said board shall cause the height to which water may be raised by any dam to be marked by permanent monuments and bench marks and shall have supervision and control of the times and extent of the drawing of water from the reservoirs, and the power to compel the maintenance of all reservoirs, established.

Another provision of the act reads as follows:

The State of Wisconsin shall have the right at any time whenever it may have the constitutional power, to take over to itself and become the owner of all reservoirs and other works and property acquired by the Wisconsin Valley Improvement Company, pursuant to this act, by paying therefor the cash capital actually paid on the capital stock of said company theretofore lawfully issued and outstanding, or the actual value of the physical properties so taken over and without any allowance for franchises or good will of the business, and if such actual value cannot be agreed upon between the state and such owner, then the same shall be determined by the railroad commission of Wisconsin.

The legislative committee above referred to, reported as follows on this act, and this feature of the report has the full endorsement of your engineer:

"We believe that a matter of such vast importance (the privileges and power of the Wisconsin Valley Improvement Company), to so many people and so many conflicting interests, should not be lodged in any one but the sovereign power of the state. There is but one way of preventing abuse in an enterprise of this kind. The sovereign state should manage and control such system (of storage) with due regard to the rights of all."

EXISTING WATER POWER RENTAL PLAN.

The U. S. Forest Service imposes a gradual rental on water powers located on streams which drain water sheds included in whole or in part in the forest reserves. This bureau has done no actual construction work. The principle on which they base their rental is that the forest cover, acting as reservoirs, in the National Forests owned by the United States, increases the flow of rivers and thereby benefits the water powers. The rental charge is based upon the quantity of electrical energy generated each year, which shall not exceed the following amounts per 1000 kilowatt hours (=1340 horsepower hours):

For the 1st year	2 cts.
For the 2nd year	4 cts.
For the 3rd year	6 cts.
For the 4th year	8 cts.
For the 5th year	10 cts.
For the 6th to 10th years inclusive	12½ cts.
For the 11th to 15th years inclusive	15 cts.
For the 16th to 20th years inclusive	17½ cts.
For the 21st to 25th years inclusive	20 cts.
For the 26th to 30th years inclusive	22½ cts.
For the 31st to 35th years inclusive	25 cts.
For the 36th to 40th years inclusive	27½ cts.
For the 41st to 45th years inclusive	30 cts.
For the 46th to 50th years inclusive	32½ cts.
Average	20.86 cts.

There are several objections to this method of rentals. (1) The imposition of a tax upon output means that the man who installs a highly efficient plant will pay a higher charge than the man who wastes water by the installation of a cheap and inefficient plant. (2) The method of charging imposes a heavier burden upon the man who sells his power at a low price than upon him who sells it at a high price.

Wherever power is transmitted at a distance, a deduction should be made for the losses incurred in this transmission. There should be a limiting amount below which a deduction should not be made, on this account.

The U. S. Forestry permits are revocable at the discretion of the Secretary of Agriculture. This is too great a power to be vested in any one person or commission but the power of revocation might be vested in the legislature as far as water powers in the State of Maine are concerned.

The Forest Service has now under consideration and in course of preparation, a revised code governing water power installation in National Forests that will materially modify their present regulations. It is understood that the following features are under consideration, although there is no assurance that they will be adopted exactly in the form stated:

The annual charge shall be based on the "power capacity" of the works, which is understood to mean, the estimated annual station output in electrical horsepower, which, under continuous operation with reasonable load factor, is possible of development from all water available therefor, falling through effective head, with deductions for reasonable mechanical and electrical losses in generating machinery. Deductions will be allowed on account of unreserved lands or patented lands if any portion of the reservoir is located on same. Similar deductions will be allowed if any part of the conduit is on such lands. From the gross power capacity remaining after the above deductions have been made, shall be made a further deduction, which deduction, in per cent, shall be calculated by multiplying the square of the distance of primary transmission in miles by the constant factor 0.001, provided, however, that in no case shall deduction exceed 25 per cent.

Provision will probably be made for a review every 10 years of the "power capacity" of the plant.

The rental rates are not to exceed the following amounts per net electrical horsepower per annum:

For the 1st year	0.10 dollars
For the 2nd year	.20 dollars
For the 3rd year	.30 dollars
For the 4th year	.40 dollars
For the 5th year	.50 dollars
For the 6th year	.60 dollars
For the 7th year	.70 dollars
For the 8th year	.80 dollars
For the 9th year	.90 dollars
For the 10th year to 50th year inclusive	1.00 dollars

Provision will probably be made for the termination of the agreement and the right to occupy the lands at the expiration of 50 years, unless sooner revoked by the Secretary of Agriculture, but with provision of possible renewal of rights.

The construction of new power plants should be subject to the approval of an established commission. Permits and charters should have a time limit, say 50 years. The purpose of this provision is to give a sufficiently long period of enjoyment to the investor under unchanging terms and conditions, so that the same will attract and justify investment in the development of power and industrial enterprise connected therewith. It is believed that the period stated will give every investor practically a life time in which to get returns on his investment and on the other hand will leave to future legislatures the right to legislate to meet the conditions then existing. A permit might be made non-transferable only on the approval of the governor and council.

DECISIONS OF LAW.

The Supreme Judicial Court of the State of Maine in the case of the City of Auburn vs. the Union Water Power Co. (90 Maine, 577), held:

It is a rule of law peculiar to this State and Massachusetts under the Colonial Ordinance of 1641-7 that all great ponds,—that is, ponds containing more than 10 acres,—are owned by the State.

While private property cannot be taken for public use without compensation, the waters of great ponds and lakes are not private property.

Under the ordinance, the State owns the ponds as public property held in trust for public uses. It has not only the jus privatum, the ownership of the soil, but also the jus publicum and the right to control and regulate the public uses to which the ponds shall be applied.

The authority of the State to control waters of great ponds and determine the uses to which they may be applied, is a governmental power and the governmental powers of the State are never lost by mere nonuse.

The same court, in the case of Emily P. McFadden vs. Haynes & Dewitt Ice Co., (86 Maine, 319), held:

Below the line of low water, the State owns the beds of the navigable rivers and great ponds and holds them in trust for the public.

The Supreme Court of the United States has established the right of a State or municipality to fix charges in the case of a public utility company selling its products within the limits of such State or municipality.

A STATE POLICY.

The State of Maine ranks third in the Union in the total horse-power developed. It has natural storage facilities per square mile of area, that can be improved by artificial construction, unsurpassed by any State. If Maine desires to assume active control of its water powers or storage reservoirs, it should take early and adequate steps to that end, for the reasons: first, before private power rights become further vested, and second, before the shores of its lakes are more thickly settled and land damages increase, if the ponds and lakes are to be utilized as reservoirs.

The much discussed problem of the relation of our lakes to the large summer tourist travel can be looked at both from a commercial and altruistic standpoint. Conservation of the twenty million dollars or over, as has been estimated, brought into the State every summer, from the outside, should be considered. It is, furthermore, the duty of the State to consider, to a certain extent, the regulation of reservoirs, in ways that will not be objectionable to the artistic views of the people. The utilization of our lakes and ponds for manufacturing and commercial uses may be of primary importance, but the scenic side should also be made prominent. The developers of water powers, in some cases, are inclined to neglect, and occasionally ridicule this stand, and the State should therefore assume control. With a central state authority having in its possession all the hydraulic facts of a drainage basin or system of storage, certain legislative fights, that have occurred in the past, should be obviated. Lines of compromise should be found, that will satisfy the manufacturer, the sportsman, and the lover of the beauties of nature.

Will not State regulation of reservoirs inure to the benefit of power users? Let us consider a concrete example: that of the Kennebec River basin. In the earlier days the storage on Moosehead and other lakes, was controlled by the various log driving associations. To a certain extent lumbering and water power interests conflict on the same stream in regard to the manner of use of stored water. The use of water for log driving begins early in the spring and continues well into the summer. Formerly little or no care was taken to prevent the waste of water during log driving, with the result that frequently by the end of the log driving season, little water would be left stored in Moosehead Lake, and consequently the water power users on the river suffered from a scarcity of water in the fall and early winter. In later years, however, the log driving and water power interests became more harmonious and the two associations, the Kennebec Log Driving Association and the Kennebec Water Power Company, worked together. The former controlled the dams at the outlets of the lakes. The latter company spent considerable money to improve the river channel and facilities for driving, thus preventing the needless waste of water in log driving and storing it instead to be used in the fall for the benefit of the power companies. By these improvements, the driving head, as it is called, the amount of water used in driving logs out of Moosehead Lake was reduced from about 3500 sec. ft. to about 2200 sec. ft.

The third stage has now been reached. The Kennebec Power Company is a mutual organization. Funds, especially for river improvements, have been raised by assessments, but there is no way, under the charter of the company, of enforcing assessments. In the last year or so, some of the companies have refused to pay any assessments, on the ground that further improvements are unnecessary. It would seem that this example is an excellent argument for state control of reservoirs.

Numerous other examples of unsatisfactory river and reservoir regulations through the State could be given.

The following plan is suggested for such a state control of reservoirs: Divide the State into districts by river drainage lines; district superintendents having in charge the regulation of reservoirs to be appointed by the water users of that basin, by the log driving association, the water power users and the reservoir owners; the appointment of said district superintendents to be approved by the Water Storage Commission; and the said superintendents to report to the engineer of the Commission.

This provides for appointment of practical men to control the reservoirs but they reporting to a central authority who will have power to settle difficulties when they arise.

STATE RENTAL OF WATER POWERS.

Whatever policy the State may adopt for the conservation of its water resources, let there be no unnecessary hampering of water power development, but let the public in on the ground floor at the start, for the public must first grant the power, and for all time the public will be the party chiefly interested in its use.

There seems to be no doubt among authorities that if the State should adopt the policy and actually build storage reservoirs, it could charge a rental on account of the increased powers to developed water privileges that would be benefited thereby. It is believed that the State has not yet reached this stage of development.

It is believed, however, that the State should insist on publicity of plans of proposed water power developments by requiring the approval of the plans by the State Water Storage Commission before allowing construction.

Furthermore this State, following the example of other states, should charge an annual franchise fee for all new franchises of water powers or reservoirs granted. The State should receive compensation for valuable rights conferred.

Permits, charters or franchises for water powers should have a time limit, say 50 years.

It would seem that the State of Maine, under the decisions of the State Supreme Court, quoted previously, had peculiar and extensive powers over the lakes of the State, that contribute so much to the value of its water powers. Could the State place rentals on developed water powers under the provisions of the law?

Another feature under discussion throughout the country is the question of rentals on undeveloped water privileges. This subject will not be considered further in this report.

If a method of rental is developed, it should be as simple as possible and the rates at first should be extremely low.

Many authorities on the subject advocate that the rental rate should be based on the capacity of the canal or penstock above the wheels and the effective head. These data can be obtained by qualified engineers in the field. The tendency on the part of the power owners would be to conserve their water resources by developing as highly an efficient plant as possible and not to waste water.

At the present time one of the latest views that obtains on the rentals of water powers, under the present conditions of hydro-electric development, is to base the rental on a certain percentage of the gross receipts secured by a power company; or if the power is used without consideration, a percentage based on an appraisal of the value of said power. The advocates of this plan hold that this is the logical plan, because if any state be justified in making charges of this kind, the justification arises from the fact that the state has made concessions that are of value to the concessioner, and upon which a profit is to be realized. Therefore the charges should be based on that profit or on the value of the concession granted. In such cases it would probably be advisable to adjust the percentages in four or five-year periods, having a merely nominal charge, during the first five years of operation, and raising it thereafter according to the prosperity of the plant.

The proceeds from the rentals of water powers should be used to conserve the natural resources of the state, to conserve the forests, in the building of storage dams, etc., and to provide funds for the operation of the department having charge of the work.

RECOMMENDATIONS.

Complying with the request of the legislature to report a plan, and the necessary steps that should be taken by the State to increase and conserve the water powers of the State, it is recommended that the State Water Storage Commission be given authority along the following lines:

First—To require every person, firm, or corporation, contemplating the construction of a dam for the storage of water or the development of water power in the State, to submit their plans to the Commission and obtain the approval of the Commission before beginning construction.

Second—To require every person, firm, or corporation applying for a charter for the development of storage or water power, to submit their plans to the Commission for approval before beginning construction; to provide for practically the same requirements in the case of agreements for the merger or consolidation of two or more corporations for the same purpose; to require the approval of the Commission in all cases of sale, assignment, disposition or transfer of any franchise of a company formed for the development of storage or water power.

Third—To assess and collect fees annually for all franchises of water power which may be granted hereafter by the State, the amount of assessment being on a sliding scale and based either on the gross receipts of the company, or on the horsepower proposed to be developed.

Fourth—To assume control and regulation of all reservoirs now built or that will be built by private parties on lands in part or in whole controlled by the State, known as public lots or State lands, and on all great ponds and lakes of the State, taking care in such legislation not to injuriously affect vested rights. For a suggested plan for the administrative control of reservoirs reference should be made to page 26. Briefly stated, it contemplates the formation of river districts with district superintendents in charge of the regulation of reservoirs; said district superintendents to be appointed by the water users, approved by the State Water Storage Commission, and reporting to the engineer of said Commission.

PART II.

This section contains data relative to the water resources of the State: forestry; precipitation; evaporation; water powers both developed and undeveloped; and surface water supply, including the run-off of rivers, as on such data accurate engineering plans of water powers and reservoir storage depend.

TOPOGRAPHIC, RIVER AND LAKE SURVEYS.

The U. S. Geological Survey, in co-operation with the State Survey Commission, for the past several years have been prosecuting surveys throughout the State. The results of the topographic work appear in the standard quadrangles of the U. S. Geological Survey. The unit of publication is an atlas sheet showing a tract (quadrangle) 15′ in extent each way or from 203 to 226 square miles, varying with the latitude. The scale is 1:62,500 or about one mile to an inch. Contours, or lines of equal elevation, are shown with a 20-foot interval. These sheets are sold by the U. S. Geological Survey at the rate of five cents a sheet. When one hundred or more are ordered, the rate is $3.00 per hundred.

Fifty sheets have been issued for the State of Maine, named as follows: Eastport, Petit Manan, Cherryfield, Bar Harbor, Swan Island, Mt. Desert, Ellsworth, Deer Isle, Bluehill, Orland, Orono, Matinicus, Vinalhaven, Castine, Penobscot Bay (scale 1:125,000), Bucksport, Bangor, Tenants Harbor, Rockland, Monhegan, Boothbay, Wiscasset, Vassalboro, Waterville, Small Point, Bath, Gardiner, Augusta, Norridgewock, Anson, Bingham, The Forks, Casco Bay, Freeport, Lewiston, Biddeford, Portland, Gray, Poland, York, Kennebunk, Buxton, Sebago, Norway, Dover, Berwick, Newfield, Fryeburg, Kezar Falls, North Conway, N. H., and Gorham, N. H.

The following sheets are in course of publication: Livermore and Buckfield.

Special river and lake surveys of many of the more important rivers and lakes in the State have been made. The resulting river maps, generally on a scale of 1 inch to 2000 feet, show, not only the plan of the rivers with 5-foot contours along the banks, but also the profiles of the rivers. These maps are of great value in studying both developed water powers and undeveloped water power possibilities. From these maps can be obtained a close estimate of the total horsepower that can be developed at the various unutilized falls and rips, when studied in connection with the stream gaging work.

The special lake maps are on varying scales of one inch to 1,200 feet, 2,000 feet, 3,000 feet, and 4,000 feet. Some large scale maps, one inch to 200 feet, of the outlets of a number of the lakes are also shown. These maps in general show the high water line, the low water line, and the 5-foot contour lines from 10 to 25 feet above the lake. Soundings are often shown, and occasionally several 5-foot sub-contours. These sub-contour lines are interesting, in that they represent the shore lines that would result if the lakes should be drawn down 5 or 10 feet as the case may be. These lake maps are of special value in computing the capacity of the various lakes in cubic feet when used as storage reservoirs.

The following is a list of these maps to date. They are issued upon request, to interested parties as long as the edition lasts.

River and Lake Surveys.

Kennebec Basin.

1. Kennebec River, Skowhegan to The Forks Sheet No. 1.
2. Kennebec River, Skowhegan to The Forks, Sheet No. 2.
3. Kennebec River, Skowhegan to The Forks, Sheet No. 3.
4. Kennebec River, Skowhegan to The Forks, Sheet No. 4.
5. Kenebec River, The Forks to Moosehead Lake.
6. Kennebec River, Profile, Augusta to Moosehead Lake.
7. Brassua Lake and plan of outlet.
8. Wood Pond and plan of outlet.
9. Attean Pond.
10. Long Pond; Holeb Pond; Moose River, Moosehead Lake to Brassua Lake.
11. Flagstaff Lake; West Carry Pond; Spring Lake; Spencer Ponds; Middle Roach Pond; Lower Roach Pond.

Penobscot Basin.

12. Penobscot River, Bangor to North Twin Lake, Sheet No. 1.
13. Penobscot River, Bangor to North Twin Lake, Sheet No. 2.
14. Penobscot River, Bangor to North Twin Lake, Sheet No. 3.
15. Penobscot River, Bangor to North Twin Lake, Sheet No. 4.
16. Penobscot River, Bangor to North Twin Lake, Sheet No. 5.

17. West Branch Penobscot River, Chesuncook Lake to Ambejejus Lake, Sheet 1.
18. West Branch Penobscot River, Chesuncook Lake to Ambejejus Lake, Sheet 2.
19. West Branch Penobscot River, Chesuncook Lake to Ambejejus Lake, Sheet 3.
20. East Branch Penobscot River, First Grand Lake to Medway, Sheet No. 1.
21. East Branch Penobscot River, First Grand Lake to Medway, Sheet No. 2.
22. East Branch Penobscot River, First Grand Lake to Medway, Sheet No. 3.
23. Chamberlain, Telos, and Webster Lakes and Round Pond.
24. Baskehegan, First and Second Grand and Allagash Lakes.
25. Mattawamkeag River, mouth to No. Bancroft, Sheet No. 1.
26. Mattawamkeag River, mouth to No. Bancroft, Sheet No. 2.
27. Mattawamkeag River, mouth to No. Bancroft, Sheet No. 3.
28. Schoodic, Seboois, Endless and Mattawamkeag Lakes and Pleasant Pond.
29. West Branch Penobscot River, Chesuncook Lake to Seeboomook, Sheet No. 1.
30. West Branch Penobscot River, Chesuncook Lake to Seeboomook, Sheet No. 2.

Androscoggin Basin.

31. Androscoggin River, Brunswick to Umbagog Lake—profile only—Sheet No. 1.
32. Androscoggin River, Brunswick to Umbagog Lake—profile only—Sheet No. 2.
33. Androscoggin River, Brunswick to Umbagog Lake—plan and profile—Sheet No. 3.
34. Androscoggin River, Brunswick to Umbagog Lake—plan and profile—Sheet No. 4.
35. Androscoggin River, Brunswick to Umbagog Lake—plan and profile—Sheet No. 5.
36. Androscoggin River, Brunswick to Umbagog Lake—plan and profile—Sheet No. 6.
37. Androscoggin River, Brunswick to Umbagog Lake—plan and profile—Sheet No. 7.
38. Androscoggin River, Brunswick to Umbagog Lake—plan and profile—Sheet No. 8.
39. Androscoggin River, Brunswick to Umbagog Lake—plan and profile—Sheet No. 9.
40. Androscoggin River, Brunswick to Umbagog Lake—plan and profile—Sheet No. 10.
41. Umbagog, Lower and Upper Richardson Lakes, Sheet No. 1.
42. Mooselucmaguntic Lake, Sheet No. 2.
43. Mooselucmaguntic and Richardson Lakes, Outlet plans. Sheet No. 3.

Union River Basin.

44. Abraham, Scammons and Molasses Ponds and Webbs Pond Outlet, Sheet No. 1.
45. Alligator, Rocky and Spectacle Ponds, Sheet No. 2.
46. Great Pond, Green Lake Outlet and Branch Lake Outlet, Sheet No. 3.
47. Union River, Ellsworth to Great Pond, Sheet No. 1.
48. Union River, Ellsworth to Great Pond, Sheet No. 2.

Field Work of 1910.

During the season of 1910, under the co-operative agreement of December 1, 1909, surveys were made as follows:

Androscoggin Basin.

Rangeley Lake, proper, Kennebago River, and Lake, Rapid River and Pond-in-River.

Kennebec Basin.

Dead River, mouth to Chain of Ponds.
Spencer Stream, mouth to first dam.
Little Spencer Stream.
South Branch Dead River.
King and Bartlett, Little Bartlett, Baker, Tim, and J'm Ponds, and Chain of Ponds.
Sandy River, mouth to Madrid Station, Clearwater Pond.

Penobscot Basin.

Piscataquis Basin.
Piscataquis River, mouth to Blanchard.
Schoodic Stream.
Pleasant Stream, mouth to Katahdin Iron Works.
Houston Stream.
Houston Pond and Silver Lake.
Sebec Stream and Sebec Lake.

PUBLICATIONS.

The results of the co-operative work of the U. S. Geological Survey and the State Survey Commission have appeared in the various publications of the Federal Bureau as described below. The following abbreviations are used: A, Annual Report; Pt, Part; M, Monograph; P, Professional Paper; B, Bulletin; W, Water Supply Paper; M. R., Mineral Resources; G. F., Geological Folio. The map work has previously been described.

STREAM MEASUREMENTS.

Report of progress of stream measurements for 1897......A 19, Pt. 4
Operations at river stations for 1898......................W 27
Report of progress of stream measurements for 1898......A 20, Pt. 4
Operations at river stations for 1899......................W 35
Report of progress of stream measurements for 1899......A 21, Pt. 4
Operations at river stations for 1900......................W 47
Report of progress of stream measurements for 1900.......A 22, Pt. 4
Operations at river stations for 1901......................W 65
Report of progress of stream measurements for 1901......W 75
Report of progress of stream measurements for 1902......W 82
Report of progress of stream measurements for 1903......W 97
Report of progress of stream measurements for 1904......W 124
Report of progress of stream measurements for 1905......W 165
Determination of stream flow during the frozen season, by H. K. Barrows and R. E. Horton.......................W 187
Water Resources of Kennebec River Basin by H. K. Barrows ....W 198
Surface Water Supply of New England, 1906.............W 201
Surface Water Supply of the North Atlantic Coast 1907, 1908 ....W 241
Surface Water Supply of the North Atlantic Coast 1909....W 261
Index to hydrographic progress reports of the U. S. Geological Survey, 1888 to 1903 inclusive......................W 119
Turbine water-wheels and power tables by R. E. Horton..W 180
Weir experiments, coefficients and formulas, by R. E. Horton ....W 200

WATER RESOURCES.

GEOLOGY.

Contributions to economic geology, 1906, by S. F. Emmons and E. C. Eckel..B 315

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FORESTRY.

The area of the State of Maine is 33,040 square miles. Of this area approximately 21,000 square miles or about 64%, is forest land. The act creating the State Water Storage Commission contemplates certain investigations on the condition of a portion of the forests. The Commission is asked to ascertain what townships or parts of townships of land can be purchased by the State and the cost thereof, with all necessary data for the correct understanding of their value as a forest reserve or for conserving the water powers of the State or for reforestation. It is also asked to investigate the extent and value of the denuded, burnt over, or barren lands in the State with a view to their purchase by the State for reforestation.

Such an investigation is comprehensive and would require a large outlay of money far in excess of the appropriation allowed the Commission. In order to arrive at an approximate cost of such an exploration let us consider the figures from actual work. For the last year or so the State Assessors have had an annual appropriation of $5,000 for a timber survey of the wild lands of the State. They have averaged about fifteen townships a year. The cost has ranged from a little under 1 cent for easily accessible townships, to about 2 cents per acre for the more remote ones. The average cost in Wisconsin for such a timber investigation has been about 2½ cents per acre. It is believed that the cost in the State of Maine is economical. This cost ranges, then, from about $6 to $13 per square mile. To make such an exploration of the entire 21,000 square miles an expenditure of from $125,000 to $275,000 would be required. To make the investigation of the denuded land, alone, as outlined by section 8 of the act in question, would require an appropriation of at least $50,000.

Having in mind the suggested plan of a national or state forest reserve in the vicinity of Mt. Katahdin, an attempt was made to obtain the cost of purchase of land in that vicinity. Township 3, Range 9, in which Mt. Katahdin is located, is owned by three families or individuals, one owning one half of the township, one three eighths, and one one eighth of the area. It was found that none of the owners were willing to make a definite price per acre on their land, but some owners would be willing to sell to the State provided a price could be agreed upon. The commercial rate for good average timber land through the State ranges from $4 to $8 per acre. At these rates the value of the township in question would be from $90,000 to $185,000.

In the matter of denuded, burnt over, or barren lands in the State, of which said section 8 requires the Commission to ascertain the extent and value, with a view to their purchase by the State for the purpose of reforestation, the appropriation of the Commission was not sufficient to allow for an investigation of this kind. No investigation of the extent of such lands has ever been made and any estimate of the acreage would be the veriest guess of whatever authority might make it. According to prevailing prices, barren lands, that is, lands that are practically not capable of reproduction, might be purchased for 50 cents an acre. Burnt over lands, that might be susceptible of reforestation, might be purchased for $1 per acre. The cost of reforestation, that is, the purchase of seedling pines from nurseries, and the planting of same, would cost on an average of $16.00 per acre.

PRECIPITATION.

In an engineering study of any drainage basin whether for storage problems or water power investigations, a knowledge of the amount of rainfall, the maximum, the minimum, and the average is valuable. The stream flow is the more important, for instance in a study of a water power possibility, but often this information is not available for certain streams. Precipitation records are then used. Run-off records may be available for some adjoining basin. Then from a comparison of the rainfall in the two basins and the run-off of one, the run-off of the other may be computed. A study of a long rainfall record is valuable at times as showing either an excess or deficient series of years that may not be covered by a run-off record. There are several ways of studying rainfall records; by monthly and yearly averages, by graphic curves of monthly and yearly records and by the computations and study of "mass curves."

Studies of the general distribution of rainfall in the State have been made during the past year, and many interesting facts have been perceived. It has been the wish to construct a rainfall map of the State showing by isohyetal lines, or lines of equal rainfall, a long time average distribution of rainfall for the State. The preparation of such a map is a considerable piece of work. There are a few long term, say 20 year records and over, and many short period records. These latter may cover periods of abnormal rainfall, either maximum or minimum cycles, and it is necessary to reduce them to the basis of the long term records.* The method was adopted of correcting the average of each short term series of records to make it con-

*See Progress Report, 1908, New York State Water Supply Commission, page 143.

form to the normal or long term average, by first finding at the neighboring long term stations what percentage the rainfall in each of the years covered by the said short record had borne to the long term average and then compensating the average of the short term series in the same ratios.

Time was not sufficient with the small office force to complete these computations and the map is not ready for publication.

In computing the mean monthly and yearly precipitation, where data were lacking for a few months only, they have usually been supplied from adjacent stations, as noted, using "Fournie's Method," (a) briefly explained as follows: If X is the station at which a monthly record is missing and A, B, etc., two or more adjacent stations, where records were obtained, the ratio of precipitation at X to that at A, B, etc., is obtained, for the month in question, over a period when records were taken at all the stations. These ratios are applied to the values of precipitation at A, B, etc., during the month when the observations were not made at X to obtain the probable precipitation at the latter point. The adjacent stations, A, B, etc., will give probable values of precipitation at X, which can be averaged or weighted in deciding upon the result to use for X during the missing month.

Computations are in progress for mass curves for all long time records, as by this graphical method, the best study can be made of variations of rainfall at any place or the relation of rainfall at different places. For an explanation of the generel properties and uses of mass curves reference should be made to Water Supply Paper 198, Page 153, U. S. Geological Survey.

Briefly described, the mass curve is computed as follows: For each year, the excess (+) or the deficit (—) of the annual precipitation from the mean of the period is computed. The arithmetical sum of these values is then taken by adding the excess or subtracting the deficit as the case may be. These figures, as computed for each year, are used in plotting the mass curve.

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a. See Monthly Weather Review, U. S. Weather Bureau, January, 1907.

As an example of the use of the mass curve, the one for Lewiston will be considered. (See figure 1).

This figure shows graphically the mean annual precipitation for each year since 1875 and its relation to the mean for the entire period. The mass curve in the upper part of the figure shows the tendency toward a cyclical surplus or deficit. It gives for any year the total yearly excess precipitation since 1875 over the mean for the period 1875-1909. An ascending part of the curve shows a time when the mean annual precipitation is in excess of the mean for the period, and conversely, a descending portion of the curve indicates a time of deficit in annual precipitation as compared with the mean for the period.

Beginning with 1903 the curve steadily descends, with a total deficit of about 39 inches in the 7 years to the end of 1909, and it is evident that a study of the mean of results at stations maintained only during this time would not be a true value of the average precipitation to be expected upon the drainage basin.

A study of the mass curve for the Orono record shows almost identical results. Beginning with the same year, 1903, there is a steady descent for 6 years showing a total deficit of 32 inches.

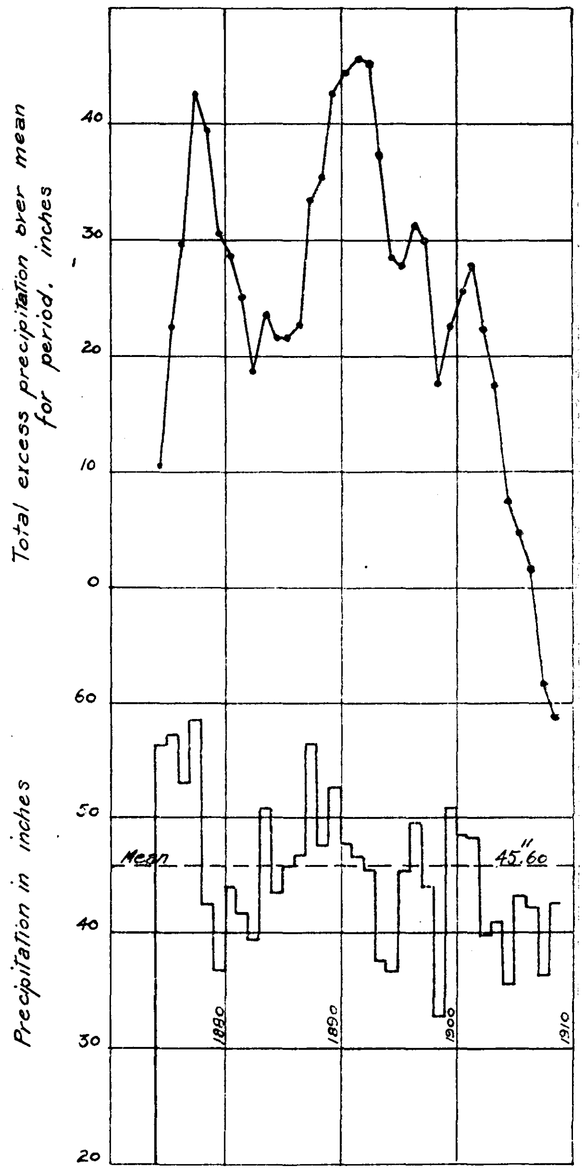


Fig. 1.—Mean annual precipitation and mass curve of precipitation at Lewiston, Maine.

The tables below are all the rainfall records that were known to be available anywhere in the State. Considerable hitherto-fore unpublished data are here included, and it is believed that this is the most complete record of rainfall ever published for this State.

List of Rainfall Stations.

St. John River Basin.
- Ft. Kent, 1844-1894
- Soldier Pond, 1905-1910
- Van Buren, 1902-1909
- Ft. Fairfield, 1905-1906
- Presque Isle, 1910
- Houlton, 1892-1910

St. Croix River Basin.
- Eastport, 1833-1910

Union River Basin.
- Ellsworth, 1908-1910

Penobscot River Basin.
- Patten, 1902-1910
- Danforth, 1902-1910
- Chesuncook P. O., 1904-1906
- Grant Farm, 1904-1906
- Debsconeag, 1905-1909
- Chesuncook Dam, 1905-1910
- Millinocket, 1899-1910
- Mayfield, 1885-1908
- South Lagrange, 1903-1905
- Carmel, 1900-1902
- Orono, 1869-1910
- Belfast, 1859-1904
- Bar Harbor, 1885-1910

Kennebec River Basin.
- Jackman, 1894-1906
- Roach River, 1901-1903
- Greenville, 1895-1910
- Flagstaff, 1895-1901
- The Forks, 1901-1910
- Solon, 1902-1903
- Madison, 1894-1910
- Farmington, 1891-1910
- Fairfield, 1886-1910
- Winslow, 1895-1910
- Kent's Hill, 1891-1894
- Gardiner, 1837-1910

Androscoggin River Basin.
- Oquossoc, 1900-1910
- Upper Dam, 1886-1910
- Middle Dam, 1905-1910
- Errol, N. H., 1885-1910
- Rumford Falls, 1894-1910
- Livermore Falls, 1909-1910
- Lewiston, 1875-1910

Presumpscot River Basin.
- North Bridgton, 1861-1910
- Songo, 1900-1910
- Portland, 1856-1910

Saco River Basin.
- Cornish, 1857-1910
- Union Falls, 1904-1909
- Biddeford, 1881-1910

FORT KENT, AROOSTOOK CO., ME.—Elevation, 532 feet.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1844	-----	-----	-----	-----	-----	-----	-----	-----	1.36	4.41	3.86	3.36	-----
1845	3.75	2.60	1.77	1.06	2.63	1.36	7.72	2.57	-----	-----	-----	-----	-----
1846 } 1892 }	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1893	1.82	0.98	0.74	1.20	2.72	2.31	-----	5.27	3.73	2.30	1.13	3.69	-----
1894	1.85	0.50	1.60	1.20	1.09	4.09	-----	-----	-----	-----	-----	-----	-----
Means	2.14	2.16	1.87	2.40	1.84	2.76	3.36	2.72	2.86	2.78	2.05	2.62	29.56

SOLDIER POND, AROOSTOOK CO., ME.—Elevation, 570 feet.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1905	-----	-----	-----	-----	-----	-----	2.61	1.37	2.06	1.63	1.77	-----	-----
1906	-----	-----	-----	-----	1.97	2.95	1.38	2.24	2.72	4.99	0.35	-----	-----
1907	-----	-----	-----	-----	2.23	4.31	6.83	3.27	4.00	4.46	1.60	3.06	-----
1908	2.48	2.90	1.67	2.21	2.31	2.68	1.69	3.77	0.40	1.92	1.19	2.05	25.27
1909	2.44	2.25	3.32	2.25	0.50	2.55	3.93	4.20	5.90	1.20	3.55	3.40	35.49
1910	1.50	1.32	0.61	2.75	2.19	1.29	3.74	1.48	2.10	2.46	3.82	1.98	25.24
Means	2.14	2.16	1.87	2.40	1.84	2.76	3.36	2.72	2.86	2.78	2.05	2.62	29.56

VAN BUREN, AROOSTOOK CO., ME.—Elevation, 510 feet.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1902	-----	-----	-----	2.17	4.42	6.54	3.48	2.69	5.64	5.51	2.24	2.75	-----
1903	2.70	3.81	4.65	2.25	1.56	2.03	4.71	3.05	1.12	2.57	2.05	2.51	33.01
1904	2.76	2.19	3.28	2.21	5.04	2.74	4.85	2.16	5.10	2.86	0.64	1.43	35.26
1905	1.42	1.61	0.78	1.08	3.26	3.27	2.54	0.15	2.20	1.14	1.60	2.60	21.65
1906	1.40	1.45	2.99	1.60	1.90	4.50	2.50	6.00	3.50	6.30	2.10	3.80	38.04
1907	2.80	1.80	3.20	2.30	0.90	6.20	5.90	4.40	3.70	2.87	3.00	4.70	41.77
1908	2.55	4.90	2.10	2.00	5.10	2.80	1.80	5.45	0.75	3.60	1.19	1.00	33.24
1909	2.60	2.60	1.00	3.00	1.00	3.30	5.60	-----	-----	-----	-----	-----	-----
Means	2.32	2.62	2.57	2.08	2.90	3.92	3.92	3.41	3.14	3.55	1.83	2.68	34.94

March, '06, Ft. Fairfield; November, '08, Soldier Pond.

FORT FAIRFIELD, AROOSTOOK CO., ME.—Elevation, 398 feet.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1905	2.12	1.21	.92	0.8	-----	2.09	2.44	.72	1.69	1.40	3.03	-----	-----
1906	1.86	1.56	2.99	2.55	2.68	3.52	-----	1.75	3.48	-----	-----	-----	-----

PRESQUE ISLE, AROOSTOOK CO., ME.—Elevation, 445 feet.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1910	1.89	-----	0.92	3.49	3.91	2.90	6.38	0.93	2.75	2.37	2.78	1.73	-----

HOULTON, AROOSTOOK CO., ME.—Elevation, 362 feet.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1892	*5.76	1.74	2.15	0.87	2.12	6.54	3.78	5.74	3.65	1.78	3.50	1.42	39.05
1893	3.27	3.49	0.99	1.57	1.30	†2.31	3.91	2.98	4.03	3.90	0.85	3.57	32.17
1894	2.54	1.75	1.52	0.72	3.05	4.07	3.78	2.22	*1.46	4.89	2.78	3.73	32.51
1895	2.55	1.30	*2.90	3.55	1.30	3.65	2.43	3.10	1.11	1.70	5.78	4.50	33.87
1896	0.85	3.00	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1902	-----	-----	-----	1.25	2.87	8.06	3.28	4.09	4.10	4.73	1.88	4.62	-----
1903	3.14	2.68	5.49	2.50	0.30	2.45	2.78	1.55	1.15	2.40	2.62	2.00	29.06
1904	4.60	2.35	2.60	2.80	3.65	2.52	2.58	3.00	6.70	3.40	2.20	1.44	37.84
1905	3.55	1.60	0.70	1.25	2.00	1.50	1.45	0.12	1.80	1.00	2.25	2.40	19.62
1906	2.70	2.10	3.20	3.20	2.00	1.40	2.55	1.50	1.20	‡7.34	1.20	‡2.48	30.87
1907	1.90	1.50	1.70	1.75	1.00	4.20	‡3.08	3.22	5.00	3.10	2.10	2.00	30.55
1908	1.89	4.75	2.51	2.25	2.20	2.00	1.30	3.57	0.49	1.35	1.07	1.50	24.88
1909	3.64	3.70	2.95	4.09	‡1.54	3.20	2.15	1.65	6.14	1.25	2.34	2.05	34.70
1910	.95	2.00	1.40	2.66	3.75	2.50	2.17	1.07	0.85	1.65	1.42	0.87	21.29
Means	2.87	2.46	2.34	2.19	2.08	3.41	2.71	2.60	2.90	2.96	2.31	2.51	31.34

*Eastport.
†Fort Kent.
‡No record—figures supplied from Patten and Millinocket records by Fournie's method.

EASTPORT, WASHINGTON CO., ME.—Elevation, 53 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1833	3.60	1.00	2.50	4.30	4.70	4.60	3.70	6.65	1.40	5.20	2.80	2.55	43.00
1834	1.70	0.90	2.00	2.00	4.30	3.40	1.70	5.00	3.00	7.20	3.50	2.50	37.20
1835 } 1872 }	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1873	-----	-----	-----	4.40	2.42	3.13	4.46	2.40	4.37	7.38	5.32	1.56	-----
1874	2.70	2.36	3.02	3.09	4.71	6.82	3.27	5.13	3.67	1.73	4.12	1.94	42.56
1875	0.89	3.93	1.39	1.80	2.90	5.86	6.61	4.29	5.21	7.50	3.93	1.11	45.42
1876	2.94	7.70	9.39	3.10	3.42	2.09	2.82	2.62	6.53	4.28	7.97	5.13	57.99
1877	3.42	1.34	8.83	5.47	2.60	2.19	3.36	5.85	1.73	4.67	8.20	2.96	50.62
1878	7.05	1.89	6.07	5.54	2.49	5.65	5.87	3.74	2.54	3.28	2.97	4.28	51.37
1879	1.65	3.39	3.78	3.95	3.18	3.42	5.57	3.66	3.42	3.28	4.52	3.67	43.48
1880	4.29	3.99	4.08	2.97	2.55	1.64	3.45	1.48	4.28	5.11	5.07	3.53	42.44
1881	1.64	4.11	6.78	1.66	13.22	4.47	3.73	3.64	2.80	4.31	3.37	6.25	55.98
1882	3.70	4.94	7.54	3.03	3.30	6.53	4.80	1.41	4.77	2.89	1.47	2.80	47.18
1883	3.20	3.63	3.61	2.25	6.60	5.23	9.07	0.49	2.49	8.41	3.76	4.43	53.17
1884	4.37	9.38	3.74	6.83	6.79	2.18	8.48	4.41	1.89	1.88	5.95	8.63	64.53
1885	3.86	2.95	5.94	5.35	4.79	4.64	1.99	4.26	3.64	5.96	4.78	5.90	54.06
1886	9.01	3.25	2.28	1.14	3.49	6.66	1.73	2.41	2.73	*2.58	*5.74	6.51	41.53
1887	7.78	3.73	4.46	2.92	2.57	6.01	4.51	3.56	1.05	2.45	2.32	5.59	46.96
1888	5.08	4.81	4.26	2.01	2.74	1.94	3.46	4.50	5.44	7.95	6.70	4.36	53.25
1889	3.44	4.13	4.06	3.19	2.20	2.85	3.69	2.00	2.52	5.02	4.60	4.56	42.26
1890	3.76	4.58	5.85	1.95	6.19	2.77	1.97	5.35	4.86	2.28	2.84	2.62	45.02
1891	5.50	3.13	2.75	1.37	1.64	3.00	2.61	4.06	2.65	4.43	2.31	2.99	36.44
1892	5.76	1.88	3.60	1.51	2.17	3.54	1.21	4.64	1.21	1.49	3.17	2.02	32.20
1893	2.08	3.26	1.35	1.94	1.91	1.85	2.61	4.04	1.93	1.83	0.99	6.08	29.87
1894	2.00	1.28	1.19	2.11	1.69	3.37	1.21	1.32	1.46	2.42	2.62	2.17	22.84
1895	2.70	1.93	2.90	2.29	1.29	1.46	3.17	4.83	2.00	1.15	6.41	2.75	32.88
1896	0.84	2.77	2.72	0.86	1.00	2.71	4.24	1.07	3.67	6.27	3.69	1.70	31.54
1897	3.14	1.45	4.03	3.35	7.88	3.32	2.78	2.79	1.82	0.61	5.79	2.61	39.57
1898	5.41	6.37	2.65	3.80	2.14	3.09	0.66	2.15	2.93	6.85	6.12	2.99	45.16
1899	3.86	3.35	5.48	0.89	3.92	2.58	4.78	0.53	2.03	1.92	3.68	3.42	36.44
1900	5.27	4.51	4.97	2.47	5.18	4.00	1.37	2.58	1.52	8.26	4.40	2.82	47.35
1901	4.80	1.65	4.88	5.58	3.29	5.45	0.91	2.48	2.92	1.72	1.91	6.02	41.62
1902	3.41	3.06	9.11	2.16	3.85	2.51	1.05	3.23	2.43	3.36	1.47	5.77	41.41
1903	3.85	4.01	4.98	3.33	2.52	1.69	3.85	1.14	1.62	2.83	3.59	3.26	36.67
1904	3.04	3.97	4.95	3.36	2.23	1.29	2.10	6.10	5.36	2.54	1.54	2.41	38.89
1905	4.14	2.77	1.10	0.83	2.64	3.03	2.62	1.76	4.32	0.47	4.29	3.91	31.88
1906	3.36	2.30	6.32	3.51	5.63	1.46	2.01	1.79	0.78	3.64	3.56	5.13	39.49
1907	5.05	4.59	3.17	4.54	1.84	1.57	4.32	2.43	4.41	4.71	2.85	4.94	44.42
1908	4.17	3.71	3.96	2.64	2.58	1.01	1.95	3.32	1.60	4.09	1.52	5.01	35.56
1909	7.09	4.76	5.10	3.86	1.56	1.59	3.37	1.61	6.40	2.54	3.62	1.69	43.19
1910	3.80	4.52	1.98	3.42	1.55	2.72	1.92	1.44	1.84	1.85	2.14	3.68	30.86
Means	3.93	3.52	4.28	3.02	3.54	3.18	3.32	3.46	3.00	3.26	3.89	3.71	42.11

*Bar Harbor record.

ELLSWORTH, HANCOCK COUNTY, ME.—Elevation, 73 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1908	-----	-----	-----	-----	-----	-----	-----	-----	1.66	5.95	2.56	3.03	-----
1909	4.36	3.57	6.70	3.75	2.23	0.61	4.62	1.97	9.59	2.60	3.31	0.49	43.80
1910	3.39	3.34	2.30	6.35	2.00	2.71	3.01	4.08	2.37	2.49	2.15	3.44	37.63

PATTEN, PENOBSCOT CO., ME.—Elevation, 550 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1902	-----	-----	-----	1.00	3.52	6.20	3.00	3.80	4.30	4.80	-----	2.20	-----
1903	1.60	*2.84	3.02	*2.03	0.12	2.29	4.03	2.64	0.69	2.58	2.42	3.40	27.66
1904	2.90	0.60	1.02	2.90	4.25	4.15	4.30	2.49	10.42	3.10	1.82	1.50	39.45
1905	4.20	0.90	0.90	2.50	2.15	5.25	2.00	0.06	3.96	1.38	3.30	2.00	28.60
1906	3.50	3.80	5.90	2.40	1.30	1.84	5.26	1.57	1.52	10.10	1.88	2.73	41.80
1907	1.00	2.40	1.40	1.50	2.05	10.04	4.21	5.00	6.04	5.70	5.30	4.00	48.64
1908	*1.68	*4.10	*1.96	*1.88	*3.38	*3.26	1.51	5.00	0.30	*2.91	*1.57	1.55	29.10
1909	5.80	4.75	4.16	5.14	1.79	2.50	6.42	3.91	9.71	2.38	4.19	1.95	52.70
1910	3.10	3.34	0.93	5.35	6.68	4 28	4.27	2.28	4.63	2.98	2.36	2.73	42.93
Means	2.97	2.84	2.41	2.74	2.80	4.42	3.89	2.97	4.62	3.99	2.86	2.45	38.96

*No record—figures supplied from Houlton and Millinocket records by Fournie's method.

DANFORTH, WASHINGTON CO., ME.—Elevation, 390 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1902	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	0.95	3.71	-----
1903	2.94	3.92	5.05	2.55	0.65	3.72	4.10	2.46	1.42	3.62	3.59	3.16	37.18
1904	2.95	2.89	3.48	2.86	4.31	1.76	2.56	3.02	6.23	2.66	2.35	1.51	36.58
1905	5.75	2.43	1.01	1.40	2.23	1.80	3.48	0.53	3.75	1.00	3.66	3.55	30.59
1906	3.95	2.22	4.94	4.88	2.40	2.57	2.21	2.79	1.41	4.73	5.56	3.32	40.98
1907	2.77	5.12	2.87	3.05	1.76	3.59	4.27	4.04	4.13	3.88	3.48	3.06	42.02
1908	2.91	5.02	2.32	2.60	4.11	1.60	2.93	4.10	1.28	6.81	1.49	2.57	37.74
1909	5.98	4.12	4.23	4.20	1.58	3.30	2.02	2.95	7.10	2.14	3.92	2.34	43.88
1910	2.91	2.38	0.35	1.85	2.40	3.57	3.55	1.93	1.80	1.62	3.28	1.35	26.99
Means	3.77	3.51	3.03	2.92	2.43	2.74	3.14	2.73	3.39	3.31	3.14	2.74	36.85

CHESUNCOOK POST OFFICE,* PISCATAQUIS CO.—Elevation, 950 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1904	1.78	0.80	2.11	2.52	3.49	2.75	4.23	5.44	5.44	1.70	0.91	0.59	31.76
1905	2.67	.69	1.32	.71	2.42	1.65	1.52	.92	1.18	.77	3.15	2.22	19.22
1906	1.94	1.61	4.22	2.33	2.74	3.10	.60	.91	3.10	2.25	-----	-----	-----
Means	2.13	1.03	2.55	1.85	2.88	2.51	2.12	2.42	3.24	1.57	2.03	1.40	25.73

*Head of lake.

GRANT FARM, PISCATAQUIS CO., ME.—Elevation, 1000 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1904	-----	0.38	1.70	1.30	4.01	2.91	3.96	2.55	7.85	2.72	1.31	-----	-----
1905	-----	-----	-----	-----	4.05	2.66	2.70	.79	1.15	.48	1.62	-----	-----
1906	-----	-----	-----	3.33	2.54	-----	3.63	-----	3.34	-----	-----	-----	-----
Means	-----	-----	-----	2.32	3.53	2.78	3.43	1.67	4.11	1.60	1.46	-----	-----

DEBSCONEAG, PISCATAQUIS CO., ME.—Elevation, 675 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1905	-----	-----	-----	-----	-----	-----	4.80	1.10	2.92	1.31	4.28	-----	-----
1906	-----	2.20	-----	-----	3.53	2.38	3.25	3.16	2.89	7.43	2.87	-----	-----
1907	2.85	1.75	2.80	3.80	1.30	7.57	5.85	2.30	6.10	4.50	*3.75	3.44	46.01
1908	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1909	-----	-----	-----	-----	-----	-----	2.60	3.04	10.27	2.87	-----	-----	-----
Means	-----	1.98	-----	-----	2.42	4.98	4.12	2.42	5.54	4.03	3.63	-----	-----

*Millinocket.

CHESUNCOOK DAM, PISCATAQUIS CO., ME.—Elevation, 930 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1905	-----	-----	-----	-----	-----	3.02	1.85	0.50	2.67	0.92	2.38	3.02	-----
1906	2.44	2.14	5.79	2.56	3.28	2.59	2.74	1.69	2.65	6.06	2.29	3.45	37.68
1907	2.06	1.41	2.10	3.77	2.39	4.41	6.76	2.49	3.38	3.96	3.36	3.24	39.33
1908	2.16	3.02	1.85	1.94	4.58	1.82	3.66	5.28	1.26	2.40	1.67	1.45	31.09
1909	3.02	2.98	3.61	3.23	1.94	2.17	3.70	3.94	7.84	0.97	3.20	1.93	38.53
1910	2.25	2.38	1.06	2.73	5.42	3.21	4.33	2.31	2.13	2.25	2.15	1.52	31.74
Means	2.39	2.39	2.88	2.85	3.52	2.87	3.84	2.70	3.32	2.76	2.51	2.44	34.47

MILLINOCKET, PENOBSCOT CO., ME.—Elevation, 386 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1899	-----	-----	-----	-----	1.14	3.80	4.08	0.57	4.08	3.80	1.14	3.31	-----
1900	6.44	9.41	6.24	1.63	6.41	3.97	6.53	1.73	2.02	6.11	3.77	0.91	55.17
1901	2.53	0.59	5.11	5.63	0.94	3.02	1.78	4.59	1.85	3.68	2.55	8.75	41.02
1902	3.97	0.86	6.47	1.95	2.47	5.82	2.50	3.63	4.15	5.09	1.88	5.23	44.02
1903	3.34	3.30	6.39	1.96	0.72	2.07	4.26	2.48	2.82	2.72	2.64	3.64	36.34
1904	3.35	1.89	3.86	2.82	4.38	2.16	4.96	4.06	6.46	3.21	2.20	1.89	41.24
1905	5.45	1.25	0.77	2.05	2.91	2.41	2.92	2.08	3.47	1.49	4.29	3.57	32.66
1906	3.09	3.45	6.29	3.69	3.57	2.96	3.24	1.92	3.15	7.18	4.21	3.35	46.10
1907	3.24	1.95	2.16	3.60	2.50	6.20	4.63	4.04	5.31	4.14	3.75	3.32	44.84
1908	2.52	3.82	2.65	1.93	5.16	2.10	2.70	5.01	2.46	3.30	1.88	3.32	36.85
1909	5.24	5.36	4.24	4.64	3.05	2.91	3.09	3.07	9.70	1.80	4.92	2.07	50.09
1910	4.05	3.56	1.66	4.27	2.97	4.37	3.72	2.39	2.61	2.21	2.86	2.96	37.63
Means	3.93	3.22	4.17	3.11	3.02	3.48	3.70	2.96	4.01	3.73	3.01	3.53	41.87

MAYFIELD, SOMERSET CO., ME.—Elevation, 1300 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December	Annual.
1885	-----	-----	-----	-----	-----	9.03	2.91	3.70	2.79	3.50	3.40	3.09	-----
1886	8.06	4.12	2.85	1.40	3.76	1.26	2.58	3.74	3.93	2.33	6.82	-----	-----
1887	-----	-----	-----	5.91	2.08	4.01	6.53	3.35	1.41	2.74	4.27	-----	-----
1888	-----	-----	-----	1.42	3.17	2.27	3.48	6.88	5.90	7.93	6.90	3.25	-----
1889	-----	-----	-----	2.09	3.66	5.70	4.98	3.35	6.52	5.83	5.39	-----	-----
1890	-----	-----	-----	2.42	10.29	3.97	3.45	6.40	5.85	3.45	2.01	-----	-----
1891	-----	-----	-----	3.75	2.37	3.34	5.11	4.78	1.58	1.56	2.91	-----	-----
1892	4.80	2.14	2.89	-----	-----	8.36	2.73	9.19	5.63	1.60	5.14	0.95	-----
1893	2.47	1.83	2.36	1.86	5.65	2.69	3.27	5.20	4.21	7.37	3.49	3.02	43.42
1894	3.15	1.61	1.31	1.17	4.83	6.45	2.65	2.05	5.71	6.41	2.48	2.27	40.09
1895	2.31	1.08	1.25	6.21	3.83	3.03	4.44	3.86	2.09	2.25	7.63	5.84	43.82
1896	0.94	3.58	7.20	2.34	3.02	3.13	6.07	4.90	5.31	4.77	5.11	1.24	47.61
1897	3.99	2.07	3.92	4.56	5.04	3.41	8.04	4.07	3.01	1.43	5.12	3.43	48.09
1898	4.22	7.99	0.96	2.26	1.88	2.94	1.52	4.43	3.57	5.79	6.02	1.14	42.72
1899	2.50	4.00	4.87	0.99	3.02	2.04	4.79	1.05	3.33	1.71	2.19	3.05	33.54
1900	6.27	7.39	5.65	1.57	5.84	3.31	4.48	1.25	3.26	2.99	7.43	1.10	50.54
1901	2.60	1.20	5.55	6.33	2.26	2.94	5.40	5.25	2.63	3.43	2.44	8.63	48.66
1902	3.21	3.60	9.50	4.16	3.40	7.39	2.95	6.36	4.33	5.83	1.65	4.12	56.50
1903	5.48	3.27	5.33	1.56	0.58	6.54	5.27	3.03	0.85	3.12	1.61	3.06	39.70
1904	3.07	1.81	2.76	3.42	6.86	3.17	4.41	5.32	5.73	2.42	1.58	1.47	42.02
1905	4.25	*1.11	1.00	2.17	3.29	3.39	4.39	1.86	4.40	0.96	2.87	2.69	32.38
1906	2.69	2.01	5.24	2.70	3.90	4.61	4.66	4.13	2.23	5.54	3.61	3.38	44.70
1907	1.40	1.72	1.86	4.04	2.40	4.64	4.75	3.18	5.67	6.11	5.35	5.42	56.54
1908	3.64	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Means	3.61	3.09	3.79	2.97	3.86	4.24	4.30	4.23	3.92	3.87	4.15	3.18	45.21

*No record—figures supplied from The Forks record.

Note.—The monthly values from January, February and March, 1892 to 1895; February and March, 1896; January, February and March, 1897 and 1898; also December, 1892 to 1894, inclusive, are for Indian Stream.

SOUTH LAGRANGE, PENOBSCOT CO., ME.—Elevation, 181 feet.

1903	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.99	1.85	2.51	-----
1904	2.10	1.50	3.60	3.03	4.85	2.62	4.77	5.10	5.93	2.40	1.92	1.75	39.57
1905	3.76	1.22	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

CARMEL, PENOBSCOT CO., ME.—Elevation, 141 feet.

1900	*8.14	5.01	7.10	1.91	7.25	3.62	3.14	1.46	3.10	4.15	3.36	1.99	50.23
1901	6.67	1.90	3.75	4.92	2.95	1.95	3.00	2.91	3.58	3.56	2.40	*7.94	45.53
1902	1.75	2.42	10.97	2.51	2.94	5.57	4.02	3.08	2.06	3.71	2.02	2.45	43.50
Means	5.52	3.11	7.27	3.11	4.38	3.71	3.39	2.48	2.91	3.81	2.59	4.13	46.41

*No record—figures supplied from Orono record.

ORONO, PENOBSCOT CO., ME.—Elevation, 129 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1869	2.54	4.26	3.36	2.39	2.95	-----	1.62	1.91	3.67	9.57	3.36	-----	-----
1870	5.61	4.30	2.11	3.55	1.96	2.07	1.78	3.21	2.23	5.53	5.61	3.04	41.00
1871	2.60	2.53	4.11	3.91	3.63	2.58	1.98	3.85	1.10	7.50	3.58	4.16	41.53
1872	2.18	1.70	5.23	1.93	3.92	4.47	2.68	6.23	3.55	6.01	7.06	3.66	48.62
1873	4.09	2.97	4.70	2.59	1.96	1.32	3.26	1.81	4.74	6.56	5.05	1.74	40.79
1874	4.57	5.50	3.40	3.76	4.74	4.93	2.10	5.39	4.37	1.14	3.06	1.98	44.94
1875	2.00	3.80	4.45	3.85	3.31	4.85	2.11	2.32	5.10	4.75	3.87	1.51	41.92
1876	3.92	8.39	8.20	1.65	3.73	2.56	5.80	0.91	4.28	3.91	4.35	4.67	52.37
1877	3.29	1.20	5.67	3.18	1.94	1.98	1.64	5.28	1.11	4.78	7.95	2.15	40.17
1878	5.08	2.41	2.73	3.46	2.14	5.42	4.77	3.00	2.00	4.73	4.91	7.92	48.57
1879	3.28	3.56	3.40	3.51	1.80	4.73	5.79	5.66	4.93	3.49	2.98	3.60	46.73
1880	2.83	2.83	2.86	4.15	2.17	0.73	3.32	1.54	3.84	4.15	3.52	1.90	33.84
1881	2.08	3.35	3.64	1.28	4.85	3.38	2.72	5.89	2.35	3.57	2.81	6.88	42.80
1882	4.19	3.96	5.20	2.05	4.52	4.44	3.10	1.64	6.44	1.09	1.78	2.85	41.26
1883	2.44	2.34	1.89	3.80	5.10	3.66	6.90	0.53	2.23	4.97	3.75	2.99	40.60
1884	4.44	6.85	4.37	3.38	5.42	1.37	2.38	3.12	2.19	2.70	3.99	4.74	44.95
1885	4.73	4.45	2.78	2.34	3.38	4.60	4.70	7.36	2.52	5.12	5.37	6.64	52.99
1886	6.64	5.42	2.87	1.80	4.67	2.74	1.05	2.27	4.11	1.42	8.67	6.38	48.04
1887	7.56	5.89	5.88	5.08	1.25	3.36	7.11	4.60	0.95	3.00	3.48	4.72	52.88
1888	4.97	6.11	6.48	1.78	2.82	3.65	2.47	4.59	6.97	7.51	6.43	4.96	58.74
1889	5.37	5.20	4.62	1.93	1.86	4.93	3.23	1.65	2.21	4.04	4.50	3.40	42.94
1890	3.33	4.52	5.81	2.02	10.52	3.84	3.84	4.55	4.47	3.36	2.67	4.10	53.03
1891	7.66	2.93	5.20	3.26	2.83	3.20	3.56	4.67	3.68	2.85	2.78	4.76	47.38
1892	4.80	1.96	2.52	1.12	1.94	5.96	1.99	6.41	3.91	1.75	4.47	2.26	39.09
1893	0.85	5.75	1.45	2.18	2.55	2.69	3.25	3.90	6.02	3.34	1.43	4.21	37.62
1894	3.01	1.73	1.23	1.18	3.84	2.90	2.41	2.01	3.40	4.33	1.24	1.75	29.03
1895	5.68	0.83	2.39	3.88	2.13	1.35	2.85	2.14	1.05	1.51	3.61	3.09	30.51
1896	0.96	2.20	6.95	2.69	2.62	2.58	2.58	4.26	8.00	3.75	4.23	1.30	42.12
1897	3.03	2.38	3.96	3.03	4.49	3.71	2.02	5.09	2.65	1.01	5.04	3.58	39.99
1898	6.32	8.05	2.23	4.95	1.02	5.28	2.44	3.14	2.29	6.19	6.84	1.27	50.02
1899	2.75	2.27	4.76	0.66	4.12	4.10	4.49	T.	3.20	2.92	2.01	3.09	34.37
1900	8.14	6.75	5.47	2.01	8.24	3.83	2.53	1.58	2.94	5.70	4.59	2.02	53.80
1901	4.33	1.95	5.45	5.12	2.07	1.79	2.75	3.76	4.22	4.12	2.54	7.94	46.04
1902	3.65	1.80	8.89	2.94	2.77	6.03	1.81	4.96	1.94	5.04	1.76	4.77	46.36
1903	3.62	3.48	6.22	1.71	0.73	2.09	6.49	2.22	1.21	3.44	2.79	3.14	37.14
1904	3.63	2.57	3.18	2.31	4.26	2.17	2.43	4.46	6.47	3.10	1.62	2.00	38.20
1905	4.28	2.20	0.83	2.22	3.47	3.13	2.19	2.13	3.19	0.78	4.08	3.51	32.01
1906	3.11	2.27	4.34	3.65	5.44	2.86	2.47	1.69	1.51	4.90	3.52	3.37	39.13
1907	4.01	3.01	2.25	3.53	1.77	5.77	3.44	1.41	6.12	2.71	4.22	3.84	42.08
1908	3.36	4.23	2.90	2.37	4.59	1.35	2.85	4.69	0.81	6.03	1.39	2.94	37.51
1909	5.87	5.32	5.23	4.42	2.21	2.11	2.37	1.82	9.09	2.43	4.14	1.98	46.99
1910	3.57	3.42	1.91	2.76	1.42	2.70	2.43	2.70	3.05	2.56	1.42	2.88	30.82
Means	4.06	3.73	4.03	2.84	3.36	3.35	3.14	3.34	3.57	3.98	3.87	3.60	42.87

BELFAST, WALDO CO., ME.—Elevation, 165 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1859	-----	-----	-----	-----	-----	-----	-----	-----	4.32	2.27	4.60	6.30	-----
1860	0.75	1.00	1.20	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1861	4.65	1.35	2.65	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1862	-----	-----	-----	2.35	3.00	3.45	-----	0.90	3.20	5.20	4.50	2.25	-----
1863	-----	3.30	4.15	4.72	3.40	-----	-----	-----	-----	-----	-----	-----	-----
1864-1887	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1888	-----	1.30	1.65	1.60	-----	-----	-----	-----	-----	0.50	1.00	0.60	-----
1889-1890	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1891	-----	-----	-----	-----	-----	3.33	4.16	3.32	1.55	2.97	3.02	5.10	-----
1892	5.65	2.61	2.77	0.93	2.71	4.50	1.62	5.38	2.70	1.26	4.86	1.70	36.69
1893	3.99	4.84	2.05	3.21	5.29	2.73	2.99	3.82	4.35	4.48	2.46	7.45	47.66
1894	4.37	3.65	1.58	1.63	5.86	1.98	4.46	4.72	4.61	5.56	2.52	3.83	44.77
1895	6.53	1.15	3.06	4.03	2.05	3.19	1.94	1.96	1.43	1.82	7.29	4.63	39.08
1896	0.98	5.01	7.30	1.18	3.03	2.21	5.19	5.02	10.32	3.25	4.25	1.40	49.14
1897	3.98	2.32	4.65	2.90	5.02	3.08	3.19	3.92	2.09	0.90	5.75	3.50	41.30
1898	5.81	11.35	2.48	4.67	1.28	4.69	1.38	2.31	3.17	8.35	5.59	2.96	54.04
1899	3.73	2.76	5.86	1.79	2.25	2.09	4.73	0.50	4.80	3.03	2.94	2.90	37.38
1900	5.68	8.19	7.31	2.26	7.18	4.34	*2.08	*1.80	3.05	5.04	5.41	1.68	54.02
1901	4.51	2.16	7.80	6.49	2.09	0.88	3.10	3.64	2.50	3.53	3.11	9.74	49.55
1902	3.37	2.59	12.70	3.00	1.85	6.38	1.52	4.62	1.84	5.05	1.34	4.90	49.16
1903	4.96	5.13	8.94	1.45	0.53	3.51	4.12	2.69	0.84	3.99	2.46	4.26	42.88
1904	4.86	1.84	3.14	5.06	6.51	1.03	1.23	4.66	6.30	2.91	*1.83	*2.82	42.19
Means	4.25	3.56	4.66	2.95	3.47	3.16	3.05	3.39	3.57	3.54	3.82	3.95	43.37

*No records. Figures supplied from Bar Harbor and Orono records by Fournie's method.

BAR HARBOR, HANCOCK CO., ME.—Elevation, 20 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1885	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	3.88	4.20	-----
1886	9.29	5.89	3.28	1.07	3.90	1.75	1.51	1.44	2.58	2.58	5.74	3.30	42.33
1887	8.22	7.29	5.03	4.81	1.11	2.58	3.48	6.61	0.60	3.53	3.85	5.11	52.22
1888	4.81	4.77	4.02	3.00	3.67	1.53	3.24	4.29	6.36	7.84	7.60	5.98	57.11
1889	4.83	3.88	4.42	2.81	1.79	2.04	2.07	1.17	1.65	5.86	6.25	5.92	42.69
1890	3.64	3.64	6.31	1.82	10.81	3.15	0.99	5.93	4.25	3.12	2.59	6.13	52.38
1891	7.21	4.68	5.18	2.87	1.57	3.73	4.36	2.45	2.15	4.76	3.12	4.40	46.48
1892	*6.65	*2.41	*3.36	1.34	2.25	4.43	1.01	5.09	1.79	1.17	5.11	2.33	36.94
1893	3.34	3.59	1.72	3.64	4.25	2.17	3.57	4.14	3.18	4.66	2.23	7.19	43.68
1894	3.46	1.47	1.46	1.59	4.33	1.50	1.99	1.65	4.17	4.96	2.70	*3.24	32.52
1895	*7.78	*1.04	*3.44	*4.68	1.59	1.63	1.79	2.64	2.29	1.42	9.73	3.08	41.11
1896	1.47	5.50	6.32	1.19	2.96	2.39	6.05	2.90	6.04	5.85	5.10	2.60	48.37
1897	4.82	2.29	3.54	2.75	6.36	4.00	5.62	8.22	2.33	0.35	9.25	4.35	53.88
1898	6.45	9.15	2.95	4.85	2.45	3.27	1.70	2.92	3.55	9.25	8.35	3.60	58.49
1899	5.52	4.05	7.15	1.09	2.25	1.36	6.55	0.75	3.80	3.05	5.65	2.57	43.79
1900	11.15	6.20	8.57	3.15	6.07	3.52	1.65	1.90	3.15	6.77	5.48	2.43	60.04
1901	4.83	1.63	10.30	5.81	2.74	3.23	1.63	3.00	3.28	3.45	3.50	9.78	53.18
1902	4.05	3.83	14.37	3.07	2.52	7.60	1.75	3.24	2.50	5.11	1.79	7.12	56.95
1903	5.83	5.30	10.05	3.65	1.65	3.23	3.25	0.75	1.68	5.28	3.97	3.35	47.99
1904	5.37	4.05	5.37	5.02	4.62	1.40	1.72	5.24	9.81	2.55	2.25	3.63	51.03
1905	5.20	3.20	1.05	0.95	3.20	4.54	3.35	2.56	7.79	2.10	7.22	7.61	48.77
1906	4.46	2.70	8.10	4.33	4.78	2.25	2.28	0.75	1.40	4.40	4.10	4.55	44.10
1907	3.00	3.45	2.00	5.30	2.90	4.48	3.05	2.37	5.90	4.90	5.30	5.75	48.40
1908	5.39	5.88	3.40	3.25	3.75	1.65	8.50	2.23	2.25	5.65	1.69	5.95	44.59
1909	7.10	6.07	5.85	5.11	4.28	1.15	2.66	1.53	8.35	1.81	5.77	2.03	51.71
1910	3.30	5.40	3.10	5.17	1.75	4.15	1.00	2.65	1.12	1.01	2.00	4.25	34.90
Means	5.12	4.06	5.08	3.25	3.35	2.84	2.73	3.06	3.58	3.95	4.78	4.63	46.43

*No record—figures supplied from Belfast and Orono records by Fournie's method.

JACKMAN, SOMERSET CO., ME.—Elevation, 1220 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1894	2.25	1.48	1.79	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1897	-----	2.20	2.55	0.95	5.00	4.00	6.23	2.45	4.20	1.68	-----	-----	-----
1903	2.32	4.65	3.30	1.51	-----	-----	-----	-----	-----	-----	-----	-----	-----
1904	-----	-----	-----	1.91	-----	-----	-----	-----	-----	-----	1.52	1.82	-----
1905	2.42	.94	1.28	.84	-----	-----	-----	-----	-----	-----	1.91	2.10	-----
1906	1.57	1.57	3.15	1.85	4.33	3.72	-----	3.29	3.51	-----	-----	-----	-----
Means	2.14	2.17	2.41	1.41	4.66	3.86	6.23	2.87	3.86	1.68	1.72	1.96	34.97

ROACH RIVER, PISCATAQUIS CO.—Elevation, 1150 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1901	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.95	6.95	-----
1902	3.25	3.82	3.37	1.21	3.56	9.29	4.30	5.32	-----	3.21	1.16	2.70	-----
1903	2.05	4.90	5.76	2.23	-----	-----	-----	-----	-----	-----	-----	-----	-----

GREENVILLE, PISCATAQUIS CO., ME.—Elevation, 1117 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1895	2.11	1.35	1.22	2.03	2.58	3.26	4.07	4.90	1.45	0.87	5.47	2.99	32.30
1896	0.37	2.51	4.49	2.24	2.46	2.47	4.02	2.00	3.27	3.61	1.95	0.90	30.29
1897	2.82	1.95	2.43	3.27	3.96	2.59	8.37	3.11	2.62	1.52	2.69	2.25	37.58
1898	4.24	6.90	0.82	2.22	-----	-----	0.90	3.30	4.50	-----	-----	-----	-----
1899	-----	-----	-----	-----	3.20	3.94	7.37	-----	-----	-----	-----	-----	-----
1900	5.17	3.47	3.90	-----	3.49	3.24	5.21	1.51	2.55	-----	-----	-----	-----
1901	2.65	1.80	1.45	4.85	0.75	6.55	1.95	2.55	0.94	2.26	2.70	7.40	35.85
1902	2.15	3.60	4.73	2.65	4.67	6.15	4.03	3.01	5.46	3.21	0.81	2.01	42.48
1903	2.36	4.90	4.99	2.23	-----	2.79	-----	-----	-----	-----	-----	-----	-----
1904	-----	-----	-----	-----	5.27	3.60	6.85	4.09	7.63	2.44	0.47	-----	-----
1905	-----	-----	-----	1.91	3.22	3.99	2.52	1.43	2.82	0.86	2.51	1.22	-----
1906	1.20	1.23	4.58	2.20	4.72	3.43	6.28	2.88	2.73	5.80	1.85	3.75	40.65
1907	0.98	1.30	2.56	3.78	2.54	6.90	5.81	2.68	5.64	4.63	4.76	3.12	44.70
1908	2.63	4.93	2.95	2.14	5.50	2.83	5.18	7.96	1.90	2.08	1.92	2.59	42.61
1909	4.51	4.80	4.76	4.22	2.72	3.60	3.34	3.00	10.12	1.73	4.57	2.59	49.96
1910	3.43	3.51	2.18	2.51	4.65	5.31	4.18	3.69	2.77	2.13	3.21	2.64	40.21
Means	2.66	3.25	3.16	2.79	3.55	4.04	4.67	3.29	3.89	2.60	2.74	2.86	39.50

Note.—The monthly values from 1895 to 1903 inclusive, are for Kineo, Me.
The Forks record: March, '06; October, November, 1907.
Roach River record: October, 1902; February, April, 1903.

FLAGSTAFF, SOMERSET CO., ME.—Elevation, 1100 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1895	-----	-----	-----	-----	-----	-----	-----	3.54	1.49	1.06	4.18	3.62	-----
1896	1.20	3.92	6.97	1.45	2.75	2.40	4.85	3.14	4.53	3.44	2.80	1.05	38.50
1897	2.90	2.60	3.07	3.02	7.33	4.27	7.77	5.01	3.72	.72	*4.96	2.53	47.90
1898	4.80	6.90	*1.05	1.76	1.20	2.45	1.05	3.60	3.21	2.65	3.25	1.05	32.97
1899	1.85	3.83	4.05	.67	1.95	1.19	*6.81	.33	1.73	1.65	2.35	2.15	28.56
1900	4.30	5.40	3.90	.35	3.55	3.43	4.80	2.17	2.35	2.47	5.66	2.45	40.83
1901	2.20	1.50	2.75	7.83	2.34	4.58	5.01	4.95	1.65	2.40	2.20	4.88	42.29
Means	2.88	4.02	3.63	2.51	3.19	3.05	5.05	3.20	2.86	2.22	3.52	2.35	38.48

*No record: figures supplied from Winslow record.

THE FORKS, SOMERSET CO., ME.—Elevation, 590 feet.

1901	-----	-----	-----	-----	-----	-----	-----	-----	-----	3.31	2.60	8.65	-----
1902	3.50	3.35	5.29	3.20	4.62	6.42	2.92	3.43	5.39	3.40	2.30	3.10	46.92
1903	2.30	3.63	4.42	1.35	0.61	4.36	4.58	3.24	0.91	1.60	1.73	2.97	31.70
1904	2.95	1.40	1.95	3.70	5.08	4.64	7.53	2.69	6.82	2.23	1.34	1.58	41.91
1905	3.39	1.11	1.30	1.68	3.58	4.33	3.37	1.86	3.47	1.24	2.90	2.40	30.63
1906	2.24	2.05	4.20	2.18	3.13	3.07	4.56	2.57	3.79	5.98	2.61	2.82	39.20
1907	1.78	2.15	2.96	5.23	2.42	4.21	8.08	2.62	5.75	4.63	4.76	2.02	46.61
1908	2.02	3.74	2.10	2.22	4.42	2.80	4.61	3.01	1.00	2.28	2.22	2.60	33.02
1909	4.36	4.04	3.85	4.65	3.14	2.22	3.50	3.35	7.56	1.00	4.34	2.05	44.06
1910	2.98	3.32	2.23	2.85	5.35	3.40	5.10	1.85	2.16	2.35	2.50	1.65	35.74
Means	2.84	2.75	3.14	3.01	3.59	3.96	4.92	4.56	4.09	2.80	2.73	2.98	41.37

SOLON, SOMERSET CO., ME.—Elevation, 350 feet.

1902	-----	-----	-----	3.20	4.62	-----	2.92	3.43	5.39	3.43	2.30	3.10	-----
1903	3.78	2.81	4.90	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

MADISON, SOMERSET CO., ME.—Elevation, 257 feet.

1894	3.23	2.25	1.70	1.45	4.75	6.00	2.12	3.28	4.81	5.30	-----	-----	-----
1901	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
1902	3.91	3.88	11.04	3.62	5.49	7.45	2.29	5.93	3.70	6.61	1.42	4.63	59.97
1903	4.34	3.98	6.32	1.94	0.23	3.72	5.37	2.30	0.76	2.40	1.17	1.43	33.96
1904	2.28	1.71	2.79	7.63	6.63	3.36	6.10	7.38	6.34	2.98	1.23	1.55	49.98
1905	4.08	1.61	2.13	2.59	3.73	4.65	5.75	2.23	5.61	1.13	4.60	3.45	41.56
1906	4.04	2.99	4.83	4.27	5.12	5.72	4.58	2.02	1.09	6.14	3.02	5.21	49.03
1907	2.38	2.45	1.84	6.32	2.83	3.89	7.34	2.54	7.49	6.31	6.28	4.35	54.02
1908	2.75	4.52	2.48	2.56	6.59	1.63	3.91	5.18	1.40	3.51	1.53	2.47	38.53
1909	6.57	5.50	3.80	3.91	2.75	2.36	2.25	2.68	10.04	1.66	4.07	2.65	48.24
1910	4.13	2.69	1.91	4.38	2.71	-----	4.01	3.69	2.95	1.51	2.87	2.99	-----
Means	3.77	3.16	3.88	3.87	4.08	4.31	4.37	3.72	4.42	3.76	2.91	3.19	45.44

FARMINGTON, FRANKLIN CO., ME.—Elevation, 368 feet.

1891	6.54	2.13	8.28	1.97	1.94	3.93	3.42	4.03	1.45	1.68	2.69	5.64	43.70
1892	5.45	2.33	2.33	.85	3.75	6.26	3.29	5.09	4.16	1.49	4.44	1.39	40.83
1893	2.66	3.81	2.69	2.34	6.95	2.78	1.60	3.76	3.02	5.72	2.99	3.39	41.71
1894	1.61	2.22	2.20	1.43	5.14	3.20	1.92	2.61	5.73	5.02	2.97	2.76	36.84
1895	4.05	.95	1.88	5.67	3.06	3.38	1.05	5.93	1.92	1.99	5.76	6.25	41.87
1896	.80	5.58	10.83	2.66	*2.80	2.49	3.75	3.97	4.62	3.88	4.22	1.15	46.75
1897	5.45	*2.13	4.85	3.19	3.75	4.32	8.11	3.93	2.98	.95	5.01	4.98	49.65
1898	*5.54	6.85	.55	2.71	1.79	4.34	2.80	3.27	2.82	4.63	4.40	1.44	41.14
1899	2.57	2.60	5.79	.92	1.97	2.41	5.07	1.91	3.26	1.43	2.60	2.71	33.24
1900	6.19	10.76	7.04	1.74	5.12	5.51	4.88	2.30	4.82	4.23	8.50	1.77	62.80
1901	3.27	1.04	4.54	6.88	3.95	3.47	4.22	3.45	2.25	3.03	2.10	8.97	47.17
1902	3.06	2.32	8.43	3.67	5.16	5.28	1.93	3.34	3.60	4.68	1.19	4.31	46.97
1903	3.61	2.81	5.67	2.47	.59	5.70	4.27	2.67	1.17	3.08	1.24	4.19	37.47
1904	3.52	.72	3.13	6.36	5.72	1.03	4.97	4.58	4.44	2.09	1.83	1.76	40.15
1905	3.79	.70	1.41	2.12	2.65	3.60	4.07	3.10	5.27	1.24	2.58	2.69	33.22
1906	2.29	1.89	4.30	2.06	3.67	5.41	-----	-----	-----	-----	-----	-----	-----
1907	2.34	1.96	2.88	4.05	2.57	2.88	4.59	2.09	5.97	6.15	4.50	3.30	43.28
1908	2.84	4.44	2.82	2.38	5.88	2.05	2.82	4.87	1.48	2.59	1.63	3.10	36.90
1909	5.79	6.32	3.92	3.94	†3.13	1.90	2.05	2.60	7.74	1.54	3.82	3.02	45.77
1910	3.48	2.97	1.41	4.38	2.16	3.15	3.10	3.94	2.30	1.19	2.31	2.74	33.13
Means	3.74	3.23	4.25	3.09	3.59	3.65	3.57	3.54	3.63	2.98	3.41	3.45	42.13

†Mean, Madison, Rumford Falls.

*No record: figures supplied from Gardiner record.

FAIRFIELD, SOMERSET CO., ME.—Elevation, 90 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1886	-----	3.61	1.75	1.36	3.04	1.04	1.71	2.06	4.76	1.83	5.08	2.26	-----
1887	2.39	2.62	2.05	3.64	0.41	2.84	8.77	2.98	1.11	1.93	3.48	3.44	35.66
1888	1.91	3.27	3.84	1.07	3.18	-----	3.60	3.56	6.75	5.44	-----	3.11	-----
1889	2.91	2.12	3.09	1.06	2.54	4.25	3.11	1.74	1.95	3.57	5.13	4.26	35.73
1890	2.55	3.31	4.61	1.71	7.79	2.97	3.81	3.57	3.85	3.45	2.06	3.39	43.07
1891	6.12	2.23	4.75	1.97	2.26	2.03	4.63	4.00	2.06	1.38	2.14	4.56	38.13
1892	3.33	2.28	1.82	0.80	2.67	5.79	1.78	5.58	3.27	1.37	3.16	1.10	33.00
1893	1.62	2.77	2.49	2.13	3.42	0.99	2.27	2.90	2.12	4.89	0.86	2.36	28.82
1894	2.43	1.03	0.86	0.72	3.78	2.97	2.56	3.50	3.82	2.41	2.02	1.82	27.92
1895	2.23	0.34	1.58	3.50	1.83	1.96	3.08	2.59	1.11	1.58	5.47	3.77	29.04
1896	0.31	2.95	5.62	1.28	2.33	1.91	3.21	3.83	5.10	2.00	2.35	1.17	32.06
1897	3.31	1.00	2.63	2.40	4.47	3.39	3.52	2.82	2.54	0.53	3.98	3.06	33.65
1898	5.07	6.48	1.45	2.31	1.55	3.32	1.13	3.71	2.37	4.33	3.71	1.42	36.85
1899	2.76	2.73	3.66	1.05	2.05	1.39	5.13	0.46	3.58	1.11	2.32	1.93	28.17
1900	5.89	7.00	4.75	1.63	5.18	4.08	3.40	1.76	2.55	4.05	4.55	2.19	47.03
1901	2.74	1.95	5.22	3.96	2.35	1.64	2.99	3.39	3.79	2.77	2.19	7.98	40.97
1902	2.25	1.54	7.76	2.41	2.54	4.04	2.22	4.06	1.86	4.01	1.03	4.68	38.40
1903	3.94	3.39	6.35	1.95	0.37	3.56	4.53	3.37	1.01	3.31	1.06	2.70	35.44
1904	3.21	1.65	3.78	5.75	4.75	2.32	2.69	4.39	5.58	2.05	1.61	1.44	39.22
1905	3.78	0.99	0.88	2.15	2.22	3.49	3.65	1.43	2.45	0.38	3.80	3.19	28.41
1906	2.59	2.52	3.33	3.69	3.55	3.29	5.32	4.78	1.55	5.38	2.63	3.55	42.18
1907	3.19	2.65	1.43	3.49	2.62	2.95	5.36	1.32	5.23	2.34	3.66	2.68	36.92
1908	1.61	3.68	1.77	1.93	4.52	2.17	2.41	3.05	0.56	3.64	1.15	2.07	28.56
1909	5.91	3.94	2.73	3.05	2.43	2.34	1.77	1.17	5.61	*1.88	*4.35	1.48	36.66
1910	2.19	2.95	1.71	2.37	1.77	1.99	2.26	4.46	2.04	1.10	1.53	2.90	27.27
Means	3.10	2.76	3.20	2.30	2.94	2.78	3.40	3.06	3.06	2.67	2.89	2.90	35.06

*Winslow.

WINSLOW, KENNEBEC CO., ME.—Elevation, 90 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1895	-----	-----	-----	-----	-----	-----	-----	-----	1.56	2.04	6.52	4.00	-----
1896	0.40	3.40	6.24	1.74	2.52	2.33	3.46	3.59	5.86	2.66	2.89	1.29	36.38
1897	4.18	1.39	3.06	2.44	5.30	3.34	5.50	3.42	3.02	0.68	4.96	2.71	40.00
1898	4.67	4.91	1.05	2.44	1.51	3.42	1.95	3.09	2.77	5.38	3.86	1.59	36.64
1899	2.88	2.45	4.10	1.00	2.32	1.13	6.81	0.25	4.03	1.34	1.76	1.90	29.97
1900	6.35	6.27	5.21	1.95	6.32	4.09	4.17	2.55	3.26	4.86	5.00	2.19	52.22
1901	2.91	0.65	5.15	4.50	2.35	2.51	3.31	4.54	3.92	3.28	1.38	8.23	42.73
1902	2.31	1.49	8.90	2.51	2.24	4.61	2.62	4.06	2.29	5.54	1.17	4.25	41.99
1903	4.14	3.01	7.15	2.21	0.31	4.47	4.53	3.37	1.01	3.31	1.34	2.98	37.83
1904	2.58	1.51	3.41	5.38	4.91	2.32	2.52	4.94	5.84	2.64	1.62	1.65	39.32
1905	3.66	0.93	0.83	2.20	2.53	3.39	4.26	2.03	3.20	0.62	4.00	2.82	30.47
1906	2.78	1.33	3.33	2.78	4.64	3.28	5.18	2.96	1.16	5.86	2.96	2.24	38.50
1907	2.60	1.56	1.72	3.40	2.58	2.90	5.26	0.83	6.00	3.24	4.49	3.15	37.73
1908	2.07	3.10	1.78	2.07	5.00	2.82	2.73	3.05	0.93	3.08	1.60	2.57	30.80
1909	5.16	4.80	3.17	3.87	2.59	2.54	1.95	1.76	6.71	1.88	4.35	1.48	40.26
1910	3.12	2.41	1.86	3.14	2.67	4.10	2.90	5.52	2.51	1.46	2.43	2.78	34.90
Means	3.32	2.61	3.80	2.78	3.19	3.15	3.81	3.06	3.38	2.99	3.15	2.86	38.10

KENT'S HILL, KENNEBEC CO., ME.—Elevation, 300 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1891	6.28	3.41	5.37	1.85	1.98	3.05	4.50	4.00	1.50	2.12	1.79	5.57	41.42
1892	4.88	1.60	1.79	1.05	2.79	5.75	2.48	6.30	4.98	1.25	3.98	1.37	38.22
1893	2.41	4.53	2.95	2.85	6.76	-----	-----	-----	-----	-----	-----	-----	-----
1894	-----	1.32	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Means	4.52	2.72	3.37	1.92	3.84	4.40	3.49	5.15	3.24	1.68	2.88	3.47	40.68

GARDINER, KENNEBEC CO., ME.—Elevation, 163 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1837	5.00	3.10	1.43	3.48	3.25	3.85	1.24	2.35	0.44	2.91	3.59	1.81	32.45
1838	1.62	2.09	1.43	1.76	3.29	4.61	1.10	2.02	4.24	3.97	3.38	0.68	30.19
1839	2.45	2.10	2.66	3.87	5.05	4.45	5.26	5.21	2.27	0.41	4.22	3.10	41.05
1840	1.77	2.29	4.13	4.14	4.22	4.20	1.72	3.72	1.54	6.02	3.88	3.52	41.15
1841	5.72	1.12	3.24	5.28	3.58	3.17	1.58	1.08	3.83	1.46	3.37	5.09	38.52
1842	2.88	4.49	3.26	3.51	1.83	3.05	3.08	2.35	3.06	1.62	3.33	5.67	38.13
1843	2.54	5.67	5.80	5.52	3.50	3.96	1.76	4.81	1.17	5.28	3.58	2.71	46.30
1844	3.95	1.68	4.82	0.65	3.01	1.79	1.47	3.03	2.36	5.72	3.93	5.91	38.32
1845	5.85	2.24	2.96	2.59	2.67	1.95	6.55	2.40	3.20	2.89	1.06	4.82	39.18
1846	2.66	1.29	6.27	1.59	4.83	2.77	2.62	3.83	1.00	2.09	3.42	2.94	35.31
1847	5.11	3.67	1.62	2.90	2.69	6.32	3.34	3.95	3.32	4.06	3.64	4.28	44.90
1848	3.84	2.53	2.84	1.22	8.64	1.88	6.29	4.32	5.76	4.60	2.38	4.56	48.86
1849	0.92	1.50	2.80	3.47	5.18	2.59	1.70	6.10	2.82	5.85	2.67	3.96	39.56
1850	3.09	2.96	2.20	2.98	11.76	5.44	3.09	4.36	3.70	5.29	2.41	4.10	51.47
1851	4.66	4.45	1.90	3.74	3.15	3.42	5.56	2.36	2.76	8.43	6.30	4.08	50.81
1852	2.36	3.89	2.22	6.12	0.36	3.89	2.80	5.87	3.51	4.38	6.33	4.92	46.65
1853													
1854													
1855	7.17	1.70	1.10	4.57	1.93	5.98	2.42	3.10	1.76	1.31	3.18	5.01	39.23
1856	2.25	1.95	0.90	2.46	4.52	2.04	2.49	7.49	3.82	3.20	2.15	4.70	37.97
1857	4.22	2.46	4.03	5.30	4.74	3.59	2.33	5.51	1.24	4.97	3.63	4.18	46.20
1858	3.31	2.33	3.16	4.44	3.02	2.52	6.43	7.25	3.74	5.06	2.91	2.87	47.04
1859	4.42	2.16	10.06	2.51	3.00	6.35	1.97	2.79	2.48	1.08	4.75	6.54	48.11
1860					0.88								
1861	3.68	3.26	5.47	4.35	4.40	1.27	4.14	1.37	1.85	5.47	2.64	2.17	40.07
1862	4.20	3.60	2.49	2.75	2.73	3.83	2.41	1.94	3.18	5.21	4.34	2.56	39.24
1863	3.68	4.49	4.22	3.97	2.44	1.73	6.45	4.39	4.33	2.36	7.30	4.34	49.61
1864	3.51	2.07	4.58	2.46	3.94	0.65	0.59	6.12	4.32	2.76	5.77	4.18	40.95
1865	3.10	2.85	5.39	4.43	5.05	2.68	4.61	1.46	0.84	5.15	3.24	3.07	41.87
1866	1.63	5.24	5.47	1.91	4.97	3.50	3.01	5.50	5.66	2.59	3.18	3.00	45.66
1867	2.62	4.36	5.76	4.96	5.27	1.96	3.94	8.49	0.98	4.60	2.85	1.89	47.68
1868	2.86	1.87	2.38	2.28	9.59	3.20	1.87	1.06	8.24	0.98	6.75	2.04	43.12
1869	1.96	6.75	4.00	3.05	4.50	5.50	1.51	1.16	3.37	12.67	3.10	4.74	52.31
1870	6.13	5.93	3.22	4.78	1.90	1.94	2.43	1.98	1.33	6.38	4.19	2.82	43.03
1871	2.11	1.55	5.37	3.38	3.92	1.58	4.58	1.93	1.84	7.58	4.90	3.28	42.02
1872	1.85	1.84	3.03	1.85	2.58	3.88	3.10	6.98	4.73	3.42	5.81	3.57	42.64
1873	4.63	2.09	3.94	2.97	2.38	1.26	3.65	1.59	3.88	6.01	3.63	2.03	37.97
1874	4.41	3.33	2.05	4.63	3.14	3.86	5.56	6.21	2.75	1.72	3.11	1.66	42.43
1875	3.23	3.83	4.00	3.99	2.90	5.87	2.22	6.66	4.89	5.06	3.80	0.92	47.37
1876	3.05	8.78	7.96	2.69	3.61	2.95	6.15	0.19	4.63	2.61	4.13	3.44	50.19
1877	1.90	0.58	7.91	3.01	1.60	1.16	2.22	5.28	1.41	5.30	8.23	1.24	39.84
1878	3.70	2.74	3.22	5.84	1.49	3.69	1.07	4.43	2.38	7.81	4.63	7.55	48.55
1879	2.91	3.08	4.21	3.40	1.50	5.83	5.27	5.20	4.04	2.05	4.70	4.19	46.38
1880	4.10	3.61	2.67	3.28	2.39	1.53	3.93	2.17	4.06	4.39	4.86	2.96	39.95
1881	3.73	5.84	5.31	1.56	5.89	3.07	3.75	2.42	3.00	2.64	3.26	6.56	47.03
1882	3.56	5.00	5.05	2.69	4.74	4.25	2.60	0.33	7.00	2.02	1.14	3.55	41.93
1883	2.49	2.89	2.32	3.51	5.02	4.86	3.48	0.32	3.10	4.47	2.97	3.63	39.11
1884	6.82	7.62	5.42	6.55	4.00	1.22	5.16	4.22	2.11	3.14	2.36	6.85	55.47
1885	5.28	6.47	2.18	2.51	3.41	5.06	1.73	3.21	1.98	3.93	2.86	2.61	41.23
1886	6.61	7.25	4.65	1.46	3.76	1.85	1.93	2.81	3.63	3.67	6.06	4.68	48.41
1887	7.32	5.62	7.27	6.87	1.08	3.42	6.96	3.42	1.05	2.44	3.64	5.61	54.70
1888	5.13	5.90	5.09	2.27	2.48	2.59	2.20	4.33	7.12	6.71	5.98	4.20	54.00
1889	5.20	1.84	2.76	2.38	2.54		2.96	1.60	2.55	4.59	5.44	5.51	
1890	3.18	3.78	4.52		7.84								
1891													
1892											4.52	1.07	
1893	2.70	4.79	3.18	2.52	4.66	2.56	1.12	3.27	3.23	5.90	1.83	5.13	40.89
1894	3.30	1.99	1.44	1.86	5.84	1.18	2.30	3.08	3.81	4.25	2.21	2.80	34.06
1895	2.50	1.64	2.48	4.83	1.50	2.01	4.55	3.28	1.21	1.82	6.85	4.40	37.07
1896	0.87	5.25	7.19	2.02	2.80	1.94	3.18	2.88	7.60	2.61	4.12	1.52	42.01
1897	4.51	2.13	4.30	2.86	5.94	4.32	3.15	2.66	3.11	0.92	5.99	3.83	43.72
1898	5.54	5.45	1.76	3.44	1.60	3.56	0.98	3.73	2.90	6.23	4.57	2.74	42.50
1899	3.41	3.10	5.56	1.19	1.87	2.43	5.48	1.08	3.90	1.85	2.42	2.61	34.90
1900	7.19	8.96	7.23	2.50	5.42	1.34	1.87	2.77	2.45	4.47	5.28	1.64	51.12
1901	3.78	1.76	6.25	6.43	3.97	1.36	4.26	5.54	2.08	4.18	2.41	9.43	51.45
1902	2.67	1.70	10.33	3.71	2.01	4.52	2.07	4.46	3.22	4.90	1.21	5.35	46.15
1903	4.54	3.63	6.65	1.42	0.45	5.12	4.77	2.90	1.34	3.82	1.63	3.56	39.83
1904	4.12	2.24	3.71	7.10	3.95	1.29	1.25	4.53	5.09	2.02	2.39	2.28	39.97
1905	4.85	1.32	0.94	2.10	2.17	4.83	4.52	2.03	4.09	0.78	3.95	3.12	34.70
1906	2.95	1.98	4.86	3.74	4.52	4.89	6.40	1.21	0.94	5.73	3.95	3.41	44.58
1907	3.12	2.50	2.09	3.70	2.48	3.10	2.77	1.51	7.38	4.15	4.97	3.75	41.52
1908	2.65	4.58	2.17	2.20	4.29	1.03	4.38	2.36	0.92	4.16	1.40	3.28	33.42
1909	5.66	4.95	3.97	3.81	2.55	2.90	2.19	1.59	6.39	1.88	3.88	2.02	41.79
1910	3.22	4.30	1.98	4.45	2.03	2.26	1.83	4.53	2.58	2.26	2.70	2.97	35.11
Means	3.74	3.51	4.01	3.41	3.63	3.17	3.26	3.44	3.24	3.97	3.84	3.70	42.92

OQUOSSOC, FRANKLIN CO., ME.—Elevation 1534 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Ssptember.	October.	November.	December.	Annual.
1900	4.25	5.96	4.95	0.38	5.55	4.42	2.64	2.28	3.06	4.68	8.58	1.82	48.57
1901	3.60	1.20	5.90	7.14	4.00	1.66	5.46	2.28	1.87	2.75	3.70	2.20	41.76
1902	------	1.58	4.82	0.80	4.15	4.63	1.02	3.71	2.62	------	------	------	------
1903	------	------	------	------	------	14.60	3.49	2.82	------	------	------	------	------
1904	2.86	1.08	2.00	4.56	3.23	2.98	2.89	4.77	6.63	1.69	1.39	1.99	36.07
1905	3.33	1.03	1.53	1.91	3.63	3.06	3.78	2.49	2.95	1.67	1.55	1.47	28.40
1906	2.03	2.64	2.14	2.17	5.67	3.75	4.57	1.33	4.50	4.08	1.43	1.96	36.27
1907	1.95	1.38	2.86	3.61	1.90	------	------	2.31	7.35	------	4.80	3.78	------
1908	2.73	3.01	1.88	1.10	2.10	2.75	4.65	2.58	0.50	0.90	1.95	2.10	26.25
1909	5.20	5.25	4.75	3.95	------	2.40	3.00	2.60	------	------	------	1.95	------
1910	3.80	4.05	1.80	2.50	3.60	3.55	3.15	2.70	3.05	2.60	2.50	1.80	35.10
Means	3.31	2.72	3.26	2.81	3.76	4.38	3.46	2.72	3.61	2.62	3.24	2.12	38.01

NOTE.—The monthly values from 1900 to 1903 inclusive, are for Bemis, Me.

UPPER DAM, OXFORD CO., ME.—Elevation, 1,470 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Ssptember.	October.	November.	December.	Annual.
1886	4.29	2.32	2.74	1.17	3.20	3.15	2.01	4.13	4.71	1.56	4.27	2.63	36.18
1887	3.92	3.37	1.96	3.53	2.01	4.46	5.43	3.33	1.26	1.96	3.10	3.67	38.00
1888	2.40	1.73	3.09	2.04	2.89	2.96	2.28	4.79	4.27	6.62	6.50	2.13	41.70
1889	2.48	0.77	2.68	0.63	3.79	3.23	3.17	2.50	5.30	3.62	0.86	1.67	30.70
1890	3 26	1.45	2.40	1.37	4.00	3.69	2.45	4.23	5.83	2.90	2.73	2.59	36.90
1891	3.80	3.26	6.36	1.76	2.65	1.49	3.02	3.47	1.35	1.85	2.51	5.67	37.19
1892	4.57	0.67	4.74	1.39	1.48	4.68	4.80	6.68	1.99	0.10	6.47	0.80	38.37
1893	1.35	3.06	1.24	2.80	3.78	4.10	2.95	3.08	3.14	2.97	1.46	3.07	33.00
1894	3.76	1.49	0.24	1.48	3.19	2.61	4.17	2.68	5.52	2.25	1.70	1.57	28.97
1895	3.77	0.29	1.18	2.92	4.64	2.48	1.57	3.16	2.21	0.40	6.41	3.89	32.92
1896	0.50	2.27	5.13	3.57	2.40	3.15	4.59	3.20	4.97	1.33	1.82	2.20	35.13
1897	2.27	1.81	5.07	3.14	4.92	4.95	7.28	1.31	2.88	1.00	2.83	2.28	39.74
1898	3.08	5.63	0.74	1.15	2.38	5.98	2.98	4.24	3.55	3.90	2.46	1.35	37.44
1899	1.87	2.82	3.32	0.00	2.45	2.40	3.16	0.51	1.97	1.70	1.83	1.69	23.72
1900	3.22	4.21	3.60	0.32	5.47	3.57	5.12	2.16	2.54	2.43	5.86	1.00	39.52
1901	3.95	0.55	2.69	3.22	3.54	2.63	6.18	2.10	2.08	2.18	1.20	3.01	33.33
1902	0.90	1.49	4.42	1.64	4.87	4.30	1.64	5.21	3.05	2.15	1.65	3.36	34.68
1903	2.62	1.83	3.53	1.66	0.00	3.56	4.25	3.38	0.92	1.69	0.00	2.94	26.38
1904	2.57	0.90	2.25	3.03	2.82	2.40	3.30	4.30	5.07	2.18	0.67	1.76	31.25
1905	2.56	0.79	1.76	1.40	2.82	2.89	4.10	2.66	3.35	0.79	2.02	3.59	28.73
1906	1.41	1.84	2.40	1.19	4.05	3.51	2.90	1.15	2.23	2.78	2.21	2.29	27.85
1907	1.69	1.38	1.79	4.10	0.67	2.94	3.72	1.11	5.80	3.76	3.53	2.80	33.29
1908	1.74	2.81	1.85	1.47	3.38	2.48	2.28	2.25	0.88	0.96	1.43	2.04	23.57
1909	5.36	4.40	1.62	2.65	3.83	1.22	2.18	1.69	3.86	1.02	2.58	1.15	31.56
1910	3.03	4.01	1.61	3.24	5.40	2.79	3.15	3.59	2.62	1.82	1.82	1.33	34.41
Means	2.82	2.21	2.49	2.04	3.22	3.26	3.55	3.08	3.17	2.17	2.72	2.42	33.15

MIDDLE DAM, OXFORD CO., ME.—Elevation 1,430 ft.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Ssptember.	October.	November.	December.	Annual.
1905	2.46	0.67	1.50	1.59	3.49	2.96	3.95	4.27	3.65	1.00	1.71	1.84	29.09
1906	2.40	1.32	1.90	1.59	4.93	4.36	2.83	1.42	2.88	3.03	1.51	2.35	30.52
1907	1.03	1.16	1.77	2.55	1.76	2.17	4.03	1.33	5.99	3.37	3.31	2.24	30.71
1908	1.47	2.07	1.57	1.25	5.02	1.90	3.37	3.95	1.81	1.21	1.11	1.96	26.69
1909	5.75	4.67	2.28	3.16	3.81	1.92	2.73	2.14	3.38	1.06	2.35	1.15	34.40
1910	2.85	2.62	1.23	2.90	4.92	2.97	3.75	4.06	3.34	2.05	1.21	1.68	33.58
Means	2.66	2.08	1.71	2.17	3.99	2.71	3.44	2.86	3.51	1.95	1.87	1.87	30.82

ERROLL, N. H.—Elevation 1,260 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1885	2.10	3.50	1.90	0.60	0.00	1.20	3.75	2.56	2.86	2.90	2.02	4.40	27.79
1886	5.60	2.60	2.20	0.50	2.27	1.47	1.90	3.71	3.37	1.30	3.63	3.40	31.95
1887	3.35	3.30	2.37	0.86	1.02	3.10	4.92	5.86	0.99	2.23	3.00	3.14	35.14
1888	2.65	3.58	4.13	4.96	3.14	4.47	1.67	5.56	4.99	4.80	4.48	2.28	46.76
1889	2.67	1.31	3.36	1.11	1.07	5.58	4.18	1.78	4.32	4.02	3.47	3.39	36.26
1890	3.87	3.34	3.04	1.65	5.92	3.75	2.19	5.74	3.62	3.54	3.24	2.67	42.57
1891	4.50	3.31	2.79	1.88	2.58	1.95	4.75	3.78	1.89	1.46	2.24	3.43	34.56
1892	3.73	1.50	1.96	0.71	3.29	8.14	4.10	6.62	2.85	1.93	3.47	1.41	39.71
1893	1.36	3.94	2.29	5.41	3.03	2.70	2.81	4.08	2.49	2.38	3.24	4.26	37.99
1894	2.97	1.80	1.70	1.63	3.08	4.59	3.02	2.79	3.16	3.12	3.92	2.51	34.29
1895	1.74	0.55	1.53	3.42	2.97	3.30	3.16	4.24	1.86	1.07	5.76	3.30	32.90
1896	1.01	3.53	4.99	2.78	3.26	2.56	5.00	3.70	3.49	2.99	2.30	1.17	36.78
1897	1.73	2.17	3.68	3.33	4.74	5.62	5.49	2.97	2.07	1.04	4.75	2.58	40.17
1898	3.98	5.48	1.17	2.54	0.79	3.89	2.52	3.92	5.45	3.72	3.00	1.97	38.43
1899	2.43	2.61	7.17	0.58	1.67	3.45	3.47	0.66	2.57	1.81	1.85	2.26	30.53
1900	3.53	4.85	4.77	0.94	4.80	3.89	5.41	1.51	4.25	2.89	6.43	1.51	44.83
1901	2.44	0.72	2.85	3.90	3.96	7.05	5.31	3.61	2.30	2.82	1.14	4.53	40.63
1902	1.71	1.65	3.81	2.20	4.86	3.10	2.76	6.53	4.34	3.32	1.52	4.63	40.43
1903	2.92	3.07	4.17	1.27	0.05	4.39	3.55	2.67	0.74	2.23	0.95	2.22	28.23
1904	1.80	1.89	2.42	3.35	3.27	1.65	2.22	4.74	3.96	2.81	0.88	2.50	31.49
1905	3.09	1.31	1.69	1.62	3.19	3.13	5.25	3.51	4.47	1.14	2.61	3.27	34.28
1906	2.01	2.33	2.68	1.79	4.34	4.82	2.40	2.11	1.99	3.78	2.25	2.51	33.01
1907	1.74	1.50	1.66	3.92	1.10	4.86	5.70	2.40	5.92	4.37	2.66	3.18	39.01
1908	2.07	3.89	2.66	2.69	3.71	1.98	2.45	3.23	1.73	1.01	1.81	2.75	29.98
1909	6.34	4.67	2.28	2.93	4.04	1.92	2.58	2.29	2.38	3.41	2.55	1.62	37.01
1910	3.09	4.04	0.99	2.90	4.42	2.74	3.75	3.31	2.54	1.91	1.22	2.83	33.74
Means	2.86	2.79	2.86	2.29	2.94	3.67	3.63	3.61	3.10	2.62	2.86	2.84	36.07

RUMFORD FALLS, OXFORD CO., ME.—Elevation, 505 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1894	2.40	1.85	1.57	1.20	5.55	3.20	5.15	4.20	4.35	3.95	4.25	2.70	40.37
1895	3.50	0.60	1.06	5.60	4.40	2.30	2.15	3.10	2.05	1.60	5.40	5.71	37.47
1896	1.10	6.65	10.00	1.65	2.75	1.75	2.90	3.45	4.40	3.20	3.70	0.95	42.50
1897	3.90	3.15	4.05	3.68	4.24	5.85	9.34	2.68	1.97	0.66	5.63	3.73	48.88
1898	5.57	8.49	1.08	2.87	2.65	5.20	2.85	4.99	3.96	4.52	5.00	2.15	49.33
1899	2.38	4.26	5.89	1.50	1.15	2.56	4.71	0.64	3.00	2.05	1.94	1.95	32.03
1900	5.80	7.96	5.82	1.21	4.57	3.35	4.35	2.42	2.31	3.91	7.22	1.15	50.07
1901	2.77	0.74	4.05	7.91	6.54	3.84	4.91	3.47	2.59	3.48	1.76	5.53	47.59
1902	1.76	2.19	3.12	3.31	5.32	4.45	2.31	3.86	3.88	4.14	1.47	4.60	40.41
1903	3.51	3.89	4.09	1.51	0.18	5.25	6.01	2.96	1.21	2.69	0.98	3.63	35.91
1904	2.88	1.41	2.51	5.72	3.89	2.42	2.34	4.10	4.75	2.76	1.43	1.51	35.72
1905	3.90	1.11	2.08	2.11	2.33	4.15	4.61	2.85	4.21	1.51	2.92	2.98	34.76
1906	2.01	1.68	2 79	1.69	4.22	5.07	6.83	3.47	1.01	4.79	2.68	3.39	39.63
1907	1.67	1.52	2.90	3.88	1.84	3.03	3.53	1.22	6.34	5.17	5.14	2.86	39 10
1908	2.84	4.08	1.95	1.73	5.90	1.42	2.30	3.62	1.26	1.96	1.48	2.38	30.92
1909	5.39	6.12	4.04	3.49	3.51	2.11	2.34	1.79	7.08	1.03	3.31	2.13	42.34
1910	3.88	2.68	1.78	4.68	2.83	2.97	2.22	3.51	2.94	1.36	2.28	2.31	33.44
Means	3.25	3.43	3.46	3.16	3.64	3.47	4.05	3.08	3.37	2.87	3.33	2.92	40.04

LIVERMORE FALLS, ANDROSCOGGIN CO., ME.—Elevation 338 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
190.	-------	------	------	------	------	------	------	------	------	1.78	1.22	2.96	------
1910	3.83	2.76	1.62	4.56	3.02	2.75	4.70	5.61	0.78	0.28	------	------	------

LEWISTON, ANDROSCOGGIN CO., ME.—Elevation, 185 feet.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1875	3.35	5.30	5.40	5.00	2.90	6.32	2.65	5.45	4.98	6.82	6.80	1.31	56.28
1876	4.25	5.80	12.31	3.49	3.85	4.15	6.03	0.85	5.91	1.90	4.18	4.50	57.22
1877	2.43	0.90	8.05	3.26	2.36	2.45	2.75	8.35	1.84	6.95	12.13	1.55	53.02
1878	4.47	2.20	3.80	5.78	1.42	6.20	2.25	3.66	4.39	8.12	5.49	10.77	58.61
1879	3.15	4.15	3.30	3.36	0.75	5.71	3.76	5.87	2.78	1.73	4.25	3.45	42.26
1880	3.72	3.40	2.20	2.55	1.79	1.54	2.93	2.02	4.28	4.60	4.68	3.10	36.81
1881	3.33	3.95	5.22	1.68	5.03	2.61	4.22	3.33	1.84	2.89	2.73	7.14	43.97
1882	3.76	5.81	4.41	2.34	5.15	3.19	2.69	0.99	7.38	1.32	1.65	2.93	41.62
1883	2.57	3.49	1.73	2.96	4.82	4.26	3.98	0.91	3.25	4.08	3.06	4.07	39.18
1884	4.89	6.87	5.40	5.97	4.36	1.49	5.66	3.18	1.36	2.43	3.65	5.54	50.80
1885	4.21	4.12	1.96	2.85	4.12	5.85	3.79	2.97	2.31	4.09	3.65	3.40	43.32
1886	6.59	7.45	2.56	1.71	3.23	1.26	2.16	3.09	3.09	4.80	4.80	5.05	45.79
1887	3.99	5.28	4.60	5.18	1.14	2.81	5.73	3.77	0.88	2.42	5.09	5.73	46.62
1888	5.98	5.09	5.11	2.87	3.48	3.34	3.62	4.13	7.73	6.04	5.77	3.25	56.41
1889	4.67	3.21	3.30	2.48	2.85	4.12	5.22	2.68	2.92	4.61	6.25	5.00	47.31
1890	3.00	4.14	5.88	2.17	7.51	3.71	4.83	3.47	5.13	5.47	1.89	5.55	52.75
1891	8.10	3.89	7.03	2.89	2.60	3.64	5.27	2.97	1.00	2.40	2.66	5.27	47.72
1892	5.52	2.21	2.43	1.05	4.62	7.22	3.18	8.11	4.48	1.81	4.54	1.49	46.66
1893	2.82	5.59	2.78	2.58	8.26	2.51	1.32	3.55	2.69	6.08	2.31	4.87	45.31
1894	2.93	2.26	1.99	2.24	6.55	1.74	1.46	2.55	4.48	5.62	2.59	2.98	37.59
1895	3.41	0.63	2.10	5.64	1.85	2.59	2.22	2.54	1.15	2.11	7.21	5.07	36.52
1896	1.04	5.82	10.10	1.63	2.37	2.58	3.08	2.98	6.73	3.58	3.79	1.45	45.15
1897	5.17	2.55	4.49	2.93	5.25	3.71	6.63	3.79	3.43	0.95	5.92	4.65	49.47
1898	5.93	7.07	1.40	3.48	2.03	4.85	2.35	2.21	3.04	4.34	4.44	2.85	43.99
1899	3.19	3.06	5.96	1.48	1.14	2.04	4.43	1.16	3.65	1.97	2.63	2.03	32.74
1900	6.85	8.69	8.01	1.92	4.04	1.69	2.02	3.69	2.48	4.42	4.95	2.13	50.89
1901	3.19	1.15	5.14	8.16	5.77	1.12	4.25	4.75	1.75	3.33	2.20	7.59	48.40
1902	3.04	3.01	8.96	4.37	2.67	5.21	2.02	3.52	3.70	5.07	1.45	5.26	48.28
1903	4.48	4.15	6.32	2.11	0.35	5.30	3.90	2.53	1.44	3.53	1.58	4.13	39.82
1904	4.26	2.32	3.71	6.74	4.34	2.64	2.39	4.29	3.82	1.88	2.63	1.93	40.95
1905	4.42	1.80.	1.48	1.54	2.04	4.12	4.58	1.79	5.51	1.01	3.70	3.65	35.64
1906	3.15	1.59	4.51	2.93	4.21	7.42	5.44	0.80	0.85	4.97	3.26	3.94	43.07
1907	2.45	2.29	3.05	3.71	2.11	4.79	2.63	2.56	7.03	3.56	4.25	3.58	42.01
1908	2.82	4.68	2.18	2.64	4.94	0.90	3.66	2.73	0.80	5.01	1.61	4.16	36.13
1909	6.75	5.59	4.14	3.59	2.75	2.29	2.47	1.25	6.14	1.84	2.79	2.99	42.59
1910	3.44	4.24	1.90	4.16	1.94	2.62	2.40	4.81	2.68	1.69	2.18	3.14	35.20
Means	4.09	3.99	4.53	3.32	3.46	3.55	3.55	3.26	3.53	3.71	3.97	4.04	45.00

NORTH BRIDGTON, CUMBERLAND CO., ME.—Elevation, 450 feet.

Year	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1861	3.35	1.45	2.30	------	------	------	------	------	------	------	------	------	------
1862 } 1892	------	------	------	------	------	------	------	------	------	------	------	------	------
1893	------	------	------	------	------	------	------	------	------	------	2.73	2.96	------
1894	1.64	2.24	2.51	1.88	6.40	2.61	3.90	3.59	5.90	4.65	------	------	------
1895	1.92	1.08	1.73	6.86	2.74	3.49	2.74	2.98	2.41	2.91	6.58	5.79	41.23
1896	0.97	8.12	10.70	1.90	2.88	2.09	3.54	3.72	6.26	3.12	5.08	1.67	50.05
1897	4.59	3.17	4.74	2.93	5.47	6.00	13.25	3.35	2.76	1.14	5.79	4.76	57.95
1898	5.76	7.26	1.11	3.53	2.39	4.19	5.42	2.46	3.09	4.33	6.10	3.19	48.83
1899	3.38	3.98	6.58	1.81	0.80	2.42	5.35	1.86	3.95	1.56	2.46	2.18	36.33
1900	6.44	9.06	6.55	0.96	3.93	1.64	2.95	2.16	3.27	4.22	6.70	1.42	49.30
1901	*2.77	1.70	4.30	7.60	7.56	3.91	5.13	5.46	2.55	3.24	2.14	5.75	52.61
1902	4.36	2.55	8.21	4.67	3.98	5.50	2.66	4.21	4.11	5.72	1.78	6.27	54.02
1903	4.20	4.02	5.62	2.02	0.54	6.38	3.45	2.88	2.16	4.04	1.02	3.36	39.69
1904	4.58	2.46	3.47	5.90	4.31	2.87	2.96	5.91	4.25	1.70	1.33	1.67	41.41
1905	4.67	1.66	2.06	1.65	2.16	5.50	5.97	2.53	7.02	1.56	3.16	2.95	40.89
1906	2.77	1.52	3.87	2.36	4.66	6.13	5.82	1.79	0.83	5.18	3.36	4.32	42.61
1907	1.90	1.89	3.68	3.80	2.21	4.28	2.95	2.10	6.49	4.49	4.74	3.67	42.20
1908	2.43	3.65	2.20	2.58	4.51	1.00	5.34	3.55	0.81	2.40	1.46	3.27	33.20
1909	6.12	5.79	3.78	3.68	3.55	2.42	2.00	1.51	6.13	1.34	2.71	2.95	41.98
1910	3.77	4.48	1.65	4.92	3.20	3.28	1.35	5.72	4.15	3.13	2.51	3.63	41.79
Means	3.65	3.67	4.20	3.47	3.61	3.75	4.34	3.28	3.89	3.22	3.51	3.52	44.11

*Rumford Falls.

SONGO, CUMBERLAND CO., ME.—Elevation. 280 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1900	------	------	------	1.56	4.37	1.52	1.75	2.21	2.59	3.22	5.35	1.82	------
1901	2.51	0.82	3.82	8.05	7.12	1.65	4.11	5.35	2.04	3.30	2.04	7.44	48.25
1902	3.23	3.80	6.22	4.71	3.02	5.50	2.47	5.05	3.31	6.41	1.22	4.29	49.23
1903	4.23	4.11	6.34	1.86	0.47	5.97	4.27	3.09	1.06	3.41	1.65	3.87	40.33
1904	3.40	1.82	3.42	5.84	4.63	1.70	1.81	4.27	4.38	1.31	1.85	1.52	35.95
1905	4.64	1.11	2.29	1.49	1.85	3.84	5.36	2.05	5.91	1.13	3.24	3.43	36.34
1906	2.89	1.16	3.45	2.37	5.58	5.54	3.99	0.95	0.67	4.16	2.41	4.04	37.31
1907	1.74	2.25	2.83	3.15	1.98	2.99	2.23	1.91	6.52	3.67	4.54	2.86	36.67
1908	2.78	4.22	2.20	2.34	5.34	0.76	2.90	3.36	0.48	3.43	1.26	3.23	32.30
1909	5.63	4.87	3.95	4.18	3.23	2.20	2.62	2.17	4.83	1.78	2.53	3.02	41.01
1910	3.10	4.40	1.23	4.37	1.88	3.63	1.95	4.84	2.83	3.25	2.31	3.54	37.33
Means	3.72	3.30	3.70	4.03	3.76	3.54	3.22	3.20	3.15	3.19	2.58	3.55	40.94

PORTLAND, CUMBERLAND CO., ME.—Elevation, 99 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1856	------	1.25	------	------	------	1.55	4.45	6.83	4.89	3.47	2.25	5.15	------
1857	6.46	1.68	4.77	5.85	3.42	3.00	5.38	4.93	0.64	7.00	2.39	4.15	49.67
1858	4.02	2.51	1.67	3.83	3.68	2.15	5.58	4.69	3.81	5.61	1.98	4.92	44.45
1859	4.63	2.77	8.03	3.35	3.43	5.95	------	2.24	4.44	2.26	4.56	6.12	------
1860 } 1870 }	------	------	------	------	------	------	------	------	------	------	------	------	------
1871	------	------	1.69	3.41	3.71	2.20	2.80	5.88	2.08	6.55	6.37	3.00	------
1872	0.77	0.35	1.44	1.60	3.23	5.95	3.23	6.97	3.12	3.55	4.27	2.54	37.02
1873	4.42	0.93	2.87	2.79	2.80	1.60	3.52	2.63	4.03	6.15	3.36	1.80	36.90
1874	3.13	2.13	1.14	4.03	3.86	3.14	5.41	5.29	2.73	1.23	3.18	0.97	36.24
1875	2.58	2.85	3.63	3.16	2.62	5.51	1.81	2.70	3.49	3.53	2.64	1.62	36.14
1876	2.38	3.84	5.29	2.59	4.68	2.55	6.00	0.54	4.29	1.57	2.83	2.48	39.04
1877	2.65	0.60	5.91	2.26	2.24	3.43	2.81	7.90	1.11	5.56	7.84	1.20	43.51
1878	3.83	3.28	2.19	5.60	1.16	3.13	1.56	2.93	1.34	4.48	3.74	5.36	38.60
1879	2.30	3.80	4.42	3.68	0.88	6.61	3.80	3.73	2.67	1.43	4.90	3.39	41.61
1880	5.36	4.50	1.42	2.66	1.35	3.03	3.12	2.32	3.20	4.21	3.25	3.17	37.59
1881	4.30	5.30	5.09	1.43	5.64	3.99	3.94	1.42	2.75	2.90	3.13	6.79	46.78
1882	4.39	4.58	3.97	1.97	3.95	3.20	2.00	0.66	7.58	2.90	0.93	2.61	38.74
1883	2.53	2.81	1.58	1.33	2.91	2.94	5.05	0.36	2.68	3.51	3.66	2.63	31.99
1884	4.54	6.92	4.86	6.12	6.46	1.41	6.78	3.98	0.56	2.21	2.25	6.42	52.51
1885	3.02	2.68	1.59	2.09	1.91	4.06	5.63	5.91	1.37	4.32	3.43	2.94	39.95
1886	4.65	5.52	3.26	2.28	4.07	1.66	3.63	3.93	5.56	6.70	5.33	5.04	51.63
1887	3.89	5.73	4.15	4.96	1.93	4.07	4.70	6.56	0.70	2.47	4.74	5.17	49.07
1888	6.05	5.40	3.72	3.80	3.36	2.79	1.90	4.36	8.22	7.47	7.46	4.71	59.24
1889	3.47	2.74	2.68	2.39	2.65	3.26	3.10	2.76	2.49	3.47	7.95	4.96	41.92
1890	2.89	4.04	6.24	2.51	6.10	4.53	3.58	2.99	4.88	6.82	2.31	5.08	51.97
1891	7.72	4.31	5.48	1.89	3.47	2.77	4.78	1.15	1.94	3.22	2.38	4.17	43.28
1892	4.22	2.18	2.27	1.04	4.41	4.60	2.68	8.14	2.89	1.64	3.76	1.32	39.15
1893	2.19	4.51	3.58	3.71	7.59	3.62	0.96	2.74	2.33	5.13	1.83	5.42	43.61
1894	3.13	2.70	1.97	2.55	7.33	2.01	2.96	3.27	2.76	4.65	2.05	1.75	37.13
1895	2.47	0.94	3.37	5.95	1.59	1.97	3.59	4.72	1.79	1.91	7.18	3.30	38.78
1896	2.00	5.27	8.02	1.65	3.21	2.23	3.10	2.57	9.57	3.19	2.45	2.18	45.44
1897	4.09	2.60	4.55	2.60	5.87	4.97	2.62	1.41	2.34	0.46	6.69	4.22	42.42
1898	6.61	7.61	1.21	4.33	2.62	3.98	1.78	3.88	3.48	5.90	5.51	2.85	49.76
1899	3.39	3.41	6.49	1.55	0.73	1.04	3.92	1.66	4.47	1.46	3.11	2.84	34.07
1900	6.28	9.25	6.00	2.25	4.09	1.25	1.70	3.72	2.56	5.81	5.50	2.38	50.79
1901	3.34	1.68	6.43	7.47	7.17	0.93	4.21	3.26	2.18	3.12	1.89	7.14	48.82
1902	2.73	3.34	8.76	3.97	2.17	3.78	2.21	4.36	4.08	4.95	0.86	6.54	47.75
1903	4.90	3.44	5.60	2.51	0.68	5.53	2.50	1.85	2.06	3.57	1.44	3.46	37.54
1904	4.04	2.35	2.52	7.51	4.75	2.45	1.63	3.64	3.49	1.16	1.93	1.43	36.90
1905	5.16	1.78	1.97	1.43	2.58	3.08	3.65	2.78	5.35	0.95	4.45	5.44	38.62
1906	2.87	2.00	4.95	3.53	4.79	7.18	4.32	1.73	0.58	2.75	3.04	4.80	42.54
1907	2.46	2.95	2.58	2.75	1.99	3.55	3.63	2.07	7.81	2.53	4.40	4.12	40.84
1908	2.42	3.72	2.26	2.14	4.76	0.53	2.58	3.73	0.69	3.65	1.34	2.92	30.74
1909	4.71	5.07	2.76	3.13	2.95	2.33	2.14	1.68	4.68	1.50	2.83	2.06	35.84
1910	2.90	4.84	1.62	4.12	1.65	3.26	1.64	2.79	2.89	1.27	1.85	3.43	32.26
Means	3.81	3.52	3.81	3.25	3.50	3.24	3.40	3.49	3.33	3.60	3.62	3.73	42.30

CORNISH, YORK CO., ME.—Elevation, 778 feet.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1857 -------	4.50	5.11	1.75	8.26	4.75	3.53	4.67	6.17	0.91	9.70	3.09	5.65	58.07
1858 -------	4.25	2.10	1.82	3.97	3.60	3.48	7.87	3.47	5.15	3.88	2.53	2.45	44.57
1859 -------	4.84	3.89	9.63	3.22	2.41	7.01	1.77	2.70	3.47	1.79	4.27	5.69	50.69
1860 -------	2.00	7.03	4.67	2.26	1.30	5.48	3.09	4.08	3.05	4.90	9.22	3.87	50.95
1861 -------	4.70	3.14	4.62	3.67	4.10	1.83	3.13	1.60	3.28	6.39	7.86	2.42	46.74
1862 -------	4.15	4.02	2.40	3.90	2.00	4.52	4.62	2.57	1.19	2.70	5.32	1.32	38.71
1863 -------	-----	3.33	4.51	6.58	1.84	1.71	7.40	4.70	2.66	4.12	8.25	2.59	-----
1864 -------	3.16	1.52	5.47	4.42	2.43	0.80	0.63	8.29	3.83	3.88	5.89	4.78	45.10
1865 -------	3.92	3.05	4.30	3.93	5.50	2.07	4.00	4.64	1.64	4.31	3.63	4.24	45.23
1866 -------	1.78	5.41	4.94	2.03	3.30	4.59	2.60	5.48	5.46	2.67	3.43	3.86	45.55
1867 -------	3.20	3.06	3.49	4.11	3.79	2.16	4.90	9.07	1.09	4.33	3.00	1.62	43.82
1868 -------	4.15	1.18	2.12	2.48	9.25	3.34	2.33	3.02	7.95	0.89	6.14	2.80	45.65
1869 -------	2.47	4.93	5.36	1.69	4.57	2.99	3.65	2.26	3.47	12.04	4.20	4.27	51.90
1870 -------	6.63	5.85	4.97	5.79	1.55	3.69	3.00	3.86	1.10	5.55	4.73	2.49	49.21
1871 -------	3.02	3.13	4.65	4.32	4.84	2.35	5.11	5.59	1.80	5.20	5.02	3.63	48.66
1872 -------	1.73	1.06	2.77	1.12	3.13	5.86	3.99	6.39	3.38	3.19	5.14	4.18	41.94
1873 -------	4.94	2.15	4.25	3.36	2.48	1.28	7.19	1.39	3.96	9.12	4.72	*1.80	46.64
1874 -------	3.25	2.09	1.42	3.37	3.36	4.04	5.10	4.23	2.14	1.63	2.08	1.95	34.66
1875 -------	3.60	3.30	4.46	2.27	2.60	5.84	5.37	5.75	3.51	7.36	3.15	6.07	53.28
1876 -------	2.55	3.80	5.32	0.92	2.28	3.15	4.50	0.16	4.38	2.76	3.21	3.20	36.23
1877 -------	1.55	0.18	6.60	3.16	2.35	3.32	2.87	7.45	0.92	6.01	7.98	1.10	43.49
1878 -------	2.74	2.25	3.79	4.45	1.05	4.92	2.57	2.50	3.69	5.26	5.56	6.54	45.32
1879 -------	2.38	3.58	2.72	3.47	0.62	5.55	3.45	5.07	4.27	1.94	3.60	4.52	41.17
1880 -------	3.43	3.08	1.81	2.98	1.37	1.52	2.54	3.13	3.37	4.46	3.55	2.86	34.10
1881 -------	3.60	2.87	5.63	1.26	3.95	2.28	4.91	1.54	3.17	2.57	3.52	6.25	41.55
1882 -------	4.15	5.02	3.06	1.47	3.85	3.86	4.65	1.99	8.04	1.94	0.84	2.90	41.77
1883 -------	3.04	3.57	2.25	2.07	4.91	3.39	6.21	1.05	2.45	3.89	3.03	3.25	39.11
1884 -------	2.74	7.28	5.31	4.32	4.38	1.88	5.27	4.53	1.39	3.96	5.90	5.92	52.88
1885 -------	4.00	4.50	2.00	3.73	2.94	5.23	6.64	6.08	2.00	3.85	5.93	3.35	50.25
1886 -------	7.17	6.00	2.85	3.13	3.71	2.19	3.10	4.08	4.95	5.10	5.48	4.46	52.22
1887 -------	4.34	5.27	3.55	3.86	2.13	4.32	5.85	2.52	0.06	2.04	4.92	4.36	43.22
1888 -------	4.85	4.10	2.75	1.36	4.04	1.61	1.74	4.48	7.97	6.57	5.85	2.81	48.13
1889 -------	5.10	3.00	3.17	2.34	2.31	3.13	4.47	2.50	4.16	4.41	5.24	3.13	42.96
1890 -------	3.45	4.43	5.65	2.26	6.66	6.58	5.95	4.12	9.08	6.11	2.66	3.68	60.63
1891 -------	4.93	3.78	6.79	2.58	2.87	2.95	5.54	3.70	2.42	4.58	2.77	4.87	47.78
1892 -------	5.09	1.95	1.85	1.14	5.40	5.58	2.64	11.12	2.76	2.14	6.18	1.38	47.23
1893 -------	1.90	7.33	2.08	2.59	8.82	3.09	1.31	3.94	2.57	6.76	2.54	3.46	46.39
1894 -------	2.32	2.51	1.93	3.12	7.44	2.49	4.70	4.79	5.24	5.22	2.65	3.00	45.41
1895 -------	1.78	1.40	2.86	7.81	1.95	3.53	4.18	3.10	1.91	3.29	8.30	5.07	45.18
1896 -------	1.50	8.79	9.74	1.25	3.56	2.68	4.20	5.02	7.04	5.48	4.19	1.50	54.95
1897 -------	4.02	3.23	2.96	3.07	6.66	8.68	7.19	4.84	3.15	0.77	6.36	5.13	56.06
1898 -------	5.23	3.85	1.45	4.63	3.54	3.28	1.46	3.13	3.69	5.20	4.48	3.12	43.06
1899 -------	2.82	3.29	6.22	0.98	1.05	3.77	5.87	2.13	5.38	2.84	2.27	1.79	38.41
1900 -------	5.81	9.76	6.68	2.17	3.34	2.45	2.38	3.65	2.98	4.96	7.39	3.39	54.96
1901 -------	3.03	1.26	5.70	11.52	8.40	1.79	6.25	9.00	3.06	3.47	2.00	7.52	63.00
1902 -------	4.18	2.61	8.10	6.56	3.05	4.92	3.24	8.36	6.68	6.80	1.70	7.06	63.26
1903 -------	4.54	4.50	6.84	2.81	0.27	8.83	3.69	3.28	1.27	4.21	1.63	3.19	45.06
1904 -------	3.39	2.14	3.95	7.67	5.71	2.94	2.24	5.12	5.10	1.41	1.24	1.66	42.57
1905 -------	5.53	1.51	2.65	1.97	2.15	4.12	9.11	4.26	7.46	1.38	4.48	4.21	48.83
1906 -------	2.93	1.76	3.67	1.91	5.14	7.95	5.02	1.92	0.90	4.32	2.57	4.15	42.24
1907 -------	3.04	2.45	3.03	3.19	2.05	4.25	2.85	2.06	7.51	4.06	6.04	3.27	43.80
1908 -------	2.85	4.67	1.90	2.95	5.47	0.65	2.66	2.62	1.54	3.41	1.47	3.63	33.82
1909 -------	5.08	5.79	4.38	3.92	4.03	2.56	3.13	2.34	5.54	1.17	2.06	3.65	43.68
1910 -------	4.25	5.19	1.76	4.90	1.88	3.39	1.64	3.53	3.40	2.04	2.62	3.42	38.02
Means ---	3.69	3.74	4.05	3.49	3.63	3.69	4.16	4.15	3.68	4.22	4.29	3.66	46.45

*No record: supplied from Portland record.

UNION FALLS, YORK CO., ME.—Elevation, 75 feet.

1904 -------	4.70	1.65	4.40	7.55	5.60	1.85	3.70	4.40	4.10	1.60	6.20	3.20	48.95
1905 -------	4.50	1.30	1.65	1.90	2.80	4.40	4.20	4.10	6.10	1.70	4.60	5.75	43.60
1906 -------	3.05	2.15	3.80	2.70	7.00	6.90	6.10	2.95	1.30	2.30	2.95	3.50	44.70
1907 -------	4.00	1.90	2.05	2.40	2.40	5.40	4.60	3.50	9.70	4.50	6.10	4.95	50.90
1908 -------	3.60	5.28	2.05	1.80	7.70	0.50	4.20	4.90	1.00	4.50	1.65	3.90	41.08
1909 -------	3.90	4.60	5.55	4.15	3.65	2.55	1.35	2.15	5.60	2.35	3.20	4.80	43.85
Means ---	3.96	2.66	3.25	3.42	4.86	3.60	3.92	3.67	4.63	2.82	4.12	4.35	45.26

BIDDEFORD, YORK CO., ME.—Elevation. 75 feet.

Year. (a)	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1881	1.15	3.75	3.83	3.00	5.65	*3.99	5.35	4.55	1.65	2.20	1.60	5.60	42.32
1882	0.70	0.40	0.70	1.60	5.40	3.25	2.90	0.30	7.25	2.90	0.52	2.60	28.52
1883	0.70	*2.81	0.30	2.60	4.55	3.70	6.30	1.00	3.00	5.10	3.30	0.30	33.66
1884	2.90	1.80	2.90	4.80	4.60	1.50	4.15	5.40	1.50	2.80	3.20	4.50	40.05
1885	1.80	4.30	0.35	4.30	4.40	5.80	3.40	6.50	1.20	7.10	3.20	2.30	44.65
1886	4.30	6.00	3.20	3.00	3.60	2.35	3.00	4.10	4.40	4.35	4.60	1.90	44.80
1887	1.70	2.10	2.60	4.10	3.50	4.70	5.50	6.40	1.00	2.90	4.80	4.60	43.90
1888	1.80	3.50	2.90	2.40	4.90	1.30	1.80	5.50	8.00	9.70	9.20	4.20	55.20
1889	4.90	1.70	3.70	3.40	3.50	4.20	5.70	3.20	2.90	4.00	9.50	4.00	50.70
1890	2.30	2.70	3.70	2.90	6.90	5.60	2.95	4.00	6.90	8.80	2.30	0.00	49.05
1891	4.70	2.20	4.90	3.10	3.25	3.50	5.00	1.30	1.70	4.10	2.60	3.15	39.50
1892	3.40	0.00	0.50	1.10	5.90	3.40	2.80	10.75	3.40	2.40	4.50	1.00	39.15
1893	1.90	6.25	2.70	3.90	11.60	3.80	2.50	4.60	2.20	6.70	2.80	3.65	52.60
1894	2.35	2.50	3.00	3.00	7.70	1.20	2.10	2.30	3.60	6.20	3.20	2.25	39.40
1895	2.30	1.50	3.60	7.00	1.80	2.95	3.80	3.90	2.80	2.60	8.90	4.10	45.25
1896	1.00	5.70	11.70	2.10	2.90	2.50	2.70	2.20	10.90	4.60	3.45	2.25	52.00
1897	2.70	3.55	4.20	3.40	6.90	8.50	3.90	2.20	2.20	0.40	7.90	5.20	51.05
1898	6.90	7.70	1.65	5.20	3 90	5.20	1.60	3.70	3.40	7.70	6.50	3.40	56.85
1899	4.40	2.70	9.30	1.98	1.45	1.27	5.45	1.50	5.50	2.20	3.80	3.00	42.55
1900	8.60	11.60	7.00	2.60	4.60	2.00	2.70	3.15	3.15	5.85	6.50	3.20	60.95
1901	2.45	1.30	7.50	10.10	8.35	1.10	5.80	4.60	3.55	2.80	2.75	9.45	59.75
1902	3.20	3.20	9.60	5.30	3.10	5.15	2.40	5.45	8.25	6.30	1.55	8.85	62.35
1903	5.10	4.20	6.70	2.80	1.20	5.85	3.40	2.70	2.40	4.70	1.90	4.15	45.10
1904	4.50	2.20	2.95	9.25	6.90	3.25	2.80	5.50	4.60	1.75	2.50	1.60	47.80
1905	2.95	1.70	2.60	2.40	3.10	3.20	8.55	7.30	7.35	1.95	5.65	6.20	52.95
1906	3.25	1.70	8.20	4.30	6.00	8.55	3.75	4.50	1.50	3.30	4.30	3.70	53.05
1907	3.50	3.50	1.00	3.30	2.65	5.60	3.40	2.20	9.10	4.20	5.25	4.60	48.30
1908	3.05	3.20	1.60	2.30	5.30	0.70	3.20	4.50	0.70	4.50	1.00	3.55	33.60
1909	3.45	5.00	3.40	3.70	2.70	2.10	1.70	1.80	6.30	1.70	3.90	2.50	38.25
1910	3.30	4.70	1.40	3.90	1.70	4.30	2.85	2.50	3.50	1.90	2.10	3.60	35.75
Means	3.18	3.45	3.92	3.76	4.60	3.68	3.72	3.92	4.13	4.19	4.08	3.65	46 28

(a.) Snowfall not included 1881 to 1892.

*No record: supplied from Portland record.

EVAPORATION.*

Measurements of evaporation have been carried on at four places in Maine by the U. S. Geological Survey, in cooperation with private parties. From the results at these four stations an approximate idea of the amount of evaporation in the State of Maine can be obtained, but the data during the winter months are rather incomplete.

Evaporation Stations in Maine.

STATION.	Location.	Date established.	Date discontinued.
Soldier Pond..........	Soldier Pond................	July 1, 1905........	November 7, 1908
Millinocket	Ferguson Pond	July 1, 1905........	October 31, 1907
Lewiston	Androscoggin River	July 1, 1905........	October 31, 1907
Upper Dam	Mooselucmaguntic Lake....	August 19, 1905....	October 29, 1907

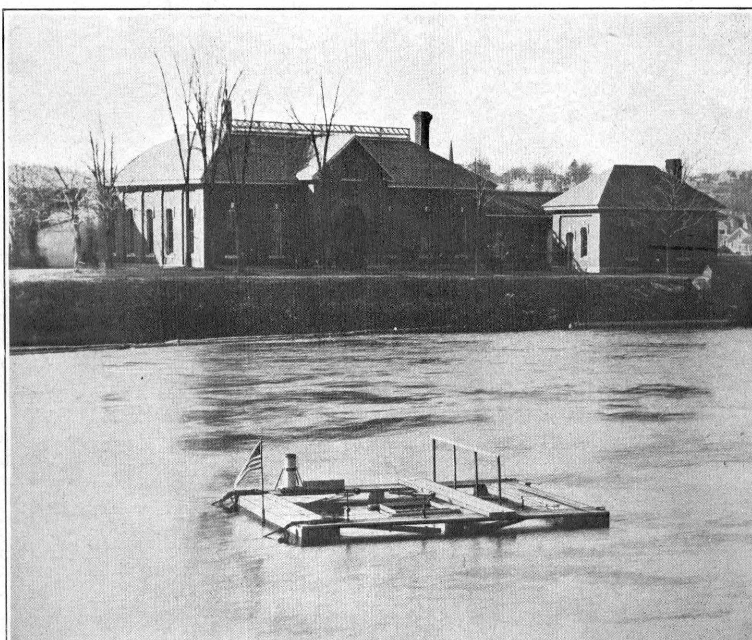
METHODS USED FOR DETERMINATION.

The method used for the measurement of evaporation has been that of the floating raft and dish, commonly used for this purpose. Plate II shows the evaporation raft, etc., at Lewiston. A skeleton log raft about 15 feet square is arranged to float with its surface just out of the water. A clear opening 6 feet square is left in the center and in this opening the evaporation pan floats, its top being kept perhaps 2 or 3 inches above the water surface by means of galvanized-iron pontoons, which are cylindrical in shape and air tight. The evaporation pan is 3 feet square and 18 inches deep, and is constructed of galvanized iron, properly braced with iron straps. A spindle with sharp points is fixed vertically in the middle of the pan, with its point 1 or 2 inches below the top.

In measuring the amount of evaporation, the water surface is made of exactly the same height as the point of the spindle,

*From Mss. by H. K. Barrows to be published shortly in series of Water Supply Papers, U. S. Geological Survey.

Plate II



Evaporation and Rainfall Station on Androscoggin River at Lewiston

and then at the next time of observation the process is repeated, the amount of water required to restore the water surface to the level of the spindle point being noted. The spindle is surrounded by a thin iron cylinder about 3 inches in diameter, with its axis parallel to the spindle and closed with the exception of some small holes near the bottom. This prevents rapid movement of the water surface and enables very close determinations to be made of its height. A small cup of such capacity that it represents 0.01 inch depth of water in the pan is used for pouring in the water (or dipping it out in case it has rained and the rainfall has exceeded the evaporation), so that the number of cupfulls represents the change in depth in hundredths of inches—the exaporation if there has been no rainfall. A rain gage is maintained on the raft so that correction can be made for any rainfall.

At Soldier Pond, the temperatures of the water in the pan and outside of the pan, the precipitation and evaporation are noted. At the other three stations there are also observed the temperature of the air, relative humidity and velocity of the wind.

The results obtained have been in general very satisfactory, and it has been found that with the spindle point surrounded by a cylinder, as just described, the water surface moves but little, even when the pan is being considerably shaken by wave motion. A difference of half a cupful (0.005 inch) can readily be detected. At some of the stations, especially Millinocket, difficulty was experienced from waves during occasional high winds, causing the loss of several days' records.

During the frozen period some data were obtained at Millinocket and Lewiston regarding the evaporation from ice. At Lewiston, the results were obtained by filling an iron dish, allowing it to freeze solidly, and then exposing it. The weight was observed from time to time and the loss by evaporation thus determined. During storms of rain and sleet observations had to be discontinued and the record therefore interrupted. Owing to the fact that the evaporation was not measured for the stormy days, it seems probable that the estimates made of the monthly evaporation are slightly large. As the evaporation thus obtained was from ice and as there is usually some snow during the winter months, serving to protect the lake ice cover, the actual evaporation from the lakes and reservoirs is probably smaller than the figure given. The evaporation from snow is, however, an undetermined quantity.

The following tables show the results in monthly periods, of the evaporation for the four stations.

Monthly Evaporation in inches at Soldier Pond, Maine.

MONTH.	1905.	1906.	1907.	1908.	Average.	Remarks.
May	....	1.67 (b)	1.40	0.86 (c)	(1.15)	(b) 29 days (c) 12-31
June	....	2.88	2.10	2.63	2.5	
July	4.30	4.34	2.32	4.69	3.9	
August	5.25	5.34	3.16	4.64	4.6	
September	2.65	3.10	2.03	3.66	2.9	
October	1.51 (a)	1.99	2.06	2.97	2.2	(a) 28 days

Monthly Evaporation in inches at Millinocket, Maine.

MONTH.	1905.	1906.	1907.	Average.	Remarks.
May	....	....	2.15 (b)	(2.7)	(b) 25 days
June	....	....	2.85	(2.8)	
July	5.55	4.80	3.94	4.8	
August	5.80	5.91	5.39	5.7	
September	3.32	4.50	3.72	3.8	
October	2.94	1.82 (a)	2.98	2.7	(a) 25 days

Monthly Evaporation in inches at Lewiston, Maine.

MONTH.	1905.	1906.	1907.	Average.	Remarks.
January	....	0.90 (a)	0.47 (e)	(1.0±)	(a) 22 days. (e) 21 days
February	....	1.05 (b)	0.69 (f)	(0.8±)	(b) 27 days. (f) 26 days
March	....	1.87 (c)	0.66 (g)	(1.7±)	(c) 26 days. (g) 18 days
April	....	2.90 (d)	....	(2.8±)	(d) 25 days
May	....	2.14	2.22 (h)	(2.5±)	(h) 23 days
June	....	2.86	3.80	(3.3)	
July	5.99	4.79	5.08	5.3	
August	4.32	5.96	5.19	5.2	
September	3.02	4.73	2.93	3.6	
October	2.54	2.30	2.10	2.3	
November	1.01 (i)	....	....	(1.3)	(i) 24 days
December	0.60 (1)	0.28 (j)	....	(0.7)	(j) 14 days. (1) 24 days

Monthly Evaporation in inches at Mooselucmaguntic Lake, Maine.

MONTH.	1905.	1906.	1907.	Average.	Remarks.
June	....	1.10 (a)	....		(a) 28 days
July	....	3.28	3.27	(3.3±)	
August	....	5.10	3.82	(4.5±)	
September	2.51 (c)	3.52	2.14	(3.0)	(c) 23 days
October	2.56	2.56	2.26 (b)	(2.2)	(b) October 1-29

The observations were not as continuous as could be desired, but it is believed that the results are fairly representative of the evaporation in the State of Maine, especially in the portion of the year of importance regarding water storage. It is probable that during the winter months the relative evaporation at Lewiston is larger (as regards that at the other stations) than during the summer months, since the change in conditions at Lewiston is less during the winter than at the other places.

The table below shows the average monthly evaporation for the various stations. Column 6 shows the adopted average for the entire State, column 7 show the amount of evaporation from water surface in the vicinity of Boston as determined by Fitzgerald.* The average annual evaporation from water surface in Maine is about 26 inches as compared with 39.12 inches in Boston.

*Fitzgerald, Desmond, Evaporation; Trans. Am. Soc. C. E., vol. 15, 1886, p. 581.

Average Monthly Evaporation in inches for Maine.

Month.	Soldier Pond.	Millinocket.	Lewiston.	Mooselucmeguntic.	Composite average.	Average evaporation near Boston, Mass.
January	....	....	1.0	....	(0.7±)	0.98
February	....	....	0.8	....	(0.7±)	1.01
March	....	....	1.7	....	(1.1±)	1.45
April	....	....	2.8	....	(1.6±)	2.39
May	1.5	2.7	2.5	....	(2.1)	3.82
June	2.5	2.8	3.3	....	(2.8±)	5.34
July	3.9	4.8	5.3	3.3	4.32	6.21
August	4.6	5.7	5.2	4.5	5.00	5.97
September	2.9	3.8	3.6	3.0	3.32	4.86
October	2.2	2.7	2.3	2.2	(2.2)	3.47
November	....	....	1.3	....	(1.3±)	2.24
December	....	....	0.7	....	(0.7±)	1.38
Total					25.84	39.12

WATER POWERS, GENERAL.

DEVELOPED POWERS.

The Law directs that the Commission should report, so far as its investigations will permit, on the present development of the water powers of the State.

A census of the developed water powers was therefore started. A blank was first sent out to the chairmen of the selectmen of each town in the State asking them to send in a list of all water power companies and mill owners in their towns. Replies were received from these and other sources. A total of 965 names were received. The letter in question read as follows:

Dear Sir:—

The State Water Storage Commission is desirous of obtaining information on the developed water powers in this State. If you will kindly give below the names and addresses of water power companies, mill owners, etc., in your town, you can materially assist in the investigation. The enclosed envelope for your reply will require no extra postage. Thanking you for your courtesy in this matter, I am

Very truly yours,

CYRUS C. BABB.

A second form was thereupon mailed to all such water power users, reading as follows:

STATE OF MAINE.

STATE WATER STORAGE COMMISSION.

Augusta, Maine.

Gentlemen:

Pursuant to the laws of the State of Maine, Public 1905, Chapter 144, and Public 1909, Chapter 212, providing for an investigation of the water resources of the State, I have the honor to request your reply to as many of the following questions as you may wish to give me. Your co-operation in this matter will be appreciated.

Very respectfully,

CYRUS C. BABB.

Name of corporation, partnership or individual operating plant..........
....
Post Office.............County............State.............

1. Date of charter........... 2. Date of construction...........

3. Dates of important changes in construction and details...........
....

4. Capital Stock........... 5. Dates of changes of forms of ownership ....

6. Name of stream on which plant is located.......................

7. Location of plant, accompanied, if possible by a plan, sketch or photograph showing features of plant, location and togography........
....

8. Drainage area of stream above dam, accompanied by map if possible........... sq. miles.

A. Nature of topography.......................................

9. Dam.

A. Height...........ft. B. Length...........ft.

C. Width............ft. D. Material........... Cost ....

E. Capacity of reservoir...........cubic ft.

F. Area flooded...........square miles. If possible submit map showing property lines.

G. Leakage...........cubic ft. per second. H. Elevation of crest.......................

I. Owner of dam...

10. Canal.

A. Method of supplying water to wheels.......................

B. Operating capacity of canal or pipe line.......................

11. Plant.

A. Nature of product...

B. Quantity ....

C. Waterwheels or turbines.

a. Size and number.......................................

b. Total rated capacity...............horsepower.

c. Head under which they operate...........feet. Range ....feet.

d. Operation ....

Horsepower developed during average low water ....

Number of wheel.	Kind of wheel.	Name of maker.	Size of wheel (inches).	Usual gate opening (inches).	Rated power at usual gate and head.	Discharge cubic feet per sec.
....	....	....	....	....	....	....

D. Generators:

Number.	Maker.	Kilowatts.	Voltage.	Phase.	Current.	Connection.	Remarks.
....	....	....	....	....	....	....	....

E. Is power transmitted................Where.................
How much...
For what purpose...
Market price of power....................................

12. Operation of plant.
A. Hours of daily run.......... B. Number days per week........
C. Do you store water when not running........................
D. How long do you operate auxiliary steam plant...............
.... Horsepower ....

13. Storage.
A. Do you have the benefit of additional important storage..........
B. Location of storage dam....................................
C. Owner of dam...
D. Is operation of dam satisfactory...........................
E. Remarks on operation of storage dam........................

14. Names and addresses of other water power plants in vicinity......
....

15. Additional remarks...
....

Information furnished by...

Out of 965 of these letters sent out, 594 have been returned to date. It is deemed best not to present the partial returns, in a summarized form, in this report. Considerable information regarding many of the developments is given in the descriptions of the various drainage basins in the following pages. Some basins are described in more detail than others according to the information available. When the information requested, is filled out for all water users in the State, very valuable data will be on hand for the future use of the State.

In 1908 the U. S. Geological Survey, in co-operation with the U. S. Bureau of the Census, made a special census of the developed water powers of the United States.*

New York State has the largest water-power development, the total being 885,862 horsepower. It is proper to add that

*See Water Supply paper No. 234, U. S. Geological Survey, Washington, D. C., 1909.

the Niagara powers on the New York side assist largely in making up this figure. The second State in water-power development is California, the total being 466,774 horsepower, with 1,070 wheels, or a unit installation of about 436 horsepower. Water power development in California is comparatively recent, and it is only lately that that State has superseded Maine in second place. The third State is Maine, with 343,096 horsepower, and 2,797 wheels, or an average of 123 horsepower per wheel. As the use of water power in this State is comparatively ancient, the contrast in unit capacity between it and California is significant.

The following table shows for each State in the Union, the area in square miles, the number of water powers, the number of wheels, and the total horsepower developed.

Developed Water Powers in the United States.

STATE.	Area square miles.	Number of water powers.	Number of wheels.	Total horse-power.
Alabama	52,250	1,382	1,804	161,694
Alaska	561,409	31	106	17,289
Arizona	113.020	29	37	16,855
Arkansas	53,850	203	255	5,868
California	158.360	559	1,070	466,774
Colorado	103,925	230	353	78,878
Connecticut	4,990	893	1,546	118,145
Delaware	2,050	119	277	7,976
District of Columbia	70	1	6	1,000
Florida	58,680	166	207	4,539
Georgia	59,475	1,596	2,314	166,587
Idaho	84,800	199	285	78,743
Illinois	56,650	155	413	50,116
Indiana	36,350	222	495	29,153
Iowa	56,025	207	461	17,304
Kansas	82,080	118	184	18,606
Kentucky	40,400	691	834	14,156
Louisiana	48,720	64	79	1,184
Maine	*33,040*	*1,222*	*2,797*	*343,096*
Maryland	12,210	496	694	21,715
Massachusetts	8,315	1,370	2,749	260,182
Michigan	58,915	657	1,498	205,019
Minnesota	83,365	195	531	152,380
Mississippi	46,810	273	336	7.922
Missouri	69,415	277	397	10,107
Montana	146,080	94	204	148,052
Nebraska	77.510	157	227	12,792
Nevada	110.700	32	39	20,577
New Hampshire	9,305	876	1,799	183,167
New Jersey	7,815	560	902	38.011
New Mexico	122,580	48	56	2,310
New York	49,170	3,148	6,513	885,862
North Carolina	52,250	2,614	3,975	162,284
North Dakota	70,795	9	16	613
Ohio	41,060	480	873	34,840
Oklahoma	70,430	25	29	2,994
Oregon	96,030	345	590	231,379
Pennsylvania	45,215	3,721	5,596	290,990
Rhode Island	1,250	191	387	37,165
South Carolina	30,570	846	1,301	207,242
South Dakota	77,650	45	68	11,112
Tennessee	42,050	1,793	2,160	95,060
Texas	265,780	147	195	9,966
Utah	84,970	200	260	64,265
Vermont	9,565	1,148	2,018	170,276
Virginia	42,450	2,243	3,011	100,123
Washington	69,180	322	475	147,041
West Virginia	24,780	525	672	20.500
Wisconsin	56.040	580	1,667	220,916
Wyoming	97,890	33	66	3,855
Totals	3,586,289	31,537	52,827	5,356,680

UNDEVELOPED POWERS.*

In the same investigation by the U. S. Geological Survey, a study of undeveloped water powers has been made. The table

*Water Supply Paper No. 234. Conservation of Water Resources, article on Undeveloped Water Powers, by M. O. Leighton.

below gives the amount of available water power according to three classifications: (1) that which may be produced by the minimum flow based on the lowest two consecutive seven-day periods; (2) the assumed maximum development, based on that amount, the continuation of which can be assured during six months of the year; and (3) the additional power that may be recovered by developing the available storage capacity and using stored water to compensate the low-water periods. The rivers have been divided into sections of varying length, determined by channel slope, and the fall and flow of each section have been obtained from the best available sources of information.

Ninety percent of the fall has been taken and this has been further reduced by 10% to allow for inefficiency of wheels. It is recognized that 90% of the fall can seldom be developed, nor that 90% wheel efficiency is yet reached. The computations are made for future developments.

In determining the minimum horsepower, the average minimum discharge for each year was taken as the average of the lowest two weeks period (consecutive 14 days), and the mean of these values for the period of record was taken as the minimum flow.

The assumed maximum development has been determined on the assumption that it is good commercial practice to develop wheel installations up to that amount, the continuance of which can be assured during 6 months of the year. The minimum weekly flow for each month of the year was arranged according to magnitude, and the sixth value was taken as the basis for estimating the power, the mean of these values for the record period in each case being that used in the computations.

The estimates of additional water power due to storage are of necessity quite rough. They were based on whatever data were published, and whatever unpublished data were in the files of the U. S. Geological Survey. It is believed that these estimates are very conservative.

The following table shows by drainage areas, figures concerning run-off and potential water powers:

Water Power Developments by Drainage Areas.

River.	Drainage area, square miles.	Flow from Area.				Water Powers.								
				Per annum.		Developed.			Undeveloped.				Additional H. P. due to storage.	
									Minimum H. P.		Maximum H. P.			
		Second-feet.	Second-feet per square mile.	Depth, inches.	Billion cubic feet.	Wheels.	Horse-power—total.	Horse-power per square mile.	Total.	Per square mile.	Total.	Per square mile.	Total.	Per square mile.
St. John*	7.500	13,200	1.76	23.90	416	147	13.681	1.8	30,500	4.1	73,800	9.8	92,000	12.3
St. Croix	1.630	4,260	2.61	35.40	134	89	20,500	12.6	28,700	17.6	49,000	30.0	35,000	21.5
Penobscot	8,500	16,700	1.96	26.60	526	518	70,454	8.3	157,000	18.5	298,000	35.1	110,000	12.9
Kennebec	5,970	11,000	1.84	25.00	347	659	63,936	10.7	144,000	24.1	284,000	47.5	100,000	16.8
Androscoggin	3,500	7,500	2.14	29.00	236	590	†101,355	‡29.0	168,000	48.0	218,000	62.3	95,000	27.1
Presumpscot	600	1,010	1.68	22.80	32	179	20,569	34.2	14,000	23.4	20,000	33.4	1,000	1.7
Saco	1,720	4,060	2.36	32.00	128	169	‖22,303	§13.0	20,900	12.2	69,000	40.1	8,000	4.7
Minor streams	2,080	4,260	2.05	27.81	135	446	30,299	14.6	5,000	2.4	12,000	5.8	12,000	5.8
Total	31,500	61,990	....	....	1,954	2,797	343,096	....	568,100	....	1,023,800	....	453,000	
Mean	....	....	2.05	27.81	....	....	....	10.9	....	18.1	....	32.6	....	14.4

* Maine only. † Total for drainage basin, 123,455 horsepower. ‡ Total for drainage basin, 35.3 horsepower per square mile.
‖ Total for drainage basin, 35,332 horsepower. § Total for drainage basin, 14.7 horsepower per square mile.

SURFACE WATER SUPPLY.

Fortunately for the State in its decision to make a study of its water resources, the fundamental data necessary are available through the hydrographic work of the U. S. Geological Survey, the State Survey Commission, and various water power companies.

METHODS OF MEASUREMENT AND COMPUTATION.

There are three distinct methods of determining the flow of open-channel streams: (1) By measurements of slope and cross-section and the use of Kutter's and other formulas; (2) by means of a weir or dam; (3) by measurements of the velocity of the current and the area of the cross-section.

First: This method has its use especially in flood estimates. It is seldom or never used, however, for continuous records.

Second: Some of the stations in the State are of this type, especially those maintained by a number of water power companies. The records for the flow over the dam proper have generally to be supplemented by the discharge through water wheels and turbines. A gaging station at a dam has the general advantage of continuity of record through the periods of ice and floods, and the disadvantage of uncertainty of coefficients to be used in the weir formula and of complications in the diversion and use of the water. The determination of discharge over the different types of weirs and dams is treated fully in "Weir experiments, coefficients and formulas" (Water Supply Paper 200) and in the various text books on hydraulics. "Turbine water-wheel tests and power tables" (Water Supply Paper 180) treats of the discharge through turbines when used as meters.

Third: Most of the measurements of the U. S. Geological Survey are done by this method. Such stations consist essentially of a gage for determining in feet and tenths the daily fluctuations of stage of the river and some structure or apparatus from which discharge measurements are made, usually a bridge or cable. The discharge of a stream, usually expressed as cubic feet per second or second-feet, is the product of the area of cross-section at any point in cubic feet, times the mean velocity of the water in feet per second, at the same section.

In making the measurements, an arbitrary number of points are laid off on a line perpendicular to the thread of the stream. The points at which the velocity and depth are observed are known as measuring points, and are usually fixed at regular intervals, varying from 2 to 20 feet, depending on the size and condition of the stream. For each strip of the river between measuring points, the area and velocity is determined, the latter generally by current meter. The corresponding discharge for each strip is then computed. By this method conditions existing in one part of the stream are not extended to parts where they do not apply.

Discharge measurements should be well distributed over the fluctuations of the river where possible, from the lowest to the highest gage heights.

Rating tables are computed for each station, giving for each tenth of a foot on the gage record, the corresponding discharge in cubic feet per second or second-feet. The rating tables are then applied to the daily gage heights, as sent in by the river observers, to obtain the daily discharge and from these applications the tables of monthly discharge and run-off are computed.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the run-off or discharge—is expressed in various terms, each of which has become associated with a certain class of work.

"Second-foot" is an abbreviation for cubic foot per second and is the rate of discharge of water flowing in a stream 1 foot wide, 1 foot deep, at the rate of 1 foot per second. It is generally used as a fundamental unit from which all others are computed.

"Gallons per minute" is generally used in connection with pumping and city water supply.

"Second feet per square mile," is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area. It is the unit most convenient to use when comparing run-off from different basins, and when using the measured run-off from one basin for computations of the discharge from another basin where stream measurements are not available.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

"Cubic feet" is the unit generally used in the east to express the capacity of reservoirs.

EXPLANATION OF RECORDS.

In the yearly reports of the Water Resources Branch of the U. S. Geological Survey on surface water supply, the following data are given, as far as available, for each regular gaging station:

1. Description of station.
2. List of discharge measurements.
3. Gage-height table.
4. Rating table.
5. Table of monthly and yearly discharges and run-off.

The descriptions of stations give such general information about the locality and equipment as would enable the reader to find and use the station, and they also give, as far as possible, a complete history of all the changes that have occurred since the establishment of the station that would be factors in using the data collected.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of the hydrographer, width and area of cross section, gage height, and discharge in second-feet.

The table of daily gage heights gives the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. At most stations the gage is read in the morning and in the evening.

The discharge measurements and gage heights are the base data from which the other tables are computed. In cases of extensive development it is expected that engineers will use these original data in making their calculations, as the computations made by the Survey are based on the data available at the time they are made and should be reviewed and, if necessary, revised when additional data are available.

The rating table gives the discharge in second-feet corresponding to various stages of the river as given by the gage heights. It is published to enable engineers to determine the daily discharge in case this information is desired.

In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest, and it is the flow as given in the rating table for that mean gage height. As the gage height is the mean for the day, there might have been short periods when the water was higher and the corresponding discharge larger than given in this column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow for each second during the month. Upon this the computations for the remaining columns, the second-feet per square mile, and run-off in inches, defined above, are based.

These complete data for the rivers of Maine are distributed through a number of water supply papers and owing to occasional re-computations, are sometimes confusing when quick reference is desired. It would be advantageous to have all past records of stream flow systematically arranged and published in one volume, and they have been so compiled in the office of the Water Storage Commission. Owing to the space that would be occupied, it is deemed best not to publish it in this form in this report.

In this volume are collected all the data to date of the run-off, but besides the brief descriptions of the stations, only the following columns of figures are given; the run-off in second-feet per square mile and the depth in inches.

ST. JOHN RIVER DRAINAGE BASIN.

DESCRIPTION.

St. John River drains the largest basin between the St. Lawrence and Susquehanna rivers. Its extreme headwaters lie in the mountainous region between Maine and Canada, adjacent to those of the Penobscot. From the junction of the northwest and southwest branches, where the river first takes its name, to its junction with St. Francis River, at distance of 90 miles, its course is in general northeastward and lies wholly in Maine, although a portion of the tributary drainage area lies wholly in Canada. In this distance it receives Allagash River, its second largest tributary. From its junction with the St. Francis the St. John flows eastward, forming the northern boundary of Maine for 70 miles and receiving in this stretch two important tributaries—Fish River, from the south, at Fort Kent, and Madawaska River, from the north, at Madawaska. At the point where the St. John leaves the state line its drainage area measures 8,765 square miles, of which 4,670 square miles are in Maine and 4,095 square miles are in Canada. Beyond this point it flows southward and receives the waters of Aroostook, Presque Isle, and Meduxnekeag rivers, the basins of which are almost entirely in Maine. From source to mouth its length is about 450 miles, and its total drainage area measures about 26,000 square miles.

In the eastern or lower portion of the basin the country is almost level near the river, but at a distance from the stream it becomes undulating and moderately hilly, finally subsiding and merging into the flat country bordering Aroostook River. Above the mouths of St. Francis and Allegash rivers the aspect of the basin is diversified by highlands.

The basin of the St. John is higher than that of any other river in the state, but as its elevation is quite uniform, the fall of the stream and the possibilities for the development of water power are less than on the other great rivers. Allagash River, which drains about 1,500 square miles of entirely wild and forest country, has considerable fall and affords excellent storage facilities, all unutilized.

The area as a whole is well forested. Large tracts have never been touched by the ax, and other portions have been lumbered for pine only. Probably 90 per cent of the whole basin tributary to the St. John at the eastern boundary of Maine is in forest.

The prevailing rocks in the eastern part of the area are limestone and slate, with patches of sandstone, coarse rock, and granite. Clays and slates are found over about 75 per cent of the total area.

The ponds and lakes in the St. John basin have an aggregate area of 314 square miles, the largest of these lakes being tributary to Allagash and Fish rivers. On some of the lakes rough timber crib dams are used to store water for log driving, but no attempt is made to store water after the driving season is over. Previous to 1845 a canal was cut from Telos Lake, in the Allagash basin, to Webster Lake, in the Penobscot basin, and a dam was constructed between Chamberlain and Eagle lakes. In this way Chamberlain Lake, with its drainage area of 270 square miles, was rendered in part tributary to the Penobscot. This diversion continues at the present time. Its general use is to supply water to the Penobscot during the log-driving season. After the gates at the dams are opened more water flows toward the St. John, as the gate sills are 0.6 foot lower than those at Telos Lake.

Precipitation records in the basin of the St. John are very meager, but from the best information available it seems probable that the mean annual rainfall is not over 30 to 35 inches.

INTERNATIONAL COMMISSION, RIVER ST. JOHN.

As a result of long standing difficulties between the United States and Canada regarding operations on St. John River, an International Commission was appointed to report on the various questions involved. The Commission on the part of the United States was authorized by act of Congress 1908, the authority of the Commission being dated January 12, 1909. The Commission at first was simply authorized to consider the problems connected with logging operations on the St. John River. In February 1910, its authority was very materially increased and it was asked to submit a comprehensive report on the conservation of the water resources of the entire St. John basin, with special reference to log driving.

The Webster-Ashburton treaty of 1842 fixed the northeastern boundary of the United States, and defined the right of the two countries along this boundary line, a part of which is the St. John River. Article 3 of said treaty as given below, covers especially the St. John River.

ARTICLE III.

"In order to promote the interests and encourage the industry of all the inhabitants of the countries watered by the river St. John and its tributaries whether living within the State of Maine or in the province of New Brunswick, it is agreed, that, where, by the provisions of the present treaty, the river St. John is declared to be the line of boundary, the navigation of said river shall be free and open to both parties, and shall in no way be obstructed by either; that all the produce of the forests, in logs, lumber, timber, boards, staves or shingles, or of agriculture of Maine watered by the river St. John, or by its tributaries, of which fact reasonable evidence shall, if required, be produced, shall have free access into and through said river and its tributaries, having their source within the State of Maine, to and from the seaport at the mouth of the said river St. John and to and around the falls of said river, either by boats, rafts or other conveyance; that when within the province of New Brunswick the said produce shall be dealt with as if it were the product of said province; that in like manner the inhabitants of the territory of the upper St. John determined by this treaty to belong to her Britannic majesty, shall have free access to and through the river for their produce, in these parts where the said river runs wholly through the State of Maine. Provided, always, that this agreement shall give no right to either party to interfere with any regulations not consistent with the terms of this treaty which the governments respectively of Maine and New Brunswick may make respecting the navigation of said river, where both banks thereof shall belong to the same party."

The present International Commission shortly recognized that their problem was largely an engineering one, and in the summer of 1910 they placed several engineering parties in the field. Their work has been mainly in mapping the larger lakes in the St. John basin in order to determine their capacity as storage reservoirs; detailed surveys of the dam sites, in order that estimates can be prepared on the cost of storing flood waters, and holding them for use during low stages of the river;

measurements of discharge of the various rivers and especially at the outlets of the lakes, in order to determine accurately the amount of water available for storage in the various reservoirs; and finally, a close study of the actual operation of the log drive of 1910, to see where the river can be improved, by blasting in the sections that give the most trouble.

When these data have been worked up in the office of the Commission during the coming winter, valuable information will be available on the water resources of the St. John basin.

FISH RIVER BASIN.

DESCRIPTION.

The main river is formed by two branches which join in Eagle Lake. The east branch is made up practically of a chain of 5 lakes consisting of Eagle, Square, Cross, Mud and Long lakes, connected with thoroughfares. The headwaters of the south branch are adjacent to the basin of the Big Machias River, a tributary of Aroostook River, and drain first, northward into Fish Lake, thence southeasterly into Portage Lake, swinging finally to the northward again, passing through St. Froid Lake and finally emptying into Eagle Lake. The main river from the outlet of Eagle Lake, flows in a due north direction, emptying into the St. John at Fort Kent. The river falls about 75 feet through a distance of 13½ miles in this latter stretch. It is feasible to utilize 65 feet of this fall for power purposes. The drainage area at the mouth is 910 square miles.

STORAGE.

It is a feasible proposition to develop a large storage system in this basin that would give a dependable water power development with as little variation as any in the State.

It is practicable to build a dam at the outlet of Eagle Lake to elevation 591 feet or 12 feet above the channel of the river. This would cause an additional depth of 11 feet on Square and Cross lakes and about 7 feet on Mud and Long lakes. The same dam would flood St. Froid Lake to a depth of about 6 feet. This is about the limit of storage on the east branch system on account of land damages.

It is practicable to raise the present level of St. Froid Lake to 602 feet or 17 feet above the present lake surface, by the construction of a dam at the outlet of that lake.

At Portage Lake the limit of storage would be to about elevation 615 feet, for if it was raised to a greater height it would cause heavy land damages.

At Fish Lake it is feasible to construct a dam 18 feet above the low water level of the lake.

The estimated capacity of the lakes, as outlined above, is 16,000,000,000 cu. ft. which can be increased to 20,000,000,000 cu. ft. by excavation of a number of connecting thoroughfares.

WATER POWER.

There are two excellent opportunities for power development on the main Fish River below Eagle Lake. At Big Falls, 6½ miles above the mouth, occurs a fall of 13 feet. This can be increased to 43½ feet by the construction of a dam 30 feet high, backing water to the foot of the Eagle Lake storage dam.

At the power site of the Fort Kent Mill Company, the 12 foot fall there may be increased to 21 feet, backing the water to the foot of Big Falls dam.

A detailed engineering study has not been made of the run-off available from this basin, and considered in connection with the available storage. A preliminary estimate places 1200 sec. ft. as a constant flow that can be carried through at least one dry season. This is equivalent at Big Falls, with the head of 43½ feet and 80% wheel efficiency, to 4800 horsepower. At the lower site with a fall of 21 feet, 2300 horsepower may be developed, making a total of 7100 horsepower. On a basis of constant flow of 1000 second feet the corresponding figures would be 4000 horsepower for Big Falls and 1900 horsepower at the lower site, making a total of 5900 horsepower 24 hours a day.

With an independent dam at St. Froid Lake outlet, a fall of 12 feet may be obtained. Assuming that the storage will allow a draft of 360 second-feet the resulting horsepower would be about 400 on a wheel efficiency of 80%.

Below the outlet of Fish Lake a fall of about 33 feet occurs, that would be increased to 10 feet by the construction of a dam. Assuming that 90 sec. ft. can be constantly drawn from this reservoir, then on 80% wheel efficiency, 350 horsepower 24 hours a day may be developed.

STREAM FLOW.

The following gaging stations have been maintained in the St. John River basin:

St. John at Fort Kent (1905-1910)
Fish at Wallagrass (1903-1908)
Aroostook at Fort Fairfield (1903-1910)

A large number of additional stations were established in 1910 by the International Commission, River St. John, whose records will be available later.

The records available for these stations, although not complete, indicate 1905 as the year of minimum flow and also extreme low water, the mean annual discharge for that year being perhaps one-half as great as in 1904.

ST. JOHN RIVER AT FORT KENT, ME.

This station, which is located at the footbridge that crosses the St. John near Fort Kent post-office, a short distance above the confluence of Fish River with the St. John, was established October 13, 1905. It is about 15 miles below the mouth of St. Francis River and about 50 miles above Grand Falls, Canada, an important undeveloped power.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1905, No. 165, pp. 21 to 24.
1906, No. 201, pp. 23 to 25.
1907, No. 241, pp. 30 to 33, 342.
1908, No. 241, pp. 30 to 33, 342.

Run-off of St. John River at Fort Kent, Maine, in second-feet per square mile and depth in inhes. Drainage area, 5280 square miles.

	1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	----	----	----	----	.19	.22	.53	.61	.81	.94	.28	.32	.45	.52
February	----	----	----	----	.14	.15	.27	.29	.38	.39	.49	.51	.32	.34
March	----	----	----	----	.14	.16	.48	.55	.60	.69	.74	.86	.49	.56
April	----	----	4.41	4.92	1.27	1.42	1.47	1.64	2.80	3.12	5.98	6.67	3.17	3.55
May	----	----	4.55	5.25	7.54	8.69	7.80	8.99	7.82	9.02	3.09	3.56	6.16	7.10
June	----	----	1.34	1.50	2.95	3.29	3.05	3.40	1.35	1.51	1.67	1.86	2.07	2.31
July	----	----	.58	.67	2.25	2.59	.58	.66	1.63	1.88	.37	.42	1.08	1.24
August	----	----	.20	.23	1.09	1.26	.51	.59	.94	1.08	.53	.61	.65	.75
September	----	----	.10	.11	.61	.68	.17	.19	1.83	2.04	----	----	.68	.76
October	0.26	.30	.48	.55	1.42	1.64	.20	.23	2.23	2.57	----	----	.92	1.06
November	0.75	.84	.42	.47	2.75	3.07	.16	.17	1.18	1.32	----	----	1.05	1.17
December	----	----	----	----	1.17	1.35	.23	.26	.83	.95	----	----	.74	.85
Total	----	----	----	----	----	24.52	----	17.58	----	25.51	----	----	----	20.21
Mean	----	----	----	----	1.79	----	1.29	----	1.87	----	----	----	1.48	----

FISH RIVER AT WALLAGRASS, ME.

The gaging station, which was established July 29, 1903 and discontinued June 30, 1909, was located just below the outlet of Wallagrass Stream, near Soldier Pond post-office at a point about 7 miles south of Fort Kent and 4 miles below Eagle Lake.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey.

For 1903 No. 97 pp 16 to 17.
1904 No. 124 pp 21 to 23.
1905 No. 165 pp 21 to 24.
1906 No. 201 pp 25 to 27.
1907 No. 241 pp 33 to 36, 342.
1908 No. 241 pp 33 to 36, 342.

See also No. 187 pp 32-33, 39, 53-54, 73, 77, 82, 86 for a study of conditions under ice cover.

Run-off of Fish River at Wallagrass, Maine, in second-feet per square mile and depth in inches. Drainage area, 890 square miles.

	1903.		1904.		1905.		1906.		1907.		1908.		1909.		AVERAGE	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
Jan.	----	----	----	----	----	----	.22	.25	.34	.39	.67	.78	----	----	.41	.47
Feb.	----	----	----	----	----	----	.23	.24	.25	.26	.38	.41	----	----	.29	.30
Mar.	----	----	----	----	----	----	.43	.49	.25	.28	.46	.53	----	----	.38	.43
Apr.	----	----	----	----	2.42	2.70	1.07	1.19	.99	1.10	2.01	2.24	1.29	1.44	1.56	1.73
May	----	----	7.15	8.24	3.10	3.58	7.11	8.20	6.89	7.94	7.97	9.19	5.38	6.20	6.27	7.22
June	----	----	2.30	2.57	1.70	1.90	2.26	2.52	3.42	3.82	2.80	3.12	.86	.96	2.22	2.48
July	----	----	.83	.96	.67	.77	.85	.98	2.16	2.49	.75	.87	----	----	1.05	1.21
Aug.	.54	.63	.44	.51	.18	.20	.23	.27	2.33	2.69	.54	.63	----	----	.71	.82
Sept.	.27	.30	1.01	1.13	.08	.09	.10	.12	.92	1.03	.34	.38	----	----	.45	.51
Oct.	.10	.12	1.70	1.96	.07	.08	.47	.54	1.49	1.72	.17	.19	----	----	.67	.77
Nov.	.23	.26	.82	.91	.10	.11	.97	1.08	2.79	3.11	.14	.15	----	----	.84	.94
Dec.	----	----	----	----	----	----	.63	.73	1.21	1.40	.17	.19	----	----	.67	.77
Total	----	----	----	----	----	----	----	16.61	----	26.23	----	18.68	----	----	----	17.65
Mean	----	----	----	----	----	----	1.21	----	1.92	----	1.37	----	----	----	1.29	----

AROOSTOOK RIVER AT FORT FAIRFIELD, ME.

The sources of Aroostook River lie adjacent to those of the Mattawamkeag and the East Branch of the Penobscot. Although its drainage area is large—2,350 square miles, nearly all in Maine—its flow is quite variable, because of lack of storage facilities. During the low-water season, which frequently occurs in both the fall and midwinter, its flow has been known to reach a minimum of 0.06 second-feet per square mile, a remarkably low figure for so large a stream in the East. Considerable fall is available, and during 1907 the Aroostook Falls, with a head of about 75 feet, just across the boundary line in New Brunswick, have been developed for light and power purposes.

The gaging station, which was established July 31, 1903, is located at the steel highway bridge in the village of Fort Fairfield, about 3 miles from the international boundary and about 8 miles below the mouth of Little Madawaska Stream. The nearest dam is that at Aroostook Falls, above referred to.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1903 No. 97 pp. 17-18.
1904 No. 124 pp. 23-26.
1905 No. 165 pp. 24-27.
1906 No. 201 pp. 27-28.
1907 No. 241 pp. 36-39, 342.
1908 No. 241 pp. 36-39, 342.

Run-off of Aroostook River at Ft. Fairfield, Maine, in second-feet per square mile and depth in inches. Drainage area, 2230 square miles.

	1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	......	......	......	......	......	......	.36	.41	.67	.78	.67	.77	1.47	1.70	.79	.92
February	......	......	......	......	......	......	......	......	.22	.23	.60	.65	.61	.64	1.53	1.59	.74	.78
March	......	......	......	......	......	......	......	......	.31	.36	.77	.89	.77	.88	1.03	1.19	.72	.83
April	......	......	......	......	......	......	7.31	8.16	2.08	2.32	3.07	3.42	6.32	7.05	7.40	8.26	5.24	5.84
May	......	......	8.93	10.30	......	......	8.25	9.51	7.76	8.95	7.98	9.20	7.40	8.53	4.22	4.86	7.42	8.56
June	......	......	1.64	1.83	1.18	1.32	1.79	2.00	2.76	3.08	2.75	3.07	1.08	1.20	2.35	2.62	1.94	2.16
July	......	......	.82	.94	.35	.41	.72	.83	2.40	2.77	.36	.41	1.63	1.88	1.32	1.52	1.09	1.25
August	.29	.33	.33	.38	.13	.15	.28	.32	2.32	2.68	.38	.44	1.23	1.42	.30	.34	.66	.76
September	.21	.24	1.34	1.49	.08	.09	.11	.13	1.03	1.15	.16	.18	2.66	2.97	......	......	.80	.89
October	.10	.11	1.50	1.73	.07	.08	1.40	1.61	1.41	1.63	.19	.22	3.05	3.52	.19	.22	.99	1.14
November	.41	.46	.60	.67	.18	.20	.78	.87	2.71	3.02	.24	.27	2.19	2.44	.59	.66	.96	1.07
December	.33	.38	.64	.74	......	......	1.32	1.52	1.83	2.11	.22	.26	1.62	1.87	.57	.66	.93	1.08
Total	......	......	......	......	......	......	......	......	......	28.71	......	19.79	......	33.17	......	......	......	25.28
Mean	......	......	......	......	......	......	......	......	2.10	......	1.45	......	2.43	......	......	......	1.86	

ST. CROIX RIVER DRAINAGE BASIN.

DESCRIPTION.

St. Croix River is formed by two principal branches; the East Branch, also known as the Upper St. Croix, is the outlet of the Schoodic Lake system, including Grand and Spednic lakes; the West Branch is formed by the Grand Lake system, including Sysladobsis, Grand, and Big lakes. The St. Croix, including the East Branch, forms nearly half of the eastern boundary of Maine, and its total length is about 100 miles. Tributaries are small and unimportant. The total drainage area is 1,630 square miles, the East or principal branch having 690 square miles and the West Branch, 670 square miles at their junction. The river discharges into Passamaquoddy Bay.

The basin is in general lower than that of any other of the larger streams of the State flowing into the Atlantic, its headwaters having an elevation of about 540 feet.

A large part of the drainage basin is still covered with timber, and above Vanceboro and Princeton, at the foot of the two systems of lakes, the region is for the most part wild and inaccessible.

The mean annual precipitation is probably about 41 inches, varying from 44 inches at Eastport, on the coast, to 38 inches in the northern portions. The river is generally frozen over during the winter, although more subject to thaws during this season than basins that are farther inland.

The lake system of the St. Croix is the largest in the State in proportion to the drainage basin, except that of the Presumpscot, which is, however, a much smaller stream. The lake surface of the Upper St. Croix aggregates approximately 50 square miles, that of the West Branch, 70 square miles in area, taking into account only the principal lakes and ponds. In fact, above Vanceboro and Princeton each branch of the river is simply a sucession of lakes almost to the extreme headwaters. The total lake surface of the St. Croix is probably not less than 150 square miles, or nearly one-tenth the total drainage area.

The drainage areas are as follows:

Drainage Area of St. Croix River.

	Square Miles
East Branch	
Vanceboro dam, foot of Schoodic lakes	420
Little Falls	500
Immediately above mouth of West Branch	690
Main River	
Immediately below mouth of West Branch	1,360
Spragues Falls	1,390
Gaging station, near Woodland	1,420
Calais, lower dam	1,530
Mouth of river, eastern border of town of Calais	1,630
West Branch	
Princeton dam	500
Confluence with main river	670

LAKE STORAGE.

The storage in the principal reservoirs of the St. Croix was formerly controlled by the St. Croix Log Driving Company, a chartered association comprising the various mill owners upon the river. Its office was to maintain the dams at certain lakes, to drive the logs down to Baring, and to assess equitably upon the members the cost of these operations. While the purpose of the company was primarily to facilitate log driving, and water was drawn from the lakes for that purpose in whatever amount was needed for a period of perhaps fifty or sixty days, for the balance of the season the log-driving company sought to utilize lake storage as far as possible for the water-power interests of the river.

The St. Croix Paper Company now either own the dams or control them through lease from the log driving association. In the West Branch Basin the company maintains dams controlling the storage in Big Lake, Grand Lake, and Sysledobsis Lake. The dam at the foot of Big Lake and its prolongation through Long and Leweys lakes is situated at Princeton and gives about 5 feet of available storage, the three lakes being credited with about 16 square miles of surface. The tributary drainage area is large, amounting to 500 square miles, and every spring there is wastage at the dam. Grand Lake, which is situated the next above on this branch, between 80 and 90 feet higher than Big Lake, is controlled by a dam giving 6 or 7 feet of storage, extending back over Grand, Compass, Junior and some other smaller connecting lakes. The area of water surface is upward of 25 square miles. Still above, at the outlet of Sysledobsis Lake, is a dam giving a storage of approximately 8 feet in that lake, and having about 7 square miles of surface.

On the East Branch, or main St. Croix River, the dam at Vanceboro commands 13½ feet of storage over about 27 square miles comprised in the lower Schoodic Lake; while above, at Forest City, another dam gives a few feet of storage over the 25 square miles of the upper Schoodic, or Grand Lake.

There are also private dams on most of the minor streams, but the storage in each case is small in comparison with that obtained at the above lakes. Such dams are not kept in good repair, and the reservoirs receive no further attention after having been drawn down for the season. Much might be accomplished to improve the storage of the river as a whole by bringing these numerous private reservoirs under a general system of control, if this were found practicable. It is doubtless also possible greatly to increase the storage in many existing reservoirs by raising the dams. The country surrounding the lakes is flat, and even low dams produce extensive flowage. While such improvements, however, could have easily been secured many years ago, when the flowed tracts were woodland, they are not now so feasible in the case of the larger lakes, because of the altered uses of the land and the consequent increased damages which would be incurred for flowage.

WATER POWER.

East Branch.

A monument marking a point upon the State boundary at the extreme head waters of the St. Croix proper is 538 feet above tide, from which there is a descent of nearly 100 feet to Grand Lake. From Grand Lake to the lower Schoodic Lake, or Chiputneticook, as it has also been called, there is a fall of about 60 feet, and at the dam controlling the former lake, at Forest City, some power is utilized. At the Vanceboro dam, at the foot of the lower Schoodic Lake, no power is used; but half a mile or so further downstream there is another dam, at which a fall of about 8 feet was formerly utilized by the Leather Company's tannery. This plant was burned and the site is not utilized. From this point no dam is encountered on the St. Croix before reaching Woodland, nearly 50 miles below, excepting an occasional wing dam built by the log drivers for controlling the channel. In spite of the relatively low elevation of St. Croix Basin the river has a good slope, averaging about 7 feet per mile, and amounting to more than 350 feet from below the lower Vanceboro dam to mean tide at Calais. Of this amount approximately two-fifths in the aggregate, or say 140 feet, is concentrated at Spednic Falls, Grand Falls, Spragues Falls, and Calais, the balance being spread over the various rips and smooth-flowing sections of the stream. While at the falls the banks are generally rocky and of good height, elsewhere they are commonly low and succeeded by wide, level stretches of wooded land. Here and there, as noticeably above Canoose Rips, the river widens out almost to the dimensions of a lake, running for miles 1,000 feet or more in width, with gentle current.

Passing below the village of Vanceboro, the first important pitch encountered is that at Little Falls, some 8 miles downstream, although rapids occur at intervals in the intervening stretch, the most noticeable of these being Mile Rips. At Little Falls the river descends over ledges perhaps 3 or 4 feet in as many hundred. The banks are high and rocky, and the site excellent for a dam of moderate height, which probably need not be more than 200 feet long, and which would give a fine pondage over the wide and sluggish stretch of river above. For the first 6 or 8 miles below Little Falls there is a succession of rips of varying degrees of roughness. The river then becomes wide and sluggish, probably measuring 800 or 1,000 feet between banks, and in the 4 miles from Keene Place to Canoose Camp is broken only by the rips near Rideout's. At Canoose Rips, which are some 12 miles below Little Falls, the descent is considerable, amounting to 11 feet in about half a mile. Less than half a mile below Canoose Rips are Dog Island Rips, short but heavy, and thence, for the succeeding 8 miles to Spednic Falls, the river is almost uniformly smooth.

The Spednic Falls are not more than 2 miles above the mouth of the West Branch of the St. Croix and form an important water privilege. The river here descends in a succession of pitches and rapids, mainly comprised within 1,000 feet, and with a total fall of about 20 feet in half a mile. The banks are rocky, though not high at the head of the falls, and the main river is narrow. One or more side channels through which also the stream naturally flowed have already been dammed by the lumbermen.

MAIN RIVER.

Almost immediately below the mouth of the West Branch are Grand Falls, comprising what is known as the upper and lower pitches, perhaps half a mile apart, and each covering a fall of 15 or 20 feet. At the upper pitch there is an abrupt fall of about 6 feet, followed by heavy rapids. The river is naturally divided by a rocky island, but by a log wing dam its flow has been confined within a single main channel. The lower falls are a close counterpart of the upper in all their principal features, and both are to be regarded as important sites for power.

Below Grand Falls there are only occasional light rips for 8 miles until the development at Spragues Falls or Woodland are reached. In 1905 and 1906 there were built here the dam and mills of the St. Croix Paper Company. The dam is a fine concrete structure 1650 feet long and 28 feet high at the highest point. The wheel installation consists of Hercules turbines, 4 pairs 42-inch, and 3 pairs 36-inch diameter wheels. The average head under which they operate is 46 feet, developing a rated capacity of 14,350 horsepower. The three generators are Westinghouse 500 kilowatts, on 440 to 480 voltage. The daily output of the mill is 150 tons of news paper.

In the 5 miles from Spragues Falls to Baring, the river has but slight fall, but therefore affords large pondage and valuable storage space for logs. At Baring there is an old, dilapidated, and leaky dam, built from ledge to ledge and affording a head of 8 or 10 feet at the mills, although from the ordinary level of the mill pond to the foot of the rips below the dam the fall is stated to be about 12 feet. Thirty years ago a large amount of lumber was sawed here and eight or ten gang saws were in operation; but the old mills have been burned and not rebuilt, and the manufacturing is now confined to the Chase Manufacturing Company on the American side of the river, making shingles, barrel heads, and box shooks.

The next and last power on the river is that at Calais and vicinity. The St. Croix, which above this point has a general run between low banks and being depressed but little below the level of the adjacent country, now appears to have worn its channel much below that level and in less than 2 miles, from the surface of the upper pond at Milltown to tide water at the lower Calais bridge, descends about 54 feet measured to ordinary high tide. Calais and its upper suburb of Milltown lie on the American bank, and St. Stephen with its suburb, also called Milltown, lies across the river. Manufacturing is conducted at four different dams, three of which are old and leaky, and of log construction.

At the upper dam the fall is 12 feet, and the power is all owned by H. F. Eaton & Sons, who operate a saw mill on each bank, that on the American side being equipped with three gang saws, a planing mill and a box machine. These mills have a combined capacity for sawing more than 25,000,000 feet of lumber in a season. A short distance below, a wing dam on the American side, commanding a part only of the flow of the river, gives a fall of 9 feet, the power corresponding to which is used in James Murchie & Sons' mill, equipped with three gang saws, a planing mill, and shingle mill.

The next privilege occurs at what is known as the Salmon Falls, and is the most important and best developed at this locality. It is owned by the Canadian Cotton Mills Company, Limited, having a fine mill on the New Brunswick bank, equipped with 34,000 spindles and 1,100 looms, and employing over 700 hands. The dam is a tight and costly structure of log cribs packed with stone, and develops a normal fall of about 21 feet. Three 54-inch Hercules turbines are installed, but only from 1,000 to 1,100 horsepower is actually employed. The mill is dependent on the continuous flow of the stream, the pond being small and no material aid being received from storage of night flow either here or at the dams above.

The last dam on the river is near the head of tide water. It gives a fall reckoned as normally 10 feet, but varying, with the season, from 8 feet at times in dry weather to 12 or 13 feet in freshets. The ordinary tidal rise and fall below the dam is 1 or 2 feet, and that in spring tides 3 or 4 feet. The entire privilege is owned by Mr. Frank Todd, who operates mills on both banks, ordinarily sawing in the aggregate 8,000,000 or 10,000,000 feet of lumber per annum. He also owns the electric light station, at which 500 horsepower of turbines is installed. Below this dam heavy rapids are exposed at low tide, but the power is naturally of little consequence.

WEST BRANCH.

The West Branch has a drainage area of 670 square miles at the confluence with the East Branch, and 500 square miles at Princeton. No power is used, however, except at Princeton dam, at the foot of Big Lake, or perhaps more properly, at the foot of the eastern extension known as Leweys Lake. This dam is an old structure, clearly allowing much leakage, and gives a head at the mills amounting at a favorable stage of water to about 9 feet. Power is used for F. Mercer & Sons' grist mill, box mill, and saw mill, the latter manufacturing from 7,000,000 to 8,000,000 feet during the season, and for S. L. Peabody's one-set woolen mill.

From Princeton to the mouth of the West Branch is a distance of about 8½ miles, in which the fall amounts to between 12 and 13 feet. The stream runs much of the way between low banks, from 250 to 350 feet wide in the narrower portions of its course, but spreading out in places to a much greater width. The current is gentle and the surface smooth, broken only by Tomah and Black Cat rips, neither of them so strong that they can not be ascended readily by poling a canoe. Above Big Lake the outlet stream from Grand Lake has a fall of about 80 feet in its length of 2¾ miles.

STREAM FLOW.

A gaging station has been maintained on the St. Croix at Woodland since 1902. While complete annual records are not available, indications are that the wettest year since 1902 was 1903, and the driest was 1905.

ST. CROIX RIVER NEAR WOODLAND, ME.

This station was originally established December 4, 1902, at a point a short distance above Spragues Falls, now called Woodland, near Baring, Me. On June 8, 1905, it was moved about

1½ miles downstream to avoid backwater effect from a paper mill and dam constructed at Spragues Falls. It is about 10 miles below the junction of the West with the East Branch, and about 14 miles above the mouth of the St. Croix River. It is about 1 mile below the dam of the St. Croix Paper Co.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1902 No. 82 p. 14.
1903 No. 97 pp. 20-23.
1904 No. 124 pp. 27-30.
1905 No. 165 pp. 28-30.
1906 No. 201 pp. 29-31.
1907 No. 241 pp. 41-43, 342.
1908 No. 241 pp. 41-43, 342.

Run-off of St. Croix River near Woodland, Maine, in second-feet per square mile and depth in inches. Drainage area, 1420 square miles.

	1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	4.65	5.36	......	.....	......	......	......	......	1.23	1.42	1.90	2.19	1.64	1.89	1.75	2.02	2.53	2.58
February	3.60	3.75	......	......	......	......	......	.....	.68	.71	1.27	1.37	1.11	1.16	1.73	1.80	1.68	1.76
March	5.53	6.37	......	......	......	......	......	......	.96	1.10	4.55	1.79	1.81	2.09	2.05	2.36	2.98	2.74
April	3.48	3.88	4.34	4.84	3.26	3.64	......	......	2.20	2.46	2.37	2.64	5.24	5.85	2.06	2.30	3.28	3.66
May	1.59	1.83	5.05	5.82	1.79	2.06	3.29	3.79	3.30	3.80	3.68	4.24	3.30	3.80	1.87	2.16	2.98	3.44
June	1.82	2.03	1.87	2.09	1.63	1.82	2.18	2.43	2.98	3.32	2.46	2.74	1.63	1.82	1.87	2.09	2.06	2.29
July	1.95	2.25	2.22	2.56	2.26	2.61	1.70	1.96	2.42	2.79	1.06	1.22	1.42	1.58	1.42	1.64	1.81	2.08
August	1.32	1.52	1.08	1.24	1.00	1.15	1.48	1.71	2.32	2.68	1.27	1.46	1.41	1.63	1.46	1.68	1.42	1.63
September	.52	.58	.82	.92	.68	.76	.81	.90	2.20	2.46	1.06	1.18	2.94	3.28	1.43	1.60	1.31	1.46
October	.52	.60	.98	1.13	.39	.45	1.42	1.64	1.74	2.01	.88	1.01	3.09	3.56	1.34	1.54	1.30	1.49
November	.74	.83	.79	.88	.53	.59	1.63	1.82	1.78	1.99	.70	.79	1.82	2.03	.89	1.00	1.11	1.24
December	1.32	1.52	1.02	1.18	......	......	1.44	1.66	2.06	2.38	.63	.73	1.51	1.74	.95	1.10	1.28	1.47
Total	......	30.52	......	.....	......	......	......	......	......	27.12	......	21.36	......	30.43	......	21.29	......	25.84
Mean	2.25	......	......	......	......	......	......	......	1.99	......	1.57	......	2.24	.....	1.57	......	1.98	

WEST BRANCH ST. CROIX NEAR BAILEYVILLE.

A gaging station was established on the West Branch of the St. Croix River near Baileyville, May 10, 1910. It is located at the highway bridge about 4½ miles from the village of Princeton.

Information in regard to this station is contained in the report of the U. S. Geological Survey on Surface Water Supply of the United States for 1910.

DENNYS RIVER.

The drainage basin of Dennys, Pemaquan and associated streams is located between the St. Croix and Machias rivers and drains into Passamaquoddy Bay and the Atlantic Ocean. This area comprises about 375 square miles, of which Dennys River drains about 150 square miles; Pemaquan 40 square miles; the remainder being drained by various small streams. Dennys River has its source in Meddybemps Lake, which has an area of water surface of 10.8 square miles. The river in its course to the sea, falls about 250 feet in a distance of 25 miles. The flow of the river is small although comparatively uniform on account of control of the lake at its head.

At Dennysville a lumber company utilizes a 12-foot fall and develops about 335 horsepower with 4 wheels ranging from 27″ to 48″ diameter.

At Whiting on Orange River, a fall of about 13 feet is utilized by a number of companies, including one developing 200 horsepower, one of 95 horsepower and one of 75 horsepower.

The following table is a list of lakes in this basin with the area of water surface.

Lakes in Dennys River and adjoining basins.

Lake or Pond.	Stream.	Area water surface, square miles.
Boydens Lake	Little	1.20
Pemaquan Lake	Pemaquan	2.40
Round Lake	Pemaquan	0.50
Meddybemps Lake	Dennys	10.80
Little Lake	Dennys	0.75
Harwood Lake	Dennys	0.50
Cathance Lake	Cathance	6.10
Rocky Lake	Orange	2.10
Little Lake	Orange	1.00
Orange Lake	Orange	0.50
Indian Lake	Holmes	0.35
Total		26.20

MACHIAS RIVER DRAINAGE BASIN.

DESCRIPTION.

Machias River is fairly representative of several of the smaller streams in Maine that discharge their waters into the ocean and are commonly referred to as "coastal rivers." It rises in the Machias Lakes, in the near vicinity of the Grand Lake system of the St. Croix, flows in a generally southeasterly direction to tide water at Machias, a distance of 50 miles, and its drainage area measures 495 square miles. At East Machias, near the mouth, it is joined by East Machias River, a stream of similar characteristics rising in Pocamoonshine Lake, near Princeton, and draining about 345 square miles.

The Machias drainage basin is considerably broken with hills and low mountains, and attains an altitude in its northwestern portion of about 400 feet above sea level. Near the coast the prevailing rock is quartzite, while farther inland granite is found, and near the headwaters mica schists prevail. The basin is generally forested.

The mean annual rainfall is probably about 42 inches, or a little greater than that of the St. Croix basin, and winter conditions are similar to those of the St. Croix.

In the whole Machias basin there are about 58 square miles of lake surface which are, however, largely near the headwaters. They are utilized to a small extent for log driving.

There are good water-power sites on the Machias and its principal branch, and developments have been made at Machias, East Machias and Whitneyville. The river is one of promise as regards storage possibilities when conditions warrant development.

WATER POWER.

At the head of tide and of navigation on the main river, 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. At the Middle Falls in Whitney, there is a fall of 10 feet with excellent facilities for improvement. In Northfield, at the Holmes Falls, there is a fall of 28 feet, and there are a number of smaller powers above.

On the East Machias the lakes are not all near the head-waters of the stream but are more equally distributed over the basin, thus rendering the flow of the river rather uniform. The principal power on the stream is at the head of tide where the fall is 47 feet in 3 miles. Other powers exist above though they have been little utilized.

The following table gives the areas of water surface for various lakes in this basin.

Lake areas in Machias River basin.

Lake or Pond.	Stream.	Area water surface square miles.
Seavey, two lakes	East Machias	0.60
Second Lake	East Machias	0.60
Spectacle, three lakes	East Machias	0.85
Barrows Lake	East Machias	1.42
Crawford Lake	East Machias	3.75
Gardiners Lake	East Machias	9.07
Hadley Lake	East Machias	3.30
Long Lake	East Machias	1.25
Love Lake	East Machias	2.03
Mud Lake	East Machias	0.50
Patrick Lake	East Machias	0.30
Pocamoonshine Lake	East Machias	3.23
Rocky Lake	East Machias	3.82
Round Lake	East Machias	0.70
Bog Lake	Machias	1.10
Chain Lake	Machias	2.70
Cranberry Lake	Machias	0.53
First and Second lakes	Machias	1.25
Fourth Lake	Machias	2.77
Fifth Lake	Machias	1.73
Green and Stiles lakes	Machias	1.50
Horseshoe Lake	Machias	0.90
Lake in No. 36	Machias	0.50
Lilly, two lakes	Machias	1.00
Machias Lake in 41	Machias	1.10
Marshfield Lake	Machias	2.00
Mopang Lake	Machias	4.57
Third Lake	Machias	3.60
Sabao Lake	Machias	1.05
Total		57.72

STREAM FLOW.

A station has been maintained on the Machias River near Whitneyville since 1903. While complete yearly records are not available, 1909 was probably the wettest year during this time and 1910 the driest, the total flow during these two years being about in the ratio of 1 to 1.70.

MACHIAS RIVER AT WHITNEYVILLE.

This station was established October 17, 1903, and was originally located at the bridge of the Washington County Railroad, near Whitneyville, about 8 miles above the mouth of the river. On October 3, 1905, the gage was transferred to the wooden highway bridge, about one-half a mile upstream from the railroad bridge. The discharge has been computed for all years since the establishment of the station. The 1903-4 values as published in Water Supply Paper No. 124 have been revised on the basis of new and more accurate rating curves.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1903 No. 97 p. 24; No. 124 pp. 31-33; No. 241 pp. 44-49.
1904 No. 124 pp. 31-33; No. 241 pp. 44-49.
1905 No. 165 pp. 30-32; No. 241 pp. 44-49.
1906 No. 201 pp. 32-33; No. 241 pp. 44-49.
1907 No. 241 pp. 44-49, 342.
1908 No. 241 pp. 44-49, 342.

Run-off of Machias River at Whitneyville, Maine, in second-feet per square mile and depth in inches.
Drainage area, 465 square miles.

	1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in iuches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January									1.63	1.88	2.56	2.95	2.17	2.50	2.60	3.00	2.24	2.58
February									.86	.90	2.97	3.20	2.95	3.07	2.39	2.49	2.29	2.42
March			3.94	4.54					1.18	1.36	3.57	4.12	4.37	5.04	3.42	3.94	3.30	3.80
April			5.76	6.43	4.82	5.38	5.10	5.69	4.80	5.36	3.76	4.20	8.88	9.91	3.81	4.25	5.28	5.89
May			6.41	7.39	2.15	2.48	5.51	6.35	4.71	5.43	4.06	4.68	4.97	5.73	4.62	5.33	4.63	5.34
June			1.72	1.92	2.32	2.59	4.11	4.59	3.46	3.86	3.33	3.72	3.40	3.79	2.26	2.52	2.94	3.28
July			.65	.75	1.53	1.76	2.17	2.50	1.19	1.37	.84	.97	1.25	1.44	1.54	1.78	1.31	1.51
August			.37	.43	.60	.69	.70	.80	.63	.73	.86	1.00	.57	.65	.58	.67	.62	.71
September			1.21	1.35	1.05	1.17	.35	.39	.61	.68	.53	.59	2.32	2.59	.48	.54	.94	1.04
October	1.14	1.31	1.44	1.66	.32	.37	.64	.74	1.52	1.75	.90	1.04	2.90	3.34	.32	.37	1.15	1.32
November	1.38	1.54	.91	1.02	1.13	1.26	1.83	2.04	3.01	3.36	.96	1.07	3.08	3.44	.26	.29	1.57	1.75
December	1.50	1.73	.46	.53			1.54	1.78	2.90	3.34	.80	.93	2.06	2.38	.59	.68	1.41	1.62
Total										30.02		28.47		43.88		25.87		31.26
Mean									2.21		2.10		3.24		1.91		2.31	

NARRAGUAGUS RIVER.

The basin of this coastal stream lies to the west of the Machias River basin. Associated with the Narraguagus are the Pleasant, the Tunk, the Chandlers and other small streams near the coast. They all have several water power sites, but their discharge is small. The combined basin comprises about 550 square miles, divided as follows: Narraguagus, 215 square miles; Pleasant, 110; Tunk, 60; and Chandlers, 50 square miles.

Tributary to these rivers are 28 ponds having a combined surface of 24.11 square miles, making a fairly constant flow. At the head of tide water on Narraguagus River at Cherryfield, 6 privileges exist, the total fall being 52 feet. The present power development is upwards of 500 horsepower. It is understood that the entire privilege here has been purchased by one company and that they are undertaking an engineering investigation of the total power available.

At Great Falls, at Deblois, there is a second fall of about 50 feet in half a mile.

The following table gives the lakes and ponds in this basin and the area of water surface.

Lakes in Narraguagus and adjoining river basins.

Lake or Pond.	Stream.	Area water surface square mile,
Schoodic Lake	Narraguagus	0.67
Narraguagus Lake	Narraguagus	0.79
Spruce Mountain Lake	Narraguagus	1.20
Chalk Lake	Narraguagus	0.35
Baker Brook flowage	Narraguagus	0.82
Third Lake	Narraguagus	0.50
Eagle Lake	Narraguagus	0.52
Deer Lake	Narraguagus	0.50
Spring Run Pond	Narraguagus	1.00
Round Pond	Tunk	0.30
Great Tunk Pond	Tunk	3.07
Little Tunk Pond	Tunk	0.25
Long Pond	Tunk	1.05
Rocky Pond	Tunk	0.35
Downing Pond	Tunk	0.30
Donnells Pond	Donnells	4.05
Fox Pond	Donnells	0.25
Otto Bog	Donnells	0.25
Alder Brook Pond	Donnells	0.44
Upper Shillalah Pond	Donnells	0.35
Lower Shillalah Pond	Donnells	0.20
Sullivan, two ponds	Donnells	0.45
Chandlers Lake	Chandlers	0.75
Pleasant River Lake	Pleasant	2.85
Southwest Pond	Pleasant	0.50
Jones Pond	Jones	1.00
Flanders Pond	Flanders	1.00
Forbes Pond	Prospect	0.35
Total		24.11

UNION RIVER DRAINAGE BASIN.

DESCRIPTION.

The Union River is located mainly in Hancock County in the southeastern part of the State. The main river is formed by the junction of the East and West branches in the towns of Waltham and Mariaville. From the junction the river flows in a general southerly direction for 15 miles, meeting tidewater at Ellsworth.

The East Branch has its source in the Lead Mountain ponds of Township 28 M. D. It thence flows southerly for 8 or 9 miles to Rocky Pond; thence in a southwesterly direction 7 miles or so to Spectacle Pond; thence northerly and westerly some 10 miles by river to its junction with the West Branch.

The West Branch rises in the extreme northern end of Hancock County in Townships 39 M. D. and 40 M. D. It flows in a general direction a little west of south for about 35 miles joinign the East Branch about 0.9 mile above Jordans Bridge. During its course it passes through Brandy and Great ponds and in addition receives the drainage from a number of other ponds, the largest of which are Alligator Pond and Long Pond. Above Great Pond the basin is largely covered with young growth of timber. There is little cultivated land in the whole course of the river except in the town of Amherst.

The tributaries of the main river are, on the west, Branch Lake Outlet which enters between Ellsworth and Ellsworth Falls, Green Lake Stream which enters just above Brimmers Bridge, Beech Hill Stream and Floods Pond Outlet. On the east the main tributary is Webbs Brook.

The following table gives the areas drained by a number of the tributaries and by the two larger lakes of the basin:

Drainage Areas Union River Basin.

RIVER OR LAKE.	Location.	Drainage area square miles.
Union River	Jordans Bridge 0.75 m. below forks	312
Union River	Ellsworth gaging station	537
West Branch	Amherst gaging station	140
West Branch	Mariaville, Goodwins Bridge	172
East Branch	Waltham	123
Webbs Brook	Old gaging station	50
Branch Lake	Outlet	31
Green Lake	Outlet	47

The river is bountifully supplied with a number of large lakes, suitable for the storage of water for the purpose of maintaining an equitable discharge of the river in the interest of the power developments at Ellsworth and Ellsworth Falls. The following table gives the surface area in square miles of the more important lakes and ponds in the basin:

Lake Areas Union River Basin.

LAKE OR POND.	Drainage.	Surface area, square miles.
Abraham Pond	Main river	0.69
Alligator Lake	West Branch	1.73
Beech Hill Pond	Main river	2.09
Branch Lake	Main river	4.33
Brandy Pond	West Branch	1.60
Burnt Pond	Green Lake	0.11
Dennings Pond	Tide water	0.75
Duck Pond	Green Lake	0.08
Eagle Pond	Tide water	0.75
Floods Pond	Main river	1.04
Floods Pond	Tide water	0.25
Four Ponds	Tide water	1.00
Great Pond	West Branch	1.01
Great Pond and two connecting	Tide water	3.50
Green Lake	Main river	4.43
Georges Pond	Main river	0.90
Goose Pond	Green Lake	0.32
Harriman Pond	Branch Lake	0.10
Hat Case Pond	Green Lake	0 50
Hopkins Pond	West Branch	1.75
Long Pond	West Branch	1.00
Lead Mountain Ponds, two	East Branch	2.00
Molasses Pond	Main river	1.90
Mountain Pond	Green Lake	1.00
Morrisons Pond	West Branch	0.35
Pattens Pond, upper	Tide water	1.10
Pattens Pond	Tide water	4.00
Rocky Pond	Green Lake	0.20
Rocky Pond	Branch Lake	0.25
Little Rocky Pond	Green Lake	0.10
Rocky Pond	East Branch	0.96
Scammons Pond	Main river	1.11
Spectacle Pond	East Branch	2.74
Seal Cove Pond	Tide water	0 75
Salt Pond	Tide water	1.50
Springy Pond	Main river	0.60
Webbs Pond	Main river	1.43
Total		47.92
Total excluding tide water		34.32

During 1909, the U. S. Geological Survey in co-operation with the State Survey Commission surveyed certain sections of the river as well as a number of the more important lakes. The data given below were obtained at that time.

The following maps, the results of these surveys may be obtained from the Director of the U. S. Geological Survey, Washington, D. C., or from the State Survey Commission, Augusta, Maine; Union River, Ellsworth to Great Pond, 2 sheets; Abraham, Scammons and Molasses ponds and Webbs Pond Outlet; Alligator, Rocky and Spectacle ponds; Great Pond, Green Lake Outlet and Branch Lake Outlet.

The following lakes are shown on the Ellsworth Quadrangle of the U. S. Geological Survey: Green Lake, Beech Hill Pond and Webbs Pond. Branch Lake is shown on the Orland Quadrangle.

WATER POWERS.

DEVELOPED POWERS.

During 1908 there was constructed on Union River at the head of tide, a concrete dam by the Bar Harbor & Union River Power Company. This dam is 360 feet long and 60 feet high. On the right bank is located the power station generating electricity for use in the vicinity and in Bar Harbor and Bangor. There are installed at present in the plant two pairs of McCormick turbines (S. Morgan Smith), 33″ and 36″ respectively. There is also an 18″ single runner wheel used for each of the two exciters, the latter of 75 K. W. capacity each. Connected to the turbines are two General Electric, 3 phase, 60 cycle, alternating current, 2,300 volt generators of 1,000 and 1,250 kilowatt capacity respectively. The plant is run 24 hours a day and there is no auxiliary steam plant. The annual output is about 7,000,000 K. W. hours. The nominal rated capacity of the plant at present is 2,250 K. W. or 3,000 horsepower, although penstock capacity is designed for 4,300 horsepower. Such of the current as is now delivered to Bangor and Bar Harbor is transformed at Ellsworth to 33,000 volts and then fed to the transmission lines.

The next development is at Ellsworth Falls about 1¾ miles above Ellsworth, where Whitcomb Haynes & Company develop at two dams about 300 horsepower. Each dam averages about a 7½ foot head. The wheel installation consists of 4 Samsons 72", three old style wheels 72" and two sets of four wheels on horizontal shafts, 42" diameter.

UNDEVELOPED POWER.

From Ellsworth Falls the river is practically dead water to above the junction of the East and West Branches. The valley is about a mile wide up to Brimmers Bridge 3½ miles above tidewater and 0.7 mile below the mouth of the outlet stream from Green Lake. Here high ground closes into the river and at this place is a good location for a storage dam.

From the upper dam at Ellsworth Falls, the river rises only 3 feet in a distance of 15 miles or to a point 0.6 mile below Goodwins Bridge on the West Branch.

West Branch.

From Goodwins Bridge in Mariaville to Great Pond, a distance of 17.3 miles, the river rises 183.5 feet, or an average of 10.6 ft. per mile. This fall per mile is only exceeded at a few places, as follows:

1st. At Goodwins Rips, about a mile above Goodwins Bridge, or 18 miles above Ellsworth. Here is a 10 foot fall in 0.7 mile. The run is wide, filled with rocks and boulders, with a few ledge outcrops. The land is high on the west shore, but low on the east shore for several hundred feet, then rises rapidly. Were a dam to be placed here, the best place probably would be just above Goodwins Bridge, where high land comes in on both sides. The foundation here is gravel.

2nd. Mariaville Falls, 3 miles above Goodwins Bridge, and 20 miles above Ellsworth. At the head of the falls, ledge outcrop extends across the river and there is an abrupt fall of 8 feet. The banks are steep and high, with ledge underneath the soil. Below the ledge falls the river falls fast over a succession of small falls, so that the total fall of the river in a distance of 1600 feet is 26 ft. A dam of any height from 10 to 40 feet could be put in, the height being governed by the flowage area desired. The erection of a very high dam would flood out considerable cultivated land, for above Mariaville Falls the river rises but little.—only three feet in the three miles up to Sumners Bridge. For this distance the shores are rather low, the river running through a narrow valley, and there is more or less open, cultivated land bordering on the river. On the sides of the valley the land rises steep. A water surface from 5 to 7 ft. above present water level in the river could probably be maintained without doing much damage.

If land damage should be found not to be excessive, a dam of about 15 feet in height could be put in which would flood back all the valley up to the foot of the Tannery Dam at Amherst.

3rd. Tannery Dam at Amherst, 24 miles by river from tidewater. Formerly there existed a tannery and dam which developed from 15 to 17 ft. of head. The buildings and dam have been burned and the river is under free flow. The site is one of the best on the river as a ledge outcrop runs clear across, with high banks on both sides. A dam 400 ft. long would hold the water up to elevation 175 and develop about a 23-ft head. The damage done above by the flooding back would not be excessive, although at the upper end there is a flat area of grass land that would be flowed at high water. Also at the dam, the highway on the north side of the river would be flooded out for a quarter of a mile.

4th. Captains Roll and the Scarecrow, 25 to 26 miles above Ellsworth. This quick water is about 1¼ miles above the Tannery Dam. At the roll there is a vertical fall of 4 ft. and above this, quick water, so that in a distance of two-thirds mile there is a 20-ft fall. Ledge foundation exists across and on both sides of the run. The north shore is high, the shore being 10 ft. above the river and level for several hundred feet, then rises rapidly. From a 10 to a 15-foot head could easily be developed here.

5th. Fourth Falls, 29.5 miles above Ellsworth, where exists a five-foot vertical fall. Ledges exist on both banks and a 10-ft. head could easily be developed.

6th. Hells Gate. This applies to the lower end of the quick water just below Bog Dam, where there is a 6-ft. fall in 250 feet, through a narrow channel with ledge banks. The total fall in the half mile to Bog Dam is 30 ft. There is no storage here and the banks are not high enough to admit of a dam over 15 or 20 ft. unless it be very long.

7th. Bog Dam, 2 miles below Great Pond and 31.5 miles from tidewater, formerly flooded out some three feet of fall just above it and Flat Rips at the head of the dead water, and controlled about 7 feet of head which was used in log driving. At the present time the gates are gone. The site of the dam as ledge and gravel. A 10-ft. dam could be maintained here and considerable storage obtained, as above the dam there is nearly two miles of dead water, with a large area of flat land on the east shore. No damage would be done except to brush and a few trees. The elevation of the ordinary stage of the water at the Bog Dam is 270 ft. above sea level.

For power purposes, Mariaville Falls and Tannery Dam are the best; for storage purposes the further development of Bog Dam offers good possibilities.

East Branch.

A profile survey of the East Branch was not made but from observations and aneroid readings the following data were obtained. From the mouth to Spectacle Pond in a distance of 10.0 miles the rise is 173 ft. or from elevation 87 ft. to 260 ft. above sea level. In the 3 miles from the mouth to Foxs Bridge the rise is 30 ft., 22 ft. of which occurs at Great Falls through a distance of 0.25 mile. In 1.5 miles between Foxs Bridge and Jones Bridge there is a rise of about 27 ft. Thence in the 3 miles to the mouth of the Middle Branch there is a rise of about 53 ft.; thence a rise of 36 ft. in a distance of 1.5 miles to the foot of Ledge Falls where there occurs a rise of 8 ft. in 400 ft.; then dead water for one mile to Pond Rips; then, Pond Rips, a rise of 13 ft., in ½ mile to Spectacle Pond dam.

At Ledge Falls a timber crib dam has been built, having 3 gates which are 24 ft. over all. From the gates a wing wall extends to the east 88 ft. to ledge, and on the west a wing wall extends 82 ft. to a high ledge. Bed rock occurs undoubtedly across the river as the wings of the dam abut against vertical ledges. This dam could be raised 5 ft. making the entire length not over 300 ft. This location demands especial attention in any studies of storage on the East Branch.

Proceeding upstream from the head of Spectacle Pond the rise is 40 ft. in a distance of 7 miles to Rocky Pond. This makes the elevation of the average water surface of Rocky Pond 300 feet.

Webbs Brook.

The only tributary to the Union River on the east, of any importance, is Webbs Brook. This brook enters the river in the town of Waltham and is the outlet of Webb Pond, Scammons Pond, Abraham Pond and Molasses Pond.

For a mile or more upstream from the river, Webbs Brook is dead water and the course of the stream is very crooked. From this point the brook rises either gradually or with abrupt falls up to the highway bridge. In this distance of about half a mile, there is a rise of about 34 ft., the water surface of the brook at the highway being about elevation 121. Of this 34-ft. fall, about 12 ft. occurs at an old privilege about ⅜ of a mile below the highway. Formerly there was a dam there, but at present everything is gone.

There is also a fall of about 14 ft. at a sawmill some 500 ft. below the highway. The mill is old and in poor condition. The site of the dam is excellent, being ledge; the present dam, not over 100 ft. long, develops about a 14-ft. head, and this could be easily increased several feet. The mill pond is so small that the mill cannot run continuously, but has to shut down and wait for the pond to fill up. When the pond is full it floods out falls of about 3 ft. at the highway bridge.

About ¾ of a mile above the highway there is quick water and a fall of from 3 to 4 ft. in a distance of ¼ of a mile. At the head of these rips there is the Googin rough timber crib dam, controlling about a 3-ft. head, which is used only during the log driving season. At other times free flow takes place in the brook.

The shores are low, the top of the present dam on the south side being 1 ft. above the ground, so that at high water it wastes around the dam.

The best location for a dam is about 200 ft. above the present dam. Here on the south side, the ground rises to 10 ft. above the brook. The north shore is not as high, but about 5 ft. above the brook. A dam could be placed here which would hold the water at the height of the present dam, and a little higher if desired,—probably to about elevation 136, the water surface in Webbs Pond being 132.5.

There is a second possibility of a dam on the brook, at a point about ¾ of a mile above the present dam, and below

Little Webb Pond. Here on the left bank going up there is high land with ledges 10 to 12 ft. high. The other shore is low for 250 to 300 ft., then rises in a knoll about 8 ft. high. Both shores are wooded.

LAKE STORAGE.

BRIMMERS BRIDGE RESERVOIR SITE.

At Brimmers bridge, 3½ miles above Ellsworth, the valley narrows and here is an excellent site for a storage reservoir. A dam built here and storing water would create a pond 15 miles long, and back water both up the East Branch and West Branch, up the latter stream to Goodwins Rips. The larger proportion of country that would be covered is at present marshy and of little value.

The following table shows the capacity of this reservoir site for various elevations:

Area and Capacity of Brimmers Bridge Reservoir Site.

Elevation, Feet.	Area square miles.	Capacity section cubic feet.	Total capacity cubic feet.
88		0	0
89	5.81	162,200,000	162,200,000
90	6.95	193,700,000	355,900,000
91	8.06	223,200,000	579,100,000
92	8.98	250,500,000	829,600,000
93	9.96	277,700,000	1,107,300,000
94	10.94	304,900,000	1,412,200,000
95	11.92	332,200,000	1,744,400,000
96	12.77	356,200,000	2,100,600,000
97	13.47	375,600,000	2,476,200,000
98	14.22	396,300,000	2,872,500,000
99	15.01	418,700,000	3,291,200,000
100	15.53	433,000,000	3,724,200,000
101	16.13	449,900,000	4,174,100,000
102	16.80	468,900,000	4,643,000,000
103	17.28	481,700,000	5,124,700,000
104	17.73	494,400,000	5,619,100,000
105	18.19	507,200,000	6,126,300,000

BRANCH LAKE.

General Description. Branch Lake lies in the town of Ellsworth, Maine, and runs in the general direction N. W. to S. E. It is considered locally as consisting of three parts,—the Mill Pond, Lower and Upper lakes.

The Mill Pond is formed by the dam at the lower end of the lake, and is about 0.7 mile long and an eighth of a mile average width. It joins the Lower Lake by a narrow channel known as the "Outlet."

The Lower Lake is about 2½ miles long and 0.6 mile average width, and joins the Upper Lake by a comparatively narrow passage known as the "Narrows." The Upper Lake, 2½ miles long, widens out above the Narrows and attains its maximum width, which is nearly 2½ miles, at its extreme upper end.

The total length of all three parts along what would be called the natural center line of the lake, which extends from the mouth of Dean Brook to the dam at the Mill Pond, is 5.9 miles, while the distance from the head of McGowans Cove to the dam is 6.9 miles.

The elevation of the lake as given by the Topographic Branch, U. S. Geological Survey, is 236, and this height was taken as the water surface at the time of the reconnaissance, and for this assumption the height of the top of the dam is 240 feet.

The shores are all wooded to the water's edge, the growth being from 15 to 20 years stand and comprising both hard and soft wood. As a rule, the land rises uniformly, there being no low land except at the northwest end around Lincompaw Brook. The 240 contour averages about 30 ft. back from the present lake level, and the 250 is not far distant.

There are three or four lumber camps along the shore, standing at an elevation of 15 or more feet above the present pond level, and one summer cottage,—that of U. S. Senator Hale. This cottage and accompanying barn are on the east shore at the southeast end of the lower lake. The cottage stands about 10 ft. above the present pond level and the stable about 6 ft. above. The Branch Pond Lumber Co., from whom Senator Hale bought the land, reserved the right to flood the pond to an elevation of the top of the present dam, or elevation 240.

Inflowing Streams. There are no large streams entering the pond: Great Brook enters on the east shore of the Lower Lake and is about 2 miles long. At the head of the lake several streams enter, none being over 4 miles long,—the largest being Lincompaw Brook, the outlet of Harriman Pond, a pond 0.10 square mile in area and at elevation 536 or 300 ft. above Branch Pond.

The stream from Rocky Pond, which has an area of 0.25

square mile and is situated about one mile from the pond and at elevation 313, enters on the south side near the head of the pond.

Description of dam and mill. The dam and mill at the outlet are owned by the Branch Pond Lumber Company. The dam is a very poor affair and consists in part of natural ledges filled in between with a rock wall faced on the front side with 2″ planking. The elevation of the top of the dam was assumed as 240 ft. but the crest is very uneven, in places being a foot lower than this. On the east shore there is a retaining dam having a waste gate 10 ft. wide, the top being at elevation 238.0 and the bottom at elevation 234.5 ft.

The mill has a wheel installation of one 3 ft. Chase and one 6 ft. Samson. The average head under which they operate is about 8 ft., developing perhaps 250 H. P. The mill generally runs 10 hours on the 3-ft. wheel and only occasionally on the 6-ft. wheel. The number of hours each wheel runs and the number of hours water is turned on for the woolen mill below are recorded, and are used in connection with the computations of discharge at the U. S. Geological Survey gaging station in the outlet stream below the mill.

Storage Possibilities. There are two possible projects for the utilization of this lake for storage purposes. First: The present dam could be rebuilt and water stored to elevation 245 ft. Second: A dam could be placed at the original outlet. Here the channel is from 260 to 320 ft. wide and comparatively shallow, not over 8 ft. deep and this for only a few feet in width. A dam about 700 ft. long would be sufficient for raising the lake to elevation 250 ft. or 14 ft. above the present lake level.

The damage done would be to second growth standing timber with an average value of from $5 to $10 an acre, and to the summer camp of U. S. Senator Hale. These buildings, which are expensive and exceedingly well built, would be flooded out, the barn at elevation 242 ft. or above, and the cottage at elevation 246 ft. or above.

The following table shows the capacity of Branch Lake for several elevations:

Area and Capacity of Branch Lake.

Elevation, Feet.	Area water surface, square miles.	Capacity of section cubic feet.	Total capacity cubic feet.
234	4.10	0	0
236	4.33	234,700,000	234,700,000
238	4.56	247,600,000	482,300,000
240	5.04	267,600.000	749,900,000
245	5.38	726,200,000	1,476,100,000
250	5.62	766,700,000	2,242,800,000

BRANCH LAKE STREAM.

This stream in its course to Union River falls about 150 ft. in a distance of about 5 miles. About half way down the stream is situated the Ellsworth Woolen Mill, operated under a head of about 17 ft. The horsepower developed is small. The dam and penstock are in very poor condition, leaking badly, and probably at least half of the water is wasted. They also control what is known as the Wilson privilege, which is a short distance above, where a 20 ft. head could be developed, flooding approximately 200 acres. This is now in disuse and undeveloped. The Woolen Co.'s deed calls for a daily delivery of 900 inches from Branch Lake. On account of the poor condition of the dam and its surroundings, for the pondage is small, it is necessary at times to keep the gates at Branch Pond open at night, in order to have water enough to operate.

The city of Ellsworth takes its water supply from this stream, at a point just above its junction with Union River, water being pumped from here to a stand-pipe.

GREEN LAKE.

General Description. Green Lake is situated in the towns of Dedham and Ellsworth, about half of the lake length, and also the lake area, being in each town. It runs in the general direction N. W. to S. E., is nearly 6½ miles long, narrow in width,—on the average being about ¾ of a mile. At each end it widens out into basins about 1¼ miles wide.

The elevation of the lake as given by the Topographic Branch of the U. S. Geological Survey is 156. There being no bench mark in the vicinity, the top of the dam at the north side of the gates was taken as elevation 160 and for this elevation the water surface at the time of reconnaissance was 157.52.

The shores for the most part are wooded and rise either very abruptly or gradually, except on the northern shore at the west end where the cottages are situated; here they rise very slowly.

There are no camps on the eastern part of the lake, but on the north shore at the west end of the lake, there are a large number of summer cottages, and the buildings of the U. S. Fish Hatchery are also on the north shore, about midway of the narrow part. The cottages for the most part are about 5 ft. above the lake, and the land is low.

Inflowing Streams. The streams entering the pond are small and possess but little length, except the one coming from Mountain Pond. They are, for the most part, outlets of small ponds that drain into the lake. At the northwest end of the lake enters the stream coming from Goose Pond, which has an area of 0.32 square mile and is at elevation 307, or 141 ft. above the lake, and distant from it about 3 miles. This stream is joined on its way to the lake by several other streams, and also receives the overflow of Phillips Lake when at high water.

On the southern shore, about one and a half miles from the western end of the pond, and near each other, enter the brooks from Little Rocky Pond and Duck Pond. Little Rocky Pond has an area of 0.10 sq. mile and is at elevation 229, or 73 ft. above the lake, and about half a mile from it. Duck Pond is about ⅛ mile from the lake at elevation 170, or 14 ft. above the lake, and has an area of 0.08 square mile.

On the northern shore three streams enter, one about a mile from the western end; one at about the center of the lake, this stream being the outlet of Burnt, Rocky and Mountain ponds; Burnt Pond being at elevation 230 and of area 0.11 sq. mile and Rocky Pond at elevation 206 and 0.20 sq. mile in area. The third brook is the outlet of Muddy Pond and is practically the drainage of a marsh. The brook enters at Northeast Cove.

Description of Dam. The dam is a timber crib structure, originally owned by the Boom Co., but is now principally controlled by Whitcomb & Haines Lumber Co. There are two gates, each controlling a 6.8 ft. head. At the time of survey the water was 0.8 ft. below the top of the gates, and 6.7 feet deep in front of the gate screen. The present gates would draw off all the water immediately in front. The crest of the dam is irregular, the lowest part being at the gates, and is 1.5 ft. above the top of the present gates. The height of the gates could be increased, by the addition of boards, up to 9.75 ft., in which case about 1.5 ft. would then be flowing over the low part of the dam.

Storage Possibilities. The topography adjacent to the present dam would admit of any increase in height up to fifty feet; the control is however governed by the conditions existing at the western end of the lake.

The Maine Central R. R. runs along the southern shore and is perhaps 10 or more feet above it. At the Green Lake R. R. Station, the tracks are at elevation 168.5 or 11 ft. above the lake surface at the time of reconnaissance. The wharf at Green Lake is 3.5 ft. above the lake or at elevation 161.0 and is covered at high water. The basements of some of the cottages are also flooded at high stages of the lake. The highway bridge is 4.5 ft. above the lake elevation 162.0 and is nearly flooded at high water.

Increased storage could only be obtained at considerable expense, for practically all of the cottages would be damaged extensively. The railroad is probably high enough in most places, and if not could be moved to higher land, as south of the railroad the land rises steeply.

The following table shows the capacity of the lake to various elevations:

Area and capacity of Green Lake.

Elevation, Feet.	Area water surface square miles.	Capacity of section cubic feet.	Total capacity cubic feet.
156	4.43	0	0
160	5.29	534,800,000	534,800,000
170	5.85	1,552,800,000	2,087,600,000
180	6.41	1,708,900,000	3,796,500,000

BEECH HILL POND.

General Description.

Beech Hill Pond, in the town of Otis, is about 3 miles long and on an average of half a mile wide. The general direction of the pond is from N. W. to S. E. and it is fairly regular in shape. The lake elevation as given by the Topographic Branch, is 199, and at this elevation the area is 2.09 square miles. The pond is deep, the maximum depth being about 150 feet. The shores are wooded and rise rapidly from the lake surface.

Only a few brooks enter the pond, and these are not large or long, as the drainage area of the pond is small.

Description of Dams at the Outlet.

There are a number of dams on the outlet brook of the pond. The lowest dam is just above the road to Ellsworth and is owned by David Salisbury. This dam at elevation 174 is 100 feet long, 5 feet high, and is a timber crib structure. The head developed is used in running a mill for sawing shingles and staves, and is operated most of the year, except during a portion of the summer. 100 ft. below are the remains of an old mill and dam, the latter being now nothing more than a heap of logs.

Above Salisbury's mill, there is a pond about 600 ft. long and from 100 to 200 ft. wide, the depth at the dam being about 2 ft., but the pond is deeper above.

Fifty feet above the mill pond, and on the brook, there is a dam 2½ ft. high, 20 ft. long, made of timber and used for log driving purposes. The water is 1 ft. deep above the dam and 2¼ ft. deep below it.

Three hundred feet above this dam is another dam of the same type. These dams have no gates. The brook between the dams falls rapidly and has a very rocky bed.

Two hundred and fifty feet above this last dam are the ruins of a mill and dam, there being but little left of the mill. The dam was originally about 6 ft. high, with a log sluice 6 ft. wide in the center, through which the water now runs. Between this and the dam below, the brook falls rapidly and has high banks.

Two hundred feet above the ruins of the old mill is the last of the dams, this one being of stone and earth, 150 ft. long, 6 ft. high, with a gate 5 ft. wide. At the time of inspection, the gate was up about 0.1 ft. Water above the dam stood 1 ft. below the top of the dam. Above the dam the water is from 2 to 4 ft. deep. The lake at this point is very narrow, being about 100 ft. wide for 200 ft., then narrows still more and opens into the lake proper.

The outlet brook below this set of dams is about 12 feet wide and falls rapidly; the flow of the pond is estimated at 10 second feet.

Judging from the topographic sheet, the land is high on the north shore at the outlet, but lower on the south shore. To raise the pond to elevation 220 would necessitate a dam about 1200 ft. long, and also it would be necessary to put in a dyke at one place on the north shore. Probably some increase could be obtained at not a very great expense.

The following table gives the capacity of the lake to various elevations:

Area and capacity of Beech Hill Pond.

Elevation, Feet.	Area water surface square miles.	Capacity of section cubic feet.	Total capacity cubic feet.
199	2.09	0	0
200	2.17	60,800,000	60,800,000
205	2.46	322,000,000	382,800,000
210	2.75	362,400,000	745,200,000
215	3.04	404,200,000	1,149,400,000
220	3.33	443,300,000	1,592,700,000

FLOODS POND.

General Description.

Floods Pond, in the town of Otis, is about 3 miles long, irregular in shape and narrow in width, on the whole. Its general direction is from N. W. to S. E. The pond elevation is 298, and at this elevation the area is 1.04 sq. miles. The pond is from 50 to 150 feet deep. The shores are steep and wooded. The only stream entering the pond is that from Burnt Pond.

Dams at the Outlet.

At the outlet there is a mill, practically in ruins, and has not been used for 6 years. It is owned by the Whitcomb & Haines Co. of Ellsworth. There are two dams, one 40 ft. back of the mill, and a second one 100 ft. upstream from this and 1000 ft. from the foot of the pond. The dams are each about 100 ft. long and of timber crib construction. The upper dam is 10 ft. high and has two gates, one 4 ft. wide, the other 6 ft. wide, and situated 20 ft. apart. The lower dam has two gates, one for the wheel, the other to float logs into the mill. The top of the lower dam is about on a level with the bottom of the upper dam. The mill pond back of the upper dam is almost dry and is filled up with stumps, dead wood, etc. Only a small stream flows through it from the pond proper 1000 ft. above. The dams are leaky and do not hold the water. The head at the mill is about 15 ft. 200 ft. below the mill is a fall of 25 to 30 ft. The banks are high and a fine power could be developed. The flow from the pond is about 8 or 10 second feet.

Storage Possibilities.

The lower end of the pond for half a mile is narrow, from 200 to 300 ft. wide, with high shores. The pond surface could easily be raised 20 ft. without doing extensive damage. If this were done it would connect Flood and Burnt Ponds, giving a lake area of about 2¼ square miles. The capacity to elevation 298 would be 920,000,000 cubic feet. The pond could not be drawn down any lower without dredging an outlet.

WEBBS POND AND LITTLE WEBBS POND.

General Description.

No survey was made of this pond,—only a brief reconnaissance. Its area as obtained from the topographic sheet is 1.41 sq. miles. A few soundings were made, the maximum depth found being 13 ft.

The shores are wooded and rise gradually, except around the inlet and outlet. At the outlet, the land is low and swampy, and there is also some low land at the inlet.

There is one camp on the north shore, built in 1909 and owned by Googin Bros. It is about 250 ft. east of Alder Brook and 6 ft. above the present water level, or about elevation 138.5.

Inflowing Streams.

There are only two streams of importance entering the pond, that from Georges Pond, which is a very small pond about 1¼ miles above, and Mill Stream, which is the outlet of the ponds above.

Mill Stream is about a mile long, very crooked, and connects Webbs Pond and Scammons Pond.

Little Bog River enters it just above the bridge on the highway from Waltham to Eastbrook Corners.

Elevation of Water Surfaces.

The floor of the highway bridge over Mill Stream, on the Waltham-Eastbrook Corners Road is given as 137.4 by the Topographic Branch. The water surface was 4.8 ft. below, giving 132.6 as the elevation, and this can be taken as the elevation of Webbs Pond and Webbs Brook to Googins Dam. The elevation of the water surface in Mill Brook, just below the mill at Scammons Pond, at the highway bridge from Eastbrook Corners to Molasses Pond, was found by leveling to be 135.0.

Storage Possibilities.

A dam just above Googin's dam, or at the second place ¾ of a mile above it, would increase the height from 2 to 5 ft. The following are the resulting areas:

At elevation 133 ft. 1.43 sq. miles. At elevation 140 ft. 2.98 sq. miles. This latter height could not be maintained, as it would flood out high both on the Waltham-Eastbrook Corners Road and at Scammons Mill. A maximum height of about 136 could probably be maintained.

The following table shows the capacity of the lake for various elevations:

Area and capacity of Webbs Pond.

Elevation, Feet.	Area water surface square miles.	Capacity of section cubic feet.	Total capacity cubic feet.
133	1.43	0	0
136	2.10	147,800,000	147,800,000
140	2.98	283,200,000	431,000,000

SCAMMONS POND.

General Description.

Scammons Pond, in the town of Eastbrook, is a long, very narrow and irregular shaped pond of shallow depth. Its general direction is from S. E. to N. W., the extreme length being 3.8 miles and the maximum width ½ mile. The area at elevation 145.5 feet, high water, is 1.11 square miles. The maximum depth found was 10 feet; the upper part of the pond especially is filled up with stumps, floating logs, and dryki, in general presenting a very poor appearance.

The shores are wooded, in the main, being covered with both hard and soft wood growth of from 10 to 25 years standing. One open piece of pasture land borders the pond on the right shore near the middle of the pond. At high water, there is a narrow marshy strip, on the average about 100 ft. wide, around most of the pond. Back of this the land rises gradually, although in some places steep. The land is low around the outlet, especially along the road leading to Molasses Pond. Here the highway in places is not over a foot above the present pond surface.

Three streams enter the pond,—one from Abraham Pond, the other two from Molasses Pond.

There are no comps or buildings along the shores of the pond, except those around the dam. The dam is a stone filled structure with plank facing, irregular in alignment and of total length 300 ft. The front of it has been gradually filled up with refuse from the mill so that it is hard to determine its exact form. The mill is owned by W. Clow and saws spool bars and box stuff, but is only operated part of the year. The mill has two wheels, H. P. not known, that are run under an average head of about 8 ft.

Storage Possibilities.

The present capacity is perhaps 100,000,000 cubic feet. No additional storage could be obtained without excessive cost, owing to the low land around the outlet and along the highway.

ABRAHAM POND.

General Description.

Abraham Pond is a small pond lying westerly from Scammons Pond and connected to it by a brook about 1000 ft. long. Its general direction is from S. to N., it is 1½ miles long, of maximum width 0.8 mile, fairly regular in shape and quite deep, the maximum found being 32 ft. Its pond area under normal conditions is 0.69 square mile at elevation 164.

The shores rise rapidly all around the pond, except for very small areas near some of the brooks. They are wooded except at the westerly end, where there is pasture land, and also there is open land northerly from the outlet brook.

The inflowing streams are all very small, having no length or magnitude, the pond being fed by springs.

There are a number of camps along the shore at the northerly end and along the west side, but these are all back from the lake and some 20 ft. above it.

Outlet Brook.

The outlet brook is five feet wide and 0.5 ft. deep, with a flow of from 2 to 3 second feet. At some previous time a dam existed at the outlet. A dam 35 ft. long would raise the pond level 5 ft. if there is water enough to fill it. Below the outlet the land slopes rapidly down to Scammons Pond, a fall of 18.5 ft. in 1000 ft.

Storage Possibilities.

The pond having but a limited drainage area, and being fed by springs, cannot have a large flow, and the lake surface probably could not be raised very much. The nature of the shores at the outlet would admit of raising the water surface 4 ft. by a dam 35 ft. long and probably it could be raised 5 ft. by dyking in places. The advantage of a dam would be to store the spring high water and use it as needed. The pond could be lowered 4 to 5 ft. by digging to a distance of probably not over 100 ft. The small expense necessary to store the water would seem to demand its consideration, although the amount stored would not be large, about 190,000,000 cubic feet.

OUTLET STREAM BETWEEN MOLASSES POND AND SCAMMONS POND.

This stream is very crooked and falls rapidly, the fall being about 66 ft. in 1¼ miles. About half a mile below Molasses Pond there is a mill pond, with a mill owned by Macomber Bros. which is used for sawing lumber. The mill operates under a head of about 15 ft. Below this mill pond there are two streams, one flowing direct to Scammons Pond, while the other feeds a small mill pond about ¼ of a mile below the first. At this mill pond there is a mill used for sawing staves, owned by Macomber Bros. It operates under a head of about 10 ft. Below this mill the brook falls rapidly to Scammons Pond. The entrances of these two branches of the outlet stream are about ½ of a mile apart at Scammons Pond.

MOLASSES POND.

General Description.

Molasses Pond, in the town of Eastbrook, is at the head waters of the Webbs Brook supply. It lies easterly from Scammons Pond about 1¼ miles. Its general direction is from S. E. to N. W., is fairly regular in shape, with one large bay. Its extreme length is 2.7 miles, and maximum width is a little over a mile. The lake area at elevation 211, which was the water surface at the time of survey, is 1.90 sq. miles.

The shores are all wooded and there is but little low land bordering the lake; in most places it is not over 100 feet wide, two exceptions being on the west side about one mile from the end of the pond and at the head of the pond. Here there is a small swamp and the highway runs along the shore of the pond. This highway crosses part of the marsh and skirts the pond for about 1000 feet, being not over 3 feet above the present water surface and not over 50 feet back from the pond.

Four very small streams enter the pond, two at the extreme northerly end, one on the east shore at Deep Cove, and one on the west shore ¾ of a mile above the dam. They are all small and short in length.

The Quagador House is situated at the northern end, about 150 ft. back from the shore and 3 ft. above the present pond surface. The barn connected with the place is 300 ft. from the pond and 10 ft. above the pond surface.

There is a small camp on the northerly side of Deep Cove, the camp proper being 100 ft. from the pond and 6 ft. above it. The stable connected with it is 20 ft. from the pond and 4 ft. above it.

Description of Dam.

The dam, 325 ft. long, is a vertical planked faced dam with rock backing. The alignment of the dam is straight and the ends abut on two small ridges. Very little of the dam shows above ground, as evidently the original outlet was very narrow.

The dam has two gates, each 5 ft. wide, which are situated 90 ft. from the extreme east end of the dam and 20 ft. from normal shore line. At the time of survey the west gate was 3.6 ft. high, with 0.8 ft. of water flowing over the top; the east gate was 4.1 ft. high with 0.3 ft. of water going over it. The west gate alone can be raised and is the one used to sluice logs. The depth of the water in front of the gate is 4.4 ft. and 60 ft. out in the pond 5 ft. deep. The water surface in the pond is at elevation 211.

Storage Possibilities.

The bridge at the highway at the upper end of the lake is at elevation 213 ft., 1.9 ft. above the present lake level. High water in the spring has just reached the flooring, and this would mean that not over 0.25 ft. of water was flowing over the dam. The present dam thus holds about all that can be collected. As far as the topography around the outlet is concerned, the dam could be increased in height from two to three feet. The area at the 5-ft. contour, or 216 ft. is 2.2 square miles. The capacity would be 286,000,000 cubic feet.

EAST BRANCH UNION RIVER.

SPECTACLE POND.

Spectacle Pond, in Township 21 M. D., is the largest pond on the East Branch. It consists of practically two ponds lying side by side and joined by a narrow channel. The main pond extends from N. to S. and the smaller pond from S. to N. The extreme length of the pond from Johns Brook to the outlet is 3.6 miles, and the maximum width is 1¾ miles. The pond area at approximate elevation 258, which corresponds to a water surface 4 ft. below the top of the dam, is 2.74 sq. miles. The maximum depth found was 22 ft. in the lower pond. The average depth is probably about 15 ft.

The shores are irregular, wooded and rise abruptly except in a few places, there being around the inlet of the stream from Rocky Pond, at the mouth of Johns Brook, a small area easterly from Cape Sharp and a small swamp area on the north side just above the outlet.

The inflowing streams are Johns Brook at the extreme north end of the large pond, two small streams at Southeast Cove on the large pond, a small brook at the north side ¼ of a mile above the outlet, and the Inlet at about the middle of the east shore of the main pond. With the exception of the Inlet, all streams are small and short in length.

There are two sets of camps on the shores of the pond that are now used. The first is owned by Hollis Jordan and situated at the apex of the "Tongue", so called. The buildings are about 100 ft. from the shore and 15 ft. above the present pond level.

The other camp is owned by Robert H. Jordan and is some 400 ft. from shore at the extreme end of Southeast Cove. It is about 10 ft. above the pond level.

There is a set of lumber camps at Grants Cove that are now rapidly going to pieces, not having been used for a number of years.

The dam, which is a timber crib structure, has a total length of about 500 ft., 100 ft. of which covers the length of outlet except at very high water. There are three gates occupying a total length of 30 ft. The height of the dam is 6 ft. above the bottom of sluice-way of the gates. At the time of survey, the water in the pond was 2 ft. above the bottom of the sluice-way. The north gate was shut, the middle one partly open, and the south gate had broken away so that free flow was taking place. The water surface below the dam was 2 ft. below the bottom of the sluice-way. Above the dam the outlet is narrow, about 50 ft., with a swift current, with a depth of water from 2 to 3 feet.

Storage Possibilities.

Spectacle Pond offers excellent possibilities for storage; while there is not a large area of low land bordering the pond, the topography at the outlet is such that a dam of sufficient height to hold all the water could easily be built.

Considering the water surface at the time of the survey as at elevation 258, the pond area is 2.74 sq. miles. To raise the water to elevation 263, would call for raising the present dam one foot, but would not call for lengthening it. To raise to the 268 contour would call for increasing the length of the dam to about 800 ft., as well as raising it 5 ft. more.

The following table gives the capacities of this pond for various elevations:

Area and capacity of Spectacle Pond.

Elevation, Feet.	Area water surface square miles.	Capacity of section cubic feet.	Total capacity cubic feet.
258	2.74	0	0
263	3.20	414,000,000	414,000,000
268	3.60	474,000,000	888,000,000

ROCKY POND.

Rocky Pond, in Township 22 M. D., about 7 miles easterly by stream from Spectacle Pond, is a small pond about 1¾ miles long and 0.8 mile maximum width. It runs in a general direction from south to north, is fairly regular in shape, and has an area of 0.96 sq. mile for a water surface 1.7 ft. below the top of the present dam; this is approximately at elevation 300. The maximum depth noted was 24 ft., but only a few soundings were made.

The shores are irregular, wooded in places but burnt and bare in others, and rise gradually except at the north and south ends. At the south end, around the brook entering the southeast corner, there is a narrow valley of low land that extends probably back for a mile. At the inlet at the north end the shore is low and marshy and probably extends back for several miles, the width of the valley being from ¼ to ½ a mile.

There are no camps on the shores.

There are two small inflowing streams at the south end of the pond and two at the north end. Of these only one is of any size, the stream from Lead Mountain Ponds, which enters at the northeast corner of the pond.

The dam is irregular in alignment, the main part being about 200 ft. long. On the south side a retaining dyke runs off and skirts along the shore of the pond for a distance of about 300 ft. to the foot of a knoll. The dam varies in height, being about 7 ft. high at the gates and 6 ft. high elsewhere.

Storage Possibilities.

The study of the topography around the dam shows that it is possible to raise the dam from 5 to 10 ft. without great expense. On the south side the land is low for about 400 ft., the 5-ft. contour above the present water surface being here; then the land rises steeply. On the north side there is a knoll 200 ft. from the present gates, that rises to the 10-ft. contour. This knoll continues for about 75 ft., then falls away to a 5-ft. contour; then there is a narrow gully not over 100 ft. wide where the height is less than 5 ft. above the present level. Beyond this gully the land rises gradually.

To raise the pond level 5 ft. above its present surface, or 3.3 ft. above the top of the present dam, would call for a dam and retaining dykes of total length about 900 ft. The capacity would be 140,000,000 cubic feet. This would probably hold the spring floods. The area flooded would probably be largely increased owing to the low land at the north. As far as could be judged, without going up the stream, the damage would be small, as there is nothing on the low land except dead trees and dryki.

WEST BRANCH UNION RIVER.

GREAT POND.

General Description.

Great Pond in Township 33 M. D. is at the head of the West Branch of Union River. Its length at present is 2¾ miles and average width a little less than half a mile. The depth is not great, averaging about 20 ft., the maximum found being 35 ft. The water surface elevation is 287 and at this height the lake area is 1.01 square miles.

The shore on the west side is wooded and rises abruptly all the way to the head of the lake. The east shore is wooded and steep on the whole, the exception being a small area at Collar Brook, up to the Main Stream. From this point to the head of the lake the land is lower, but rises gradually. At the head of the lake there is a wide area of low, flat land, a large portion of which was flooded when the dam was in existence. This area is about ¾ of a mile wide and one or more miles long.

Collar Brook enters on the east about ¾ of a mile above the outlet, and is the outlet of three small ponds, namely: Long Pond, King Pond, and Rift Pond, the descriptions of which are given in the reconnaissance of Alligator Lake.

Main Stream enters on the easterly shore about 2 miles above the outlet, and receives the drainage of Alligator Lake, Buffalo Lake and all the small headwater streams. A more detailed description is given later.

Dead Stream enters at the head of the lake, winding sluggishly down through the flat land.

There are several camps along the lake, those of Guy Patterson being on the east shore on ledges just below the mouth of the Main Stream. The main camps are about 25 ft. above the present lake level, but some of the smaller outbuildings are not as high above the lake.

There is a camp situated on the largest island, opposite the mouth of Main Stream. It is about 14 ft. above the present water surface and is an expensive camp.

The dam that originally controlled the pond was burned in the autumn of 1908, and all that is left are portions of the wing walls. The total length of the dam was about 300 ft. and it probably controlled an 8 ft. head. The shores rise abruptly and there is a splendid place for a dam, the foundation being gravel and boulder.

Storage Possibilities.

Great Pond offers exceptional possibilities for storage at comparatively little expense. The wide extent of low land at the head of the lake can again be flooded as formerly and the height of the old dam increased ten or more feet. At the lake level at the time of survey, namely about 287, the lake area was 1.01 sq. miles. At an elevation of 295, which was about the high water for the old dam, the lake area would be about 2 sq. miles. This gives a capacity of 339,000,000 cu. ft.

The height of the dam to be put in can be anything desired, as the hills rise high on each side. A study of the topography around the old dam was made, from which the length can be determined when the height is fixed. If we select elevation 210 as the height of the dam, this will give an increase of 15 ft. over the old dam and probably increase the area up to about four square miles. At a height of 210, the length of the dam necessary would be 800 ft.

The following table gives the capacity of this pond to various elevations:

Area and capacity of Great Pond.

Elevation, Feet.	Area of water surface square miles.	Capacity of section cubic feet.	Total capacity cubic feet.
287	1.01	0	0
295	2.0	335,000,000	335,000,000
210	4.0	1,256,000,000	1,591,000,000

Alligator Lake.

General Description.

Alligator Lake, the largest lake at the headwaters of the West Branch of the Union River, lies in Townships 28 M. D. and 34 M. D., the greater part being in the latter township. It runs in a general direction a little west of north, is 3½ miles long and half a mile average width. It is fairly regular in shape, being made up of a large bay at the head, which lies in an east and west direction, and out of this runs the main lake in a northwesterly direction. The lake elevation is about 440, with a lake area of 1.73 sq. miles.

The water is remarkably clear, the bottom being seen at 20 ft. depth, and the lake averages probably about 40 ft. deep. The deepest place is on the east side near what is known as Tree Rock, and here it is 65 to 70 ft. deep at high water.

The shores are all wooded and as a rule rise rapidly from the lake. There is but very little low land bordering on the lake, the low places being near the outlet, on the west side, and a low swale which runs through on the west side below Haynes' camp from one bay to the upper end of the lake.

The 5-foot contour averages 4 ft. back, and from this on, the land rises gradually or steeply.

There are no streams of any size entering the pond. In the spring there are a number of small brooks running in from the adjacent hills, but at the time of survey the only brook found was at South East Inlet. This brook is not over 10 ft. wide and has its origin in Gould Valley about half a mile from the pond, and probably not over 20 to 25 ft. above the pond. The lake is fed by underground springs, which account for its clearness and low temperature.

There is one camp on an island near the northern end, about half a mile from the outlet. The main camp is about 10 ft. above normal summer level, although some of the outbuildings, as the ice house, are nearer lake level and not much above high water.

The dam is an old affair that holds no water, but hinders for a little while free discharge from the pond at high water. It has not been used to control water for about 12 years.

Storage Possibilities.

As far as the topography is concerned, a dam from 5 to 15 ft. high could be easily constructed and but little damage would be done. According to report, the pond rarely filled up to the heights of the old dam. The lake area, as has been given, is 1.73 sq. miles for elevation 440, which corresponds to a height of 1.25 ft. above the sill of the old dam; at elevation 445 the lake area would be 1.96 sq. miles, and it is doubtful if the lake would fill up much above this height. This would give a capacity of 258,000,000 cu. ft. A 7-ft. dam made to hold at a maximum height of 5 ft. above the present level is probably all that would ever be needed, and this would cause no damage to the one camp.

The drainage area of the lake is very small,—only about 10 square miles, and this also would not warrant heavy expenditures for storage.

SUMMARY OF STORAGE.

The following table is a summary of the storage that can be developed on the larger lakes in the Union River Basin.

Summary of Storage in Union River Basin.

NAME OF LAKE.	Capacity, cubic feet.
Union River.	
Brimmers bridge reservoir site.....	6,126,300,000
Branch Lake	2,242,800,000
Green Lake	3,796,500,000
Beech Hill Pond	1,592,700,000
Floods Pond	920,000,000
Webbs Pond	431,000,000
Scammons Pond	100,000,000
Abraham Pond	190,000,000
Molasses Pond	286,000,000
East Branch.	
Spectacle Pond	888,000,000
Rocky Pond	140,000,000
West Branch.	
Great Pond	1,591,000,000
Alligator Lake	258,000,000
Total	18,562,300,000

STREAM FLOW.

UNION RIVER AT ELLSWORTH, MAINE.

Records of flow of the Union River at Ellsworth have been kept since September 1908 and have been furnished by the Bangor Railway and Electric Company.

Information in regard to this station is contained in the U. S. Geological Survey Report of Progress of Stream Measurements for 1910.

WEST BRANCH UNION RIVER AT AMHERST, MAINE.

A gaging station was established July 7, 1909 on the highway bridge across the West Branch of the Union River, about 1 mile west of the village of Amherst.

Information in regard to this station is contained in the U. S. Geological Survey Report of Progress of Stream Measurements for 1910.

GREEN LAKE STREAM AT LAKEWOOD, MAINE.

A gaging station was established July 2, 1909, at the highway bridge across Green Lake Stream about ¼ mile downstream from the dam at the outlet of Green Lake.

Information in regard to this station is contained in the U. S. Geological Survey Report of Progress of Stream Measurements for 1910.

BRANCH LAKE STREAM NEAR ELLSWORTH, MAINE.

A record of stage of Branch Lake and also that of Branch Lake Stream just below the outlet dam have been furnished since July 2, 1909, by H. B. Moor.

Information in regard to this station is contained in the U. S. Geological Survey Report of Progress of Stream Measurements for 1910.

Run-off of Branch Lake Stream at Ellsworth, Maine, in second-feet per square mile and depth in inches. Drainage area, 31 square miles.

	1909.		1910.		AVERAGE	
	Section feet per square mile.	Depth in inches.	Section feet per square mile.	Depth in inches.	Section feet per square mile.	Depth in inches.
January	----	----	1.72	1.98	1.72	1.98
February	----	----	2.11	2.20	2.11	2.20
March	----	----	4.19	4.83	4.19	4.83
April	----	----	3.65	4.07	3.65	4.07
May	----	----	4.00	4.61	4.00	4.61
June	----	----	2.98	3.32	2.98	3.32
July	2.15	2.48	2.83	3.26	2.49	2.87
August	1.71	1.97	3.45	3.98	2.58	2.98
September	1.53	1.71	2.80	3.12	2.16	2.42
October	1.66	1.91	2.66	3.07	2.1[illegible]	2.49
November	1.76	1.96	3.03	3.38	2.4[illegible]	2.67
December	2.25	2.59	2.27	2.62	2.2[illegible]	2.60
Total	----	----	----	40.44	---	37.04
Mean	----	----	[illegible]	----	2.7[illegible]	....

PENOBSCOT RIVER DRAINAGE BASIN.*

DESCRIPTION.

The basin of Penobscot River is contained wholly within the State of Maine and comprises about 8500 square miles or more than 25% of the entire State. It extends from the basin of the St. John on the north to the Atlantic Ocean on the south, and from the basin of the Kennebec on the west to those of the St. Croix, Machias and Union rivers on the east. It has a length of about 160 miles and an extreme breadth of about 115 miles.

The basin is in general at a somewhat less elevation than that of the Kennebec River for the latter is nearer to the summit mountain range which runs southwest and forms the western boundary of the State. Taken as a whole the basin is rather uniform in its topographic features. Hills and low mountains stretch from near the sea to above Bangor; farther north is an undulating plain, while to the west the surface becomes more broken and generally diversified by hills, detached peaks, lakes, ponds and swamps. At the south and west it merges into that of the Kennebec, and at the north into that of the Allagash, terminating on the northwest in a highland region intermingled with swamps and lagoons, the latter furnishing water to both the Penobscot and the St. John. A large part of the basin is known as "wild land" being heavily timbered and known only to lubmermen and sportsmen, large numbers of the latter coming yearly to the "sportsman's paradise" afforded by the headwaters and surrounding country of the Penobscot.

Mt. Katahdin, the highest peak of which is 5273 feet above mean tide and is the highest mountain in the State, lies in a detached range of mountains between the West and East branches, and affords an excellent view over a large area of the valley of the Penobscot.

*From mss. by H. K. Barrows to be shortly published in the series of Water Supply Papers, U. S. Geological Survey.

The headwaters of the river are divided into two principal branches, the West Branch and the East Branch—the former having its rise about 2000 feet above mean sea level in the mountains forming the boundary between Maine and Quebec.

The East Branch of the Penobscot formerly had its rise in small lakes and ponds lying about midway between the western and eastern boundaries of the State, but, as explained more in detail under a description of the East Branch, about 1840 the drainage area tributary to Chamberlain and Telos lakes, whose natural flow is into the St. John basin, was added to that of the East Branch. This additional drainage area amounts to about 270 square miles, and affords excellent opportunities for storage. The elevation of Chamberlain and Telos lakes is about 938 feet above mean sea level, while that of Allagash Lake, the principal tributary of these lakes, is about 1042 feet.

The West Branch of the Penobscot flows in a general easterly and northeasterly direction until it reaches Chesuncook Lake when the direction becomes generally southeasterly until its confluence with the East Branch. From the junction of the two branches, the main river flows in a general southerly direction to the ocean.

The headwaters of the East Branch flow easterly until reaching Grand Lake, when the stream turns toward the south and joins the West Branch at Medway.

Two other important branches of the Penobscot are the Mattawamkeag and the Piscataquis rivers. The former joins the main river from the east a few miles below Medway, and has a drainage area of 1500 square miles. This stream drains the extreme eastern portion of the basin, and includes many swamps and much low land.

The Piscataquis River, joining the main river just above West Enfield also has a drainage area of 1500 square miles, and drains the territory lying to the southeast of Moosehead Lake, which is in general much higher than that of the Mattawamkeag basin. The headwaters of the Piscataquis adjoin those of the Kennebec.

The Penobscot drainage system is remarkable for the large number of detached lakes and ponds within its confines which assist markedly in equalizing the flow of the river.

Two large natural storage basins exist upon the West Branch: (1) the "Twin Lake" system comprising North and South Twin, Pemadumcook and Ambejejus lakes, giving an area at mean low water of about 17 square miles, the outlet of which is located 13 miles above Medway, and (2) Chesuncook and Ripogenus lakes, with an area of about 19 square miles at mean low water, the outlet of which is situated about 22 miles above the lower lakes. Both of these systems have been improved and are doing excellent service. Still further improvement is under contemplation for the upper basin.

The principal storage basins on the East Branch are that of Chamberlain and Telos lakes, the artificial headwaters of this branch, and 12 miles below, Second and Grand lakes. The former has an area of about 18 square miles at mean low water, which by the addition of Allagash Lake, lying about 5 miles northwest, is increased to 24 square miles.

Second and Grand lakes have an area at mean low water of about 4 square miles, which can easily be doubled by proper development. Some storage improvements have been made upon the East Branch system, but chiefly for log driving purposes. There is excellent opportunity for further development.

No single lake or series of lakes of the Penobscot system can compare with the Umbagog-Rangeley Lake series of the Androscoggin basin, or with Moosehead Lake in the Kennebec basin as a reservoir to tide over dry weather flow, as the lakes and ponds tributary to the Penobscot are widely scattered so that they cannot be commanded by a few artificial structures. There are, however, so many opportunities for economical storage in this basin as a whole that it is destined, with proper development, to afford some of the best water power in the State.

DRAINAGE.

The following table compiled from publications of the U. S. Geological Survey, and from the best maps obtainable, shows the drainage area at different points on the Penobscot River and its tributaries.

Drainage areas of Penobscot River and principal tributaries.

STREAM.	Point of measurement.	Drainage area. square miles.
Penobscot So. Branch.	Above mouth of North Branch	186
Penobscot No. Branch.	Above mouth South Branch	272
Penobscot W. Branch.	Seeboomook Dam, just below Nulhedus Stream	530
Penobscot W. Branch.	Entrance into Chesuncook Lake	825
Penobscot W. Branch.	Outlet of Chesuncook Lake	1,330
Penobscot W. Branch.	Outlet of Ripogenous Lake	1,410
Penobscot W. Branch.	Abol Falls	1,550
Penobscot W. Branch.	Head of Ambejejus Lake	1,600
Penobscot W. Branch.	Millinocket, dam at foot of Quakish Lake	1,880
Penobscot W. Branch.	Above junction with East Branch	2,100
Penobscot	Below and including East Branch	3,230 (a)
Penobscot	Above mouth of Mattawamkeag River	3,360 (a)
Penobscot	Below and including Mattawamkeag River	4,860 (a)
Penobscot	Above mouth of Piscataquis River	5,100 (a)
Penobscot	Below and including Piscataquis River at West Enfield gaging station	6,600 (a)
Penobscot	Below and including Sunk Haze Stream	7,210 (a)
Penobscot	Above mouth of Pushaw Stream, Old Town	7,270 (a)
Penobscot	Below and including Pushaw Stream	7,400 (a)
Penobscot	Bangor Water Works Dam	7,720 (a)
Penobscot	Mouth, at head of Penobscot Bay, opposite Sandy Point	8,570 (a)
Caucogomuc Str	Outlet of Caucogomuc Lake	174
Caucogomuc Str	Entrance into Chesuncook Lake	230
Umbazooksas Str	Entrance into Chesuncook Lake	50
Chesuncook Lake	Exclusive of previous two rivers	225
Allegash Str	Outlet Allegash Lake	102
Allegash Str	Entrance into Chamberlain Lake	124
Chamberlain Lake	Telos Dam	270
Penobscot E. Br	Webster Lake Outlet	288 (a)
Penobscot E. Br	Grand Lake Dam	496 (a)
Penobscot E. Br	Grindstone gaging station	1,100 (a)
Penobscot E. Br	Mouth	1,130 (a)
Mattawamkeag W. Br.	Outlet Mattawamkeag Lake	305
Mattawamkeag W. Br.	Above junction with E. Br. Mattawamkeag R	352
Mattawamkeag E. Br.	Just below outlet from Pleasant Pond	79
Mattawamkeag E. Br.	Above junction with W. Br. Mattawamkeag R	158
Mattawamkeag	Above mouth Baskahegan Stream	610
Mattawamkeag	Below and including Baskahegan Stream	874
Mattawamkeag	Below and including Molunkus Stream	1,370
Mattawamkeag	Gaging station, practically at mouth	1,500
Baskahegan Str	Outlet of Baskahegan Lake	151
Baskahegan Str	Mouth	264
Molunkus Str	Mouth	195
Piscataquis	Lows Bridge, gaging station	286
Piscataquis	Dover	369
Piscataquis	Above mouth of Sebec River	463
Piscataquis	Below and including Sebec R	856
Piscataquis	Below and including Pleasant R	1,200
Piscataquis	Above mouth of Schoodic Str	1,240
Piscataquis	Below and including Schoodic Str	1,300
Piscataquis	Above mouth of Seboois Str	1,350
Piscataquis	Mouth	1,500
Sebec	Outlet Sebec Lake	367
Sebec	Mouth	393
Lower Ebeemee Lake.	Outlet	87
Pleasant	Outlet Silver Lake	104
Pleasant	Mouth	334
Houston Pond	Outlet	21
Schoodic Lake	Outlet	32
Schoodic Str	Mouth	58
Seboois Lake	Outlet	49
Endless Lake	Outlet	66
Seboois Str	Mouth	150
Passadumkeag Str	Above mouth of Nicatous Str	171
Passadumkeag Str	Mouth	383
Pushaw Str	Outlet Pushaw Lake	125
Pushaw Str	Mouth	263
Kenduskeag Str	Above mouth of Black Str	136
Kenduskeag Str	Near Bangor at gaging station	191 (b)
Kenkuskeag Str	Mouth	214 (b)
Souadabscook Str	Above mouth of Black Str	100
Souadabscook Str	Mouth	203 (c)
Black Str	Total drainage	35

(a) Includes Chamberlain Lake drainage, 270 sq.
(b) Includes all drainage area of Black Stream.
(c) Not including any drainage area of Black Stream.

WATER POWER.

DEVELOPED POWERS.

The following description of developed water powers in the Penobscot basin is taken from data obtained by visiting each site and interviewing some responsible person. In general the information obtained seemed to be fairly accurate. In some instances, however, it was possible to obtain data only through an estimate of such person, especially if the equipment was old or of local manufacture. In very few instances has the power been developed to a maximum for ordinary low flow.

PENOBSCOT RIVER.

Bangor.

The first dam on Penobscot River is located at Bangor, about 40 miles from the coast, and is used by the city for pumping the water supply and for lighting the streets.

As the river at this point comes under the influence of the tide, the head available varies. At ordinary low tide a head of about 12 feet is obtained. The range of tide here is about 8 to 10 feet, although tides occur which flow out the dam, and prevent the wheels from running. At such times steam is used. About 3,200 horsepower is in use with a 12-foot head, and it is estimated that the average for nine months of the year will be about 50% of this amount, while for the remaining three months a still less amount will be obtained. The dam is a log crib dam with fish way, log sluice, and a long waste way, and is in fair condition. The dam ponds water nearly three miles up stream, and in times of high water backs up in the tail race of the Veazie plant.

Veazie.

The next dam is located at Veazie, 3 miles from the Bangor dam, and the power is used by the Bangor Railway and Electric Co., for the purpose of generating electricity for lighting, power and heat. The head will average about 11 feet. Fifteen wheels develop an aggregate of about 2,200 horsepower. An auxiliary plant is installed to assist during high water, when by reason of back water the head is considerably reduced. The dam is a wooden crib structure in rather poor repair. Water is ponded by this dam for a distance of about 2¾ miles up river, and in times of high water up to the next dam.

Basin Mills.

At a point 6¾ miles from the Bangor dam, at Basin Mills in the town of Orono, the mills of the James Walker Co. were located until they were burned in August, 1910. The dam is a wooden crib structure in rather poor repair, 1,900 ft. long and 30 ft. high above the bed of the river at the highest point. The power was used to run a large saw mill, with attached box mill. The annual output was 17,000,000 ft. of lumber. The turbines worked under a head of from 10 to 14 feet and there were installed thirteen 72″ diameter, two 84″, seven 48″, and eight 44″ wheels. Their total rated capacity was 2,100 horsepower. Many of the wheels were of local make and very old. With a modern turbine equipment, very much more power could be developed. For 7 months of the year an auxiliary steam plant of 150 horse power was used. The dam ponds water for a distance of about one mile. Since the burning of the mills, a number of offers for the purchase of the privilege have been made. According to an unverified report an offer of about $200,000 has been made. The privilege was subsequently purchased by the Penobscot Realty Co. and plans are under way for the construction of a modern hydro-electric plant here.

The mills of the Orono Pulp and Paper Co. are located at Basin Mills but all their water power is developed at the Stillwater dam and transmitted electrically to the mills.

Orono.

One-half mile above Basin Mills, in the town of Orono, is the mouth of the Stillwater River, which is simply a branch of the Penobscot River with its head a short distance above Old Town. The Webster Mills of the International Paper Co. are located at the outlet of this branch as well as the saw mills of the William Engel Co. There are two log dams in poor condition with considerable leakage. The International Paper Co. have three mills here. At the pulp mill 12 turbines develop about 2,400 horsepower, being mostly used to run the grinder units under an average head of about 24 feet. At the barker mill, one wheel furnishes about 50 horsepower under a 10-ft. head. At the paper mills 3 wheels develop 338 horsepower under a head of from 9 to 11 ft. The total development is about 2,788 horsepower. The daily output is 25 tons of paper and 30 tons of pulp. The upper dam ponds water nearly to the dam at Stillwater.

Stillwater.

On the Stillwater River, 7 miles from the Bangor dam, is the dam of the Orono Pulp and Paper Co. in the village of Stillwater. The average head is 18 feet. The wheel installation consists of special Hercules turbines, two 45", two 33" and one 21", with a total rated capacity of 1,460 horsepower. The generators are Westinghouse, two of 400 kilowatts each and one of 200 kilowatts, three phase, alternating current. An auxiliary steam plant of 1,650 horsepower capacity is in operation, a part of it at least, all the time. The dam is partly wooden cribwork although the largest is of concrete. It is proposed at an early date to replace all wooden portions with concrete. The dam and development were completed in 1902. The dam ponds water nearly to Gilman Falls, a distance of about 2½ miles.

Great Works.

Returning now to the main river; the next dam above Orono is located at Great Works, about 10 miles above the Bangor dam. The power is used by the Penobscot Chemical Fibre Co. for the manufacture of fibre from wood. The annual output is 18,000 tons. The dam develops a head of from 10 to 17 feet. The 17 wheels of various sizes have a rated capacity of 2,800 horsepower under a 17-ft. head. The dam is a timber structure 1,200 feet long with a concrete forebay. The generator capacity is 394 kilowatts. The pondage extends only a short distance up river.

Old Town.

The next dam is located at Old Town, 12¼ miles from the Bangor dam. It is the property of the Bodwell Water Power Co. This dam is of concrete construction, completed during 1907, and replaced a dam of timber crib construction located a short distance upstream. The dam is 1,100 feet long and cost $60,000. Several plants use the water from this dam under slightly different heads, as follows:

The Bodwell Water Power Co., the only plant on the Milford side, was established for the purpose of generating and transmitting electricity, and not yet fully completed, has an installation of 9 turbines, consisting of 8 wheels 44", with vertical shaft, and one smaller wheel for an exciter, the nine wheels supposed to give a total of 7,400 horsepower under a 20-foot head. In addition to this an auxiliary wheel for pumping, etc., furnished about 50 horsepower, giving a total of 7,450 horsepower. It is seldom, however, that this head can be maintained, the average being from 16 to 18 feet, when it is claimed that about 5,700 horsepower are obtained. As a matter of fact, however, the output up to the present time has been but 2,500 to 3,000 horsepower.

The Bangor Railway and Electric Co. have one wheel which is rated to give 125 horsepower under an 11-ft. head. About 80 horsepower is the average amount used. This power is used to pump the water supply for Old Town and Milford.

The Old Town Woolen Co. has an installation of 4 turbines, two Victor 35" and two Hercules 36" each, rated to give a total of about 175 horsepower under an average head of about 10 feet.

The Ounegan Mills of the American Woolen Co. have two S. Morgan Smith turbines 30" diameter with a rated capacity of 100 horsepower under an 11-ft. head. This plant was formerly known as the Maine Woolen Co. but was purchased by the present concern in February, 1910.

The Nekonegan Paper Co., a company manufacturing wood pulp, has 18 turbines installed, rated for a total of 2,400 horsepower under a head of 18 feet.

The estimated total horsepower actually used from this dam is 5,800. The elevation of water surface just below the dam is about 81 feet above mean tide. This dam ponds water only about a mile up the main river, but a considerable pondage is created back of Orson Island for a distance down the Stillwater.

Enfield.

The next dam on the main river is 36¾ miles above Bangor dam, just above the outlet of the Piscataquis River, located in the towns of Enfield and Howland. It is owned by the International Paper Co. An average head of 19 feet is obtained. Twenty-four Victor wheels develop about 2,860 horsepower. The dam is a log crib dam about 640 ft. in length. It has been built about twenty years and is in excellent repair. The pondage extends for a distance of about four miles up the river. Elevation of water surface just below the dam is about 131 ft. above mean tide. The output of pulp is 35 tons per day.

Millinocket.

The next power plant on the river is that of the Great Northern Paper Co., consisting of two dams, the first located about 76 miles from the Bangor dam, two miles above the junction with the main river and the East Branch. The second is located about 1¾ miles above the first. The lower plant, called the East Millinocket mill, is equipped with six units, each consisting of four 30″ Hercules turbines developing 1,050 horsepower, used for grinder units, under a head of 25 feet. The upper plant, called the Dolby Power Station, is equipped with three pairs 39″ Hercules turbines, each pair developing 2,250 horsepower under a 50 ft. head, used for grinders, and two pairs of 30″ turbines, each pair developing 1,375 horsepower, used for generators. In addition to the above equipment, space and settings are ready for one extra pair of grinder and generator wheels. Pulp is sent to the lower mill by a pipe line. The total power developed at these mills is 15,800 horsepower, and the output is 180 tons of pulp and 130 tons of paper per day. These two dams develop practically all of the fall from the lower dam to Shad Pond.

The next dam is at the outlet of Quakish Lake, 87 miles from the Bangor dam, and about 11 miles above the lower power just described. This dam is used to divert the waters of the West Branch into Ferguson Lake and through a canal for a distance of about 1¼ miles to the penstocks of the Great Northern Paper Co's. plant at Millinocket. After passing through the wheels, the water finds its tail race in Millinocket Stream, and again joins the West Branch in Shad Pond, to be used over again at the development below. The head obtained at the Millinocket mill is 110 feet. The equipment consists of five pairs 57″ Rodney Hunt turbines at 3,900 horsepower per pair, used for grinders, three pairs 36″ wheels at 1,600 horsepower, and two single 24″ at

150 horsepower, used for generators. The total capacity is 24,600 horsepower. Total output 300 tons of pulp and 300 tons of paper per day. The largest output made for any one day was 315 tons. This mill has the largest capacity of any in the world.

PISCATAQUIS RIVER.

At a point two miles below Blanchard, at Barrows Falls, the elevation of the Piscataquis river is 525 feet. To the mouth of Sebec River in a distance of 37.1 miles, the Piscataquis river falls 266 feet or to elevation 259 feet, making the average fall 7.2 feet per mile. To the mouth of the river at Howland, a distance of 22.7 miles, the drop is 132 feet or to an elevation of 127 feet above sea level. The total fall of the Piscataquis River from Barrows Falls to the mouth is 398 feet in a distance of 59.8 miles or 6.7 feet per mile.

The first development on Piscataquis River is in Howland where a dam exists near the outlet of this river into the Penobscot. The dam is a timber crib structure about 800 feet in length, giving a head of about 12 feet and is in poor repair. The elevation of the top of the dam is 140 feet above sea level. The plant using the power is the Howland Pulp and Paper Co., with an installation of three S. Morgan Smith wheels, one 54″, one 45″ and one 48″ diameter, giving a total of 537 horsepower. The daily output is 40 tons sulphite pulp and 24 tons of paper. A steam auxiliary of 500 horsepower is used for about two months every year.

At the outlet of Schoodic Stream, about 9 miles above Howland, is located a small sawmill owned by Lovejoy & Dean, Medford Center. The dam is located very near to the outlet of the stream and gives a head of about 10½ feet. One turbine, a 23″ Samson, is installed, developing about 50 horsepower.

The next dam on the main river is located about 2½ miles below Dover and Foxcroft at East Dover, at the plant of the Dover & Foxcroft Light & Heat Co. The plant is used to deliver light, heat, and power to Dover, Foxcroft, and Sangerville. The dam is a crib structure about 50 years old, built between solid masonry abutments, 175 feet long, and appears to be in fair repair. The elevation of the crest is 295.3 ft. A canal built of granite blocks leads to the forebay, being built about 1901. The average head is 11.5 feet. The instalaltion consists of three Hercules turbines 39", 48", and 52", with a rated capacity of 419 horsepower. Two generators develop 300 kilowatts.

Two dams are located in Dover and Foxcroft. The lower dam furnishes power for the American Woolen Co., Brown Mills, Dover. The installation consists of one vertical turbine 24", one horizontal 30", and one pair horizontal 42", developing a total of 382 horsepower under an average head of 22 ft. The dam is said to be from 50 to 60 years old, and is in fair repair. The elevation of the crest is 327 ft.

The upper dam, 225 feet long, furnishes power in three separate plants. Mayo & Son, woolen mill, has one 51" and one 39" Hercules turbine with a capacity of 386 horsepower. Omar, Clark & Thayer, sawmill, has two wheels which give about 175 horsepower. Harold Farnham, woodworker, has one wheel which gives 30 horsepower, making a total of 591 horsepower developed at this dam. The average head for all is 12 feet. The dam is of crib construction, built about 1853, and is in fair repair. The elevation of the crest is 339 feet.

About one mile above Foxcroft is the pumping station of the Dover & Foxcroft Water Co. The dam is a log crib structure about 214 feet in length, 14 or 15 years old, and is in excellent condition. The average head obtained is 11½ feet. One wheel develops 50 horsepower.

The next dam is located at Guilford, where an average head of 10 feet is obtained. The Piscataquis Woolen Co. has one Chase 54" and two Hercules, 36" and 51" turbines installed for 260 horsepower. The Hussey Woolen Co. has one 51" Rodney Hunt wheel of 137 horsepower, and Hussey & Goldthwaite grist mill uses 50 horsepower, making a total of 447 horsepower developed at this dam. The dam is concrete, 165 ft. long, 12 ft. high, built in 1905, and cost $4,000. The elevation of the crest is about 382.

A dam at Abbot Village, on the South Branch of Kingsbury Stream at its mouth, furnishing about 48 horsepower used to run a sawmill owned by C. W. Brown. Another dam within a few hundred feet furnishes about the same head, so that it would be possible to obtain about 22 feet in one head at this point. This amount was formerly used by a woolen mill which burned recently.

The next dam on the main river is at Upper Abbot, where the Abbot Excelsior Mill has a development. The elevation of the top of this dam is 421 feet, and the head available 13 feet. The power developed will approximate 75 horsepower.

There is an old dam at Blanchard but the mill has been burned.

At Shirley Village the Shirley Lumber Co. has a dam with a 6-foot head.

SEBEC RIVER.

Sebec River, which is the outlet of Sebec Lake, joins the Piscataquis River 2 miles below Milo, and is 9¾ miles in length. The elevation of the mouth of the river is 259 feet.

In the town of Milo is a dam from which power is developed by three concerns, Milo Electric Light & Power Co., Boston Excelsior Co., and Milo Lumber Co. The Electric Co. has concrete headgates in the east channel of the stream. There is one 42-inch turbine acting under a 12-foot head and developing 95 horsepower. The generator has a capacity of 65 kilowatts. The total amount of power developed at this dam is about 200 horsepower. The elevation of the crest of this dam is 278.7 feet and it backs water 4 miles up the river.

A dam at the outlet of Sebec Lake formerly furnished power to run a grist mill, woolen mill, tannery, carriage shop, and saw mill, all located in the village of Sebec. Nearly all of these industries have disappeared, so that at the present time only about 60 horsepower is used. The head obtained by this dam will average about 11½ feet. The high water will average perhaps a foot more. With a head of 12 feet, elevation 327 feet, the water is at the top of gates with 4 feet flowing over wasteway. It is estimated that an additional head of 3 feet, or to elevation 332 feet, would not do excessive damage to cultivated lands or timber. The dam is a timber crib structure in poor repair. Only a part of the fall at the outlet has been developed by the dam, as the stream has a considerable fall for some distance below. It would seem that at least a part of this could be utilized to advantage.

PLEASANT RIVER.

This stream enters the Piscataquis River 3.6 miles below the mouth of Sebec River. The only developed power on the stream is at Brownville, controlled by the U. S. Pegwood &

Shank Co. The timber crib dam, directly above the highway bridge, is 300 feet long. One wheel under 11.5-ft. head develops 35 horsepower and is used in the mill at the end of an open flume. From the end of this flume extends a steel penstock to a power house below the highway bridge where a head of 14 feet is obtained and the one wheel installed develops 100 horsepower. This power is used in generating electricity for lighting Brownville. On the east end of the dam was formerly located an old grist mill which burned in the spring of 1909. Later in the fall of the same year, an extreme flood in the river washed out the foundations of this old mill, and saved a large amount of excavation that would have been necessary in the construction of a new power plant that is being erected at the present time (fall of 1910). This new plant is the property of the Brownville Electric Light & Power Co. This company will furnish electric lights to Brownville as well as to the upper and lower villages. The power should be good, but it could be considerably increased if storage should be developed in the lakes above; Silver Lake, Houston Pond, "B" Pond and Lower Ebeemee Pond.

Summary.

The total amount of power developed upon the main river from Bangor to Millinocket is 63,598 horsepower; the total head used to obtain this being 310 feet; the total rise to the crest of Quakish Lake dam being 457 feet. Of the above, the Great Northern Paper Co. controls 185 feet producing 40,400 horsepower, or about two-thirds of the total.

On West Branch above Ferguson Lake there is no development, the existing dams being solely for storage and log driving purposes.

On East Branch and Mattawamkeag River the conditions are similar, there being no developed powers.

On Piscataquis River a total amount of 2,599 horsepower is developed under a total head of 113.5 feet. This extends from Howland to Abbot, the total fall in this distance being 281 ft.

From the above we obtain 66,197 horsepower under a head of 423.5 ft. as the total horsepower developed on Penobscot River and its main tributaries.

In addition to the above there are many small developments scattered over the basin, located on small streams, and in many cases running only a small part of the year. These developments are used for sawmills, grist mills, etc., and usually have an equipment of local make, although some have wheels of modern patterns.

UNDEVELOPED POWERS.

GENERAL CONSIDERATIONS.

The Penobscot River drainage basin affords a large amount of undeveloped water power, especially on its principal tributaries, the West and East Branches, Mattawamkeag and Piscataquis.

Of the 230 feet fall on the main river from tidewater to Medway, at the mouth of the East Branch, about 120 feet have been utilized, 100 feet of which is between Bangor and Old Town, within 13 miles of tidewater.

Of the fall of over 800 feet on the West Branch between Medway and Seeboomook, only 185 feet is utilized, in the developments of the Great Northern Paper Co. at Millinocket, Dolby and E. Millinocket.

On the East Branch between Medway and Chamberlain Lake, is a fall of over 700 feet, none of which is utilized.

On the Mattawamkeag between its mouth and North Bancroft, at the confluence of Baskahegan Stream, is a fall of 150 feet, completely unused.

On the Piscataquis there is also a large amount of unutilized power, especially on Sebec and Pleasant Rivers, the principal tributaries of the Piscataquis.

Profiles and plans of the Penobscot River and several of the more important tributaries, have been made by the U. S. Geological Survey, in co-operation with the Maine State Survey Commission, for the special purpose of indicating undeveloped water power sites. These may be obtained by addressing the Director of the United States Geological Survey, Washington, D. C., and include the following:

Penobscot River, Bangor to North Twin Dam.
West Branch Penobscot, Ambejejus Lake to Seeboomook.
East Branch Penobscot, Medway to Grand Lake.
Mattawamkeag River, Mattawamkeag to No. Bancroft.

Also plans of the following lakes: Mattawamkeag Lake, Baskahegan Lake, Pleasant Pond, Schoodic Lake, Seboois Lake, Northwest Pond, Endless Lake, First and Second Grand Lakes.

Brief descriptions follow of some of the more important unutilized water privileges. The data upon the most of these were obtained in connection with the field work of making the plans and profiles previously mentioned, or by a reconnaissance of the territory including the vicinity of the fall. The figures given are in general only meant to point out sites of possible development, and are by no means exhaustive.

PENOBSCOT RIVER.

With the exception of Marsh Island Rapids, between Orono and Great Works, the fall of the river between tidewater at Bangor and the Old Town dam is practically all controlled by existing dams.

Marsh Island Rapids begin at about elevation 47, some 7.7 miles from the Bangor dam, and extend to elevation 65, 2.6 miles further upstream at the foot of the Great Works dam, giving a fall of about 18 feet in this length. The banks are high for the entire distance, and a dam could probably be located near the entrance of Blackman Stream that would utilize a considerable part of this undeveloped fall.

A project has been outlined for the more complete development of the Penobscot between Old Town and Bangor, but has not however received legislative approval.

It is proposed to build dams on the main river about one mile above the Old Town dam, and on Stillwater Branch, thus diverting at least a portion of the waters of the river through Pushaw Stream into Pushaw Lake, and thence by artificial and natural channels to some point near Bangor, where by the use of penstocks, a head of about 110 feet can be obtained at tidewater. From an engineering point of view the work presents no serious difficulties, but on account of the numerous developments in this part of the river, and other private interests, many difficulties appear. In connection with the development as outlined, it is proposed to greatly increase the storage upon the various branches. The cost of development is variously estimated at from $3,000,000 to $7,000,000 depending upon the plans adopted.

From Old Town to Shad Pond the river consists of many rapids, with some stretches of quick water, and some comparatively slack water. The following table gives the name, location, elevation and differences of elevation and distance from Bangor of a number of controlling points in this distance.

Elevations Along Penobscot River.

Name of Place.	Distance from Bangor. miles.	Difference, miles.	Elevation, feet.	Difference, feet.
Crest Old Town Dam	12.25	....	99	
Olamon Stream (Outlet)	25.5	13.25	111	12
Passadumkeag Rapids, Head	30.75	5.25	128	17
West Fnfield Dam, Foot	36.7	5.95	131	3
West Enfield Dam, Crest	36.7	....	152	21
Mohawk Rapids, Foot	42.4	5.70	154	2
Brown Islands	58.6	16.20	169	15
Five Island Rapids, Foot	60.0	1.40	175	6
Five Island Rapids, Head	60.6	0.60	182	7
Mattaseunk Stream	65.0	4.40	189	7
Bartlett Brook, Head Mattaseunk Rapids	67.3	2.30	203	14
Jo Mary Rapids	70.7	3.40	221	21
Medway (East Branch)	73.6	2.90	230	6
Rockabema Rapids, Head	74.7	1.10	245	15
Burnt Land Rapids Head	75.8	1.10	260	15
Shad Pond	82.6	6.80	343	83

NOTE—The river from Burnt Land Rapids to Shad Pond is nearly all developed.

From the water surface above Old Town dam to the outlet of Olamon Stream a distance of 13.25 miles, the rise of the river is but 12 feet. Many islands and much low land appear throughout the most of this section. From this stream to a crib (used to divert logs) located at the head of Passadumkeag Rapids, a distance of 5.25 miles, there is a gradual rise of 17 feet, the banks becoming higher, and although islands still abound they are becoming much smaller, and the river, which is comparatively wide below, is narrowing.

From this point to the foot of West Enfield dam, a distance of 5.95 miles, the rise is only 3 feet, this dam giving a head from 19 to 21 feet. From here to the foot of Mohawk Rapids, a distance of 5.7 miles, the rise is about 2 feet, the elevation here becoming 154 feet. If a dam should be constructed at the foot of these rapids to maintain a head of 16 feet, the elevation of the water surface would come to contour 170. This contour crosses the present water surface near the foot of the Brown Islands, 16 miles up river, and runs very near the shore on both sides of the river except in a few places. It is entirely probable that damage would be created at Lincoln by the flowage, and it is evident that the highways would be flowed out in places.

From the foot of Five Island Rapids to the mouth of Mattawamkeag River, a distance of 2.3 miles, the rise in the river is about 11 feet. If a dam were constructed on Five Island Rapids with its crest at an elevation 200 it would control a head of about 25 feet. The flowage would extend about 2¾ miles up Mattawamkeag River, flowing out a part of Stratton Rips, and apparently doing very little damage to the town of Mattawamkeag. Some damage would, however, be done to the road bed of the Maine Central R. R. and perhaps to the bridge of the Canadian Pacific R. R. across the main river. The flowage would meet the water surface of the main river about 6½ miles from the dam site, perhaps doing some damage at Jordan Mills.

A better development would be to construct a dam near Jordan Mills, a distance of 4.4 miles from Five Island Rapids. If a dam should be constructed here to an elevation 220 a head of 31 feet would be obtained, and the contour would intersect the present water surface 5 miles up river between Salmon Stream Rapids and Jo Mary Rapids. Apparently very little damage would be done except that the highway would be flowed in places.

From this point to the head of Burnt Land Rips is about 5.8 miles, with a rise of 40 feet. The East Branch joins the main river about 1½ miles below the rips at Medway. It is probable that a part of this fall could be developed by a dam near the head of Jo Mary Rapids, but the flowage which would be created by a high dam would cause damage at Medway upon East Branch waters, a rise of 25 ft. at the mouth flowing back up stream over 7 miles.

From Burnt Land Rips to Shad Pond, a distance of about 6½ miles, there is a fall of about 83 feet, 75 of which is developed. From Shad Pond to Quakish Lake, a distance of about 4 miles, there is a rise of over 90 feet, which is all included in the development at Millinocket.

WEST BRANCH PENOBSCOT RIVER ABOVE AMBEJEJUS LAKE.

The valley of the West Branch of the Penobscot River from Chesuncook Lake to the Twin Lakes affords much rugged and picturesque country, the river flowing over some of the roughest bed to be found in the system. The total fall in this distance of 25 miles taken from the sill of the deep gates of Chesuncook dam to the elevation of the sill of the deep gates of North Twin dam is 444 feet. Chesuncook dam will hold a head of about 22 feet, while the level of the lower lakes may be raised 25 feet by North Twin dam. Of this 444 feet, 310 feet fall occurs in the first ten miles, and 240 feet, in the first five and one-half miles from Chesuncook dam.

A number of abrupt pitches occur in the distance from Ambejejus to Chesuncook, usually separated by some distance of comparatively dead water: The following table gives the name, location, elevation, and differences of elevation of the several falls from Ambejejus Lake to Chesuncook Lake.

Elevation along West Branch Penobscot River.

NAME OF PLACE.	Distance, miles.	Difference, miles.	Elevation, feet.	Difference, feet.
Ambejejus Lake elevation 465 to 490				
Ambejejus Falls, Foot	0.00	....	*478	0
Ambejejus Falls, Head	0.40	0.40	488	10
Passamagormac Falls, Foot	1.87	1.47	488	0
Passamagormac Falls, Head	2.10	0.23	498	10
Debsconeag Falls, Foot	5.35	3.25	499	1
Debsconeag Falls, Head	5.60	0.25	527	28
Pockwockamus Falls, Foot	8.50	2.90	528	1
Pockwockamus Falls, Head	8.95	0.45	549	21
Abol Falls, Foot	9.65	0.70	551	2
Abol Falls, Head	10.15	0.50	564	13
Sourdnahunk Falls, Foot	13.30	3.15	573	9
Sourdnahunk Falls, Head	13.70	0.40	†598	25
Big Ambejamackamus Falls, Foot	16.98	3.28	624	26
Big Ambejamackamus Falls, Head	17.65	0.67	653	29
Big Eddy	19.60	1.95	668	15
Sill Ripogenus Dam Foot of Lake	22.00	2.40	882	214
Head of Ripogenus Lake (mean low w. s.)	24.53	2.53	883	1
Sill of Chesuncook Dam	25.10	0.57	909	26

* The elevation of Ambejejus lake is controlled by North Twin dam. Elevation deep gates, 465. Elevation flashboards, 490. Mean, 478.

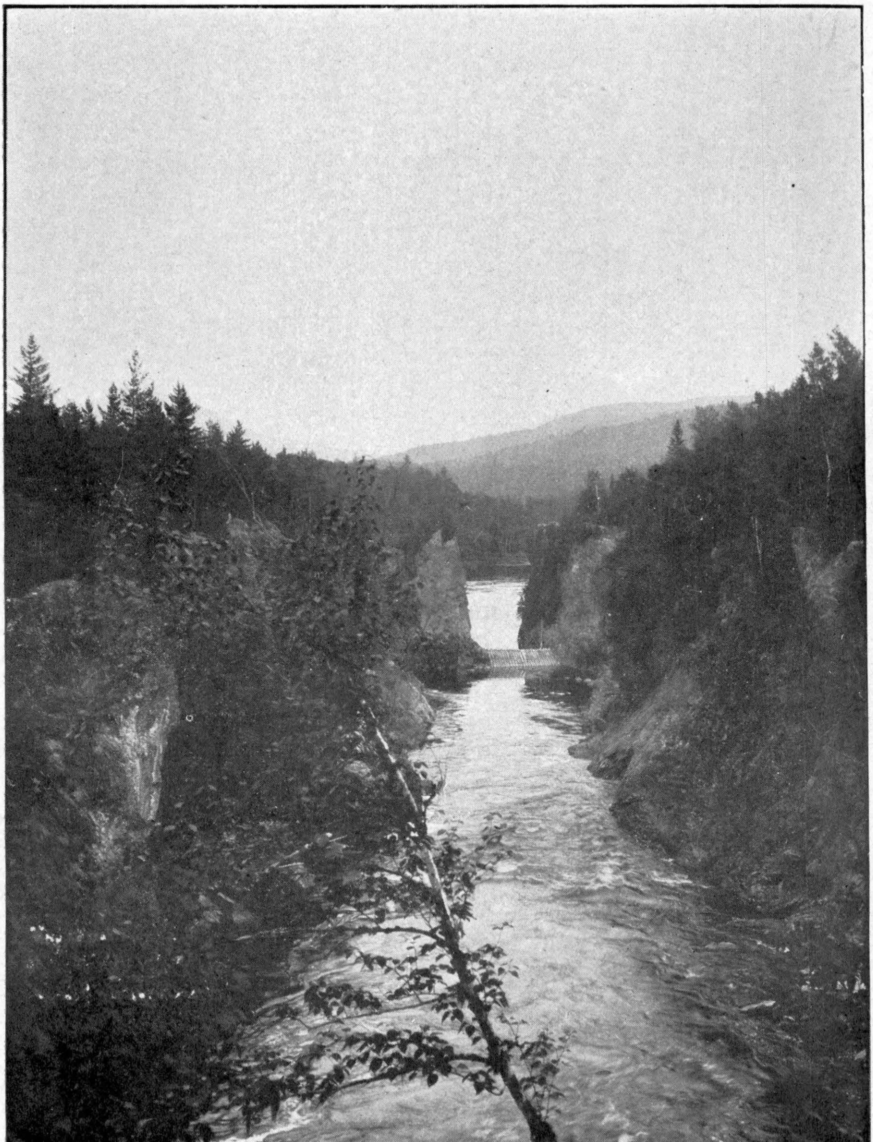
† The elevation of the water surface above Sourdnahunk Falls is controlled by the dam at head of main pitch. Elevation w. s. at mean low water under natural conditions is about 590. Elevation of spillway of dam, 606. Mean, 598.

The first two falls met with in going up the river from Ambejejus Lake are comparatively unimportant on account of the back water from the Twin Lake system. The elevation of the top of the flashboards controlling the elevation of the water surface of the lakes is 489.62. The elevation given in the preceding table for the foot of Passamagormac Falls is 488. If additional storage should be provided for the system, the 8-foot fall at Passamagormac would be reduced to such a figure as would render the site unfit for power development.

Debsconeag Falls, located about 5½ miles from the lower lakes, has a fall of about 28 feet occurring in a distance of a quarter of a mile. The fall is through solid ledge in the upper portion, and continues through rocks and boulders. The land is high on both sides, and an excellent opportunity is afforded for the location of a dam. The water surface could easily be raised at least 5 feet above the elevation of that given for the head of the falls. The distance to the next fall above is nearly three miles, and considerable pondage is afforded by the natural condition of the river, and more would be created by a further rise of the surface. A few sporting camps are located within this area which would probably be damaged by any considerable rise, but otherwise the only damage would be to timber.

From the head of Debsconeag Falls to the foot of Pockwockamus Falls there is practically no fall. Here is a fall of about 21 feet, in a distance of about half a mile, there being two pitches in this distance. The banks are high on the right bank, and fairly so on the left, and the river bed is rough and rocky. Very good opportunities exist for the location of a dam. Very little pondage would be caused by a further rise of the water above the falls.

About 0.7 mile further up stream, or 9.65 miles from the lower lakes, Abol Falls is reached. This fall is about ½ mile in length, and is composed of two pitches, the total fall being about 13 feet. The fall is rough with many rocks and boulders. Opportunities present themselves for the location of a dam, although they are not so favorable as at the two previous sites. The banks are fairly high on both sides. If the water surface was raised to any extent above the falls considerable pondage would be created and numerous logans flowed out. The twin streams, Abol and Katahdin, come in just above the head of Abol Falls, their waters coming from around Mt. Katahdin. From this point to the foot of the next fall, a distance



Great Arches at Ripogenus below Chesuncook Lake of 2.75 miles, the current grows stronger with occasional rips.

Sourdnahunk Falls, located about 13 miles from the lower lakes, is the next important fall. It is about 0.4 mile in length and has a natural fall of about 17 feet. A dam located at the head of the upper pitch for log driving purposes has its spillway at elevation 606, while the elevation of the water surface at the foot of the lower pitch is 573, giving a difference of 33 feet. The fall is crooked, rough and rocky, the upper portion being over and through the solid ledge. The natural upper pitch has an abrupt fall of about 9 feet, with an excellent opportunity for the location of a dam between solid ledge abutments. A considerable pondage is formed by the present dam, Sourdnahunk Deadwater, as it is called, extending back for a distance of 2.2 miles, being of a considerable width and depth in places.

From the head of Sourdnahunk Deadwater extends what is known as the Horserace, having its head at the foot of Big Ambejamackamus Falls, one mile further up stream. The elevation of the water surface at the head of the Horserace is 624, while the level of Sourdnahunk Deadwater controls the foot, and is in turn controlled as previously explained by the dam below. This fall of from 15 to 30 odd feet is very rough, being over a rocky bed, between gradually sloping banks, and is distributed very evenly over the entire distance.

Immediately above the Horserace commences Big Ambejamackamus Falls. The foot of the falls is at elevation 624 and the head at elevation 653, giving a fall of 29 feet in a distance of 0.67 mile. The most of the fall is through the solid ledge with high banks and is very crooked, with an excellent opportunity for a dam.

From this point to the Big Eddy, a distance of 1.95 miles, the river has a fall of about 15 feet, this occurring in several pitches, together with considerable rapid water. From the Big Eddy to Ripogenus Dam at the foot of Ripogenus Lake, a distance of 2.4 miles, the river is a boiling torrent, falling 214 feet. The most of this fall is through ledges with almost vertical sides, in many places from 40 to 75 feet high. Many excellent sites for a dam occur, for in many places the river is very narrow between ledges (see Plate III). The drainage area at the outlet of Ripogenus Lake is 1,410 sq. miles. Under natural conditions this should provide for an average low flow of 423 sec. ft., which would give, under a fall of 214 feet, 10,000 gross horsepower.

From the mean low water surface of Ripogenus Lake to the sill of the deep gates of Chesuncook dam is about 26 feet, this fall ocurring in about 0.57 mile, the majority, however, occurring in less than half this distance. The dam located at the outlet of Chesuncook is a timber crib structure about 1,500 ft. in length, controlling a head of about 22 feet, used entirely for the two purposes of storage and log driving. This dam is located 25.1 miles from the lower lakes.

From this point to the head of Chesuncook Lake is about 16 miles. From the head of the lake to Seboomook dam is 29 miles. The elevation of the water surface above this dam with gates open, is 1,041.5 feet. If the water surface of Chesuncook when full is 930.6 the total fall in the 29 miles is 111 feet. Within 4½ miles from Chesuncook two falls occur; Pine Stream Falls, and Rocky Rips. The former is entirely flowed out, and the latter partly so, when the lake is full, or at elevation 930.6, the flowage under this condition extending 4.3 miles up the river. Under ordinary stages Rocky Rips affords a fall of about 7 feet, but when high water prevails in the lake this is reduced to about 2 feet. The head of Rocky Rips is 4.6 miles from the lake, at elevation 932.6. There is little fall in the river until the foot of Fox Hole Rips is reached about 7 miles from Chesuncook, the elevation here being about 934 ft. The head of the Rips is at elevation 952, giving a fall of about 18 ft. in a distance of 1.65 miles. Probably the best place for a dam would be just below the island near the head of the Rips. At this point the water surface is at elevation about 945, and a dam raising the water 20 feet, or to elevation 965, would afford a total head of about 30 feet, by means of a canal and penstock 4,000 to 5,000 feet long situated on the right bank. Elevation 965 would meet the present water surface of the river at a distance of 25.25 miles from Chesuncook, forming a pond 17 miles long. This would do no special harm to Joe Smith's Halfway house as the banks at this place are quite high, his main buildings being at elevation 980. In all probability this pond would raise Lobster Lake slightly, the river at Lobster Stream inlet being at about elevation 962. No data are available as to the width of this pond in the low stretch of river between these rips and some distance above North East Carry, but this width would undoubtedly be considerable.

The natural stretch of slack water ends about 4.65 miles above North East Carry, or 24.9 miles from Chesuncook. In the next 1½ miles the rise is about 14 feet to the foot of the Roll Dam, as it is called, where a fall of about 9 feet is obtained reaching elevation 985. In the next ¾ mile the rise is very rapid reaching elevation 1,012, or a difference of 27 feet. The shores are fairly steep and the bed rough and rocky in this vicinity. This may be said to constitute the lower pitch of Seboomook Falls. Another pitch of about 4 feet occurs 28 miles from Chesuncook, but the upper pitch is located 28.9 miles from the lake, or about 2½ miles above the Roll Dam, the foot of this pitch being at elevation 1,019. The water surface above the dam located at thi point, when the gates are open is at elevation 1,041.5, giving a fall of 22½ feet. The elevation of the crest of the dam is at 1,050.6. This dam is a rough timber construction, used for log driving.

EAST BRANCH PENOBSCOT RIVER.

The total fall from the sill of Telos dam to mean low water at Medway is about 702 feet in the total distance of 69.1 miles. Telos Lake is at the same elevation as Chamberlain, the principal feeder being Allagash stream, flowing from a lake of the same name, located about 5.4 miles above Chamberlain, the fall in this distance being about 100 feet.

From the gate sills of the Telos dam to those of Grand Lake dam, a distance of about 21.6 miles, the fall is about 294 feet. In this upper section is located practically all of the natural or artificial storage to be found upon this branch, although many swamps and bogs drain into the lower portions. The East Branch differs noticeably from the West in having a much larger proportion of its fall composed of quick water, with a less proportion of sharp pitches. The total fall from sill of gates of Grand Lake to Medway is about 408 feet, this fall being distributed very evenly throughout the entire distance, in swift water, rips, and abrupt pitches.

The following table gives the name, location, elevation, and differences of elevation of the several falls from Medway to Grand Lake.

Elevation along East Branch Penobscot River.

NAME OF PLACE.	Distance from Medway, miles	Difference, miles.	Elevation, feet.	Difference, feet.
Medway	0.0	....	233	
Ledge Falls, Foot	2.1	2.1	241	8
Ledge Falls, Head	2.4	0.3	247	6
Rocky Rips, Foot	7.1	4.7	258	11
Rocky Rips, Head	7.4	0.3	265	7
Grindstone Falls, Foot	8.3	0.9	271	6
Grindstone Falls, Head	9.4	1.1	301	30
Crowfoot Falls, Foot	11.2	1.8	301	
Crowfoot Falls, Head	11.3	0.1	303	2
Whetstone Falls, Foot	20.5	9.2	330	27
Whetstone Falls, Head	20.9	0.4	341	11
Matagamon House	22.6	1.7	342	1
Wessataquoik Stream	23.5	0 9	345	3
East Branch Crossing	24.3	0.8	347	2
Little Seboois Stream	24.8	0.5	347	
Big Seboois Stream	26.8	2.0	348	1
Lower Mountain Line	27.7	0.9	351	3
Little Spring Brook	33.7	6.0	396	45
Big Spring Brook	36.1	2.4	425	29
Bowlin Pitch, Foot	37.1	1.0	433	8
Bowlin Pitch, Head	37.2	0.1	438	5
Hulling Machine, Foot	38.1	0.9	446	8
Hulling Machine, Head	38.3	0.2	468	22
Grand Pitch, Foot	39.0	0.7	482	14
Grand Pitch Head	39.1	0.1	501	19
Pond Pitch, Foot	39.7	0.6	520	19
Pond Pitch Head	39.8	0.1	531	11
Haskell Rock Pitch, Foot	40.1	0.3	537	6
Haskell Rock Pitch, Head	40.8	0.7	580	43
Stair Falls, Foot	41.7	0.9	587	7
Stair Falls, Head	42.5	0.8	605	18
Sill of Grand Lake Dam	47.5	5.0	641.2	36.2

From Medway to Ledge Falls, a distance of 2.1 miles, the rise is about 8 feet, the most of this occurring in the upper half of the distance. Ledge Falls is a fall of 6 feet in 0.3 mile. An excellent site for a dam is located about 1,000 ft. from the mouth of the branch. A head of about 20 feet could be obtained at this point, except for the damage which would be caused to a newly constructed railroad, and farming lands.

It would be possible to obtain a head of about 20 feet by constructing a dam from 700 to 1,00o feet in length at Ledge Falls for flowage extending for about 5 miles up river. The only damage would be to farming lands except that the highway would be flowed in places.

From Ledge Falls to the foot of Grindstone Falls is about 5.9 miles, this point being 8.3 miles from Medway. The total rise of the river from here to the head of Grindstone, a distance of 1.1 miles, is 30 feet, the head of the falls being located only a short distance down from the Bangor and Aroostook R.

R. Bridge. This is probably the best power on this branch, taking into consideration the head, flow, and its proximity to the railroad. There is an excellent chance for a dam near the foot of the upper pitch between solid ledge abutments, and very high banks. Length of dam would be about 800 ft. The fall is, for the most part, over ledge, the stratification planes of which are nearly vertical and almost perpendicular with the current. This formation is observed in several places along this branch. It would probably be possible to increase this head by 8 or 10 feet without causing much damage. An increase of about 20 feet however would flow out the most of the buildings located near the railroad station, and would come very nearly overflowing the track. The elevation of the bottom of the bridge is about elevation 318, giving about 17 ft. from bottom of bridge to mean water surface. The regular gaging station of the U. S. Geological Survey is located at this bridge, the drainage area at this point being 1,100 sq. miles.

From the head of Grindstone to the foot of Whetstone, a distance of 11.2 miles, there is a rise of about 29 feet, composed of falls, swift water and slack water. The rise of Whetstone is 11 feet in a distance of 0.4 mile. The fall is composed of two pitches with a short stretch of slack water between. The bed is rough, and is composed of the same formation described under Grindstone Falls. The shores are ledgy with comparatively low banks. It would not be possible to gain much increase in head over the natural fall by constructing a dam. For this reason, and also for the reason that the chances for the location of a dam are poor, this fall is one of the poorest to develop in spite of the fact that the drainage is more than that at points further up.

The country from the head of Whetstone to about ½ mile below Wessataquoik Stream, a distance of two miles, is very low. It begins to grow slightly higher, and attains a good elevation on the left bank, the right being high in places, until arriving at Big Seboois Stream, when low land is again met, the fall in about 6 miles being 6½ feet. This low land increases from here to and above Monument Line, which is about one mile above Seboois Stream, where it spreads out in a large meadow which is entirely under water during the spring freshets. From Monument Line to the foot of Bowlin Pitch is 9.4 miles. In this distance there is a rise in the river of about 82 feet, or nearly 9 feet per mile, which is rather uniformly distributed with the exception of one or two points where it is rather more. This fall is over gravel beds and rocks between comparatively low banks, allowing only poor chances for development of more than from 10 to 15 feet at any one point, the flowage caused by such a dam probably being considerable.

One possible development would be to construct a dam about 1 mile below Devils Hole, which is 1.8 miles below the Hatchery. This would give from 12 to 15 feet head, and would flow back to meet present water surface about 1¼ miles up stream. The dam would probably need to be at least 1,000 feet long to obtain this head.

Another possibility would be to construct a dam about 0.9 mile below the Hatchery where a head of from 15 to 20 feet could be obtained by a dam about 600 feet in length. A head of 20 feet would, however, flow out the Hatchery, and would meet the present water surface 1.3 miles above. The only other damage done would be to standing timber and would probably be small.

Bowlin Pitch, the lowest pitch of the Grand Falls, is located 37.1 miles from Medway, and has a fall of 5 feet occurring in 0.1 mile. It would be possible to locate a dam about 1,500 feet below the falls and obtain a head of 20 feet, flowing out the fall, the flowage extending back and flowing out the lower pitch of Hulling Machine Falls. Very little damage would be caused by this development, the banks in general being very high. The shores are rough and rocky with ledge outcropping in many places, the river being of such a width that several excellent locations for a dam from 300 to 400 feet in length can be found. The foot of "Hulling Machine" is located 0.9 mile from the head of Bowlin Pitch, and consists of a crooked fall, with precipitous ledge banks, of about 22 feet in 0.2 mile. Many excellent chances exist for the location of a dam, it being possible to obtain a head of 25 feet. By locating the dam near the head of the Hulling Machine Falls and using a penstock below, a 35-foot head could be obtained. Under the latter conditions, the dam would be about 400 feet in length, with a wing for a short distance on the left bank. The back water would extend nearly to the foot of Grand Pitch, a distance of 0.6 mile. The banks hold so high for this distance that no pondage of any considerable width would be created.

Grand Pitch, located 39 miles from Medway, and 0.7 mile above the head of Hulling Machine, consists of a fall of about 19 feet in about 500 feet distance, nearly all of this occurring in an almost shear drop through the solid ledge. By constructing a dam at this point, a 28 to a 30-foot fall could be obtained, the back water extending about 1,800 feet up stream, creating very little pondage. This would probably be the cheapest development to construct of any on the river.

The next fall is Haskell Rock Pitch, located one mile above the head of Grand Pitch. It is composed of two separate pitches with slack water between, the total rise being 43 feet, all occurring in a distance of 0.7 mile. The upper pitch is through the solid ledge, and drops about 36 feet in a distance of about 1,900 feet. The lower is 7 feet, through banks composed of rocks and earth, in a distance of about 1,500 feet. The water boils through this fall over rocks and boulders, the banks being rather low. Probably not more than the natural fall could be readily developed, and that only by placing a dam near the head of the first pitch and using a penstock below. The country above is wide and swampy, any rise in the natural water surface flooding large areas, with probable run-arounds. The flowage would extend back very nearly to the foot of Stair Falls, under a 5-foot rise.

Stair Falls, the last pitch of the Grand Falls, is located 41.7 miles from Medway, and 0.9 mile from the head of Haskell Rock. The fall is over the same peculiar formation throughout its length as occurs at Grindstone. The total fall is about 18 feet occurring in a distance of 0.8 mile. The shores are low for the entire distance without any good opportunities for the location of a dam.

The river is very crooked a short distance above Stair Falls, flowing through a very low country for about 3 miles, the rise in this distance being about 7 feet.

From Stair Falls to Grand Lake Dam is five miles, the total rise from the head of the falls to the sill of the gates of the dam being 36.7 feet. Of this amount 16 feet occurs in the first ½ mile from the dam, and 18 feet in the first mile. The head held by the present dam, at Second Lake which is used entirely for log driving is about 14 feet. It would be possible to build a dam at this point of any reasonable height of 200 to 300 feet in length between ledge abutments, the only limit being the flowage in Grand and Second Lakes, and several run-arounds near the outlet of the former, which are now closed by cribwork and piling against a head of about 14 ft. on sill of gates of dam. The dam is a timber crib structure about 185 ft. long, having 5 gates 8 ft. wide and one sluice gate 17 ft. wide and is a frail structure, although founded between excellent ledge abutments.

WEBSTER BROOK AND EAST BRANCH STREAM.

As previously stated, Webster Brook has become a connecting link between the East Branch and its main headwaters. The distance from Telos Dam to the head of Second Lake is 12.5 miles and the fall in this distance is 294.2 feet, considered from the sill of the gates of Telos to elevation of the sill of Grand Lake Dam, the latter holding a head of 14 feet, and the former a head of 13 ft. only 10 of which can be used.

Webster Brook and East Branch Stream join a short distance from the head of Second Lake, the distance of Third Lake from the point of junction being about 5.9 miles, and the fall in this distance being about 95 feet.

Webster Brook flows over gravel beds in the lower part of its course, soon becoming rough and rocky, and attaining an elevation ½ mile above its mouth of 678, or 37 feet above the elevation of the sill of Grand Lake Dam. From this point to a point about 250 ft. above Grand Pitch is about 0.1 mile, the fall in this distance being 35 feet, 16 feet of which is contained in Grand Pitch in a nearly sheer drop and 7 feet contained in the 250 feet above the falls.

From the head of Grand Pitch to the dam located at Indian Pitch is about 2.1 miles, and the fall in this distance, from the sill of the dam, is about 62 feet. This dam is a log dam about 75 ft. in length with two 12 ft. gates, and will hold a head of about 8 ft. It is used simply for "flushing" purposes, and is about three years old, and in good repair. From Indian Pitch to Webster Lake is 6.0 miles, the fall in this distance being about 116 feet, considered from the sill of Webster Dam to that of Indian Pitch Dam. The lower part of Webster Brook is, as indicated by the relative distances, rougher and contains more abrupt pitches than the upper portion. The entire length is however for the most part a boiling torrent, although there are stretches of simply strong water, together with slack water. The banks alternate in being low on one side and then on the other, although for the most part they are fairly high.

Webster Lake is three miles in length, the remaining fall of 44 ft. being in the distance of 0.9 mile from its head to the sill of Telos Dam. This distance is rough and rocky with high banks and shores on each side.

Many excellent dam sites are found along this stream from Second Lake to Telos and although surveys were not made to determine the topography, it is probable that heads of from 15 to 40 feet could be developed. The drainage area at the outlet of Webster Brook is, however, only about 295 square miles, although excellent storage facilities exist above.

From the elevation of the sill of Grand Lake Dam to that of the dam located at the outlet of Third Lake on East Branch Stream, the fall is about 110 feet, the elevation of the latter sill being about 751. The fall is fairly uniform, with some abrupt pitches and strong water separated by stretches of dead water. About 0.8 mile above the mouth is an old dam, the elevation of the water surface just above being 671, or 30 ft. above the elevation of the sill of Grand Lake Dam. There is a fall here of about 7 feet. About 0.4 mile farther up is a fall of about 3 ft., at the foot of about a mile of deadwater. Dog Brook comes in from the left bank about 3.1 miles from the mouth, there being a 4-ft. fall at this point, the elevation of water surface above being about 690. Brayley Brook enters from the right bank 4.3 miles from the mouth, the water surface here being about 705. From this point to the outlet of Third Lake the fall is about uniform, the amount being about 48 feet in the remaining 1.6 miles.

The dam at the outlet of Third Lake is a timber crib structure about 225 feet in length, holding about 9.7 feet head, and is in good condition, being about 5 years old. It is used for log driving. It is probable that, owing to low land in the vicinity of the dam, not much more head could be held than at present.

The following tables show the relative elevations of the lower portion of each stream:

Elevations along Webster Brook.

Place.	Distance, miles.	Elevation, feet.
Water suface at junction of two streams	0	657
Foot of Roll Dam	0.5	678
Head of Roll Dam (250' farther up)	....	690
Head Grand Pitch	0.6	706
250' above Grand Pitch	....	713

Elevations along East Branch Stream.

Place.	Distance, miles.	Elevation, feet.
Water surface at junction	0	657
Old Dam	0.8	
(500' below)	....	664
(Just above)	....	671
Falls	1.2	674
Head of Deadwater	2.2	674

MATTAWAMKEAG RIVER.

This branch of the Penobscot River joins the main river at the town of Mattawamkeag 62 miles from the Bangor dam. The drainage area above the mouth of Mattawamkeag River is 3,360 square miles, while below this point it becomes 4,860, this branch adding 1,500 square miles.

From the mouth of the branch to Baskahegan Stream is about 35 miles. The total fall in this distance is 150 feet. In this distance there are only two places where dead water occurs, one of them being, however, over 11 miles in length. Elsewhere the current is swift, or actual rapids or falls occur.

In order to gain a general idea of the river it will be divided into five portions and briefly discussed as follows:

1.—From the Penobscot River to the mouth of Carlisle Brook, the latter located near the Mattawamkeag-Kingman town line. This distance is 8.0 miles, and the total fall is 108.5 feet. The largest proportionate fall occurs upon this portion of the river, two-thirds of the total 108.5 feet occurring in about 2 miles. The shores in general are of gravel or ledge, rise high, and are wooded most of the way.

2.—From the mouth of Carlisle Brook to the canoe landing at Kingman Village: This stretch 3.1 miles in length, is known as Kingman Deadwater, since there is practically no fall. The quick water begins just above the canoe landing. The river banks are low and wooded, and the country is more or less swampy in the vicinity of the river.

3.—From the foot of the swift water at Kingman Village to Grants Mills, a distance of 2 miles, in which there is a fall of 19.3 feet: The banks are fairly high until approaching Grants Mills, when they grow rather low. The shores are wooded on the left bank, open on the right, and are of gravel with many large boulders.

4.—From Grants Mills to the Wytopitlock Highway Bridge: This stretch is known as the Drew Deadwater, and is 11.2 miles in length. The total fall in this distance is only 0.2 foot. The shores are low and wooded. The general character of the surrounding country is low and swampy, especially in the vicinity of Mud Lake and the Oxbow.

5.—From Wytopitlock Highway Bridge to the mouth of Baskahegan Stream at North Bancroft: This distance is 9.6 miles, with a fall of 22 feet. The shores are varied in character, quite high as a rule, and especially so where there is the most fall. Certain parts of the shore are under cultivation, but most of the country is wooded.

The following gives brief details of the different falls and mentions some of the possibilities for development.

The first well defined rapids on the river occur at what is known as Stratton Rips, about 1½ miles above the Maine Central R. R. bridge. Below this point, although the water runs swift, and there is a fall of 8 feet to its junction with the main river, there is no favorable place for a dam. Commencing with, and in the next 2½ miles above Stratton Rips, there are a number of important falls. The first, Stratton Rips, gives a fall of 4 feet in a distance of 1500 feet. Both banks are high at this point. Ledge exists for several hundred feet along the right shore, outcropping to a height of 20 feet above the river, and doubtless underlies the high land back from the river. The right shore is of gravel, rises quickly, and is wooded. The water surface has an elevation of 197 where the ledge occurs, and the 250 contours are found upon both sides, at not over 400 feet from the shore.

Ledge Falls occurs 1¾ miles above Stratton Rips, giving a fall of 3 feet in a distance of 300 feet. Ledges exist on both banks, those on the left bank being about 10 feet high, while those on the right bank are higher. High land exists back of the ledges.

Less than ½ mile above Ledge Falls comes Gordon Falls, the largest on the river. There are two distinct falls about 700 feet apart. They are called the Lower and Upper Gordon Falls. At the lower pitch there is a fall of 7 feet in a distance of 500 feet, and at the upper pitch a fall of 14 feet in a distance of 700 feet. Both banks are of ledge which shows for a distance of 10 feet above the river. Back of this ledge the right shore rises very steep, with a more guadual rise on the left.

Between these different falls the river is swift and drops rapidly so that from the head of Upper Gordon Falls to the foot of Stratton Rips there is a total fall of 48 feet, all occurring in a distance of about 2½ miles. The river has high banks for the entire distance with the exception of the mouth of Mattaceunk Brook. As this brook, at its mouth, has a quick descent, it is probable that it rises rapidly.

Dams could be erected at any of the places mentioned and a good head obtained. An excellent development could be obtained by constructing a dam at Stratton Rips and flooding back to the foot of Lower Gordon Falls, giving a head of about 24 feet, and another dam at Lower Gordon Falls, flooding out Upper Gordon Falls, giving another 24 foot head. Or it would be entirely feasible to erect the dam at Stratton Rips and flood back to, and exceeding Upper Gordon Falls, obtaining a head of about 50 feet. Either of these developments would aid materially in log driving by making slack water over a portion of the river which is now difficult to drive. Formerly some sort of structure existed at Lower Gordon Falls, designed to flood out the rocks, but there remains only the shore ends of the structure.

About one mile above Upper Gordon Falls is the beginning of a stretch of very quick water. The lower end of this stretch is known by the name of Slewgundy, and the upper part by the name of Scatterack. The total length is about 1½ miles, and the total fall in this distance is 40 feet. The bed is very rough with ledge banks, in some places 50 feet high. The river is about 200 feet wide at Slewgundy. All, or nearly all, of this fall could be developed by a dam built near the lower end.

One mile above the Scatterack is found Rams Head Falls, which consists of two short stretches of quick water separated by a distance of 1000 feet. At the lower one there is a 5-foot fall in 1,000 feet, and at the upper part a fall of 2 feet in 100 feet. Kingman Deadwater commences at this point. A dam could be built at the foot of the quick water below, just above Scatterack, and a head of about 10 feet obtained, flooding out Kingman Deadwater to some extent.

The water is swift from Kingman Village to Grants Mills, with two places where there is a decided pitch. One is at Kingman highway bridge, where there is a fall of 3 feet in some 500 feet distance, and the other at the head of the quick water, near an island just below Grants Mills, where a fall of 8 feet occurs in a distance of 1,800 feet. The right shore is high and steep all of the way, while the left shore is less steep but rises gradually to a height of from 20 to 30 feet above the river, these contours running within a few hundred feet of it.

Formerly mills existed at Kingman which utilized a part of the power, but they have long since been burned, and nothing remains but the crib wing walls on each side. At the site of this old structure the banks are steep on both sides, with ledge outcropping on the left shore. This would be a favorable site for a dam designed to flood out the falls up to the slack water at Grants Mills and obtain a head of about 15 feet. The water surface would be about 5 feet below the Kingman bridge under these conditions. It is probable that it would not be possible to flood out the Drew Deadwater to any extent as the land is low on both sides of the river and, although data is not at hand to verify the statement, it is probable that much damage would be created by such flowage.

In the upper section of the river there are no decided falls but there are a number of places where the river falls one or two feet. The most favorable place for obtaining a development would be at the village of Bancroft. There is swift water from the Maine Central R. R. bridge down to a point near the Reed-Bancroft town line, a distance of about 1,500 feet. The banks are extremely high and are of shale ledge. The river is narrow and it would be possible to develop from a 10 to a 15-foot head, as the shores above, in most cases, are either steep or with a gradual rise from the river.

PISCATAQUIS RIVER.

The following data of undeveloped water power privileges were obtained by a quick reconnaissance of the river, and from a study of the planetable sheets of the 1910 survey. The territory covered extends from the mouth of the river at Howland to within 2 miles of Blanchard, a distance of 59.8 miles. In this distance the total fall is 398 feet from elevation 525 to 127 feet above sea level. Ninety-two feet only of this fall have been developed.

The elevation of the river at its mouth is 127 feet. The top of the dam of the Howland Pulp and Paper Co. is 140 feet, This pondage extends nearly 2 miles upstream. 2.4 miles from the mouth, Seboois Stream enters on the left side and the elevation of the water surface here is 142 feet. At Swallowtail Island, 4.0 miles from the mouth, an elevation of 146 feet is reached. The rate of rise for the next 3 miles slightly increases but is fairly uniform to the mouth of Hardy Brook or the foot of the Mackintosh Rips. Here at 7.0 miles from the mouth, an elevation of 161 feet has been reached.

Mackintosh Rips in a distance of 0.3 mile has a fall of 6 ft. and in 0.5 mile a drop of 8 ft. From here to the mouth of Roberts Run the elevation has reached 175 feet in a distance of 1.0 miles. 0.3 miles farther upstream is the foot of Clapps Rips which continue upstream for 1.0 mile with a rise of 14 feet.

The foot of Schootarza Rips is 10.3 miles from the mouth at elevation 194 feet and continue up to the mouth of Schootoarza Stream, a distance of 0.7 mile, with a rise of 16 feet. Three feet of this is concentrated at the Falls in a length of 500 feet. A series of falls and rips, known as Schoodic Falls, occur from this point up to the mouth of Schoodic Stream, 12.3 miles from the mouth, where an elevation of 228 ft. is reached. The banks of the river are high for all of this distance and for some distance above Schoodic Stream outlet. It is probable that a dam of any reasonable height could be constructed about 1 to 1½ miles below the mouth of Schoodic Stream. Some ledge appears, but for the most part the banks appear to be gravel and loam. The river at this point is perhaps 300 ft. in width, and it is probably the best undeveloped site remaining on the river.

Campbells Rips at the 15.7 mile point has a fall of 5 feet in a distance of 0.1 mile. The next rise of 8 feet is comparatively gradual to Upper Ferry, a distance of 2.3 miles, where the elevation is 257 feet. In the next stretch of 4.5 miles, or to within 0.2 mile of the mouth of Sebec River, the river is practically ponded, as the rise is only 1 foot in this distance. Immediately above the mouth of Sebec River, rips occur of a 5-foot rise in a distance of 0.2 mile. The Bangor & Aroostook R. R. crosses Piscataquic River at this point.

The river has a gradual ascent from this point to the foot of the dam of the Dover and Foxcroft Light & Heat Co., 36.7 miles from the mouth. Less than a 2-ft. rise occurs in the next stretch or to the foot of the rips about ½ mile below Foxcroft. Here an ascent of 6 ft. is made in a distance of 0.3 mile. Not much back flowage could be created, however, on account of the dam of the American Woolen Co. immediately above.

Just above the mouth of Salmon Stream a fall of 2 feet occurs in about 400 feet. The river is practically all developed as far as Abbot Village where the elevation of the top of the dam is 421 feet. The distance from the mouth of the river to this place is 54.0 miles.

The rise for the next 5.8 miles is considerable, 104 feet to the head of Barrows Falls, about 2 miles below Blanchard. The entire length is a succession of rips and quick water.

The following table gives the distances and elevations of the several controlling points along the main river:

Elevations along Piscataquis River.

Locality.	Distance from mouth, miles.	Difference, miles.	Elevation, feet.	Difference, feet.
Mouth	0.0	......	127	......
Top dam Howland Pulp & Paper Co.	0.1	0.1	140	13
Mouth Seboois Stream	2.4	2.3	142	2
Swallowtail Island	4.0	1.6	146	4
Hardy Brook, foot of Mackintosh Rips	7.0	3.0	161	15
Hardy Brook, head of Mackintosh Rips	7.5	0.5	169	8
Roberts Run	8.5	1.0	175	6
Clapps Rips, foot	8.8	0.3	177	2
Clapps Rips, head	9.8	1.0	191	14
Schootarza Rips, foot	10.3	0.5	194	3
Schootarza Rips, head	11.0	0.7	210	16
Schootarza Stream	11.0	0.0	210	0
Schoodic Falls, head	12.2	1.2	228	18
Schoodic Stream, mouth	12.3	0.1	228	0
Little Schoodic Stream, mouth	14.1	1.8	234	6
Campbells Rips, foot	15.7	1.6	244	10
Campbells Rips, head	15.8	0.1	249	5
Alder Brook, mouth	17.1	1.3	253	4
Upper Ferry	18.0	0.9	257	4
Pleasant River, mouth	19.1	1.1	257	0
Sebec River, mouth	22.7	3.6	259	2
Rips	22.9	0.2	264	5
Dover & Foxcroft Light & Heat Co., foot of dam	36.7	13.8	283.8	19.8
Dover & Foxcroft Light & Heat Co., top of dam	36.7	0.0	295.3	11.5
Rips	39.1	2.4	297	1.7
Rips	39.4	0.3	303	6
American Woolen Co., Dover, foot of dam	39.7	0.3	305	2
American Woolen Co., Dover, top of dam	39.7	0.0	327	22
Mayo & Son, foot of dam	40.2	0.5	327	0
Mayo & Son, top of dam	40.2	0.0	339	12
Dover & Foxcroft Water Co., foot of dam	41.8	1.6	342	3
Dover & Foxcroft Water Co., top of dam	41.8	0.0	353.5	11.5
Salmon Stream, mouth	43.7	1.9	357	3.5
Salmon Rips, head	43.8	0.1	359	2
Guilford Dam, foot	48.7	4.9	372	13
Guilford Dam, top	48.7	0.0	382	10
South Branch or Kingsbury Stream, mouth	51.9	3.2	385	3
Abbot Village, bridge	52.7	0.8	390	5
Upper Abbot, foot of dam	54.0	1.3	408	18
Upper Abbot, top of dam	54.0	0.0	421	13
Barrow Falls, head	59.8	5.8	525	104

SEBEC RIVER.

On this stream are two undeveloped privileges. At Sebec Falls 6.2 miles from the mouth occurs a fall of 10 feet in a distance of 0.3 mile. Immediately below the dam at the outlet of Sebec Lake, undeveloped rips of 9 feet occur in a distance of about 700 feet. By the construction of a dam at Sebec Falls flooding to an elevation of 316 feet or to the foot of the present dam at the outlet of the Lake, a head of 36 feet can be obtained. This site is now held by parties contemplating power development, and detailed surveys of it have already been made. It should make a good project as besides Sebec Lake there are a number of other important lakes in the drainage above that can be utilized as storage reservoirs.

The following table shows distances and elevations at certain points on this stream:

Elevations along Sebec River.

Locality.	Distance, miles.	Elevation, feet.
Mouth	0	259
Milo, foot of dam	1.9	267
Milo, top of dam	1.9	278.7
Sebec Falls, foot	6.2	280
Sebec Falls, head	6.5	290
Sebec Village, foot of dam	9.75	316
Sebec Village, top of dam	9 75	327.3

PLEASANT RIVER.

This river is an important tributary of the Piscataquis River, taking its rise in Bowdoin College Grant Township immediately south of the Roach River drainage. There are a number of small lakes in the basin that could be utilized for storage reservoirs.

The elevation at the mouth of the river is 257 feet. 5.7 miles from the mouth is the foot of rips rising 4 feet in about 1100 feet, the head of the rips being located a short distance below Snows Bridge. From here the river rises rapidly to the 7.8 mile point where in a distance of 0.4 mile a rise of 9 feet occurs. The next important rise begins at 9.5 miles from the mouth and continues up to the foot of the dam at Brownville, rising 12 feet in 1.0 mile. This dam ponds water to above the mouth of Weststone Brook at a distance of 1.5 miles. A good dam site exists about half way between Brownville and Brownville Junction, where a head of about 12 feet might be obtained. There would be considerable flowage above as the land is somewhat low in the vicinity of Brownville Junction.

The foot of the next important rise is 0.8 mile above the mouth of the East Branch where 10 feet occur in a distance of about 1000 feet. The ascent increases to elevation 390 feet at the mouth of Roaring Brook, 17.7 miles from the mouth until the mouth of Houston Stream is reached, elevation 434 feet and 20.0 miles from the mouth.

Houston Stream, in the 6½ miles from the outlet of Houston Pond to the mouth, has a fall of 388 feet.

The main river rises very rapidly, 158 feet, in the 3¾ miles to the foot of the dam at the outlet of Silver Lake at Katahdin Iron Works.

The following table gives the distances and elevations of the controlling features along this stream:

Elevations along Pleasant River.

Locality.	Distance, miles.	Difference, miles.	Elevation, feet.	Difference, feet.
Mouth	0.0	....	257	....
Snows Bridge Rips, foot	5.9	5.9	267	10
Snows Bridge Rips, head	6.1	0.2	271	4
Rips, foot	7.8	1.7	291	20
Rips, head	8.2	0.4	300	9
Rips, foot	9.5	1.3	308	8
Brownville dam, foot	10.5	1.0	320	12
Brownville dam, top	10.5	0.0	337	17
Bridge, Brownville Junction	13.7	3.2	343	6
East Branch, mouth	14.9	1.2	350	7
Falls, foot	15.7	0.8	362	12
Falls, head	15.9	0.2	372	10
Roaring Brook, mouth	17.7	1.8	390	18
Houston Stream, mouth	20.0	2.3	434	44
Houston Pond	26.5	6.5	822	388
Houston Pond dam, top	26.5	0.0	830.3	8.3
Silver Lake dam, foot	23.75	3.75	588	154
Silver Lake dam, top	23.75	0.0	593.1	5.1
Silver Lake, water surface, September, 1910	23.75	0.0	592.3	0.8

PASSADUMKEAG RIVER.

This branch of the Penobscot has its rise in Nicatous Lake and several brooks and ponds lying to the west of the St. Croix and Machias basins, the waters of the three systems lying very near together in a number of places. It has its outlet about 5 miles below that of the Piscataquis, at the village of Passadumkeag. It is joined a short distance from its mouth by Cold Stream, flowing from Cold Stream Pond. The length of the stream from Nicatous Lake to its junction with the Penobscot is not far from 35 miles.

A dam at the outlet of the lake, holding a head of about 8 feet, gives a flush for driving purposes. From this point to Nicatous Falls, located about 2 miles further down, the water is strong, while at the falls there is a fall of perhaps 10 or 15 feet in a distance of 1½ miles. From this point to the mouth of Pistol Brook the current is strong. Dead water is met with at this point caused by a dam located at Grand Falls, near the point where the highway crosses the stream. This dam causes back water upon the main stream as far as Taylor Brook. Surveys have not been made covering the fall upon Passadumkeag River, but from the information obtained it is probable that Grand Falls drops about 25 feet in a distance of about 1 mile. These are practically the only falls worthy of note on the river, although in the distance from Grand Falls to the mouth a number of slight falls are met with, together with much quick water. Notable among these are White Horse Rips, below Saponic Pond; Lightening Rips, below Page's mill at Lowell; and Rocky Rips further down.

Much of the country drained by this stream is low and flat, with many bogs and ponds. The dams located at the mouth of several of these ponds are used entirely for log driving.

The drainage area of the river at the mouth is 383 square miles which includes the 37 square miles tributary to Cold Stream.

WATER STORAGE.

GENERAL CONSIDERATIONS.

The Penobscot ranks next to the Kennebec, among the larger river basins of the State, in the proportion of drainage area made up of lake and pond surface. The Kennebec has a ratio of water surface to total drainage of about 1 to 14, while the Penobscot has a ratio of about 1 to 16. While the Penobscot drainage does not include any single lake of area equal to Moosehead Lake, in the Kennebec drainage, there are several very large lakes, notably Chesuncook, Chamberlain and the Twin Lake system, that afford splendid opportunities for water storage.

The importance of utilizing stored water in an efficient manner has not generally been realized upon the Penobscot to the extent that it has upon the Kennebec, except in the single case of the West Branch of the Penobscot. There the Great Northern Paper Company has, at its own expense, improved the storage facilities afforded by Chesuncook Lake and the Twin Lake system. The log driving companies on the Penobscot have not in general worked as harmoniously with power users as on the Kennebec, and the result has been much waste of stored water.

As a result of the co-operation between the Maine State Survey Commission and the United States Geological Survey, surveys of several lakes and ponds in the Penobscot drainage have been made by the National Survey.

The following lake plans will be furnished to persons especially interested in the subject:

Reconnaissance map of Mattawamkeag Lake, Pleasant Pond, Schoodic Lake, Seboois Lake and Endless Lake.

Plan of Baskahegan Lake, First and Second Grand Lakes and Allagash Lake.

Plan of Chamberlain Lake, Telos Lake, Webster Lake and Round Pond.

Storage on West Branch Penobscot River.

General Description.

The West Branch of the Penobscot is formed at its head waters by the union of the North and South Branches and many brooks and small streams, nearly all having their rise in the mountainous country forming the western boundary between Maine and Quebec.

Much of the territory drained by these streams is used for lumbering operations, and during the spring freshets various brooks and streams, which are nearly dry for the remainder of the year, are used to drive the logs into the main West Branch.

Many of the ponds located on the headwaters have a timber crib dam at their outlet for the purpose of holding back the water until such a time as it is desirable to use it for obtaining a "flush" for driving purposes. After the drive is out of these streams it is the usual practice to leave the gates open so that during the remainder of the year the flow is natural. Usually all of this stored water is required for the drive.

A timber crib dam is located at Seeboomook Falls, 29 miles from Chesuncook Lake, used only for the purposes of log driving. Above this point the West Branch is more of the nature of a small stream, while a short distance below, it begins to widen and partake more of the nature of a river.

Several streams join the river between Seeboomook and Chesuncook Lake, the most important being Russell Stream, Lobster Stream, and Pine Stream. All of these are connected with small ponds, the largest being Lobster Lake, containing about 4 square miles of area.

From the head of Chesuncook Lake to the union of the West Branch with the East Branch, a distance of 69 miles, two large natural basins occur; Chesuncook and Ripogenus Lakes, and the so-called "Lower Lakes" comprising North and South Twin, Pemadumcook and Ambejejus lakes.

Several other lakes having areas about equal to that of South Twin Lake, discharge their waters into the West Branch. The largest are Lower, Middle and Upper Jo Mary, First, Second and Third Debsconeag, Nahmakanta, Rainbow, Harrington and Millinocket. The last named lake although the largest of the detached lakes is not available for storage in the Lower Lake system except at high water, as explained in the description of the basin.

The storage upon the West Branch is controlled by the West Branch Driving and Reservoir Co., a corporation closely affiliated with the Great Northern Paper Co. Some of the dams serve two purposes, that of holding stored water for power purposes, and of holding the water temporarily for a "flush" for driving, while at least two others serve only the latter purpose. These two are located, one at the outlet of Ripogenus Lake, the other at Sourdnahunk Falls, 8.4 miles below. Both of these are timber crib structures. It is proposed to replace that at the outlet of Ripogenus in the near future with a concrete dam of sufficient height to flow into Chesuncook Lake.

The original use made of these reservoirs was for log driving, as is the condition now existing on the East Branch, but with the advent of the Great Northern Paper Co. at Millinocket, improvements were made to both the storage and the river channel, and a much more economic use made of the available flow than before.

These improvements have continued from time to time resulting in a total storage capacity of the two systems of over 30 billion cu. ft. at the present time. Further development is possible, both from the standpoint of increased storage, and from that of a more economic use made of the water during the log driving season.

North, and South Twin, Pemadumcook, and Ambejejus Lakes.

These lakes are situated in townships Indian Nos. 3 and 4, 1 R. 9, 1 R. 10 and 2 R. 10 and are the first lakes of importance met with upon West Branch waters. They form a natural reservoir into which the river flows at the head of Ambejejus Lake, and leaves at the foot of North Twin Lake. They are very irregular in shape, having many islands, points and coves. The banks hold fairly high although considerable low land is found adjacent to the shores in many places. The water level is the same for all except during low water, when the surface of Pemadumcook and Ambejejus is slightly above that of the Twin Lakes.

The dam at the outlet of the system is of concrete construction in excellent condition. The lowest level of the lakes occurred during April 1906, at an elevation above mean sea level of 466.75 ft., giving 17 square miles for the area of the water surface. The top of the flash boards of the dam is at elevation 489.6 when the area becomes 24.6 square miles.

About a mile below North Twin Dam the river widens out into Quakish Lake, with an area of about one square mile. At the foot of this lake is a concrete dam used to divert the waters of the West Branch through Ferguson Lake, largely created by flowage, and a canal, for a distance of about a mile, to the penstocks of the Great Northern Paper Co. at Millinocket. After passing through the wheels the tail race flows into Millinocket Stream, and returns to the West Branch at Shad Pond. This leaves about four miles of the main West Branch, from the Quakish Lake to Shad Pond, nearly dry except during the periods when all of the flow is not being used through the mills.

The drainage area above Quakish Lake Dam is 1880 square miles. Millinocket Lake, situated principally in townships 1 R. 8 and 2 R. 8 lies directly east from Ambejejus Lake and at high water overflows into it. The natural outlet is Millinocket Stream, and except for high water overflow, its waters are not available for the storage of the Twin Lake system. The area of Millinocket Lake is about 11 square miles, and it is fed by several small streams, the principal one being Sandy Stream, having its rise around Mt. Katahdin.

When the surface of the Twin Lake system reaches elevation 492 G. N. P. Co. or B. & A. Rw. datum (see note in following table), this being the top of the flashboards on the dam at the outlet, the river backs up for about 5½ miles above the head of Ambejejus Lake to Debsconeag Falls, filling numerous logans, and flowing back into First Debsconeag Lake.

Although a considerable area is covered by the flowage, its value for storage is comparatively small as the increase in depth of stored water over the natural conditions is not large owing to the two falls at Ambejejus and Passamagormuc.

The dam at the outlet of North Twin Lake gives a head of about 25 feet available for storage. It is probable that this can be increased only slightly without a considerable outlay due to "runarounds" etc. It is also probable that any great increase would result in flooding large area, although the damage done would be almost wholly to standing timber, there being no settlements of importance coming under the flowage.

The following table gives the area and capacity of the Twin Lake system at different elevations:

Area and capacity of Twin Lake System.

(All elevations refer to Bangor & Aroostook Railway datum. To obtain mean sea level subtract 2.38 ft.)

DRAINAGE AREA, 1,880 SQUARE MILES.

Elevation, B. & A. datum.	Area, square miles.	Capacity, section cubic feet.	Total capacity, cubic feet.	Remarks.
469				
471	17.0	950,000.000	950.000,000	
473	21.3	1,190,000.000	2,140.000,000	
475	23.0	1.230,000.000	3.420,000,000	
477	23.0	1,280.000.000	4.700,000,000	
479	23.3	1,300.000.000	6,000.000,000	
481	24.0	1.340,000,000	7,340.000.000	
483	24.0	1,340,000,000	8.680,000,000	
485	24.4	1,360.000.000	10,040,000,000	
487	24.6	1.370,000,000	11.410,000,000	
489	21.9	1.390,000,000	12,800.000,000	
491	24.9	1,390,000,000	14,190,000.000	
487	24.6	....	11,410.000.000	Crest spillway.
482	24.0	....	8,010,000,000	Bottom log sluice.
473	21.3	....	2,140,000,000	Bottom shallow gates.
467	....	....	....	Deep gates (25).
469.13	17.0	....	60.000,000	Lowest level April 1906.
492.00	24.9	....	14,880,000,000	Highest level of lake. (Top flash boards).

Ripogenus Lake.

Upon leaving Ambejejus Lake no lakes of importance are found until reaching Ripogenus Lake, the outlet of which is 22 miles above Ambejejus Falls.

This lake is more like an enlargement of the river than a lake, and is about 2½ miles in length, averaging from about ½ to ¾ mile in width. The banks are high except in the upper portion where Harrington Stream enters, where they are low and marshy for a considerable distance inland.

At the outlet of the lake is a timber crib dam which will hold a head of about 10 feet, and is in fair condition. From this point to the "Big Eddy," a distance of 2.4 miles, the fall is 215 feet. The river here flows through high almost perpendicular ledge banks, and is very narrow. This dam is used principally for log driving purposes to obtain a flush to carry the logs through Ripogenus Gorge as it is called, to the Big Eddy. (See Plate III.) The elevation of the sills of the gates is about 879. The area of the lake at elevation 883.3 is 1.07 square miles, while the area at elevation 900 is probably more than 1.55 square miles. There is an excellent chance for a dam of any reasonable height near the location of the present one, and it is understood that the West Branch Driving and Reservoir Co. have already received authority from the State to construct a concrete dam here, the crest of which is to be 4 ft. higher than the spillway of the present Chesuncook Dam. As the latter is at elevation 930.6 this will mean a dam at the outlet of Ripnogenus of 50 odd feet. It is estimated that the increased storage occasioned by this dam will amount to from 8 to 10 billion cubic feet. The drainage area at the outlet of Ripogenus Lake is 1410 square miles.

The principal damage caused by increased flowage would be due to standing timber, and to the flooding of a set of camps on the right shore.

Area and capacity of Ripogenus Lake.

DRAINAGE AREA 1,410 SQUARE MILES.

Elevation. feet.	Area. square miles.	Capacity section. cubic feet.	Total capacity. cubic feet.	Remarks.
879	0.90	....	....	Gate sills.
883.3	1.07			
889	1.27	301,100.000	301,100.000	Crest of dam.
934.6	....	9.000.000.000	9.301.100.000	

Chesuncook Lake.

Chesuncook Lake is situated in townships 3 R. 12, 4 R. 12, 4 R. 13, and 5 R. 13.

Its outlet is separated from the head of Ripogenus by only 0.57 miles of river. The elevation of Chesuncook when drawn down to the deep gate sills of the dam is 908.6 above mean tide, while the mean low water of Ripogenus is about 883, giving a difference in lake levels of about 25.6 feet. When Chesuncook is filled, the limit high water is supposed to be at elevation 930.6, although for a short time during the spring freshets it may exceed these figures.

The dam is a timber crib structure built during the winter of 1903-4, and is in good condition. Its length is about 1500 feet, and it contains 6 pairs of deep gates with dimensions 8′ x 8′ and three pairs of shallow gates, 8′ x 12′ besides one log sluice 25 feet in width. The dam controls a head of about 20 feet.

Chesuncook Lake is about 17.7 miles in length, and will average from ¾ to 1 mile in width. It is comparatively free from islands, has a fairly regular shore outline and fair banks except in certain places where the flowage amounts to considerable.

About 5½ miles from the dam, a deep inlet, known as Caribou Cove, connects with a lake of the same name, lying on the west of Chesuncook. This lake is from 6¾ to 7 miles in length and in its course, or widest part is about 1.4 miles, narrowing to less than ½ mile near each end. It is fed by brooks and streams, the principal one being Ragged Stream having its rise in a lake, of about ¾ the size of Caribou Lake, of the same name as the stream.

Numerous brooks and streams flow into Chesuncook, the two most important, excepting West Branch, are Umbazooksus and Caucogomoc, each having its rise in a lake of the same name as the stream.

The head waters of each approach very closely to East Branch waters, the waters of Caucogomoc Lake being within a few miles of Allagash Lake, and Umbazooksus Lake being separated from Mud Pond, which flows into Chamberlain Lake, by only 1.7 miles.

The elevation of mean low water on Umbazooksus Lake is about 941, while that of Mud Pond is 955, and that of Chamberlain is about 938.

When the water level reaches its extreme elevation of 930.6 in Chesuncook the effect of the flowage is felt for about 4.3 miles above the lake upon the river, flowing out Pine Stream Falls and a part of Rocky Rips.

The effect is also felt upon Umbazookus Stream for a distance of about 5 miles from its mouth, and as the most of this distance is through low meadow land, the stream increases to a width of from ¼ to ½ mile. The flowage also extends up Cuxabexis Stream into Moose Pond, and joints that of Umbazooksus.

The area of Chesuncook at mean low water is about 18 sq. miles. while the area when filled to the crest of the spillway of the dam 930.6 is 32.1 sq. miles or nearly double.

The drainage area at the entrance to Chesuncook Lake is 825 sq. miles while that at the outlet is 1330 sq. miles.

The only damage to be created by further storage, other than to standing timber, would be to the settlement at the upper end of the lake and it is probable that this would be comparatively small.

The following table gives the area and capacity of Chesuncook Lake at different elevations:

Area and capacity of Chesuncook Lake.

Elevation Bangor and Aroostook Railway datum. To get sea level substract 2.38 feet.

DRAINAGE AREA 1,330 SQUARE MILES.

Elevation Bangor and Aroostook datum.	Area square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
913				
915	18.1	1,010,000,000	1.010,000,000	
917	18.3	1,020.000,000	2,030,000,000	
919	18.5	1,030,000.000	3,060,000,000	
921	19.7	1,100.000.000	4,160,000.000	
923	22.2	1,240,000,000	5,400,000.000	
925	25.6	1,430,000,000	6.830,000.000	
927	28.0	1,560.000,000	8.390,000,000	
929	29.8	1.660.000,000	10.050,000,000	
931	31.6	1,760,000,000	11.810,000.000	
933	32.1	1,790,000,000	13.600.000.000	
935	35.9	2.000.000.000	15,600.000.000	
937	35.9	2,000,000,000	17,600,000.000	
933	35.9	....	13.600,000,000	Crest spillway.
924	23.9	....	6.100,000,000	Bottom log sluice.
921	19.7	....	4,160,000,000	Bottom shallow gates (6).
911.00	....	....	....	Bottom deep gates (12).
912.61	....	....	....	Lowest level lake December 1905.

Caucogomoc Lake.

This lake is situated in townships 6 R. 14, 6 R. 15, 7 R. 14 and 7 R. 15.

It has an area of about 7 sq. miles, and is fed by several brooks and streams, some of which are connected with fair-sized ponds.

The outlet is a stream of the same name as the lake of about 12 miles in length, flowing into Chesuncook Lake at a point very near the inlet of the West Branch. The elevation of the lake is not known, but it is considerably higher than Chesuncook.

An old timber dam exists at the outlet, used for driving, which controls a head of about 8 feet.

It is estimated that about 7 feet additional head could be obtained by proper development, giving about 8 or 9 sq. miles of water surface.

The waters of Wadley Brook, a tributary of the lake, approach very near to the waters of Allagash Lake, which is in the East Branch system.

Area and capacity of Caucogomoc Lake.

DRAINAGE AREA 174 SQUARE MILES.

Elevation above sill of dam.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
0	5.15	....	....	Sill of dam.
5	6.33	800,110,000	800,110,000	
8	7.00	557,840,000	1,357,950,000	Crest of dam.
10	7.45	402,600,000	1,760,550,000	
15	8.50	1,112,300,000	2,872,850,000	

Umbazooksus Lake.

This lake is situated in township 6 R. 13.

It has an area of only about 1 or 1½ sq. miles, and is very shallow. The outlet is into a stream of the same name, the flow being controlled, by a timber dam in poor repair, giving a head of 5 or 6 feet. The elevation of mean low water is about 942.

This lake is of interest in that it approaches to within 1.7 miles of Mud Pond, the latter being in the East Branch system. Cuxabexis Lake, of about the same size, and Caucogomoc Lake, drain the part of the West Branch water shed lying to the southwest of Chamberlain Lake.

STORAGE ON EAST BRANCH PENOBSCOT RIVER.

General Description.

The East Branch of the Penobscot was originally formed by two branches, East Branch Stream which rises in the vicinity of Stink Pond and Webster Brook rising in Webster Lake. The chain of lakes lying just to the northwest of Webster Lake, viz., Telos, Chamberlain and Allagash lakes and Round Pond had a natural flow into Eagle Lake and thence down the Allagash River to St. John. At high water, however, an overflow may have occurred at the east of Telos Lake into a small brook draining into Webster Lake, as the topography indicates this possibility.

As the early lumbering operations progressed up the East Branch a point was reached where it was necessary to provide means for hauling logs over the divide between Telos and Webster Lakes. As a result, about 1840 a dam was built at the natural outlet of Chamberlain Lake toward Eagle Lake, and a canal cut from the east end of Telos Lake, a distance of about 800 feet to connect with Webster Lake. As Chamberlain and Telos lakes were of the same elevation and connected, this meant that the flow from this series of lakes was turned into the East Branch of the Penobscot. This dam and canal made it possible to lumber on Chamberlain Lake territory and drive logs directly down the Penobscot.

Later to permit of lumbering around Eagle Lake and driving down the Penobscot a second dam was built at the natural outlet of Chamberlain Lake below the first dam, the two dams formed a lock into which logs could be driven and raised to the level of Chamberlain. This method was utilized for a number of years but was finally abandoned and only the remains of the original "lock dam" are now visible. The present dam at the natural outlet of Chamberlain is now known as the "lock dam."

The sills of the gates of the present "lock dam" at the natural outlet of Chamberlain Lake are about 0.6 foot lower in elevation than those of the dam at the artificial outlet of Telos Lake, so that in very low water, with gates open, the flow from Chamberlain Lake is nearly or all into Eagle Lake. The elevation of the sill of the "lock dam" is 934.8 ft. and of the Telos Dam, 935.4 ft.

About 1893 Marsh & Ayer, a firm of lumbermen of Bangor, built a log carry called the "Tramway" from Eagle Lake to Chamberlain Lake at a point near the northerly end of Chamberlain Lake where the distance between the two lakes is only about three-fourths of a mile. This consists of an endless chain driven by steam power, and is the present means by which logs are taken from the region of Eagle Lake and driven into the Penobscot.

Under present conditions it will be noted that the drainage area tributary to Chamberlain and Telos lakes has become the principal headwaters of the Penobscot East Branch, the drainage area above the outlet of Telos Lake being 270 sq. miles while there is only about 226 sq. miles of area between Telos Lake Outlet and Grand Lake Dam.

Grand and Second Lakes.

These lakes are located in townships 6 range 8 and 6 range 9 and constitute the first lakes of importance upon the East Branch above its mouth. They are very irregular in shape, with many rugged points and coves and are at about 645 feet above mean tide at low water. They are separated by a "thoroughfare" about two miles long, and at extreme low water Grand Lake is slightly lower in elevation than Second Lake. From Grand Lake Dam at its lower end to the head of Second Lake is a distance of about 8 miles. Their total area at mean low water is about 4.4 sq. miles.

The south shore of each lake is very rough with high banks especially on Grand Lake, where the Trout Brook Mountains and the Traveller Range extend southward from the shores. The other portions of these two lakes in general have steep banks except in the vicinity of the "thoroughfare" where Trout Brook enters into the upper end of Grand Lake, from the north. At about the middle of the thoroughfare extending eastward about 1½ miles is the "Big Logan" which is about 1,500 feet in maximum width and has low banks on its northern and eastern shores.

The dam at the outlet of Grand Lake is a timber crib dam about 185 feet long between ledge abutments, and affords a head of 14 ft., the elevation of the gate sills being about 641.2 feet. There are 5 gates 8 feet wide, and one sluice gate 17 feet wide. There are several channels a short distance to the west of the dam through which water would run at ordinary and high stages which are closed by crib work and piling. The dam is a frail structure and needs repairs. Conditions are such at the outlet that a dam of any reasonable height could be built. Little or no damage would be occasioned by raising the lake level to an elevation of 665 feet or 20 feet above the ordinary low water level.

The drainage area at the mouth of Grand Lake is 496 sq. miles. The following table gives the area and capacity of Grand and Second lakes at different elevations:

Area and capacity of Grand and Second Lakes.

DRAINAGE AREA 496 SQUARE MILES.

Elevation, feet.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
641.2	3.30	....	....	Gate sills, present dam.
645	4.40	407,900,000	407,900,000	Ordinary low water.
650	5.60	697,000,000	1,104,900,000	
655	6.63	854,100,000	1,959,000,000	Crest present dam.
660	7.52	990,900,000	2,949,900,000	
665	8.36	1,106,800,000	4,056,700,000	
670	9.17	1,221,100,000	5,277,800,000	

Webster Lake.

Webster Lake is situated about equally in townships 6 range 10 and 6 range 11 and as previously noted is connected at its upper end by an artificial canal with Telos Lake. It is about 3 miles long and 2,000 feet maximum width, and quite regular in shape, running approximately east and west. It has an area of 0.82 sq .miles at low water, corresponding to an elevation of about 891 feet above mean tide. The shores are high and steep. Coffeelost Stream entering from the north and Thissell Brook from the south are small tributary streams.

A timber crib dam with earth abutments affords a head of from 7 to 9 feet. It is about 125 feet long with a wing piling backed with earth, about 250 feet long and is in poor condition. The right bank of the dam is high and steep while the left bank is low, the dam is used solely for log driving down Webster Brook and the gates are usually raised after the drive has reached Indian Pitch Dam some 6 miles below Webster Brook.

This lake could readily be raised in elevation by a higher dam at the outlet. It is probable too that it could be drawn down at least two feet lower than at present, but the area of the lake is so small that it is not of much importance for storage except for log driving as noted previously.

The drainage area of Webster Lake at the outlet dam is 1 sq. miles. The following table gives its area and capacity at different elevations.

Area and capacity of Webster Lake.

DRAINAGE AREA 288 SQUARE MILES.

Elevation, feet.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
886	0.72	....	....	
891	0.82	107,300,000	....	Gate sills present dam and ordinary low water.
896	0.91	119,900,000	119,900,000	
899	(0.96)	78,620,000	198,500,000	
901	1.00	133,800,000	253,700,000	Crest present dam.
906	1.08	145,000,000	398,700,000	
911	1.16	156,100,000	554,800,000	
916	1.23	167,300,000	722,100,000	

Telos Lake and Round Pond.

These two lakes situated mostly in township 6 range 11, are at the same level as Chamberlain Lake being connected with it by a "thoroughfare" about 4,000 feet long extending northward from Round Pond. Telos Lake and Round Pond are irregular in form separated by a narrow passageway and extending in a general direction from northwest to southeast, and their combined area at low water is 3.7 sq. miles. Their total length is about 3 miles and the maximum width about half a mile. The shores are usually high and steep and thickly wooded. Telos Brook entering Telos Lake from the west, and Bog Stream entering Round Pond from the East, are small streams with some low land near their outlets.

A timber crib dam at the outlet of Telos Lake has its gate sills at elevation 935.4 feet above mean sea level and is capable of storing a head of about 13 feet, except for the fact that at this elevation water would flow over the " lock dam" at Chamberlain Lake. The area and storage capacity of Telos Lake and Round Pond at different elevations is given in the following table.

Area and capacity of Telos Lake and Round Pond.

DRAINAGE AREA 270 SQUARE MILES.

Elevation.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
932.9	2.82			
934.8	3.00	154,100,000	....	Gate sills, Lock dam.
935.4	3.04	50.520,000	....	Gate sills, Telos dam.
937.9	3.24	218,800,000	218,800,000	Ordinary low water.
942.9	3.64	479.500.000	698,300,000	
945.8	3.85	302.400,000	1.000,700,000	Crest lock dam which is about 2½' lower than Telos.
947.9	3.97	529,700.000	1,228,000,000	
952.9	4.28	574.300,000	1,802,300,000	
957 9	4.52	613.300,000	2,415,600,000	
962.9	4.76	646,800,000	3,062,400,000	

Chamberlain Lake.

Chamberlain Lake, the largest lake now tributary to the East Branch of the Penobscot, is a long and comparatively narrow lake resembling Chesuncook Lake, except that it has a greater width and has more irregular shape. It runs from northwest to southeast, extending through several townships and is about 14 miles long, and some 2 miles in maximum width with an average width of about 1 mile. At low water it is about 938 feet above mean tide, (the same elevation as Round Pond and Telos Lake- with an area of water surface of 15.4 miles.

The shores of the lake are generally high and steep except at inlet of Allagash Stream at the northwestern end of the lake and at the inlet of Mud Pond on the south. Ellis Stream on the west and Leadbetter Stream on the east are other small tributaries. There are a few small islands mostly in the half toward Round Pond. This lake is noted for its rough water, as the prevailing winds obtain a sweep from end to end, and frequently for days at a time no ordinary boat or canoe will stay afloat.

As previously explained the natural outlet of Chamberlain Lake was originally toward Eagle Lake, on the east, but there is now an artificial outlet through Round Pond. The "lock dam," so called, at the outlet of Chamberlain Lake toward Eagle Lake is a timber crib dam, with earth abutments reinforced by sheet piling some two or three years old and in excellent condition. There are two gates for letting water into Eagle Lake, but these gates are kept closed and caulked nearly all the time. The dam is very tight and there is little or no leakage. It affords a head of about 11 feet although with this amount there is an overflow of about one foot in depth for a short distance through the woods beyond one wing. It is stated that the channel from the lake to the dam has been blasted out so that at present the sills of the gates which are at elevation 934.8 ft. hold back about 3 feet of dead water.

The dam controlling flow by way of Round Pond and Telos Lake has been described previously and it will be noted that the "lock dam" has lower gate sills, and also a lower crest elevation so that if desired all flow from Chamberlain Lake can be via the "lock dam" toward Eagle Lake.

Chamberlain Lake (with Round Pond and Telos Lake) constitutes an excellent storage basin and is capable of still further developments in this way. In all probability its surface could be maintained 15 or 20 feet higher than at present without great difficulty. The Chamberlain Farm Settlement, situated on the northerly side of the lake, would be somewhat affected by such a change of lake level, but otherwise any damage would be to timber land only, and not of material consequence.

The drainage area tributary to these lakes, including their water surface, is 270 sq. miles. The area and storage capacity of Chamberlain and Telos lakes and Round Pond at different elevation is given in the following table. These areas and capacities also include approximately the effect of flooding the country around Mud Pond which would occur if the surface of Chamberlain Lake were raised above elevation 956 (a rise of 20 ft. above present low water level). No surveys were made to accurately determine this, but under the above conditions it is probable that two or three sq. miles in the vicinity of Mud Pond could be flooded to a depth of 2 feet.

Area and capacity of Chamberlain Lake.

DRAINAGE AREA 270 SQUARE MILES.

Elevation.	Area, square miles.	Capacity section cubic feet.	Total capacity, cubic feet.	Remarks.
932.9	13.65			
934.8	14.33	741,000,000	....	Gate sills, Lock dam.
935.4	14.52	241,300,000	....	Gate sills, Telos dam.
937.9	15.38	1,042.000,000	1,042,000,000	Ordinary low water.
942.9	16.92	2.251.000,000	3,293,000,000	
945.8	....	1,435,000,000	4,728,000,000	Crest present dam.
947.9	18.26	2,452,000,000	5.745,000,000	
952.9	19.42	2,626,000,000	8,371,000,000	
957.9	20.45	2,780.000,090	11,151,000,000	
962.9	21.37	2,914,000,000	14,065,000,000	
Including Mud Pond (Approximate).				
957.9	23.0	2,956.000,000	11,327,000,000	
962.9	26.0	3,415,000,000	14,742,000,000	

Allagash Lake.

Allagash Lake, in Townships 7 and 8, R. 14, is situated about 5½ miles northwest of Chamberlain Lake connected with it by Allagash Stream. It is rather irregular in shape, but in a general way rectangular. With numerous islands and with an elevation of 1,041.5 feet above mean tide at ordinary low water, when its area is 6.85 sq. miles. It has the greatest elevation of any body of water of considerable size on the headwaters of the East Branch. The shores are steep and wooded except for the portion near the principal inlet, Allagash Stream on the west, where some low land exists. There are no other inlet streams.

A timber crib dam controls a head of 7 or 8 feet at the outlet of the lake. It is 40 feet long with a wing of sheet piling reinforced with earth and is in rather poor condition. The waterway consists of three gates about 9 feet wide, the sills of which are at elevation 1,037.0. The dam is used solely for log driving purposes and the gates are left up after the driving season is over.

Allagash Lake affords a good opportunity for additional storage and there are no settlements near by and damage would be simply to standing timber. A dam could be built to any reasonable height a short distance above the present dam, where a high ledge bank appears on one shore.

The drainage area at the outlet of Allagash Lake is 102 sq. miles.

The following table gives the area and capacity of Allagash Lake at different elevations:

Area and capacity of Allagash Lake.

DRAINAGE AREA 102 SQUARE MILES.

Elevation.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
1036.5	6.40			
1037.0	6.46	89,630,000	....	Gate sills present dam.
1041.5	6.85	835,500,000	835,500,000	Ordinary low water.
1044.0	7.05	....	1,320,000,000	Crest present dam (approximate.)
1046.5	7.22	979,900,000	1,815,400,000	
1051.5	7.55	1,029,000,000	2,844,400,000	
1056.5	7.81	1,071,000,000	3,915,400,000	
1061.5	8.05	1,105,000,000	5,020,400,000	
1066.5	8.27	1,138,000,000	6,150,400,000	
1071.5	8.47	1,167,000,000	7,325,400,000	

STORAGE ON MATTAWAMKEAG RIVER.

Baskahegan Lake.

Baskahegan Lake is located in the towns of Brookton and Topsfield. It is very irregular in shape and about 5 miles in greatest length, which is from southwest to northeast. It is probably about 450 feet above mean tide and has an area at ordinary low water of about 12.5 sq. miles. It is a shallow lake, the greatest depth being 35 feet at about the middle of the lake. The shores rise rather gradually as a rule and there are large tracts of low land near the outlet brook, and Dead Brook, an important inlet on the north. The most important inlet is Alder Brook entering the lake near the southwestern part. Baskahegan Stream, the outlet of Baskahegan Lake into the Mattawamkeag River, flows in a general direction northward and reaches the river in the town of Bancroft falling about 110 feet in some 18 miles.

The dam at the outlet of Baskahegan Lake has 6 gates making with timber crib piers a length of 103 feet, and with additional wings of concrete, and a low dike or wall of loose rock and gravel, mostly on the east side of the dam. The total length is 75 feet. This dam is used solely for log driving purposes and the gates are left open after the drive is over. Additional storage could readily be obtained, by placing a dam at the sharp bend in the outlet stream known as "Weber Place" about 1.5 miles below the present dam, and an increased depth of from 10 to 12 feet obtained. The bed of the river at this point is gravel and the banks high. This would require an additional earth dam or dyke at the low area near "Dung Fork Points" at the northeast corner of the lake. Baskahegan Lake affords excellent opportunity for water storage as its shores are practically wild and the damage done by flowage would be of little consequence. The drainage area at the outlet of the lake is 151 square miles. The areas and storage capacity of Baskahegan Lake at different elevations are given in the following table:

Area and capacity of Baskahegan Lake.

DRAINAGE AREA 151 SQUARE MILES.

Elevation from crest of present dam.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
—7	8.6	....	....	Lowest gate sill.
—3.5	12.8			
0	16.4	2,468,000,000	2,468,000,000	Crest present dam.
5	20.4	2,565,000,000	5,033,000,000	
10	23.0	3,025,000,000	8,058,000,000	
15	25.2	3,360,000,000	11,418,000,000	
20	27.1	3,652,000,000	15,070,000,000	

Mattawamkeag Lake.

Mattawamkeag Lake, the largest lake on the West Branch of the Mattawamkeag River lies in the town of Island Falls and township 4 range 3. It runs generally northwest or southeast and is about 7.2 miles long, 2.4 miles in maximum width, and very irregular in shape.

It is approximately 464 feet above sea level and about 6 sq. miles in area. It is a comparatively shallow lake for its size, the maximum depth of about 50 feet occurring north of Big Island, which is toward the southerly end of the lake. The shores are low and flat at the northwest and southeast ends of the lake and in general high for the remaining portions.

A number of small brooks enter the lake from different points along the eastern shore but are not of importance. On the western shore enters the important inlet of the lake, the West Branch of the Mattawamkeag River. Its mouth is about 2 miles from the head of the lake but in its course it runs parallel to the lake nearly a mile, and has a cut-off connection with it that is used for log driving at high water.

The present dam is of timber crib work and was built about 1862, there having been 2 previous dams at this place, washed out soon after they were built. It is in rather poor condition and has been repaired many times. The dam is about 375 feet long of which 145 feet are made up of waste ways and sluice gates and affords a head of 8.5 feet. On the right bank the ground rises gradually and is about 10 feet higher, 150 feet from the end of the existing wing wall. On the east side the rise is rather more abrupt for a short distance and then gradual.

The present high water level on this lake causes much flooding of low lands, and while the conditions at the present dam would permit of an increase in height without difficulty, it is probable that damages by flowage would be extensive. These would include the partial flooding out of a 9-ft. fall at the village of Island Falls about 7 miles up stream, utilized by the Emerson Lumber Co. The present maximum height could, however, be maintained most of the year and would afford considerable storage and cause damage only to timber land.

The drainage area at the outlet of Mattawamkeag Lake is 305 sq. miles. The following table gives the area and capacity of Mattawamkeag Lake at different elevations.

Area and capacity of Mattawamkeag Lake.

DRAINAGE AREA 305 SQUARE MILES.

Elevation.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
455	4.52	....	....	Gate sills present dam.
457	4.96	262,600,000	262,600,000	
460	5.41	431,600,000	694,200,000	
462	5.72	310,000,000	1,004,200,000	
464	6.02	327,300,000	1,331,500,000	Crest present dam.
465	6.19	170,100,000	1,501,600,000	Probable limit high water without excessive damage to Island Falls.

Pleasant Pond.

Pleasant Pond is long and narrow, fairly regular in shape, running approximately northwest to southeast, situated in the town of Island Falls and township 4 range 3, and discharging into the East Branch of the Mattawamkeag River, by an outlet about half a mile long. It is about 4 miles long and one mile in maximum width, is approximately 600 feet above mean sea level and about 2¼ square miles in area. It possesses very clear water and is quite deep, the lower half averaging 50 feet with a maximum depth of 65 feet, and the upper half about 30 ft. There are a few small islands.

The shores are wooded and rise abruptly from the water's edge, the western shore being somewhat steeper than the eastern. At the head of the pond there is some low land, but there are no streams of any size entering this pond and it seems probable that considerable of its water supply comes from springs, as the pond surface remains very constantly at the same elevation, having an extreme range of only about 2 feet.

A dam, the remains of which still exist, formerly governed the flow of this pond, but the pond is not utilized at present for storage purposes. A dam could be placed at the site of the old dam to raise the present water surface about 7 feet with a total length of 650 feet, all but 30 feet of this being wing walls. The pond could further be lowered 3 feet by dredging the channel for a few hundred feet.

A higher dam might be placed here (a height of 20 feet above present pond level would require a total length of dam of about 1,800 ft.) provided there were sufficient tributary drainage areas. There are, however, but 79 sq. miles directly tributary to Pleasant Pond and its only use for storage purposes would be by diverting flow from the East Branch of the Mattawamkeag. This might be done by a dam just below Pleasant Pond outlet to the East Branch (about half a mile from the pond and some 30 ft. lower) or by a diversion dam and canal further up the East Branch.

It will be further noted that Pleasant Pond is nearly 40 ft. higher in elevation than Mattawamkeag Lake. It is therefore possible to divert water to Mattawamkeag Lake by a cut through the dividing low land at the west end of Pleasant Pond. This distance is stated to be about a half mile and the maximum depth of cut about 10 ft.

The drainage area of the East Branch of the Mattawamkeag River just below Pleasant Pond outlet is 79 sq. miles. The area and storage capacity of Pleasant Pond at different elevations are given in the following table:

Area and capacity of Pleasant Pond.

DRAINAGE AREA 79 SQUARE MILES.

Elevation.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
595.0	2.08	....	....	Proposed elevation outlet to be obtained by dredging.
598.0	2.20	178.980,000	178,980,000	Present elevation of outlet.
600.0	2.27	124,900,000	303.880,000	
602.5	2.35	161,000,000	464,880,000	
605.0	2.42	165,900,000	630,780,000	
607.5	2.50	171,500,000	802,280.000	Probable limit of high water without excessive expense for dam, etc.
610.0	2.55	175.600.000	977,880,000	
620.0	2.75	738,800,000	1,716,680,000	
602.0	2.34	....	....	Present elevation of crest dam not used.

STORAGE ON PISCATAQUIS RIVER.

Schoodic Lake.

Schoodic Lake, Piscataquis County, lies mostly in township 4 range 8. N. W. P. It runs in a general direction north and south and is rather irregular in shape with numerous bays and is some 8¾ miles long. It is 2.5 miles in maximum width, this being opposite Howard Cove on the west shore, about 5.5 miles from the upper end. There are a number of small islands, principally at the upper end and near the east shore, this latter group being known as Five Islands. The lake as a whole is deep, the maximum depth above Five Islands being 75 feet and south of this point 155 feet. In the vicinity of Norway Point toward the lower end of the lake is an extensive area more than 100 feet deep.

At ordinary level Schoodic Lake is about 430 feet above mean tide with an area of water surface of 10.75 square miles. The shores are in general high, and the banks steep with the exception of low places in the vicinity of Howard Cove and another area on the west shore near the northern end of the lake, and a portion of the east shore near Five Islands. No stream of any magnitude enters the lake, and the tributary drainage area is quite small. The outlet, Schoodic Stream, enters the Piscataquis River in the town of Medford, about 4 miles from the lake, in which distance it falls some 200 feet.

There are three lines of railroad in the vicinity of Schoodic Lake. The main line of the Bangor & Aroostook Railroad passes about 500 feet west of the head of the lake some 50 feet above ordinary water level. The Medford extension of this same railroad (built during 1907) skirts the eastern shore and in places is only above ordinary lake surface. The Canadian Pacific R. R. runs by the southern end of the lake and along its west shore for a short distance. At its lowest it is about 12 feet above lake surface.

An old broken down and decaying timber dam exists at the outlet of Schoodic Lake situated about 600 feet downstream from the Bangor and Aroostook railroad bridge, and owned by the American Spool Co. It is very irregular in shape and some 250 feet long and controls a 3-foot head. Originally there were two sluice gates each about 7 feet wide, but at present one gate is entirely gone, and the other leaks badly.

An increased depth of water of from 8 to 10 feet above ordinary level could be obtained by placing a dam some 700 feet above the old dam and 100 feet above the Bangor & Aroostook R. R. bridge. Considerable damage would be entailed by such change of lake level, however, as Schoodic Lake is rapidly becoming a popular summer camping place and there are numerous public and private camps on its shores. Further, the settlement at Lakeview, mostly the buildings of the American Spool Co., would be affected by a rise of more than 5 feet, as would also the new Medford Extension of the Bangor and Aroostook R. R. so that it is doubtful whether any elevation of water surface greater than 2 or 3 feet above the present level is feasible.

The drainage area at the mouth of Schoodic Lake is 32 sq. miles, and it is probable that the present dam, if properly repaired, would control the run-off. The area and capacity of Schoodic Lake at different elevations are given in the following table.

Area and capacity of Schoodic Lake.

DRAINAGE AREA 32 SQUARE MILES.

Elevation.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
428.5	10.65	....	....	Probable elevation of outlet.
430.0	10.75	447,500,000	447,500.000	
432.5	10.92	754,800.000	1.202,300.000	Probable present limit of storage.
435.0	11.07	766,700,000	1.969.000,000	Probable limit of storage on account of damage.
437.5	11.18	775 000,000	2,744,000,000	
440.0	11.29	782,700,000	3,526,700,000	

Seboois Lake.

Seboois Lake lies in townships 8 and 9 R. 4 N. W. P., the larger part in township number 8. It runs in a general direction north and south, and is shaped like a long, narrow, equilateral triangle with two bays leading from each side, one at about the middle of the eastern shore leading to the outlet stream and a bay on the eastern shore leading to the "thoroughfare" to Northwest Pond which is at the same elevation as Seboois Lake. Seboois Lake is 6.8 miles long with a maximum width of 1.4 miles near its northern end and is about 440 feet above mean tide, at this level having an area of water surface of 6.2 square miles. There are numerous islands in the lake, the largest being Leyford Island near the western shore and about midway of the lake, which is over a mile long and about half a mile wide. North of Leyford Island the lake averages 50 feet deep, with a maximum depth of 80 feet just northeast of the lake. South of Leyford Island the lake is rather shallow.

All the northern shore is low, this low land extending back for a mile or more to the vicinity of the Bangor & Aroostook R. R. the northeastern inlet flowing through a long narrow swamp extending back several miles. Other low areas exist near the east outlet and in the vicinity of the "thoroughfare" to Northwest Pond. The remaining shores are in general rough, and rise fairly steep from the waters edge.

Northeast inlet is the most important entering stream although there are one or two smaller entering brooks. The outlet bay is a long gradually narrowing and winding arm of the lake about a mile in length and the outlet, Seboois Stream, flows into Endless Lake, about 1.5 mile distant, and thence to the Piscataquis River.

A timber crib dam with main portion about 40 feet long and wings aggregating 250 feet in length, controls the outlet of Seboois Lake, affording a head of about 8 feet, regulated by two gates. No ledge appears at the dam and it is probable that only a gravel foundation exists. The storage possibilities of Seboois Lake are discussed under Northwest Pond.

Northwest Pond.

Northwest Pond, or Little Seboois Lake as it is often called, is situated in township 4 range 9 N. W. P. and is practically a part of Seboois Lake, being separated from it only a short distance by a "thoroughfare" which affords boat connection between the two lakes. It lies west of the northern portion of Seboois Lake, being separated from it by the "Tongue" with an average width of about half a mile.

Northwest Pond runs northwest to southeast. It is 1.4 miles long and about half a mile wide and is at the same elevation as Seboois Lake with a pond area of about one half square mile.

The Medford extension of the B. & A. R. R. passes about 800 feet west of the pond and joins the main line of the railroad in the vicinity of the Northwest Pond station. The railroad at its lowest point is about 4.5 feet above pond surface.

The eastern shore of the lake has a gradual rise but in general all the other shores of the pond are low. At the northern end a large swamp extends back to the railroad and swings around toward the low land at the head of Seboois Lake.

The only stream of any size entering the pond is at the northeastern end and this comes from a limited drainage.

Storage Possibilities of Seboois Lake and Northwest Pond.

The contour of the ground at the present dam controlling the outlet of Seboois Lake, and consequently Northwest Pond, would admit of an increase in height of from 5 to 8 feet without greatly increasing its length. To reach the 20-ft. level above ordinary water surface would require a total length of dam of over 2000 feet and a 10-foot rise would require about a 1700-foot dam.

There are several camps on both Seboois Lake and Northwest Pond which would be affected by any considerable increase in water level, and moreover the railroad near Northwest Pond would be affected by any rise of over 4 or 5 feet.

The drainage area at the outlet of Seboois Lake is 49 square miles, and it is probable that little rise in water level at this point would be practicable.

The area and capacity of Seboois Lake, including Northwest Pond at different elevations are given in the following table:

Area and capacity of Seboois Lake and Northwest Pond.

DRAINAGE AREA 49 SQUARE MILES.

Elevation.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
432.0	5.63	....	....	Probable elevation of outlet.
432.5	5.69	78,900,000	78,900,000	
435.0	5.93	404,900,000	483,800,000	
437.5	6.19	422,400,000	906,200,000	
440.0	6.4	439,100,000	1,345,300,000	Probable present limit of storage.
442.5	6.63	454,400,000	1,799,700,000	
445.0	6.82	468,400,000	2,268,100,000	Limit of storage on account excessive damage.

Endless Lake.

Endless Lake, or Trout Pond as it is sometimes called, is situated in township 3 range 9 N. W. P. and runs generally north and south. It is 4.3 miles long and fairly regular in shape, the eastern shore being almost a straight line. It is about 1.25 miles in maximum width and 400 feet above mean tide, at which elevation it has an area of water surface of 2.57 square miles. It is quite uniform in depth, the maximum being 35 feet near the middle and toward the southern end of the lake. There are several small islands. The shores are in general steep and the lake is surrounded on all sides by high hills either at or a little back from the shore. Seboois Stream enters from the west coming from Seboois Lake. Flat Iron Pond outlet enters near the northeastern end of the lake, this pond being about 3/8 mile from Endless Lake and some 40 feet above it.

A timber crib dam 77 feet in length with additional wings aggregating 130 feet in length controls the outlet of the southern end of the lake affording a head of about 8 feet, regulated by three gates. The contour of the shores in the vicinity of this dam is very favorable for an increased elevation of water surface. Probably an additional depth of 20 or 30 feet could be maintained without especial difficulty.

The drainage area at the outlet of Endless Lake is 66 sq. miles and about 10 square miles are water surface (principally Seboois and Endless lakes and Northwest Pond), and it is probable that a greater height of dam is not warranted. The area and storage capacity of Endless Lake at different elevations are given in the following table:

Area and Capacity of Endless Lake.

DRAINAGE AREA 66 SQUARE MILES.

Elevation.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
392.0	1.86	....	....	Sill of dam.
395.0	2.16	168,100,000	168,100,000	
397.5	2.38	158,200 000	326,300,000	
400.0	2.57	172,800,000	499,100,000	Crest of dam.
402.5	2.75	185,400,000	684,500,000	
405.0	2.90	196,500,000	881,000,000	Probable limit of storage due to lack of drainage area.
407.5	3.05	207,700,000	1,088,700,000	
410.0	3.80	217,500,000	1,306,200,000	

Lower Ebeemee Lake.

Lower Ebeemee Lake is situated mostly in the southeastern part of township 15 range 9, and is very irregular in shape being practically three different ponds joined by narrow channels. It drains into Pleasant River, a tributary of the Piscataquis. The most easterly one of the lakes has been examined with reference to diversion of water to Schoodic Lake. At the time of the observation, July 1907, the water surface of Ebeemee Lake was about elevation 425 feet above mean tide, or 5 feet lower than Schoodic Lake. The divide between these lakes rises perhaps about 30 or 40 feet above Ebeemee Lake.

There is said to be a dam about 50 feet long at the outlet of Ebeemee Lake controlling a head of 8 feet and used for log driving, which could be raised sufficiently to cause diversion as noted above. The distance across between the two lakes is between 1.5 and 2 miles, and such a diversion would afford an additional tributary drainage to Schoodic Lake. Considering the large fall of Schoodic Stream (over 200 feet in some 4 miles) this diversion may sometime be brought about.

This storage is also of importance in connection with power development on Pleasant River, and could be utilized for this purpose in connection with storage in "B" Pond, Silver Lake and Houston Pond in the same basin.

Sebec Lake.

Sebec Lake, Piscataquis County, lies in the towns of Willimantic, Foxcroft, Sebec, and township 7 range 8. The lake lies in a generally east and west direction, the western portion becoming long and narrow. The shores are quite steep on the north portion, becoming much lower on the south. The northern drainage extends nearly to Moosehead Lake while the southern closes into that of the Piscataquis River.

Sebec Lake is fed by a number of ponds and lakes, the principle ones being Onawa Lake, Long Pond, Bear Pond, the three Buttermilk Ponds, Benson Pond, Monson Pond, Hebron Pond, Spectacle Pond, Grindstone Pond, Davis Pond, Little Bennet and Big Bennet ponds, Beaver and Wilson Pond.

Many of these ponds and lakes could be made to store more than at present, some of them already having dams at their outlets.

It is estimated that the area of these ponds is about equal to the area of Sebec Lake.

Sebec Stream flows into the Piscataquis River in the town of Milo, about 7 miles from the outlet of the lake at Sebec Village. A dam at the outlet of the lake formerly furnished power to run several mills. Nearly all of these have disappeared, at the present time very little power being used. The village of Sebec is located about 6 miles from railroad facilities, transportation being handicapped upon this account.

The present dam at the outlet is a timber crib structure in poor repair. The head obtained by this dam will average perhaps 11½ ft. With a 12-ft. head, the water is at the top of gates with 4 ft. flowing over wasteway. It is estimated that an additional head of 3 ft., or a total of 15 ft., would flow out many cottages located upon the south shore of the lake, but excepting this damage an additional 5-ft. head or a total of 17 feet, would not do excessive damage to cultivated land or timber.

Only a part of the fall has been developed at the outlet, as the stream has considerable fall for some distance below, a part of which, at least ,could be utilized.

According to the old inhabitants, the flow is fairly steady even in dry years, and freshets are not felt to any large extent.

The drainage area for the most part is thickly wooded with mixed growth, there being about 367 square miles tributary to the outlet at Sebec village.

The following table gives the area and capacity of Sebec Lake at different elevations:

Area and capacity of Sebec Lake.

DRAINAGE AREA 367 SQUARE MILES.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.	Remarks.
315.3	9.08	....	....	Sill of gates.
316.7	9.32	359,074.000	359,074,000	
321.7	10.19	1,360.466,000	1,719.540,000	
326.7	10.83	1,465.010,000	3,184.550,000	Water surface, September 10.
327.3	10.93	181,990,000	3,366,540,000	
331.7	11.66	1,386,114,000	4,752,654,000	Top of dam.

Silver Lake.

Silver Lake is the source of the main Pleasant River. It is located in Katahdin Iron Works township, at the terminal of a branch railroad. The remains of the old iron furnaces that were formerly operated are at the outlet of the lake. The dam at the outlet is a timber structure in fair repair that is now used largely for log driving purposes. Little damage except to standing timber would arise from increasing the height of the dam and enlarging the capacity. The additional storage would benefit the power development below. The drainage area is 104 square miles and is a heavily wooded, mountainous country.

The following table gives the areas and capacities of this lake at various elevations:

Area and capacity of Silver Lake.

DRAINAGE AREA 104 SQUARE MILES.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.	Remarks.
587.3	0.29			
587.6	0.31	2,509.000	2,509.000	Sill of gates.
592.3	0.57	57.653.000	60.162.000	Water surface, August 15, 1910.
593.1	0.70	14,274,000	74.436,000	Top of dam.
597.3	1.37	121,773,000	196.209,000	
606.3	2.10	242.542.000	438.751.000	
611.3	2.63	328,965,000	767,716,000	

Houston Pond.

Houston Pond is located in Township 7 Range 9 and 4 miles southwest of Silver Lake. The dam is a crib structure in poor repair. The only damage to the raising of the level of the lake would be to a few summer cottages and to the timber land that would be flooded. The area drained is 21 square miles.

The following table gives the areas and capacities of this pond for various elevations:

Area and capacity of Houston Pond.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.	Remarks.
817.2	0.99			
819.3	1.02	58,545,000	58,545,000	Sill of gates.
822.2	1.07	84,081.000	142,626,000	Water surface August 11, 1910.
827.2	1.14	153,331,000	295,957.000	
830.3	1.19	100,251,000	396,208,000	Top of dam.
832.2	1.22	63,563,000	459,771.000	
837.2	1.30	175,634,000	635,405,000	

ADDITIONAL STORAGE BASINS.

Cold Stream Pond.

Cold Stream Pond is really a series of ponds located mostly in the towns of Enfield and Lincoln, and having a total water surface of about 10 square miles. The ponds are irregular in shape, the largest having an area of about 8 square miles. The outlet, a stream of the same name, is about 4½ miles in length, and in turn flows into Passadumkeag Stream. The drainage area of Cold Stream is about 37 sq. miles.

The basin is mostly wooded and but sparsely settled.

This pond would be an excellent source for obtaining the water supply for some town or city. The surface area is about 6 sq. miles.

Nicatous Lake.

Nicatous Lake is situated in townships 3 N. D., 4 N. D., 40 M. D. and 41 M. D.

The area of this lake is about 10 square miles, and it is probable that the water surface can be raised, so that 10 feet would be available for storage purposes. A dam already exists at the outlet.

The lake flows by a stream of the same name into Passadumkeag Stream, which joins the Penobscot at the village of Passadumkeag, about 5 miles below the outlet of the Piscataquis.

The lake is fed by several brooks some of which have their rise in small ponds, the three principle ones being Duck and Gassabias lakes and West Lake, with a total area of perhaps 5 square miles.

Dams exist at the outlets of the two latter lakes, although it would probably not take an excessive rise of Nicatous to flow them. There is probably too much drop between Duck Lake and Nicatous to flow out the former.

The waters of Nicatous approach very closely to those of the Machias River.

Pushaw Lake.

Pushaw Lake is located in the towns of Hudson, Glenburn, Old Town and Orono. Its greatest length is about 7½ miles, and its greatest width about 2½ miles. The northerly three quarters will average from ½ to ¾ mile in width. Several islands and ledges appear. The lake lies nearly north and south, and has an area of about 7.5 square miles. It is chiefly fed by springs and bogs, having but one inlet, a stream of the same name as the lake. This stream has several branches, the most of which drain very low country, until reaching the town of Hudson, located about 2½ miles from the lake, when it flows between higher land which again becomes a marsh before reaching the lake.

The outlet, Pushaw Stream, leaves the lake 1½ miles from the inlet, at the northerly end, and joins the Penobscot a short distance above the city of Old Town. The drainage area at this point is about 263 square miles, which includes that of Dead Stream which joins Pushaw Stream about 1½ miles below the lake, and which has its rise in a small lake called Boyd Lake, located about 2½ miles south of the Piscataquis branch.

The westerly shores of the lake hold good with much high land, while to the south and east much low country appears, which during the spring, is entirely overflowed. This territory includes a pond of perhaps ½ square mile, called Mud Pond, which is only a bog hole, draining into the stream.

The elevation of the lake as given on the topographic sheet

(Bangor Quadrangle) is 117 feet above mean tide. If the surface should be raised three feet, or to contour 120, an area of over 26 square miles would be covered. This does not include the flowage likely to occur north of that part of Pushaw Stream flowing through the town of Alton.

Many summer cottages appear along the southern half of the lake, and a number of farms are located on the higher land to the west. The most of the land to the east is unfit for use from 1 to 1½ miles.

Area and capacity of Pushaw Lake.

DRAINAGE AREA 125 SQUARE MILES.

Elevation.	Area, square miles.	Capacity section, cubic feet.	Total capacity, cubic feet.	Remarks.
117	7.5			
120	22.0	1,233,600,000	1,233,600,000	

Phillips Lake.

Phillips Lake lies wholly in the town of Dedham, about 10 miles southeast from Bangor, and has an area of about 1.4 sq. miles.

It drains an area of about 11.5 square miles, and the water is apparently of excellent quality and of considerable depth. The shores are generally rocky, and the adjacent country mostly wooded and but sparsely settled.

The lake has two drainage outlets. The greater amount of water flows from the north end of the lake northward through the village of East Holden, thence southward through Long Pond, and into Penobscot River below Bucksport. The total length of this outlet is 18 miles. The other outlet, situated at the southeast end of the lake, flows into Green Lake and thence into Union River. There is a flow through this outlet only during medium and high stages.

SUMMARY OF STORAGE.

The following is a summary of the storage in Penobscot valley as given in the preceding descriptions of the different lakes. It should be noted that the present more important developed storage area amounts to 156.4 square miles and that the area available for storage possibilities is 202.4 square miles. Wells gives the aggregate area of the lakes belonging to this system as about 585 square miles, the principle ones, however, above tide water amounting to 434 square miles. It is thus seen that, although the following summary comprises all of the more important lakes, there are more smaller ones widely scattered, which, although relatively unimportant, are capable of increased storage.

Principal Storage in Penobscot Basin.

LAKE.	Drainage area.	Present storage, cubic feet.	Available storage, cubic feet.
West Branch:			
Twin Lake System	1,880	11,410,000,000	14,880,000,000
Ripogenus Lake	1,410	301,100,000	9,301,100,000
Chesuncook Lake	1,330	13,600,000,000	17,600,000,000
Caucogomuc Lake	174	1,357,950,000	2,872,850,000
East Branch:			
Allagash Lake	102	1,320,000,000	7,325,400,000
Chamberlain Lake	270	4,728,000,000	14,742,000,000
Telos and Round Ponds	270	1,000,700,000	3,062,400,000
Webster Lake	288	198,500,000	722,100,000
Grand and Second Lakes	496	1,959,000,000	5,277,800,000
Mattawamkeag River:			
Baskahegan Lake	115	2,468,000,000	15,070,000,000
Mattawamkeag Lake	305	1,331,500,000	1,501,000,000
Pleasant Pond	79	....	802,280,000
Piscataquis River:			
Schoodic Lake	32	1,202,300,000	1,969,000,000
Seboois Lake and Northwest Pond	49	1,345,300,000	2,268,100,000
Endless Lake	66	499,100,000	881,000,000
Silver Lake	104	74,440,000	767,720,000
Houston Pond	21	396,210,000	635,410,000
Sebec Lake	367	3,366,540,000	4,752,650,000
Main River:			
Pushaw Lake	125	....	1,233,600,000
Total	....	46,558,590,000	105,664,410,000

The following table, summarizing the storage in Penobscot basin, is taken mainly from Well's report, such corrections and additions being made as are possible with the data at hand. In general, the areas of water surface as given by Wells are too large. Unless more or less definite knowledge to the contrary was at hand the areas as given by him have been assumed to be correct.

Summary of Storage in Penobscot Basin Connected with West Branch.

LAKE.	Approximate surface area, square miles.	Present storage.	Additional available storage.
South Twin Lake	24.9	25 feet.	
North Twin Lake			
Pemadumcook Lake			
Ambejejus Lake			
Jo-Mary Upper Lake	3.00		
Jo-Mary Middle Lake	2.50		
Jo-Mary Lower Lake	3.00		
First Debsconeag Lake,	0.75		
Second Debsconeag Lake	1.00		
Third Debsconeag Lake	2.50		
Nahmakanta Lake	3.00	8	
Rainbow Lake	3.75	4 to 6	
Sourdnahunk Lake	3.75	....	4
Five Ponds in A. R. 11	4.75	Dam.	
Penobscot Pond	1.00		
Three Ponds west of Nahmakanta Lake	2.50	Two flowed 4 to 6	
Ragged Lake	4.00		
Harrington Lake	4.00	Some.	
Ripogenus Lake	1.10	10	46 (Proposed).
Chesuncook Lake	32.10	22	4
Duck Pond	2 00	Several feet.	
Cuxabexis Lake	2.00	2	5 to 6
Umbazooksus Lake	1.25	4	
Longley Pond	1.50	7	
Black Pond	1.00		
Shallow Lake	2.50	6	
Poland Lake	0.75		
Caucogomoc Lake	7.00	8	7
Round Pond	1.25		
Daggett Pond	1.00		
Loon Pond	3.00	....	Dam feasable.
Two Ponds above Loon	1.25		
Hurd (2)	1.50		
Wadleigh Pond	0.75		
Pine Stream two Ponds	1.00		
Lobster Lake	6.00		
Russell Pond	1.00	5 to 6	
Elm Pond	0.90		
Nulhedus Pond	1.00		
Two Ponds in 3 R. 3	1.25		
Jones and Hale Ponds	1.50		
Penobscot Lake	1.50		
Lang and Dole Ponds	1.50		
Shirley Pond	0.75		
Salmon Stream Pond	2.00		
Nollesemic Pond	2.5		
Quakish Pond	1.5		
Shad Pond	0.75		
Millinocket Lake	11.0		
Katahdin Pond in 2 R. 9	2.0		
	161.50		

Connected with East Branch.

Lake.	Approximate surface area, square miles.	Present storage.	Additional available storage.
Katahdin Pond	0.65		
Lunksoos Pond	1.5		
Bowlin Pond	1.1	4	
Upper Bowlin (2)	0.85	....	Several feet.
Grand Lake / Second Lake	6.63	14	10
Third Lake	1.75	10	
Fourth Lake	0.9	12	
Flowage above Fourth Lake	1.0	Several feet.	
Snake Pond	1.0	7	
Big Leadbetter Pond	0.8	10	
Upper Shin Pond	1.3	....	12 to 20
Lower Shin Pond	2.25		
Perry Pond	1.0		
First Lake	1.1	5 to 6	
Second Lake	1.1	5 to 6	
Seboois Lake	4.75	5 to 6	
Five Ponds in 6 R. 8	3.0		
Scraggly Lake	3.0		
Big Pond	1.5		
Webster Lake	1.0	8	10 feet or more.
Hudson and Blunder Pond	1.5	Several feet.	
	37.68		

Artificially connected with East Branch.

Lake.	Approximate surface area, square miles.	Present storage.	Additional available storage.
Telos Lake / Round Pond	3.85	10	15 to 20
Chamberlain Lake	17.0	10	15 to 20
Leadbetter Lake	0.6	8	
Big Leadbetter Bog	0.75	Flowed.	
Doddle Brook Flowage	0.9	8	
Allagash Lake	7.0	7	20
Mud Pond in 9 R. 15	2.0		
	32.10		

Connected with Mattawamkeag River.

Lake.	Approximate surface area, square miles.	Present storage.	Additional available storage.
Mattakeunk Pond	1.5	Dam	Can be made fine reservoir.
Mud Pond	0.6		
Molunkus Pond	3.0		
Benedicta Pond	0.75		
Mackwacook Pond	1.0		
Wytopitlock Pond	3.25		Can be made fine reservoir.
Brayley Lake	0.75		
Holbrook Pond	3.5		
Baskahegan Lake	16.4	7	10 to 12
Pond in 3 R. 3	1.0		
Mattawamkeag Lake	6.02	9	1
Caribou Pond	1.5		
Pleasant Pond	2.5	4	8½
Pond in Island Falls	1.0		
Sketicook Lake	1.25		
Spauldings Lake	2.5		
Rockabema Lake	2.25	5	Several feet.
Ponds in Moro	2.50		
Mud Lake	1.25	8	
	52.52		

Connected with Piscataquis River.

Lake.	Approximate surface area, square miles.	Present storage.	Additional available storage.
Seboois Lake and N. W. Pond	6.4	8	5
Endless Lake	2.57	8	5
Cedar Pond	1.1		
East Branch Pond	1.2		
Schoodic Lake	10.92	4	3
Dover Pond	0.7	6	More.
Harlow (2)	0.5	6	Lower Outlet.
Kingsbury Pond	3.0	10	More.
Sangerville Ponds	0.9	Dams.	
Piper Pond	1.25		Dam feasable.
Upper Piper Pond	0.35		Dam feasable.
Spectacle Pond	1.1	Dam	10
Lower Ebeeme Lake	2.25		
Upper Ebeeme Lake	1.25		
Sebec Lake	10.66	8	9
Long Pond	1.0		4
Onawa Lake	3.0	Dam	10
Hebron Pond	2.0	Dam.	
Monson Pond	0.4		Several feet.
Bowdoin College 3 pond	2.0		
Wilson Pond	2.25	7	Several feet.
Houston Pond	1.19	13	
B. Pond	1.0		
Bald Mountain Pond	2.0	4	4
Shirley Bog	8.0	7 on 2 square m.	Can be made large reservoir.
Silver Lake	0.70		
	67.69		

Connected with Passadumkeag River.

Lake.	Approximate surface area, square miles.	Present storage.	Additional available storage.
Cold Stream Pond	6.00	Dam.	10 can be held.
Second Cold Stream Pond	0.95	8	
Clear Water Pond	0.8	8	
Escutassis (2)	1.4	8	
Saponac Pond	1.3		
Madagascal Pond	1.7	7	
Two ponds above	0.25	6 (larger).	
Spring Pond	0.2		
No. 3 Pond	1.0		
First Pistol Pond	1.0	6	
Second, Third and Fourth Pistol Lake	0.5	8	
Porter Pond	0.2		
Nicatous Lake	10.0	10	
West Lake	2.0	7	
Duck Lake	2.0	9	
Gassabias Lake	1.0	6	
Coombs Lake	0.15	5	
Ware Pond	0.8		
	31.25		

Connected with Main River Above Tide Water.

Lake.	Approximate surface area, square miles.	Present storage.	Additional available storage.
Pushaw Lake	7.5	....	3 to 5 feet.
Boyd Lake	1.75		
Little Pushaw Lake	0.9		
Mud Pond	0.75		
Chemo Lake	3.0		
Pickerel Pond in Alton	0.5	Dam.	3 feet over 1.75 square miles.
Davis Pond	0.9	Dam.	
Hoolbrooks Pond	0.9		
Mattanawcook Pond	1.3	Dam.	
Crooked Pond	0.7	Dam.	
Fulsom Pond	0.4	Dam.	
Upper Pond	1.2	Dam.	
South Branch Lake	4.5		
Mattamiscontis Pond	2.0		
Lower Mattamiscontis Pond	0.9		
Cambolasse Pond	0.65	Dam.	
Long Pond	1.0	Dam.	
Caribou Pond	0.85	Dam.	
Center Pond	0.3	Dam.	
Madunkeunk Pond	1.0		
Mattaceunk Lake	2.5		
	33.50		

Summary of Areas of Principal Lakes and Ponds in Penobscot Basin.

	Square miles.
West Branch	161.50
East Branch	37.68
Artificially with East Branch	32.10
Mattawamkeag River	52.52
Passadumkeag River	31.25
Piscataquis River	67.69
Main River above tide water	33.50
Total	416.24

Wells gives a total area for the above at 434.2.

The total reservoir surface of the Penobscot Valley as estimated by Wells, is given as 585 square miles. It is probable that this figure is too large, 550 square miles probably being nearer to the correct figure. This latter figure correspond to a ratio of water surface to total drainage area of about 1 to 15.6.

STREAM FLOW.

The following gaging stations have been maintained in the Penobscot River basin:

West Branch Penobscot River at Millinocket (1901-1910)
Penobscot River at West Enfield (1902-1910)
East Branch Penobscot River at Grindstone (1902-1910)
Mattawamkeag River at Mattawamkeag (1902-1910)
Piscataquis River at Foxcroft (1902-1910)
Cold Stream at Enfield (1904-1906)
Kenduskeag River near Bangor (1908-1910)
Phillips Lake and outlets (1904-1908)

WEST BRANCH PENOBSCOT RIVER AT MILLINOCKET, MAINE.

The discharge of the Penobscot River at Millinocket has been furnished since 1901 by H. S. Ferguson, engineer of the Great Northern Paper Company.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1901, No. 82 pp. 19-21.
1902, No. 82 pp. 19-21.
1903, No. 97 pp. 26-27.
1904, No. 124 pp. 36-37.
1905, No. 165 pp. 33-35.
1906, No. 201 pp. 34-35.
1907, No. 241 pp. 52-55, 342.
1908, No. 241 pp. 52-55, 342.

Run-off of West Branch Penobscot River at Millinocket, Maine, in second-feet per square mile and depth in inches. Drainage area, 1880 square miles.

	1901.		1902.		1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	.76	.88	1.13	1.30	.87	1.00	.17	.20	1.18	1.36	.21	.25	1.08	1.24	1.66	1.91	.74	.85	1.14	1.31	.89	1.03
February	.87	.91	1.21	1.26	.99	1.03	.19	.21	1.16	1.21	.40	.41	.80	.83	1.52	1.64	.43	.45	2.16	2.25	.97	1.02
March	.86	.99	2.86	3.30	3.07	3.54	.28	.32	.92	1.06	.37	.42	.20	.23	1.59	1.83	.72	.83	2.16	2.49	1.30	1.50
April	5.02	5.60	6.26	6.98	7.07	7.89	.53	.59	1.18	1.32	.64	.71	.77	.86	1.56	1.74	1.30	1.45	1.34	1.50	2.57	2.86
May	3.50	4.04	5.03	5.80	3.43	3.95	2.71	3.12	3.22	3.71	3.67	4.23	3.76	4.34	5.43	6.26	4.97	5.73	3.03	3.49	3.88	4.47
June	1.41	1.57	5.00	5.58	1.13	1.26	1.96	2.19	1.42	1.58	2.56	2.86	3.69	4.12	3.68	4.11	2.46	2.74	2 86	3.19	2.62	2.92
July	1.91	2.20	1.28	1.48	1.29	1.49	1.76	2.03	1.27	1.46	1.93	2.22	2.77	3.19	2.02	2.33	1.76	2.03	1.52	1.75	1.75	2.02
August	1.37	1.58	1.39	1.60	1.77	2.04	1.81	2.09	1.63	1.88	1.71	1.97	1.85	2.13	1.32	1.52	1.23	1.42	1.23	1.42	1.53	1.76
September	1.38	1.54	1.16	1.29	1.02	1.14	1.14	1.27	1.22	1.36	1.08	1.20	1.14	1.27	1.06	1.18	1.21	1.35	1.25	1.40	1.17	1.30
October	.73	.84	1.22	1.41	.42	.48	1.17	1.35	.78	.90	1.09	1.26	1.44	1.66	.94	1.08	1.20	1.38	1.18	1.36	1.02	1.17
November	.35	.39	1.30	1.45	.21	.23	1.22	1.36	.23	.26	1.10	1.23	3.83	4.27	.92	1.02	1.18	1.32	1.14	1.27	1.15	1.28
December	.62	.71	1.41	1.63	.23	.26	1.15	1.33	.22	.25	1.08	1.24	2.40	2.77	.98	1.13	1.16	1.34	1.14	1.31	1.04	1.20
Total	......	21.25	......	33.08	.....	24.31	......	16.06	......	16.35	......	18.00	......	26.91	......	25.75	......	20.89	......	22.74	......	22.53
Mean	1.56	......	2.44	......	1.79	......	1.18	......	1.20	......	1.32	......	1.98	......	1.89	......	1.53	.....	1.68	......	1.66	......

PENOBSCOT RIVER AT WEST ENFIELD, MAINE.

This station, which has been maintained to obtain data regarding the total flow of the Penobscot, was established November 5, 1901, and prior to 1904 was designated as being at Montague, Maine. In 1904 the name of this village was changed to West Enfield. It is located at the steel highway bridge about 1,000 feet below the mouth of Piscataquis River. There is a dam on Piscataquis River near its entrance into the Penobscot, and about a mile above the station is the dam of the International Paper Company, on the main river. During low water considerable daily fluctuations in gage height occur, due to the variations in wheel gate openings at the mills above.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1901 No. 65, p. 15, No. 82, p. 18.
1902 No. 82, pp. 16-18, No. 97 p. 31.
1903 No. 97, pp. 28-32.
1904 No. 124, pp. 37-40.
1905 No. 165, pp. 35-37.
1906 No. 201, pp. 35-37.
1907 No. 241, pp. 56-58, 342.
1908 No. 241, pp. 56-58, 347.

Run-off of Penobscot River at West Enfield, Maine, in second-feet per square mile and depth in inches. Drainage area, 6,600 square miles.

	1902.		1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	1.28	1.48	......	......	......	......	......	......	......	......	1.03	1.19	1.71	1.97	1.35	1.56	1.96	2.26	1.47	1.69
February	1.67	1.74	......	......	......	......	......	......	......	......	.60	.62	1.58	1.70	1.24	1.29	2.19	2.28	1.46	1.53
March	9.64	11.11	8.06	9.29	......	......	......	......	......	......	.44	.51	1.70	1.96	1.52	1.75	2.17	2.50	3.92	4.52
April	6.16	6.87	5.55	6.19	4.54	5.06	3.66	4.08	6.68	7.45	2.67	2.98	3.42	3.82	6.52	7.27	4.19	4.68	4.82	5.33
May	3.68	4.24	2.21	2.55	5.56	6.41	2.48	2.86	6.12	7.06	6.10	7.03	5.97	6.88	5.86	6.76	2.99	3.45	4.54	5.25
June	4.46	4.98	1.02	1.14	1.99	2.22	1.24	1.38	2.13	2.38	3.02	3.37	2.70	3.01	1.99	2.21	2.53	2.82	2.34	2.62
July	2.12	2.44	1.13	1.30	1.29	1.49	.80	.92	1.29	1.49	2.67	3.08	1.20	1.38	1.29	1.49	1.26	1.45	1.45	1.67
August	1.49	1.72	1.03	1.19	1.04	1.20	.72	.83	1.03	1.19	1.64	1.89	.91	1.05	.77	.89	.93	1.07	1.06	1.23
September	.85	.95	.71	.79	1.09	1.22	.59	.65	.64	.71	1.15	1.28	.64	.71	1.61	1.80	.64	.72	.88	.98
October	1.14	1.31	.33	.38	1.54	1.78	.40	.46	1.24	1.43	1.53	1.76	.52	.60	2.35	2.71	.51	.59	1.06	1.22
November	1.38	1.54	.42	.47	1.11	1.24	.39	.43	1.66	1.85	3.39	3.78	.61	.68	1.73	1.93	.61	.68	1.26	1.40
December	1.17	1.35	.41	.47	1.00	1.15	......	......	......	......	2.55	2.94	.60	.69	1.47	1.70	.75	.87	1.14	1.31
Total	......	39.73	......	......	......	......	......	......	......	......	......	30.43	......	24.45	......	31.36	......	23.37	......	28.80
Mean	2.92	......	......	......	......	......	......	......	......	......	2.23	......	1.80	......	2.31	......	1.73	......	2.12	

EAST BRANCH PENOBSCOT RIVER AT GRINDSTONE, MAINE.

The gaging station was established October 23, 1902, at the Bangor & Aroostook Railroad bridge, one-half mile south of the railroad station at Grindstone. It is about 8 miles above the junction of the East Branch of the Penobscot with the Penobscot at Medway. No water power is used on the river above the station, but dams are maintained at the outlet of several of the lakes and ponds near the source of the river, and the impounded water is used for log driving.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey.

For 1902, No. 82, p. 22. No. 97, p. 34. No. 124, p. 41.
1903, No. 97, pp. 32-34.
1904, No. 124, pp. 40-43.
1905, No. 165, pp. 38-40.
1906, No. 201, pp. 38-39.
1907, No. 241, pp. 59-61, 342.
1908, No. 241, pp. 59-61, 342.

Run-off of East Br. Penobscot River at Grindstone, Maine, in second-feet per square mile and depth in inches.
Drainage area, 1100 square miles.

	1902.		1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	......	......	......	......	......	......	......	......	.73	.84	.84	.97	.24	.27	.97	1.12	.70	.80
February	......	......	......	......	......	......	......	......	......	......	.32	.33	.62	.67	.20	.20	.54	.56	.42	.44
March	......	......	6.94	8.00	......	......	......	......	......	......	.27	.31	.94	1.09	.22	.25	.60	.70	1.79	2.07
April	......	......	4.08	4.55	4.19	4.68	3.40	3.79	6.03	6.73	1.79	2.00	2.46	2.74	4.53	5.05	4.96	5.53	3.93	4.38
May	......	......	2.79	3.22	6.02	6.94	2.43	2.80	7.21	8.31	7.27	8.38	6.30	7.26	6.89	7.94	3.46	3.99	5.30	6.10
June	......	......	.89	.99	2.72	3.03	1.80	2.01	3.13	3.49	4.55	5.08	2.69	3.00	3.56	3.97	4.35	4.85	2.96	3.30
July	......	......	2.37	2.73	2.08	2.40	1.90	2.19	2.74	3.16	3.26	3.76	2.13	2.46	1.69	1.95	1.41	1.63	2.20	2.54
August	......	......	1.49	1.72	1.44	1.66	.73	.84	.33	.39	1.36	1.57	.76	.88	.70	.80	.47	.54	.91	1.05
September	......	......	.55	.61	.87	.97	.81	.90	.63	.70	.72	.81	.46	.52	2.25	2.51	.24	.27	.82	.91
October	1.36	1.57	.31	.36	1.54	1.78	.20	.23	.92	1.06	.62	.72	.34	.40	2.62	3.02	.19	.22	.90	1.04
November	1.03	1.15	.43	.48	.74	.83	.33	.37	1.22	1.36	3.14	3.50	.40	.44	1.75	1.95	.36	.40	1.04	1.16
December	.74	.85	......	......	......	......	......	......	......	......	2.70	3.11	.16	.18	1.34	1.54	.25	.29	1.04	1.19
Total	......	......	......	......	......	......	......	......	......	......	......	30.41	......	20.61	......	29.45	......	20.10	......	24.98
Mean	......	......	......	......	......	......	......	......	......	......	2.23	......	1.51	......	2.16	......	1.48	......	1.83	

MATTAWAMKEAG RIVER AT MATTAWAMKEAG, MAINE.

The gaging station, which was established August 26, 1902, is located at the Maine Central Railroad bridge in the village of Mattawamkeag, about half a mile from the mouth of the river.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey.

For 1902, No. 82, pp 22-23. No. 97, pp 35-38.
1903, No. 97, pp 35-38. No. 124, pp 44-47.
1904, No. 124, pp 44-47.
1905, No. 165, pp 41-43.
1906, No. 201, pp 39-41.
1907, No. 241, pp 62-65, 342.
1908, No. 241, pp 62-65, 342.

Run-off of Mattawankeag River at Mattawamkeag, Maine, in second-feet per square mile and depth in inches. Drainage area, 1500 sq. miles.

	1902.		1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	......	......	......	......	......	......	......	......	.89	1.02	1.99	2.29	1.03	1.19	1.71	1.97	1.40	1.62
February	......	......	......	......	......	......	......	......	......	......	.49	.51	1.67	1.80	1.17	1.22	2.06	2.14	1.35	1.42
March	......	......	8.97	10.34	......	......	......	......	......	......	.46	.53	1.52	1.75	1.79	2.06	2.11	2.43	2.97	3.43
April	......	......	5.77	6.44	6.86	7.65	6.09	6.80	9.14	10.20	4.46	4.98	4.52	5.04	9.27	10.34	5.38	6.00	6.44	7.18
May	......	......	2.04	2.35	7.68	8.85	2.58	2.97	6.82	7.86	6.05	6.98	6.11	7.04	6.47	7.46	3.12	3.60	5.11	5.89
June	......	......	.57	.64	2.04	2.28	1.12	1.25	1.75	1.95	2.65	2.96	2.33	2.60	1.13	1.26	2.05	2.29	1.70	1.90
July	......	......	.66	.76	.67	.78	.40	.46	.55	.64	2.84	3.27	.30	.35	.99	1.14	.73	.84	.89	1.03
August	.79	.91	.43	.50	.35	.41	.17	.19	.23	.26	1.57	1.81	.30	.34	.36	.42	.36	.41	.51	.58
September	.81	.90	.22	.25	.95	1.06	.14	.15	.15	.17	1.00	1.12	.13	.14	1.11	1.24	.18	.20	.52	.58
October	1.38	1.59	.16	.18	1.80	2.08	.06	.08	1.14	1.31	1.68	1.94	.29	.33	2.89	3.33	.10	.11	1.06	1.22
November	1.99	2.22	.49	.55	1.15	1.28	.36	.40	2.04	2.28	2.45	2.73	.61	.68	2.27	2.53	.47	.52	1.31	1.47
December	2.55	2.94	.62	.72	1.56	1.80	.97	1.12	......	......	2.94	3.39	.48	.55	2.21	2.55	.57	.63	1.49	1.72
Total	......	......	......	......	......	......	......	......	......	......	......	31.24	......	22.91	......	34.74	......	21.18	......	28.04
Mean	......	......	......	......	......	......	......	......	......	......	2.29	......	1.69	......	2.56	......	1.57	......	2.06	

PISCATAQUIS RIVER NEAR FOXCROFT, MAINE.

The gaging station, which was established August 17, 1902, is located at Lows Bridge, about half way between the villages of Guilford and Foxcroft, and is just above the mouths of Black and Salmon streams.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1902, No. 82, pp. 23-24. No. 124, pp. 47-50.
1903, No. 97, pp. 38-41. No. 124, pp. 47-50.
1904, No. 124, pp. 47-50.
1905, No. 165, pp. 44-46.
1906, No. 201, pp. 41-42.
1907, No. 241, pp. 65-67, 342.
1908, No. 241, pp. 65-67, 342.

Run-off of Piscataquis River near Foxcroft, Maine, in second-feet per square mile and depth in inches. Drainage area, 286 square miles.

	1902.		1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE.	
	Second-feet per square miles.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	......	......	2.10	2.42	2.81	3.24	......	......	1.75	2.02	2.87	3.31	2.24	2.58	1.46	1.68	2.20	2.54
February	......	......	......	......	1.24	1.34	2.41	2.51	......	......	.87	.91	2.78	3.00	4.40	4.58	2.38	2.48	2.35	2.47
March	......	......	10.05	11.59	5.21	6.01	4.00	4.61	......	......	1.05	1.21	3.08	3.55	5.56	6.41	3.50	4.04	4.64	5.35
April	......	......	5.72	6.38	10.70	11.90	8.79	9.81	16.46	18.36	8.39	9.36	7.66	8.55	13.00	14.50	7.97	8.89	9.84	10.97
May	......	......	1.01	1.16	9.04	10.40	3.06	3.53	8.29	9.56	9.27	10.69	8.29	9.56	7.06	8.14	2.08	2.40	6.01	6.93
June	......	......	2.17	2.42	1.14	1.27	1.41	1.57	1.65	1.84	2.16	2.41	1.43	1.60	.87	.97	2.41	2.69	1.66	1.85
July	......	......	.83	.96	1.39	1.60	.71	.82	.79	.91	3.19	3.68	.24	.27	.35	.40	.46	.53	1.00	1.15
August	.78	.90	.76	.88	.62	.72	.34	.40	.66	.76	1.56	1.80	.60	.69	.18	.21	.51	.59	.67	.77
September	1.07	1.19	.15	.17	1.16	1.29	.37	.41	.74	.82	2.09	2.33	.33	.37	3.09	3.45	.28	.31	1.03	1.15
October	1.81	2.09	.17	.20	2.10	2.42	.27	.31	1.66	1.91	4.16	4.80	.32	.37	2.10	2.42	.14	.17	1.41	1.63
November	2.28	2.54	.21	.23	1.41	1.57	.29	.33	2.24	2.50	6.57	7.33	.24	.26	1.56	1.74	.14	.15	1.66	1.85
December	1.35	1.56	1.16	1.34	.98	1.12	.38	.44	2.77	3.19	4.16	4.80	.52	.60	1.72	1.98	.43	.49	1.50	1.72
Total	......	......	......	......	......	42.06	......	27.99	......	......	......	51.34	......	32.18	......	47.38	......	24.42	......	38.38
Mean	......	......	......	......	3.09	......	2.07	......	......	......	3.77	......	2.86	......	3.50	......	1.81	......	2.83	

COLD STREAM AT ENFIELD, MAINE.

The station was established June 14, 1904, and was located at the highway bridge about three-fourths mile south of Enfield on the road to Passadumkeag. On September 12, 1904, to avoid backwater effects from Passadumkeag Stream the gage was taken from the highway bridge and placed about 200 feet below the old mill near Enfield post-office.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1904, No. 124, pp. 50-51. No. 201, pp. 42-44.
1905, No. 165, pp. 46-47. No. 201, pp. 42-44.
1906, No. 201, pp. 42-44.

Run-off of Cold Stream at Enfield, Maine, in second-feet per square mile and depth in inches. Drainage area, 26 square miles.

	1904.		1905.		1906.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	.88	1.01	.60	.70	.74	.86
February	......	......	.93	.97	.75	.78	.84	.88
March	......	......	1.01	1.16	.45	.52	.73	.84
April	......	......	1.62	1.81	2.78	3.10	2.20	2.46
May	......	......	2.56	2.95	4.12	4.75	3.34	3.85
June	......	......	1.38	1.54	5.88	6.56	3.63	4.05
July	......	......	1.39	1.60	2.53	2.92	1.96	2.26
August	......	......	.26	.30	1.38	1.59	.82	.94
September	1.53	1.71	1.05	1.17	1.14	1.27	1.24	1.38
October	2.05	2.36	.73	.84	1.03	1.19	1.27	1.46
November	1.29	1.44	.68	.76	.86	.97	.94	1.06
December	.87	1.00	.53	.61	.79	.91	.73	.84
Total	......	......	......	14.72	......	25.26	......	20.88
Mean	......	......	1.08	......	1.86	......	1.54	

KENDUSKEAG STREAM NEAR BANGOR, MAINE.

This station, which was established September 15, 1908, to obtain general statistical data regarding the total flow of the Kenduskeag Stream, is located at the wooden highway bridge about six miles northwest of the Bangor post office and is just below the Six Mile Falls, which is the best unutilized power development of the lower stretch of the river. The discharge at this point does not represent the actual discharge from the original or natural drainage basin of Kenduskeag Stream. A number of years ago an artificial cut was made for log driving purposes through a low divide between Souadabscook Stream and Black Stream, the latter a tributary of the Kenduskeag entering it about seven miles above the gaging station. During high stages in the Souadabscook a portion of its waters finds its way through the artificial cut into Kenduskeag. At low stages in the Souadabscook all of the flow continues down its own channel. It is believed that all of the flow of Black Stream is into the Kenduskeag and none into the Souadabscook. The drainage area of Kenduskeag Stream above the mouth of Black Stream is 136 square miles; at the gaging station, including all of Black Stream but none of Souadabscook, it is 191 square miles; at the mouth, under the same conditions, it is 214 square miles. The drainage area of Black Stream itself is 40 square miles. The monthly discharge data show the conditions actually existing at the station. The discharge per square mile and the depth in inches on the drainage area is not absolutely accurate on account of the conditions outlined above. There is no way of determining the area of the Souadabscook that contributes to the Kenduskeag discharge.

The datum of the gage has remained the same during the maintenance of the station. During the winter months the datum is somewhat affected by ice. Conditions for obtaining accurate discharge data are good and a good rating curve has been developed, although more measurements are needed at higher stages.

Run-off of Kenduskeag Stream near Bangor, Maine, in second-feet per square mile and depth in inches. Drainage area, 191 square miles.

	1908.		1909.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	....	....	2.82	3.25	2.76	3.18	2.79	3.22
February	....	....	.54	.57	1.98	2.06	1.26	1.32
March	....	....	5.15	5.94	5.21	6.01	5.18	5.98
April	....	....	13.10	14.62	3.03	3.38	8.06	9.00
May	....	....	3.10	3.57	1.32	1.52	2.21	2.54
June	....	....	.53	.60	.60	.67	.56	.64
July	....	....	.33	.38	.22	.25	.28	.32
August	....	....	.13	.15	.22	.26	.18	.20
September	.04	.04	1.82	2.03	.03	.09	.65	.72
October	.17	.20	2.38	2.74	.07	.08	.87	1.01
November	.69	.77	2.73	3.05	.14	.15	1.19	1.32
December	.48	.55	2.19	2.52	.53	.61	1.07	1.23
Total	....	....	....	39.42	....	18.26	....	27.50
Mean	....	....	2.90	....	1.35	....	2.02	

PHILLIPS LAKE AND OUTLETS IN HOLDEN AND DEDHAM, MAINE.

The gage at the northern outlet was established July 7, 1904, and discontinued July 1, 1908. It was located about 1¼ miles from the lake and about one quarter of a mile south of the village of East Holden.

The gage at the southeast outlet was established July 19, 1904. It was located at the highway bridge about 1½ miles southeast of Lake House railroad station. The flow through this outlet is proportional to the lake height.

The gage on Phillips Lake was established July 19, 1904, and discontinued July 1, 1908. It was originally located at a point on the east shore of the lake about 300 feet northwest of Dr. L. S. Chilcott's cottage. On December 6, 1904, its location was changed to the Maine Central Railroad bridge over the north end of Phillips Lake, being still referred to the same datum.

Information in regard to these stations is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1904, No. 124, pp. 52-54. No. 201,pp. 44-47.
1905, No. 165, pp. 48-51. No. 201, pp. 44-47.
1906, No. 201, pp. 44-48.
1907, No. 241, pp. 68-73, 342.
1908, No. 241, pp. 68-73, 342.

Run-off of Phillips Lake Outlet at Dedham and Holden, Maine, in second-feet per sq. mile and depth in inches. Drainage area, 12.3 sq. miles.

	1905.		1906.		1907.		1908.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	3.04	3.50	1.98	2.28	4.31	4.97	3.14	3.58
February	1.36	1.42	3.62	3.77	3.28	3.42	4·15	4.48	3.10	3.27
March	1.52	1.75	3.69	4.25	3.41	3.93	4.35	5.02	3.24	3.74
April	5.85	6.53	5.02	5.60	5.01	5.59	5.59	6.24	5.38	5.99
May	3.02	3 48	5.72	6.60	5.25	6.05	5.38	6.20	4.84	5.61
June	2.02	2.25	4.63	5.17	3.19	3.56	4.13	4.61	3.49	3.90
July	.78	·89	1.43	1.65	2.75	3.17	......	......	1.65	1.90
August	1.23	1.42	1.11	1.28	1.67	1.92	......	......	1.34	1.54
September	.33	.37	.70	.78	1.80	2.01	......	......	.94	1.05
October	.25	.28	.59	.68	1.61	1.86	......	......	.82	.94
November	.33	.37	2.97	3.31	3.08	3.44	......	......	2.13	2.37
December	1.33	1.53	1.10	1.27	3.97	4.58	......	......	2.13	2.46
Total	......	......	......	37.86	......	41.81	......	......	......	36.35
Mean	......	......	2.80	......	3.C8	.....	......	......	2.68	

ST. GEORGE RIVER.

This coastal stream drains an area of 228 square miles, emptying into the Atlantic Ocean west of Penobscot Bay. The lakes in the basin have a combined water surface area of 12 square miles.

WATER POWERS.

At the head of tide at the town of Warren, the Georges River Woolen Mills utilize a head of about 15 feet developing 150 horsepower. At their upper dam, at the old powder mill site ½ mile above their mill, a fall of 10 feet is utilized, one 6-ft. wheel is installed capable of generating 150 horsepower. The generator capacity is 90 kilowatts.

At the town of Union a head of 12 feet is utilized by four companies. The five wheels are rated at 125 horsepower.

One and one-half miles above the town are saw mills developing perhaps 50 horsepower.

At North Appleton 10 ft. is utilized and 75 horsepower developed.

At Searsmont under a head of 14 ft., 50 horsepower is developed.

At Liberty four privileges utilize heads from 8 to 15 feet, developing a total of 170 horsepower.

At South Union on Crawford Stream, are a number of good but small powers; a uniform flow results from the regulation of Crawford Pond. Five separate heads, totaling 90 feet, have been developed to upwards of 117 horsepower.

The following table gives the lakes in this basin with their surface areas.

Lakes and Ponds in St. George River Basin.

Lake or Pond.	Area water surface, square miles.	Lake or Pond.	Area water surface, square miles.
South Pond	1.05	Trues Pond	0.30
North Pond	0.50	St. George Pond	1.38
Seven Tree Pond	0.54	Stevens Pond	0.75
Crawford Pond	1.05	Lake Pond	2.00
Round Pond	0.35	Lermond Pond	0.50
Western Pond	0.30	Hobbs Pond	0.25
Senebec Pond	0.60	Southern Hobbs Pond	0.75
Quantabacook Pond	1.35	Fish Pond	0.40
		Total	12.07

MEDOMAC, PEMAQUID, DAMARISCOTTA AND DYERS RIVERS.

Medomac River, adjoining St. George River on the west, drains 62 square miles. At Waldoboro there are 8 powers, with a total fall of about 80 feet.

Damariscotta River drains 43 square miles above the lowest fall. At the outlet of the pond of the same name there are falls of 52 feet in a distance of about 400 feet. A power development company here have wheel installations of 425 horsepower.

In the town of Bristol, Pemaquid River falls 50 feet in the 500 feet from tide. The 195 horsepower developed here is quite constant.

Dyers River drains about 38 square miles. At North Newcastle, a 12-foot head, and at South Jefferson a 14-foot head are developed.

The following table gives the lakes in this basin with their surface areas.

Lakes and Ponds in Medomac, Pemaquid, Damariscotta and Dyers River Basins.

LAKE OR POND.	Stream.	Area water surface, square miles.
Medomac Pond	Medomac	0.75
Little Medomac Pond	Medomac	0.25
Washington Pond	Medomac	0.63
Clarks Pond	Medomac	0.50
Damariscotta Pond	Damariscotta	6.21
Muscongus Pond	Muscongus	0.50
Biscay Pond	Pemaquid	1.00
Pemaquid Pond	Pemaquid	2.00
Duck Pond	Pemaquid	0.30
Dyers Long Pond	Dyers	1.20
Dyers Pond	Dyers	0.20
		13.59

SHEEPSCOT RIVER.

This is the westernmost of the coastal basin streams between the Penobscot and Kennebec rivers. It drains about 248 sq. miles.

The first development is at Head Tide where 10 feet was formerly utilized. At Whitefield a new grist mill has lately been erected. Other power developments on the West Branch are at Coopers Mills, Weeks Mills and Palermo.

The following table gives the lakes in this basin with their surface areas.

Lakes and Ponds in Sheepscott River Basin.

Lake or Pond.	Area water surface, square miles.	Lake or Pond.	Area water surface, square miles.
Pleasant Pond	0.94		
Travel Pond	0.60	James Pond	0.80
Patricktown Pond	1.00	Sheepscott Great Pond	1.50
		Total	4.34

KENNEBEC RIVER DRAINAGE BASIN.

DESCRIPTION.

Kennebec River rises in Moosehead Lake, in the west central part of Maine, the headwaters being collected by Moose River, Roach River, and a number of smaller streams rising in the hilly, forested areas east and west of the lake. The drainage basin extends from the Canada line to the ocean, measures about 150 miles in length, varies in width from 50 to 80 miles in the main portion, and embraces a total area of 5,970 square miles (about one-fifth the total area of the State), of which 1,240 square miles are tributary to Moosehead Lake. The length of the river from the lake to the entrance of Merrymeeting Bay, including the more considerable windings, is about 140 miles.

The northern part of the drainage basin is broken by offsets from the White Mountains, and nearly the whole upper portion is forest covered and in its original wild state. Near Moosehead Lake the hills and highlands lie well back from the lake, leaving a great open plain; below the outlet of the lake into the Kennebec the hills close in on the river, forming a narrow, rocky chasm, with steep, precipitous sides.

From Moosehead Lake to the upper end of Indian Pond, a distance of about 4.5 miles, there is a fall of about 90 feet, this being a very rough, rocky, and turbulent part of the river. Indian Pond varies in width from a few hundred feet to about three-fourths of a mile, and has a total length of about 5 miles. It has two levels, separated by a short stretch of rapids at the "narrows," about a mile from the upper end of the pond, where there is ordinarily a fall of about 5 feet. From Indian Pond to The Forks the river is a torrent, falling over a rough and rocky bed more than 350 feet in a distance of about 15 miles. Below The Forks, where it is joined by the waters of Dead River, the Kennebec flows through a broader valley whose gentler slopes are still covered to some extent with forest growth. About 60 miles from the coast the hills again rise, though not to any considerable height. The general elevation of the basin is less than that of the Androscoggin, which adjoins it on the west, though near the center of the area, Mt. Saddleback, Mt. Abraham, 3388 ft., and Mt. Bigelow, 3600 ft., rise as isolated peaks to an elevation higher than any mountains in the State except Mt. Katahdin, 5273 ft.

DRAINAGE.

The following table gives the areas drained by the Kennebec River and its tributaries at various locations.

Drainage areas of Kennebec River and its tributaries.

Stream.	Location.	Drainage area, square miles.
Kennebec River	Outlet Moosehead Lake	1,240
Kennebec River	The Forks gaging station above mouth of Dead River	1,570
Kennebec River	Below and including Dead River	2,440
Kennebec River	Solon dam	2,700
Kennebec River	North Anson gaging station above mouth of Carrabassett River	2,790
Kennebec River	Below and including Carrabassett River	3,180
Kennebec River	Madison dam	3,200
Kennebec River	Above mouth of Sandy River	3,220
Kennebec River	Below and including Sandy River	3,890
Kennebec River	Skowhegan dam	3,950
Kennebec River	Somerset Mills, Fairfield	4,260
Kennebec River	Waterville. Hollingsworth & Whitney Co.'s dam above mouth of Sebasticook River	4,270
Kennebec River	Below and including Sebasticook River	5,240
Kennebec River	Above mouth of Messalonskee Stream	5,240
Kennebec River	Below and including Messalonskee Stream	5,450
Kennebec River	Augusta	5,580
Kennebec River	Above mouth of Cobbosseecontee Stream	5,600
Kennebec River	Below and including Cobbosseecontee Stream	5,840
Kennebec River	Head of Merrymeeting Bay	5,970
Moose River	Outlet of Holeb Pond	170
Moose River	Outlet of Attean Pond	270
Moose River	Outlet of Wood Pond	320
Moose River	Outlet of Long Pond	520
Moose River	Outlet of Brassua Lake	675
Moose River	Gaging station at mouth	680
Roach River	Outlet of Upper Roach Pond	20
Roach River	Outlet of Middle Roach Pond	35
Roach River	Gaging station near Roach River at outlet of Lower Roach Pond	85
Roach River	Mouth	120
Moxie Stream	Outlet of Moxie Pond	80
Moxie Stream	Mouth	90
Dead River, North Branch	Outlet Chain of Ponds	78
Dead River, North Branch	Ledge Falls	135
Dead River, North Branch	Mouth	195
Dead River, South Branch	Mouth	168
Dead River	Below junction North and South branch	363
Dead River	Above mouth Flagstaff Stream	392
Dead River	Long Falls	500
Dead River	Grand Falls	546
Dead River	Below and including Spencer Stream	764
Dead River	Mouth, gaging station	878
Spencer Stream	Mouth	218
Little Spencer Stream	Mouth	62
Spencer Ponds	Outlet (Dead River)	48
Spring Lake	Outlet (Dead River)	10
West Carry Pond	Outlet (Dead River)	14
Flagstaff Lake	Outlet (Dead River)	45
Jim Pond	Outlet (Dead River)	21
Tim Pond	Outlet (Dead River)	11
King and Bartlett Pond	Outlet (Dead River)	3
Little Bartlett Pond	Outlet (Dead River)	7
Baker Pond	Outlet (Dead River)	25
Carrabassett River	Above mouth of Rapid Stream	90
Carrabassett River	Below and including Rapid Stream	160
Carrabassett River	Gaging station at North Anson	340
Carrabassett River	Mouth	395
Sandy River	Phillips	160
Sandy River	Farmington Falls above Wilson Stream	370
Sandy River	Below and including Wilson Stream	490
Sandy River	Gaging station near Madison	650
Sandy River	Mouth	670
Sebasticook River	Outlet Moose Pond	220
Sebasticook River	Near Pittsfield above East Branch	320
Sebasticook River	Below and including East Branch	560
Sebasticook River	Mouth	970
Messalonskee Stream	Gaging station at Waterville	205
Messalonskee Stream	Mouth	210
Cobbosseecontee Stream	Gaging station at mouth	240

GEOLOGY. (a)

BY GEORGE OTIS SMITH.

The water resources of a drainage basin are to a large extent dependent on the geology of the area. The geologic factors that are of prime importance in influencing the present drainage conditions of the Kennebec basin are the rock structure and the processes of land erosion that have produced the present configuration of the surface, which represent one stage in the topographic development as shown by the amount of relief and its details. All of these details are the products of past geologic processes and constitute the record of geologic history. Most, if not all, of these conditions directly affect the character of the drainage system, and largely control the availability and permanence of its water resources, thus showing the intimate relation between the geologic work of the past and the industrial activity of the present.

The Kennebec basin presents considerable variety in its rock formations. In the northern part of the basin the rocks are of later Paleozoic age and include sandstones, conglomerates, shales, slates, and impure limestones, these sedimentary rocks in several localities being fossiliferous. Within this area there are also some masses of volcanic rocks, of which the porphyritic rhyolite of Mount Kineo furnishes the most conspicuous exposure. The sedimentary rocks of this portion of the Kennebec basin have a general northeast-southwest trend, but it is not known that the geologic structure has any marked influence on the topography except where certain more massive and resistant strata may control the position of minor ridges. To the northwest of the divide between the Kennebec waters and the drainage of the Chaudiere is probably determined in part by the presence of some older schists which have withstood erosion more effectively than the sediments of the Moosehead region.

South of The Forks the rocks of the Kennebec basin include roofing slates similar to those quarried in Piscataquis County, other argillaceous rocks, impure limestone, and calcareous sand-

(a) Water Supply Paper No. 198, U. S. Geological Survey, Washington, D. C., 1907.

stones. Associated with these sedimentary rocks are several areas of intrusive granite, the largest of which is on the headwaters of Dead, Carrabassett, and Sandy rivers. The general trend of the formations in this part of the basin is also northeast and southwest, and the river gorge cuts across several ridges whose position appears to be determined by rock structure.

South of Augusta the rocks are sedimentary in origin and were once similar to those just described, but have been altered into slates, schists, and gneisses, which are thoroughly impregnated with pegmatitic and granitic material. So complex is the character of this widespread intrusion that in many places it is difficult to distinguish between the schist or gneiss and the granite. The quarries at Hallowell are located on one of the larger masses of pure granite.

A noticeable characteristic of all the rocks mentioned above is their compactness and hardness. Not only is this due to their age, but more especially to the degree of their alteration. During the ages that have elapsed since their deposition they have undergone important changes by which soft mud rock or shale has been metamorphosed into crumpled achist, and loose-textured sandstone into flintlike quartzite. This has been effected both by the intrusion of large masses of molten granite and by the folding of beds that were originally horizontal but are now steeply inclined. Similar rock folds characterize deeply eroded mountain masses, and here the rocks may have been elevated into ridges. Of these ridges the lower portions alone remain, and any suggestion of their existence is furnished only by the closely folded beds of rock that line the stream bank in so many localities.

These hard and compact rocks give to the present channels of the Kennebec and its tributaries a permanence which they might not possess if the rocks were softer. The complicated structure of the rocks and the consequent alternation of relatively hard and soft beds control to a large extent the abrupt changes in the grade of the streams where rips and falls succeed quiet reaches.

The topography of the region drained by Kennebec River is the resultant of a long-continued process of erosion or land wear in which normal weathering and stream work have been the most important elements. The agency that has been most active in the production of the present land forms is running water, and the topography of the basin is to be considered as largely the product of the activity of Kennebec River and its many tributary streams. Glacial erosion and deposition have also contributed to the production of the present land surface, with the result that in certain areas the relief in its details is due largely to glacial processes rather than to river work.

The differences between the topography of this region at the beginning of the Pleistocene or glacial epoch and that at its close are doubtless great and are of special interest in the present connection.

It is probable that before the first invasion of the ice the hills and mountains of this basin rose more abruptly above the valleys, and that the Kennebec and its principal tributaries meandered over relatively wide valley floors instead of being confined between terraces as at present. In the valleys firm rocks were exposed in few places, probably, and residual soils and clays formed a deep cover where today there are ledges of solid rock or benches of gravels, sands and clays. The first effect of the occupation of the basin by the ice sheet from the north was the planing away of the decomposed rock and the smoothing down of the outlines of the hills and mountains. A consequence of this planing action of the ice is the presence today of firm rock foundations that afford opportunity for the erection of mill structures and dams whose safety is insured against destruction by freshets.

The detritus produced by this glacial erosion furnished in turn the material transported in the ice and the mass of gravel, sand and finer material transported by the streams flowing on the surface of the glacier, beneath it, or over the land surfaces beyond its margin. All this material was deposited at various points within this area or in the submarine extension of this basin. The subsidence of the land during the later stages of the glacial epoch caused an advance of the sea northward along the Kennebec Valley to a distance of 100 miles or more from the present coast line. In the quiet waters of the estuary thus produced the glacial streams deposited their loads, and from these deposits have resulted many of the present topographic forms, such as the terraces, sand plains, and kettle basins, which are familiar to those who traverse the Kennebec Valley. The glacial deposits, however, affect more than the scenery. The preglacial Kennebec drainage system was greatly altered and not only were old channels filled with boulder clay and with glacial gravel and sand, but the streams, thus diverted at a time when their volume and load were greatly increased by the contribution from the melting glacier, were compelled to cut new channels, which in many cases followed courses quite different from the old. This resulted in the transfer of drainage from one river system to another and, what is more important, the creation of waterfalls. The stream, thus forced to abandon a valley that probably was relatively wide and possessed a moderate grade, now cuts across a rock divide, where it develops a waterfall. When the drainage history of the Kennebec basin is thoroughly worked out it will be found that there have been many such stream diversions, which have resulted in the development of water powers that now constitute one of the most valuable assets of the State.

One of the more conspicuous cases of probable stream diversion that can be cited is that of Sandy River. This stream flows almost north where it enters the southward-flowing Kennebec a short distance below Madison. This abnormal relation between the two rivers points to the existence of diversion, and it seems probable that in preglacial times the drainage from the Sandy River basin flowed in a different direction and entered Androscoggin River in the vicinity of Jay. Through obstruction of the lower course of the Sandy by glacial deposits the channel south of the present site of Farmington an outlet to the east. The position of the abandoned portion seems to have been abandoned and the stream forced to seek of the Sandy River Valley is indicated in the present topography, and like many other such abandoned valleys this one has been utilized by the railroad engineer, being followed approximately by the Farmington branch of the Maine Central. The water powers at Farmington and Farmington Falls may be regarded as owing their origin to this stream diversion. It is also possible that a part of the present drainage basin of Dead River was once tributary to the Sandy, but was likewise diverted by glacial deposits during the retreat of the ice. This supposition is based principally on the abnormal course of the lower part of Dead River and the presence there of rapid water and falls, in strong contrast with the upper reaches which give the name to the river.

Not only are there in the Kennebec basin such cases of diversion of former tributaries of other river systems as that just cited, but the Kennebec itself seems to possess a somewhat complex character. It now occupies portions of the valleys of streams that were formerly tributaries. There is reason to believe that the portion of the Kennebec north of Norridgewock formerly flowed more nearly southward from that point and united with the drainage of Wesserunsett and Carrabassett streams and Sebasticook River at some point south of Waterville. If this is true, then that portion of the Kennebec between Norridgewock and Skowhegan, with its abnormal northeasterly course, represents the diversion of the upper Kennebec eastward to the point where it joined the valley of the Wesserunsett below Skowhegan. This change in the river's course can doubtless be attributed to the thick deposits of glacial gravels and sands in the western part of the town of Norridgewock, where in fact the low divide between the streams flowing directly into the Kennebec and those tributary to the Smithfield ponds and Messalonskee Stream is relatively close to the main river at Norridgewock. In a similar way the Messalonskee drainage seems to have been itself diverted from its original course, so that this stream is turned northward nearly to the point of its junction with the Kennebec. Another stream whose present abnormal course suggests similar diversions is the Cobbosseecontee. The result of all these diversions has been to create valuable water powers. These drainage changes, examples of which are not peculiar to the Kennebec basin but are common throughout western Maine, might be described with greater detail had fuller study been made of this interesting subject. The statements made above are, however, sufficient to indicate to what a large degree the present wealth of available water powers in the Kennebec basin is the result of the glacial history of the region.

A hardly less important result of the glaciation has been the formation of the numerous lakes and ponds that are so characteristic of almost the whole of the Kennebec basin. As has been pointed out, the original system of drainage was so modified by the distribution of glacial deposits as hardly to be recognizable in the present stream arrangement, and with this stream adjustment is connected the origin of these ponds and lakes, the total area of whose water surface is very great, as is shown in other portions of this report. These conditions are extremely important in their economic bearing, for the ponds and lakes, together with extensive swamps, constitute a vast storage system by which the water supply is held in reserve, the rather indirect communication which many of these natural reservoirs have with the main river serving to hold back the water somewhat in times of freshets. So it is that the glacial occupation of this drainage basin is responsible not only for the creation of most of the Kennebec water powers, but also for the constancy of the flow.

The existing topography, as has been shown above, is the result of modification of an earlier topography by the different geologic processes. Although the present seems to the casual observer to be a period of equilibrium and quiet so far as these geologic processes are concerned, in reality this may not be the case, so silent and slow moving are these natural forces. It is therefore of interest to suggest the stage in topographic development which has been reached at the present time. As might be expected, different portions of the Kennebec Valley exhibit quite different characters; thus the broad valley along the lower courses of the river is in marked contrast with the canyon occupied by the stream north of Bingham. The canyon-like character of the valley of the upper Kennebec is all the more noticeable because of the type of upland topography to be seen a few miles east of the river. This upland is suggestive of a topography which is much older than that represented by the gorge through which the river runs. Thus it may be said that this part of the Kennebec basin exhibits both the mature topography of the upland and the youthful topography of the canyon. This suggests that the region had reached the stage of maturity in one cycle of its history and has now entered on the first stage in a later cycle.

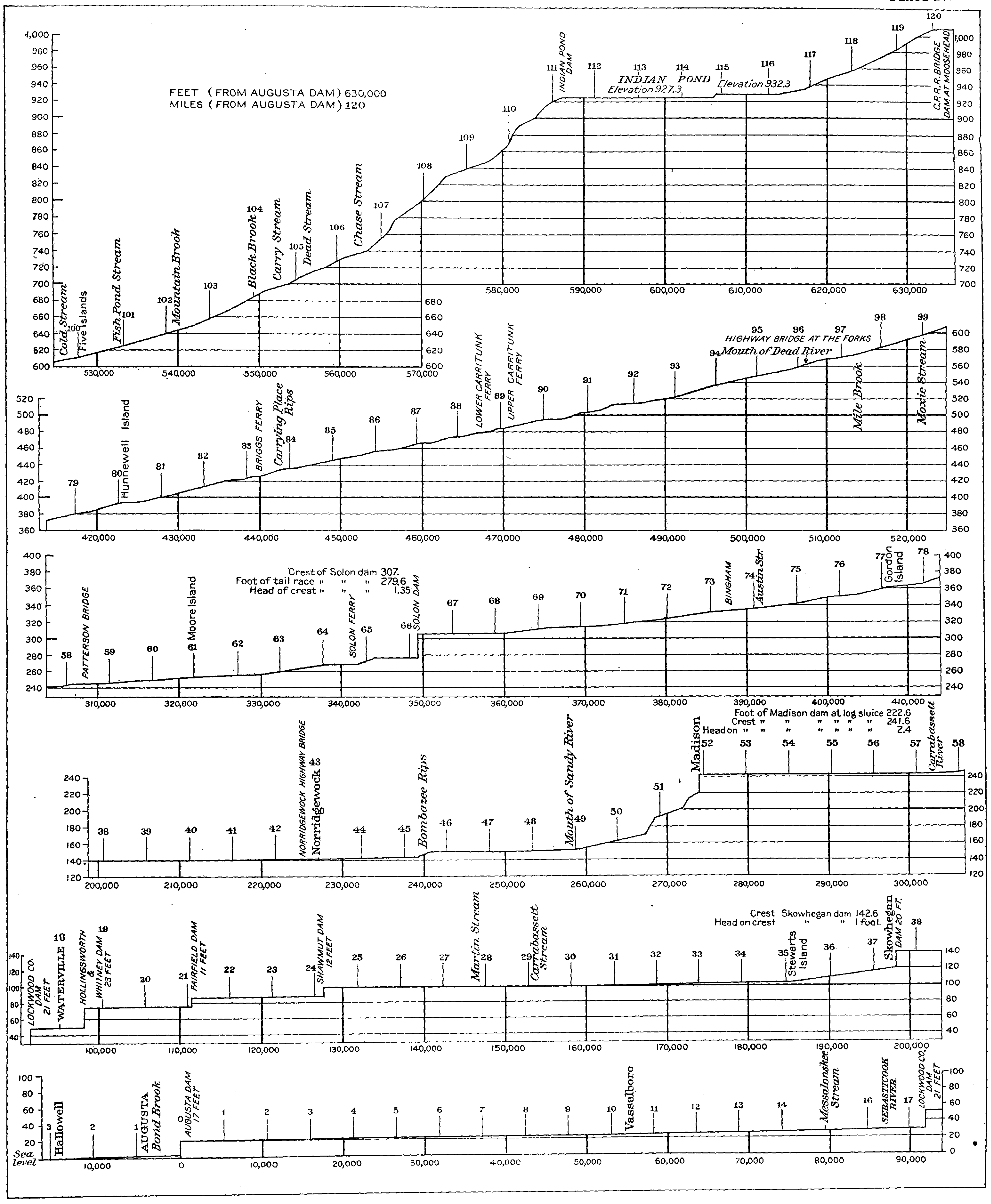
The amount of relief within the Kennebec basin is considerable, although the highest mountains in the State are not included within this basin. Its highest peaks are those about the headwaters of Dead and Sandy rivers, the more prominent being Mount Bigelow, Mount Abraham, and Saddleback, and the peaks along the divide between the Kennebec and Piscataquis waters, as well as Mount Kineo. South of Moosehead Lake the upland has a general elevation between 1,000 and 1,400 feet, above which rise peaks to elevations of 2,000 to 3,000 feet. In this area the elevation of the river in the gorge is between 500 and 900 feet. Farther south the contrasts of relief are much less. The presence of the extensive elevated regions in the northern part of the basin directly affects the amount of precipitation and of forest cover within this region.

In short, in the Kennebec basin the geologic structure, the geologic processes that have controlled the evolution of the present topography, the amount of relief, and the details in the land forms all contribute to the permanence and value of the water resources.

WATER POWER.

Kennebec River is an important river for water power development. It has large storage facilities including Moosehead Lake of 115 square miles surface area. The fall of the river from Moosehead Lake to the head of tide water at Augusta is 1,026 feet, the distance being 120 miles and the average descent 8.55 per mile. Plate IV is a profile of the river.

The following table gives the distances from tidewater and elevation above sea level of important features along the river.



PROFILE OF KENNEBEC RIVER

Elevations along Kennebec River.

Locality.	Distance.		Elevation.	
	Total miles.	Difference, miles.	Above sea level. Feet.	Difference, feet.
Augusta—Edwards Manufacturing Company dam, foot	0	....	6	......
Augusta—Edwards Manufacturing Company dam, crest	0	0	23	17
Messalonskee Stream, mouth	15.0	15.0	30	7
Sebasticook River	16.7	1.7	31	1
Lockwood dam, foot	17.4	0.7	33	2
Lockwood dam, crest	17.4	0.0	54	21
Hollingsworth & Whitney Company dam, foot	18.6	1.2	55	1
Hollingsworth & Whitney Company dam, crest	18.6	0.0	78	23
Fairfield dam, foot	21.1	2.5	78	0
Fairfield dam, crest	21.1	0.0	89	11
Shawmut dam, foot	24.2	3.1	91	2
Shawmut dam, crest	24.2	0.0	103	12
Martin Stream, mouth	27.8	3.6	103	0
Carrabassett Stream, mouth	29.0	1.2	103	0
Skowhegan dam, foot	37.6	8.6	123	20
Skowhegan dam, crest	37.6	0.0	143	20
Bombazee Rips, foot	45.3	7.7	146	3
Bombazee Rips, head	45.7	0.4	153	7
Sandy River, mouth	49.0	3.3	155	2
Hollingsworth & Whitney Company dam, foot	51.0	2.0	195	40
Hollingsworth & Whitney Company dam, crest	51.0	0.0	220	25
Madison dam, foot	51.9	0.9	223	3
Madison dam, crest	51.9	0.0	242	19
Carrabassett River, mouth	57.5	5.6	245	3
Moore Island	61.0	3.5	256	11
International Paper Company, Solon, dam, foot	66.2	5.2	280	24
International Paper Company, Solon, dam, crest	66.2	0.0	307	27
Austin Stream, mouth	74.0	7.8	341	34
Gordon Island	77.2	3.2	365	24
Hunnewell Island	80.1	2.9	393	28
Carrying Place Rips, foot	83.8	3.7	433	40
Lower Carratunk Ferry	88.6	4.8	482	49
Upper Carratunk Ferry	89.2	0.6	489	7
Dead River, mouth	96.1	6.9	563	74
Mile Brook, mouth	97.4	1.3	577	14
Moxie Stream, mouth	98.8	1.4	598	21
Cold Stream, mouth	99.5	0.7	608	10
Five Islands	100.0	0.5	615	7
Fish Pond Stream, mouth	100.8	0.8	628	13
Mountain Brook, mouth	102.2	1.4	645	17
Black Brook, mouth	104.0	1.8	687	42
Carry Stream, mouth	104.7	0.7	698	11
Dead Stream, mouth	105.2	0.5	713	15
Chase Stream, mouth	106.5	1.3	728	15
Indian Pond	111.2	4.7	927	199
Moosehead Lake	120.5	9.3	1,029	102

Developed Powers.

KENNEBEC RIVER.

The uppermost of the developed water powers on the Kennebec is that of the International Paper Company at Carratunk Falls, near Solon. There is a natural fall at this point of about 28 feet through a narrow gorge, above which the river widens out. The dam was built in 1891 and affords an average head of about 29 feet. Turbines aggregating about 3,000 horsepower are installed, and the power is used in the manufacture of ground wood pulp. This dam ponds the water for about 2 miles upstream.

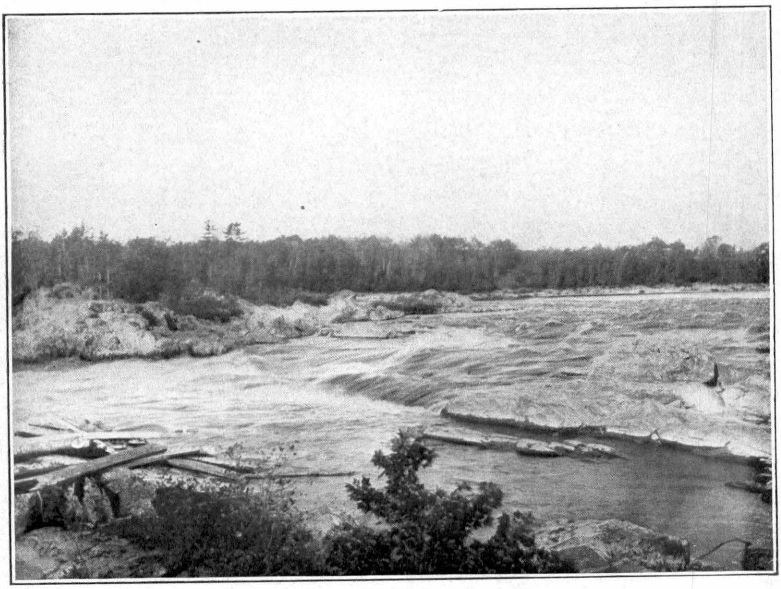
The next utilized power downstream is that at Madison, which is used by the Great Northern Paper Company for manufacturing paper, ground wood pulp, and sulphite fiber; by the Indian Spring Woolen Company and the Madison Woolen Company for manufacturing woolen goods, and by the Madison pumping station for pumping the town water supply.

The dam is of granite, 20 feet high and 540 feet long. The ownership is as follows: Great Northern 5/8; Madison Woolen Co. 1/4; and Indian Springs Woolen Co. 1/8. The Great Northern Paper Company has the following wheel installations: 1 pair 21 inch; 1 pair 27 inch; 8 pairs 35 inch; 2 pairs 42 inch; 3 pairs 45 inch. The head varies from 16.5 to 20 feet. The total horsepower development is 5878. The Indian Springs Woolen Co. has one 48-inch Rodney Hunt turbine operating under an average head of 14 feet and capable of developing 250 horsepower. During low water stages the power is reduced to 150 horsepower. The Madison Woolen Co. has two 45-inch Victor turbines under a 20-foot head, and capable of developing 600 horsepower. This dam at Madison ponds water usually up to the mouth of Carrabassett River, a distance of about 5½ miles. Log jams occur occasionally above Madison as shown on Plate V A.

A second dam at Madison directly below the one first described, has recently been completed by the Hollingsworth & Whitney Co. It is a concrete structure 25 feet high and 800 feet long. The power developed here is used in the manufacture of wood pulp. There are installed 3 pairs of 48-inch and one single 24-inch Holyoke turbines, capable under the 40-foot head of developing 7700 horsepower.

The next dam is at Skowhegan, crossing three separate channels of the river. The Skowhegan Water Power Company control the power on the right and left channels, but in the middle or island channel, the power is controlled by the Skowhegan Electric Light Company and two other concerns. The average head developed at this location varies from 14 to 20 feet. The wheel installations are as follows: American Woolen Co. one wheel 57″ diameter, 350 H. P.; Savage Manufacturing

A. Log jam in Kennebec River above Madison



B. Kennebec River below Madison

Co., two wheels 29", two wheels 24", 350 H. P. Marston Construction Co., one wheel 60", 178 H. P.; Milburn Co., one wheel 48", 265 H. P.; Nolin Manufacturing Co., one wheel 60", 146 H. P.; Riverside Pulp Co., four wheels 36", one wheel 60", 730 H. P.; Skowhegan Pulp Co., three wheels 48", one wheel 50", one wheel 40", one wheel 33", one wheel 24", with 1492 H. P.; Edith G. Shepherd, two wheels 42" and 66", 599 H. P.; Skowhegan Electric Light Co., one wheel 48" and two wheels 56", 1420 H. P.; Steward Bros., one wheel 48", 150 H. P.; L. W. Weston, one small wheel. The total theoretical horsepower here is 5680. Of this there is actually developed about 3500 H. P. and in low water it does not exceed 2500 H. P. This power is used in the manufacture of wood pulp, electric light and electric power, and in grist, saw, planing and woolen mills and in a sash and blind factory. The dam ponds water to about one mile above Norridgewock, a total distance of about six miles.

At the village of Shawmut is a dam affording a fall of about thirteen feet and 1102 feet long. It is owned by the Shawmut Manufacturing Co. The power developed from the 12 wheels installed totals 2500 H. P. and is used in the manufacture of ground wood pulp.

At Fairfield is a log dam 1300 feet long, with a total fall of about 11 feet. The dam is controlled by the Fairfield Junction Mills and Water Power Co. acting simply as a holding company for the following concerns: United Boxboard Co. with five wheels each 36", 39", 42", 48" and 56" diameter, 338 H. P.; American Woolen Co. with two wheels each 42" and 45" diameter, 170 H. P.; F. J. Savage, one wheel 36" developing 75 H. P.; Fairfield Furniture Co. with two wheels developing about 100 H. P.; and the Waterville and Fairfield Railway and Light Co. with six wheels 54" diameter developing 1000 H. P.

At Waterville are the dam and mills of the Hollingsworth and Whitney Co. where is manufactured manila paper and ground wood and sulphite pulp. Their daily output is 165 tons paper and 110 tons pulp. There are 49 turbines installed, operating under a 20-foot head, and capable of developing 6000 H. P. in addition to 2000 H. P. of auxiliary steam. This dam ponds water to the foot of the Fairfield dam, a distance of about 2½ miles.

At Ticonic Falls directly in the city of Waterville is the dam of the Lockwood Company manufacturing cotton goods with an annual output of over 16,000,000 yards. The dam, 750 feet long, raises the river surface 7 feet and a natural fall of about 13 feet on a slate ledge gives a total fall of 20 feet. There are installed 9 wheels capable of developing 3300 H. P. This dam ponds water to the foot of the Hollingsworth & Whitney dam, a distance of about one mile upstream.

At Augusta, at the head of tide water, is a timber crib dam 900 feet long affording ordinarily a head of 17 feet. The dam is owned by the Edwards Manufacturing Co. The cotton mills of this company located on the west bank, have installed one wheel 54″, two wheels 57″, and five wheels 60″ diameter, developing 2600 horsepower. The Cushnoc Paper Co. on the east bank have six wheels 42″ diameter developing 1000 H. P. The Kennebec Light and Heat Co. with its three wheels, two of 45″ and one of 48″ diameter uses 400 H. P. The head at this dam is affected somewhat by the rise of the tide. At ordinary stages the water is ponded upstream for about 12 miles or about ¾ of the way to Waterville.

DEAD RIVER.

There are no developed water powers of importance on Dead River: On the North Branch at Eustis is a dam affording a head of 15 feet, used for a lumber and grist mill; on the South Branch at Stratton is also a small developed power of about 50 horsepower.

CARRABASSETT RIVER.

At Kingfield is a dam affording a head of 10 to 12 feet, used for lumber and planing mills and the manufacture of rakes, cant dogs, cotton mill rolls, etc. Wheels aggregating about 170 horsepower are installed, about half of which can be run during the low-water season.

At East New Portland the Carrabassett Stock Farm Company owns a privilege affording a head of 15 to 26 feet, used for a sawmill and electric light plant, with three wheels rated at a total of 465 horsepower. Auxiliary steam (75-horsepower boiler) is also used.

At Cleveland Rips, 4.5 miles from the mouth, a hydro-electric plant was erected in 1910, with a pole line to Farmington, by the Franklin Power Co. A head of about 28 ft. is utilized and about 700 H. P. is developed.

At North Anson just above the Somerset Railway bridge a dam affording a head of about 9 feet is used by the North Anson Lumber Co. for a sawmill. One wheel is installed, rated at 110 horsepower, 70 per cent of which is available at low water.

On the tributaries of Carrabassett River are a few small developments, principally at North and West New Portland.

SANDY RIVER.

At Phillips is a dam affording a head of 20 feet, used for a sawmill and electric-light plant; two wheels are installed, rated at 125 horsepower; the low-water flow, lasting usually about a month, is good for 40 or 50 horsepower.

At Farmington Falls a dam gives a head of 8 or 9 ft., used by four different concerns, saw mills, carriage, spool, and box factories.

At New Sharon a fall of from 10 to 12 ft. is utilized. The dam is owned by the New Sharon Water Power Co. The Harding & Jordan Shoe Co. has one 36″ turbine and develops about 20 horsepower. The C. A. Thompson Co. has one 33″ Hercules wheel and develops 71 horsepower.

About 2 miles above the mouth of Sandy River is located the dam of the Madison Electric Works. The dam is of masonry and rests on ledge rock. It is 341.1 ft. in length between vertical abutments. The crest is 1 ft. wide on top; upstream side, 3.8 to 1 slope, downstream side vertical. The head developed by the dam is about 15 ft., which is used in a power development on the right bank. The head bay is nearly 100 ft. long, decreasing in width from 40 to 20 ft. at the racks. The wheel installation consists of one pair 36″ McCormick turbines and one pair 39″ Hunt turbines, the latter set in 1909. The total horsepower developed is 740.

WILSON STREAM.

This stream is a tributary of Sandy River and there is considerable power developed on it, in the town of Wilton. The power is quite dependable on account of storage in Wilton Lake.

The G. H. Bass & Co., manufacturers of shoes, have one 21″ Hercules turbine under a head of from 14 to 19 ft. The rated capacity is 60 horsepower. The G. R. Fernald & Co. grist mill have one 21″ Hunt turbine and develop about 55 horsepower. The Wilton Woolen Co. has two mills. One 21″ McCormick turbine is under a 34 ft. head and develops 150 horsepower. The other 27″ McCormick wheel, under a 12 ft. head, develops about 55 horsepower.

At East Wilton are the Walker Woolen Mills with power development

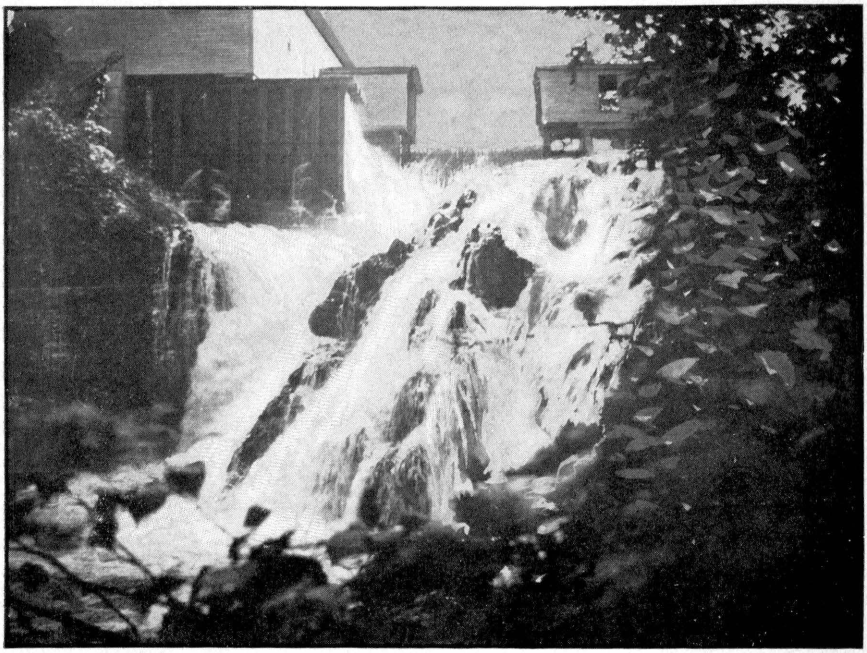
There are a number of small water power developments on a tributary of Wilson Stream in the town of Chesterville.

SEBASTICOOK RIVER.

At Hartland, on West Branch, are two dams, the upper affording a head of about 6 feet and operating two wheels for a lumber and planing mill, which uses half the flow. The remaining water is carried farther downstream, and discharged under a head of 16 feet, with a second dam providing a fall of about 11 feet, used by the Linn Woolen Co. for the manufacture of shawls, rugs, dress goods, etc. This company has about 180 horsepower of wheels and 150 horsepower of auxiliary steam.

At Pittsfield, on West Branch, is a dam affording a head of about 11 feet, utilized by the Waverly Woolen Company, which has three wheels aggregating 300 horsepower and 250 horsepower of auxiliary steam (used only in times of very low water). About half a mile farther downstream is a privilege affording a fall of about 10 feet; one-third of the flow at this point is utilized by the Smith Woolen Company (one wheel of 60 horsepower and auxiliary steam of 85 horsepower), and the remainder by Robert Dobson & Co., manufacturers of woolen goods, who have 150 horsepower of wheels and 215 horsepower transmitted electrically from the Sebasticook Power Company's plant near Burnham.

A. Falls on Carrabassett River



B. Falls on Messalonskee River

At Corinna, on East Branch, is a dam affording a head of 10 feet, used for a flour and grist mill, with wheels of about 90 horsepower installed.

At Newport, on East Branch, is the plant of the Newport Woolen Company, which utilizes a fall of about 10 feet, with 135 horsepower of wheels and 75 horsepower of auxiliary steam.

At Detroit, on East Branch, is a dam with head of about 12 feet, used for a lumber mill, with turbines of 250 horsepower.

Near Burnham Junction, on the main river, is a timber crib dam with masonry abutments, built in 1903, giving a head of about 27.5 feet. This is owned by the Sebasticook Power Company and used for generating light and power to be transmitted, mostly to Pittsfield at present. The plant is not yet fully developed; three pairs of wheels are installed, rated in the aggregate at about 800 horsepower, and the company has 400 horsepower of auxiliary steam. The minimum flow at this point is considered to be good for 1,200 horsepower.

At Clinton is a dam affording a head of about 6 or 8 feet, used for flour and grist and lumber mills. Wheels of about 200 horsepower are installed.

In the town of Benton, the Sebasticook Water Power Co. has a hydro-electric plant developing 1200 H. P.

At Benton Falls, a fall of 25 feet is utilized by the United Box Board & Paper Co., which has wheels of about 800 horsepower installed and manufactures wood-pulp board.

The Ft. Halifax Power Co. completed in the early part of 1908 a modern concrete dam and power house at the mouth of the river in Winslow. The machinery installation has a rated capacity of 2800 horsepower.

Early in 1910 the Central Maine Power Co. was formed by the consolidation of the Messalonskee Electric Co., Ft. Halifax Power Co. of Winslow, Sebasticook Power Co. of Pittsfield and Sebasticook Water Power Co. of Benton. They own all the stock of the Kennebec Light & Heat Co., Augusta; Bingham Electric Co., Bingham; Dexter Electric Co., Dexter; and practically the entire capital stock of the Solon Electric Co., Solon. The company has the following developed water powers: Oakland 850 horsepower, Pittsfield 1200 horsepower, Winslow 2800 horsepower, Benton 1200 horsepower and Augusta 400 horsepower; total 6450 horsepower. They have developed steam plants: Pittsfield 400 horsepower, Oakland 400 horsepower, Augusta 1400 horsepower; total 2200 horsepower steam. The grand total of developed water and steam power is 8650 horsepower.

The company has undeveloped water power: at Clinton on the Sebasticook about 1500 horsepower; at Rice Rips on the Messalonskee about 1500 horsepower; and on the Kennebec about 20,000 horsepower; or a total of 23,000 horsepower.

A system of high tension transmission lines, about 60 miles in length, connects its five power stations at Oakland, Pittsfield, Winslow, Benton, and Augusta. All these power stations can be operated in unison.

The Central Maine Power Co. has exclusive franchise rights in Oakland, Pittsfield, Burnham, Augusta, Hallowell, Farmingdale, Gardiner, Randolph, Pittston, Togus, Chelsea, Richmond, Manchester, a portion of Winthrop and Bingham; and franchise rights in Waterville, Fairfield, Benton, and Winslow. Their franchises are liberal in their terms and without limit of time.

MESSALONSKEE STREAM.

There are several dams affording slight falls between the various lakes in the headwaters of Messalonskee River—at Smithfield, between East and North ponds (7-foot fall); at Belgrade Mills, between Great and Long ponds (9-foot fall), etc. One of these power sites is shown on Plate VI B.

At Oakland the following powers have been developed: (1) A dam at the foot of Messalonskee Lake, with 8-foot fall, utilized for woolen mill, pumping station, and axe factory; (2) a dam with 12-foot fall, used for scythe and axe factory, machine shop, and shoddy mill; (3) a dam with 14-foot fall, two 48-inch Hercules wheels, used for axe, scythe, and tool factory; (4) a dam with 40-foot fall, 600 horsepower of wheels used by Messalonskee Electric Light Company and about 100 horsepower for scythe forge shop; (5) a dam with 18-foot fall, 150-horsepower wheel used by Cascade Woolen Mill, the balance unused. The last three privileges are owned by the Dunn Edge Tool Company.

A dam with a fall of about 14 feet is used for pumping the Waterville municipal water supply, which comes by gravity flow from China Lake. Just below is the dam of the Chase Manufacturing Company, with a fall of about 8 feet. About a mile farther downstream, a short distance from the mouth of the river, is a masonry dam affording a fall of about 40 feet, owned by the Waterville Gas and Electric Company and used for electric light and power.

COBBOSSEECONTEE STREAM.

There are developed privileges at Readfield, Winthrop and Monmouth.

Between Cobbosseecontee Pond and Gardiner are two developed privileges, which, however, are not of much value for power because at times all the water is shut back for storage purposes in the ponds.

At Gardiner there are seven dams controlled by the Gardiner Water Power Company. They afford a total fall of 128 feet, used as indicated in the following table:

Developed water powers at Gardiner, Me.

OWNER.	Use.	Fall, feet.	Horse-power.
Gardiner waterworks	Pumping station	11	360
S. D. Warren & Company	Paper mill	37	*1,000
Hollingsworth & Whitney Company	Paper mill	17	
Hollingsworth & Whitney Company	Paper mill	16	†1,268
Hollingsworth & Whitney Company	Paper mill	16¼	
Joshua Gray & Son	Lumber mill, etc	12½	400
Gardiner Real Estate Association	Varions small industries	20	640
Total		130	3,668

*2 wheels. †9 wheels.

UNDEVELOPED POWERS.

GENERAL CONSIDERATIONS.

In 1882 Swain* called attention to the large amount of excellent undeveloped power on the Kennebec River and its tributaries. Since that time many important plants have been constructed—notably those at Waterville, Fairfield, Madison, and Solon on the main river and numerous smaller developments

*Swain, G. F., Report on water powers: Tenth Census, vol. 16, pt. 1, 1885, pp 83-89.

on the tributary streams. There is still, however, especially in the more northerly portions of the basin, an immense amount of unutilized power. Of the 1,029 feet fall on the main river between Moosehead Lake and tide water only about 153 feet are developed. A condensed profile of Kennebec River is shown on Plate IV.

Brief descriptions follow of some of the more important unutilized water privileges. For the main stream and for Moose, Roach and Dead rivers these are based on surveys and reconnaissances of the United States Geological Survey from 1904 to 1906; for the principal tributaries such topographic atlas sheets as are available were consulted, and the facts they furnished were supplemented by information obtained chiefly through correspondence.

KENNEBEC RIVER.

Between Moosehead Lake and Indian Pond there is a drop of nearly 100 feet distributed rather evenly over a distance of about 3½ miles.

For about 7 miles below Indian Pond the river is very precipitous, falling approximately 250 feet. Much power could be developed here. The banks are high with rocky walls and there are many excellent dam sites. In the remaining 8 miles to the mouth of Dead River at The Forks, the fall is a little less steep, amounting to about 120 feet. The conditions in general are good, however, for power development.

The total fall from Moosehead Lake to The Forks is 466 feet in a distance of 24.4 miles. The Kennebec Dam & Reservoir Company, recently organized, plans to develop on an extensive scale this important fall. Three dams are planned, one at the foot of Indian Pond, one at Chase Stream and the third near The Forks. These will utilize about 400 feet of the fall, and develop, as estimated, 50,000 horsepower continuously.

From The Forks to Bingham the fall is in general fairly uniform, amounting to 230 feet in a distance of about 22 miles. At only a few places in this stretch are there rapids other than those produced by the general slope of the river. The most promising place for power development is perhaps near Carrying Place Rips, about 10 miles above Bingham, where there is a fall of about 9 feet in half a mile; but this location is not especially favorable for a dam. This entire section of the river, however, will be in time of great value for power purposes.

From Bingham down to the Solon dam the fall is considerably less than in the stretch of the river just described, amounting to only about 30 feet in a distance of 5 miles to the Solon mill pond. Between the foot of the Solon dam and Solon Ferry, a distance of 1½ miles, is a fall of about 8½ feet. The total fall between the foot of the Solon dam and the mouth of Carrabassett River, which marks the practical extent of pondage from the Madison dam, is about 36 feet in a distance of 9 miles.

At Bombazee Rips, about 2½ miles above Norridgewock, there is a fall of 7½ feet in one-fourth of a mile. (See Plate V B.) Near the head of the rips is a good ledge foundation for a dam, and probably a 10 or 12 foot head could be obtained here without difficulty. Just below Skowhegan there are 18 or 20 feet of undeveloped fall in a distance of about 2½ miles. The remainder of the river is entirely developed.

MOOSE RIVER.

Holeb Falls, about 16 miles by river below the outlet from Holeb Pond, give a fall of 20 or 30 feet. Upstream for about 8 miles the fall is slight, so that good pondage could be had here. Mosquito Rips (4 feet fall), Spencer Rips (5 feet fall), and Attean Falls (10 feet fall) occur in the remaining stretch of river to the head of Attean Pond. The total distance from Holeb Outlet to Attean Pond is about 29 miles. Between Attean, Wood, and Long ponds there is but little fall. Below Long Pond the fall is very steep, being about 110 feet in a distance of 4 miles to Little Brassua Lake, which is practically at the level of Brassua Lake. This stretch flows over a very rough and rocky bed and there are several good sites for dams. Between Brassua and Moosehead lakes is a drop of about 20 feet at ordinary stages. By placing a dam near the Rockwood gaging station of the United States Geological Survey this fall could be practically all utilized and in addition any further amount resulting from the raising of the Brassua Lake level to procure additional storage.

ROACH RIVER.

There is a little fall on Roach River above Lower Roach Pond—perhaps 30 feet to Middle Roach Pond. Between Lower Roach Pond and Moosehead Lake, a distance of some 5 miles, the fall is about 75 feet.

MOXIE STREAM.

There is a total fall of 370 feet between Moxie Pond and Kennebec River, a distance of about 4 miles, and this occurs practically all in the lower 2 miles. At Moxie Falls there is a nearly vertical drop of 95 feet near the main river.

PLEASANT POND STREAM.

Pleasant Pond Stream falls about 780 feet between Pleasant Pond and Kennebec River, a distance of 3½ miles, but the tributary drainage area is only a few square miles.

PIERCE POND OUTLET.

Pierce Pond Outlet falls about 640 feet in a distance of 3 miles from Pierce Pond to Kennebec River. The drainage area at the outlet of the pond is small, being only about 18 square miles. The possibility of bringing Dead River water to Pierce Pond and thus utilizing the large drop to Kennebec River in one fall has been investigated. Pierce Pond lies about 1,125 feet above tide (by aneroid from Carratunk), and a comparison of this elevation with those given for Dead River indicates the impossibility of carrying out this scheme without great expense, as to reach the Pierce Pond elevation it would be necessary to pond the water in Dead River to a point above Flagstaff.

CARRABASSETT RIVER.

There is considerable undeveloped fall in the upper part of Carrabassett River and on its tributaries, but the supply of water is in general too small to warrant developments. The possibilities are better on the lower stretches of the river. (See Plate VI A.)

SANDY RIVER.

Considerable undeveloped fall exists on Sandy River. There is said to be a good privilege just below New Sharon that will afford a fall of about 30 feet. At Davis Ferry, in the town of Starks, is a power site with perhaps a 15-foot fall. At Strong, and farther up the river, there is considerable unutilized fall, but the volume of water available in low-water seasons is small.

SEBASTICOOK RIVER.

Sebasticook River is one of the most fully developed for power of all the tributaries of the Kennebec. Of the 170-foot fall between Moose Pond and Kennebec River about 100 feet are developed. It is said that at Fifteenmile Rips, about 3 miles above Clinton, a good site exists to obtain a fall of about 12 feet.

MESSALONSKEE STREAM.

Of the 210-foot fall between Messalonskee Lake and Kennebec River about 135 feet are developed. A good unutilized site remains just below Oakland, where a head of about 47 feet can be obtained. This is owned by the Messalonskee Electric Light Company. The large amount of lake area in this drainage basin is of great value in rendering the flow uniform, but the storage capacity of the lakes should be increased and more care given toward regulation of flow.

WEBER POND OUTLET.

Weber Pond Outlet falls about 115 feet in 3½ miles—mostly in the last 2 miles—from Weber Pond to Kennebec River.

COBBOSSEECONTEE STREAM.

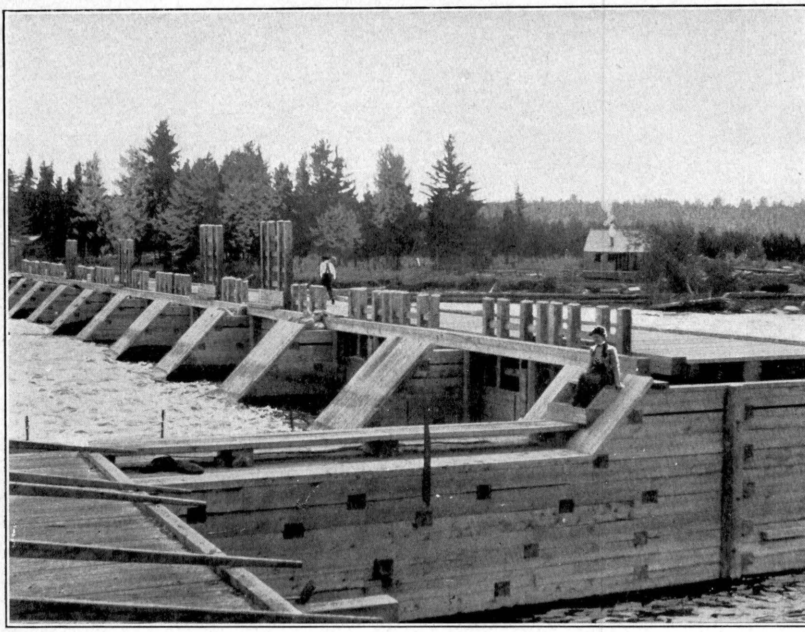
Cobbosseecontee Stream is rather fully developed, but a few unutilized sites remain above Cobbosseecontee Pond. This is a stream of very even flow, owing to its excellent storage reservoirs.

WATER STORAGE.

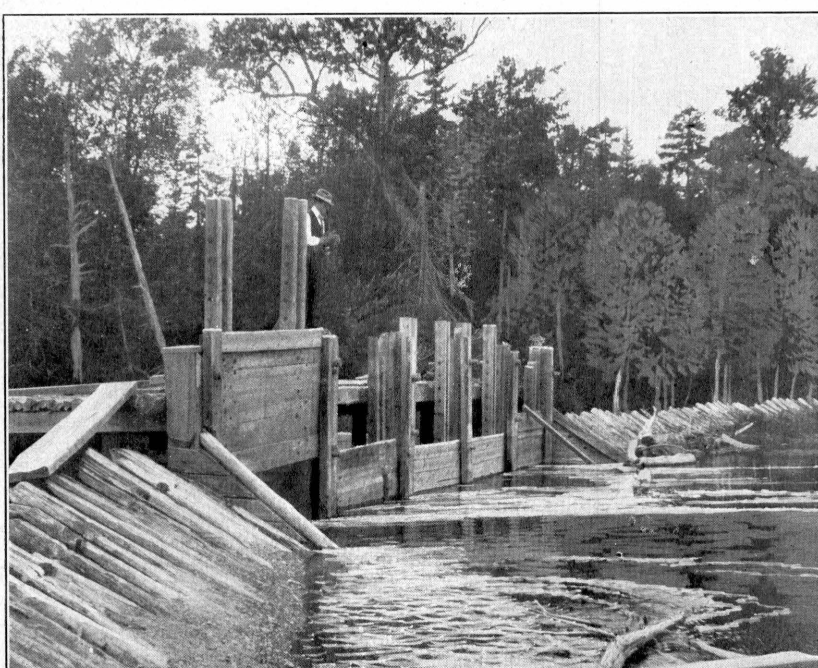
General Considerations.

No other tract of country of the same extent on the continent is so well watered—that is, supplied with well-distributed lakes and streams—as is the State of Maine. Of the three largest drainage basins of the State—the Kennebec, Penobscot, and Androscoggin—the Kennebec is first as regards the proportion of lake and pond surface to total drainage area, which for this river is about 1 to 14. Moreover, Moosehead Lake furnishes one third of this water-surface area in the Kennebec basin and constitutes one of the most valuable reservoirs for water storage and control in the country. The drainage area tributary to Moosehead Lake is large—about 1,240 square miles—so that even the great storage capacity afforded by a depth of 7.5 feet (the present head) on this lake is not nearly sufficient to prevent considerable losses of water at times.

The importance of storing and regulating the flow of Kennebec River has long been realized by the water power and lumbering interests along the river. To a certain extent these interests of necessity conflict in regard to the manner of use of stored water. The log-driving season begins in the early spring, the small streams in the headwaters being first driven and the logs temporarily held in various lakes and ponds. Eventually the main drive leaves Moosehead Lake, and it is usually well into the summer before the last of the logs reach their destination on the lower river. To drive the logs, especially in the portion of the river between Moosehead Lake and Bingham, a certain amount of flow is required to prevent the rapid formation of jams, and the practice is to let out each day from Indian Pond dam (this pond being used as a regulating reservoir for flow from Moosehead Lake) a head, or "hoist," as it is called, of water to help sluice along the drive. Formerly little or no care was taken to prevent the waste of water during log driving, with the result that frequently by the end of the log-driving season little water would be left stored in Moosehead Lake, and consequently the water-power users on the river suffered from a scarcity of water in the fall and early winter, receiving almost no benefit from the use of Moosehead Lake for storage. In late years, however, the log-driving and water-power interests on the river have become more har-



A. Head gates at East Outlet of Moosehead Lake



B. West Outlet of Moosehead Lake

monious, and the two associations representing them—the Kennebec Log Driving Association and the Kennebec Water Power Company—are to a large extent made up of the same persons. Efforts are being made not only to prevent the needless waste of water in log driving, but to improve the river channel and facilities for driving, so as to require less water for this purpose. The necessity of providing additional storage capacity over that now utilized at Moosehead Lake has been apparent for several years, and surveys of the lake have been made by the water-power company to ascertain the feasibility of further raising the lake level.

Moosehead Lake.

Moosehead Lake, with an area of about 115 square miles, is the largest lake in New England. It is about 35 miles in extreme length, 12 miles in maximum width, and of such depth that it is crossed by steamboats from end to end. It has long been used as a reservoir to store the spring flow for use in log driving and for power, and is commanded by substantial log-crib dams at its two outlets. That at the east or principal outlet was completed in 1901 replacing an old dam. (See Plate VII.) The west-outlet dam was rebuilt in 1904. Most of the regulation of flow, however, is carried on at the east-outlet dam, and in general little water flows by way of the west outlet. The west-outlet stream joins the main river at the upper end of Indian Pond.

The present head of water obtainable on Moosehead Lake is about 7.5 feet. The Kennebec Water Power Company has made surveys of the present lake shores with the view of obtaining additional storage capacity corresponding to an increased depth of 2 feet, and has spent about $16,000 for these surveys and mapping. The results indicate that an increase in water surface of about 1.6 square miles would result from this proposed rise in level. The shores are in general high and rocky, but in several places rather low, and the estimated damages are considerable. The greatest damages would occur in the village of Greenville, and to the hotel and club property at Kineo. There are many private, and in some cases, costly summer residences around the shores of the lake. It is probable that Moosehead Lake could be drawn down considerably below the present limit, if dredging was done at the outlet, but this would of course have an objectionable effect both on the navigability of the lake, and on the general scenic view, and would be met with great opposition.

The data furnished by the Kennebec Water Power Company have been used in compiling the following table, which shows the present storage capacity and that obtainable by raising the lake level 2 feet.

Area and capacity of Moosehead Lake at different elevations. (a)

(Drainage Area at Outlet 1,240 Square Miles.)

Gage height, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.
0.0	111.3		
1.0	111.9	3,110,000,000	3,110,000,000
2.0	112.4	3,127,000,000	6,237.000,000
3.0	113.0	3,142,000,000	9,379,000,000
4.0	113.6	3,158,000,000	12,537.000,000
5.0	114.3	3,176,000,000	15,713,000.000
6.0	114.9	3.195,000,000	18,908,000,000
7.0	115.6	3.213,000,000	22.121.000,000
7.5	116.0	1,614,000,000	23,735,000,000
8.5	116.8	3,245,000,000	26,980,000,000
9.5	117.6	3,267,000,000	30,247,000,000

(a.) Gage heights refer to lake datum, the zero of which is approximately at the elevation of the gate sills, or, 1,021.30 feet above mean sea level.

Moose River Basin.

Moose River and its series of lakes, comprising Brassua Lake and Long, Wood, Attean, and Holeb ponds, afford some excellent opportunities for storage of water. The natural and artificial conditions in the vicinity of these ponds are in general favorable for their utilization for storage without great cost, but at present only one of them (Long Pond) is controlled by a dam, and this is utilized solely for log-driving purposes. The following descriptions of the Moose River lakes and ponds are based on data obtained by the United States Geological Survey during 1905-6, as previously explained.

BRASSUA LAKE.

Brassua Lake is approximately rectangular in shape, running northwest to southeast, about 5.5 miles long and 1.4 miles in maximum width. Its greatest depth is about 35 feet, in the extreme northwestern part of the lake; the more shallow portions lie at the southeastern extremity along Misery Sands. It has an area of 5.55 square miles at an elevation of 1,043.0 feet above mean tide. The shores are wooded and as a rule are high, the low areas being around the entering streams—Misery Stream at the southeast, Moose River at the south, and Brassua Stream at the northern extremity. No dam now exists at the outlet of the lake.

This lake could readily be raised 10 or 15 feet, or even more, above the present low-water level, without doing any damage except to timber standing on the flooded area, but as this is mostly young growth the total damage would be small. There are several good sites for a dam at the outlet of the lake. As a rule the river bed here is rocky or of gravel and in places rather rough.

A dam with crest at elevation 1,056 feet, placed near the outlet, with a total length of about 850 feet and a maximum height of 20 to 25 feet would afford about 18 feet head of water.

About 1.3 miles below the outlet, just below the United States Geological Survey gaging station, is a site for a dam which would not only afford lake storage but would develop a fall of about 25 feet and flood out the rough section of the river intervening, which causes considerable trouble in log driving. A dam here would be about 1,000 feet in total length and about 35 feet in maximum height, if its crest were set at elevation 1,056 feet.

The following table gives the area and approximate storage capacity of Braussua Lake at various elevations:

Area and capacity of Brassua Lake.

(DRAINAGE AREA AT OUTLET, 675 SQUARE MILES.)

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.
1,038	4.45		
1,039	4.66	127,000,000	127,000,000
1,040	4.87	133,000,000	260,000,000
1,041	5.08	139,000,000	399,000,000
1,042	5.30	145,000,000	544,000,000
1,043	5.55	151,500,000	695,500,000
1,044	5.80	158,500,000	854,000,000
1,045	6.05	165,000,000	1,019,000,000
1,046	6.35	173,000,000	1,192,000,000
1,047	6.65	181,000,000	1,373,000,000
1,048	7.00	190,500,000	1,563,500,000
1,049	7.37	200,000,000	1,763,500,000
1,050	7.85	212,000,000	1,975,500,000
1,051	8.37	236,000,000	2,211,500,000
1,052	8.85	240,500,000	2,452,000,000
1,053	9.20	252,000,000	2,704,000,000
1,054	9.50	261,000,000	2,965,000,000
1,055	9.80	269,000,000	3,234,000,000
1,056	10.12	278,000,000	3,512,000,000
1,057	10.45	287,000,000	3,799,000,000
1,058	10.70	295,500,000	5,094,500,000

LONG POND.

Long Pond runs approximately from northwest to southeast and is long, narrow, and irregular in shape. Its extreme length is about 10 miles, 8 miles being the pond proper and the remainder the former river channel, in which water is held by the dam. During low water there is a fall of perhaps 2 or 3 feet between these two portions. The width of the pond varies from 300 feet at the Lower Narrows to 1½ miles opposite the mouth of Parlin Stream. Its maximum depth is about 35 feet, and it has a pond surface of 4.8 square miles at an elevation of 1,159 feet.

The shores are wooded, as a rule, with some bordering farm land toward the northern extremity. Around the upper end the ground is low and marshy; the remainder of the shore rises gradually. The Canadian Pacific Railway runs along the entire southern shore, being but little above the pond in elevation. The lowest portion of the track is just west of Parlin Stream, where the elevation is about 1,165 feet; at several other places the elevation is from 1,166 to 1,170 feet.

The existing dam is an old timber crib structure 385 feet in total length. It has two wing walls, one 43 feet and the other 170 feet long, and the dam proper is 172 feet long, with 14 sluices and gates. The elevation of the bottom of six sluices is about 1,157 feet; of the log sluice, 1,152.2 feet; and of the remaining sluices, about 1,151.2 feet. The elevation of the wing wall on the south, at which water will go to waste, is about 1,160 feet. The dam is now used for holding back water in the spring for a short time during the log-driving season; after that the gates are open and free flow takes place.

On account of the proximity of the Canadian Pacific Railway, perhaps no increase in the height of the dam is warranted, but to utilize the storage a higher summer level could be maintained. The present low-water level is about 1,152 feet at the dam, or probably about 1,154 or 1,155 in the pond proper. In the spring the water is maintained for a short time in the pond at an elevation of over 1,160 feet, and an elevation of 1,160 feet could probably be maintained without doing much damage. If the present average low-water level is considered as elevation 1,155 feet, and the average area 4.5 square miles, the capacity at elevation 1,160 feet would be about 625,000,000 cubic feet. It is probable that this quantity could be considerably increased by dredging at the narrows and lowering the gate sills at the dam. The drainage area at the outlet of the pond is 520 square miles.

WOOD AND ATTEAN PONDS.

Wood Pond is situated in the town of Jackman at an elevation at low-water level of about 1,157 feet. It is connected with Long Pond by about 7 miles of very crooked river, in which the fall is about 2 feet under average conditions. The pond is irregular in shape, 3.8 miles in extreme length and 1¾ miles in maximum width. A considerable portion of it is more than 30 feet in depth. The shores are wooded and steep, with practically no bordering flat land.

Attean Pond is connected with Wood Pond by about three-fourths of a mile of river and under normal conditions is at the same level as Wood Pond. It will thus be noted that Long, Wood, and Attean ponds are all at about the same elevation. Attean Pond is very irregular in shape, 5 miles long, 2 miles in maximum width, and about 30 feet in maximum depth. It contains many islands. The shores are wooded and high for the most part, the lowest land, which is under cultivation, being along the river connecting Wood and Attean ponds.

The Canadian Pacific Railway runs along a portion of the eastern shore of Wood Pond, crosses Moose River at its entrance into that pond, and then follows the northern shore of Attean Pond. Its lowest elevation is about 1,174 feet, just south of the bridge on Moose River.

A dam can be placed at the outlet of Wood Pond. Here the banks are high and of gravel, and the two ponds could be easily raised 10 feet by a dam 550 feet long. It is probable that water could not be drawn lower than about elevation 1,057 feet, owing to backwater influence from the river below; this would make a high-water elevation of 1,067 feet. Damage would be done to timber on the flooded land, and also to some farm land at the head of Wood Pond.

The drainage area of Wood Pond at its outlet is 320 square miles, and of Attean Pond 270 square miles. The following table gives the areas and capacity of Wood and Attean ponds at different elevations:

Area and capacity of Attean and Wood ponds.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.
1.153	6.0		
1.154	6.6		
1.155	7.1		
1.156	7.3		
1.157	7.5		
1.158	7.7	211,900,000	211,900,000
1.159	7.9	217,500,000	429,400.000
1,160	8.0	223,000,000	652,400,000
1.161	8.0	223.000,000	875,400,000
1,162	8.2	225,800,000	1,101.200.000
1.163	8.4	231.400.000	1,322,600,000
1,164	8.6	237,000,000	1,569,600,000
1.165	9 0	245,300,000	1.814,900,000
1.166	9.4	256,400,000	2,071,300,000
1,167	10.0	270,400.000	2.341,700 000
1,168	11.1	295,500.000	2,637,200,000

HOLEB POND.

Holeb Pond, in the town of Holeb, is about 1 mile from Moose River, to which it is connected by Holeb Stream. It is irregular in shape, 3¾ miles long and 1¼ miles in maximum width. The shores are wooded and high, except around the brooks and inlets entering the pond. The elevation of the low-water summer level is about 1,231 feet, and the area of the pond at this elevation is about 1.70 square miles; at elevation 1,241 feet the area of the water surface would be about

2.8 square miles. The Canadian Pacific Railway runs along the southern shore and crosses Holeb Stream just below the point where it leaves the pond, at an elevation of about 1,246 feet.

During the spring freshets, when Moose River is high, the backwater due to a ledge about 8 miles below Holeb Stream sets back to Holeb Pond, and at times has flooded the railroad tracks. This backwater causes the pond to act as a natural storage basin for a short time in the spring.

The only suitable place for a dam would be at the Canadian Pacific bridge, and could one be built here and an elevation of the lake surface of 1,241 feet maintained, the capacity of the lake above elevation 1,231 feet would be about 627,000,000 cubic feet. The drainage area of Holeb Pond at its outlet is about 24 square miles.

Roach River Basin.

Roach River, with its three connected ponds, affords some opportunity for storage, although not as good as Moose River on account of its much smaller drainage area.

LOWER ROACH POND.

The present dam at Lower Roach Pond is as high as the surface of the surrounding ground will admit, and could not be raised without considerable expense because of the lowland. This dam controls about an 8-foot head, and, with an average area of 4.9 square miles, the present capacity is about 1,093,000,000 cubic feet. At present the summer pond level is but little above the minimum low water, and a higher level could be maintained without doing any damage. It is probable, too, that this pond could be drawn down considerably lower by dredging and lowering the outlet. The drainage area at the outlet of the pond is about 85 square miles.

MIDDLE ROACH POND.

On Middle Roach Pond is a dam now controlling 6 feet of head. The average area of the pond is 1 square mile, and with the present dam the capacity is 167,000,000 cubic feet of water. The land is low around the dam, but with flashboards an increase in height of about 2 feet could be obtained without doing any material damage. This increase would add 67,000,000 cubic feet to the capacity.

Moxie Pond.

Moxie Pond, situated in The Forks and East Moxie townships, is about 4 miles from Kennebec River, to which it is tributary by Moxie Stream. It is long and narrow, about 8 miles in extreme length and three-fourths in maximum width, running approximately north and south. It has an area at low water of about 2.6 square miles. The shores are in general fairly high and steep, except near each end of the pond where there is considerable low ground. The shores are wooded, but mostly with small growth.

A timber-crib dam about 450 feet long controls a head of about 9 feet, at which level (about 969 feet above tide) the area of the water surface is about 3.0 square miles. This dam is used at present solely for log-driving purposes. The storage capacity of the pond is about 705,000,000 cubic feet. The outlet can be cut down about 2 feet and the dam raised 3 feet without great expense, and a total head of 14 feet obtained, corresponding to about 1,100,000,000 cubic feet capacity. To more nearly control the run-off from this drainage basin (80 square miles at the mouth of the pond) a dam 18 or 20 feet high would be required, furnishing a storage capacity of about 1,600,000,000 cubic feet. The most serious obstacle to raising the level of Moxie Pond any considerable amount is the proximity of the Somerset Railway extension, and the necessary changes involved in grading, etc., would add largely to the expense. On the other hand, the large amount of available water power on Moxie Stream, which has a fall of about 370 feet in practically 2 miles, make any increase in the storage capacity of Moxie Pond of twofold value.

Pierce Pond.

Pierce Pond is located principally in Pierce Pond Township, about 3.5 miles west of Kennebec River, to which it is tributary by Pierce Pond Stream. It is very irregular in shape, being practically two ponds connected by a thoroughfare. It runs approximately north and south, and is 5 miles in extreme length, a little over a mile in maximum width, and in places rather deep. It has an area of about 2.3 square miles and the surface is approximately 1,125 feet above mean tide. The shores of the pond are wooded, mostly with young growth, and in the main are high with steep banks, but there are a few low places of small area.

A timber-crib dam, in rather poor condition, about 385 feet in total length, affords a head of 10 feet and a storage capacity of approximately 620,000,000 cubic feet.

The drainage area tributary to Pierce Pond is only about 18 square miles and any additional storage over the present amount is of double value, although it could be obtained without great outlay. The thoroughfare between the two sections of the pond could be cut down with little expense, so that the northern part, in which at present there is a height of about 3.5 feet not utilized, would drain down within a foot of the outlet level. Pierce Pond would make an excellent storage reservoir if a greater area were tributary to it.

Clear Water Pond.

This pond is one of the largest ponds in the Sandy River basin. It is located in the towns of Farmington and Industry. It drains into Sandy River just above the village of New Sharon.

The following table gives the areas and capacities of this pond for various elevations:

Area and Capacity of Clear Water Pond.

Elevation, feet.*	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.
1,520	1.08		
1,525	1.15	156,119,000	156,119,000
1,530	1.22	164,483,000	320,602,000
1,535	1.29	175,634,000	496,236,000

* Approximate. Barometric elevation.

DEAD RIVER BASIN.

GENERAL DESCRIPTION.

Dead River is formed by the junction of two branches known respectively as the North and South branches of Dead River.

The North Branch has its origin in the mountains in the northern part of Franklin County, along the boundary between Maine and the province of Ontario, Canada, receiving the waters of Mooshorn Pond and the Chain of Ponds. It flows in a general southeasterly direction some 21 miles, where it is joined in the southern part of the town of Eustis by the South Branch. There is one developed power on this branch at Eustis where there is a dam and a utilized head of 15 feet.

The South Branch rises in the mountains east of the Rangeley Lakes, and flows northeasterly about 20 miles to its junction with the North Branch. One developed power of about 50 horsepower exists at Stratton in the town of Eustis.

Dead River enters the Kennebec at The Forks. The length from the junction of the two branches to the mouth is 47.3 miles.

The drainage areas of Dead River and a number of its tributaries, as well as a number of its tributary lakes, are given on page 221.

DESCRIPTION OF RIVER.

Below junction of North and South Branches.

From the junction of the North and South branches, the river flows in a general northeasterly direction to Flagstaff, about 6 miles. It is fairly straight for the first half of this distance, but quite crooked, the remainder. Several small streams enter it, but no important ones. The width of the river is from 75 to 150 ft.; the current is slight, and smooth water exists all the way except at Arnolds Falls and one stretch of rips 4 miles below the junction. The river banks are from 5 ft. to 12 ft. above the water surface, at normal conditions. The land bordering on the banks is level and cultivated, the valley being wide, and of varying width.

At Flagstaff village, the intervale land is nearly all on the right bank of the river, and continues low for a mile, then rises rapidly. On the left bank above the intervale land, the ground rises slowly, and does not attain a high elevation. The intervale land along the valley is often flooded during high water conditions, and the river has been high enough to flood the main street of Flagstaff, which ordinarily is about 15 ft. above the river. The village of Flagstaff is situated on the left bank of the river at an abrupt bend, and consists of some 30 houses —most of them being situated on the main street that runs parallel to the river, and 200 ft. to 300 ft. back from it. The outlet stream of Flagstaff Lake joins Dead River at Flagstaff village. This stream falls about 16 ft., and it would be impossible to divert Dead River into Flagstaff Lake.

Flagstaff to Dead River Post Office.

Below Flagstaff and down to Parson's Ranch at Dead River Post Office, a distance of 10 miles, the river flows in a general southeasterly direction, receiving in this distance quite a number of small brooks, principally those originating on the slopes of Mt. Bigelow. It flows fairly straight down to Hurricane Falls, about 5 miles, with width varying from 75 ft. to 150 ft. Below this point, and especially in the neighborhood of Mr. Parson's ranch, the river is very crooked. The river valley is flat and narrow, varying in width from ¼ to 1 mile, and the banks are in general from 8 ft. to 10 ft. above the normal water surface. The intervale land is nearly all under cultivation, and farms are scattered along on each side of the river. Back from the intervale land, the ground rises rapidly, and in general is wooded. There is but little current in the river, and only one set of rapids occurs, which are known as Hurricane Falls.

Dead River Post Office to Dead River Dam.

The river in this stretch, a distance of about 13 miles, flows in a general northerly direction with several large and abrupt bends. The intervale land down to Bog Brook, a distance of 2 miles, is under cultivation. From here down to the mouth of the Kennebec, the land is nearly all wooded.

West Carry Pond Brook enters the right bank 2½ miles below Bog Brook. It is about 100 feet at the mouth, with dead water extending back ½ mile.

The head of Long Falls is 1½ miles farther down stream. From dead water to the mouth of Black Brook, a distance of 1.05 miles, the total fall is 81 feet.

Black Brook enters the right bank at the foot of Long Falls. It is about 50 ft. wide at the mouth and drains an area extending almost to Pierce Pond.

The outlet of Spring Lake enters from the left bank, 2.2 miles below the foot of Long Falls. From here down to Dead River Dam, a distance of 4 miles, the river is very crooked, of average width 200 ft. and with little perceptible current. The banks are low and wooded, averaging from 3 to 8 ft. high. Low land extends back from the river in places at least a mile and this stretch is flooded when the water is held by the Dead River Dam.

Dead River Dam. This dam, built in the autumn of 1905 by the Dead River Log Driving Association, is situated at the head of the quick water leading to Grand Falls, and about 1,400 feet above the falls proper. It is a timber crib structure 333 feet long, broken in alignment about 10°, 240 feet from the east end of the dam proper. A crib wing wall extends to east 135 ft., and abuts upon a ledge. On the west a crib wing wall extends 50 ft. to a high gravel bank. The dam contains two special sluices for logs—one 34 feet wide, the other 15 ft.,—and 20 gates. These gates are 12 feet high, and the elevation of the bottom of the gate sluices varies from 0.1 to 0.5 foot. The bottom of the log sluices is about 2 ft. above the bottom of the gate sluices.

The piers are timber crib, stone filled, stepped on the downstream side, and sloping on the upstream. The gates are housed in. The dam is used for log driving a very short time in the spring. When filled, a 13 foot head is obtained, and the river is raised back to the foot of Long Falls, flooding much of the low land on the left bank in the neighborhood of Half Way Brook. The water is not held long enough, however, to injure the trees.

Dead River Dam to The Forks. Below Dead River Dam the water is swift to Grand Falls in a distance of some 1400 ft., dropping in this distance, 6 ft. At Grand Falls a precipitous drop of 28 ft. occurs.

From the basin of comparatively quiet water at the foot of the falls, elevation 981 ft., the river drops to elevation 565 ft. in a distance of 15 miles, or to its junction with the Kennebec at The Forks. The total fall is 416 ft., or an average slope of about 28 ft. to the mile. In this distance, there is no dead water and only two very short stretches where there is but little current. For the most part a gradual descent is maintained, no precipitous falls occurring, but a succession of very rocky rapids with short distances of connecting swift water.

Several streams enter the river, the most important by far, being Spencer Stream, which enters the left bank about ½ mile below Dead River Dam. Four other smaller streams enter on the left bank but they drain limited areas except Enchanted Stream entering the left bank about half way down to The Forks.

FALLS OF DEAD RIVER.

Important Falls of Dead River below the junction of the North and South branches are as follows:

Arnolds Falls. These falls occur immediately below the junction of the North and South branches. First occurs a drop of 4 ft. in a distance of about 700 ft. The fall in the distance of 0.6 miles is only 7 ft. The banks of the stream are high, the shore and bed of the stream being filled with large rocks but no ledges in sight.

Hurricane Falls. These falls occur 4.4 miles below Flagstaff village. They are opposite the Durrell farm about 500 ft. north of the highway. The fall does not exceed 4 ft. in a distance of about 150 feet. The shores are covered with large boulders but no ledge appears. The bank on the north side of the stream is of gravel, high and wooded with the land beyond rising rapidly. The bank on the south side is also of gravel and from 8 to 10 ft. above the top of the falls.

Long Falls. These falls occur about 6 miles below Dead River Post Office. From dead water at the head down to the mouth of Black Brook, a distance of 1.5 miles, the fall for the first 0.3 mile is uniform and is about 10 ft. The river then turns abruptly to the left for a short distance and here in these stretches and bends, a total distance of 0.14 mile, a series of precipitous falls occur aggregating 44 ft. The banks are all high ledge on both sides and afford an excellent site for a dam at several points. The total fall, in a distance of 1.05 miles is 81 ft.

Engineering studies have been made in the office of the Water Storage Commission from time to time during the past year of the power that can be developed here. During the field season, 1910, a party has been in the field mapping various lakes and reservoir sites in the Dead River Basin, especially above Long Falls. Some excellent reservoir sites have been discovered that, if utilized and regulated in the interest of power development at Long Falls, will increase three to four fold, the power that could be developed here on the natural flow. Time has not been sufficient, however, since this year's maps have been received in the office, to make the complete engineering study of this power development.

Long Falls is located on what is known as a public lot and it is still controlled by the State of Maine. At the present time, on account of public demand all over the country for State and even national regulation of water powers, it does not seem advisable for the State to relinquish control of this power by charter to a private company until the State has further outlined its policy on control or regulation of the water powers within its borders.

Grand Falls. These falls are about 1400 ft. below Dead River Dam and are at the end of about ¼ mile of quick water in which the fall is about 6 ft. At the falls proper, there is a perpendicular drop of 28 ft. Below this, quick water extends over a rocky channel about 200 ft. falling about 1 ft. The banks are high and are of ledge at the top of the falls. The ledge on the right bank is about 10 ft. high while that on the left bank is 25 ft. high. The ledges on each side below the falls are about 50 feet high and extend downstream about 500 ft. There is a fine location for a dam at the head of the falls and a 40-ft. head could easily be developed.

Falls below Spencer Stream. As previously stated, successive rapids exist all the way down to the junction of the Kennebec, the total fall in the 15 miles being 416 ft. Ledge occurs in many places on both banks and there are many excellent opportunities for dam sites with moderate head.

Spencer Stream Dam. This dam is a log-roll dam affording a head of about 9 ft., situated about 4 miles up Spencer Stream from the entrance of Little Spencer Stream. It makes several small ponds that are very quickly filled, affording frequently three or four heads per day during the log-driving season.

LAKE STORAGE.

Flagstaff Lake. This lake is at elevation of 1126 ft. above mean sea level and is situated in the town of Flagstaff. It lies on the north side of Dead River and is connected with it by a small stream about ½ mile in length. The lake is fairly regular in shape, being approximately rectangular with a length of 2½ miles and a width of 0.9 mile. It has an area of 1.43 square miles at a water surface of 2.5 ft. below the top of the sill at the log sluice of the dam. It is a shallow lake, being not over 10 ft. in maximum depth at medium stages. The shores are in general rather low.

A rough timber and boulder filled dam, situated about 2300 ft. down the outlet stream and a short distance above Dead River, controls a head of 12 ft., although considerably less than this amount is actually obtained owing to the position of the gates. Power is used at this dam for running a saw mill. This dam could not be raised more than 3 ft. without flooding a part of the village of Flagstaff. A dam could, however, be placed 500 ft. below the lake or 1800 ft. upstream from the present dam, where the channel is about 100 ft. wide and the stream has a rocky bed. An increase of 10 ft. on the storage capacity could be obtained. The capacity with a depth of 12 feet and a water surface of 1.4 square miles is about 470,000,000. With the increased head of 10 ft., a large storage capacity could be obtained, probably as much as 2,000,000,000 cubic ft. The drainage area at the outlet of Flagstaff Lake is 45 square miles.

West Carry Pond. This pond is in the town of Carrying Place, about 4 miles east of Dead River, to which it is tributary. It is regular in shape, about 2 miles in extreme length and 0.8 mile in maximum width. In places it is more than 80 feet deep. It has a water surface area of approximately 1.3 square miles, at an elevation of 1,250 feet above mean tide, or about 180 feet above Dead River. The shores are high and wooded.

A timber-crib dam at the outlet, 600 feet in total length, controls a head of about 10 feet, which would correspond to a storage capacity of about 360,000,000 cubic feet. This level could be easily raised 10 feet or more, but the tributary drainage area is only 14 square miles, and it is stated that water has never flowed over the present dam, so that no changes seem warranted.

Spring Lake. This lake, in T. 3, R. 4, lies about 1 mile west of Dead River, to which it is tributary. It is long and narrow, with two deep bays, 2.6 miles in total length, 0.75 mile in maximum width, and about 60 feet in maximum depth. The water-surface area is about 1.1 square miles, at an elevation of about 1260 feet above mean tide, or 260 feet above Dead River. The shores are high and wooded.

No dam is situated at the outlet of this pond, although a head of 10 feet could be readily controlled. The drainage area is only about 10 square miles, and probably this lake will be of little value for storage unless the topography is such that adjacent streams can be readily turned into it.

Spencer Ponds. These ponds are situated mainly in Hobbstown, about 5 miles north of Dead River, with which they are connected by Little Spencer and Spencer streams. They are known as Lower Basin, Upper Pond, and Fish Pond, and are connected by narrow thoroughfares. They are long and narrow, running approximately north and south. The total length is 6 miles and the maximum width, in the lower basin, 0.8 mile. The area of water surface is about 2.6 square miles, at an elevation of about 1,150 feet above tide, or 170 feet above Dead River at Spencer Stream. The shores are wooded and generally steep and high, except at the north end.

A timber-crib dam approximately 105 feet long at the outlet of Lower Basin controls a head of about 12 feet, although a bar in the stream above the dam prevents the utilization of the last foot of storage. This could be easily removed and would result in a storage capacity with the present dam of approximately 870,000,000 cubic feet. It is practicable to raise the level of these ponds 5 ft. or more, depending on the quantity of water available. A total head of 16 ft. would afford a storage capacity of about 1,500,000,000 cubic feet. The drainage area at the outlet of Lower Basin is 48 square miles.

Greenbush Reservoir Site.

There was surveyed during 1910 a reservoir site on the North Branch of Dead River. The dam site is located at the present log drivers' dam at Ledge Falls, 3 miles above Eustis. There is a secondary or overflow channel here that would necessitate the construction of practically two dams, if a reservoir is created to the limits given in the table below. Such a reservoir would flood out several small ponds, including Greenbush Pond and back water some distance up Alder Stream.

The following table gives the areas and capacities of this site for several elevations.

Area and Capacity of Greenbush Reservoir Site.

DRAINAGE AREA 135 SQUARE MILES.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.
1,180	0.0		
1,185	0.288	20.078,000	20,078,000
1,190	0.668	66,680.000	96,758.000
1,195	1.058	120.295.000	217,053,000
1,200	1.281	163,018,000	380,071,000

Chain of Ponds. This system consists of a series of ponds connected by thoroughfares, and located in Township 2, Range 6, in the northern end of Franklin County and near the head of the North Branch of Dead River. The individual ponds are known as Lower, Bag, Long, and Round. There is a crib dam at the outlet that is regulated in the interest of log driving.

A dam considerably higher could be built here, making this site a valuable storage for power developments below. The only damage outside of that to the timber lands, would be to the property of an angling association on the south shore of Long Pond.

The following table gives the areas and capacities of this site for various elevations:

Area and Capacity of Chain of Ponds.

DRAINAGE AREA 78 SQUARE MILES.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.	Remarks.
1,261	0.95	0	0	Average low water.
1.266	1.20	150,543,000	150.543.000	Present storage.
1.271	1.48	186.785.000	337,328.000	
1,276	1.67	220.239,000	557.567.000	
1.281	1.86	245,330,000	802,897,000	

Jim Pond. This pond is tributary to the North Branch of Dead River and is located in the northern part of Franklin County in Township 1 Range 5. It drains into the North Branch

The following table gives the areas and capacities of this pond for various elevations:

Area and Capacity of Jim Pond.

DRAINAGE AREA, 21 SQUARE MILES.

Elevation, feet.*	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.
1.235	0.47		
1,240	0.52	69,696,000	69,696,000
1,245	0.57	75.272,000	144,968,000
1,250	0.62	83,635,000	228,603,000
1,255	0.68	90,605,000	319,208,000

* Barometric elevations.

Tim Pond. This pond is a tributary of the North Branch of Dead River and is located in the northern part of Franklin County, in Township 2, Range 4. It has a small tributary drainage area. The outlet stream has a general northwesterly direction emptying into the North Branch just above the town of Eustis.

The following table gives the areas and capacities of this pond for various elevations:

Area and Capacity of Tim Pond.

DRAINAGE AREA, 11 SQUARE MILES.

Elevation, feet.*	Area, square miles	Capacity of section, cubic feet.	Total capacity, cubic feet.
1,995	0.46		
2,000	0.73	83,635,000	83,635.000
2,005	0.98	119,877,000	203,512,000

* Barometric elevations.

King and Bartlett Pond. This pond is a tributary of Big Spencer Stream and is located in Somerset County in Township 4, Range 5.

The following table gives the areas and capacities of this pond at various elevations:

Area and Capacity of King and Bartlett Pond.

DRAINAGE AREA, 3 SQUARE MILES.

Elevation feet.*	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.
1,525	0.81		
1.530	0.85	115.695,000	115,695.000
1,535	0.89	121.271,000	236,966.000
1,540	0.93	126,847.000	363,813,000
1,545	0.97	132.422.000	496,235.000
1,550	1.00	136.604.000	632,839.000
1,555	1.03	142,180.000	775.019.000
1,560	1.06	144,968,000	919,987.000
1,565	1.10	150,543,000	1,070,530,000

* Barometric elevations.

Little Bartlett Pond. This pond is also a tributary to Big Spencer Stream and is located in Township 4, Range 5.

The following table gives the areas and capacities of this pond for various elevations:

Area and Capacity of Little Bartlett Pond.

DRAINAGE AREA, 7 SQUARE MILES.

Elevation, feet.*	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.
1,385	0.14		
1,390	0.16	20,909,000	20,909,000
1,395	0.18	23.697.000	44,606,000
1,400	·0.20	26,484,000	71,090.000
1,405	0.23	30,666.000	101,756,000
1.410	0.24	33,454.000	135,210,000
1,415	0.25	33.454,000.	168,664.000
1,420	0.26	36.242.000	204,906.000
1,425	0.27	36,242,000	241,148,000

* Barometric elevations.

Baker Pond. This pond is also a tributary to Big Spencer Stream and is located in Township 5, Range 6, directly north of King and Bartlett Pond.

The following table gives the areas and capacities of this pond at various elevations:

Area and Capacity of Baker Pond.

DRAINAGE AREA, 25 SQUARE MILES.

Elevation, feet.*	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.
1.395	0.25		
1,400	0.31	39.030.000	39.030.000
1,405	0.37	47,393.000	86,423.000
1,410	0.43	55,757,000	142,180,000
1,415	0.49	64.120,000	206 300.000
1,420	0 61	76,666,000	282,966.000
1,425	0.69	90.605.000	373,571,000

* Barometric elevation.

ELEVATIONS.

The following table gives elevations of controlling features along Dead River from the mouth to Chain of Ponds. They were obtained from the plane table sheets of the survey of 1910.

Elevations along Dead River.

Locality.	Distance. Total miles.	Distance. Difference, miles.	Elevation. Total feet.	Elevation. Difference, feet.
Mouth Kennebec River	.00	....	565	......
U. S. G. S. gage rod	1.65	1.65	600	35
The Ledges	2.75	1.10	620	20
Lumber camp	3.00	.25	625	5
Apple Tree Inn	6.16	3.16	750	125
Enchanted Stream, mouth	7.63	1.47	800	50
Stony Brook camp	9.00	1.37	835	35
Durgins lumber camp	9.45	.45	845	10
Stony Creek, mouth	10.28	.83	862	17
Abandoned cabin	11.12	.84	880	18
The basin	11.50	.38	895	15
Haydens Landing	12.38	.88	920	25
Alder Brook	13.52	1.14	953	33
Spencer Stream, mouth	14.75	1.23	978	25
Grand Falls, foot	14.98	.23	981	3
Grand Falls, head	15.00	.02	1,009	28
Dead River dam, foot	15.30	.30	1,015	6
Dead River dam, water surface above	15.30	.00	1,018	3
Spring Lake outlet	19.50	4.20	1,019	1
Black Brook, mouth	21.70	2.20	1,022	3
Long Falls, foot	22 17	.47	1,043	21
Long Falls, top	22.31	.14	1,087	44
Long Falls rapids	22.44	.13	1,096	9
Long Falls, dead water	22.75	.31	1,103	7
Bog Brook, mouth	26.40	3.65	1,103	0
Hurricane Falls, foot	33.80	7.40	1,104	1
Hurricane Falls, head	33.82	.02	1,110	6
Hurricane Brook	34 30	.48	1,110	0
Highway Bridge, water surface	37 70	3.40	1,110	0
Flagstaff Stream, mouth	38.25	.55	1,110	0
Flagstaff Lake	(38.75)	.50	(1,126)	16
Rips in bend river, foot	42.90	....	1 110	......
Rips in bend river, head	43.04	.14	1,114	4
Rips	46.50	3.46	1.117	3
Arnolds Falls, foot	47.00	.50	1,120	3
Arnolds Falls, head	47.15	.15	1,124	4
Junction, North and South branches	47.30	.15	1,125	1
North Branch, highway bridge, W. S	52.95	5.65	1,130	5
Eustis dam, foot	54.95	2.00	1.134	4
Eustis dam, head	54.95	.00	1,149	15
Ledge Falls dam, foot	57.80	2.85	1,177	28
Ledge Falls dam, head, W. S	57.80	.00	1,180	3
Chain of Ponds, dam, foot	68 75	10.85	1,250	70
hain of Pond s, water surface	68.75	.00	1,261	11

PRINCIPAL STORAGE.

The following table shows the amount of storage in the principal lakes in the Kennebec basin as discussed in the preceding pages.

Principal Storage in Kennebec Basin.

LAKE.	Drainage area.	Present storage, cubic feet.	Available storage, cubic feet.
Moosehead Lake	1,240	23,735,000,000	30,247,000,000
Brassua Lake	657		3,512,000,000
Long Pond	520	625,000,000	625,000,000
Wood and Attean ponds	320		2,341,700,000
Holeb Pond	24		627,000,000
Lower Roach Pond	85	1,093,000,000	1,093,000,000
Middle Roach Pond	32	167,000,000	234,000,000
Chain of Ponds	78	150,500,000	802,900,000
Greenbush Reservoir	135		381,100,000
Jim Pond	21	69,700,000	319,200,000
Tim Pond	11	83,600,000	203,500,000
Flagstaff Lake	45	470,000,000	2,000,000,000
West Carry Pond	14	360,000,000	360,000,000
Spencer Ponds	48	870,000,000	1,500,000,000
King and Bartlett Pond	3		1,070,500,000
Little Bartlett Pond	7		241,100,000
Baker Pond	25		373,600,000
Moxie Pond	80	705,000,000	1,600,000,000
Pierce Pond	18	620,000,000	620,000,000
Clear Water Pond		156,100,000	496,200,000
Total		29,104,900,000	48,647,800,000

SUMMARY OF STORAGE.

The following table compiled from various sources is a summary of present storage in the Kennebec Basin with remarks on additional available storage.

Summary of Storage in Kennebec Basin.

CONNECTED WITH MOOSE RIVER.

LAKE.	Approximate area, square miles.	Present storage, feet.	Additional available storage, feet.
Brassua Lake	5.55	None	10-15
Misery Pond	1.50	2 or more	Can be raised.
Parlin Pond	2.75	5 formerly	3
Long Pond	5.00	8	
Wood Pond	3.30	None	10
Little Big Wood Pond	1.35	7	10
Attean Pond	4.50	None	10 by dam of outlet of Wood Pond
Holeb Pond	2.00	None	Can be raised by a dam at Holeb Falls.
Thorndike Ponds (2)	1.00	6 (one pond)	The other can be raised 6 feet.
	26.95		

CONNECTED WITH DEAD RIVER.

Lake.	Approximate area, square miles.	Present storage, feet.	Additional available storage, feet.
Spencer Ponds	2.6	12	4 or 5
Whipple Pond	0.5	....	6
Great Pond	4.0	....	Considerable.
King and Bartlett Pond	0.9		
Spring Lake	1.1	....	10
Flagstaff Lake	1.4	12	More.
West Carry Pond	1.3	10	10 or more.
Jim Pond, Township 1, Range 5	0.6	8	2
Tim Pond, Township 2, Range 4	0.7	9	
Chain of Ponds (3)	1.2	8	2; one dam flows all.
Baker Pond	0.4		
Little Bartlett Pond	0.2		
	14.9		

CONNECTED WITH CARRABASSETT RIVER.

Lake.	Approximate area, square miles	Present storage, feet.	Additional available storage, feet.
Fahi Pond	0.6	4	4
Sandy Pond	0.4		
Embden Pond	2.4	4	12
Hancock Pond	1.0	4	Several.
Spruce Pond	0.35		
Rowe Pond	0.70	....	8
Gilman Pond	0.50	Dam.........	
Judkins Pond	0.75		
Butler Pond	0.40		
Porters Pond	1.00	Dam.........	4
Tufts Pond	0.50	....	Several.
Dutton Pond	0.20	8	Several.
Jerusalem Pond	0.30	Dam.........	Several.
Carrying Place Pond (middle)	0.30	Dam.........	Several.
	9.10		

CONNECTED WITH SANDY RIVER.

LAKE.	Approximate area, square miles.	Present storage, feet.	Additional available storage, feet.
Bog Pond	1.00		
Clear Water Pond	1.15	8	3
Norcross Pond	0.35		
Chesterville Ponds (6)	2.00	Dam	4 or 5 can be had on four ponds.
Wilton Pond	1.25	Dam 7	Can raise 2 feet and lower outlet 3 feet.
North Pond	1.00	Dam	Can raise dam and lower outlet
Taylor Pond	0.20		
Sandy River Ponds (4)	1.00	2	Several.
Lufkin Pond	1.25		5
Sylvester Pond	0.30	Dam	
	9.50		

CONNECTED WITH WESSERUNSETT STREAM.

LAKE.	Approximate area, square miles.	Present storage, feet.	Additional available storage, feet.
Hayden Lake	3.00	7	3
Wentworth Pond	1.00 (with Bakers Pond)	None	10
Bakers Pond		None	Can be made a good reservoir.
Wyman Pond	0.75	None	9
Weeks Pond	0.60	6	
	5.35		

CONNECTED WITH SEBASTICOOK RIVER.

Lake.	Approximate area, square miles.	Present storage, feet.	Additional available storage, feet.
China Lake	6.10	6	
Pattee Pond	0.85		
Lovejoy Pond	0.70		
Sandy Pond	0.95	6	
Twenty-five Mile Pond	4.25	2	2 by lowering outlet.
Carlton Bog	1.75	....	4 on 3.50 square miles.
Plymouth Pond with flowage	3.00	10	
Skinner Pond	0.70		
Stetson Pond	2.50	....	Several.
Sebasticook Lake	7 50	4	4
Corinna Pond	0.60		
Dexter Ponds	3.00	8	
Palmyra Ponds (2)	0.60		
Stuarts Pond	0.80		
Indian Pond, with flowage	2.50	Dam.........	
Little Indian Pond	0.35		
Weymouth Pond	0.40		
Rogers Pond	0.90	....	Can have a high dam.
Mill Pond	1.10		
Moose Pond	9.50	4	10 or more.
Stafford Pond	0.35		
Starbird Pond	0.35		
Barker Pond	0.35		
	48.20		

CONNECTED WITH MESSALONSKEE STREAM.

Lake.	Approximate area, square miles.	Present storage, feet.	Additional available storage, feet
Messalonskee Lake	5.40	4-5	4 with large flowage.
Long Pond	4.20	1-2	
Great Pond	12.70	Dam.	
Ellis Pond	0.90		
McGrath Pond	0.70		
Little Pond	0.35		
East Pond	2.60	8	
North and Little Ponds	3.60		
	30.45		

CONNECTED WITH COBBOSSEECONTEE STREAM.

LAKE.	Approximate area, square miles.	Present storage, feet.	Additional available storage, feet.
Pleasant Pond	1.1	4	3 by higher dams and 3 by cutting down the "Rips" and "Hazards" ledge.
Purgatory Pond (first)	0.7	3	The three Purgatory ponds can be raised 8 feet and drawn down 4 feet.
Purgatory Pond (second)	0.5	Dam	
Purgatory Pond (third)	0.2	....	
Cochnewagon Pond	1.0	7	
Wilson Pond	0.9	4	
Cobbosseecontee Pond	8.4	4	Can draw down and add 6 feet.
Narrows Pond	0.8		
Lake Annabessacook	2.2	3	3
Lake Maranacook	2.5		
Carlton Pond	0.5		
Greeley Pond	1.1		
Sanborn Pond	0.3	....	Can be flowed.
Desert Pond	0.3		
Jamies Pond	0.3		
	20.9		

CONNECTED WITH KENNEBEC RIVER.

LAKE.	Approximate area, square miles.	Present storage, feet.	Additional available storage, feet.
Weber Pond	1.90	6	
Threemile Pond	1.60	8	
Sibley and Morrill Ponds	2.00	....	10 on Morrill Pond.
Long Pond	0.95		
Austin Ponds (5)	3.20	....	All can have dams.
Robinson Pond	0.75		
Pleasant Pond	1.60	4	8
Mores Bog Stream Pond (Caratunk)			
Otter Ponds (2)	0.50		
Chase Ponds (3)	1.00		
Mosquito Pond	1.00	....	12
Moxie Pond	3.00	9	5 or more.
Lower Baker Pond	1.00		
Black Brook Pond	0.50	8	2
Knights Pond	0.20	7	2
Pierce Pond	2.30	10	Good reservoir.
Carrying Place Pond (lower)	1.00	....	High dam.
Cold Stream Pond	1.25	....	12
Chase Stream Pond	0.60		
Indian Pond	1.50	12	
Moosehead Lake	115.00	7.5	2
Lower Roach Pond	5.00	8	4
Middle Roach Pond	1.50	6	2
Upper Roach Pond	1.50	Poor dam	
Tomhegan Pond	0.75	No dam	6
Spencer Pond	1.50	4	
West Outlet Ponds (3)	1.25	Dam feasible	
Nequasset Pond	0.60		
Togus Pond	1.00	Dam	10
Small ponds in Augusta	1.50		
Gardiner Pond	0.90		
	156.85		

Summary of areas of principal lakes and ponds in Kennebec Basin.

	Square miles.
Moose River	26.95
Dead River	14.90
Carrabassett River	9.10
Sandy River	9.50
Wesserunsett Stream	5.35
Sebasticook River	48.20
Messalonskee Stream	30.45
Cobbosseecontee Stream	20.90
Kennebec River	156.85
Total (152 lakes and ponds)	322.20

STREAM FLOW.

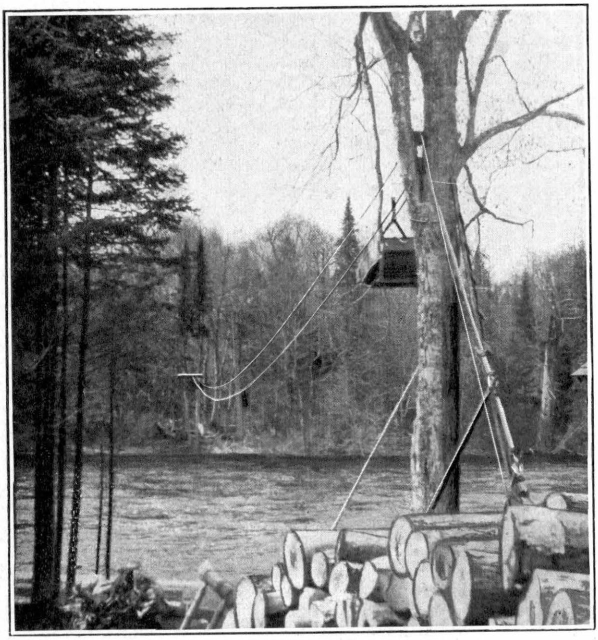
The longest continuous run-off record on Kennebec River is that at Waterville, beginning in 1893. The driest year since that time was 1908 and the wettest was 1907, the total flow in these two years being in the ration of about 1 to 2.32.

The following gaging stations have been maintained in this basin:

Moose River at Rockwood (1902-1908 and 1910).
Moosehead Lake at Greenville (1903-1910 stage only).
Moosehead Lake at East Outlet (1905-1910 stage only).
Kennebec River at The Forks (1901-1910).
Kennebec River at Bingham (1907-1910).
Kennebec River at North Anson (1901-1907).
Kennebec River at Waterville (1893-1910).
Roach River at Roach River (1901-1908).
Dead River at The Forks (1901-1907 and 1910).
Carrabassett River at North Anson (1901-1907).
Sandy River at Farmington (1910).
Sandy River at Madison (1904-1908).
Messalonskee Stream at Waterville (1903-1905).
Sebasticook River at Pittsfield (1908-1910).
Cobbosseecontee Stream at Gardiner (1890-1910).

All reliable data pertaining to the Kennebec River drainage collected prior to 1907 have been assembled and published in Water Supply Paper, 198, Water Resources of Kennebec River Basin.

Plate VIII



Cable Station on Moose River at Rockwood

MOOSE RIVER NEAR ROCKWOOD, MAINE.

The gaging station was established September 7, 1902, and discontinued December 31, 1908, but was re-established May 16, 1910. It is located 4 miles west of Kineo, near the village of Rockwood, and 2 miles from the mouth of the river. A view of this station in shown on Plate VIII.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1902, No. 82, p. 36. No. 165, p. 62. No. 198, pp. 59-64, 121, 149.
1903, No. 97, pp. 49-50. No. 165, p. 62. No. 198, pp. 59-64, 121, 149.
1904, No. 124, p. 64. No. 165, p. 62. No. 198, pp. 59-64, 121, 149.
1905, No. 165, pp. 60-62. No. 198, pp. 59-64.
1906, No. 198, pp. 59-64. No. 201, pp. 57-59.
1907, No. 241, pp. 77-79, 342.
1908, No. 241, pp. 77-79, 342.

Run-off of Moose River at Rockwood, Maine, in second-feet per square mile and depth in inches. Drainage area, 680 square miles.

	1902.		1903.		1904.		1905.		1906.		1907.		1908.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	.....	.....	.75	.86	.....	.....	.....	.....	.28	.32	.44	.51	1.18	1.36	.....	.....	.66	.76
February	.....	.....	.....	.....	.....	.....	.....	.....	.54	.57	.22	.23	.59	.63	.....	.....	.45	.48
March	.....	.....	5.70	6.57	.....	.....	.....	.....	.23	.26	.34	.40	.82	.95	.....	.....	1.78	2.04
April	.....	.....	4.50	5.02	2.19	2.44	3.46	3.86	1.53	1.71	1.51	1.68	2.97	3.31	.....	.....	2.69	3.00
May	.....	.....	.....	.....	5.92	6.82	4.69	5.41	7.04	8.12	7.15	8.24	7.04	8.12	2.37	1.41	5.70	6.35
June	.....	.....	.....	.....	2.42	2.70	2.56	2.86	3.02	3.37	2.90	3.24	3.28	3.66	2.85	3.18	2.84	3.17
July	.....	.....	.67	.77	1.04	1.20	1.17	1.35	1.09	1.26	2.32	2.68	.50	.58	1.16	1.34	1.14	1.31
August	.....	.....	.68	.78	.53	.61	.42	.49	.39	.45	1.51	1.74	.32	.37	.41	.47	.61	.70
September	1.00	1.12	.27	.30	1.18	1.32	.32	.36	.38	.42	.69	.77	.26	.29	.35	.39	.56	.62
October	1.35	1.56	.15	.17	2.09	2.41	.22	.25	.87	1.00	1.96	2.26	.28	.32	.35	.40	.91	1.05
November	1.82	2.03	.19	.22	.95	1.06	.23	.26	1.21	1.35	4.96	5.53	.20	.22	.64	.71	1.28	1.42
December	.96	1.11	.18	.21	.54	.62	.32	.36	.81	.93	2.21	2.55	.15	.17	.64	.74	.73	.84
Total	.....	.....	.....	.....	.....	.....	.....	.....	.....	19.76	.....	29.83	.....	19.98	.....	.....	.....	21.74
Mean	.....	.....	.....	.....	.....	.....	.....	.....	1.45	.....	2.18	.....	1.47	.....	.....	.....	1.61	

KENNEBEC RIVER AT THE FORKS.

This station is located at the wooden highway bridge across Kennebec River at The Forks, about 2,000 feet above the mouth of Dead River. It was established September 28, 1901.

The nearest dam used for storage is about 12 miles above the station, at the outlet of Indian Pond. From about May 1 to July 31 considerable fluctuation in gage height, ranging from 2 to over 5 feet, occurs daily, owing to regulation of flow for log driving.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1901. No. 65, p. 16, No. 82, pp. 26-28. No. 124, p. 57. No. 198, pp. 33-40, 76-81, 118, 120-121, 146-148, 149.
1902, No. 82, pp. 26-28. No. 124, p. 57. No.198, pp. 33-40, 76-81, 118, 120, 121, 146-148, 149.
1903, No. 97, pp. 43-45. No. 124, p. 57. No. 198, pp. 33-40, 76-81, 118, 120-121, 146-149.
1904, No. 124, pp. 56-59, No. 198, pp. 33-40, 76-81, 118, 120, 121, 146-149.
1905, No. 165, pp. 53-55, No. 198, pp. 33-40, 76,81, 118, 120, 121, 146-149.
1906, No. 198, pp. 33-40, 76-81, 118, 120, 121, 146-149. No. 201, pp. 51-52.
1907, No. 241, pp. 82-84, 342.
1908, No. 241, pp. 82-84, 342.

Run-off of Kennebec River at The Forks, Maine, in second-feet per square mile and depth in inches. Drainage area, 1570 square miles.

	1901.		1902.		1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	......	......	......	......	......	......	......	......	......	......	.59	.68	1.56	1.80	.30	.35	1.84	2.12	1.07	1.24
February	......	......	......	......	1.85	1.93	......	......	......	......	......	......	.80	.84	1.29	1.39	.60	.63	1.21	1.26	1.15	1.21
March	......	......	2.09	2.41	2.08	2.40	......	......	1.01	1.16	......	......	1.03	1.19	1.97	2.27	.77	.89	.99	1.14	1.42	1.64
April	......	......	6.37	7.11	5.32	5.94	1.46	1.63	1.06	1.18	1.68	1.87	1.00	1.12	1.93	2.15	1.73	1.93	2.59	2.89	2.57	2.87
May	......	......	6.05	6.98	2.26	2.61	3.22	3.71	2.76	3.18	4.74	5.46	5.38	6.20	6.69	7.71	5.11	5.89	3.81	4.39	4.45	5.13
June	......	......	6.11	6.82	2.72	3.03	4.15	4.63	3.44	3.84	3.64	4.06	3.23	3.60	4.37	4.88	2.52	2.81	3.03	3.38	3.69	4.12
July	......	......	3.86	4.45	2.93	3.38	3.60	4.15	2.59	2.99	2.74	3.16	2.50	2.88	1.89	2.18	2.06	2.38	2.04	2.35	2.69	3.10
August	......	......	1.87	2.16	1.78	2.05	1.89	2.18	1.32	1.52	1.75	2.02	2.34	2.70	1.80	2.08	1.63	1.88	1.55	1.79	1.77	2.04
September	......	......	1.04	1.16	1.21	1.35	1.35	1.51	.80	.89	1.03	1.15	1.24	1.38	.99	1.10	1.15	1.28	.89	1.00	1.08	1.20
October	1.01	1.16	.91	1.05	.71	.82	1.00	1.15	.55	.63	.81	.93	.76	.87	.58	.67	.80	.93	1.01	1.16	.81	.94
November	.89	1.00	.66	.74	.44	.49	.85	.95	.53	.60	.40	.45	3.79	4.23	.37	.41	.88	.98	.76	.85	.96	1.07
December	4.91	5.66	1.57	1.81	.38	.44	......	......	.46	.53		......	1.73	1.99	.29	.33	.36	.42	.93	1.07	1.33	1.53
Total	......	......	......	......	......	......	......	......	......	......	......	......	......	27.68	.....	26.97	......	20.37	......	23.40	.....	26.09
Mean	......	......	......	......	......	......	......	......	......	......	......	......	2.03	......	1.98	......	1.49	......	1.72	......	1.92	

KENNEBEC RIVER AT BINGHAM, MAINE.

This station, which is located at the new steel highway bridge across Kennebec River at Bingham, was established June 21, 1907, and was discontinued June 30, 1910. It was located just below the mouth of Austin Stream. The nearest dam is about 11 miles downstream at Solon, but the station is above the influence of backwater.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1907, No. 241, pp. 85-87, 342.
1908, No. 241, pp. 85-87, 342.

Run-off of Kennebec River at Bingham, Maine, in second-feet per square mile and depth in inches. Drainage area, 2660 square miles.

	1907.		1908.		1909.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	1.20	1.38	.33	.38	1.66	1.91	1.13	1.22
February	......	......	.98	1.06	.57	.59	1.28	1.33	.94	.99
March	......	......	1.43	1.65	.97	1.12	1.11	1.28	1.17	1.35
April	......	......	2.45	2.73	3.68	4.11	3.67	4.10	3.27	3.65
May	......	......	5.86	6.76	6.24	7.19	3.75	4.32	5.28	6.09
June	2.23	2.49	3.09	3.45	2.32	2.59	2.79	3.11	2.61	2.91
July	2.24	2.58	1.33	1.53	1.53	1.76	......	......	1.70	1.96
August	1.71	1.97	1.05	1.21	1.19	1.37	......	......	1.32	1.52
September	1.18	1.32	.73	.81	1.02	1.14	.....	......	.98	1.09
October	1.38	1.59	.42	.49	1.03	1.19	......	......	.94	1.09
November	3.66	4.08	.28	.31	.85	.94	.....	......	1.60	1.78
December	2.13	2.46	.28	.33	.52	.60	......	......	.98	1.13
Total	......	......	......	21.71	......	22.98	......	......	......	24.78
Mean	.....	.....	1.59	......	1.69	......	......	......	1.83	

KENNEBEC RIVER NEAR NORTH ANSON, MAINE.

This station is located 1½ miles east of North Anson and about 1 mile above the mouth of Carrabassett River, at a wooden highway bridge across the Kennebec, known locally as Patterson Bridge. It was discontinued August 16, 1907, being superseded by the station at Bingham.

Dams are located at Solon, about 8 miles above the station, and at Madison, some 6 miles below. The discharge at North Anson is probably not affected by the dam at Madison.

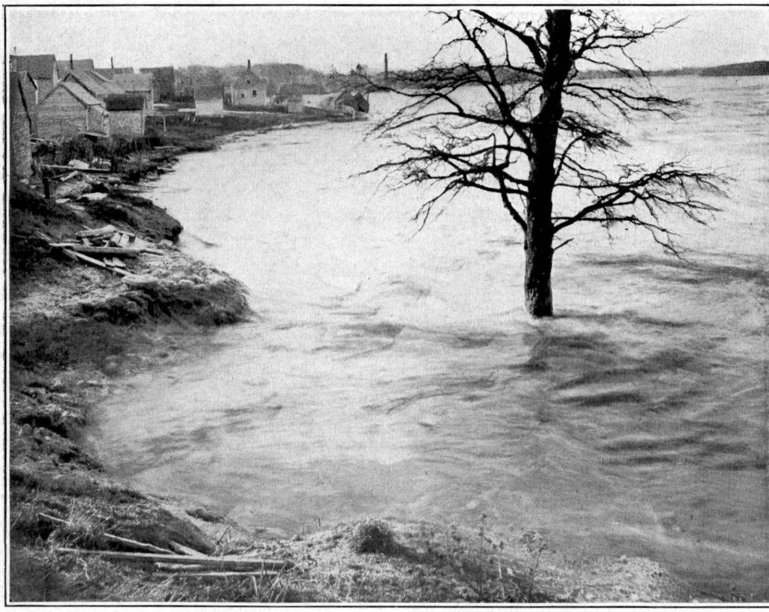
Details of ice measurements at this point are given in Water Supply Paper No. 187, pp. 33-34, 40, 44-45, 53-61, 73, 77, 79.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

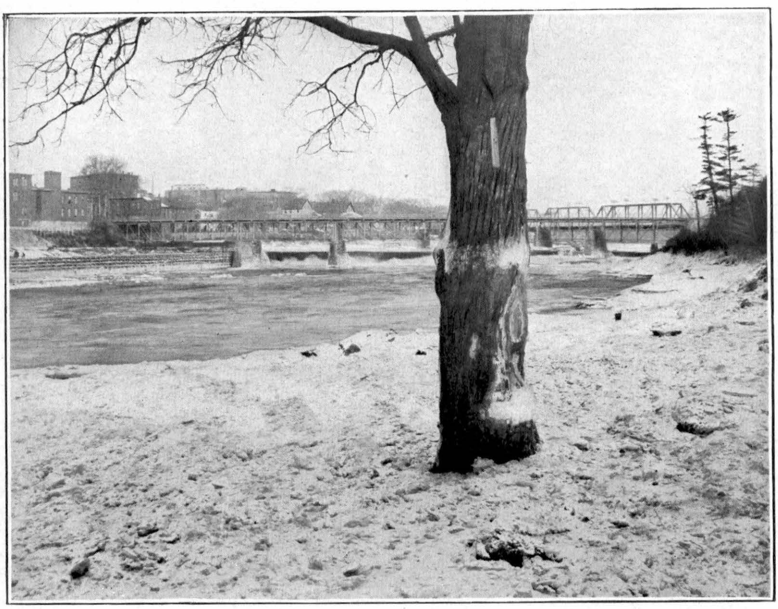
For 1901, No. 65, pp. 16-17. No. 124, p. 60. No. 198, pp. 41-48, 81-86, 120, 121, 146-149.
1902, No. 82, pp. 28-29, No. 97, p. 48, No. 124, p. 60, No. 198, pp. 41-48, 81-86 120, 121, 146-149.
1903, No. 97, pp 45-48, No. 124, p. 60. No. 198, pp. 41-48, 81-86, 120, 121, 146-149.
1904, No. 124, pp. 59-62, No. 198, pp. 41-48, 81-86, 120, 121, 146-149.
1905, No. 165, pp. 56-58, No. 198, pp. 41-48, 81-86, 120, 121, 146-149.
1906, No. 198, pp. 41-48, 81-86, 120, 121, 146-149. No. 201, pp. 52-55.
1907, No. 241, pp. 87-89, 342.

Run-off of Kennebec River at North Anson, Maine, in second-feet per square mile and depth in inches. Drainage area, 2790 square miles.

	1901.		1902.		1903.		1904.		1905.		1906.		1907.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January ..	....	....	....	....	.....	.....	0.25	0.28	0.95	1.10	0.60	0.69	0.52	0.59	0.58	0.66
February..	....	....	....	....	.....	.....	0.24	0.26	0.74	0.77	0.44	0.46	0.55	0.57	0.49	0.52
March.....	...	....	6.82	7.86	10.11	11.66	0.33	0.38	1.47	1.69	0.44	0.50	0.88	1.01	3.34	3.85
April......	....	....	5.29	5.90	4.23	4.72	2.67	2.98	3 74	4.17	2.55	2.84	2.31	2.58	3.46	3.86
May	....	....	5.00	5.76	2.62	3.02	5.10	5.88	3.12	3.60	4.75	5.48	6.24	7.19	4.47	5.16
June......	....	....	4.59	5.12	2.06	2.30	2.76	3.08	2.52	2.81	2.54	2.83	2.77	3.09	2.87	3.20
July	....	....	2.67	3.08	1.45	1.67	1.88	2.17	1.97	2.27	1.64	1.80	2.58	2.97	2.03	2.33
August....	....	....	1.50	1.73	1.31	1.51	1.46	1.68	1.04	1.20	1.09	1.26	1.81	2.09	1.37	1.58
September	....	....	1.25	1.39	1.00	1.12	1.29	1.44	0.71	0.80	0.88	0.98	....	....	1.03	1.15
October ..	0.71	0.82	1.31	1.51	0.70	0.81	1.45	1.67	0.43	0.50	1.07	1.23	....	....	0.94	1.09
November	0.78	0.87	1.30	1.45	0.52	0.58	1.09	1.22	0.48	0.54	0.70	0.78	....	....	0.81	0.91
December	....	....	1.19	1.37	0.36	0.42	0.99	1.14	0.91	1.05	0.73	0.84	....	....	0.84	0.96
Total..	....	....	....	....	.....	.....	....	22.18	....	20.50	....	19.80	....	....	....	25.27
Mean	....	....	....	...	.....	.....	1.63	.....	1.51	.....	1.45	......	....	....	1.85	



A. During flood of December, 1901



B. After flood.

"Freshet Oak," Kennebec River at Winslow

KENNEBEC RIVER AT WATERVILLE, MAINE.

Records of the flow of Kennebec River at the dam of Hollingsworth & Whitney Company at Waterville, Maine, have been furnished since 1893.

Information in regard to this station is contained in the following Annual Reports and Water Supply Papers of the U. S. Geological Survey:

For 1892, W. 69, pp. 45-57, W. 198 pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161.
1893, W. 69, pp. 45-57, W. 198 pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, A 19 IV, p. 71-78, A 20 IV, p. 65.
1894, W. 69, pp. 45-57, W. 198 pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, A 19 IV, p. 71-78, A 20, IV, p. 46, 64-65.
1895, W. 69 pp. 45-57, W. 198 pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, A 19 IV, p. 71-78, A 20 IV, p. 46, 65.
1896, W. 69, pp. 45-57, W. 198 pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, A 19 IV, p. 71-78, A 20 IV, p. 46, 65.
1897, W. 69, pp. 45-57, W. 198, pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, A 19 IV, p. 71-78, A 20 IV, p. 46, 65.
1898, W. 69, pp. 45-57, W. 198, pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, A 20 IV, p. 46, 64-65, A 21, IV, p. 51-53, W. 27, p. 9-14.
1899, W. 69, pp. 45-57, W. 198 pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, A 21 IV, p. 51-53, W. 35, p. 25-26.
1900, W. 69, pp 45-57, W. 198, pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, A 22 IV, p. 56-58, W. 47, pp. 29-30.
1901, W. 198, pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, W. 82, p. 30-32.
1902, W. 198, pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, W. 82, p. 30-32.
1903, W. 198, pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, W. 97, p. 48-49.
1904, W. 198, pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, W. 124, p. 62-63.
1905, W. 198, pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, W. 165, p. 58-60.
1906, W. 198, pp. 48-59, 90-92, 106-110, 118, 120, 121, 146-152, 158-161, W. 201, p. 55-57.
1907, W. 241, p. 90-92, 342.
1908, W. 241, p. 90-92, 342.

The flood of December 1901, is, so far as known, by far the greatest flood of the past century. Plate IX, A, shows the "freshet oak" at about the time of highest water December 16, and the same plate, B, (looking in the opposite direction) shows it a few days later, when the river was at about normal height.

Run-off of Kennebec River at Waterville, Mainê, in second-feet per square mile and depth in inches. Drainage area, 4270 square miles.

	1893.		1894.		1895.		1896.		1897.		1898.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January ..	.62	.72	.38	.44	.48	.55	1.01	1.16	.84	.97	.75	.87
February..	.55	.57	.42	.43	.42	.44	.66	.72	.87	.90	.80	.83
March	.98	1.13	.94	1.08	.47	.54	3.07	3.54	.93	1.07	2.64	3.04
April.......	2.73	3.05	3.43	3.83	5.60	6.25	6.42	7.16	5.94	6.63	6.98	7.79
May	7.14	8.23	2.24	2.58	2.24	2.58	3.99	4.60	6.30	7.26	5.88	6.78
June.......	3.58	3.99	1.82	2.03	1.50	1.67	1.29	1.44	3.04	3.39	2.34	2.61
July	1.35	1.56	1.34	1.54	.82	.95	1.25	1.44	3.07	3.54	.92	1.06
August	.53	.61	.70	.80	.63	.73	.74	.85	1.71	1.97	.73	.85
September.	.48	.53	.64	.72	.42	.47	.80	.89	1.07	1.19	.61	.68
October....	.54	.63	.88	1.01	.29	.34	.86	.99	.62	.71	.95	1.09
November.	.52	.58	.88	.98	1.31	1.46	2.12	2.36	1.33	1.48	1.21	1.35
December.	.37	.43	.45	.52	1.41	1.62	.64	.74	1.25	1.44	.61	.71
Total.....	......	22.03	......	15.97	......	17.58	......	25.89	......	30.55	.....	27.65
Mean......	1.62	......	1.18	......	1.30	......	1.90	......	2.25	......	2.03	......

	1899.		1900.		1901.		1902.		1903.		1904.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January ..	.55	.64	.56	.64	.74	.86	.90	1.04	.94	1.08	0.23	0.26
February..	.55	.58	2.12	2.21	.58	.61	.89	.93	.93	.97	0.22	0.23
March	.75	.87	2.14	2.47	1.13	1.30	6.73	7.76	4.54	5.23	0.89	1.02
April.......	5.62	6.27	6.66	7.43	9.63	10.74	5.19	5.79	3.85	4.30	3.50	3.90
May	4.98	5.74	6.62	7.63	3.55	4.09	3.95	4.55	1.70	1.96	4.85	5.59
June.......	2.06	2.30	2.35	2.64	1.93	2.15	3.57	3.98	1.57	1.75	1.94	2.16
July	1.19	1.37	1.35	1.55	1.20	1.38	1.83	2.11	1.22	1.40	1.25	1.44
August	.77	.89	.98	1.13	.98	1.13	1.18	1.36	.91	1.04	1.10	1.27
September.	.43	.48	.66	.74	.66	.74	.99	1.10	.59	.65	1.00	1.12
October....	.30	.34	.72	.83	.68	.79	1.23	1.42	.45	.52	1.10	1.27
November.	.53	.59	1.49	1.66	.56	.63	1.06	1.18	.34	.38	0.79	0.88
December.	.64	.74	.96	1.11	2.79	3.21	1.02	1.18	.32	.37	0.64	0.74
Total.....	......	20.81	.... .	30.04	......	27.58	....	32.40	....	19.66	....	19.89
Mean......	1.53	......	2.22	......	2.04	......	2.38	......	1.45	.....	1.46	......

Run-off of Kennebec River at Waterville, Maine, in second-feet per square mile and depth in inches. Drainage area, 4270 square miles.

	1905.		1906.		1907.		1908.		1909.		1910.		AVERAGE.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	0.72	0.83	0.75	0.87	0.68	0.79	0.91	1.05	.51	0.58	1.30	1.50	0.72	0.82
February	0.62	0.64	0.53	0.56	0.68	0.71	0.91	0.98	0.76	0.79	1.11	1.16	0.76	0.79
March	1.23	1.42	0.54	0.62	0.96	1.10	1.20	1.38	0.95	1.09	2.44	2.81	1.81	2.08
April.........	3.16	3.52	4.03	4.50	3.93	4.38	2.09	2.33	3.91	4.36	5.22	5.82	4.88	5.45
May..........	2.46	2.83	5 22	6.02	4.61	5.32	2.07	2.39	4 89	5.64	3.37	3.88	4.22	4.87
June	1.57	1.75	3.00	3.35	3.79	4.23	1.77	1.98	1.98	2.21	2.74	3.06	2.32	2.59
July..........	1.09	1.26	1.48	1.71	2.09	2.41	0.96	1.11	1.11	1.28	1.26	1.45	1.38	1.59
August.......	0.75	0.86	0.86	0.99	1.25	1.44	0.93	1.07	0.69	0.80	0.99	1.14	0.91	1.05
September...	0.70	0.78	0.59	0.66	1.10	1.23	0.50	0.56	0.97	1.08	0.59	0.66	0.71	0.79
October......	0.41	0.48	0.89	1.02	1.81	2.09	0.40	0.46	0.88	1.02	0.60	0.69	0.76	0.87
November....	0.54	0.60	0.80	0.90	4.47	4.99	0.30	0.34	0.81	0.91	0.59	0.66	1.09	1.22
December ...	0.48	0.56	0.60	0.69	3.26	3.76	0.29	0.33	0.71	0.82	0.45	0.52	0.94	1.08
Total.....	....	15.52	....	21.89	....	32.45	. ..	13.98	....	20.58	....	22.34	....	23.20
Mean	1.14	......	1.61	......	2.39	......	1.03	......	1.51	......	1.72	......	1.71	

ROACH RIVER AT ROACH RIVER, MAINE.

A gaging station was established November 10, 1901, at the outlet of Lower Roach Pond and was discontinued June 30, 1908. The gage was located about 100 feet downstream from the lowest of the dams, at which point the river is so completely under control that the stage varies but little for weeks at a time.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1901, No. 65, pp. 17-18. No. 198, pp. 64-70.
1902, No. 82, pp. 36-38. No. 198, pp. 64-70.
1903, No. 97, pp. 51-52. No. 198, pp. 64-70, 121, 149.
1904, No. 124, pp. 65. No. 198, pp. 64-70, 121,149.
1905, No. 165, pp. 63-65. No. 198, pp. 64-70, 121, 149.
1906, No. 198, pp. 64-70, 121, 149.
1907, No. 241, pp. 93-95, 342.
1908, No. 241, pp. 93-95, 342.

Run-off of Roach River at Roach River, Maine, in second-feet per square mile and depth in inches. Drainage area, 85 square miles.

	1901.		1902.		1903.		1904.		1905.		1906.		1907.		1908.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	2.92	3.37	.54	.62	......	......	......	......	......	......	.59	.68	1.11	1.28	1.29	1.49
February	......	......	2.21	2.30	.54	.56	......	......	......	......	......	......	.35	.37	1.27	1.37	1.09	1.15
March	......	......	4.91	5.66	5.51	6.35	.80	.92	.95	1.10	......	......	.59	.68	1.44	1.66	2.37	2.73
April	......	......	9.12	10.18	5.64	6.29	1.13	1.26	1.13	1.26	.70	.78	1.10	1.23	1.79	2.00	2.94	3.29
May	......	......	8.71	10.04	4.80	5.53	10.73	12.37	7.86	9.06	7.01	8.08	11.50	13.26	8.53	9.83	8.45	9.74
June	......	......	2.28	2.54	4.00	4.46	5.36	5.98	2.14	2.39	3.45	3.85	6.85	7.64	3.11	3.47	3.88	4.3
July	......	......	2.44	2.81	.54	.62	.98	1.13	4.42	5.10	2.73	3.15	1.61	1.86	......	......	2.12	2.44
August	......	......	1.41	1.63	.54	.62	2.14	2.47	.84	.97	.95	1.09	2.92	3.37	......	......	1.47	1.69
September	......	......	1.06	1.18	.66	.74	.95	1.06	.37	.41	.54	.60	2.84	3.17	......	......	1.07	1.19
October	......	......	.80	.92	.32	.37	1.75	2.02	.32	.37	1.19	1.37	2.76	3.18	......	......	1.19	1.37
November	.64	.71	1.40	1.56	.32	.35	.34	.38	.01	.01	.95	1.06	4.21	4.70	......	......	1.12	1.25
December	2.89	3.33	1.24	1.43	.32	.37	......	......	......	......	.80	.92	1.67	1.92	......	......	1.38	1.59
Total	......	......	......	43.62	......	26.88	......	......	......	......	......	......	......	42.06	......	......	......	32.26
Mean	......	......	3.21	......	1.98	......	......	......	......	......	......	......	3.08	......	......	......	2.36	

DEAD RIVER NEAR THE FORKS, MAINE.

A gaging station on Dead River about 1½ miles west of The Forks was established September 29, 1901, discontinued August 15, 1907, and re-established March 16, 1910.

Information in regard to this station is contained in the following Water Supply Papers of the U. S .Geological Survey:

For 1901, W. 65, p. 18. W. 198, p. 76-81, 121, 149.
1902, W. 82, p. 34-35. W. 198, p. 76-81, 121, 149.
1903, W. 97, p. 53-54. W. 198, p. 76-81, 121, 149.
1904, W. 124, p. 66-67, W. 198, p. 76-81, 121, 149.
1905, W. 165, p. 66-68. W. 198, p. 76-81, 121, 149.
1906, W. 198, p. 76-81, 121, 149, W. 201, p. 60-62.
1907, W. 241, p. 95-97, 342.

Run-off of Dead River at The Forks, Maine, in second-feet per square mile and depth in inches. Drainage area, 870 square miles.

	1902.		1903.		1904.		1905.		1906.		1907.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	....	....	....	....	......	......	....	......	....	....	.44	.50	1.40	1.61	.92	1.06
February	....	....	....	....	......	......	....	......	....	....	.23	.24	1.39	1.45	.81	.84
March	....	....	....	....	......	......	....	......	....	....	.66	.76	2.16	1.29	1.41	1.02
April	....	....	....	....	4.28	4.78	3.85	4.30	5.27	5.88	2.80	3.12	7.18	8.01	4.68	5.22
May	....	....	....	....	10.22	11.78	8.99	10.36	6.82	7.86	8.48	9.78	4.69	5.41	7.84	9.04
June	5.58	6.23	2.01	2.24	3.41	3.80	2.25	2.51	2.98	3.32	2.66	2.97	2.08	2.32	2.99	3.34
July	1.09	1.26	.74	.86	.81	.93	1.36	1.57	1.00	1.15	1.94	2.24	.57	.66	1.08	1.24
August	1.14	1.31	.74	.86	.57	.66	.85	.98	.34	.3[illegible]	1.67	1.92	.50	.57	.63	.96
September	1.17	1.30	.26	.28	1.11	1.24	.55	.61	.39	.4[illegible]	....	....	.42	.47	.65	.72
October	1.08	1.24	.20	.23	2.03	2.34	.33	.38	1.07	1.2[illegible]	....	....	.20	.23	.82	.94
November	1.41	1.57	.41	.46	.85	.95	.54	.60	.81	.9[illegible]	....	....	.50	.55	.75	.84
December	....	....	....	....	.82	.94	.81	.93	.87	1.00	....	....	.95	1.09	.86	.99
Total	....	....	....	....	......	......	....	......	....	....	....	....	....	23.66	....	26.21
Mean	....	....	....	....	......	......	....	......	....	....	....	....	1.84	.....	1.95	

CARRABASSETT RIVER AT NORTH ANSON, MAINE.

The gaging station was established October 19, 1901, and was discontinued April 30, 1907. It was located about 4 miles from North Anson, above Embden Brook and below Anson Brook.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1901, No. 65, p. 19. No. 198, p. 81-86, 121, 149.
1902, No. 82, p. 32-34. No. 124, p. 68. No. 198, p. 81-86, 121, 149.
1903, No. 97, p. 54-56. No. 124, p. 68. No. 198, p. 81-86, 121, 149.
1904, No. 124, p. 67-70. No. 198, p. 81-86, 121, 149.
1905, No. 165, p. 68-70. No. 198, p. 81-86, 121, 149.
1906, No. 198, p. 81-86, 121, 149. No. 201, p. 62-63.
1907, No. 241, p. 97-98, 342.

Run-off of Carrabassett River at North Anson, Maine, in second-feet per square mile and depth in inches. Drainage area, 340 square miles.

	1902.		1903.		1904.		1905.		1906.		1907.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	....	....	....	...	......	......	....	....	....	....	.74	.85	.74	.85
February	....	....	....	....	......	......	....	....	....	....	.44	.46	.44	.46
March	....	....	....	....	....	......	....	....	....	....	1.18	1.36	1.18	1.36
April	....	....	4.98	5 56	8.56	9.55	5.34	5.96	8.75	9.76	6.85	7.64	6.90	7.69
May	....	....	1.45	1.67	10.46	12.06	3.87	4.46	5.77	6.65	19.30	22.25	8.17	9.42
June	8.87	9.90	3.92	4.37	1.16	1.29	2.32	2.59	2.08	2.32	......	......	3.67	4.09
July	1.28	1.48	1.42	1.64	1.25	1.44	1.35	1.56	1.14	1.31	......	.....	1.29	1.49
August	2.17	2.50	1.06	1.22	1.14	1.31	1.01	1.16	.63	.73	......	......	1.20	1.38
September	2.04	2.28	.32	.36	1.06	1.18	1.44	1.61	.35	.39	......	......	1.04	1.16
October	2.24	2.58	.59	.68	1.92	2.21	.60	.69	2.28	2.63	......	......	1.53	1.76
November	1.96	2.19	.47	.53	1.23	1.37	1.04	1.16	1.20	1.34	......	......	1.18	1.32
December	1.66	1.91	2.25	2.59	1.08	1.24	1.19	1.37	2.23	2.57	......	......	1.68	1.94
Total	....	....	....	....	......	......	....	....	....	....	......	......	....	32.92
Mean	....	....	....	....	......	......	....	....	....	....	......	......	2.42	

SANDY RIVER NEAR FARMINGTON, MAINE.

The gaging station was established June 22, 1910. It is located at the Fairbanks bridge about 3 miles above Farmington and 8 miles above the dam at Farmington Falls.

Information in regard to this station is contained in the report of the U. S. Geological Survey on Surface Water Supply of the U. S. for 1910.

SANDY RIVER NEAR MADISON, MAINE.

The gaging station was established March 23, 1904, and was discontinued December 31, 1908. It was located about 2 miles from the mouth of the river, at the dam of the Madison Electric Works—a municipal light and power plant—just over the town line in Starks, but nearer the Madison post-office.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1904, No. 124, p. 71-72. No. 165, p. 72. No. 198, p. 86-90, 121, 149.
1905, No. 165, p. 71-72. No. 198, p. 86-90, 121, 149.
1906, No. 198, p. 86-90, 121, 149. No. 201, p. 63-64.
1907, No. 241, p. 99-101, 342.
1908, No. 241, p. 99-101, 342.

Run-off of Sandy River near Madison, Maine, in second-feet per square mile and depth in inches. Drainage area, 650 square miles.

	1904.		1905.		1906.		1907.		1908.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square miles.	Depth in inches.
January	......	.....	.76	.87	.97	1.12	.56	.65	1.11	1.28	.85	.98
February	....	.....	.48	.50	.66	.68	.22	.23	1.29	1.39	.66	.70
March	4.12	4.75	2.21	2.55	.63	.73	.71	.82	2.45	2.82	2.02	2.33
April	7.47	8.33	3.94	4.40	5.33	5.95	6.28	7.01	4.54	5.06	5.51	6.15
May	5.51	6.35	2.06	2.37	3.78	4.36	4.26	4.91	3.62	4.17	3.85	4.43
June	.55	.61	1.01	1.13	2.87	3.20	1.29	1.44	1.54	1.72	1.45	1.62
July	.36	.42	.45	.52	.....	......	.97	1.11	.14	.16	.48	.55
August	.50	.57	.34	.40	......	......	.29	.33	.45	.52	.40	.46
September	.42	.47	.54	.60	......	......	.61	.68	.13	.15	.42	.48
October	1.01	1.16	.14	.16	.63	.73	2.11	2.43	.11	.12	.80	.92
November	.63	.70	.33	.37	.66	.74	3.62	4.04	.19	.21	1.09	1.21
December	.46	.53	.50	.58	.53	.61	1.77	2.04	.19	.22	.69	.80
Total	......	......	......	14.45	......	......	......	25.69	......	17.82	......	20.63
Mean	......	......	1.06	......	......	......	1.89	.....	1.31	.....	1.52	

MESSALONSKEE STREAM AT WATERVILLE, MAINE.

This station is located at the dam of the Chase Manufacturing Company in Waterville and was maintained from June 18, 1903, to June 1, 1906.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1903, No. 97, p. 56-57.
1904, No. 124, p. 72-73.
1905, No. 165, p. 72-73.
1906, No. 198, p. 90-92, 121.

Run-off of Messalonskee Stream at Waterville, Maine, in second-feet per square mile and depth in inches. Drainage area, 205 square miles.

	1903.		1904.		1905.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	.....	.....	.....	.....	2.14	2.47	2.14	2.47
February	.....	.....	.....	.....	1.68	1.75	1.68	1.75
March	.....	.....	1.95	2.25	2.65	3.06	2.30	2.66
April	.....	.....	2.97	3.31	2.23	2.49	2.60	2.90
May	.....	.....	.....	.....	1.54	1.78	1.54	1.78
June	.82	.91	1.24	1.38	.81	.90	.96	1.06
July	.89	1.03	.95	1.09	.....	.....	.92	1.06
August	.80	.92	.62	.72	.....	.....	.71	.82
September	.49	.54	.51	.57	.....	.....	.50	.56
October	.33	.38	.50	.57	.....	.....	.42	.48
November	.30	.33	.48	.53	.....	.....	.39	.43
December	.44	.50	.35	.40	.....	.....	.39	.45
Total	.....	.....	.....	.....	.....	.....	.....	16.42
Mean	.....	.....	.....	.....	.....	.....	1.21	

SEBASTICOOK RIVER AT PITTSFIELD, MAINE.

The gaging station on the Sebasticook River, which was established July 3, 1908, is located at the steel highway bridge just above the Maine Central Railroad bridge across the river in the town of Pittsfield, Maine.

About 800 feet upstream from the gaging station is a dam which furnishes power to the Robert Dobson Company and the Smith Woolen Company. About 5 miles below the station is the Sebasticook Power Company's dam.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1907, No. 241, p. 102.
1908, No. 241, p. 102-103.

Run-off of Sebasticook River at Pittsfield, Maine, in second-feet per square mile and depth in inches. Drainage area, 320 square miles.

	1908.		1909.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile,	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	.....	.....	.98	1.12	1.48	1.71	1.23	1.42
February	.....	.....	1.58	1.64	1.63	1.70	1.60	1.67
March	.....	.....	2.46	2.84	2.48	2.86	2.47	2.85
April	.....	.....	10.60	11.83	3.59	4.00	7.10	7.92
May	.....	.....	2.64	3.04	1.87	2.16	2.26	2.60
June	.....	.....	.94	1.05	1.08	1.20	1.01	1.12
July	.69	.80	.96	1.11	.83	.96	.83	.96
August	.60	.69	.86	.99	.85	.98	.77	.89
September	.44	.50	.95	1.06	.64	.72	.68	.76
October	.43	.49	1.32	1.52	.41	.48	.72	.83
November	.43	.48	1.53	1.71	.38	.42	.78	.87
December	.51	.58	1.74	2.01	.31	.36	.85	.98
Total	.....	.....	.....	29.92	.....	17.54	.....	22.87
Mean	.....	.....	2.21	.. ...	1.30	.....	1.69	

COBBOSSEECONTEE STREAM AT GARDINER, MAINE.

The discharge of the Cobbosseecontee Stream at the dam of the Gardiner Water Power Company at Gardiner has been furnished by the S. D. Warren Company since 1890.

Information in regard to this station is contained in the following Annual Reports and Water Supply Papers of the U. S. Geological Survey:

1890, A 19 IV p. 79-84, A 21 IV p. 55 W 69, p. 59-70, W 198, p. 93-105, 110-113.
1891, A 19 IV p. 79-84, A. 20 IV p. 46, A. 21, IV p. 55 W 69, p. 59-70, W 198, p. 93-105, 110-113.
1892, A 19, IV p. 79-84, A 20 IV p. 46, A 21 IV p. 55 W 69, p. 59-70, W 198, p. 93-105, 110-113.
1893, A 19 IV p. 79-84, A 20 IV p. 46, A 21 IV p. 55, W 69, p. 59-70, W 198, p. 93-105, 110-113.
1894, A 19 IV p. 79-84, A 20 IV p. 46, A 21 IV p. 55, W 69, p. 59-70, W 198, p. 93-105, 110-113.
1895, A 19 IV p. 97-84, A 20 IV p. 46, A 21 IV p. 55, W 69, p. 59-70, W 198, p. 93-105, 110-113.
1896, A 10 IV p. 97-84, A 20 IV p. 46, A 21 IV p. 55, W 69, p. 59-70, W 198, p. 93-105, 110-113.
1897, A 21 IV p. 53-55, W 69, p. 59-70, W 198, p. 93-105, 110-113.
1898, A 21 IV p. 53-55, W 69, p. 59-70, W 198, p. 93-105, 110-113.
1899, A 21 IV p. 53-55, W 69, p. 59-70, W 198, p. 93-105, 110-113.
1900, A 22 IV p. 58-59, W 69, p. 59-70, W 198, p. 93-105, 110-113.
1901, W 65, p. 19-20 W 75, p. 21, W 69, p. 59-70, W 198, p. 93-105, 110-113.
1902, W 82, p. 38-39, W 198, p. 93-105, 110-113.
1903, W 97, p. 57-58, W 198, p. 93-105, 110-113.
1904, W 124, p. 73-74, W 198, p. 93-105, 110-113.
1905, W 165, p. 73-75, W 198, p. 93-105, 110-113.
1906, W 198, p. 93-105, 110-113, W 201, p. 64-66.
1907, W 241, p. 103-106, 342.
1908, W 241, p. 103-106, 342.

Run-off of Cobbosseecontee Stream at Gardiner, Maine, in second-feet per square mile and depth in inches. Drainage area, 240 square miles.

	1890.		1891.		1892.		1893.		1894.		1895.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	.....	......	2.01	2.32	.90	1.04	.98	1.13	.80	.92	.91	1.05
February	......	......	2.32	2.42	1.00	1.08	1.04	1.08	.79	.82	.76	.79
March	......	......	5.77	6.65	1.02	1.18	1.65	1.90	1.42	1.64	.68	.78
April	......	......	5.32	5.94	1.02	1.14	2.53	2.82	1.14	1.27	.32	.36
May	......	......	1.05	1.21	1.05	1.21	4.27	4.92	1.27	1.46	1.00	1.15
June	1.17	1.30	1.08	1.20	.97	1.08	1.04	1.16	1.36	1.52	.97	1.08
July	1.17	1.35	1.02	1.18	.75	.87	.94	1.09	.94	1.09	.98	1.13
August	1.02	1.18	1.00	1.15	1.02	1.18	.99	1.14	1.02	1.18	.99	1.14
September	1.09	1.22	.98	1.10	1.01	1.13	.82	.92	.90	1.01	.83	.93
October	1.18	1.36	.81	.93	.98	1.13	.75	.86	.91	1.05	.42	.49
November	1.44	1.61	.34	.37	.97	1.08	.78	.87	.87	.97	.60	.67
December	1.04	1.20	.61	.71	1.02	1.18	.74	.85	.84	.97	.78	.90
Total	......	......	.....	25.18	......	13.30	......	18.74	.....	13.90	......	10.47
Mean	......	......	1.86	......	.98	......	1.38	......	1.02	......	.77	......

	1896.		1897.		1898.		1899.		1900.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	.97	1.11	.8[illegible]	1.01	.98	1.13	.94	1.09	.50	.57
February	.98	1.06	.9[illegible]	.98	1.25	1.30	.96	1.00	1.89	1.97
March	4.59	5.29	.9[illegible]	1.06	3.51	4.05	.98	1.13	5.69	6.56
April	3.38	3.77	1.8[illegible]	2.03	2.46	2.74	3.23	3.60	4.02	4.48
May	.95	1.10	1.71	1.97	1.27	1.46	1.02	1.18	2.27	2.62
June	1.01	1.13	1.6[illegible]	1.78	1.01	1.13	1.01	1.13	1.02	1.14
July	.98	1.13	.99	1.14	.94	1.09	.94	1.09	.92	1.07
August	.95	1.09	.98	1.13	1.00	1.15	1.00	1.15	.96	1.10
September	.91	1.02	1.01	1.13	.91	1.02	.69	.77	.85	.95
October	.84	.97	.84	.97	.83	.96	.36	.41	.75	.86
November	.78	.86	.98	1.09	.87	.97	.55	.61	.72	.80
December	.88	1.01	.96	1.11	.97	1.12	.48	.56	.78	.90
Total	......	19.55	......	15.40	......	18.12	......	13.72	. ....	23.02
Mean	1.43	......	1.15	......	1.33	......	1.01	......	1.70	

Run-off of Cobbosseecontee Stream at Gardiner, Maine, in second-feet per square mile and depth in inches.
Drainage area, 240 square miles.

	1901.		1902.		1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	.84	.97	1.88	2.17	.92	1.07	.65	.75	.53	.61	.82	.95	1.04	1.20	1.70	1.96	.65	.74	.77	.88	.98	1.13
February	.62	.65	1.20	1.25	1.19	1.24	.57	.61	.59	.61	.98	1.02	1.06	1.10	1.94	2.09	.72	.75	.86	.90	1.08	1.14
March	1.25	1.44	5.68	6.55	6.55	7.55	1.16	1.34	.69	.80	.98	1.13	1.09	1.26	1.76	2.03	1.28	1.48	1.15	1.33	2.39	2.76
April	7.23	8.07	2.88	3.21	1.90	2.12	2.05	2.29	1.45	1.62	2.54	2.83	3.32	3.70	1.77	1.98	4.75	5.30	1.22	1.36	2.72	3.03
May	1.06	1.22	1.40	1.61	.98	1.13	3.24	3.74	1.00	1.15	1.82	2.10	1.40	1.61	2.60	3.00	1.02	1.18	1.58	1.82	1.60	1.84
June	1.15	1.28	.97	1.03	1.01	1.13	1.01	1.13	1.02	1.14	2.37	2.64	.98	1.10	1.61	1.80	.99	1.11	1.01	1.13	1.16	1.29
July	.98	1.13	.95	1.09	.98	1.13	.93	1.07	.89	1.02	1.57	1.81	.99	1.14	.96	1.11	.89	1.03	.86	.99	.98	1.13
August	[a]1.02	1.18	.98	1.13	.97	1.11	.96	1.11	.93	1.07	1.19	1.37	1.01	1.16	.94	1.09	.91	1.05	.94	1.09	.99	1.14
September	.95	1.06	1.01	1.13	.92	1.02	.92	1.03	.80	.89	1.00	1.12	.92	1.02	.95	1.06	.94	1.05	.94	1.05	.92	1.03
October	.91	1.05	1.00	1.15	.85	.98	.92	1.06	.73	.84	1.02	1.18	.97	1.11	.71	.82	.91	1.05	.81	.93	.83	.96
November	.85	.95	.94	1.05	.52	.59	.78	.87	.60	.66	1.00	1.12	1.22	1.36	.54	.60	.94	1.05	.70	.78	.81	.90
December	1.84	2.12	.95	1.10	.55	.64	.57	.65	.66	.76	.92	1.06	.93	1.07	.48	.55	.92	1.07	.46	.53	.83	1.04
Total	......	21.12	......	22.52	......	19.71	......	15.66	......	11.18	......	18.33	......	16.83	......	18.09	......	16.86	......	12.79	......	17.39
Mean	1.56	......	1.65	......	1.45	......	1.15	......	.82	......	1.35	......	1.24	......	1.33	......	1.24	......	.94	......	1.27	

ANDROSCOGGIN RIVER DRAINAGE BASIN.

DESCRIPTION.

Androscoggin River is formed by the junction of Magalloway River and the outlet of the Umbagog-Rangeley Lakes near the Maine-New Hampshire boundary. For about 35 miles it flows southward in the State of New Hampshire, then turns abruptly and flows eastward in the State of Maine, finally turning toward the south and joining the Kennebec in Merrymeeting Bay, near Brunswick. The river is about 200 miles in length and the greatest width of its basin about 70 miles. The total drainage area is 3,470 square miles, about 80 per cent of which is in Maine. The principal tributary is Little Androscoggin River which enters at Lewiston.

The lower part of the basin is hilly and partially wooded, and much of it is in farm land, while the upper portion is very broken and mountainous and largely in forest. In general the elevation of the basin is greater than that of any other watershed on the Atlantic coast. Umbagog Lake is about 1,240 feet above mean tide, and Rangeley Lake about 1,500 feet. The sources of the Magalloway River reach elevations of from 2,600 to 2,900 feet.

Granite, gneiss, and mica schists are found along the main course of the river, with clay slate in the upper part of the basin. The bed of the river, like that of the Kennebec and Penobscot, is generally rocky where falls occur, with high banks little subject to overflow—conditions that are advantageous in the development of water power.

The mean annual precipitation is probably about 40 inches, varying from 43 inches near the coast to less than 35 inches in the extreme northern part of the basin. Winter conditions in the northern portions of the basin are extremely rigorous and low water frequently occurs during the winter months on this account.

Androscoggin River is an important stream for log-driving, but more care is taken in the use of water for this purpose than probably on any other stream in the State of Maine, and consequently there is little waste of water during the driving season.

Little Androscoggin River, about 30 miles in length, with a drainage area of about 380 square miles, is well endowed with storage facilities and is an important water-power stream for its size.

Other tributaries are Kennebago, Magalloway, Ellis, Swift, Webb, Dead, Twenty Mile, and Sabattus rivers.

DRAINAGE.

The following table gives the drainage area of the main river at a number of points and its important tributaries.

Drainage Area of Androscoggin River.

River.	Locality.	Drainage area, square miles.
Androscoggin	Errol Dam	1,095
Androscoggin	Berlin	1,350
Androscoggin	Gorham	1,375
Androscoggin	Shelburne	1,500
Androscoggin	Rumford Falls	2,090
Androscoggin	Dixfield	2,230
Androscoggin	Livermore Falls	2,550
Androscoggin	Lewiston	2,950
Androscoggin	Brunswick	3,470
Magalloway	Mouth	460
Little Androscoggin	Mouth	380

WATER POWER.

Androscoggin River is probably more fully developed in respect to water power per square mile of drainage area, than any other river in the country. The power developed in the State of Maine is 101,355 horsepower, or 29.0 horsepower per square mile; while for its whole drainage basin the figures are 123,455 horsepower and 35.3 horsepower per square mile, respectively. See table, page 70.

The total fall of the river between Umbagog Lake and tidewater at Brunswick is 1230 ft. in a distance of 167.1 miles or 7.4 ft per mile. About 730 feet of this fall have been developed, furnishing power to many mills, including the cotton mills of Brunswick and Lewiston, and the great pulp and paper mills of Brunswick, Livermore Falls, Rumford Falls and Berlin, N. H. There still remain some excellent unutilized sites of special value on account of the uniform regimen of flow of the river.

The following table gives the elevation and distance from tide water of important developments and features on the river, as well as the elevation of controlling points on the Umbagog-Rangeley series of lakes.

Elevations along Androscoggin River and Umbagog and Rangeley Lakes.

Locality.	Distance. Total miles.	Distance. Difference, miles.	Elevation. Above sea level, feet.	Elevation. Difference, feet.
Brunswick, Pejepscot Paper Co., tail water	0.0	....	2.6	....
Brunswick, Pejepscot Paper Co., crest dam	0.0	0.0	18.4	15.8
Brunswick, Cabot Manufacturing Co., crest dam	.1	.1	39.1	20.7
Pejepscot Paper Co., Topsham Plant, tail water	4.6	4.5	41.4	2.3
Pejepscot Paper Co., Topsham Plant, crest dam	4.6	0.0	61.2	19.8
Pejepscot Paper Co., Lisbon Falls, tail water	7.7	3.1	63.8	2.6
Pejepscot Paper Co., Lisbon Falls, crest dam	7.7	0.0	76.3	12.5
Worumbo Manufacturing Co., tail water	8.1	.4	78.4	2.1
Worumbo Manufacturing Co., crest dam	8.1	0.0	95.2	16.8
Sabattus River, mouth	10.1	2.0	97	1.8
Donovans Rips, foot	10.5	.4	97	0
Donovans Rips, head	10.8	.3	100	3
Dressers Rips, foot	21.0	10.2	104	4
Dressers Rips, head	21.4	.4	112	8
Little Androscoggin River, mouth	22.8	1.4	113	1
Union Water Power Co., dam No. 4, tail water	24.3	1.5	113.2	.2
Union Water Power Co., dam No. 4, crest dam	24.3	0.0	164.4	51.2
Libbey & Dingley dam, tail water	27.5	3.2	174.7	10.3
Libbey & Dingley dam, crest	27.5	0.0	201.6	26.9
Babbet & Googan dam, about tail water	30.5	3.0	204	2.4
Babbet & Googan dam, about crest	30.5	0.0	214	10
Clarks Rips, foot	32.6	2.1	214	0
Clarks Rips, head	34.1	1.5	238	24
Turner Center Rips, foot	36.6	2.5	240	2
Turner Center Rips, head	36.8	.2	250	10
Twenty Mile River, mouth	38.1	1.3	250	0
Ram Island Rips, foot	41.2	3.1	251	1
Ram Island Rips, head	41.8	.6	259	8
North Turner Rips, foot	43.3	2.5	261	2
North Turner Rips, head	43.4	.1	267	6
Dead River, mouth	45.2	1.8	268	1
Stricklands Ferry	47.9	2.7	271	3
Huntoons Rips, foot	48.6	.7	272	1
Huntoons Rips, head	49.4	.8	279	7
Livermore Falls, foot of rips	55.1	5.7	280	1
International Paper Co., Livermore Falls dam, foot	55.7	.6	294.6	12.6
International Paper Co., Livermore Falls dam, crest	55.7	0.0	313.6	19
International Paper Co., Chisholm dam, below	56.4	.7	314.4	.8
International Paper Co., Chisholm dam, crest	56.4	0.0	338.8	24.4
International Paper Co., Jay Bridge dam, below	58.6	2.2	341.3	2.5
International Paper Co., Jay Bridge dam, above	58.6	0.0	352.2	10.9
International Paper Co., Riley dam, below	61.3	2.7	353.5	1.3
International Paper Co., Riley dam, crest	61.3	0.0	370.1	16.6
Worthley Brook, mouth	71.2	9.9	381	1.9
Peru	73.3	2.1	385	4
Webb River, mouth	76.6	3.3	394	9
Oxford Mill, tail race	81.4	4.8	421	27
Swift River, mouth	81.8	.4	422	1
Rumford Falls Power Co., Middle dam, below	82.7	.9	482.8	60.8
Rumford Falls Power Co., Middle dam, crest	82.7	0.0	503	20.2
Rumford Falls Power Co., Upper dam, below	83.1	.4	576.3	73.3
Rumford Falls Power Co., Upper dam, crest	83.1	0.0	599.8	23.5
Rumford Center Rips, foot	89.5	6.4	602	102.2
Rumford Center Rips, head	90.1	.6	606	4
Concord River, mouth	90.8	.7	607	1
Rumford Corner, ferry	92.7	1.9	607	0
Ellis River, mouth	93.1	.4	607	0
Hanover Ferry	94.5	1.4	607	0
Bear River, mouth	99.1	4.6	622	15
Sunday River, mouth	102.4	3.3	626	4
Alder River, mouth	105.9	3.5	628	2
Mayfield	106.1	.2	628	0

Elevations along Androscoggin River and Umbagog and Rangeley Lakes.—Continued.

Locality.	Distance.		Elevation.	
	Total miles.	Difference, miles.	Above sea level, feet.	Difference, feet.
Pleasant River, mouth	111.0	4.9	645	17
Wheeler Brook, mouth	114.0	3.0	659	14
Gilead Village	116.1	2.1	676	17
Wild River, mouth	116.5	.4	678	2
Lary Brook, mouth	117.8	1.3	680	2
Maine, N. H. State line	118.8	1.0	681	1
Connor Brook, mouth	119.0	.2	681	0
Stock Farm Brook, mouth	120.6	1.6	684	3
Seavy Brook, mouth	121.2	.6	688	4
Clement Brook, mouth	122.0	.8	691	3
Shelburne Highway Bridge, water surface	122.2	.2	693	2
Burbank Creek, mouth	122.8	.6	698	5
Rattle River, mouth	124.9	2.1	716	18
Lead Mine Bridge power station, below dam	125.1	.2	716.3	.3
Lead Mine Bridge power station, crest dam	125.1	0.0	725.5	9.2
Peabody Rips, foot	126.3	1.2	727	1.5
Peabody River, mouth	127.9	1.6	758	31
Cascade Power Station, below dam	128.1	.2	758.1	.1
Cascade Power Station, crest dam	128.1	0.0	768.4	10.3
Moose River, mouth	130.0	1.9	783	14.6
Gorham Power Station, below dam	130.6	.6	790.4	7.4
Gorham Power Station, crest dam	130.6	0.0	808.5	18.1
Pulsifer Rips, foot	131.8	1.2	815	6.5
Tinker Brook, mouth	132.7	.9	835.8	20.8
Cascade Brook, mouth	133.3	.6	845	9.2
Berlin Mills Co., Cascade mill, below dam	133.5	.2	854.1	9.1
Berlin Mills Co., Cascade mill, crest dam	133.5	0.0	897.6	43.5
Berlin Mills Co., Cross power station, below dam	134.1	.6	900.6	3
Berlin Mills Co., Cross power station, crest dam	134.1	0.0	918.1	17.5
International Paper Co., Dam No. 1, below dam	134.8	.7	924.2	6.1
International Paper Co., Dam No. 1, top flashboards	134.8	0.0	963.4	39.2
International Paper Co., Dam No. 5, below dam	135.0	.2	963.4	0.0
International Paper Co., Dam No. 5, crest dam	135.0	0.0	985.1	21.7
International Paper Co., Dam No. 3, below dam	135.2	.2	986.6	1.5
International Paper Co., Dam No. 3, crest dam	135.2	0.0	1004.1	17.5
Burgess Sulphite Mill, below dam	135.6	.4	1023.3	19.2
Burgess Sulphite Mill, crest dam	135.6	0.0	1037.9	14.6
Berlin Mills Co., paper mill, below dam	135.7	.1	1044	6.1
Berlin Mills Co., paper mill, top flashboards	135.7	0.0	1065.5	21.5
Riverside Pulp Mill, below dam	135.8	.1	1063.1	0.0
Riverside Pulp Mill, crest dam	135.8	0.0	1071.3	8.2
Berlin Mills Co., Upper dam, below	136.2	.4	1076.9	5.6
Berlin Mills Co., Upper dam, crest	136.2	0.0	1092.3	15.4
Stearns Brook, mouth	141.1	4.9	1095	2.7
Milan Corner Highway Bridge, water surface	143.3	2.2	1096	1
Ponticook Rips, foot	147.1	3.8	1096	0
Ponticook Rips, head	149.3	2.2	1154	58
Ponticook Dam, below	149.3	0.0	1154.3	.3
Ponticook Dam, crest	149.3	0.0	1161.2	6.9
Sessions Brook, mouth	153.3	4.0	1160	0.0
Mile and One-half Rips, foot	153.4	.1	1160	0.0
Mile and One-half Rips, head	154.7	1.3	1175	15
Bog Brook, mouth	154.9	.2	1175	0
Bear Brook, mouth	157.0	2.1	1176	1
Seven Islands	158.0	1.0	1176	0
Molledgewock Rips, foot	158.2	.2	1176	0
Molledgewock Rips, head	160.1	1.9	1190	14
Smoky Camp Brook, mouth	161.7	1.6	1205	15
Alder Brook, mouth	162.2	.5	1206	1
Molledgewock Stream, mouth	163.1	.9	1213	7

Elevations along Androscoggin River and Umbagog and Rangeley Lakes.—Concluded.

Locality.	Distance.		Elevation.	
	Total miles.	Difference, miles.	Above sea level, feet.	Difference, feet.
Clear Stream, mouth	166.2	3.1	1214	1
Errol Rips, foot	166.3	.1	1214	0
Errol Rips, head	166.7	.4	1229	15
Errol Dam, below	167.1	.4	1231.8	3.9
Errol dam, sill of gates	167.1	.0	1231.3	0
Errol dam, zero of gage	....	....	1231.3	0
Umbagog Lake, high water line	....	....	1246.3	15
Middle Dam, sill of deep gates	....	....	1428.38	182.08
Middle Dam, zero of gage	....	....	1428.38	0
Richardson Lakes, high water line	....	....	1448.9	20.5
Upper Dam, sill of gates	....	....	1446.41	....
Upper Dam, zero of gage	....	....	1446.41	0
Mooselucmaguntic Lake, high water line	....	....	1467.41	21
Rangeley Lake Dam, sills	....	....	1507.06	39.65
Rangeley Lake, low water line	....	....	1511	3.94
Rangeley Lake, high water line	....	....	1517	6
Kennebago Lake, low water line	....	....	1774	257
Kennebago Lake, high water line	....	....	1782	8

Developed Powers.

ANDROSCOGGIN RIVER.

Proceeding upstream from the mouth, the first dam at the head of tidewater is the dam of the Pejepscot Paper Co. and Brunswick Electric Light and Power Co. The dam is of crib construction, 353 ft. long. The Pejepscot Paper Co., formerly the plant of the Bowdoin Paper Co., utilizes an average head of 14 ft. Their wheel installation consists of Chase vertical turbines as follows: three 54", three 48", two 30", and one 27". The total rated capacity is 840 horsepower.

The Brunswick Electric Light and Power Co. has three units of four 33" Hercules or 12 turbines in all. They operate under an average head of 16 feet with a total rated power of 1500 H. P. They have 3 Westinghouse generators of 375 kilowatt capacity each, or a total of 1125 K. W.

The next dam is that of the Cabot Manufacturing Co., about 600 feet above. The dam is in three parts, with a total length of about 400 feet and 18 feet high. It was originally built about 1809. The date of the original charter of the present company was 1858. The company for its own use, has three 48″ Hercules turbines, three 45″ Victor, two 33″ Hercules, one 54″ Hercules and one 39″ Victor. The average head utilized at this dam is 18 feet. The above wheels have a capacity of 2275 horsepower. The company, furthermore, sells power to the Lewiston, Augusta and Waterville Railway Co., generated by two 45″ Victor and two 44″ American turbines. One thousand horsepower is the rated capacity of these wheels, but 800 horsepower is the average usually sold. This power is furnished the railway company 17 hours daily for every day in the year. It is sold for $20 per horsepower per year. The Cabot Manufacturing Co. furthermore, has two other wheels, one 48″ Hercules and one 45″ Victor on the island that was formerly used by the Brunswick Electric Light and Power Co. The wheels are rated at 1000 horsepower but were not in use in 1910 or since the installation of the new plant of the Brunswick Electric Light and Power Co. at the dam below.

Considerable inconvenience is experienced by power users at Brunswick by the method of handling water at Lewiston, 24 miles above. At low stages, water is stored at Lewiston during the night in order to run on full head during the day. The resulting low flow or daily "hole" in the river is felt during the forenoon at Brunswick. The head, when released in the morning at Lewiston, takes about 10 hours to reach Brunswick. This difficulty might be obviated in part by the construction of low storage dams below Lewiston to hold the night flow, as has been done in the upper reaches of the river. There are two localities where this might be done, at Donovans Rips and at Dressers Rips, 10.5 miles and 21 miles, respectively, above Brunswick.

The next development is the Topsham plant of the Pejepscot Paper Co., 4.6 miles above tidewater. The dam is of crib construction 500 feet long. The average head developed is 20 feet. The wheel installation consists of 42 Risdon-Alcott, horizontal turbines, 36″ diameter. The rated capacity is 7500 horsepower. The power developed here will not exceed 3000 horsepower at low water.

The Lisbon Falls plant of the Pejepscot Paper Co., is located 7.7 miles above tidewater. The dam is of crib construction 300 ft. long and develops an average head of 14 feet. The wheel installation consists of one 66", one 72", one 43", five 36", and one 27". The total rated capacity of the wheels is 1150 horsepower.

The dam of the Worumbo Manufacturing Co. is 0.4 miles next above. It is of crib construction 950 feet long. The average head utilized is 17 feet. There is one 30" Hercules turbine, two 54" Hercules and one pair 42" Victors. The total rated capacity is 1183 horsepower.

The next power is at Lewiston, 22 miles by river above tidewater and is owned by the Union Water Power Co. The stock of this company, charter dated December 13, 1878, is owned by the various mill companies operating at Lewiston. The company was formed for the better regulation of the power here. The company also controls various dam sites on the Androscoggin River above and is owner of the dams and controls the storage on the Umbagog-Rangeley series of lakes at the headwaters of the river. Under the efficient management of this company, by the regulation of storage, the river, considering the large area drained, is probably the best power river in the country.

The river at Lewiston had naturally a fall over a rocky bed of about 38 feet in a few hundred feet. This head was increased by the construction of a masonry dam in the year 1852. There are four main dams and four auxiliary ones. The length is approximately 800 feet. Above the dam the pond is only 1½ miles in length and is of insufficient capacity to store completely the night flow in dry weather. The power is used on the left bank from two levels, the upper canal being 4200 feet long and the mills on it utilizing about a 50-ft. head; and the lower canal 1600 ft. long with a 22-ft. head.

The total maximum power developed at Lewiston is 18,464 horsepower for 11 hours. This requires 3500 sec. ft. for 11 hours or about 1700 sec. ft. constant flow for the 24 hours. The larger amount is obtained during low water periods, through night storage at the dam here and the one of the Libbey and Dingley Co., 3.2 miles above. The average minimum power is 13,000 horsepower. There are 64 water wheels and turbines altogether in operation here.

The city of Lewiston has the first right to 450 horsepower net, for pumping its water supply and to 150 horsepower net, for the purpose of electric street lighting. They have 4 wheels. The Union Water Power Co. itself, has two Hercules wheels, one 36" and one 45" under an average head of 18 ft. The 250 horsepower generated is sold to various small manufacturers. The Bates Manufacturing Co. manufacturers of cotton goods, has 17 wheels under average heads of 19 ft. and 28 ft. The total rated capacity is 4800 horsepower although 4600 horsepower is only obtained during low water. The Hill Manufacturing Co., manufacturers of cotton sheetings, etc., has six 73" Boyden, two 24" and two 36" Hercules turbines under a 28-ft. head. The rated capacity of the wheels is 2485 horsepower. They have steam installation of 700 horsepower. The Avon Manufacturing Co., manufacturers of cotton goods, has one 20" horizontal turbine under a head of 47 feet and develops 109 horsepower. The Androscoggin Mills, cotton manufacturers, have five 72" and four 56" wheels of the Holyoke Machinery Co. make, developing 2800 horsepower. The Continental Cotton Mills have 12 wheels. The Lincoln Mill of the Libbey and Dingley Co., manufacturers of cotton yarns, has two 45" Hercules wheels with a rated capacity of 932 horsepower under a head of 28 feet. One wheel is used in the mill proper while the other wheel is used only occasionally when needed by the Lewiston and Auburn Electric Company. The Lewiston Bleachery and Dye Works has one Boyden 75" and one Hercules 33" turbine under a 30-ft. head with a total rated capacity of 750 horsepower. At low water only 400 horsepower can be obtained. The other three mills here, the Cumberland Mills, the Cowan Woolen Co., and the Columbia Mills are manufacturers of woolen goods. The Cumberland Mills, owned by the Libbey & Dingley Co., have one 56" Leffel wheel under a head of 11 ft. and generate 87 horsepower. The Columbia Mill has two wheels. The Cowan Woolen Co. has two 30" horizontal Victor turbines under a head of 18 feet. Their rated capacity is 300 horsepower, although 125 horsepower is the amount generally used.

The next dam is 3 miles above Lewiston or 27.5 miles above tidewater, the property of the Lewiston and Auburn Electric Light Co. (Libbey & Dingley Co.). It is located at what is known as Deer Rips and was completed in 1904. It is a concrete structure 900 ft. long and from 15 ft to 40 ft. high. The reservoir created, or the natural channel of the river, has a capacity of about 40,000,000 cubic feet. The wheel installation, under an average head of 30 ft., consists of four 39" Victor, two 45" American, and two pairs 17½" Victor turbines. The rated capacity of the wheels is about 4800 horsepower. There are in use one 1000 kilowatts and two 750 kilowatts each, generators. The power is used for lighting; for miscellaneous manufactures with nearly 300 motors in use; and for street railway purposes.

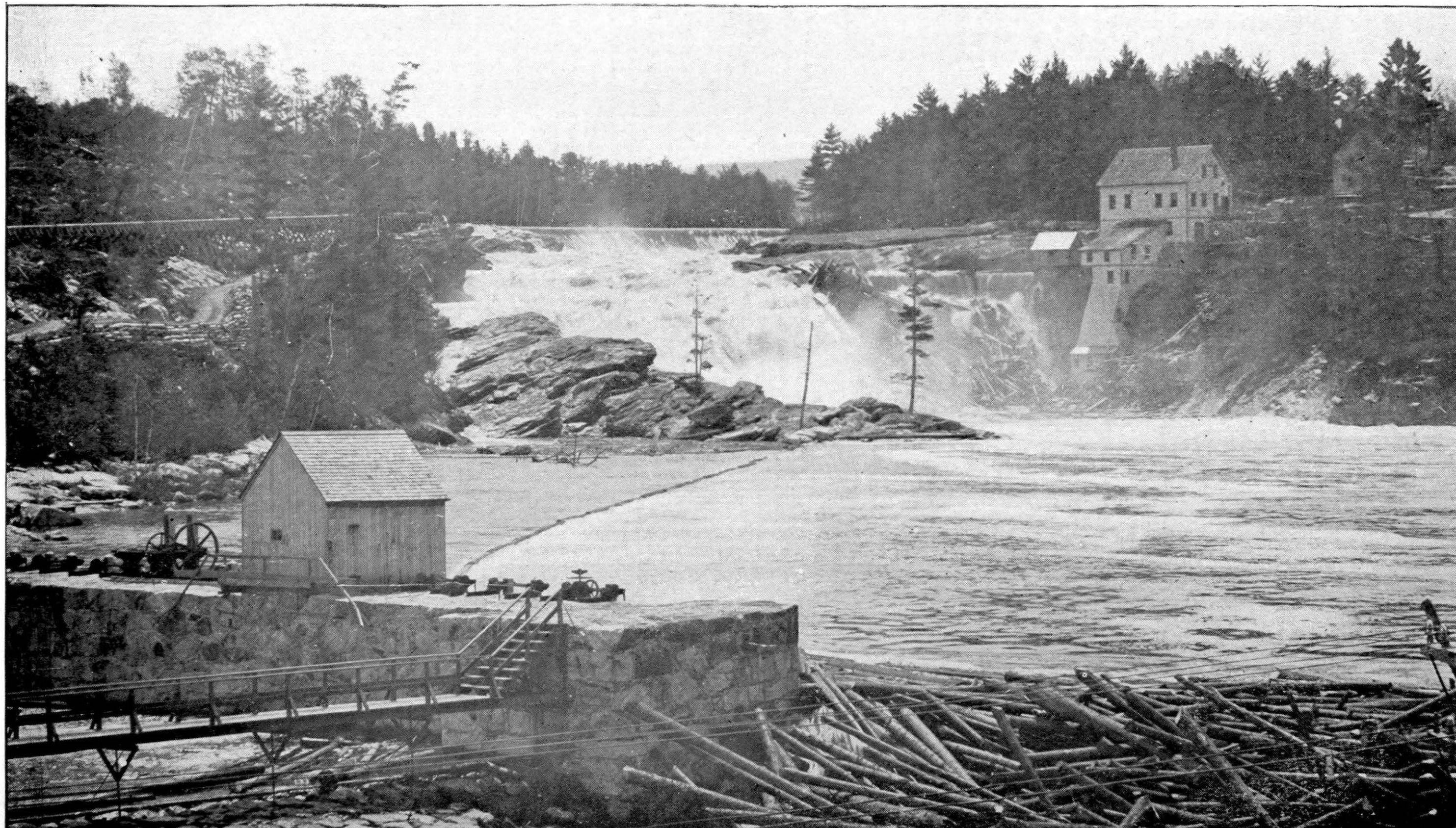
The next development is at Livermore Falls, 55.7 miles above tidewater. The dam is the property of the International Paper Co. There are 14 McCormick wheels most of them 42" diameter. Their rated capacity under a 31-foot head is 9240 horsepower.

The Chisholm plant of the International Paper Co., is located 0.7 mile next above. The 49 wheels, Hercules, and Victor, under a 26-ft. head, have a rated capacity of 9682 horsepower.

The Jay Plant of the same company is 58.6 miles above the mouth and utilizes a head of about 11 feet.

The Riley Plant of the same company 2.7 miles immediately above or 61.3 miles above tidewater, utilizes a head of about 17 feet, which can be increased 4 ft. by flashboards.

At Rumford Falls is one of the finest water powers on the Atlantic coast. Here the Androscoggin descends 180 feet in 1.7 miles. The privilege is controlled by the Rumford Falls Power Co., which has laid out a comprehensive plan of development and has now practically executed it. (See Plate X.) The power is used from three levels—a high level canal of 100 feet to the middle level; the latter also receiving a direct and independent supply of water from the river; the water to be used from the middle-level canal and discharged after a fall of 50 feet into the low level, from which in turn there is a final drop of 30 feet into the river. 54,000 horsepower is the proposed total development. The present wheel installation calls for 30,000 horsepower of which 25,000 horsepower is in use. The greater part of this power is used in the manufacture of wood pulp and paper by the Oxford Paper Co. and the International Paper Co. The plant of this latter company is located on the



Upper and Lower Dams on Androscoggin River at Rumford Falls

left hand side of the middle-level canal. The wheel installation, Hercules and McCormick, consists of 16 turbines, sizes 27″ and 42″ acting under an average head of 48 feet. The total rated capacity is 11,000 horsepower.

The Oxford Paper Co. has in use, one 36″, two pairs 36″ and two pairs 39″ Hercules turbines under an average head of 30 feet and rated at 4550 horsepower. The Fort Hill Chemical Co. has a pair of 39″ Rodney Hunt turbines under a 50-foot head and rated at 1500 horsepower. The Rumford Falls Power Co. is now installing a hydro-electric plant with the following wheel equipment: one single 12″, one pair 30″ and two pairs 36″ Holyoke turbines. They operate under a head of 100 feet and are rated at 13,000 horsepower. There are five Westinghouse generators, 400, 550, 800 and two 4000 kilowatts capacity.

This is the last development in the State of Maine. In New Hampshire at Berlin is one of the great power developments of the country. From the crest of the upper dam of the Berlin Mills Co. to the foot of their Cascade Mill dam, the fall is 238 feet in a distance of 2.7 miles. This entire fall except about 14 feet, is utilized. The power here is run on 1300 sec. ft. If the natural flow does not equal this quantity, an amount sufficient to make up the deficiency is released from storage from the Rangeley Lake system above. This represents a power development of 25,000 horsepower, 24 hours per day at 75 per cent efficiency. It is doubtful if all the wheels here develop as high as 75% efficiency. This does not include the developments at the hydro-electric plants at the Gorham Power station, the Cascade Power station, or the power station of the Berlin Light & Power Co. at Shelburne represented by a total developed head of 47 feet and handling a portion of the 1300 sec. ft. During the unprecedented drought of 1903-4 the discharge of the river for a short while was down to 950 sec. ft. This represents, on a head of 224 ft. and 75 per cent efficiency, a total power of about 18,000 horsepower.

Ponticook Dam is located 149.3 miles from tidewater or 13.1 miles from the upper dam at Berlin. It was formerly used simply in the interest of log driving but about a year ago it came under the control of the Androscoggin Reservoir Co. The dam was then repaired and improved. Provision was made for the use of a log sluice instead of allowing the logs, when driving, to pass over the entire length of crest of the dam. This not only expediated driving but also prevented the waste of water at the same time. The dam is now under daily control for night storage in the interest of power.

The dam is an overflow weir with gates on the left bank. The storage head is 3 ft. and when full, it covers an area of 355 acres. The total capacity of the reservoir is about 46,000,-000 cubic feet.

LITTLE ANDROSCOGGIN RIVER.

This river is an important stream and is practically all developed at the present time from the mouth up as far as Welchville. The lowest power on the river, in New Auburn and about ½ mile from the mouth, is the Little Androscoggin Water Power Co., proprietors of the Barker cotton mill. The minimum head developed here is 22 feet. One-half mile above is the hydro-electric plant No. 1 of the Lewiston and Auburn Electric Light Co.

Two and five-eighths miles above is the Littlefield plant of the Lewiston and Auburn Electric Light Co. There are installed 6 Hercules wheels, 42″ diameter, operating under an average head of 22 feet, and with a total rated capacity of 2000 horsepower. There is one General Electric generator of 1000 kilowatts capacity.

The next development is at Minot Corner 4⅝ miles above. The dam is of concrete 35 feet long and 8 feet high. A saw mill is operated here by Mr. Henry True developing 25 horsepower under an average head of 8 feet.

One mile further upstream is the plant of the National Fibre Board Co. There are 4 turbines under an 11-ft. head and rated at 200 horsepower. The power at average low water is 150 horsepower.

The next development is at Mechanic Falls 4 miles above. The Poland Paper Co., manufacturers of book paper, has two 42″ and one 27″ Hercules turbines under a head of 37 ft. which develop 1400 horsepower.

Two miles further upstream is the hydro-electric plant of the Mechanic Falls Electric Light Co. The dam is 200 ft. long and 13 feet high. The capacity of the reservoir created is 600,000 cu. feet. There are two Rodney Hunt vertical turbines of 42″ diameter rated at 225 horsepower. There is one Westinghouse generator of 75 kilowatts and one of 90 kilowatts. The power is transmitted to Mechanic Falls, Oxford and Hebron and is used for lighting and power purposes. There is a steam auxiliary of 150 horsepower.

The next dam on the river is at Welchville owned by the Poland Paper Co. and used for storage only.

At the outlet of Lake Thompson in the village of Oxford is the plant of the Robinson Manufacturing Co., manufacturers of dress goods. There are two water wheels, 48″ and 108″ operating under an average head of 9 feet and rated at 200 horsepower.

At the outlet of Pennesseewassee Lake in Norway village is the birch spool and box shooks mill of C. B. Cummings & Sons. They have one 42″ turbine under a 13-ft. head and develop about 40 horsepower. They operate a steam auxiliary of 60 horsepower 8 months in the year.

The Norway and Paris Street Railway has a power plant on the same stream one mile below the above plant and located just above the mouth to Little Androscoggin River. A head of about 57 feet is developed.

The Maine Power Co. has a hydro-electric development at South Paris. The dam is of wood 200 feet long and 11 feet high. There is one Chase upright 56″ wheel under a 15-ft. head and developing 150 horsepower. There is one Westinghouse generator of 120 kilowatt capacity. The power is all transmitted to Norway and leased to Norway and Paris St. Railway. The Maine Power Co. owns and operates a storage dam at Bryants Pond.

At Snow Falls in the town of Paris, is the privilege of the Snow Falls Manufacturing Co. The dam is simply a caping of stone 3 ft. high on a natural ledge fall. The wheel installation acts under a 40-ft. head with a capacity of 500 horsepower. It is estimated that the minimum horsepower is 350 in unusual low stages of the river. This mill property is for sale or for lease.

At West Paris is located the grist mill of D. H. Fifield. There are 4 wheels, one 30″, two 48″ and one of unknown diameter. They operate under an average head of 6 ft. with a total development of about 60 horsepower.

Undeveloped Powers.

There is considerable undeveloped power yet on the Androscoggin River. Only mention will be made here of a number of the unutilized sites. They are important on account of the well regulated flow of the river through the control of storage. Mention has already been made of two sets of rips below Lewiston, Dressers Rips and Donovans Rips, that might be utilized for night storage for the powers at Lisbon Falls and Brunswick.

Above Lewiston the Old Babbet and Googan dam, not now in use, controls a head of about 10 feet. The privilege is owned by the Union Electric Power Co., an organization affiliated with the Union Water Power Co., who also own the important unimproved privilege of Clarks Rips. The fall at this latter place is 24 ft. in a distance of 1.5 miles. Plans are being considered for a large hydro-electric development here. At the present time, fall of 1910, borings are being made at the dam site to determine the nature of the foundation.

Between this point and Livermore Falls are Turner Center Rips, Hoopers or Ram Island Rips, North Turner Rips, and Huntoon Rips. The various heads at these places are given in the table on page 290.

There is practically no unutilized head between the Livermore Falls plant and the Riley plant of the International Paper Co.

From the top of the flashboards at the Riley dam to the tail race of the Oxford Mills at Rumford Falls, the difference in head is 47 ft. in a distance of 20 miles.

From the top of the upper dam at Rumford the ascent gradually increases per mile until the foot of the dam at the Shelburne, N. H., power station is reached. This difference of elevation is 116 ft. in a distance of 42 miles.

From this latter point to the top of the saw mill dam, of the Berlin Mills Co. the total ascent is 376 ft. in a distance of 11 miles. 271 ft. of this is at present utilized. The difference, 105 ft., offers excellent opportunities.

The next important privilege owned by the International Paper Co. is the Ponticook Rips. The fall from the crest of the Ponticook Dam to the foot of the rips is 65 feet in a distance of 2 miles.

On the Magalloway River from the foot of the new Aziscoos Dam, now under construction by the Androscoggin Reservoir Co., the fall is 200 feet to Wilson Mills in a distance of 2.3 miles. This dam, as described on page 314 is being constructed for storage purposes. If the power below it should ever be used, it is estimated that 5000 horsepower continuous through the year, could be developed.

Rapid River, the connecting stream between Richardson and Umbagog lakes, has power possibilities as the fall in it is 200 ft. in a distance of about 5 miles.

LAKE STORAGE.

GENERAL.

The primary causes for the preeminence of the Androscoggin River as a power river are due to its concentrated falls and to the lake storage in its headwaters in the Umbagog-Rangeley lakes series. The present total storage to high water marks in each lake is 22,475,400,000 cubic feet. Construction is rapidly progressing on the Aziscoos storage dam on the Magalloway River that by 1911 will increase this storage by 8,000,000,000 cubic feet or to a total of say 30,475,000,000 cubic feet.

The Union Water Power Co. of Lewiston owns the dams at the outlets of the various lakes and hence controls and regulates the storage.

The area drained at the Errol Dam, the lowest of the storage dams of the system, and below the mouth of the Magalloway River, is 1095 square miles. The drainage area of the Magalloway at its mouth is 460 square miles. Therefore the run-off that supplies the Umbagog-Rangeley system comes from 635 square miles.

The following table shows the total storage and the areas of the lakes at high water for this system:

Areas and Storage in Umbagog-Rangeley and Magalloway Lake Systems.

LAKE.	Area, square miles.	Total capacity, cubic feet.
Umbagog	15.80	3,476,715,000
Richardson	13.08	5,294,276,000
Mooselucmaguntic	25.95	10,002,039,000
Rangeley	9.76	2,584,328,000
Kennebago	4.13	1,118,042,000
Total	68.72	22,475,400,000
Magalloway	10.50	8,000,000,000
Total	79.22	30,475,400,000

Surveys of these lakes have been made by the U. S. Geological Survey in cooperation with the Maine State Survey Commission. Umbagog, Richardson and Mooselucmeguntic lakes were surveyed in 1909. Rangeley and Kennebago lakes, Pond-in-River, Rapid River and Kennebago River were surveyed in 1910.

Data on the Magalloway reservoir were furnished by Mr. Walter H. Sawyer of the Union Water Power Co. and the Androscoggin Reservoir Co.

UMBAGOG LAKE.

Errol Dam controls the storage of Umbagog Lake, the lower of the Rangeley series of lakes. The dam is located about 5 miles below the outlet of the lake, and about 3.5 miles below the mouth of the Magalloway River, thus making the latter stream one of the feeders of Umbagog Lake.

Errol Dam. This dam is a wooden structure completely housed over and 175 ft. long between abutments. The entire flow passes through various gates of different sizes, fourteen in all. There is no provision for overflow besides the gates. Beginning at the left end, gates are described as follows:

One gate 10 ft. deep by 15 ft. wide, seldom used.

Three gates, 10½ ft. deep by 5 feet wide, open nearly all the time. These three gates were originally the same depth as the one mentioned above but a 6 inch plank was removed a short time ago as it interferred with the driving of logs.

Nine gates 15 feet deep by 7 feet wide in the clear (so called deep gates), opened a portion of the time only.

One gate, 15 feet by 5 feet wide, grist mill gate and only used occasionally.

The cap of all the fourteen gates is one continuous beam and on the same level, thus making the bottom of the various gates at different levels. The elevation of the sill of deep gate No. 6 and of the zero of the Errol dam gage is 1231.3 feet. A dead head of 2.66 feet exists a short distance above the present dam.

The gates of the Errol dam have been rated as well as could be done by current meter gagings, and study of coefficients. Records of the gage heights and computations of the discharge here have been maintained since January 1, 1905 (see p. 321). Readings below about 7 feet in depth on the deep gates do not indicate the correct height of water in Umbagog Lake, on account of the obstruction by the old dam and by the bar at "Quick Water Point," the lowest point of which is about 4 ft. above the sill of the present dam.

The dam was built in 1888 and seemingly is a first class and sound structure at the present time. It is located about 1000 feet below the site of the old dam built sometime previously. There is a drop of about 2½ feet between the two sites and the quick water resulting in approaching the sluicing gates, causes more or less difficulty in driving logs. The cost of the present dam was about $75,000.

The land on the right bank rises rapidly, while that on the left bank is low for some distance, and is now controlled by a dike.

Description of Lake.

Umbagog Lake is very irregular in shape having many deep coves and resulting points. Nearly two-thirds of the lake is in New Hampshire the remainder being in Maine. The general direction of the lake is north and south. From the extreme southern portion to the extreme northern portion it is about 7.8 miles. The greatest width is nearly 2 miles, while the average width will be about from 3,000 to 5,000 ft. The distance from Lakeside Hotel, at the lower end, to Sunday Cove, at the northeastern end, is about 9 miles. The distance from Errol Dam to Sunday Cove, via boat route, which includes the crooked channel, is 8.85 miles.

The lake is comparatively free from islands, except for a few in the southern portion. The most important, but not the largest, is known as Dutton's Island, upon which is located a summer residence said to have cost $150,000. The residence occupies about one-half of the island, which has a sea wall surrounding it. During high water in the spring the island is flooded, the water at times reaching nearly to the foundation of the house.

A few camps and deserted farms appear on the shores of the lake.

The largest settlement is at the southern end at the village of Upton. At this point the Cambridge River enters, and at the mouth is located a birch mill and a saw mill, the former using steam, the latter using the water of the river.

A short distance from Upton in New Hampshire is located the Lakeside Hotel, a summer resort.

The lake is for the most part very shallow. For a gage reading of 10 feet at the Errol dam, the soundings averaged from 8 to 11 feet in the southern portion, increasing to from 12 to 16 feet in the central portion, again growing more shallow near the outlet of the delta. In the extreme northern portion 17 to 24 feet were found, one hole giving 46 feet. 43 feet was found in one hole at the mouth of Rapid River, the outlet of the Richardson lakes into Umbagog.

In making the survey of this lake in 1909, the shore line corresponding to Errol Dam gage height 10 feet, was located together with contours showing high water, and 5 and 10 feet above high water. It was found that high water corresponded to about 15 feet on Errol Dam gage.

The contours in general follow fairly close to the shores, except in the northern half of the lake where considerable flat land is found. This is especially true along the outlet of the lake and in the lower part of the Magalloway where extensive meadows appear which are flooded at high water.

The lake surface apparently cannot be raised any appreciable amount above the level of high water without creating some damage by flowage, and necessitating a considerable amount of diking, especially in the vicinity of the present dam. Present high water now extends up the Magalloway River for about 5 miles or to what is known as the Brown farm.

Not much extra storage could be obtained by dredging at the outlet or in the river to the dam, as the river in general is deeper than the lake. A little improvement could be made by dredging the "dead head" just above the dam and at "Quick Water Point."

The following table shows the areas and capacities of this lake for various elevations:

Area and Capacity of Umbagog Lake.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.*	Total capacity, cubic feet.	Remarks.
1,231.3	....	....	....	Gate sills at Errol Dam.
1,235.0	†7.50	....	....	Limit of draft.
1,241.3	10.90	1,615,832,000	1,615,832 000	
1,246.3	15.80	1,860,883,000	3,476,715,000	High water line.
1,251.3	17.80	2,341,786,000	5,818,501,000	
1,256.3	20.34	2,658,205,000	8,476,706,000	

* Does not include storage due to back water up the Magalloway River, which extends for several miles and will approximate 50,000,000 cubic feet to high water line.

† Approximate.

POND-IN-RIVER.

This body of water is simply a widening of Rapid River, located a short distance below Middle Dam. It is used to advantage in the log driving season by creating a head from water released from Richardson Lake and using it in driving logs down Rapid River.

Rapid River is about 6 miles long connecting Richardson and Umbagog lakes, the river falling in this distance about 200 ft. A carry road follows fairly near the river.

There is no dam at the outlet of Pond-in-River although the construction of one has been considered.

The following table gives the areas and capacities of this body of water for various elevations:

Area and Capacity of Pond-in-River.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.	Remarks,
1398	0.72	....	....	Low water.
1402	.83	86,981,000	86,981,000	High water.
1407	.93	122,665,000	209,646,000	
1412	1.02	136,604,000	346,250,000	

LOWER RICHARDSON LAKE.

The next lake in the chain is Lower Richardson or Wellekennebacook.

Middle Dam. The dam that controls the flow of this lake as well as the Upper Richardson Lake is known as Middle Dam, belonging to the Union Water Power Co. It is of the same type as Errol Dam, and is about 170 feet between abutments. It is a housed dam completely controlling the flow through gates, with no provision for an open overflow or weir. The sill of the deep gate upon which gage readings are based, is at elevation 1428.38 giving a difference of level of 197.08 feet higher than that of the sill of Errol Dam. The dam will hold a head of about 21 ft. it being about 22 feet from sill to floor.

Description of Lake.

Lower Richardson Lake is fairly regular in shape, being about 8000 feet in width at the north end, narrowing to 1000 feet or less at the south end. The total length is about 5.3 miles, the general direction being northwest and southeast. The outlet into Rapid River is near the north end. The plan of this lake shows the shore line (corresponding to gage height 15 feet) and 10-foot sub-contour; also average high water, and contours 10 and 20 feet above high water. Soundings of the bed of the lake were taken and referred to gage height 15 feet. The contours follow very close to the shore line with the exception of two places. In the vicinity of the outlet into Rapid River the ten foot contour above high water leaves the shore at a point about a mile south of the dam near Black Cat Brook at nearly right angles and runs back for nearly 4000 feet coming back to within 600 feet of the lake at a point about 2000 feet south of the dam where it again turns from the lake and runs back indefinitely. A "knob" some 800 feet in width upon which both the 10 and 20-ft. contours appear is located between this point and the dam. The 20-ft. contour follows the 10-ft. except at the point where the 10-ft. is furthest from the lake where it disappears leaving an opening some 2000 to 2500 ft. in width.

At the southern end of the lake several islands appear, forming what is termed "The Pocket." At the lower end of The

Pocket the 20-ft. contour runs out, it being about 17 feet above high water to the height of land. The opening is about 400 to 500 feet in width. The drainage beyond this point is into Black Brook which flows into a stream tributary to the Androscoggin which unites with the latter in the town of Rumford. It is said that some years ago a project was under consideration to dig a canal through this opening and drive logs into the Androscoggin by the way of this stream which would cut off many miles of the main river.

The lake is very free from islands except in the extreme southern portion, and the depth of water averages much more than on Umbagog, 40 to 70 or 80 feet being a common figure, while 100 feet was found in one place. The soundings were referred to gage height 15 feet.

Very few camps appear on the shores of this lake, the principal point of note being Lakewood Hotel near the outlet of the lake into Rapid River. Near the hotel is located the house of the caretaker of the dam, belonging to the Union Water Power Company.

It would be possible by dredging to increase the head controlled by the dam at the outlet.

UPPER RICHARDSON LAKE.

Upper Richardson, or Molechunkamunk, Lake is really a continuation of the lower lake, being connected with it by the "Narrows," some 1000 to 1500 feet in width, and about 1.7 miles in length from lake to lake, this distance depending upon the point assumed for the beginning of Upper Richardson.

This lake is about 6.8 miles in length and 4000 to 5000 feet in width. The general direction is about parallel to Lower Richardson, the general curvature of the lake being concave on the western shore, which is opposite to that of Lower Richardson. The "Narrows" might be likened to the tangent connecting the two curves, both lakes and the "Narrows" taken as a whole forming a reversed letter S. The shores are less regular than those of Lower Richardson and the contours depart further from the lake. The lake is very free from islands, and the soundings give a good depth of water, the two lakes averaging about the same.

There are a number of summer cottages and club houses on the shores of the lake, and at Upper Dam, the outlet of Mooselucmaguntic Lake, is located the Upper Dam House. This hotel and the outlying cottages are located on "Big" Lake although in sight and under control of the 20-ft. contour, of Upper Richardson Lake, the outlet from the dam to the lake being about 2000 ft. in length. The 10 and 20-ft. contours leave the shores at several places and extend a considerable distance back, the 20-ft. contour at one point receding nearly a mile, for a distance of over a mile.

The distance from Middle Dam wharf to the wharf at Upper Dam on Lower Richardson is about 7.92 miles, measured in three courses.

Increased Storage Possibilities.

The possibilities for increasing the storage on Upper and Lower Richardson lakes by a higher dam at the outlet of the latter are excellent, provided it is deemed expedient to dike Lower Richardson at the two points noted. A rise of ten feet above present high water would not necessitate a dike at the lower end of the "Pocket," and in all probability would require a dike of only about half the length in the vicinity of the dam as would be required if the lake were raised 20 feet above high water.

A 20-ft. rise would bring the lakes to practically the same elevation as the top of the dike in the vicinity of Upper Dam, and in places would flow back over this dike, as it is not exactly level. This would, of course, necessitate a change in the construction at the site of the present dam at this point.

A 10-ft. rise would seriously damage the camps and club houses located on these lakes, while a 20-ft. rise would completely flood out nearly all of them.

Damage to standing timber would not be excessive and probably would be slight.

As before remarked, it would be possible by dredging to lower the outlet of Lower Richardson, in which case it would probably be necessary to do some dredging in the "Narrows."

The following table gives the areas and capacities of the two lakes for various elevations:

Area and Capacity of Richardson Lakes.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.	Remarks.
1428.4	....	....	....	Middle dam gate sills.
1432.0	9.84	....	....	Probable limit of draft.
1433.4	10.05	387.956.000	387 956.000	
1438.4	10.79	1,452,465,000	1.840 421,000	
1443.4	11.53	1,555,615,000	3,396.036,000	
1446.4	12.53	1,006,131,000	4,402.167,000	
1448.9	13.08	892,109,000	5,294.276,000	High water line.
1451.4	13.62	930.442,000	6,224,718.000	
1456.4	14.72	1,905.489,000	8,130,207.000	
1461.4	15.72	2,121.546,000	10,251,753,000	
1466.4	16.72	2,260,938,000	12,512,691,000	

MOOSELUCMAGUNTIC LAKE.

This lake is the largest of the Rangeley series and is immediately above the Richardson Lakes. The county line separating Franklin and Oxford counties, passes through the lake, the larger portion of the lake being in Oxford County.

Upper Dam.

The outflow from this lake is controlled by what is known as Upper Dam, a structure similar to Errol and Middle dams, and is about 200 feet between abutments. A dike extends from each abutment to the higher land beyond, that in the southeast being nearly a mile in length, mostly of artificial construction.

Daily readings of the height of the lake have been taken since April 1, 1880. The elevation of the sill of the deep gate upon which the readings are taken is 1446.41 being 18.03 ft. higher than the sill of Middle Dam. All readings less than about 10.3 feet on the sill of the deep gate do not indicate the true height of water in the lake. The old original bar which formed the dam for the natural lake is about one-half mile above the present dam, and if the gates at the dam are opened a sufficient amount, the water in the pool between this bar and the dam is drawn down to a point much below the water in the lake. For example: On February 12, 1904, the gates in the dam were closed and the reading on the deep gate was 9.25 feet and indicated the height of the lake; but on February 14, the gates were opened and the reading was but 3 feet whereas the height of the lake was still 9.25 feet. On January

3, 1910, the depth shown by the gage reading was 8.75 feet whereas the level of the lake was at gage height 9.60 feet. The lowest point which the lake reached in the dry season of 1904 was March 31, with a level corresponding to a reading of 8.3 feet on the gage. On March 20, 1910, the lake was at height 8.80 feet while the gage reading showed 6.7 feet.

Description of Lake. The upper part of Mooselucmaguntic now floods what was formerly Cupsuptic Lake, and extends from Cupsuptic Stream down about 4¼ miles to a narrow part of the lake, or just below the combined mouth of Kennebago and Rangeley streams. Before the lake was raised to its present level, the separation between the two lakes was much more marked than at present. The upper part runs in a direction a little east of south, and is very irregular in shape with irregular shores and deep bays. Numerous islands exist upon which are summer camps. This part of the lake is comparatively shallow for the most part with a few places where the depths run to 50 and 60 feet.

Mooselucmaguntic Lake begins at the lower end of Cupsuptic Lake, about half a mile above Haines Landing, and runs almost due south for a little over 5 miles to Students Island. At the upper portion it is narrow, about a mile wide, but gradually widens out and below Laroc Lodge extends easterly into Bugle Cove, and here attains the greatest width of 4 miles. It again contracts, so that at Students Island there is only a narrow channel at the east, while that at the west is about two thirds of a mile.

Below Students Island the lake makes nearly a right angle bend and extends easterly and westerly, the outlet being at the west at Upper Dam. This east and west part of the lake is about 8 miles long and of maximum width 2⅛ miles.

The length of the lake from Cupsuptic Stream to Upper Dam is between 11 and 12 miles and from Cupsuptic Stream to Bemis Stream about 16 miles. From Upper Dam to Bemis Wharf the distance is about 7 miles.

Numerous soundings were made. On the east and west portions of the lake, the deepest part is found south from the west end of Students Island, where a maximum depth of 100 feet is found. The average depth for quite an area is probably about 50 feet. East of Toothaker Island, the maximum depth is from 30 to 35 feet. The deepest part of the lake is in Bugle Cove at the foot of Bald Mountain, where a depth of 124 feet was found. At places shoals occur where the depth is only a few feet at high water, and which appear as islands at low water. The above given depths are for high water.

The shores are irregular, with points and bays both large and small. The greater part of the shore is covered with drift wood and drykhi, and in some of the low places the ground is covered for a quarter of a mile. This is particularly true of the portion around Cupsuptic Lake. The greater part of the shore line is wooded being covered with second growth timber both hard and soft.

There is but little low land bordering the lake, this being found on Mooselucmaguntic Lake at the eastern extremity near Bemis Stream and a small area near Upper Dam. On Cupsuptic Lake there is low land on the east around the entrance of Kennebago and Rangeley streams and also at the upper end. With the exception of these low places the land rises gradually, the 5-foot contour above high water being from 50 to 100 feet back on the average, and the 10-ft. contour about 150 feet.

There are a number of islands in the lake. Toothaker Island is the largest of all. It is situated in the east part toward Bemis and is 1⅞ miles long by 0.8 mile wide. There are no camps upon it except those used in lumbering. Students Island is the next in size, being ¾ of a mile long by one-third of a mile wide. The other islands are very small, being only a few hundred feet long. These are found principally in the west bay of Mooselucmaguntic Lake and in the middle and upper part of Cupsuptic.

The town of Bemis is situated at the east end of Mooselucmaguntic Lake, the buildings being from 5 to 25 feet above high water. At the outlet at Upper Dam is the Upper Dam House with about a dozen cottages. On Students Island are "The Birches Camps" consisting of some 25 camps well arranged and well built. These for the most part stand from 10 to 25 feet above high water. Near the upper end of Mooselucmaguntic Lake the east shore for about two miles is practically covered with camps, both private and public. The largest of these public camps are those of The Barker and Mooselucmaguntic House at Haines Landing.

On Cupsuptic Lake are the private camps of United States Senator William P. Frye and former Vice President C. A. Hobart besides a number of others. There are also the camps of the Oquossoc Angling Association, at the mouth of Rangeley and Kennebago Stream, and the Pleasant Island Camps near the head of the lake. All of these camps are from 5 to 15 feet above high water at least.

Possibilities of Storage. These lakes have been developed about up to their maximum storage possibilities. The Union Water Power Co. has, during the last 10 years, increased the height of the dam up to the level of the land on the south shore of the lake.

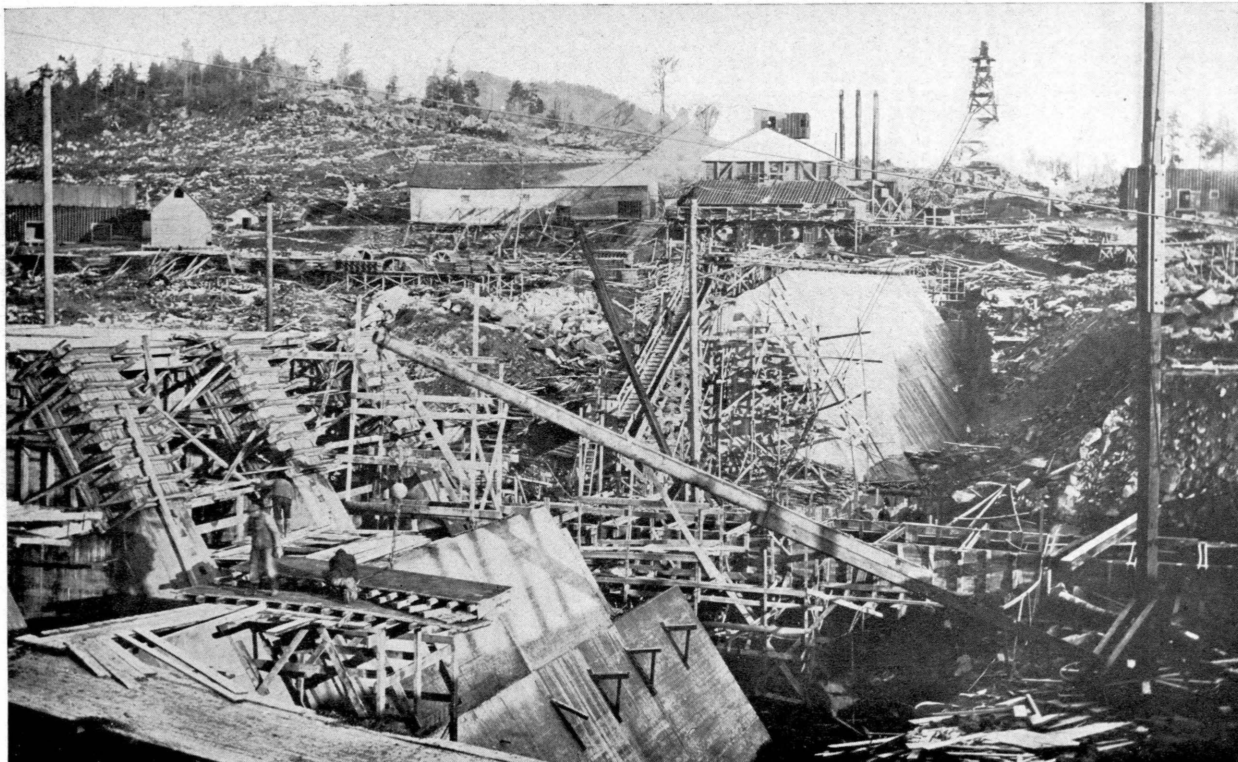
The land is low around the outlet at Upper Dam and any decided increase would call for dykes for quite an extent on the shore. The fact that the lake is now becoming such a summer resort with many camps which are now not over 10 feet above the water precludes the raising of the lake surface.

The capacity might be increased by dredging at the outlet but up to the present time there has been sufficient influence to prevent it on account of the resulting disagreeable appearance and its effect on the tourist interests.

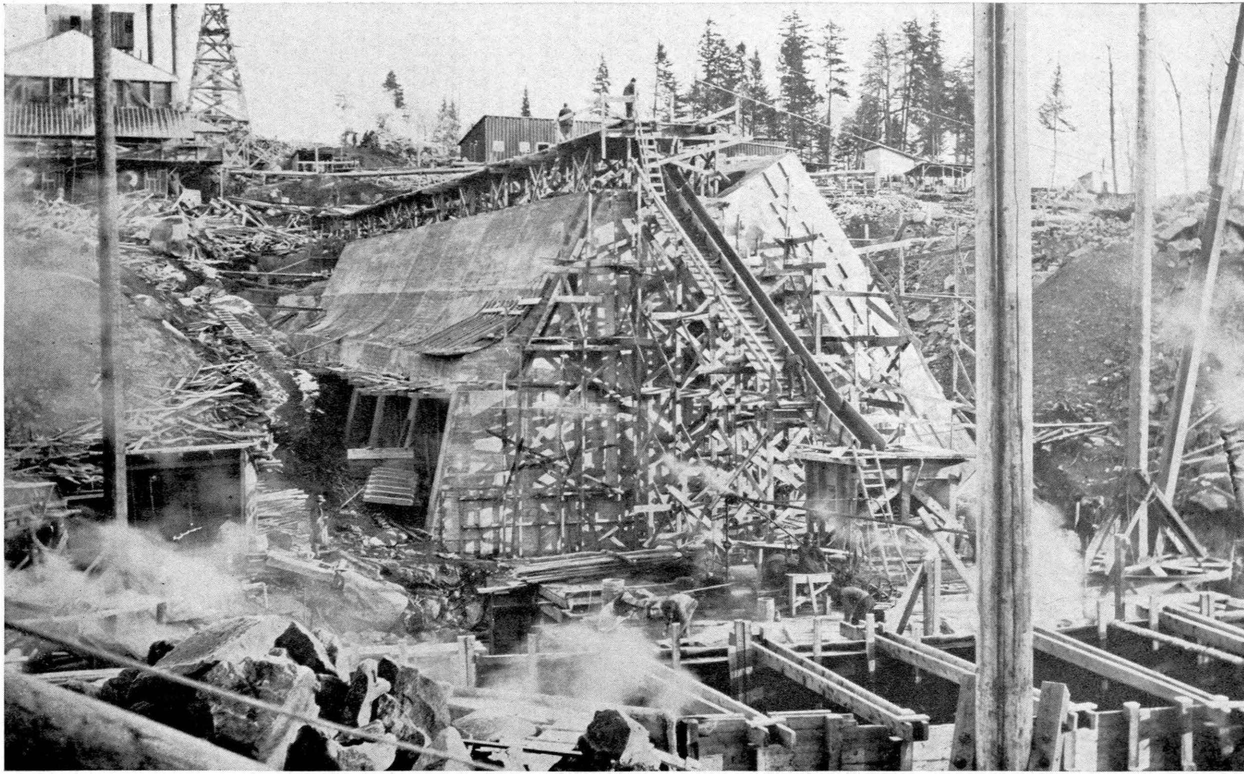
The following table gives the areas and capactites of this lake for various elevations:

Area and Capacity of Mooselucmaguntic Lake.

Elevation, feet.	Area, square miles.	Capacity of section cubic feet.	Total capacity, cubic feet.	Remarks.
1,446.4	....	....	....	Upper Dam, gate sills.
1,452.0	19.94	....	....	Limit of draft.
1,457.4	22.41	3,188,508,000	3,188,508,000	
1,462.4	24.7[illegible]	3,284,126,000	6,472,634,000	
1,467.4	25.9[illegible]	3,529,405,000	10,002,039,000	High water line.
1,472.4	28.27	3,778,917,000	13,780,956,000	
1,477.4	29.43	4,021,459,000	17,802,415,000	



Aziscoos Dam, Magalloway River. View north, up stream face



Aziscoos Dam, Magalloway River. View north, down stream face

RANGELEY LAKE.

Rangeley Lake proper, or Oquossoc Lake, is the uppermost of this series of natural storage reservoirs. It drains into Mooselucmaguntic Lake through Rangeley Stream 2.6 miles long.

The storage is controlled by a crib dam of the open weir type but seldom if ever, water flows over the crest. The right hand half of the dam is occupied by the usual log sluicing gates, housed over. The elevation of the sill of the gate is 1507.06 or 60.65 above the sill of the gate at Upper Dam. The stored water from this lake is usually the last to be drawn upon and hence high level is generally maintained through the summer tourist season.

The summer cottages are numerous around the shore of the lake, many of them costly constructions. The Mountain View House near the outlet, would be slightly affected by an additional 5-foot rise above the present high water line, as would be a number of cottages. The town of Rangeley would be partially submerged by the additional 5-foot rise, and would be nearly covered with a 10-foot rise on high water line. Very slight, if any, additional storage could be obtained in height on account of the resulting excessive damages. Additional storage might be obtained by dredging 3 or 4 feet, but that would be detrimental to the summer interests and would be very energetically opposed. It should not be allowed.

The following table shows the areas and capacities of the lake for various elevations:

Area and Capacity of Rangeley Lake.

Elevation, feet.	Area, square miles.	Capacity, of section, cubic feet.	Total capacity, cubic feet.	Remarks.
1,507.1	....	....	....	Rangeley dam gate sill.
1,507.2	8.76	....	....	
1,511.0	9.15	949,204,000	949,204,000	Limit of draft.
1,512.2	9.27	308,112,000	1,257,316,000	Average low water.
1,517.2	9.76	1,327,012,000	2,584,328,000	Average high water.
1,522.2	11.24	1,463,616,000	4,047,944,000	
1,527.2	12.01	1,619,735,000	5,667,679,000	

KENNEBAGO LAKE.

Kennebago Lake furnishes additional although relatively small storage to the system. It is located in Franklin County mainly in Township 3, Range 3. The outlet is through Kennebago River 12.3 miles long from the dam at the outlet to Indian Rock at the mouth. The elevation of average low water is 1774 feet, or 327.6 ft. above the sill of the gate at Upper Dam. The storage is controlled by a crib dam at the outlet and the north end of the lake. High water in the lake floods out Little Kennebago Lake. There are a few summer camps around the lake.

The following table gives the areas and capacities of the lake for various elevations:

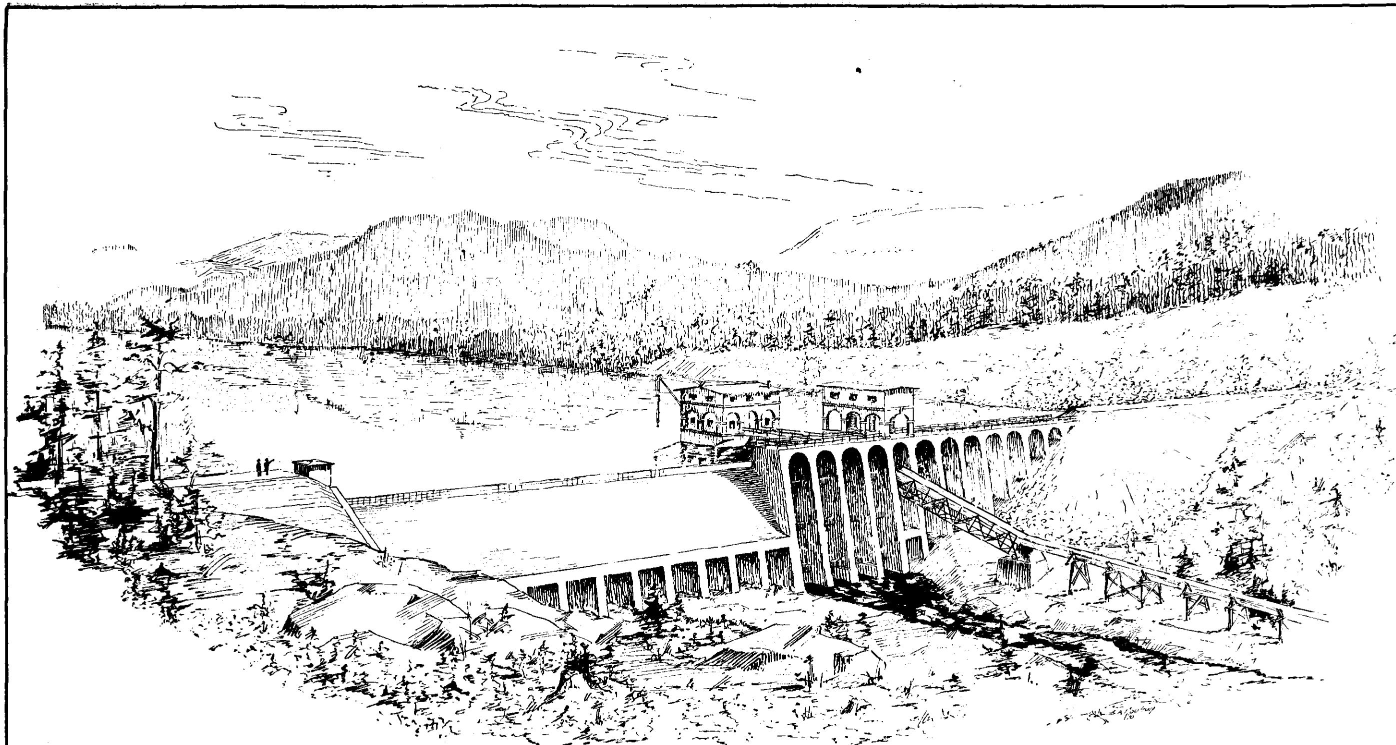
Area and Capacity of Kennebago Lake.

Elevation, feet.	Area, square miles.	Capacity of section, cubic feet.	Total capacity, cubic feet.	Remarks.
1,769.1	2.31	....	....	
1,774.1	2.74	350.828,000	350,828,000	Low water line.
1,782.1	4.13	767,214.000	1,118,042,000	High water line.
1,787.1	5.03	638,416,000	1,756,458,000	
1,792.1	6.04	772,232,000	2,528,690,000	

MAGALLOWAY RESERVOIR.

There is now under construction a notable structure that will largely increase the storage facilities of the Androscoggin Basin. It is the Aziscoos Dam, located on Magalloway River in Lincoln Plantation, Oxford County. It is being built by the Androscoggin Reservoir Co., an organization comprising the four principal power users on the river, namely: the Union Water Power Co., the Rumford Falls Power Co., the International Paper Co., and the Berlin Mills Co. Mr. Walter H. Sawyer of Lewiston is the agent for the company and in charge of the work.

The Aziscoos Dam is a concrete structure 501 feet long between abutments of which 236 feet is the rollway and 265 feet, the main dam. There will be an earthern embankment about 380 feet long at the south end. The maximum height will be about 80 feet. The dam is of hollow arch type. The original



Aziscoos Dam, Magalloway River

design called for about 30,000 cubic yards of concrete, but after the foundation was stripped, it was found necessary to go into the granite deeper than was first thought, and a somewhat greater quantity of concrete will be required. The water from the reservoir is to be taken through two 8-ft. reinforced concrete pipes under a 47-foot head. The new dam is a short distance below the old crib log driving dam, which is being used as a coffer dam during construction. The first run of concrete for this dam was made July 11, 1910. The rapid progress on its construction is shown by two views, plates XI and XII. Both of the views are looking north, one being of the upstream face and the other of the downstream face of the dam. By November 1, 1910, about 12,000 cu. yards of concrete had been placed. It is expected that the dam will be closed early in 1911 and carried to a height sufficient to store half the capacity of the reservoir.

Plate XIII is a perspective view of the Aziscoos Dam as it will look when completed, made from original designs by Mr. S. A. Moulton.

The reservoir will have a storage capacity of 8,000,000,000 cubic feet. It will be about 14 miles long and flood 10.5 square miles of which 6.5 square miles is flooded by the old dam. The only damage has been to standing timber.

The Androscoggin Reservoir Co. is building the dam for the purpose of forming a lake to be used as a storage reservoir for flood water during the freshet season. The primary function of the new reservoir is to maintain the flow of water in the Androscoggin River at the present amount required for manufacturing purposes during times of extreme drought. It is estimated, however, that the new storage reservoir, if operated in connection with the storage system formed by the Rangeley Lakes, will increase the ordinary low water flow of the river in what may be termed "average years."

The present flow of the Androscoggin River at Berlin, New Hampshire, during days in the year when storage is being used is about 1,300 second-feet, but with the additional storage reservoir in operation, the storage is to be controlled so that the flow at Berlin shall not fall below 1,550 second-feet, thus making an increase of little over 19 per cent. above that which can be depended upon at present.

As lake storage is required during 9 months of the year in order to maintain the required flow at Berlin, this increase of 19 per cent will be for that length of time.

The total fall used at present between the saw-mill of the Berlin Mills Co. at Berlin, New Hampshire, and the power station of the Berlin Light & Power Co. at Shelburne, New Hampshire, is 279 ft. As the increased flow will be 250 second-feet for 9 months, this means an increase of 5,929 horsepower at 75 per cent efficiency, 24 hours per day, 9 months in the year, to that section of the river.

At points further down the Androscoggin River, the increased horsepower available will not be as large proportionately owing to the gradually increasing drainage area. The consequent increase of the flow in the stream through local rains would require that the storage reservoirs be called upon during a shorter period than 9 months, so that it is difficult to estimate the benefit due to storage in terms of horsepower without going into a very elaborate study of the history of the flow of the river in years past.

The total developed fall in the Androscoggin River below Shelburne, omitting the fall of 180 ft. at Rumford Falls which is now being developed but not to its full capacity, is 352 ft. It is probably safe to say that the additional 250 second-feet increase in flow at Berlin will be utilized for, at least, 6 months in the year by the power users below Shelburne. This amounts to 7,480 horsepower at 75 per cent efficiency, 24 hours per day.

The total fall in the Androscoggin River from Errol Dam to the sea is 1,231 ft., of which, probably, it is safe to say that 1,195 ft. will be ultimately developed. 250 second-feet utilized on this fall means an increase of 25,412 horsepower at 75 per cent efficiency, 24 hours per day.

LAKE AREAS.

The following table gives the areas of water surfaces of the principal lakes and ponds in the Androscoggin basin, as measured from the best maps available, including the special lake survey maps, the topographic sheets of the U. S. Geological Survey, and the new map of the State Water Storage Commission.

Lake Areas, Androscoggin River Drainage Basin.

LAKE OR POND.	Drainage.	Surface area, square miles.
Allen Pond	Main River	0.28
Androscoggin Pond	Dead River	7.20
Akers Pond	Clear Stream	0.60
Asnagunticook Pond	Main River	0.54
B Pond	Main River	0.90
Bear Pond	Twenty Mile River	0.75
Beaver Pond	Magalloway River	0.06
Beaver Pond	Main River	0.93
Beaver Bog Pond	Kennebago River	0.24
Beaver Pond	Kennebago River	0.68
Beaver Pond	Swift River	0.30
Berry Pond	Main River	0.03
Big Island Pond	Kennebago River	1.20
Birch Pond	Swift River	0.09
Black Pond	Magalloway River	0.18
Brettons Pond	Twenty Mile River	0.22
Bryants Pond	Little Androscoggin River	0.24
Bunker Pond	Swift River	0.09
C Pond	Main River	0.52
Cranberry Pond	Magalloway River	0.30
Crotched Pond	Dead River	2.10
Cupsuptic Pond (included in Mooselucmaguntic Lake)		
Cupsuptic Pond	Cupsuptic River	0.30
Davids Pond	Dead River	0.75
Ellis Pond	Ellis River	0.96
Ell Pond	Kennebago River	0.30
Flatiron Pond	Kennebago River	0.30
Flying Pond	Dead River	0.52
Forest Pond	Main River	0.22
Great Pond	Kennebago River	0.34
Gull Pond	Main River	0.75
Hales Brook Pond	Dead River	0.30
Half Moon Pond	Webb River	0.12
Hall Pond	Little Androscoggin River	0.08
Hicks Pond	Little Androscoggin River	0.27
Hogan Pond	Little Androscoggin River	0.26
Horseshoe Pond	Ellis River	0.14
Jersey Bog Pond	Twenty Mile River	0.24
Johns Pond	Kennebago River	0.57
Kemankeag Pond	Kennebago River	0.27
Kennebago Lake	Kennebago River	2.74
Labrador Pond	Twenty Mile River	0.15
Lake Auburn	Main River	3.47
Lincoln Pond	Magalloway River	0.93
Lincoln Pond	Magalloway River	0.42
Little Ellis Pond	Ellis River	0.54
Little Island Pond	Kennebago River	0.40
Little Kennebago Pond	Kennebago River	0.26
Little Pennesseewassee Pond	Little Androscoggin River	0.17
Little Sabattus Pond	Sabattus River	0.05
Little Wilson Pond	Main River	0.17
Lone Star Pond	Main River	0.26
Long Pond in D and E Townships	Main River	0.68
Long Pond in Sandy River Plantation	Main River	0.75
Long Pond in Livermore	Main River	0.32
Long Pond	Kennebago River	1.05
Long Pond	Magalloway River	0.26
Loon Pond	Sabattus River	0.11
Lovejoy Pond	Dead River	0.60
Lower Range Pond	Little Androscoggin River	0.43
Marshall Pond	Little Androscoggin River	0.22
Metallak Pond	Main River	0.07
Middle Range Pond	Little Androscoggin River	0.59
Millsfield Pond	Clear Stream	0.30
Moose Pond	Little Androscoggin River	0.26
Moose Pond	Main River	0.21
Mooselucmaguntic Lake	Main River	25.95
Mountain Brook Pond	Swift River	0.15
Mud Pond	Main River	0.03

Lake Areas, Androscoggin River Drainage Basin—Concluded.

Lake or Pond.	Drainage.	Surface area, square miles.
Mud Pond	Little Androscoggin River	0.15
No Name Pond	Sabattus River	0.22
North Pond	Little Androscoggin River	0.30
North Pond	Main River	0.21
North Pond	Twenty Mile River	0.32
Northeast Pond	Twenty Mile River	0.06
Otter Pond	Magalloway River	0.03
Parkers Pond	Dead River	3.60
Parmachenee Lake	Magalloway River	4.35
Pennesseewassee Lake	Little Androscoggin River	1.38
Pond-in-River	Rapid River	0.83
Quimby Pond	Main River	0.27
Rangeley Lake	Main River	9.76
Richardson Lake	Main River	13.08
Richardson Pond in T 4 R 2	Main River	1.65
Round Pond in E Township	Main River	0.12
Round Pond in Rangeley	Main River	0.18
Round Pond in Livermore	Main River	0.27
Rump Pond	Magalloway River	0.12
Sabattus Pond	Sabattus River	4.56
Sabbathday Pond	Main River	0.12
Sand Pond	Little Androscoggin River	0.11
Sandy Bottom Pond	Twenty Mile River	0.05
Saturday Pond	Little Androscoggin River	0.29
Secret Pond	Kennebago River	0.22
South Pond	Twenty Mile River	0.39
South Pond	Main River	0.54
Sturtevant Pond	Magalloway River	0.90
Success Pond	Main River	0.45
Snnday Pond	Main River	0.30
Sutherland Pond	Sabattus River	0.06
Swift Pond	Swift River	0.12
Taylor Pond	Little Androscoggin River	0.98
Tompson Lake	Little Androscoggin River	6.82
The Basin	Main River	0.11
Tilton Pond	Dead River	0.22
Tripp Pond	Little Androscoggin River	1.15
Twitchell Pond	Main River	0.36
Umbagog Lake	Main River	15.80
Upper Metallak Pond	Magalloway River	0.39
Upper Range Pond	Little Androscoggin River	0.59
Webbs Pond	Webbs River	3.98
White Cap Pond	Kennebago River	0.22
Whitney Pond	Little Androscoggin River	0.28
Wings Pond	Dead River	0.75
Worthleys Pond	Main River	0.48
Worthley Pond	Little Androscoggin River	0.08
Total		142.90

STREAM FLOW.

The following stations have been maintained in this river basin:

Androscoggin River at Errol, N. H. (1905-1910).
Androscoggin River at Gorham, N. H. (1903) fragmentary.
Androscoggin River at Shelburne, N. H. (1903-1907 and 1910).
Androscoggin River at Rumford Falls, Me. (1892-1910).
Androscoggin River at Dixfield, Me. (1902-1908).

The longest record of flow on the Androscoggin is that at Rumford Falls, extending back to 1892. The driest year since the beginning of the records was 1904, and the wettest 1893, the total flow during these two years being about in the ratio of 1 to 1.66.

FLOOD CONDITIONS.

The greatest discharge of the Androscoggin River at Rumford Falls since the beginning of the record there was in April, 1805. The discharge was 55,200 sec. ft. or on the drainage area of 2,090 sq. miles the discharge was 26.4 sec. ft. per square mile. The flood of March 2, 1896, at Rumford Falls gave a maximum discharge of 39,000 sec. ft. or 18.7 sec. ft. per sq. mile. This flood was not as severe here as on the lower reaches of the river.

At Lewiston, the flood of March 2, 1896, was the maximum of which there is a record and a great financial damage was the result. Most of the bridges below Rumford were carried away including the two highway bridges at Lewiston. The Maine Central Railroad bridge at Lewiston was damaged but the Grand Trunk Railroad bridge was left practically intact. Immense quantities of logs were carried down in the freshet and were eventually lost at sea.

Before the rain started there was about one foot of snow over the drainage basin of the lower river. In 36 hours there had fallen at Lewiston 6.1 inches of rain, the maximum record of precipitation since the establishment of the gate house at Lewiston.

The water reached an elevation of 79.1 ft. on the Union Water Power Company's gage. At that time the elevation of crest of dam No. 1 was 70 and the elevation of crest of dams Nos. 2, 3, and 4 was 70.67. The amount of flow at that time can only be roughly approximated as there are low islands between the dams over which a large volume of water would pass at elevations given above. It is probable that the flow was approximately 65,000 sec. ft. The drainage area of the Androscoggin River at Lewiston is 2,950 sq. miles. The discharge was therefore 22.1 sec. ft. per sq. mile.

The discharge at the Errol dam in March, 1896, was only 1,400 sec. ft. and was not materially increased until April 15. The discharge at Rumford Falls during this freshet, as given above, was only 39,000 sec. ft. or 18.7 sec. ft. per sq. mile.

The "Pumpkin Freshet," so called, occurred October 4, 1869. The height over the dams was 8.5 ft. At that time the elevation of all the dams was 70. During this freshet, a mark on the wall of the mill, which is now the Columbia Mill, was made, which indicated the height to which the water then rose. During the flood of March 2, 1896, the water reached 3 ft. above this mark. It is believed that the 1896 flood was the greatest that has occurred at Lewiston during the past century.

LOW WATER CONDITIONS.

Within the length of record at Rumford Falls, the period of greatest drought and low water flow was in 1903-1904. The minimum discharge occurred February 18, 1904 and was 658 sec. ft. or 0.315 sec. ft. per sq. mile. For the seven days period from February 15 to 21, the discharge averaged 686 sec. ft. or 0.328 sec. ft. per sq. mile. For the entire month of February it was 740 sec. ft. or 0.354 sec. ft. per sq. mile. The preceding month of January has the next lowest record of 1,010 sec ft. or 0.483 sec. ft. per square mile. For the entire year of 1904 the run-off was 1.33 sec. ft. per sq. mile.

Low water conditions are now prevailing (fall of 1910) and the run-off during the coming winter may reach nearly to the 1904 record again.

ANDROSCOGGIN RIVER AT ERROL, N. H.

A record of flow of the Androscoggin River at Errol Dam, N. H., has been furnished by the Union Water Power Company since 1905.

Information in regard to this station is contained in the 1910 U. S. Geological Survey Report of Progress of Stream Measurements.

Run-off of Androscoggin River at Errol, N. H., in second-feet per sq. mile and depth in inches. Drainage area, 1095 square miles.

	1905.		1906.		1907.		1908.		1909.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	1.44	1.66	1.06	1.22	1.00	1.15	1.46	1.68	.69	.80	1.13	1.30
February	1.14	1.19	1.03	1.07	.97	1.01	1.60	1.73	.70	.73	1.09	1.15
March	.69	.80	.84	.97	1.00	1.15	1.77	2.04	.80	.92	1.02	1.18
April	1.36	1.52	1.27	1.42	1.12	1.25	2.18	2 43	3.02	3.37	1.79	2.00
May	3.29	3.79	4.62	5.33	4.54	5.23	5.41	6.24	5 67	6.54	4.71	5.43
June	1.99	2.22	3.32	3.70	2.13	2.38	2.81	3.14	2.89	3.22	2.63	2.93
July	1.63	1.88	1.42	1.64	1.72	1.98	1.27	1.46	1.29	1.49	1.47	1.69
August	1.27	1.46	1.21	1.40	1.41	1.63	1.02	1.18	1.25	1.44	1.23	1.42
September	1.17	1.30	1.13	1.26	1.35	1.51	1.24	1.38	1.12	1.25	1.20	1.34
October	1.23	1.42	1.21	1.40	1.34	1.54	1.20	1 38	.86	.99	1.17	1.35
November	1.26	1.41	.91	1.02	3.42	3.82	.95	1.06	.98	1.09	1.50	1.68
December	1.06	1.22	.86	.99	1.61	1.86	.77	.89	.99	1.14	1.06	1.22
Total	......	19.87	......	21.42	......	24.51	......	24.61	......	22.98	......	22.69
Mean	1.46	......	1.57	......	1.80	......	1.81	......	1.69	......	1.67	

ANDROSCOGGIN RIVER AT SHELBURNE, N. H.

This station is located at the steel highway bridge about one-half mile north of the railway station at Shelburne, N. H., and was established May 30, 1903. It was discontinued April 30, 1907, but was re-established May 20, 1910.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1903, No. 97, p. 61-62. No. 165, p. 79.
1904, No. 124, p. 76-77. No. 165, p. 79.
1905, No. 165, p. 76-79.
1906, No. 201, p. 67-69.
1907, No. 241, p. 108-110, 342.

Run-off of Androscoggin River at Shelburne, N. H., in second-feet per square mile and depth in inches. Drainage area, 1500 square miles.

	1903.		1904.		1905.		1906.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	......	......	......	......	......	......	......	......
February	......	......	......	......	......	......	......	......	......	......
March	......	......	......	......	......	......	......	......	......	......
April	......	......	2.37	2.64	2.24	2.50	2.18	2.43	2.26	2.52
May	......	......	5.56	6.41	3.99	4.60	5.47	6.31	5.01	5.77
June	1.87	2.09	1.62	1.81	1.76	1.96	3.31	3.69	2.14	2.39
July	1.18	1.36	1.35	1.56	1.53	1.76	1.08	1.24	1.28	1.48
August	1.07	1.23	.95	1.10	1.49	1.72	.93	1.07	1.11	1.28
September	1.03	1.15	1.21	1.35	1.31	1.46	.87	.97	1.10	1.23
October	1.11	1.28	1.41	1.63	1.12	1.29	.87	1.00	1.13	1.30
November	1.08	1.20	1.10	1.23	1.02	1.14	.87	.97	1.02	1.14
December	......	......	......	......	......	......	......	......	......	......
Total	......	......	......	......	......	......	......	......	......	......
Mean	......	......	......	......	......	......	......	......	......	......

ANDROSCOGGIN RIVER AT RUMFORD FALLS, MAINE.

The discharge of the Androscoggin River at Rumford Falls since 1892 has been furnished by the Rumford Falls Power Company.

Information in regard to this station is contained in the following Annual Reports and Water Supply Papers of the U. S. Geological Survey:

1890, A 19 IV, p. 92-97.
1891, A 19 IV, p. 92-97.
1892, A 19 IV, p. 92-97.
1893, A 19 IV, p. 92-97 A 20 IV, p. 66-72 W 69, p. 76-91.
1894, A 19 IV, p. 92-97 A 20 IV, p. 66-72 W 69, p. 76-91.
1895, A 19 IV, p. 92-97 A 20 IV, p. 66-72 W 69, p. 76-91.
1896, A 20 IV, p. 46, 66-72. W 69, p. 76-91.
1897, A 20 IV, p. 46, 66-72. W 69, p. 76-91.
1898, A 20 IV, p. 46, 66-72. W 27, p. 9, 14-16 W 69, p. 76-91.
1899, A 21 IV, p. 56-57. W 35, p 27-28. W 69, p. 76-91.
1900, A 22 IV, p. 59-61. W 47, p. 31-32. W 69, p. 76-91.
1901, W 65, p. 20-21. W 69 p. 76-91 W 75, p. 22.
1902, W 82, p. 42-43.
1903, W 97, p. 62-63.
1904, W 124, p. 78.
1905, W 165, p. 80-81.
1906, W 201, p. 69-70.
1907, W 241, p. 110-112, 342.
1908, W 241, p. 110-112, 342.

Run-off of Androscoggin River at Rumford Falls, Maine, in second-feet per square mile and depth in inches.
Drainage area, 2090 square miles.

	1892.		1893.		1894.		1895.		1896.		1897.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	1.37	1.58	1.17	1.35	.78	.90	1.26	1.45	.78	.90
February	......	......	1.29	1.34	.84	.87	.54	.56	.75	.81	.73	.76
March	......	......	1.38	1.59	1.74	1.94	.53	.61	2.35	2.71	.78	.90
April	......	......	2.17	2.42	4.08	4.55	5.17	5.77	5.36	5.98	3.41	3.80
May	3.30	3.80	7.45	8.59	3.55	4.10	3.29	3.80	3.25	3.75	5.01	5.78
June	3.19	3.56	2.47	2.75	2.20	2.45	1.24	1.38	1.34	1.50	3.02	3.37
July	3.33	3.84	1.24	1.43	1.08	1.25	.77	.89	.86	.99	2.85	3.29
August	2.09	2.41	1.42	1.64	.83	.96	.78	.90	.83	.96	1.01	1.16
September	1.74	1.94	1.16	1.29	.96	1.07	.86	.96	.83	.93	.69	.77
October	1.20	1.38	1.69	1.95	1.08	1.25	1.16	1.34	.91	1.05	.69	.80
November	2.47	2.75	1.31	1.46	1.31	1.46	1.54	1.72	1.32	1.47	.98	1.09
December	1.38	1.59	1.13	1.30	.90	1.04	1.80	2.08	.87	1.00	1.12	1.29
Total	......	......	......	27.34	......	22.29	......	20.91	......	22 60	......	23.91
Mean	......	......	2.01	......	1.65	......	1.54	......	1.66	......	1.76	......

	1898.		1899.		1900.		1901.		1902.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	.84	.97	.91	1.05	.61	.70	.82	.95	1.22	1.41
February	.73	.76	.79	.82	1.10	1.15	.79	.82	.98	1.02
March	2.22	2.56	.80	.92	.91	1.05	1.06	1.22	4.17	4.81
April	4.01	4.47	3.75	4.18	4.21	4.69	6.42	7.16	3.77	4.21
May	3.89	4.49	4.36	5.03	5.45	6.28	4.62	5.33	4.04	4.66
June	2.04	2.27	1.40	1.56	1.78	1.99	1.91	2.13	3.16	3.53
July	.81	.93	.78	.90	.95	1.10	1.15	1.33	1.39	1.60
August	.73	.84	.62	.71	.68	.78	1.22	1.41	1.42	1.64
September	.84	.94	.68	.76	.69	.77	.69	.77	1.17	1.31
October	1.22	1.41	.69	.80	.95	1.10	.96	1.11	1.36	1.57
November	1.18	1.32	.75	.84	1.70	1.90	.69	.77	1.45	1.62
December	.94	1.08	.69	.80	1.00	1.15	1.62	1.87	1.11	1.28
Total	......	22.04	......	18.37	......	22.66	......	24.87	......	28.66
Mean	1.62	......	1.35	......	1.67	......	1.83	......	2.10	

Run-off of Androscoggin River at Rumford Falls, Maine, in second-feet per square mile and depth in inches. Drainage area, 2090 square miles.

	1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	1.04	1.20	.48	.55	.91	1.05	1.12	1.29	.74	.86	1.25	1.44	.65	.74	1.28	1.48	.96	1.10
February	1.00	1.04	.35	.38	.75	.78	.88	.92	.66	.69	1.33	1.43	.78	.82	.94	.98	.85	1.08
March	4.66	5.37	.76	.88	1.36	1.57	.65	.75	.93	1.07	1.76	2.03	.84	.96	1.88	2.17	1.60	1.84
April	3.26	3.64	2.88	3.21	2.56	2.86	2.59	2.89	2.72	3.04	3.31	3.69	4.88	5.44	4.03	4.50	3.81	4.25
May	1.96	2.26	4.91	5.66	2.72	3.14	4.27	4.92	4.61	5.32	4.32	4.98	4.83	5.57	2.11	2.43	4.10	4.73
June	2.08	2.32	1.38	1.54	1.57	1.75	2.85	3.18	1.79	2.00	2.02	2.25	1.91	2.13	1.76	1.96	2.06	2.30
July	1.09	1.26	.86	.99	1.41	1.63	1.16	1.34	1.42	1.64	.83	.95	.88	1.01	.80	.93	1.25	1.44
August	.91	1.05	.74	.85	1.43	1.65	.86	.99	.98	1.13	.76	.88	.79	.91	.85	.98	1.00	1.15
September	.72	.81	.80	.89	1.33	1.48	.73	.82	1.18	1.32	.66	.74	.89	.99	.80	.90	.92	1.02
October	.90	1.04	1.21	1.40	.96	1.11	.93	1.08	2.14	2.47	.75	.86	.78	.90	.69	.80	1.07	1.23
November	.82	.92	.81	.90	.98	1.10	.78	.86	3.62	4.04	.72	.81	.85	.94	.79	.88	1.27	1.41
December	.76	.88	.78	.90	.97	1.12	.61	.71	1.80	2.08	.54	.62	.76	.88	.69	.79	1.02	1.18
Total	......	21.79	......	18.15	......	19.24	......	19.75	......	25.66	......	20.68	......	21.29	......	18.78	......	22.73
Mean	1.60	......	1.33	......	1.41	......	1.45	......	1.88	......	1.52	......	1.57	......	1.38	......	1.66	......

ANDROSCOGGIN RIVER AT DIXFIELD, MAINE.

This station was established August 22, 1902, and was discontinued July 1, 1908. It was located about one-half mile west of Dixfield which is situated just above the confluence of Webbs River, at the highway bridge on the road to West Peru.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1902 No. 82, p. 41.
1903 No. 97, p. 64-66.
1904 No. 124, p. 78-79.
1905 No. 165, p. 82-84.
1906 No. 201, p. 70-71.
1907 No. 241, p. 112-114, 342.
1908 No. 241, p. 112-114, 342.

Run-off of Androscoggin River at Dixfield, Maine, in second-feet per square mile and depth in inches. Drainage area, 2230 square miles.

	1902.		1903.		1904.		1905.		1906.		1907.		1908.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile,	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	......	......	......	......	......	......	......	......	....	......	.84	.97	1.42	1.64	1.13	1.30
February	......	......	......	......	......	......	......	......	......	......	.75	.78	1.51	1.63	1.13	1.20
March	......	......	6.33	7.30	4.56	5.26	2.57	2.96	......	......	1.05	1.21	2.03	2.34	3.31	3.81
April	......	......	4.26	4.75	3.68	4.11	3.13	3.49	3.11	3.47	3.52	3.93	4.17	4.65	3.64	4.06
May	......	......	2.63	3.03	6.06	6.99	3.12	3.60	4.93	5.68	5.70	6.57	5.29	6.10	4.62	5.33
June	......	......	2.56	2.86	1.61	1.80	1.72	1.92	3.38	3.77	2.01	2.24	2.40	2.68	2.28	2.54
July	......	......	1.29	1.49	1.10	1.27	1.34	1.54	1.32	1.52	1.52	1.75	......	......	1.31	1.51
August	1.65	1.90	1.02	1.18	.80	.93	1.63	1.88	.95	1.10	1.02	1.18	......	......	1.18	1.33
September	1.44	1.61	.74	.83	.86	.96	1.41	1.57	.81	.91	1.24	1.38	......	......	1.08	1.21
October	1.69	1.95	.96	1.11	1.33	1.53	.97	1.12	1.07	1.23	2.44	2.81	......	......	1.41	1.62
November	2.06	2.30	.87	.97	.90	1.01	1.01	1.13	.87	.98	4.35	4.85	......	......	1.68	1.87
December	1.37	1.58	.90	1.04	1.34	1.54	1.22	1.41	......	......	2.15	2.48	......	......	1.40	1.61
Total	......	......	......	......	......	......	......	......	......	......	......	30.15	......	......	......	27.39
Mean	......	......	......	......	......	......	......	......	......	......	2.22	......	......	......	2.01	

ROYAL RIVER DRAINAGE BASIN.

This coastal stream drains 136 square miles between the Androscoggin and Presumpscot rivers. The principal water power developments are at Yarmouth. The Yarmouth Manufacturing Co. utilizes a 12-ft. head, with one Victor 33" turbine. The power developed is 125 horsepower. There is in use one General Electric generator of 150 kilowatts. A portion of the power is transmitted to Freeport.

The Royal River Manufacturing Co. utilizes a head of about 24 ft. It develops 200 horsepower with one Chase 42" wheel.

PRESUMPSCOT RIVER DRAINAGE BASIN.

DESCRIPTION.

Presumpscot River, the outlet of Sebago Lake, rises about 17 miles northwest of Portland, in Cumberland County. The principal tributary of the lake is Crooked River, a stream heading 35 miles farther north in Oxford County, and within three miles of the Androscoggin. The northern part of the basin is mountainous and wooded; the southern part is moderately hilly and mostly in farm land. Granite, gneiss and mica shists appear in many places, and the soil is gravelly and sandy. The mean annual precipitation is about 42 inches.

DRAINAGE.

The following table gives the drainage area of Presumpscot River and a number of its tributaries:

Drainage areas of Presumpscot River.

	Square miles.
Presumpscot River, outlet of Sebago Lake gaging station	436
Presumpscot River, mouth	600
Crooked River, mouth	136
Songo River, mouth	244
Muddy River, mouth	17
Northwest River, mouth	25
Panther Run, mouth	32
Pleasant River, mouth	48
Little River, mouth	50
Piscataqua River, mouth	41

WATER POWER.

Developed Powers.

The fall of the Presumpscot River from the crest of the stone dam at the outlet of Sebago Lake to mean low tide is 265 ft. in a distance of 21.7 miles, or an average of 12.2 ft. per mile. Up to 1903 only 132 ft. had been utilized and developed to about 6,000 horsepower. At the present time 209 ft. are being utilized with a total development of 17,459 horsepower or 83.5 horsepower per foot of fall. The drainage area of the Presumpscot River at its mouth is 600 sq. miles. Miscellaneous small developments throughout the basin will bring the total power to 20,569 horsepower. The developed power is therefore 34.2 horsepower per sq. mile, which is probably the second highest developed power per square mile of any river basin in the country.

The lowest developed power on the river, at the head of tide, is the Lower Falls station of the Presumpscot Electric Co. The dam is of wood, 200 ft. long and 15 ft. high. The head developed varies from 10 to 16 ft. The turbine installation consists of 8 Hercules and Victor wheels size 48″ with a total rated capacity of 1,200 horsepower. At the low water stages the output is 700 horsepower. There are 4 Westinghouse generators of 225 kilowatts capacity.

The next plant is the Cumberland Paper Mills of the S. D. Warren & Co., 6.1 miles above tidewater. The dam is of stone 400 ft. long and 15 ft. high. The head developed is 22 ft. The turbine installation consists of two pairs horizontal 39″ Hercules; one vertical 51″ Hercules; two pairs horizontal 27″ Victor; one pair horizontal 27″ McCormick and one 48″ wheel. The total rated capacity is 2,700 horsepower. The output of the plant is 150 tons of paper per day.

The next plant is the Saccarappa station of the Presumpscot Electric Co. The dam is of wood and concrete, 500 ft. long, 15 ft. high, with a developed head of 28 ft. There are three pairs of 36″ horizontal Hercules turbines, capacity 2,500 horsepower. There are three Westinghouse generators, each 450 kilowatt capacity. This dam is 7.2 miles from tidewater and ponds water to the next development.

At Mallison Falls, 12.3 miles from the mouth, are two developments, Mallison Power Co. and the Robinson Woolen Mills. The power company has 12 Hercules 24″ horizontal turbines under a head of 19½ ft., with a rated capacity of 1,000 horsepower. There are one Westinghouse, 200 kilowatt, and one General Electric, 792 kilowatt generators. In the Robinson Mills is one Chase 66″ wheel under a 14-ft. head and with a capacity of 165 horsepower. This dam backs water 0.6 mile to the next privilege.

The Androscoggin Pulp Co. has a development at Little Falls, 12.9 miles from tidewater. There are installed one wheel 15" diameter, seventeen of 27½"; one of 30"; two of 35"; and one of 48". They operate under a 17-ft. head with a total capacity of 2,100 horsepower. This dam ponds water to the next development 1.4 miles above.

The E. I. Du Pont de Nemours Powder Co. utilizes a 19-ft. head at Gambo Falls. There are six Sampson 32½" upright wheels and one double horizontal 35" wheel with a total capacity of 1,250 horsepower. The company manufactures 20 tons daily of dry wood flour for use in the manufacture of explosives.

The next development is that of the Portland Electric Lighting and Power Co. at Great Falls 19.0 miles from the mouth. The turbine installation consists of four pairs Victor cylinder gates 33" wheels operating under a 34-ft. head and with a rated capacity of 3,544 horsepower. There are four General Electric generators of 500 kilowatts each and four 30 kilowatt exciter generators. The power is transmitted to Portland for power and lighting purposes. This dam ponds water for 0.8 mile to the next privilege.

The upper development is the Eel Weir station of the Presumpscot Electric Co. built in 1904. The stone dam, 400 ft. long and 20 ft. wide, is at the outlet of Sebago Lake. The water is brought through a canal about one mile long directly from the lake to the plant. The water is used through three 33-inch horizontal Hercules wheels under an average head of 40 ft. The total rated capacity is 3,000 horsepower. The electric installation consists of three Westinghouse generators of 600 kilowatts each. The power is transmitted to Westbrook where it is used for manufacturing, and private and public lighting purposes.

There are from 25 to 30 small power plants on the various tributaries of the Presumpscot, most of them developing under 100 horsepower each.

Undeveloped Powers.

The remaining undeveloped power on the main river is the 56-ft. fall between the Gambo and Great Falls development, or between the 16.3 mile point and the 19.0 mile point from tide-water. Applying the unit horsepower per foot of fall developed on this river, would give for this undeveloped power about 4,700 horsepower.

LAKE STORAGE.

Sebago Lake is a magnificent natural storage reservoir, and its utilization for this purpose has made the regimen of flow of the Presumpscot extremely regular. Nowhere in the United States is there a better example of efficient regulation of storage than on this stream. A record of flow from Sebago Lake has been kept since 1887. During this period of over 20 years the driest season was that of 1905 and the wettest 1891, the total flow for these two years being about in the ratio of 1 to 2.22.

The following table gives the area of water surface of a number of the lakes and ponds in this basin:

Lake Areas, Presumpscot River Basin.

Lake or Pond.	Drainage.	Surface area square miles.
Adams Pond	Muddy River	0.17
Anonymous Pond	Main river	0.73
Bear Pond	Bear River	0.36
Bog Pond	Main river	0.06
Bog Pond	Sucker Brook	0.04
Brandy Pond	Songo River	1.09
Browns Pond	Mill Brook	0.13
Coffee Pond		0.21
Cooks Pond	Main river	0.05
Duck Pond	Duck Pond Brook	1.06
Dumpling Pond		0.06
East Sebago Pond	Northwest River	0.03
Highland Lake	Main river	1.70
Holt Pond	Muddy River	0.12
Ingalls Pond	Muddy River	0.12
Island Pond	Main river	0.19
Keoka Pond	Main river	0.73
Little Pond	Main river	0.02
Little Sebago Pond	Main river	3.85
Long Lake	Main river	7.52
Long Pond	Main river	0.73
Mill Branch Pond	Mill Brook	0.04
Moose Pond	Main river	0.29
Nubble Pond		0.05
Otter Pond	Main river	0.20
Panther Pond	Panther	2.15
Pappoose Pond	Crooked	0.14
Parker Pond	Main river	0.26
Peabody Pond	Northwest River	1.05
Perley Pond	Northwest River	0.05
Pleasant Pond	Main river	1.41
Rattlesnake Pond	Tenny River	1.30
Raymond Pond		0.63
Sandy Creek Pond	Willette River	0.05
Sebago Lake	Main river	45.60
South Naples Pond	Muddy River	0.19
Thomas Pond	Main river	0.68
Trickey Pond	Muddy River	0.46
Webbs Pond		0.02
Wood Pond	Willette River	0.54
Total		74.08

Sebago Lake has an area of water surface of 45.60 sq. miles. Low water is at elevation 262.5 ft. and the top of the dam is at elevation 270.16 ft. This is a storage depth of 7.66 ft. or about 9,700,000,000 cubic feet. The outlying ponds emptying into Sebago Lake have a total area of 23.6 sq. miles, with an average amount of storage under control of 4 ft. or a total of 2,600,000,000 cubic feet. Little Sebago Lake, discharging into Presumpscot River below the main lake, has an area of 3.85 sq. miles with a storage of about 9 ft. or about 970,000,000 cubic feet. The total storage amounts to approximately 13,270,000,000 cubic feet.

STREAM FLOW.

PRESUMPSCOT RIVER AT OUTLET OF SEBAGO LAKE, ME.

A record of flow from Sebago Lake has been kept since 1887 and has been furnished from time to time by the S. D. Warren Company.

Information in regard to this station is contained in the following Annual Reports and Water Supply Papers of the U. S. Geological Survey:

For 1887, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1888, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1889, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1890, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1891, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1892, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1893, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1894, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1895, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1896, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1897, A 19 IV p 97-108 A 20 IV p 46 W 69 p 91-104
1898, W 69 p 91-104
1899, W 69 p 91-104
1900, W 69 p 91-104
1901, W 65, p 21-22 W 75 p 19, 22 W 69 p 91-104
1902, W 82, p 44-46
1903, W 97, p 66-68
1904, W 124, p 80-81
1905, W 165, p 85-87
1906, W 201, p 72-73
1907, W 241, p 116-118, 342
1908, W 241, p 116-118, 342

Run-off of Presumpscot River at Outlet of Sebago Lake, Maine, in second-feet per square mile and depth in inches. Drainage area, 436 sq. miles.

	1887.		1888.		1889.		1890.		1891.		1892.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	2.06	2.38	2.22	2.56	2.18	2.51	2.10	2.42	2.19	2.52	1.83	2.11
February	2.14	2.23	1.97	2.12	2.29	2.38	2.24	2.33	2.21	2.30	1.87	2.02
March	2.14	2.47	2.05	2.36	2.56	2.95	2.11	2.43	2.40	2.77	1.76	2.03
April	2.12	2.36	2.14	2.39	2.29	2.56	2.88	3.21	3.83	4.27	1.64	1.83
May	2.25	2.59	3.15	3.63	2.26	2.61	3.11	3.58	2.95	3.40	1.67	1.92
June	2.20	2.46	2.24	2.50	2.14	2.39	2.21	2.47	2.20	2.46	1.64	1.83
July	2.03	2.34	2.02	2.33	2.14	2.47	1.86	2.14	1.97	2.27	2.03	2.34
August	2.12	2.44	1.92	2.21	2.07	2.39	1.91	2.20	2.03	2.34	1.91	2.20
September	2.14	2.39	2.05	2.29	1.95	2.18	2.00	2.23	2.05	2.29	1.67	1.86
October	2.14	2.47	1.70	1.96	1.97	2.27	2.23	2.57	2.10	2.42	1.39	1.60
November	2.14	2.39	2.05	2.29	2.00	2.23	2.22	2.48	1.89	2.11	1.30	1.45
December	2.18	2.51	2.19	2.52	2.02	2.33	2.33	2.69	1.72	1.98	1.32	1.52
Total	......	29.03	......	29.16	......	29.27	......	30.75	......	31.13	......	22.71
Mean	2.14	......	2.14	......	2.16	......	2.27	......	2.30	......	1.67	......

	1893.		1894.		1895.		1896.		1897.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	1.35	1.56	1.91	2.20	1.73	1.99	1.15	1.33	1.88	2.17
February	1.35	1.41	1.78	1.85	1.63	1.73	1.22	1.32	1.78	1.85
March	1.35	1.56	1.44	1.66	1.49	1.72	3.44	3.97	1.72	1.98
April	1.24	1.38	1.34	1.50	1.27	1.42	1.38	1.54	1.25	1.40
May	1.63	1.88	1.59	1.83	1.63	1.88	2.18	2.51	1.56	1.80
June	1.91	2.13	1.66	1.85	1.59	1.77	2.06	2.30	1.89	2.11
July	1.76	2.03	1.84	2.12	1.33	1.53	2.04	2.35	2.0[illegible]	2.40
August	1.71	1.97	1.56	1.80	1.25	1.44	1.85	2.13	2.55	2.94
September	1.81	2.02	1.29	1.44	1.33	1.48	1.61	1.80	2.24	2.50
October	1.73	1.99	1.26	1.45	1.22	1.41	1.66	1.91	2.24	2.58
November	1.66	1.85	1.24	1.38	.92	1.03	1.77	1.98	1.95	2.18
December	1.93	2.22	1.55	1.79	1.07	1.23	1.87	2.16	2.03	2.34
Total	......	22.00	......	20.87	......	18.63	......	25.30	......	26.25
Mean	1.62	......	1.54	......	1.37	......	1.85	......	1.93	

Run-off of Presumpscot River at Outlet of Sebago Lake, Maine, in second-feet per square mile and depth in inches. Drainage area, 436 sq. miles.

	1898.		1899.		1900.		1901.		1902.		1903.		1904.		1905.		1906.		1907.		1908.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	2.14	2.47	1.77	2.04	1.10	1.27	1.48	1.71	1.49	1.72	1.60	1.84	1.28	1.48	1.11	1.28	1.13	1.30	1.16	1.34	1.55	1.79
February	2.14	2.23	1.74	1.81	1.18	1.23	1.53	1.59	1.63	1.70	1.60	1.67	.98	1.06	.94	.98	1.41	1.47	1.08	1.12	1.76	1.90
March	1.84	2.12	1.51	1.74	1.50	1.73	1.52	1.75	1.45	1.67	1.67	1.92	1.07	1.23	.79	.91	1.23	1.42	.68	.78	1.27	1.46
April	2.04	2.28	1.35	1.51	2.06	2.30	1.03	1.15	9.25	10.32	1.58	1.76	1.31	1.46	1.06	1.18	1.15	1.28	.82	.92	1.20	1.34
May	3.22	3.71	1.53	1.76	2.09	2.41	1.45	1.67	2.89	3.33	1.70	1.96	1.37	1.58	1.12	1.29	1.21	1.40	1.10	1.27	1.28	1.48
June	2.29	2.56	1.58	1.76	1.95	2.18	1.75	1.95	1.34	1.50	1.63	1.82	1.52	1.70	1.12	1.25	1.29	1.44	1.20	1.34	1.51	1.68
July	2.30	2.65	1.59	1.83	1.83	2.11	1.65	1.90	1.49	1.72	1.66	1.91	1.37	1.58	1.05	1.21	1.43	1.65	1.16	1.34	1.29	1.49
August	2.29	2.64	1.54	1.78	1.63	1.88	1.41	1.63	1.60	1.84	1.68	1.94	1.41	1.63	1.06	1.22	1.56	1.80	1.34	1.54	1.56	1.80
September	2.26	2.52	1.57	1.75	1.50	1.67	1.51	1.68	1.64	1.83	1.70	1.90	1.49	1.66	1.06	1.18	1.56	1.74	.77	.86	1.65	1.84
October	2.18	2.51	1.51	1.74	1.46	1.68	1.43	1.65	1.60	1.84	1.70	1.96	1.41	1.63	1.05	1.21	1.59	1.83	1.12	1.29	1.60	1.84
November	1.77	1.98	1.51	1.68	1.48	1.65	1.53	1.71	1.75	1.95	1.66	1.85	1.51	1.68	.93	1.04	1.43	1.60	1.36	1.52	1.52	1.70
December	1.82	2.10	1.51	1.74	1.53	1.76	1.55	1.79	1.52	1.75	1.53	1.76	1.26	1.45	.88	1.02	1.07	1.23	1.40	1.61	1.35	1.56
Total	......	29.77	.....	21.14	......	21.87	......	20.18	......	31.17	......	22.29	.....	18.14	......	13.77	......	18.16	......	14.93	.....	19.88
Mean	2.19	......	1.56	......	1.61	......	1.49	......	2.30	......	1.64	......	1.33	......	1.01	......	1.34	......	1.10	......	1.46	......

Run-off of Presumpscot River at Outlet of Sebago Lake, Maine, in second-feet per square mile and depth in inches. Drainage area, 436 square miles.

	1909.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	1.15	1.33	1.43	1.65	1.62	1.87
February	1.19	1.24	1.47	1.53	1.63	1.71
March	1.39	1.60	1.18	1.36	1.65	1.90
April	1.12	1.25	1.17	1.30	1.94	2.16
May	1.41	1.63	1.17	1.35	1.90	2.14
June	1.56	1.74	1.21	1.35	1.74	1.94
July	1.52	1.75	1.17	1.35	1.69	1.95
August	1.49	1.72	1.19	1.37	1.69	1.95
September	1.48	1.65	1.19	1.33	1.65	1.84
October	1.47	1.70	1.13	1.30	1.62	1.87
November	1.54	1.72	1.09	1.22	1.59	1.78
December	1.48	1.71	.82	.94	1.58	1.82
Total	......	19.04	......	16.05	......	22.93
Mean	1.40	......	1.18	......	1.68	

SACO RIVER DRAINAGE BASIN.

DESCRIPTION.

Saco River rises in the White Mountain region of New Hampshire at an elevation of about 1,900 feet above the sea and has a general southeasterly course to the Atlantic Ocean. It is about 105 miles long, the maximum width of its drainage basin is about 30 miles, and its drainage area, comprising 1,720 square miles, lies about equally in Maine and New Hampshire. Ossipee River, the largest tributary of the Saco, enters the main stream at Cornish, Maine.

The headwaters of the Saco are in one of the highest and roughest mountain regions in the eastern portion of the United States, with steep wooded slopes and narrow river valleys, and with heavy falls to the mountain streams. The mountains grow gradually lower as the ocean is approached, becoming undulating hills in the central portions of the basin and comparatively flat land near the sea. The southern half of the drainage basin has been practically cleared of forests, but the remainder is still largely wooded. The prevailing rock is granite, which makes excellent building material for dams and foundations. The surface material covering the larger part of the region is sand and gravel.

The mean annual precipitation is about 43 inches. Winter conditions in the mountainous part of the basin are quite rigorous and snowfall usually deep.

The Saco River, in its upper course falls very rapidly, but the regimen of flow is variable and typical of the mountain stream. In the lower part of the basin, particularly below the entrance of Ossipee River, the stream is more stable in regimen. This river is probably destined to much development in the next few years, as its power is adjacent to Portland and other cities where a good market is available.

DRAINAGE.

The following table gives the areas drained by Saco River at several localities.

Drainage Areas of Saco River.

River.	Location.	Square miles.
Saco	Center Conway, N. H. gaging station	385
Saco	Fryeburg	439
Saco	Great Falls at Hiram	856
Saco	Bonny Eagle Falls	1,540
Saco	West Buxton, gaging station	1.550
Saco	Bar Mills	1,570
Saco	Salmon Falls	1,572
Saco	Union Falls	1,600
Saco	Mouth (Maine 820 square miles, N. H. 900 square miles)	1,720
Ossipee	Mouth	457

WATER POWER.

The principal owner of power on the river is the Saco Water Power Co., which controls the privileges at Biddeford and Saco, Union Falls and Salmon Falls. It also controls the storage in the larger lakes and ponds in the basin.

At Biddeford and Saco the river falls over trap ledges and around several islands. The power is controlled by six dams. The total descent from the upper dam to tide water is about 40 feet, fluctuating somewhat with the tide. The upper dams, known as the Bradbury and Springs dams, are used chiefly for night storage and regulation. Power at the present time is chiefly developed from what are known as the York and Lower dams. The York Manufacturing Co., whose mill is on one of the islands, utilizes a head of 36 ft. and develops 1,000 horsepower with four 27" wheels. The Saco and Pettee Machine Shops have one wheel under a 16-ft. head and develop 200 horsepower. The greatest user of power at this place is the Pepperell Manufacturing Co. This company was consolidated with the Laconia Manufacturing Co. in 1899. In what is now known as the Laconia division, there are twenty turbines of various sizes acting under an average head of 15 ft. and developing 3,800 horsepower. They have a steam installation of 2,100 horsepower, part of which is used all the time. In the Pepperell division plant, there are twenty-one turbines of various sizes also acting under a 15-ft. head and developing 3,000 horsepower. The steam installation amounts to 5,800 horsepower, a part of which only, being used all the time. This company controls the Saco Water Power Co., the nominal owner of the power.

One foot of water on the Bradbury dam ponds back to Little Falls. There is thence a rise of 13 ft. to the foot of Union Falls dam, 9 miles above tidewater. The dam at this point, owned by the Saco Water Power Co., controls a head of 14 ft. but is used for storage purposes only. There are 10 sluicing gates in this dam, 4 ft. by 6 ft.

The next privilege, 1¾ miles above, is at Salmon Falls, owned by the Saco Water Power Co. The crest of this dam is 72.6 ft. above the bottom of the gates in the Union Falls dam or the difference of level between the crests of the two dams is about 59 ft. The Salmon Falls dam is used somewhat for storage regulation but the main purpose is to hold the flowage rights.

The next development is at Bar Mills, where the Portland and Rochester R. R. crosses the river. This privilege has lately passed through several hands and is now controlled by the National Fibre Board Co. This company develops 600 horsepower with one 66″ Hunt turbine, one 66″ Chase, one 48″ Hercules and one 36″ Victor. The average head is 13 ft.

The next development is the West Buxton plant of the Portland Electric Co. The concrete dam here, completed in August 1906, is 298 ft. long and 25 ft. high. The wheel installation consists of S. Morgan Smith wicket gate turbines, four pairs of 48″ and two pairs of 21″, the latter for exciter wheels. The total power is 4,000 horsepower. In low water the output is only about 1,500 horsepower. There are four General Electric generators of 750 kilowatts each and two exciter generators of 40 kilowatts each. The power is transmitted to Portland and Sanford.

The next privilege is 1¾ miles upstream at Bonny Eagle Falls. Below the main falls, heavy rapids extend for perhaps half a mile down stream, giving a total fall on the privilege of 48 ft. At the present time, fall of 1910, extensive construction work is underway on a large hydro-electric plant at this site, by the Cumberland County Power and Light Co. The average head developed will be 40 ft. The minimum power will be about 4,000 horsepower although wheel installation will be provided for a maximum of about 8,000 horsepower.

Between five and six miles above this development are heavy rapids extending a third of a mile along the stream, constituting what is known as Limington Falls; and again about a mile further up the river, are other rapids a quarter of a mile in length.

Great Falls on Saco River at Hiram

The next water power is at Steep Falls, about 2 miles above the upper rapids just mentioned, and some 25 miles above tidewater. The privilege is now controlled by the Androscoggin Pulp Co. with an installation of 24 turbines, under a 17-ft. head, and developing 2,400 horsepower.

Proceeding upstream, there are several rapids along the river before reaching Great Falls in Hiram, about 45 miles above the mouth of the river. Here the Saco descends in successive pitches, a total of 60 ft. in 900 ft., the elevation of the water at the foot of the fall being 273 ft. and at the head 342 ft. above sea level. An island divides the stream at the head of the falls, the banks are ledge, and the topography appears favorable for the development and utilization of the power. The Maine Central Railroad from Portland to Conway skirts the east bank of the river at the foot of the falls. This privilege is one of exceptional value and is entirely unimproved at the present time. A view of it is given in Plate XIV.

Next above is a long stretch of dead water for 34 miles, or to the foot of Swan Falls, with a fall of only 40 ft. in this distance or 1.2 ft. per mile which would form a valuable pondage for the privilege just described.

The Swan Falls Water Power Co. has a development at Swan Falls. The elevation of the water surface at the foot of the dam is 382 ft. and above, 393 ft. The average head is 11 ft. fluctuating between 8 and 18 ft. The dam is 5 ft. high and 225 ft. long, and was built in 1903. The Fryeburg Electric Light Co. has one 66" Chase turbine with a rated capacity of 172 horsepower. There is one General Electric generator of 70 kilowatts capacity. The stock of this company is owned by the Swan Falls Water Power Co. This site has not yet received its full development and there is a large amount of power going to waste here.

In the next 18 miles, the average slope increases in successive intervals from 6.8 ft. to 28.5 ft. per mile. The drainage area of course is growing smaller, and the stream is not so important for power development as below. The last 12 miles to its source, the Saco is a mountain rivulet in summer and a torrent in spring, with an ascent of 1,100 ft. in the entire distance or about 90 ft. per mile.

There are power developments on the Little Ossipee at East Limington, where an average head of 12 ft. is utilized and at Newfield, where a head of 11 ft. is utilized.

On Ossipee River, the principal development is at Kezar Falls. The Cornish & Kezar Falls Light & Power Co. utilizes about 14 ft. of head. Its wheels are 24" diameter, of 4 units in 2 penstocks, about 300 horsepower being developed.

The Kezar Falls Woolen Co. has one vertical 57" turbine under a 9-ft. head and develops about 150 horsepower.

There are many other small power plants on various tributaries of the Saco River developing under 100 horsepower each.

LAKE STORAGE.

The present storage in Saco River basin although not as great as in other river basins in the State of Maine, is however, considerable, and can be further increased by the construction of higher dams at the outlets of the lakes in the basin. The Saco Water Power Co. controls the storage on the following lakes: Great Ossipee, Little Ossipee, Horne, Moose, Silver or Six Mile, Kezar, Wards, Watchic, Watchic Mill, and Little Watchic. The storage capacity in these lakes is not less than two and one-half billion cubic feet, with a water surface area of 14.43 sq. miles.

The following table gives the areas of the principal lakes and ponds in the basin, as measured from the topographic sheets of the U. S. Geological Survey, including the new Fryeburg and Kezar Falls quadrangles on the original field scale. The areas of the lakes controlled by the Saco Water Power Co. are from figures supplied by that company.

Lake Areas, Saco River Basin.

Lake or Pond.	Drainage.	Area water surface, square miles.
Barker Pond (in Hiram and Sebago)	Main river	0.33
Barker Pond (in Lyman and Dayton)	Main river	0.11
Beaver Pond (in Bridgton)	Main river	0.11
Beaver Pond (in Denmark)	Main river	0.13
Bradley Pond	Main river	0.05
Charles Pond	Main river	0.16
Conway Pond	Main river	2.70
Cushman Pond	Main river	0.05
Dan Charles Pond	Main river	0.03
Deer Pond	Main river	0.04
Eagle Pond	Main river	0.23
Five Kezar Pond	Main river	0.32
Granger Pond	Main river	0.19
Great Hancock Pond	Main river	1.52
Two ponds draining into Hancock	Main river	0.08
Heald Pond	Main river	0.12
Horne Pond	Main river	0.23
Horseshoe Pond	Main river	0.21
Keyes Pond	Main river	0.28
Kezar Lake	Main river	3.23
Kezar Pond	Main river	2.03
Kimball Pond	Main river	0.82
Little Ossipee Pond	Main river	0.82
Little Watchic Pond	Main river	0.09
Long Pond	Main river	0.08
Lovewell Pond	Main river	1.66
Middle Pond	Main river	0.06
Moose Pond	Main river	2.57
Mountain Pond	Main river	0.19
Pleasant Pond	Main river	0.36
Sand Pond	Main river	0.06
South East Pond	Main river	0.36
Spectacle Ponds (3)	Main river	0.17
Swan Pond	Main river	0.29
Trout Pond	Main river	0.07
Wards Pond	Main river	0.10
Watchic Pond	Main river	0.66
Webb Pond	Main river	0.22
Webber Pond	Main river	0.05
Bickfords Pond	Ossipee	0.32
Colcords Pond	Ossipee	0.34
Dan Hole Pond	Ossipee	1.05
Great Ossipee Lake	Ossipee	5.95
Long Pond	Ossipee	0.45
Lords Pond	Ossipee	0.22
Pine Ridge Pond	Ossipee	1.50
Province Pond	Ossipee	1.41
Six Mile (Silver Lake)	Ossipee	0.69
Adams Pond	Little Ossipee	0.19
Balch Pond (with flowage)	Little Ossipee	1.07
Boyd Pond	Little Ossipee	0.06
Long Pond (in Parsonsfield)	Little Ossipee	0.25
Holland, East, Pond	Little Ossipee	0.16
Holland, West, Pond	Little Ossipee	0.31
Northwest Pond	Little Ossipee	0.06
Poverty Pond	Little Ossipee	0.24
Sand Pond	Little Ossipee	0.03
Shy Beaver Pond	Little Ossipee	0.09
Spruce Pond	Little Ossipee	0.40
Symmes Pond	Little Ossipee	0.06
Turner Pond	Little Ossipee	0.05
Total	Total	33.68

STREAM FLOW.

The following gaging stations have been maintained in this river basin:

Saco River near Center Conway, N. H. (1903-1910).

Saco River at West Buxton, Me. (1907-1910).

A record of the gage heights at the dam of the Saco Water Power Co. at Union Falls has been kept since January 1, 1904, and are on file in the office. The Saco River at this point, however, has not as yet been rated and the gage heights cannot yet be interpreted into discharge.

The gage heights of the Saco River at Biddeford have also been kept at the Bradbury dam since January 1, 1887. The river has not been rated here, however, and it would be a difficult and expensive matter to do so. Until it is done, these gage heights cannot be interpreted into discharge.

Although complete yearly records are not available, the driest year since 1903 was probably 1906, and the wettest 1907, the total flow during these two years being about in the ratio of 1 to 1.45.

SACO RIVER NEAR CENTER CONWAY, N. H.

This station is located at the wooden highway bridge between Center Conway and Redstone, N. H., about 2 miles from each place. It was established August 26, 1903, in co-operation with the New Hampshire Forestry Commission. Since 1904 it has been maintained by the U. S. Geological Survey. It is about three miles below the mouth of Swift River and 2 miles above the outlet of Conway Lake.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1903 No. 97, p 69
1904 No. 124, p 82-84
1905 No 165, p 87-90
1906 No. 201, p 71-72
1907 No. 241, p 119-122, 342
1908 No. 241, p 119-122, 342

Run-off of Saco River at Center Conway, N. H., in second-feet per square mile and depth in inches. Drainage area, 385 square miles.

	1903.		1904.		1905.		1906.		1907.		1908.		1909.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	.....	.....	.....	.....	.....	.....	.....	.....	.88	1.02	1.36	1.57	* .86	1.00	* .76	.87	.96	1.12
February	.....	.....	.....	.....	.....	.....	.....	.....	.42	.43	2.01	2.17	* .91	.95	* .75	.78	1.02	1.08
March	.....	.....	.....	.....	12.95	14.93	.....	.....	2.08	2.40	2.29	2.64	*1.80	2.08	3.98	3.85	4.62	5.18
April	.....	.....	7.31	8.16	5.42	6.05	5.07	5.66	5.25	5.86	5.95	6.64	9.06	10.11	7.27	8.11	6.48	7.23
May	.....	.....	9.56	11.02	3.15	3.63	5.57	6.42	6 83	7.87	6.05	6.98	6.70	7.72	2.78	3.20	5.81	6.69
June	.....	.....	1.17	1.31	2.13	2.38	3.43	3.83	1.95	2.18	1.71	1.91	1.79	2.00	2.12	2.36	2.01	2.26
July	.....	....	.65	.75	2.17	2.50	1.35	1.56	1.16	1.34	.94	1.09	.69	.80	.59	.68	1.08	1.25
August	1.04	1.20	.72	.83	2.01	2.32	.68	.78	.63	.73	1.45	1.67	.42	.48	.98	1.13	.99	1.14
September	.69	.77	1.07	1.19	3.98	4.44	.41	.46	1.44	1.61	.45	.50	.78	.87	.65	.72	1.18	1.32
October	1.43	1.65	1.96	2.26	1.68	1.94	1.05	1.21	3.35	3.86	.48	.55	.85	.98	.47	.54	1.41	1.62
November	.88	.98	1.10	1.23	1.51	1.68	.94	1.05	6.47	7.22	.55	.61	.85	.95	.91	1.02	1.65	1.84
December	.....	.....	.....	.....	.....	.....	.....	.....	3.01	3.47	.43	.50	.71	.82	* .51	.59	1.16	1.34
Total	.....	.....	.....	.....	.....	.....	.....	.....	.....	37.99	.....	26.83	.....	28.76	.....	23.67	.....	32.07
Mean	.....	.....	.....	.....	.....	.....	.....	.....	2.79	.....	1.97		2.12	.....	1.80	.....	2.36	

* West Buxton record.

SACO RIVER AT WEST BUXTON, MAINE.

Records of flow at the hydro-electric plant of the Portland Electric Company have been furnished since the completion of the plant in 1907.

Information in regard to this station is contained in the following Water Supply Papers of the U. S. Geological Survey:

For 1907, No. 241, p 122-124, 342
1908, No. 241, p 122-124, 342

Run-off of Saco River at West Buxton, Maine, in second-feet per sq. mile and depth in inches. Drainage area, 1550 square miles.

	1907.		1908.		1909.		1910.		Average.	
	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.	Second-feet per square mile.	Depth in inches.
January	....	....	2.02	2.33	.86	1.00	.76	.87	1.21	1.40
February	....	....	1.83	1.97	.91	.95	.75	.78	1.16	1.23
March	....	....	2.35	2.71	1.80	2.08	3.65	4.21	2.60	3.00
April	....	....	4.39	4.90	7.74	8.64	5.28	5.89	5.80	6.48
May	....	....	4.90	5.65	4.83	5.57	3.22	3.71	4.32	4.98
June	....	....	1.84	2.05	1.86	2.08	2.00	2.23	1.90	2.12
July	....	....	.74	.85	.78	.90	.67	.77	.73	.84
August	....	....	.79	.91	.52	.59	.76	.87	.69	.79
September	....	....	.46	.51	.44	.49	.60	.67	.50	.56
October	1.38	1.59	.45	.52	.81	.94	.46	.53	.78	.90
November	4.50	5.02	.41	.46	.56	.63	.66	.74	1.53	1.71
December	2.75	3.17	.43	.50	.73	.84	.51	.59	1.10	1.28
Total	....	....	....	23.30	....	24.71	.....	21.86	......	25.29
Mean	....	....	1.72	....	1.82	....	1.61	......	1.86	......

KENNEBUNK AND MOUSAM RIVERS.

DESCRIPTION.

These rivers flow into the Atlantic near the southwest corner of Maine and have a combined drainage area of about 207 square miles, of which the Kennebunk drains about 50 square miles and the Mousam about 157. Their basins are of moderate elevations with level or moderately undulating surfaces. Granite is almost the only rock occurring. It is of fine quality and is extensively quarried. Nearly all the forests have been cut and the land is extensively cultivated. The basin is accessible at nearly all parts by railroad.

WATER POWER.

Kennebunk Pond, area 0.46 sq. mile, the source of Kennebunk River, is at an elevation of about 230 feet. The distance to the mouth is 15 miles. The stream affords a few small powers.

The elevation of Mousam Pond above sea level is about 460 ft. The distance by river to the sea is 23.6 miles, giving an average fall of 19.5 ft. per mile for Mousam River. The flow of the river is fairly constant owing to the tributary lakes. The following table gives the areas of water surface of a number of ponds in the basin.

Lake Areas in Mousam River Basin.

POND.	Area water surface, square miles.
Pleasant Pond	1.27
Mousam Pond	1.10
Emery Mills Pond	0.22
Loon Pond	0.20
Shaker Pond	0.34
Bunganut Pond	0.43
Total	3.56

The lowest power on Mousam River is at Kennebunk where a total fall of 40 ft. occurs in three pitches, only a portion of which is utilized, however. The Leatheroid Manufacturing Co. utilizes a head of 14 ft. and developes 425 horsepower. Their wheel installation consists of one 24", one 34" and two 40" turbines.

At West Kennebunk, Lord's Mills utilize a head of 14 ft. and develop 225 horsepower with one 26" wheel and one Hercules 45" wheel. A mile further up is a saw mill with a 9-ft. fall, then the Varney Falls with a 12-ft. fall, then the Great Falls with a 45-ft. fall.

At Alfred, the Alfred Embroidery Co. develops 90 horsepower under a head of 14 feet.

At South Sanford are the mills of Jagger Bros., manufacturers of worsteds and mohair yarns. 200 horsepower are developed under an 11-ft. head, with one 21" and one 51" wheel.

Considerable power is developed at Sanford. The Atlantic Shore Railway utilizes two heads. It has operating under a 64-ft. head, three 30" McCormick wheels, and under a 38-ft. head two double 24" Victor wheels. The total power developed is 2,730 horsepower.

Between the villages of Sanford and Springvale is the plant of the Sanford Light & Power Co. The dam was built in 1892 and raised 4 feet in 1906. It is of stone, 150 ft. long and 14 ft. high. There are two Hercules wheels, one 36" and one 42", operating under a 20-ft. head, and developing 180 horsepower.

In Springvale village is located the privilege of the Goodall Worsted Co. Two 33" wheels operate under a head of 17 feet, and with a rated capacity of 344 horsepower. The same company owns an undeveloped privilege on the same river about 2 miles above their mill where a head of 40 feet could be developed.

The saw mill of Fred Smith has in use two 36" wheels under a 13-ft. head, developing about 30 horsepower. The saw mill of B. C. Jordan, one mile above Springvale, has three wheels under a head of 12 feet and develops 50 horsepower.

The various powers on Mousam River have the benefit of the important storage of Mousam Lake. The storage dam is located at Emery Mills in the town of Shapleigh.

PISCATAQUA RIVER DRAINAGE BASIN.

DESCRIPTION.

This stream with Salmon Falls River forms a part of the western boundary of the State of Maine. The area is undulating to hilly, the prevailing rock granite, with patches of mica-schists and quartz rock. The forests have been largely cut. The river is formed by three tributaries, Cocheco, Salmon Falls and Great Works rivers. The last two streams only drain a portion of the State of Maine.

The following table gives the areas drained by the Piscataqua and a number of its tributaries:

Drainage Areas of Piscataqua River.

RIVER.	Location.	Square miles.
Piscataqua	Mouth	550
Salmon Falls	Milton Mills	31
Salmon Falls	Above mouth Branch River	38
Salmon Falls	Below mouth Branch River	100
Salmon Falls	Milton	120
Salmon Falls	East Rochester	152
Salmon Falls	Somersworth	236
Salmon Falls	Junction Cocheco River	340
Great Works	Outlet Bauneg Beg Pond	18
Great Works	North Berwick below mouth Neoutaquet River	44
Great Works	Mouth	85
Branch	Mouth	62
Little	Mouth	53

WATER POWER.

Salmon Falls River, with respect to water power, is the most important of the streams of this basin. From the surface of Great East Pond, the source of this stream, to tide water, a distance of 32.2 miles, the fall is 560 feet or 17.4 ft. per mile. The fall is mainly concentrated, however, in two stretches—166 feet in the first five miles above tidewater, and more than 140 feet in the 2½ miles below Milton Three Ponds. Of the total fall of 560 feet, about 360 feet, or nearly two-thirds, has been developed between Horns Pond and the mouth of the river, leaving undeveloped, about 200 feet. The 360 feet, approximately, of developed fall is represented at 22 dams. Three of these have been maintaind simply for storage at the outlets of the lakes at the headwaters. The power of the river is very largely under the control of one company, which owns about one-half of the developed fall and the greater part of the available undeveloped fall, together with the various storage reservoirs.

Great Works River is the largest in point of drainage area of any of the tributaries of Salmon Falls River. From Bauneg Beg Pond to the mouth of the river, a distance of 16.3 miles, the total fall is between 190 and 200 feet or an average of about 12 feet to the mile. Of this fall 78 feet is covered by the six water privileges at which power has been developed. Although there are several ponds of small size in the basin, the principal storage is afforded by Bauneg Beg Pond which has an area of water surface of 0.28 square mile.

MAXIMUM AND MINIMUM DISCHARGE.

In an engineering study of any river upon which to base a water power or water storage development, all available run-off data are utilized, including the daily, monthly and yearly discharges. In many particulars, however, the most important are the maximum discharges, used in computing the capacity of spillways, and the minimum discharge, as limiting in a general way reservoir storage and dependable power output.

The following table shows these data on maximum discharge as obtained at the gaging stations in the State of Maine. There is given for each river the following: The length of record; the drainage area; and the maximum discharge with date of same, the amount in second feet and in second feet per square mile.

Maximum Discharge of Maine Rivers.

River.	Locality.	Length of record.	Drainage area, square miles.	Discharge.		
				Date.	Second-feet.	Second-feet per square mile.
St. John	Fort Kent	1905–1910	5,280	May, 1909	75,600	14.3
Fish	Wallagrass	1903–1908	890	May, 1908	8,970	10.1
Aroostook	Fort Fairfield	1903–1910	2,230	May, 1907	34,300	15.4
St. Croix	Woodland	1902–1910	1,420	Sept., 1909	20,300	14.3
Machias	Whitneyville	1903–1910	465	Sept., 1909	11,100	23.9
Penobscot, West Branch	Millinocket	1901–1910	1,880	April, 1901	24,000	12.8
				April, 1903	24,200	12.9
				May, 1907	23,000	12.2
Penobscot	West Enfield	1902–1910	6,600	April, 1902	73,000	11.1
				May, 1907	93,400	14.1
				Sept., 1909	96,700	14.6
Penobscot	Bangor	1901–1910	7,700	April, 1901	115,000	15.0
				April, 1902	89,500	11.6
				Sept., 1909	80,800	10.5
Penobscot, East Branch.	Grindstone	1902–1910	1,100	May, 1907	17,400	15.8
				Sept., 1909	25,700	23.4
Mattawamkeag	Mattawamkeag	1902–1910	1,500	May, 1907	24,400	16.3
				May, 1909	21,100	14.1
				Sept., 1909	13,400	8.9
Piscataquis	Foxcroft	1902–1910	286	May, 1904	15,000	52.5
				May, 1906	12,000	42.0
				Sept., 1909	22,200	77.6
Kennebec	The Forks	1901–1910	1,570	April, 1902	18,300	11.7
Kennebec	Bingham	1907–1910	2,660	May, 1909	31,200	11.7
Kennebec	No. Anson	1901–1907	2,790	May, 1907	37,700	13.5
Kennebec	Waterville	1893–1910	4,270	Dec., 1901	151,000	35.7
Moose	Rockwood	1902–1808–1910	680	May, 1908	6,750	10.0
Roach	Roach River	1901–1908	85	May, 1906	1,970	23.2
Dead	The Forks	1901–1907–1910	878	May, 1907	18,300	21.0
Carrabassett	North Anson	1901–1907	340	May, 1904	13,700	40.3
Sandy	Madison	1904–1908	650	Nov., 1907	13,800	21.3
Sebasticook	Pittsfield	1908–1910	314	April, 1909	7,160	22.8
Cobbosseecontee	Gardiner	1890–1910	240	March, 1903	3,275	13.6
Androscogggin	Rumford Falls	1892–1910	2,090	April, 1895	55,200	26.4
Androscoggin	Lewiston	1850–1910	2,950	March, 1896	65,000	22.1
Presumpscot	Sebago Lake	1887–1910	420	March, 1896	13,800	33.0
Saco	Center Conway, N.H.	1903–1910	385	Nov., 1907	14,100	36.7
Saco	West Buxton	1907–1910	1,550	April, 1909	20,800	13.4

In the following table of minimum discharges the data are: The name of the river and place of measurement; the drainage area in square miles; the minimum discharge for one day with date of same and amount in second feet and in second feet per square mile; the minimum discharge similarly for one week, for one month and for one year.

Care should be exercised in using the minimum discharge for one day as often it does not express the natural flow, especially on small drainage areas where storage is closed down on Sundays. The weekly as well as the monthly minimum discharge is important for power development studies. The yearly discharge is useful especially in storage computations.

This table should be studied in conection with length of record given in the immediately preceding table, as well as in connection with the monthly run-off tables throughout the report. The minimum discharges in some cases may have occurred during months for which there are no records.

Minimum Discharge of Maine Rivers.

River.	Locality.	Drainage area, square miles.	One Day. Date.	One Day. Second-feet.	One Day. Second-feet per square mile.	One Week. Date beginning.	One Week. Second-feet.	One Week. Second-feet per square mile.	One Month. Date.	One Month. Second-feet.	One Month. Second-feet per square mile.	One Year. Date.	One Year. Second-feet.	One Year. Second-feet per square mile.
St. John	Ft. Kent.......	5,280	September 30, 1908	500	0.09	November 8, 1908	626	0.12	February, 1907	750	0.14	1908	6,790	1.29
Fish	Wallagrass....	890	October 13, 1905	47	0.05	October 13, 1905	55	0.06	October, 1905	63	0.07	1908	1,220	1.37
Aroostook	Ft. Fairfield...	2,230	October 11. 1903	79	0.03	October 6, 1903	123	0.05	October, 1903	217	0.10			
			September 11, 1905	130	0.06	September 11, 1905	141	0.06	October,. 1905	162	0.07	1908	3,240	1.45
St. Croix	Woodland.....	1,420	July 31, 1909	50	0.01	October 16, 1905	480	0.33	October, 1905	549	0.39	1908	2,230	1.57
Machias	Whitneyville..	465	August 4, 1904	10	0.02	August 1, 1904	37	0.08	August, 1904	172	0.37			
			October 8, 1905	40	0.09	October 6, 1905	116	0.25	October, 1905	148	0.32			
			September 17, 1908	77	0.17	September 16, 1908	77	0.17	September, 1908	247	0.53	1908	975	2.10
			December 20, 1910	56	0.12	November 1, 1910	105	0.22	November, 1910	120	0.26	1910	881	1.89
Penobscot West Branch	Millinocket....	1,880	February 21, 1904	188	0.10	February 21, 1904	320	0.17	January, 1904	328	0.17	June, 1903 to May, 1904	1,560	0.83
			March 6, 1904	109	0.06	December 20, 1905	351	0.19	January, 1906	403	0.21	1904	2,210	1.18
									November, 1908	....	0.92	1908	3,550	1.89
			November 7, 1910	1,030	0.55	December 24, 1910	2,040	1.08	December, 1910	2,140	1.14	1910	3,150	1.68
Penobscot........	West Enfield ..	6,600	October 12, 1903	1,600	0.24	October 7, 1903	2,030	0.31	October, 1903	2,260	0.34			
			October 29, 1905	1,630	0.24	October 24, 1905	1,850	0.28	November, 1905	2,630	0.40			
			September 28, 1908	1,670	0.25	September 28, 1908	2,460	0.37	October, 1908	3,450	0.52	1908	11,900	1.80
			October 25, 1910	2,470	0.37	October 19, 1910	2,990	0.45	October, 1910	3,370	0.51	1910	11,500	1.73
Penobscot East Branch	Grindstone....	1,100	October 9, 1903	252	0.23	October 7, 1903	253	0.23	October, 1903	342	0.31			
			October 31, 1905	140	0.13	October 25, 1905	156	0.14	October, 1905	220	0.20			
			December 31, 1908	100	0.09	December 14, 1908	100	0.09	December, 1908	175	0.16	1908	1,660	1.51
			October 13, 1910	150	0.14	October 9, 1910	155	0.14	October, 1910	210	0.19	1910	1,630	1.48
Mattawamkeag..	Mattawamkeag	1,500	October 12, 1903	110	0.07	October 12, 1903	120	0.08	October, 1903	242	0.16			
			October 4, 1905	86	0.06	October 4, 1905	86	0.06	October, 1905	99	0.07			
			September 24, 1908	86	0.06	September 23, 1908	88	0.06	September, 1908	191	0.13	1908	2,530	1.69
			October 14, 1910	86	0.06	October 11, 1910	92	0.06	October, 1910	142	0.09	1910	2,350	1.57
Piscataquis	Foxcroft	286	September 28, 1903	19	0.07	September 28, 1903	19	0.07	September, 1903	43	0.15			
			October 31, 1905	19	0.07	October 25, 1905	37	0.13	October, 1905	76	0.27			
			November 22, 1908	5	0.02	November 17, 1908	15	0.05	November, 1908	68	0.24	1908	676	2.36
			December 19, 1910	17	0.06	December 17, 1910	20	0.07	November, 1910	39	0.14	1910	519	1.81
Kenduskeag	Bangor........	191	September 15, 1908	7	0.04	September 15, 1908	7	0.04	September, 1908	7	0.04			
			October 5, 1910	11	0.06	October 5, 1910	11	0.06	October, 1910	14	0.07	1910	257	1.35

Phillips Lake	**Outlets**	**12.8**	**September 12, 1904**	**1.8**	**0.11**	**September 12, 1904**	**1.3**	**0.11**	**September, 1904**	**1.7**	**0.14**	**July, 1904 to June, 1905**	**18.4**	**1.09**
Cold Stream......	**Enfield**	**26**	**August 13, 1905**	**2**	**0.08**	**August 9, 1905**	**4**	**0.15**	**August, 1905**	**7**	**0.27**	**Apr., 1905 to March, 1906**	**26**	**1.00**
Kennebec	The Forks	1,570	November 17, 1906	340	0.22	November 26, 1906	421	0.27	December, 1903	594	0.38			
			December 1, 1908	451	0.29	December 1, 1908	451	0.29	December, 1908	451	0.29	1908	3,100	1.98
			November 20, 1910	920	0.59	November 16, 1910	1,028	0.65	November, 1910	1,200	0.76	1910	2,700	1.72
Kennebec........	Bingham	2,660	November 13, 1908	620	0.23	November 2, 1908	731	0.27	November 1908	744	0.28	1908	4,240	1.59
Kennebec........	North Anson ..	2,790	January, 1904	510	0.18	....			February, 1904	680	0.24	1906	4,060	1.45
Kennebec........	Waterville	4,270	January, 1904	100	0.02	January 28, 1904	720	0.17	February, 1904	921	0.22	1903	6.182	1.45
			October, 1905	100	0.02	October 23, 1905	1,528	0.36	October, 1905	1,767	0.41	1905	4,888	1.14
			October, 1908	100	0.02	November 21, 1908	853	0.20	December, 1908	1,230	0.29	1908	4,390	1.03
			September 26, 1910	100	0.02	December 8, 1910	1,440	0.34	December, 1910	1,930	0.45	1910	7,350	1.72
Moose...........	Rockwood	680	October 2, 1903	88	0.13	October 2, 1903	96	0.14	October, 1903	101	0.15			
			March 26, 1906	88	0.13	October 26, 1905	109	0.16	October, 1905	147	0.22	1906	985	1.45
			September 26, 1908	93	0.14	November 27, 1908	93	0.14	December, 1908	100	0.15	1908	997	1.47
			September 5, 1910	134	0.20	September 1, 1910	163	0.24	September, 1910	237	0.35			
Roach...........	Roach River ..	85	November 1, 1905	1	0.01	November 1, 1905	1	0.01	November, 1905	1	0.01			
Dead	The Forks.....	878	October 6, 1903	110	0.13	October 6, 1905	110	0.13	October, 1903	172	0.20			
			October 8, 1905	227	0.26	October 8, 1905	227	0.26	October, 1905	289	0.33			
			October 16, 1910	110	0.13	October 16, 1910	110	0.13	October, 1910	173	0.20			
Carrabassett......	North Anson..	340	September, 1903	55	0.16	September 21, 1903	68	0.20	September, 1903	110	0.33			
Sandy...........	Madison	650	August 27, 1905	....	....	August 25, 1905	41	0.06	October, 1905	89	0.14	1905	691	1.06
			September 22, 1908	5	0.01	September 19, 1908	30	0.05	October, 1908	69	0.11	1908	853	1.31
Sandy...........	Farmington ...	270	October 17, 1910	40	0.06	October 17, 1910	43	0.07	October, 1910	63	0.23			
Sebasticook	Pittsfield	314	November 29, 1908	30	0.10	November 24, 1908	116	0.37	October, 1908	134	0.43			
			December 4, 1910	14	0.04	December 9, 1910	52	0.17	December, 1910	99	0.31	1910	415	1.30
Cobbosseecontee.	Gardiner	240	September, 1899	0	....	September 3, 1899	66	0.28	October, 1899	86	0.36	1899	243	1.01
			January, 1905	10	0.04	January 2, 1905	115	0.48	January, 1905	127	0.53	1905	198	0.82
			1908	0	....	December 21, 1908	94	0.39	December, 1908	115	0.48	1908	319	1.33
			1910	0	....	December 21, 1910	100	0.42	December, 1910	111	0.46	1910	226	0.94
Androscoggin....	Errol, N. H....	1,095	April, 1906	443	0.40	March 20, 1905	622	0.57	March, 1905	757	0.69	1905	1,600	1.46
			September, 1909	467	0.43	January 1, 1909	580	0.53	December, 1908	844	0.77	1908	1.980	1.81
Androscoggin....	Rumford Falls	2,090	December 10, 1899	1,010	0.48	December 6, 1899	1,120	0.54	August, 1899	1,428	0.62	1899	3 136	1.35
			February 18, 1904	658	0.31	February 15, 1904	686	0.33	February, 1904	740	0.35	1903	3,340	1.60
			December, 1906	918	0.44	March 12, 1905	1,116	0.53	February, 1905	1,572	0.75	1904	2,870	1.33
			December, 1908	748	0.36	December 28, 1908	906	0.43	December, 1908	1,120	0.54	1908	3,180	1.52
			December, 7, 1910	1,116	0.53	December 7, 1910	1,278	0.61	December, 1910	1,436	0.69	1910	2,893	1.38
Presumpscot	Sebago Lake...	436	November 17, 1895	104	0.24	November 17, 1895	316	0.73	December, 1895	432	0.99	1895	545	1.25
			April, 1898	83	0.19	March 20, 1905	320	0.73	March, 1905	343	0.79	1905	443	1.01
			May, 1903	67	0.15	March 16, 1907	258	0.59	March, 1907	296	0.68	1907	465	1.07
			March, 1908	42	0.10	April 2, 1908	258	0.59	April, 1908	523	1.20	1908	635	1.46
			December 18, 1910	125	0.29	December 25, 1910	309	0.71	December, 1910	358	0.82	1910	517	1.19
Saco	Center Conway N. H	385	September 8, 1904	120	0.31	September 8, 1904	150	0.39	July, 1904	250	0.65			
			July 23, 1905	216	0.56	July 23, 1905	219	0.57	November, 1905	583	1.51			
			September, 1908	144	0.37	September 17, 1908	147	0.38	December, 1908	167	0.43	1908	759	1.97
			October 21, 1910	163	0.42	October 18, 1910	167	0.43	October, 1910	182	0.47			
Saco	West Buxton..	1,550	September, 1908	255	0.16	September 6, 1908	544	0.35	November, 1908	639	0.41	1908	2,660	1.72

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