State of Illinois
Rivers and Lakes Commission

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REPORT OF SURVEY AND PROPOSED IMPROVEMENT OF THE FOX RIVER

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INTRODUCTION.

In the days of the early settlers, before roads had been constructed, the streams and water courses were used largely as a source of water supply for man and beast and as a highway of communication and transport. Later, as the population increased and cultivation became more extensive, crude dams were built and water wheels were installed to operate grist mills, and the streams were utilized as a source of power. With the development of steam engines, the discovery of natural fuel beds and the opening of highways, the streams fell into general disuse, excepting for the more important waterways. For many years the people generally forgot and neglected them and they became dumping grounds for private individuals, public corporations and municipalities along their banks.

Of recent years these neglected water courses have forced themselves into prominence. As the timber was cut off and the land given over generally to cultivation the bared earth surface no longer retained, as of old, the water that fell upon it, so that periodic floods became the rule. Periods of high water were followed during the dry months by protracted low water, so that the indiscriminate sewage and wastes thrown into the channel were no longer carried away, but were deposited along the bed of the stream and soon made themselves known as a nuisance and by the epidemic that soon followed. In these ways the streams forced themselves to the attention of the public.

As motor boats and automobiles came into more general use, an ever-increasing proportion of the people have awakened to the natural beauties of the streams and valleys and have demanded that their long neglect shall cease. Capital also has come to appreciate the value of cheap power. Conservation of natural resources has been given national prominence, and the public is more and more realizing that with proper attention the waterways are an invaluable asset, whereas, neglected and forgotten they become a menace to life and property.

With these points in view the State of Illinois, under the Act of 1911, created the Rivers and Lakes Commission and gave them jurisdiction over all the rivers and lakes of the State, and among the duties placed upon them is the collection of all the "data with reference to all the waters of the State of Illinois, including original surveys, meander notes, maps, plats, river gages, high and low water marks," the extent and area of the water surface, whether or not they have been meandered; secure all data as to the navigability of any public water and the availability of streams for water power; ascertain whether or not any encroachments have been made, and if so to secure payment in full for the use of the privileges obtained or the removal of such obstructions or encroachments; investigate all complaints as

to encroachments, obstructions, or the pollution of streams or lakes, and also where complaint is made as to interference of public use of the State waters they shall investigate same.

The Commission shall devise ways and means to secure the reservation by the State of desirable tracts of land in connection with the public waters of the State to the end that these reservations may be used by the public for pleasure, recreation, and sport.

They shall plan ways and means of beautifying the public waters and property of the State; coöperate with the State Game and Fish Conservation Commission in order to make plans more effective for the production of a supply of various fish that may be propagated in these bodies of water.

Any parties desiring to make any improvements or erect any structures in or over any of the public bodies of water of the State must submit plans, profiles, and specifications to the Commission for their approval. The carrying capacity of the streams must not be limited by encroachments of any character.

The Commission has full and complete jurisdiction over all the public waters of the State, subject only to the paramount authority of the U. S. Government in reference to the navigation of such streams and to the laws of Illinois. The Act specifically provides that it shall be construed in a liberal manner for the purpose of preserving to the State and the people all the public rights in any of the public waters of the State so as to give the fullest possible enjoyment and to prevent the encroachment or invasion thereof.

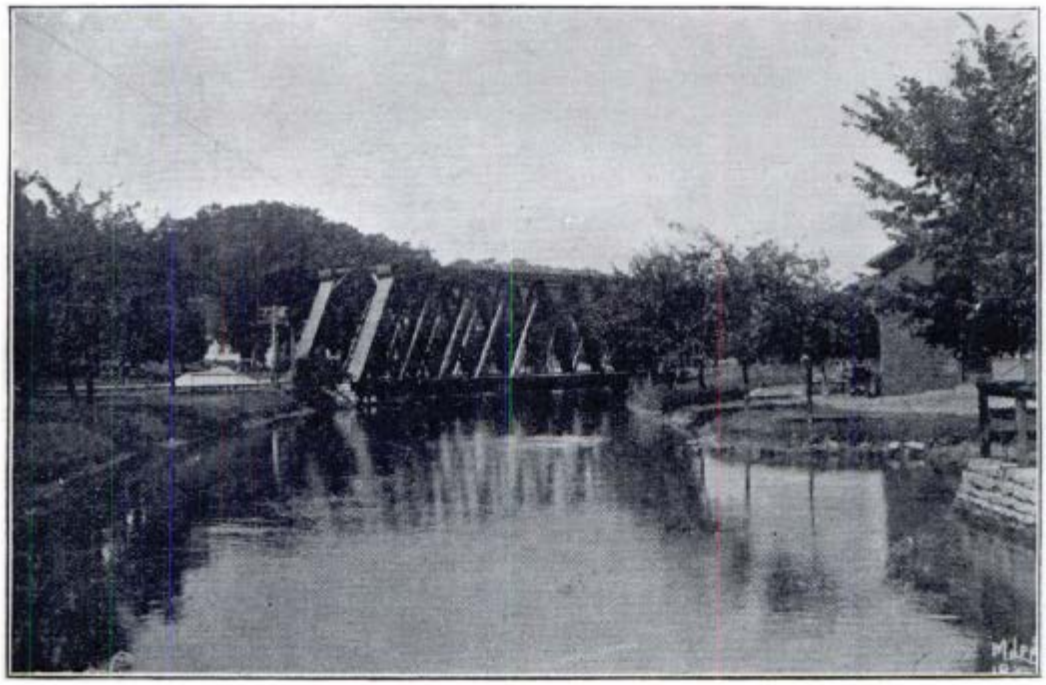
In accordance with the provisions of this Act, the Fox River was selected by the Rivers and Lakes Commission for investigation and the Engineering Department of the Commission was detailed to secure the data and make the necessary survey.

CHAPTER I.

General Description and Physical Features of the Fox River Valley.

The Fox River has its source in the northern part of Waukesha County, Wisconsin, and flows in a southerly direction to Aurora, where the course changes to the southwest and continues in this general direction to Ottawa, where it empties into the Illinois River.

There are several moderately large lakes tributary to the Fox, and an almost innumerable number of small lakes and ponds. Numerous creeks also empty their waters into its channel. These lakes and ponds are about evenly distributed between Wisconsin and Illinois, and have a combined area aggregating about forty square miles. The principal lakes drained by the Fox River are Channel, Grass, Marie,



Scene near Carpentersville, Ill.

Fox, Nippersink, Zurich, Crystal, Pistakee, and Round lakes. The principal tributary streams are the Big Indian, Bomback, Buck, Somonauk, Big Rock, Little Rock, Blackberry, Mission Hill, and Nippersink Creek. The drainage basin of the river is about 2,580 square miles, of which 1,680 are in Illinois.

Another notable feature of this river is the large number of islands

between Ottawa and McHenry, Illinois, a distance of about 97.80 miles. There are 254 islands ranging in size from a fractional part of an acre to 35 acres in extent. Above the McHenry dam there are no islands until Pistakee Lake is reached. In the lake district there are several islands of more or less pronounced shore lines.

The total length of the river is approximately 140 miles and the total fall is about 470 feet, making an average fall of 3.36 feet per mile. From its source to where it enters the lake region it is a shallow, sluggish stream of about fifty feet average width and has very little fall. Through the lake region it winds through swamps and lakes, having a very narrow channel, which, at times, is practically lost in

Fox River at Glenwood Park, Batavia, Ill.

the reeds and swamp growth. It enters Grass Lake through a large swamp of several square miles area. This swamp is dense and thick, the wild grass, reeds, and cat-tails attaining a height of seven or eight feet.

Below the Fox Lake region the river changes from a narrow, winding stream to a straighter and swifter one of more than twice its former width. The channel becomes well defined, and the character of the country grows more hilly and rolling, as is characteristic of the glacial formation and in which we find no outcropping of natural rock until we reach South Elgin, where Cincinnati limestone is found. About two miles farther down stream the river makes a short bend to the right and then to the left, passing through a large fault in the limestone. At Sheridan the limestone disappears and sandstone takes its place and shows its presence in ledges and cliffs, first on one side and then on the other, of from twenty to seventy-five feet in height.

The bed of the river for the lower seventy miles is rock, and outcropping of natural rock occurs along the banks. The river has a fall of 137 feet in the last forty-seven miles and an average fall of six feet per mile for the last five miles above the mouth.

Just above Dayton, Illinois, there is a surface cropping of bituminous coal, and here occurs a succession of rapids with a fall of 19.20 feet in a distance of 6,460 feet. The rapids flow over the natural sandstone formation, upon which are spread large granite boulders. The last mile of the river is nearly straight and at Ottawa it passes through a fault in the sandstone and empties into the Illinois River.

In the upper portions of the river within this State the banks are generally low and frequent swamps border the river first on one side and then on the other. Near Algonquin and Cary the river flows through rolling country with small hills on either side. The central portion of the river is again flatter, and from Yorkville to the mouth rougher country predominates, with frequent rocky banks twenty to seventy-five feet above the water.

The valley of the Fox River is fertile and thickly populated. By the census of 1910 the population of the cities and villages on the Fox River is 104,673, and that of the townships bordering Fox River,

Rock Bluffs along the Fox River near Wedron, Ill.

inclusive of the villages and cities in the respective townships, is 130,588. In 1900 the cities and towns had 90,345 people, or a gain of slightly more than 15.8 per cent during the decade. During the same period the total population increased 12.2 per cent. See Tables I. and II. for detailed figures for both cases.

The most important interests are those of agriculture and dairy products, although there are also important manufacturing industries at Carpentersville, Batavia, Elgin, St. Charles, Geneva, Aurora, and Montgomery. The dairy interests are very large and have made some of the cities of this valley well known throughout the United States. In the six counties that the Fox River valley traverses — namely, McHenry, Kane, Du Page, Lake, Kendall, and LaSalle — there are 14,558 farms having a total area of 1,966,347 acres. The percentage of farm land to total area ranges from 80.9 in DuPage County to 94.4 in Kendall County. Likewise there are 15,053 head of cattle in Kendall County and 77,977 head in McHenry County. In Lake, McHenry, and Kane counties, along the upper portion of the Fox River, rye, buckwheat, barley, and potatoes yield well and are grown to some extent. Corn and oats, however, form the principal crops here as throughout this region. Some wheat is raised, but the total crop is comparatively small. Table III. shows the farms and farm properties, and Table IV. the crops and values of same throughout the six counties above mentioned.

Owing to the numerous beautiful lakes and ponds and the proximity to Chicago and other large cities, there is a large temporary population during the hot months, especially in the Fox Lake region. The Fox River valley has become a summer resort district, furnishing boating, fishing, and hunting in season. The good gravel and macadam roads along this valley make this a thoroughfare for motor tourists. The drive from McHenry through Crystal Lake, Algonquin, Elgin, St. Charles, Geneva, Batavia, Aurora, and southward is famous for the beautiful scenery and the accommodations for travelers. Repairs and improvements are under way that will eliminate the famed Algonquin hill, and considerable stretches of concrete road have already been built near Geneva, Batavia, and Aurora. The Starved Rock Trail from Chicago to Aurora and Ottawa is a well-known highway, and the Lincoln Highway will ultimately introduce many more tourists to the beauties of the Fox River valley.

There are a great many boat houses in use by the owners of the more permanent improvements along the river where motor and row boats are kept during the year. There are also at McHenry and in the lake district large motor boat garages, where boats are stored and where all repairs can be made. A number of "clammers" are engaged in hunting for fresh water pearls, and the reports of lucky finds appeal to the sporting instincts of those willing to undertake the hardship of the search in hopes that chance may bring them a large stake.

The State of Illinois Game and Fish Conservation Commission has closed the Fox River and its tributaries to the commercial fishermen, and has established a fish hatchery at Spring Grove on Nippersink Creek. Fishing with hook and line is permitted.

The following is a list of the fish found in this territory: Carp, black and striped bass, pike, pickerel, perch, sunfish, croppies, catfish, red horse, buffalo, suckers, and dogfish. Formerly the muskellunge

was rated as one of the finest game fish, but it has practically disappeared from the waters of the lake district.

Many handsome summer homes are scattered along the upper part of the valley. The State of Illinois also has located a State Hospital at Elgin, a School for Boys at St. Charles, a Training School for Girls at Geneva, and the State Fish Hatchery at Spring Grove.

The valley of the Fox River is steadily growing in usefulness to the people of the State for manufacturing and agriculture, and is becoming more and more an outing and recreation ground. The river itself is capable of extensive development for power purposes, and the lakes, with proper improvements, could be made into a permanent park.

To protect for the people of the State these natural advantages this survey and investigation of the valley was made in order to determine the extent of the public rights and what encroachments, if any, were being made on them.

TABLE I.

POPULATION OF COUNTIES AND TOWNSHIPS ALONG THE FOX RIVER VALLEY.

County	Township	1910	1900	1890	Totals. 1910	1900	1890
Lake	Antioch	2,308	1,941	1,704			
	Avon	1,785	1,434	1,081			
	Cuba	1,310	1,109	956			
	Grant	829	638	511			
	Wauconda	1,033	1,083	1,097			
					7,265	6,205	5,349
McHenry	Algonquin	3,675	3,048	2,512			
	Burton	1,242	950	781			
	McHenry	2,679	2,673	2,555			
	Nunda	2,110	1,963	1,805			
					9,706	8,634	7,653
Du Page	Naperville	2,848	2,635	2,470			
	Wayne	1,157	3,399	2,786			
	Winfield	3,753	1,138	1,097			
					7,758	7,172	6,353
Kane	Aurora	34,163	27,566	22,259			
	Batavia	5,251	4,642	4,292			
	Dundee	4,864	4,937	3,876			
	Elgin	27,246	23,600	19,183			
	Geneva	3,634	3,106	2,030			
	St. Charles	5,627	3,706	2,678			
					80,785	67,557	54,318
Kendall	Big Grove	1,283	1,411	1,461			
	Bristol	1,136	1,070	1,211			
	Fox	976	1,178	1,168			
	Kendall	1,318	1,365	1,322			
	Little Rock	2,220	2,360	2,728			
	Oswego	1,432	1,532	1,538			
					8,365	8,916	9,428
La Salle	Adams	1,278	1,453	1,328			
	Dayton	644	800	761			
	Miller	794	880	1,016			
	Mission	1,350	1,384	1,394			
	Northville	768	799	857			
	Rutland	2,308	1,909	1,779			
	Serena	947	964	919			
	Ottawa	8,620	9,693	9,464			
					16,709	17,882	17,518
					130,588	116,366	100,619

TABLE II.

POPULATION OF PRINCIPAL CITIES ALONG THE FOX RIVER VALLEY.

County	City	1910	1900	1890
Lake County	Antioch	682	522	303
	Lake Villa	342	.....	.....
	Grays Lake	603	416	.....
	Hainesville	66	.....	.....
	Round Lake	182	.....	.....
	Barrington	1,953	1,814	1,742
	Fox Lake	829	638	511
	Wauconda	368	397	368
McHenry Co	Algonquin	642	550	.....
	Cary	679	398	.....
	Crystal Lake	1,242	950	781
	Spring Grove	203	.....	.....
	McHenry	1,031	1,013	979
	North Crystal Lake	689	604	438
Du Page Co	Naperville	3,449	2,629	2,216
	West Chicago	2,378	1,877	1,506
Kane Co	Aurora	29,807	24,147	19,688
	Montgomery	371	350	263
	Batavia	4,436	3,871	3,543
	E. Dundee	1,405	1,417	1,150
	Carpentersville	1,128	1,002	754
	W. Dundee	1,380	1,348	873
	Elgin	25,976	22,433	17,823
	So. Elgin	580	515	505
	Geneva	2,451	2,446	1,692
	St. Charles	4,046	2,675	1,690
Kendall Co	Lisbon	197	279	.....
	Newark	406	410	390
	Bristol	394	427	.....
	Millington	223	286	301
	Yorkville	431	413	375
	Plano	1,627	1,634	1,825
	Oswego	600	618	641
La Salle	Leland	545	634	554
	Sheridan	506	485	425
	Marseilles	3,291	2,559	2,210
	Ottawa	9,535	10,588	9,985
	Totals	104,673	90,345	73,531

TABLE III.

FARMS AND FARM PPROPERTIES ALONG THE FOX RIVER — BY COUNTIES.

	McHenry.	Kane.	Du Page.	Lake.	Kendall.	La Salle.
Population	32,509	91,862	33,432	55,058	10,777	90,132
Number of farms	2,860	2,309	1,599	2,250	1,258	4,282
Approximate land area, acres	396,800	337,280	220,800	291,200	207,360	733,440
Land in farms, acres	368,931	309,284	178,600	251,003	195,774	662,755
Per cent of land in farms	93.0	91.7	80.9	86.2	94.4	90.4
Value of all farm property	39,988,944	42,381,366	25,174,987	31,631,567	29,630,229	114,911,820
Value of land	26,511,727	29,237,261	17,558,512	20,748,461	22,870,721	94,722,629
Value of buildings	7,651,785	7,402,270	4,564,408	7,094,162	3,862,250	11,327,300
Value of inplements	1,096,747	1,256,814	596,617	859,488	794,674	2,007,525
Value of animals	4,728,685	4,485,021	2,455,550	2,929,456	2,102,584	6,854,366
Total number cattle	77,977	57,030	30,828	40,786	15,053	45,219
Value of cattle	2,593,515	2,096,250	1,127,143	1,405,324	455,907	1,310,519
Total number horses	15,361	14,212	8,734	10,370	10,421	36,569
Value of horses	1,620,317	1,734,791	1,055,073	1,197,746	1,226,868	4,620,023
Total number mules	89	291	104	95	154	685
Value of mules	13,070	34,062	12,060	13,980	22,620	92,007
Total number swine	35,702	45,341	21,811	18,527	22,808	57,134
Value of swine	314,106	449,700	176,389	164,110	279,367	553,399
Total number sheep	6,828	8,243	1,368	7,853	7,376	12,013
Value of sheep	32,464	45,881	7,682	36,820	39,789	57,820
Number of poultry, all kinds	246,114	190,751	124,000	176,200	119,064	380,779
Value of poultry, all kinds	150,414	117,805	74,300	108,204	76,432	211,334
Number colonies bees	1,176	1,329	349	538	423	2,235
Value colonies bees	6,399	5,847	3,096	2,333	1,501	8,006

TABLE IV.

CROPS AND VALUES OF SAME ALONG THE FOX RIVER — BY COUNTIES.

	McHenry.	Du Page.	Kane.	Lake.	Kendall.	La Salle.
Cereals, dollars	3,432,771	2,170,616	3,928,086	2,392,597	2,723,457	10,222,235
Other grains and seeds, dollars	3,780,900	1,273,117	2,682,250	1,222,242	2,407,369	9,044,448
Hay and Forage, dollars	4,658	1,709	1,233	2,837	2,683	6,260
Fruits and nuts, dollars	22,458	17,434	33,485	35,256	8,210	44,460
All other crops, dollars	60,503	253,200	186,276	110,962	9,249	76,486
Corn, bushels	3,029,609	1,232,667	3,321,214	1,143,622	2,961,411	13,439,327
Oats, bushels	1,421,143	1,367,149	2,053,249	1,083,208	2,128,085	6,879,858
Wheat, bushels	27,516	61,556	53,960	41,971	22,106	56,658
Barley, bushels	201,445	29,219	98,530	84,877	2,300	1,208
Buckwheat, bushels	1,793	55	925	888	.....	10
Rye, bushels	11,008	12,951	21,067	9,519	185	4,142
Timothy, tons	35,389	16,953	31,908	29,329	9,659	34,703
Clover, tons	3,233	1,428	3,649	1,917	753	4,438
Alfalfa, tons	4,274	1,587	2,661	12,962	223	716
Potatoes, bushels	214,336	148,211	155,452	195,569	53,215	193,648
Apples, bushels	7,839	7,982	10,667	23,091	2,152	7,370
Peaches, bushels	6	70	177	2,032	209	2,063
Pears, bushels	652	719	785	1,610	203	1,837
Plums, bushels	151	87	301	80	54	442
Cherries, bushels	1,669	2,716	3,046	2,228	948	6,146
Quinces, bushels	8	7	2	5	21	30
Grapes, pounds	36,162	68,467	179,770	130,645	51,230	320,588
Labor, expended, dollars	413,522	317,191	593,690	396,793	191,263	731,861
Fertilizer, dollars	2,044	5,100	6,418	6,791	2,007	10,638
Feed, dollars	277,160	216,152	327,352	195,946	27,651	161,339
Receipts from sale feedable crops, dollars	164,696	222,214	449,516	187,210	1,228,452	4,926,760

CHAPTER II.

Survey.

The survey of the Fox River was begun at Ottawa, Illinois, June 16, 1914, and completed to the north State line October 29, 1914. The object of the survey was to secure a correct map showing the river as it exists with all the data of the islands, bridges, dams and encroachments with the cross sections of the bed of the stream. The method used in the survey was by traverse line, checking same by observation on polaris. As the party was to camp in tents and move as convenience to the work demanded, the disposition of the force was as follows:

One man was detailed as cook; two men as Wye level party; three men as station party, and four men as topographical party.

The station party set the station hubs and guard stakes, cleared the line through brush and weeds and measured all bridges and located the fences crossed.

The level party recorded the elevation of all hubs and bridges, and established bench marks at frequent intervals for future use, and also assisted in clearing the transit line whenever it was necessary to avoid delay to the topographer.

The topographical party secured the data necessary to locate the top of the river bank proper, shore lines of islands, the bank and water lines of all waterways, lakes, sloughs and streams with elevation of their water surface, and depths; the points where the slope of the ground changes in either direction, the limits of timber or cultivated tracks, and the roads and railways. The bench marks used for reference were those established by the U. S. Army Engineer Corps and those of the U. S. Geographical Survey referred to plane of Memphis datum. Check levels were run to which the survey levels were referred, thereby giving assurance of accurate results.

The notes of this survey are shown on an index map of eight thousand feet to an inch and on fifty sheets drawn to a larger scale so as to show more clearly the topographical features contiguous to the river. On the index map is shown the profile of the bed and water surface of the river, the location of the dams, bridges, cities and villages and railway lines.

Results of Survey — Observations and Data.

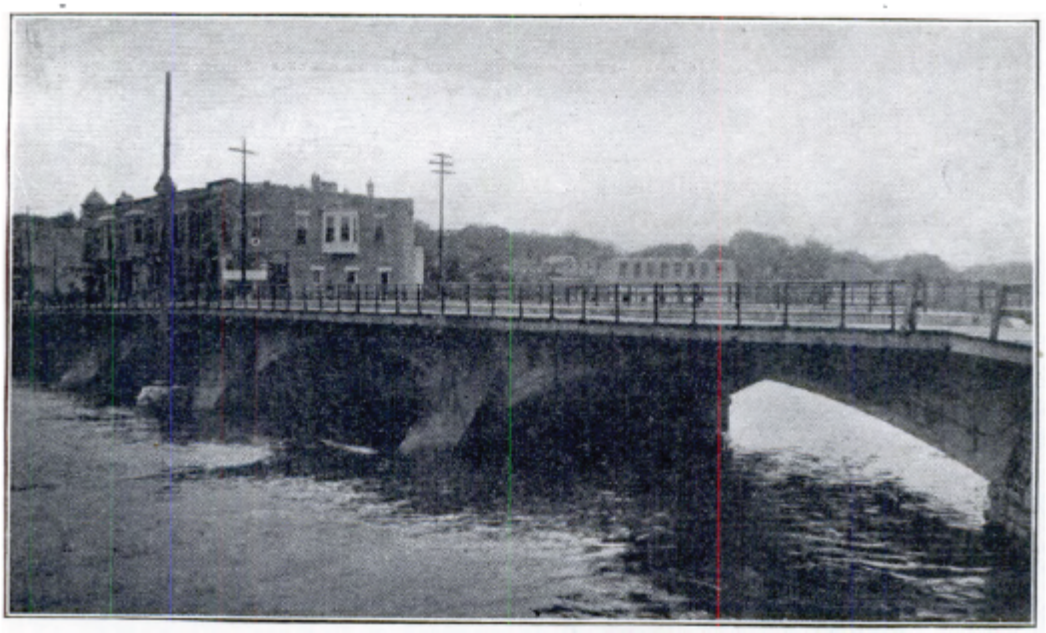
From the investigations made and data secured we find that the river in detail, referred to the principal cities located on its banks, has the characteristics as given herewith.

The total length of the river channel from Ottawa to the north State line is 114.96 miles, and the total fall of the river bed in this distance is 282.60 feet. The following table shows the distance of the respective places from Ottawa, the total fall to Ottawa, and the average fall in feet per mile:

Location.	Map Station.	Distance from Ottawa (Miles).	Fall in Feet.	Average Fall per Mile, in Feet.
Dayton	32.56	6.20	36.30	5.85
Wedron	45.92	8.70	44.60	5.13
Sheridan	104.43	19.80	80.60	4.07
Millington	136.10	25.80	93.10	3.61
Yorkville	193.60	36.70	121.80	3.32
Oswego	227.44	43.00	147.00	3.42
Aurora	253.88	48.00	169.90	3.54
Geneva	303.27	57.43	216.60	3.77
Elgin	377.58	75.11	255.50	3.40
Algonquin	431.40	81.70	274.60	3.36
McHenry Dam	516.62	97.75	282.50	2.89
State Line	606.95	114.96	282.60	2.46

Bench Marks.

The elevations of the following list of bench marks are based on a line of check levels run from Ottawa, Illinois, to Libertyville, Illinois, during the spring of 1915. All available precise bench marks of the



Main Street Bridge at St. Charles, Ill.

U. S. Engineer Corps and of the U. S. Geological Survey were tied to and were used as a control. The location of these controlling benches is as follows:

Two at Ottawa, and one at Wedron, St. Charles, near St. Charles, South Elgin, Elgin and Libertyville. The check levels were run by

Messrs. H. C. Alexander, F. B. Foote and R. L. Sanders with an ordinary Buff & Buff wye level. Care was taken in balancing foresights and backsights by counting rail lengths, when running along a track, and by pacing at other times. The equation between Memphis datum and U. S. G. S. datum was taken as 6.975 feet. All elevations are given in feet and thousandths.

List of Bench Marks along Fox River.

Ottawa: South end of west stone abutment of Main Street bridge over Fox River; copper bolt leaded vertically in top of coping stone. (U. S. Corps Eng. P. B. M. 84.) Elev. 474.042 ft. U. S. G. S. or (Biloxi D.), 481.017 (Memphis D).

Ottawa: In S. E. cor. of public (Washington) park 0.6 foot inside

C. G. W. R. R. Bridge near St. Charles, Ill.

of low stone wall 10 ft. west of intersection of sidewalks; iron post stamped 483 Ill. Elev. 490.379 ft. M. D.

Dayton: First street south of R. R. station just east of R. R. right of way and immediately south of garden fence, an iron post stamped 542. Adj. Elev. 549.294 M. D.

Wedron: Downstream end of right abutment of Highway Bridge across Fox River. Adj. Elev. 522.612 M. D.

Wedron: South of R. R. depot at angle of depot platform, an iron post stamped U. S. Geol. Survey 521. Adj. Elev. 528.654 M. D.

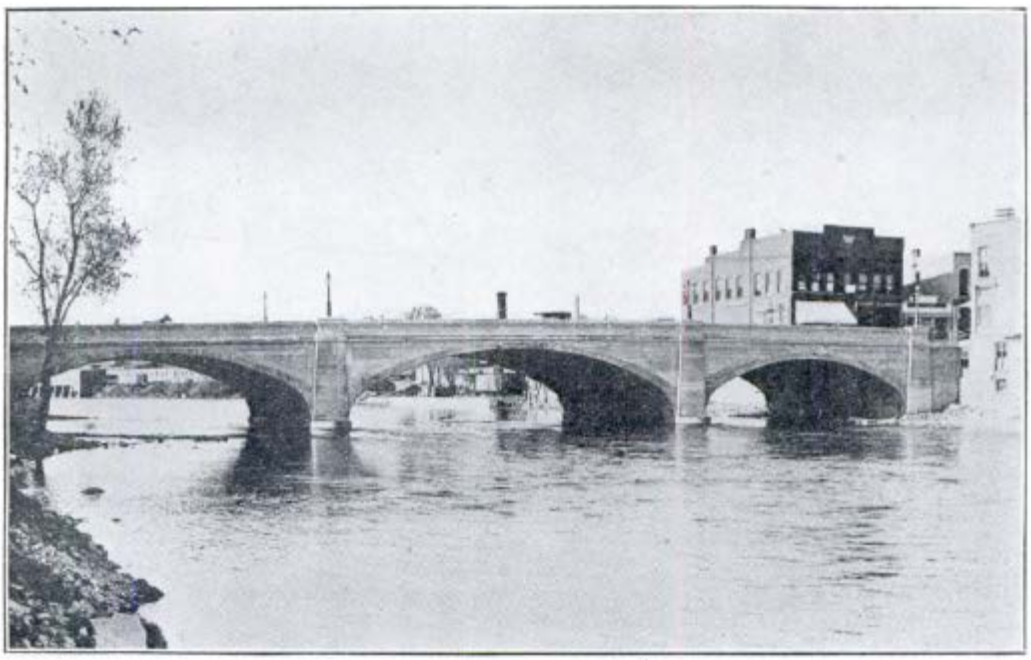
Serena Highway: Middle of North (upstream) end of right abutment of Highway bridge across Fox River on Highway leading to Serena. Adj. Elev. 546.830 M. D.

Sheridan: Cross on downstream end of extreme left stone pier of C. B. & Q. R. R. bridge over Fox River ¾ mile west of Sheridan. Adj. Elev. 555.283 M. D.

Millington: North end of N. W. abutment of Highway bridge over Clark Creek ¼ mile northeast of Millington. Adj. Elev. 560.093 M. D.

Milbrook: Cross mark on top of N. W. wing wall of Highway

Concrete Arch Bridge at Geneva.



Concrete Arch Bridge at Batavia.

bridge over Bomback Cr. ½ mile north of Millbrook. Adj. Elev. 608.167 M. D.

Yorkville: East end of north abutment of south span (on island in center of river upstream end of abutment) Yorkville Highway bridge over Fox River. Adj. Elev. 590.555 M. D.

Oswego: Northeast corner of North (or right) abutment of Oswego Highway and electric R. R. bridge over Fox River. Adj. Elev. 618.752 M. D.

Between Oswego and Montgomery: Top of North rail at west (right) end of C. B. & Q. R. R. bridge over Fox 3 miles north of Oswego. Adj. Elev. 633.704 M. D.

Montgomery: South end of west (or right) abutment of wagon bridge over mill race at Montgomery. Adj. Elev. 626.926 M. D.

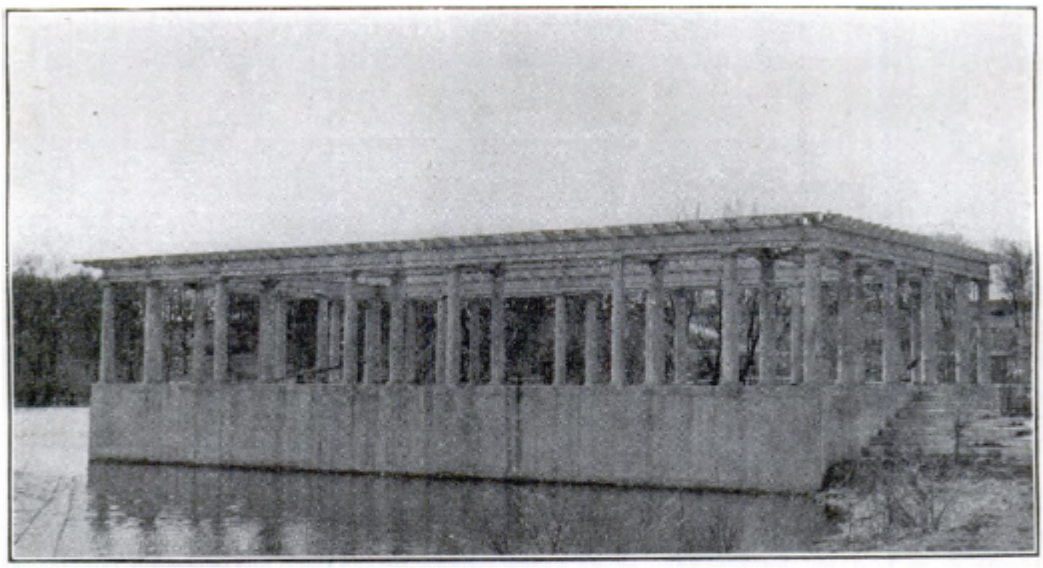
Aurora: Square cut on curb at southeast corner of intersection of River and North Streets, Aurora. Adj. Elev. 647.977 M. D.

Aurora: North curb at west (right) end of Walnut St. (or New York St.) bridge. Adj. Elev. 652.237 M. D.

Southwest corner of West (right) abutment of Illinois St. bridge. Adj. Elev. 646.194 M. D.

North Aurora: Cross mark on south end of west (right) abutment of North Aurora concrete Highway bridge. Adj. Elev. 657.960 M. D.

Mooseheart: Center of west end of north (or left) abutment of C. & N. W. R. R. bridge over Mooseheart Creek. Adj. Elev. 664.080 M. D.



Fabyan's Island, near Geneva, Ill.

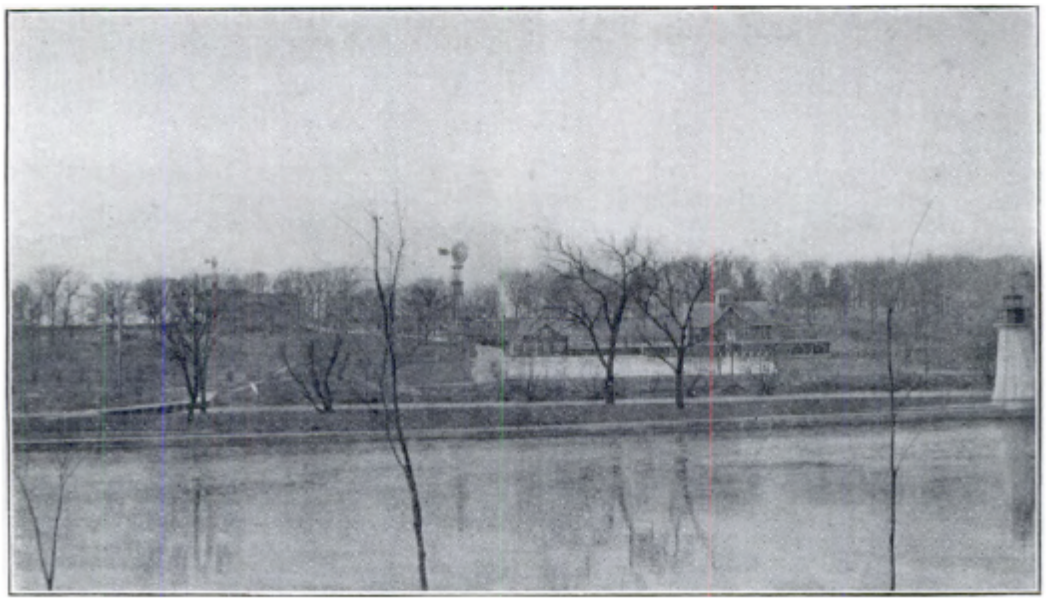
Aurora Township: Center of west (or right) abutment of dam—bridge at A. E. & C. Power Plant on Fox River. Adj. Elev. 666.064 M. D.

Batavia: Southeast corner of the east abutment of the west bridge over Fox River at Mill Street, Batavia. Adj. Elev. 681.393 M. D.

Batavia: West end of S. W. wing wall of bridge over Fox River at Wilson Ave., Batavia. Adj. Elev. 680.370 M. D.

Near Geneva: On concrete walk over southwest corner of west (or right) abutment of Colonel Fabyan's concrete bridge between the north bank of the Fox River and the island. Adj. Elev. 676,431 M. D.

Geneva: Top of metal pull box plate, set flush with concrete walk over southwest corner of west abutment of Geneva concrete Highway bridge. Adj. Elev. 691.578 M. D.



Fabyan's Island, near Geneva, Ill.

St. Charles: North end of second pier from east (left) end of foot bridge across Fox River at St. Charles. Adj. Elev. 692.729 M. D.

On north or upstream concrete foot walk, one foot south of northeast corner of same on Main St. bridge, St. Charles. Adj. Elev. 698.391 M. D.

Near Coleman: Top of upstream end of left abutment of A. E. & C. Electric R. R. bridge ½ mile downstream from Coleman. Adj. Elev. 705.172 M. D.

Coleman: Top of A. E. & C. Rail beneath the Illinois Central R. R. bridge over the Fox River at Coleman. Adj. Elev. 707.351 M. D.

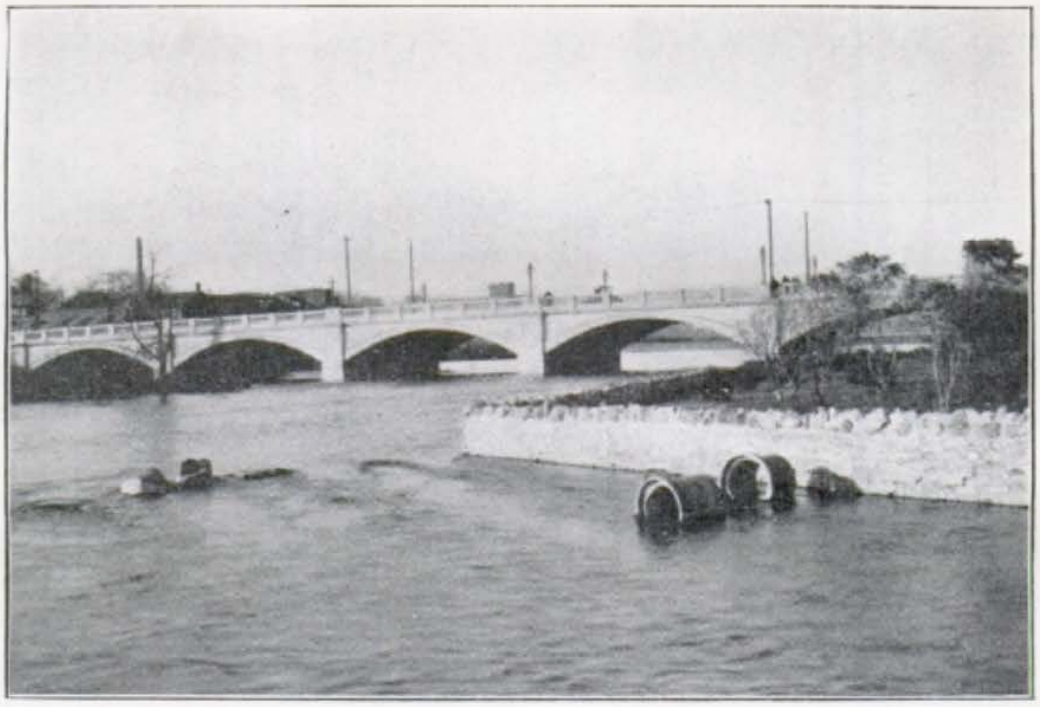
South Elgin: Square chiseled on top course, upstream end of right stone abutment of South Elgin Highway bridge. Adj. Elev. 711.010 M. D.

Same bridge, top of top course of downstream wing wall of right abutment. Adj. Elev. 712.220 M. D.

Same bridge: South end of first pier from west (or right) end of bridge. Adj. Elev. 710.327 M. D.

Elgin: N. W. cor. of iron gutter crossing at S. E. cor. of S. State & Walnut Streets, Elgin. Adj. Elev. 779.579 M. D.

Elgin: S. E. cor. of North (or right) abutment of C. N. W. Ry. bridge over Fox River. Adj. Elev. 729.310 M. D. Top of rail over same abutment 730.53 M. D.



Highway Bridge, Fox River, Geneva, Ill.

Elgin: S. W. cor. of top course of W. wing wall of south or right abutment of National St. bridge. Adj. Elev. 721.747 M. D.

Spot on N. E. cor. of concrete block in E. walk over north face of same abutment. Adj. Elev. 723.029 M. D.

Elgin: Center of south end of west (or right) abutment of Chicago St. bridge, Elgin. Adj. Elev. 723.281 M. D.

Elgin: East end of south (or downstream) abutment of C. M. & St. P. pile trestle over mill head race at Elgin. Adj. Elev. 727.576 M. D. Top of east rail over same abutment 728.053.

Near Elgin: Top of east or upstream rail over north abutment of pile trestle across Fox River to Reeds Gravel Pit about one mile upstream from Elgin. Adj. Elev. 732.715 M. D.

Near Dundee: Top of north or upstream rail over west abutment of A. E. & C. Trestle across the Fox R. to the south of Dundee. Adj. Elev. 727.126 M. D.

Dundee: On N. E. cor. of concrete block at S. W. cor. of south (or downstream) footwalk of Main St. bridge, Dundee. Adj. Elev. 729.817 M. D.

Dundee: Center of east concrete post in first support from south (or right) end of foot bridge over Fox R. at Dundee. Adj. Elev. 728.856 M. D.

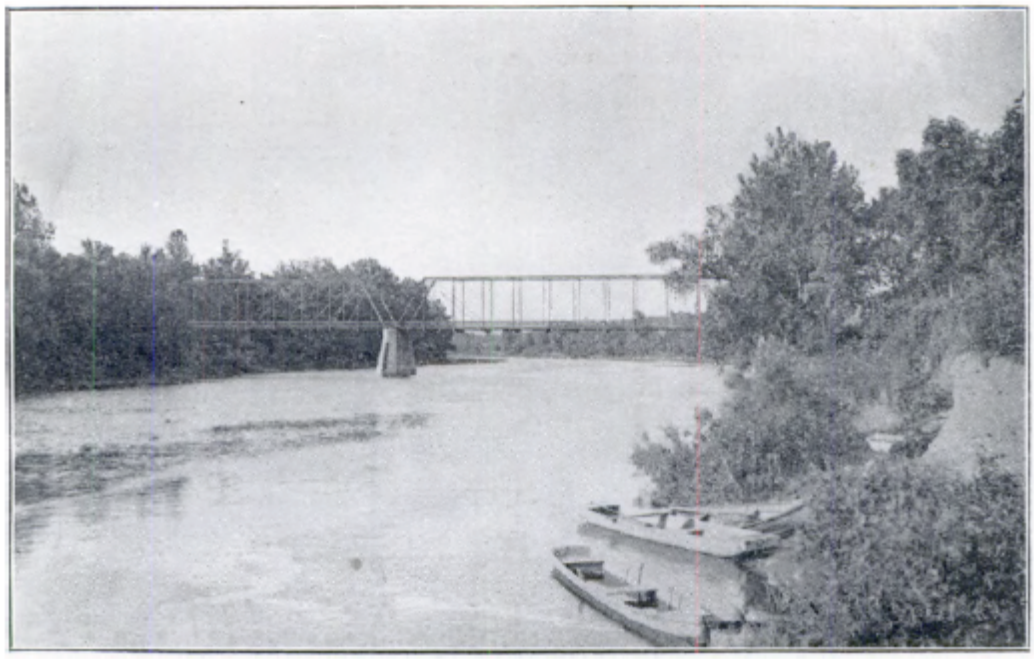
Carpentersville: S. E. cor. of bridge sidewalk over south end of

east (or left) abutment of Main St. bridge over Fox R. at Carpentersville. Adj. Elev. 731.001 M. D.

Algonquin: Square cut on east corner of top course of S. E. wing wall of south (or left) abutment of C. & N. W. Ry. bridge over Fox R. at Algonquin. Adj. Elev. 752.301 M. D.

Algonquin: Square cut on retaining wall at left bank of river, one foot north (upstream) from N. E. cor. of north boardwalk on Highway bridge at Algonquin. Adj. Elev. 746.531 M. D.

Cary: Cross mark on southwest wing wall of west (or right) abutment of Highway bridge over Fox River one mile east of Cary. Adj. Elev. 747.120 M. D.



Wedron Highway Bridge, looking downstream.

Frisch's Resort: Top of end concrete pier of dance hall in river. Downstream side of Frisch's Resort. Adj. Elev. 744.704 M. D.

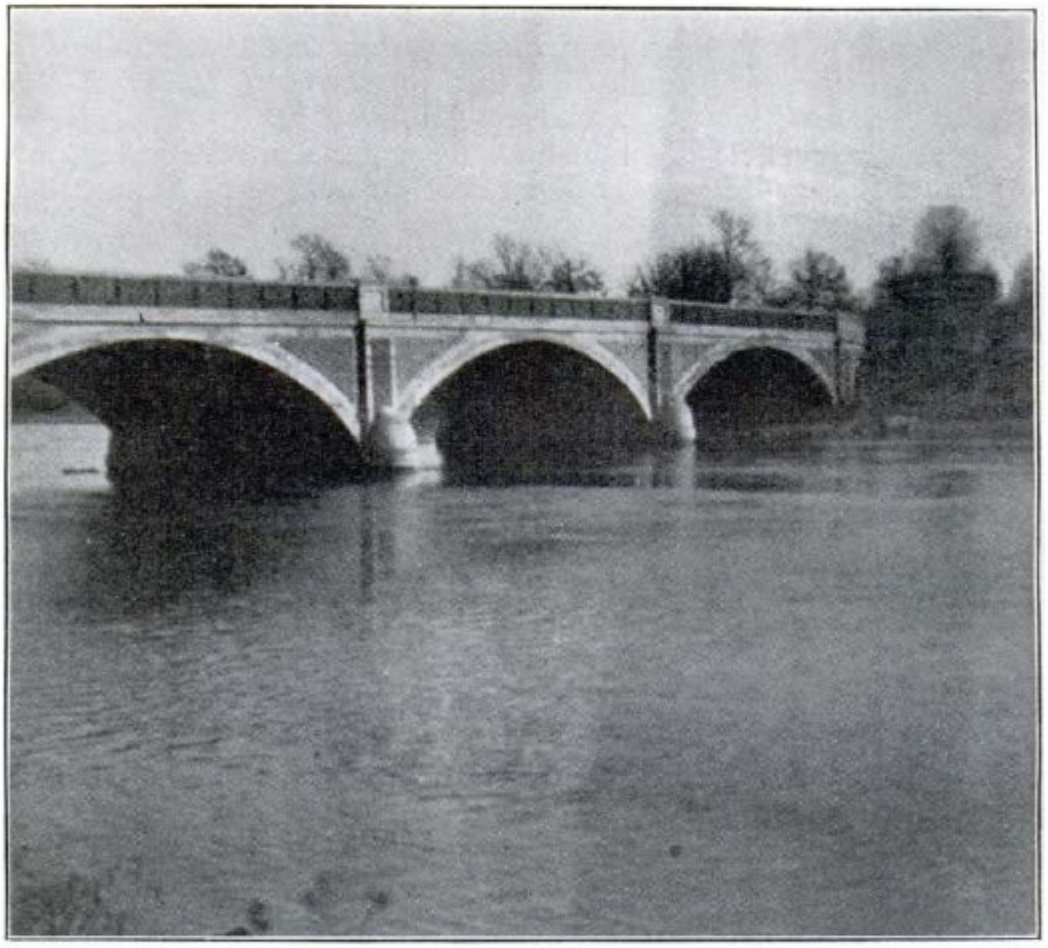
Nunda Township: Center of letter "A" in initials F. A. on top of west wing wall, north side of Rawson's bridge 2.05 feet from end of wall. Adj. Elev. 747.181 M. D.

Nunda Township: West abutment, south wing wall of old Burton's bridge. Point is east end of wing wall on south side, 3.2 ft. from end bridge pin. Adj. Elev. 746.750 M. D.

Near McHenry: Top of ringbolt on shore side of McHenry Lock at head of lock. Embedded in concrete 0.85 ft. from water edge of wall and is the only ringbolt above the lock gate. Bolt protrudes about 0.1 foot. Lock is about two miles below McHenry. Adj. Elev. 743.414 M. D.

McHenry: McHenry bridge east end downstream side of wing wall at cor. of wing wall and abutment face. Concrete wing wall and stone

facing wing wall cemented to facing. B. M. is 4.1 ft. from end bridge pin and at the southeast corner of wall and facing. Adj. Elev. 753.724 M. D.



Montgomery, Ill., Highway Bridge, 1915.

Johnsburg: Bridge abutment Johnsburg bridge, north end upstream side at corner of wing wall and facing of abutment 14 inches from edge of bridge seat plate. Adj. Elev. 754.248 M. D.

Fox Lake: On C. M. & St. P. bridge at head of Pistakee Bay. Point is drift bolt head at upstream side of bridge, east end of draw span. Only bolt in that vicinity which is 2.4 ft. below track level. Adj. Elev. 751.481 M. D.

Fox Lake: The north corner of flagging between tracks in front of Fox Lake station on C. M. & St. P. R. R. Adj. Elev. 753.316 M. D.

Ingleside: Southwest corner of concrete railway platform at Ingleside station C. M. & St. P. R. R. Adj. Elev. 751.751 M. D.

Near Ingleside: Square in 9 of 1910 on south end of west abutment of C. M. & St. P. R. R. plate girder bridge ¼ mile east of Ingleside. Adj. Elev. 752.538 M. D.

Near Ingleside: Southeast corner of bridge seat, west abutment of

small C. M. & St. P. R. R. concrete bridge about ½ mile east of Ingleside. Adj. Elev. 752.151 M. D.

Nelson City: Cross in top stone of northwest wing wall of highway bridge across the Fox River in Section 10, T. 46 N., R. 9 E. of 3d P. M. Point is 0.3 ft. from north and 0.25 ft. from west edge of wall. Adj. Elev. 752.979 M. D.

In connection with the topographic survey two gaging stations were established at South Elgin and Wedron to measure the depth of the water in the river, and discharge measurements were taken to determine the rate of discharge for the various depths of water. This work was done in connection with the Department of the United States Geological Survey, so that the results obtained would be comparable with their standards. The detailed records for these two stations are given in Tables V to XVIII inclusive. A gage was established at Aurora, Illinois, the last of June, 1914, and maintained until nearly October of that year when it was discontinued, due to local conditions making the results unsatisfactory. On October 1, 1915, the gage at South Elgin was discontinued, due to the unsatisfactory results obtained on account of the fluctuations in stream flow caused by the power dam at that point. This gage was transferred to Algonquin and is now read at the latter place. This gage and the one at Wedron will be maintained as part of the permanent gaging stations operated by this Commission in conjunction with the United States Geological Survey.

GAGE — FOX RIVER AT SOUTH ELGIN, ILL.

LOCATION.— Upstream side of highway bridge, South Elgin, Ill.

RECORDS AVAILABLE.— July 29, 1914, to June 30, 1915.

DRAINAGE AREA.— 1,500 square miles.

GAGE.— Standard chain gage, open type pulley.

CHANNEL.— Some grass growing in the channel at low water. Bed is rock and gravel.

DISCHARGE MEASUREMENTS.—Taken with current meter from highway bridge.

REGULATION.— Probably none.

TABLE V.

DISCHARGE MEASUREMENTS OF FOX RIVER AT SOUTH ELGIN, ILL.

No.	Date, 1914.	Made By	Width, Feet.	Area of Section, Sq. Feet.	Gage Height, Feet.	Discharge, Sec.-Feet.
1	7-29	Peterson & Espinosa	240	563	2.42	a/v 630
2	9-8	Peterson & Kessler	242	412	1.85	a/v 352
	1915					
3	3-6	William Kessler	242	892	3.70	3,370
4	5-5	William Kessler	239	431	1.96	648
5	5-15	William Kessler	242	431	1.87	583
6	5-20	William Kessler	239	491	2.09	824
7	5-21	William Kessler	240	480	2.01	765
8	5-21	William Kessler	241	558	2.32	1,090
9	6-19	William Kessler	241	728	3.11	2,160
10	6-22	William Kessler	240	745	3.17	2,290
11	6-26	William Kessler	241	650	2.79	1,640

a/v Grass growing in channel below the gage.

TABLE VI.

DAILY HEIGHT OF GAGE OF FOX RIVER AT SOUTH ELGIN, ILL., 1914.

Day.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	.....	.....	.....	1.35	1.13	1.94	2.20	1.51
2	.....	.....	.....	.....	.....	.....	.....	1.52	1.17	1.91	2.20	1.52
3	.....	.....	.....	.....	.....	.....	.....	1.58	1.25	1.91	2.15	1.52
4	.....	.....	.....	.....	.....	.....	.....	1.63	1.28	1.90	2.20	1.46
5	.....	.....	.....	.....	.....	.....	.....	1.36	1.30	1.89	2.15	1.49
6	.....	.....	.....	.....	.....	.....	.....	1.15	1.49	1.79	2.10	1.52
7	.....	.....	.....	.....	.....	.....	.....	1.22	1.56	1.79	1.96	1.52
8	.....	.....	.....	.....	.....	.....	.....	1.38	1.48	1.80	1.93	1.49
9	.....	.....	.....	.....	.....	.....	.....	1.09	1.45	1.65	1.94	1.50
10	.....	.....	.....	.....	.....	.....	.....	1.21	1.43	1.68	1.84	1.56
11	.....	.....	.....	.....	.....	.....	.....	1.62	1.44	1.64	1.82	1.51
12	.....	.....	.....	.....	.....	.....	.....	1.34	1.40	1.64	1.76	1.49
13	.....	.....	.....	.....	.....	.....	.....	1.24	1.43	1.64	1.78	1.42
14	.....	.....	.....	.....	.....	.....	.....	1.01	1.46	1.65	1.60	1.39
15	.....	.....	.....	.....	.....	.....	.....	1.01	1.47	1.64	1.54	1.40
16	.....	.....	.....	.....	.....	.....	.....	1.00	1.44	1.64	1.52	1.38
17	.....	.....	.....	.....	.....	.....	.....	1.03	1.49	1.66	1.49	1.38
18	.....	.....	.....	.....	.....	.....	.....	1.16	1.54	1.62	1.45	1.39
19	.....	.....	.....	.....	.....	.....	.....	1.05	1.52	1.72	1.46	1.36
20	.....	.....	.....	.....	.....	.....	.....	1.00	1.62	1.82	1.52	1.36
21	.....	.....	.....	.....	.....	.....	.....	1.12	1.79	1.95	1.48	1.48
22	.....	.....	.....	.....	.....	.....	.....	1.06	1.90	1.96	1.45	1.54
23	.....	.....	.....	.....	.....	.....	.....	1.05	1.70	2.05	1.46	1.46
24	.....	.....	.....	.....	.....	.....	.....	1.08	1.74	2.10	1.49	1.61
25	.....	.....	.....	.....	.....	.....	.....	1.19	1.98	2.15	1.45	1.58
26	.....	.....	.....	.....	.....	.....	.....	1.16	1.99	2.20	1.50	1.62
27	.....	.....	.....	.....	.....	.....	.....	1.22	2.00	2.05	1.48	1.78
28	.....	.....	.....	.....	.....	.....	.....	1.25	1.96	2.10	1.48	1.75
29	.....	.....	.....	.....	.....	.....	1.64	1.21	1.97	2.20	1.48	1.60
30	.....	.....	.....	.....	.....	.....	1.50	1.22	1.97	2.20	1.52	1.76
31	.....	.....	.....	.....	.....	.....	1.38	1.17	.....	2.20	.....	1.78

NOTE.—Corrections to gage height for backwater due to grass have been applied to above.

TABLE VII.

DAILY HEIGHT OF GAGE OF FOX RIVER AT SOUTH ELGIN, ILL., 1915.

DAY	Jan.	Feb.	Mch.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.65	2.3	3.9	2.55	1.61	2.95	.....	.....	.....	.....	.....	.....
2	1.72	2.25	3.9	2.5	1.66	3.0	.....	.....	.....	.....	.....	.....
3	1.75	1.88	3.8	2.45	1.71	3.0	.....	.....	.....	.....	.....	.....
4	1.79	1.83	3.8	2.5	1.70	3.0	.....	.....	.....	.....	.....	.....
5	1.74	1.89	3.9	2.5	1.53	3.0	.....	.....	.....	.....	.....	.....
6	1.30	2.1	3.7	2.6	1.50	2.95	.....	.....	.....	.....	.....	.....
7	1.38	1.82	3.6	2.45	1.60	2.95	.....	.....	.....	.....	.....	.....
8	1.39	1.68	3.45	2.4	1.51	2.95	.....	.....	.....	.....	.....	.....
9	1.38	2.05	3.45	2.35	1.53	2.9	.....	.....	.....	.....	.....	.....
10	1.31	2.15	3.4	2.3	1.61	2.9	.....	.....	.....	.....	.....	.....
11	1.36	2.45	3.3	2.15	1.54	3.1	.....	.....	.....	.....	.....	.....
12	1.38	3.2	3.15	2.1	1.41	3.0	.....	.....	.....	.....	.....	.....
13	1.40	3.05	3.1	2.1	1.49	3.0	.....	.....	.....	.....	.....	.....
14	1.39	3.2	3.15	2.15	1.53	3.0	.....	.....	.....	.....	.....	.....
15	1.48	2.85	3.05	2.15	1.56	3.0	.....	.....	.....	.....	.....	.....
16	1.64	2.9	3.0	2.2	1.61	3.0	.....	.....	.....	.....	.....	.....
17	1.53	2.8	3.0	2.1	1.76	2.95	.....	.....	.....	.....	.....	.....
18	1.58	2.85	3.1	2.15	1.67	2.95	.....	.....	.....	.....	.....	.....
19	1.56	2.9	3.05	2.1	1.62	2.9	.....	.....	.....	.....	.....	.....
20	1.60	3.0	2.95	2.0	1.69	2.95	.....	.....	.....	.....	.....	.....
21	1.64	3.15	2.8	2.1	1.94	3.0	.....	.....	.....	.....	.....	.....
22	1.60	3.2	2.85	2.05	1.91	2.9	.....	.....	.....	.....	.....	.....
23	1.58	3.4	2.85	2.05	2.1	2.85	.....	.....	.....	.....	.....	.....
24	1.54	3.8	2.85	1.96	2.1	2.75	.....	.....	.....	.....	.....	.....
25	1.58	3.9	2.85	1.93	2.3	2.7	.....	.....	.....	.....	.....	.....
26	1.59	4.0	2.8	1.88	2.35	2.65	.....	.....	.....	.....	.....	.....
27	1.65	3.9	2.75	1.78	2.45	2.55	.....	.....	.....	.....	.....	.....
28	1.88	4.1	2.7	1.65	2.6	2.55	.....	.....	.....	.....	.....	.....
29	1.53	.....	2.65	1.71	2.8	2.45	.....	.....	.....	.....	.....	.....
30	2.15	.....	2.55	1.66	2.95	2.4	.....	.....	.....	.....	.....	.....
31	2.2	.....	2.65	.....	2.95	.....	.....	.....	.....	.....	.....	.....

TABLE VIII.

RATING TABLE FOR FOX RIVER AT SOUTH ELGIN, ILL., 1914–1915.

Gage Height, Feet.	Discharge, Sec.-feet.	Gage Height, feet.	Discharge, Sec.-feet.	Gage Height, feet.	Discharge, Sec.-feet.
1.0	35	2.0	719	3.1	2,160
1.1	55	2.1	825	3.2	2,340
1.2	85	2.2	935	3.3	2,530
1.3	130	2.3	1,045	3.4	2,730
1.4	190	2.4	1,160	3.5	2,930
1.5	260	2.5	1,280	3.6	3,140
1.6	340	2.6	1,410	3.7	3,360
1.7	427	2.7	1,540	3.8	3,580
1.8	519	2.8	1,680	3.9	3,810
1.9	616	2.9	1,830	4.0	4,040
		3.0	1,990	4.1	4,280

TABLE IX.

DAILY DISCHARGE IN SECOND-FEET OF FOX RIVER AT SOUTH ELGIN, ILL., 1914.

DAY	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	.....	.....	.....	160	64	657	935	268
2	.....	.....	.....	.....	.....	.....	.....	276	76	626	935	276
3	.....	.....	.....	.....	.....	.....	.....	324	108	626	880	276
4	.....	.....	.....	.....	.....	.....	.....	366	121	616	935	232
5	.....	.....	.....	.....	.....	.....	.....	166	130	606	880	253
6	.....	.....	.....	.....	.....	.....	.....	70	218	510	825	276
7	.....	.....	.....	.....	.....	.....	.....	136	308	510	678	276
8	.....	.....	.....	.....	.....	.....	.....	178	246	519	647	253
9	.....	.....	.....	.....	.....	.....	.....	53	225	384	657	260
10	.....	.....	.....	.....	.....	.....	.....	90	211	410	558	308
11	.....	.....	.....	.....	.....	.....	.....	357	218	375	538	268
12	.....	.....	.....	.....	.....	.....	.....	154	190	375	482	253
13	.....	.....	.....	.....	.....	.....	.....	103	211	375	501	204
14	.....	.....	.....	.....	.....	.....	.....	37	232	384	340	184
15	.....	.....	.....	.....	.....	.....	.....	37	239	375	292	
16	.....	.....	.....	.....	.....	.....	.....	35	218	375	276	
17	.....	.....	.....	.....	.....	.....	.....	41	253	392	253	
18	.....	.....	.....	.....	.....	.....	.....	73	292	357	225	
19	.....	.....	.....	.....	.....	.....	.....	45	276	445	232	
20	.....	.....	.....	.....	.....	.....	.....	35	357	538	276	
21	.....	.....	.....	.....	.....	.....	.....	61	510	668	246	
22	.....	.....	.....	.....	.....	.....	.....	47	616	678	225	
23	.....	.....	.....	.....	.....	.....	.....	45	427	772	232	
24	.....	.....	.....	.....	.....	.....	.....	79	464	825	253	
25	.....	.....	.....	.....	.....	.....	.....	82	698	880	225	
26	.....	.....	.....	.....	.....	.....	.....	73	709	935	260	
27	.....	.....	.....	.....	.....	.....	.....	121	719	772	246	
28	.....	.....	.....	.....	.....	.....	.....	108	678	825	246	
29	.....	.....	.....	.....	.....	.....	375	90	688	935	246	
30	.....	.....	.....	.....	.....	.....	260	94	688	935	276	
31	.....	.....	.....	.....	.....	.....	178	76	.....	935	.....	

Est. 230. Sec.-ft. mean.

TABLE X

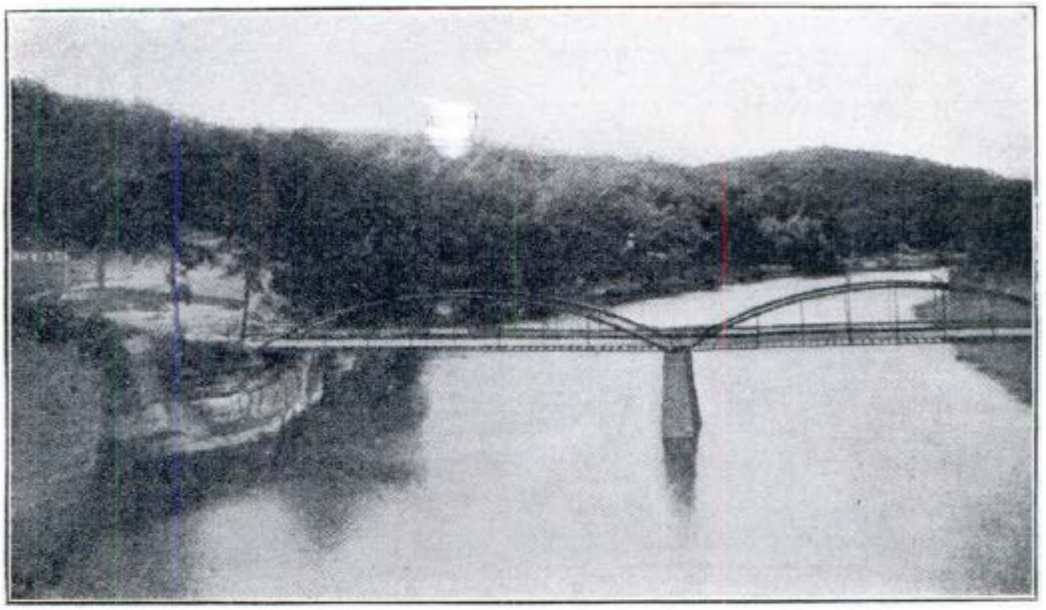
DAILY DISCHARGE IN SECOND-FEET OF FOX [illegible] AT SOUTH ELGIN, ILL., 1915.

DAY	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1	Est. mean, 300 sec.-ft.	1,040	3,810	1,340	349	1,910	.....	.....	.....	.....	.....	.....
2		990	3,810	1,280	392	1,990	.....	.....	.....	.....	.....	.....
3		597	3,580	1,220	436	1,990	.....	.....	.....	.....	.....	.....
4		548	3,580	1,280	427	1,990	.....	.....	.....	.....	.....	.....
5		606	3,810	1,280	284	1,990	.....	.....	.....	.....	.....	.....
6	130	825	3,360	1,410	260	1,910	.....	.....	.....	.....	.....	.....
7	178	538	3,140	1,220	340	1,910	.....	.....	.....	.....	.....	.....
8	184	410	2,830	1,160	268	1,910	.....	.....	.....	.....	.....	.....
9	178	772	2,830	1,100	284	1,830	.....	.....	.....	.....	.....	.....
10	136	880	2,730	1,040	349	1,830	.....	.....	.....	.....	.....	.....
11	166	1,220	2,530	880	292	2,160	.....	.....	.....	.....	.....	.....
12	178	2,340	2,250	825	197	1,990	.....	.....	.....	.....	.....	.....
13	190	2,080	2,160	825	253	1,990	.....	.....	.....	.....	.....	.....
14	184	2,340	2,250	880	284	1,990	.....	.....	.....	.....	.....	.....
15	246	1,760	2,080	880	308	1,990	.....	.....	.....	.....	.....	.....
16	375	1,830	1,990	935	349	1,990	.....	.....	.....	.....	.....	.....
17	284	1,680	1,990	825	482	1,910	.....	.....	.....	.....	.....	.....
18	324	1,760	2,160	880	401	1,910	.....	.....	.....	.....	.....	.....
19	308	1,830	2,080	825	357	1,830	.....	.....	.....	.....	.....	.....
20	340	1,990	1,910	719	418	1,910	.....	.....	.....	.....	.....	.....
21	375	2,250	1,680	825	657	1,990	.....	.....	.....	.....	.....	.....
22	340	2,340	1,760	772	626	1,830	.....	.....	.....	.....	.....	.....
23	324	2,730	1,760	772	825	1,760	.....	.....	.....	.....	.....	.....
24	292	3,580	1,760	678	825	1,610	.....	.....	.....	.....	.....	.....
25	↑	3,810	1,760	647	1,040	1,540	.....	.....	.....	.....	.....	.....
26	Est. mean, 350 sec.-ft.	4,040	1,810	597	1,100	1,480	.....	.....	.....	.....	.....	.....
27		3,810	1,610	501	1,220	1,340	.....	.....	.....	.....	.....	.....
28		4,280	1,540	384	1,410	1,340	.....	.....	.....	.....	.....	.....
29		.....	1,480	436	1,680	1,220	.....	.....	.....	.....	.....	.....
30		.....	1,340	392	1,910	1,160	.....	.....	.....	.....	.....	.....
31	↓	.....	1,480	.....	1,910	.....	.....	.....	.....	.....	.....	.....

TABLE XI.

MONTHLY DISCHARGE OF FOX RIVER AT SOUTH ELGIN, ILL., 1914-1915.

Month.	Discharge in Second-Feet.				Run-off, Depth in Inches on Drainage Area.
	Maximum.	Minimum.	Mean.	Per Sq. Mile.	
1914					
August	366	35	117	.07	.09
September	719	64	347	.23	.26
October	935	357	600	.40	.46
November	935	225	460	.31	.35
December	501	166	242	.16	.19
1915					
January	935	136	280	.19	.22
February	4,280	410	1,890	1.26	1.31
March	3,810	1,340	2,350	1.57	1.80
April	1,410	384	894	.60	.66
May	1,910	197	643	.43	.49
June	2,160	1,160	1,810	1.21	1.34



Highway Bridge over Fox River, Sheridan, Ill.

GAGE, FOX RIVER AT WEDRON.

LOCATION.— Upstream side of highway bridge, Wedron, Ill.

RECORDS AVAILABLE.— November 5, 1914, to ————.

DRAINAGE AREA.— 2,500 square miles.

GAGE.— Standard chain gage, open type pulley.

CHANNEL.— One channel at all stages. Bed is soft.

DISCHARGE MEASUREMENTS.— Taken from bridge.

REGULATION.— Control about 1,000 feet downstream, probably permanent. Buck Creek enters on right, probably 1,000 feet below the gage.

TABLE XII.

DISCHARGE MEASUREMENTS OF THE FOX RIVER, WEDRON, ILL., 1914-1915.

Date.	Hydrographer.	Width, Feet.	Area of Section, Square Feet.	Gage Height, Feet.	Discharge, Second, Feet.
1. November 5..	William Kessler	218	845	6.81	1,030
2. November 20.	Peterson and Kessler	146	b/v 537	5.62	a/v 105
3. February 17..	William Kessler	220	1,200	8.46	2,960
4. March 1.....	William Kessler	235	1,430	9.07	4,140
5. May 10.....	William Kessler	210	695	6.15	476
6. May 22.....	William Kessler	221	1,050	7.64	1,890
7. June 21.....	William Kessler	224	1,230	8.57	3,100
8. June 21.....	William Kessler	224	1,260	8.55	3,100
9. July 2.....	William Kessler	219	927	7.16	b/v 1,310
10. July 2.....	William Kessler	219	937	7.20	b/v 1,320

a/v Partial ice cover at bridge, complete ice cover at control.
b/v Main channel at control is of solid rock and large boulders. Grass can not grow there. On either side of this channel is higher rock and gravel and grass covered these places.

TABLE XIII.

Daily Gage Height in Feet of Fox River at Wedron, Ill., 1914.

Day.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.3
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.4
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.35
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.35
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.8	6.1
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.7	6.25
7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.65	6.25
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.7	6.4
9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.55	6.4
10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.75	6.35
11	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.6	6.3
12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.55	6.3
13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.45	6.35
14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.55	5.61
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.35	5.86
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.3	6.2
17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.45	6.15
18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.45	6.3
19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.5	6.3
20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.05	6.2
21	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.4	6.2
22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.1	6.3
23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.2	6.35
24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.15	6.1
25	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.4	6.3
26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.25	6.4
27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.05	6.2
28	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5.98	6.25
29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.25	6.4
30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.2	6.35
31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.6

TABLE XIV.

Daily Gage Height in Feet, of Fox River at Wedron, Ill., 1915.

DAY	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.55	9.1	9.1	7.3	6.3	8.4	.....	.....	.....	.....	.....	.....
2	6.45	8.7	9.1	7.2	6.15	8.3	.....	.....	.....	.....	.....	.....
3	6.35	8.2	9.1	7.2	6.3	8.2	.....	.....	.....	.....	.....	.....
4	6.45	8.2	9.0	7.2	6.45	8.2	.....	.....	.....	.....	.....	.....
5	6.5	10.0	8.9	6.9	6.55	8.1	.....	.....	.....	.....	.....	.....
6	6.55	9.5	8.7	7.05	6.45	7.9	.....	.....	.....	.....	.....	.....
7	6.55	8.7	8.7	6.95	6.4	8.0	.....	.....	.....	.....	.....	.....
8	6.45	8.5	8.6	6.95	6.35	8.0	.....	.....	.....	.....	.....	.....
9	6.55	8.4	8.4	6.9	6.15	7.9	.....	.....	.....	.....	.....	.....
10	6.4	8.1	8.4	6.9	6.1	7.8	.....	.....	.....	.....	.....	.....
11	6.4	8.7	8.3	6.95	6.15	8.0	.....	.....	.....	.....	.....	.....
12	6.45	9.2	8.3	6.85	6.1	8.7	.....	.....	.....	.....	.....	.....
13	6.45	9.4	8.2	7.0	6.2	10.0	.....	.....	.....	.....	.....	.....
14	6.45	9.9	8.2	6.95	6.15	9.6	.....	.....	.....	.....	.....	.....
15	6.55	9.9	8.1	6.85	6.2	9.3	.....	.....	.....	.....	.....	.....
16	6.65	8.7	8.1	6.75	6.35	9.0	.....	.....	.....	.....	.....	.....
17	6.95	8.4	8.1	6.7	6.65	8.9	.....	.....	.....	.....	.....	.....
18	6.75	8.3	8.1	6.65	6.65	8.7	.....	.....	.....	.....	.....	.....
19	6.45	8.2	8.0	6.65	6.5	8.8	.....	.....	.....	.....	.....	.....
20	6.8	8.2	8.0	6.9	6.5	8.7	.....	.....	.....	.....	.....	.....
21	6.8	8.1	7.9	6.75	7.25	8.6	.....	.....	.....	.....	.....	.....
22	6.5	8.2	7.8	6.8	7.6	8.4	.....	.....	.....	.....	.....	.....
23	6.4	9.0	7.9	6.7	7.2	8.2	.....	.....	.....	.....	.....	.....
24	6.4	9.5	7.8	6.65	7.0	8.1	.....	.....	.....	.....	.....	.....
25	6.45	9.3	7.7	6.5	7.2	7.9	.....	.....	.....	.....	.....	.....
26	6.5	9.0	7.7	6.4	7.6	7.8	.....	.....	.....	.....	.....	.....
27	6.55	8.9	7.6	6.45	7.6	7.7	.....	.....	.....	.....	.....	.....
28	6.55	8.9	7.6	6.4	7.45	7.5	.....	.....	.....	.....	.....	.....
29	6.45	.....	7.45	6.35	8.3	7.5	.....	.....	.....	.....	.....	.....
30	6.55	.....	7.45	6.1	9.1	7.35	.....	.....	.....	.....	.....	.....
31	6.6	.....	7.35	.....	8.7	.....	.....	.....	.....	.....	.....	.....

TABLE XV.

RATING TABLE FOR FOX RIVER AT WEDRON, ILLINOIS, 1914–1915

Gage Height feet.	Discharge Sec.-feet.	Gage Height feet.	Discharge Sec.-feet.	Gage Height feet.	Discharge Sec.-feet.
5.6	163	7.1	1,290	8.6	3,200
5.7	210	7.2	1,390	8.7	3,380
5.8	261	7.3	1,490	8.8	3,570
5.9	316	7.4	1,590	8.9	3,770
6.0	375	7.5	1,700	9.0	3,980
		7.6	1,810		
6.1	438	7.7	1,930	9.1	4,190
6.2	505	7.8	2,050	9.2	4,410
6.3	577	7.9	2,170	9.3	4,640
6.4	654	8.0	2,300	9.4	4,880
6.5	735			9.5	5,120
6.6	820	8.1	2,430	9.6	5,370
6.7	910	8.2	2,570	9.7	5,630
6.8	1,000	8.3	2,720	9.8	5,900
6.9	1,090	8.4	2,870	9.9	6,170
7.0	1,190	8.5	3,030	10.0	6,450

TABLE XVI.

DAILY DISCHARGE IN SECOND-FEET OF FOX RIVER AT WEDRON, ILL., 1914.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1												577
2												654
3												616
4												616
5											1,000	438
6											910	541
7											865	541
8											910	654
9											778	654
10											955	616
11											820	577
12											778	577
13											694	
14											778	
15											616	
16											577	
17											694	
18											694 Est.	
19											650 Est.	
20											300 Est.	
21											550 Est.	
22											438	
23											505	
24											472	
25											654	
26											541	
27											406	
28											363	
29											541	
30											505	
31												

Est. mean 400 second-feet.

TABLE XVII.

DAILY DISCHARGE IN SECOND-FEET OF FOX RIVER AT WEDRON, ILL., 1915.

DAY.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	Est. mean 550 sec.-ft.	4,190	4,190	1,490	577	2,870	.....	.....	.....	.....	.....	.....
2		3,380	4,190	1,390	472	2,720	.....	.....	.....	.....	.....	.....
3		2,570	4,190	1,390	577	2,570	.....	.....	.....	.....	.....	.....
4		2,570	3,980	1,390	694	2,570	.....	.....	.....	.....	.....	.....
5		6,450	3,770	1,090	778	2,430	.....	.....	.....	.....	.....	.....
6		5,120	3,380	1,240	694	2,170	.....	.....	.....	.....	.....	.....
7		3,380	3,380	1,140	654	2,300	.....	.....	.....	.....	.....	.....
8		3,030	3,200	1,140	616	2,300	.....	.....	.....	.....	.....	.....
9		2,870	2,870	1,090	472	2,170	.....	.....	.....	.....	.....	.....
10	654	2,430	2,870	1,090	438	2,050	.....	.....	.....	.....	.....	.....
11	654	3,380	2,720	1,140	472	2,300	.....	.....	.....	.....	.....	.....
12	694	4,410	2,720	1,040	438	3,380	.....	.....	.....	.....	.....	.....
13	694	4,880	2,570	1,190	505	6,450	.....	.....	.....	.....	.....	.....
14	694	6,170	2,570	1,140	472	5,370	.....	.....	.....	.....	.....	.....
15	778	6,170	2,430	1,040	505	4,640	.....	.....	.....	.....	.....	.....
16	865	3,380	2,430	955	616	3,980	.....	.....	.....	.....	.....	.....
17	1,140	2,870	2,430	910	865	3,770	.....	.....	.....	.....	.....	.....
18	955	2,720	2,430	865	865	3,380	.....	.....	.....	.....	.....	.....
19	694	2,570	2,300	865	735	3,570	.....	.....	.....	.....	.....	.....
20		2,570	2,300	1,090	735	3,380	.....	.....	.....	.....	.....	.....
21	Est. mean 650 sec.-ft.	2,430	2,170	955	1,440	3,200	.....	.....	.....	.....	.....	.....
22		2,570	2,050	1,000	1,810	2,870	.....	.....	.....	.....	.....	.....
23		3,980	2,170	910	1,390	2,570	.....	.....	.....	.....	.....	.....
24		5,120	2,050	865	1,190	2,430	.....	.....	.....	.....	.....	.....
25		4,640	1,930	735	1,390	2,170	.....	.....	.....	.....	.....	.....
26		3,980	1,930	654	1,810	2,050	.....	.....	.....	.....	.....	.....
27		3,770	1,810	694	1,810	1,930	.....	.....	.....	.....	.....	.....
28		3,770	1,810	654	1,640	1,700	.....	.....	.....	.....	.....	.....
29		.....	1,640	616	2,720	1,700	.....	.....	.....	.....	.....	.....
30		.....	1,640	438	4,190	1,540	.....	.....	.....	.....	.....	.....
31		.....	1,540	.....	3,380	.....	.....	.....	.....	.....	.....	.....

TABLE XVIII.

MONTHLY DISCHARGE OF FOX RIVER AT WEDRON, ILL., 1914–1915.

MONTH.	DISCHARGE IN SECOND-FEET.				Run-Off—Depth in Inches, on Drainage Area.
	Maximum.	Minimum.	Mean.	Per Sq. Mile.	
November, 1914	1,000	300	654	.262	.25
December, 1914	654	168	473	.189	.22
January, 1915	1,140	605	664	.265	.31
February, 1915	6,170	2,430	3,760	1.504	1.56
March, 1915	4,190	1,540	2,630	1.052	1.21
April, 1915	1,490	438	1,010	.404	.45
May, 1915	4,190	438	1,130	.452	.52
June, 1915	6,450	1,540	2,880	1.152	1.28

TABLE XIX.

DISCHARGE MEASUREMENT OF THE FOX RIVER, AURORA, ILL., YEAR ENDING SEPTEMBER 30, 1914.

DATE.	HYDROGRAPHER.	Width, Feet.	Area Section, Squate Feet.	Gage, Height.	Discharge, Sec. Feet.
1. July 14	B. J. Peterson	183	483	1.79	810
2. July 28	B.J. Peterson.	180	442	1.54	557
3. September 4	William Kessler	169	323	0.89	173

TABLE XX.

DAILY GAGE HEIGHT, IN FEET, OF FOX RIVER AT AURORA, ILL., 1914.

Day.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1								1.32	1.38			
2								1.28	1.35			
3								1.38	1.31			
4								1.44	1.25			
5								1.23	1.41			
6								1.06	1.05			
7								1.25	1.05			
8								1.16	1.15			
9								.95	1.52			
10								1.21	1.44			
11								1.23	1.48			
12								1.22	1.65			
13								1.21	1.39			
14								1.24	1.46			
15								1.14	1.51			
16								.75	1.54			
17								.85	1.45			
18								.67	1.35			
19								.88	1.44			
20								1.26	1.66			
21								1.12	1.88			
22								1.09	1.75			
23								.95	1.81			
24								1.19	1.79			
25								1.05	1.82			
26								1.26	1.81			
27								1.16	1.90			
28								1.28	2.04			
29							1.45	1.26	1.85			
30							1.40	1.08	1.81			
31							1.33	1.32				

TABLE XXI.

DAILY GAGE HEIGHT, IN FEET, OF FOX RIVER AT AURORA, ILL., 1915.

Day.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1										1.86		
2										1.82		
3										1.82		
4										1.72		
5										1.79		
6										1.82		
7										1.78		
8										1.74		
9										1.70		
10										1.68		
11										1.60		
12										1.75		
13										1.65		
14										1.68		
15										1.62		
16										1.71		
17										1.78		
18										1.79		
19										1.80		
20										1.84		
21										1.91		
22										1.92		
23										1.96		
24										2.02		
25										2.09		
26										2.24		
27										2.12		
28										2.05		
29										2.14		
30										2.11		
31										Discon	tinued.	

The Fox River is crossed by 56 bridges within the State of Illinois. Of these 35 are highway, 3 are foot, and 18 are railroad bridges. The old highway bridges are generally through steel trusses on stone or concrete abutments, although at Elgin there is an old wooden bridge. The later highway bridges are nearly all concrete arch spans. At St. Charles, Geneva, Batavia, Aurora, and Montgomery this is the prevailing type and an effort has been made to use an attractive design and produce a beautiful structure. At Geneva, a park and connecting foot bridge lead from the main concrete arch highway bridge to a playground built on one of the many islands in the Fox. The effect is both pleasing and useful and forms a bright spot and recreation ground convenient to the heart of the city. Just below Geneva private interests have transformed another island into a beauty spot, and connected it with the mainland by well designed bridges.

The railroad bridges are not as modern, generally speaking, as the highway bridges, and there are numerous pile trestles. These are both unsightly and are a source of trouble in accumulation of drift as well as themselves offering some restriction to the flow of the stream. There is always the tendency to use the trestle as a convenient place to dump surplus waste material and there are evidences that in many cases this has been done, partially filling in the bed of the river, or building out the banks into the stream proper. These trestles are generally under electric tracks or switch tracks of the steam lines. The main line railroad bridges are generally deck girders or deck truss spans. A detailed list of the bridges crossing the Fox River is given in Table XXII with the clearance and depth of the water as observed at the time of examination.

There are numerous existing and abandoned dams along the Fox River. These are discussed in detail in Chapter IV.

TABLE XXII.

BRIDGES OVER FOX RIVER IN ILLINOIS.

Location.	Purpose.	Material.	Type.	No. Spans.	Abutments.	Clearance.	Depth, Water.	Date.	Date, Built.	Built By.
Nelson City	Highway	Steel	T. Tr.	1	Stone	9.0	5.0	12-10-15	1903	Joliet Bridge & Iron Co.
Fox Lake	Footbridge	Wood	Tres.	1	Wood	8.0	3.2	12-10-15		
Fox Lake	C. M. & St. P.	Wood and Steel	Draw	11	Wood	8.6	4.7	12-10-15		
Fox Lake	C. M. & St. P.	Tres.	Tres.	3	Wood	9.9	3.2	12-10-15		
Johnsburg	Highway	Steel	T. Tr.	3	Concrete	13.0	4.6	10-19-15	1902	
McHenry	Highway	Steel	T. Tr.	3	Concrete	9.4	6.0	10-20-15		
New Burton	Highway	Concrete	Arch	5	Concrete	8.1	2.4	10-20-15	1915	J. J. O'Heron Co.
Old Burton	Highway	Steel	T. Tr.	4	Stone and caisson	6.2	2.4	10-20-15		
Rawsons	Highway	Steel	T. Tr.	3	Concrete and caisson	8.0	7.3	10-20-15	1908	Continental Bridge Co.
Cary	Highway	Steel	T. Tr.	4	Concrete and caisson	8.1	8.4	10-20-15	1898	Joliet Bridge & Iron Co.
Cary	C. & N. W. Ry.	Steel	D. Tr.	2	Stone	17.4	8.5	10-20-15		
Algonquin	Highway	Steel	Truss	4	Concrete and caisson	5.55	9.4	10-21-15		
Algonquin	C. & N. W. Ry.	Steel	D. Gr.	3	Stone	11.8	5.3	10-21-15		
Carpentersville	C. & N. W. Ry.	Timber	Tres.	26	Wood	7.1	4.0	10-21-15		
Carpentersville	Highway	Steel	T. Tr.	2	Stone	8.0	3.3	10-21-15	1899	J. G. Wagner Co.
Carpentersville	Footbridge	Steel	T. Tr.	5	Stone	7.2	2.9	10-21-15		
Dundee	Highway	Steel	T. Tr.	3	Stone and caisson	7.2	2.9	10-21-15		
Dundee	A. E. & C. Ry.	Timber	Tres.	9	Wood	7.2	6.5	10-21-15		
Dundee	C. & N. W. Ry.	Timber	Tres.	24	Wood	14.3	6.2	10-21-15		
Elgin	Highway	Timber	Tres.	24	Wood	9.5	7.5	10-22-15		
Elgin	Chicago Street	Steel	½ Tr. Gr.	3	Concrete	9.3	3.2	10-22-15	1900	Chicago Steel Bridge Co.
Elgin	National Street	Steel	Tr.	3	Concrete and stone	8.6	5.7	10-22-15	1901	Massilon Bridge Co.
Elgin	C. M. & St. P. Ry.	Steel	D. G.	6	Stone	12.0	8.8	10-22-15		
Elgin	C. & N. W. Ry.	Steel	D. G.	5	Concrete	13.5	4.7	10-22-15		
S. Elgin	Highway	Steel	T. Tr.	6	Stone	11.1	3.2	10-22-15		
S. Elgin	I. C. Ry.	Steel	D. Tr.	6	Stone	26.0	3.4	10-22-15		
S. Elgin	A. E. & C. Ry.	Timber	Tres.	29	Concrete	10.3	2.0	10-22-15		
St. Charles	C. & G. W.	Steel	D. Tr.	5	Concrete	14.7	7.0	10-26-15		
St. Charles	Highway	Concrete	Arch	4	Concrete	9.1	2.0	10-26-15	1902	
St. Charles	Footbridge	Steel	Tr.	3	Concrete	8.1	2.3	10-26-15		
Geneva	Highway	Concrete	Arch	7	Concrete	13.0	2.0	10-26-15		
Geneva	C. & N. W. Ry.	Steel	D. Tr.	4	Stone	24.9	1.5	10-26-15		
Fabyians	Highway	Wood	T. Tr.	4	Concrete	4.9	6.3	10-26-15		
Batavia	Highway	Concrete	Arch	3	Concrete	17.8	4.2	10-28-15		
N. Aurora	Highway	Steel	T. Tr.	2	Stone	10.7	6.1	10-28-15	1887	Milwaukee Bridge & Iron Co.
N. Aurora	Footbridge	Steel and wood	Susp.	2	Wood	8.4	2.7	10-28-15		
Aurora	Illinois Street	Steel	T. Tr.	4 R	Concrete	6.8	4.0	10-28-15		
Aurora	Illinois Street	Steel	T. Tr.	2 L	Concrete	6.7	4.4	10-28-15		

TABLE XXII.

BRIDGES OVER FOX RIVER IN ILLINOIS.

Location.	Purpose.	Material.	Type.	No. Spans.	Abutments.	Clearance.	Depth, Water.	Date.	Date, Built.	Built By.
Aurora	Walnut Street	Steel	T. Tr	4	Stone	10.1	3.2	10-28-15		
Aurora	Main Street	Concrete	Arch	2 L	Concrete	10.5	2.4	10-28-15		
Aurora	Fox Street	Concrete	Arch	2 R	Concrete	14.0	2.7	10-28-15	1909	Roemheld Construction Co.
Aurora	Fox Street	Concrete	Arch	3 L	Concrete	13.4	2.1	10-28-15	1909	Roemheld Construction Co.
Aurora	C. B. & Q. R. R.	Steel	D. G.	6	Concrete and stone	13.7	4.5	10-28-15		
Aurora	N. Avenue	Steel	T. Tr	4	Stone	14.7	1.5	10-28-15	1884	Milwaukee Bridge Co.
Aurora	E. J. & E. Ry	Steel	T. Tr	2	Stone	20.7	2.7	10-28-15		
Montgomery	Highway	Concrete	Arch	4	Concrete	12.4	4.7	10-29-15	1914	Newkirk & Powers.
Montgomery	C. B. & Q. R. R.	Steel	D. G.	4	Stone and concrete	11.9	3.6	10-29-15		
Oswego	Hwy. & Elect	Steel	T. Tr	3	Stone	15.7	4.6	10-29-15	1900	Joliet Bridge & Iron Co.
Yorkville	Highway	Steel	T. Tr	1 L	Stone	13.8	2.5	10-29-15	1890	Wrought Iron Bridge Co.
Yorkville	Highway	Steel	T. Tr	1 R	Stone	17.0	7.7	10-29-15	1873	Wrought Iron Bridge Co.
Plano	Highway	Steel	T. Tr	3	Stone	13.3	3.5	10-29-15	1884	Milwaukee Bridge & Iron Co.
Millbrook	Highway	Steel	T. Tr	3	Stone	12.0	2.0	10-29-15	1897	Bellefontaine Bridge & Iron Co.
Millington	Highway	Steel	T. Tr	3	Stone	17.0	2.7	11- 4-15		Morse Bridge Co.
Sheridan	Highway	Steel	T. Tr	2	Stone	17.2	3.2	11- 4-15	1887	Clinton Bridge & Iron Works.
Sheridan	Highway	Steel	Arch	2	Stone	21.8	7.8	11- 4-15		
Sheridan	C. B. & Q. R. R.	Steel	D. Tr	2	Stone	20.9	5.2	11- 4-15		
Serena	Highway	Steel	T. Tr	2	Concrete	17.0	4.1	11- 4-15	1902	Indiana Bridge Co.
Wedron	Highway	Steel	T. Tr	2	Stone	18.5	7.2	11- 4-15	1878	Wrought Iron Bridge Co.
Dayton	Highway	Steel	T. Tr	3	Stone	21.3	2.8	11- 5-15	1886	Chicago Bridge & Iron Co.
Ottawa	C. R. I. & P. Ry	Steel	D. G.	5	Stone	21.2	3.7	11- 3-15		
Ottawa	Highway	Steel	T. Tr	7	Stone	21.5	4.0	11- 3-15		
Ottawa	Main Street	Steel	Arch	1	Stone	23.6	5.6	11- 3-15		
Ottawa	Main Street Electric	Steel	T. Tr	3	Concrete	24.2	5.6	11- 3-15		

CHAPTER III.

Stream Flow and Floods.

The only authentic gagings of the Fox River are those at Elgin, Wedron, Aurora and Sheridan. The records for Elgin and Wedron are shown in Tables V to XVIII, inclusive, and Report of Rivers and Lakes Commission, 1914*. Those at Aurora are given in Tables XIX to XXI, inclusive. Those at Sheridan and Ottawa are given in Report of Rivers and Lakes Commission 1914*.

At present the best records along the Fox River are inadequate for careful work, and the conclusions drawn from them are of a more or less general nature. Records extending over a much longer period probably would show material modifications. The results of the observations at Sheridan, Wedron and Elgin are shown graphically in the following hydrographs, Plates II to VI, inclusive. The ver-

View of the Fox River, near Batavia.

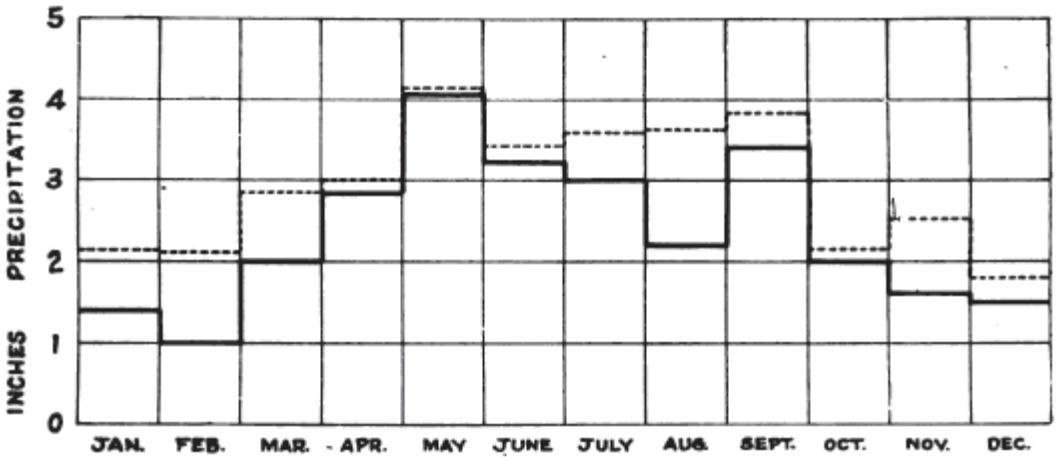
tical distances represent cubic feet per second of flow in the corresponding months as shown horizontally. It will be readily seen that these data are fragmentary. There is not a continuous record for one year at any of the stations. When it is also borne in mind that 1915

* Water Resources of Illinois. Report of Rivers and Lakes Commission of Illinois, 1914.

has been an exceptional year, with protracted rains and low temperature, the value of this data becomes even less and any conclusions as to the probable monthly stream flow drawn from it alone would be in serious error. To get more nearly at the truth, reference must also be made to other streams in this section of the country where climate,

River Road along Fox River near Aurora.

PLATE I.



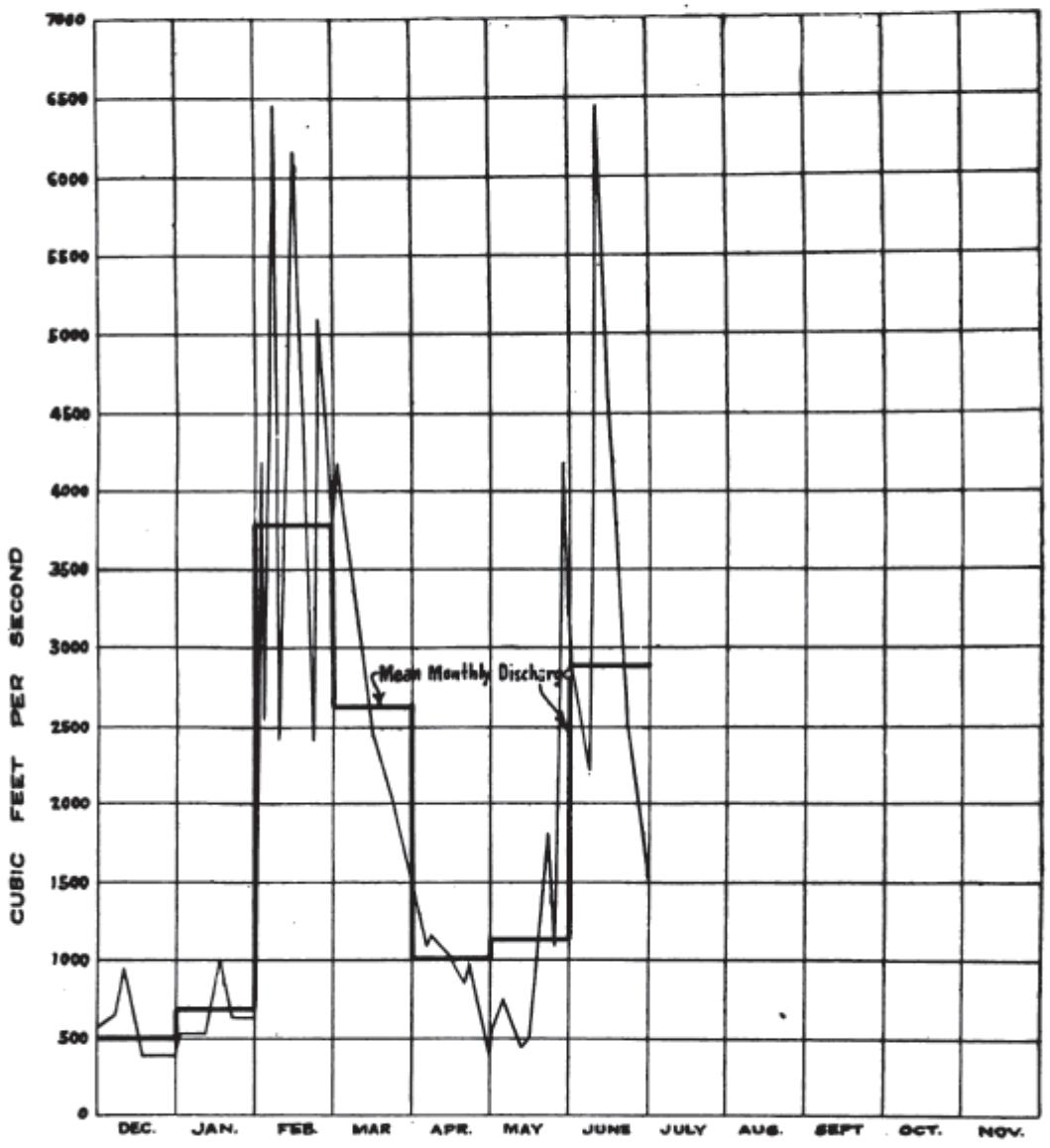
Fox Basin, average annual..... 35.64 in.
Rock Basin, average annual..... 32.00 in.

Heavy lines show average monthly precipitation on the Rock River Basin for eleven years. Dotted lines show average monthly precipitation on the Fox River, taken from Table XXI.

RIVERS AND LAKES COMMISSION.

Comparison by typical monthly rainfall diagrams of the precipitation on the Fox and Rock River Basins.

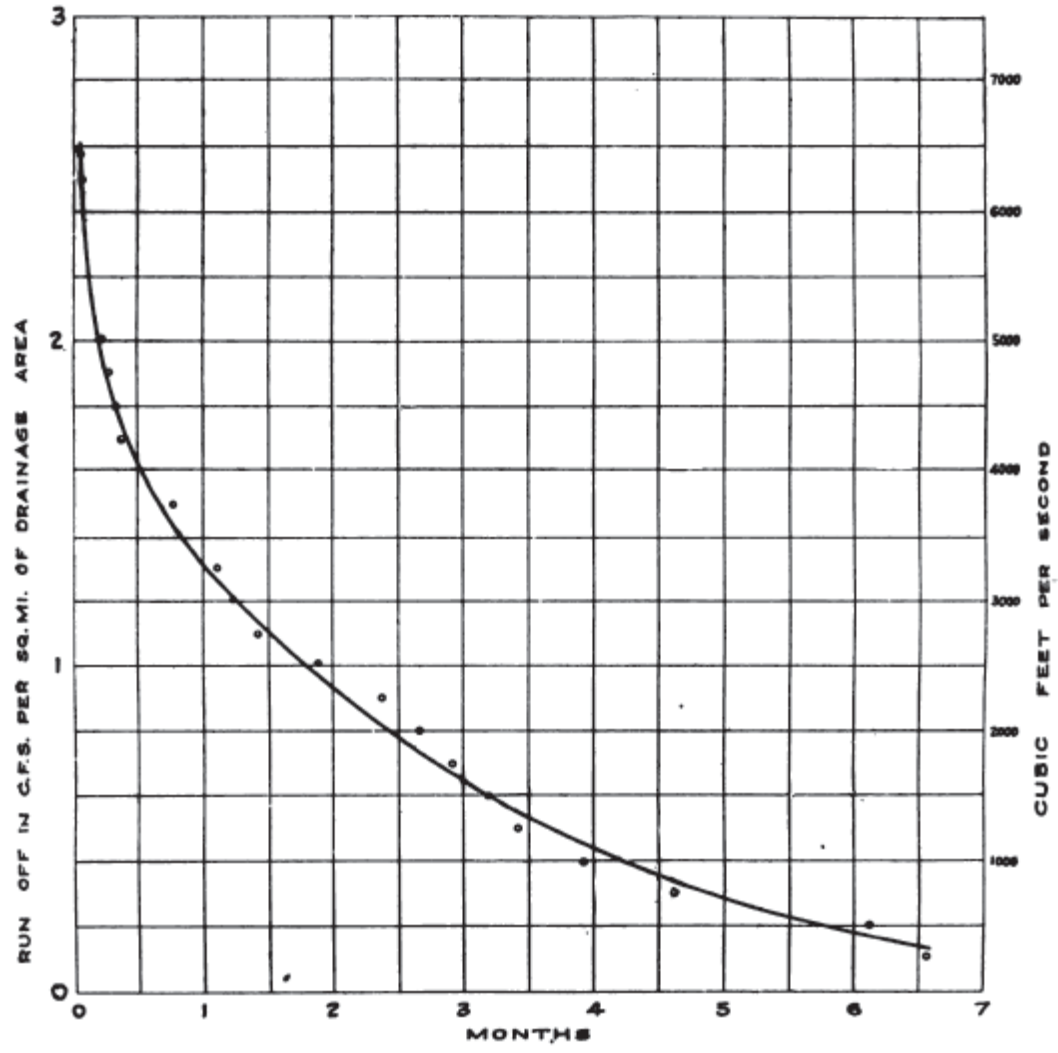
PLATE II.



RIVERS AND LAKES COMMISSION.

Hydrograph of the Fox River at Wedron, Ill., 1914-1915. Drainage area, 2,500 sq. mi.

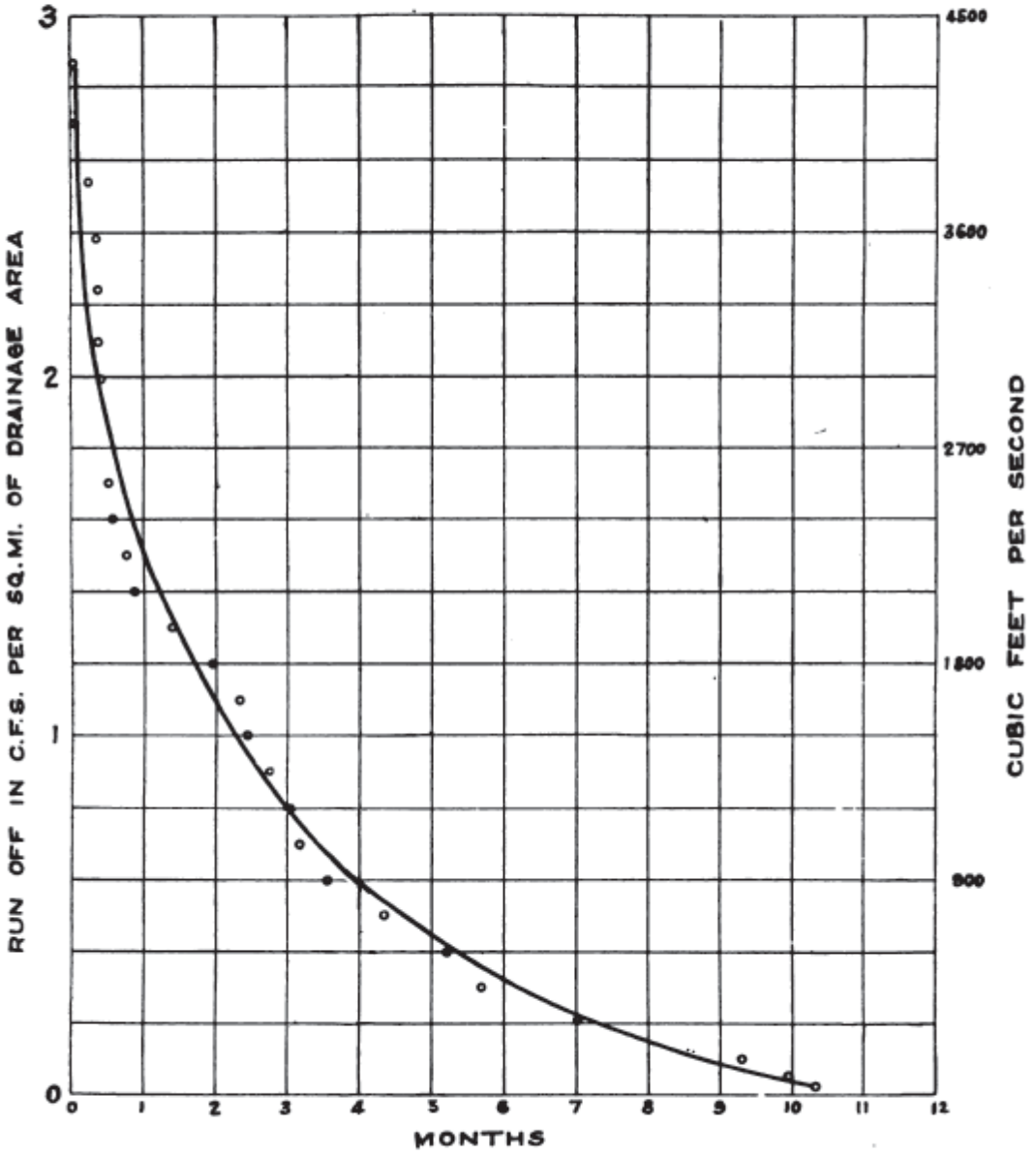
PLATE III.



RIVERS AND LAKES COMMISSION.

Run-off and Discharge Curve of the Fox River at Wedron, Ill. Nov., 1914 to July, 1915. Drainage area, 2,500 sq. mi.

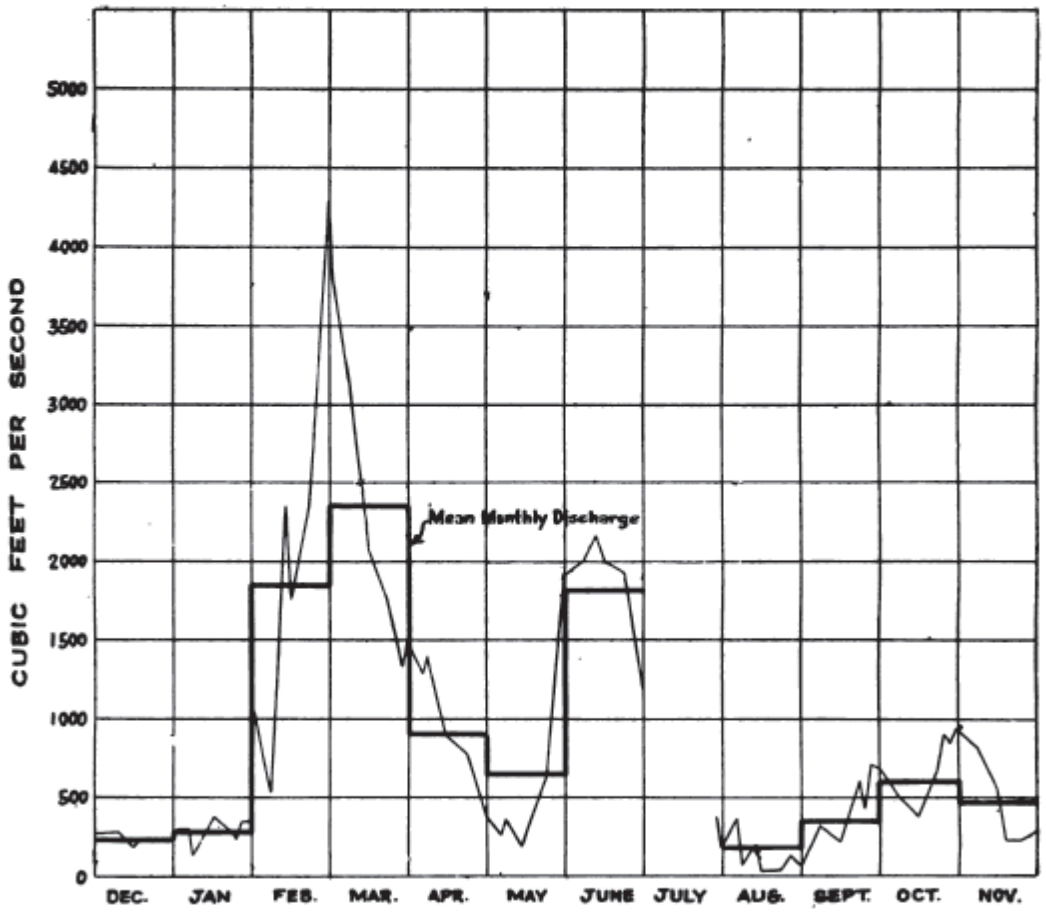
PLATE IV.



RIVERS AND LAKES COMMISSION.

Run-off and Discharge Curve of the Fox River at South Elgin, Ill. July, 1914, to June, 1915. Drainage area, 1,500 sq. mi.

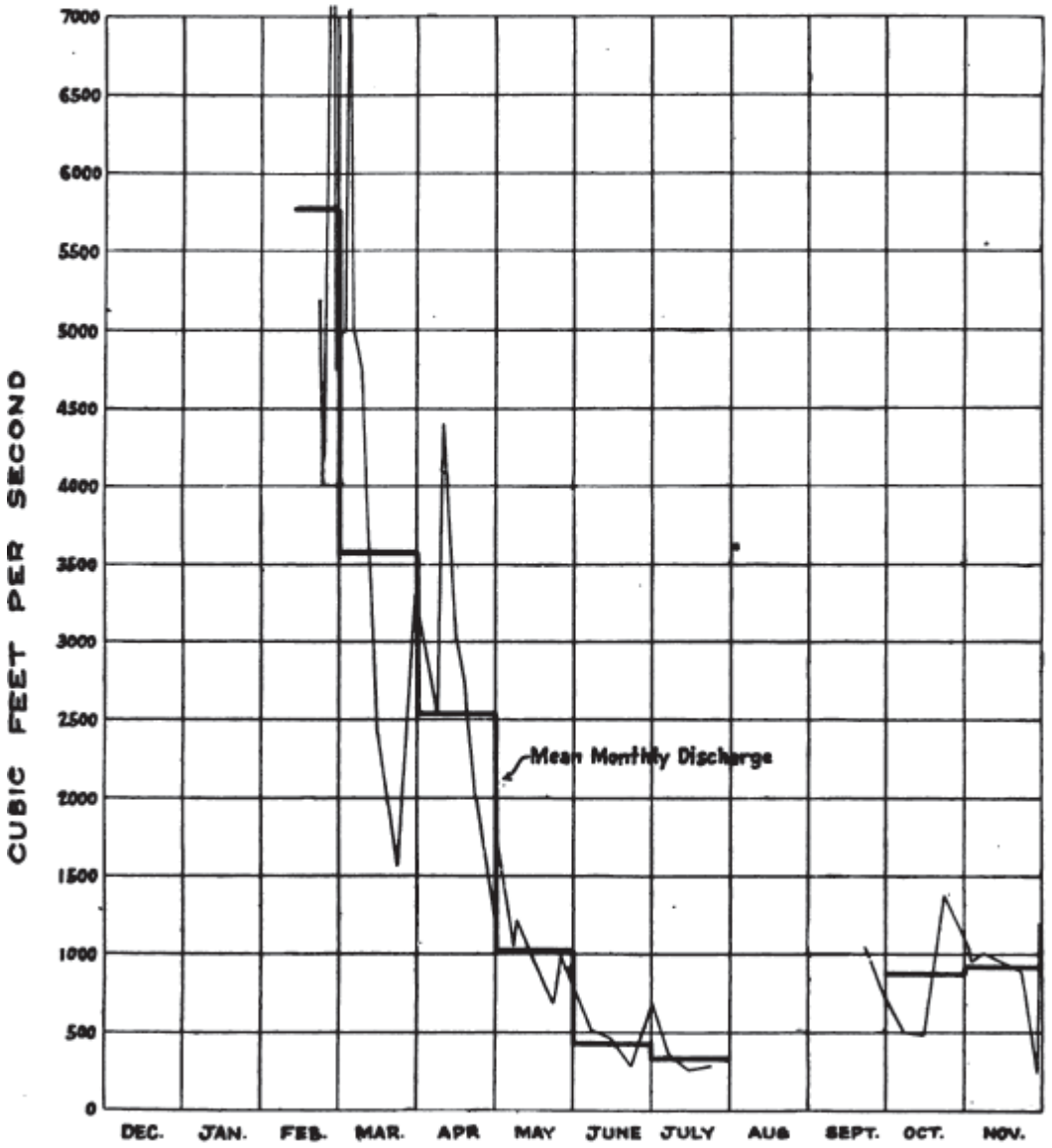
PLATE V.



RIVERS AND LAKES COMMISSION.

Hydrograph of the Fox River at South Elgin, Ill. 1914-1915.
Drainage area, 1,500 sq. mi.

PLATE VI.

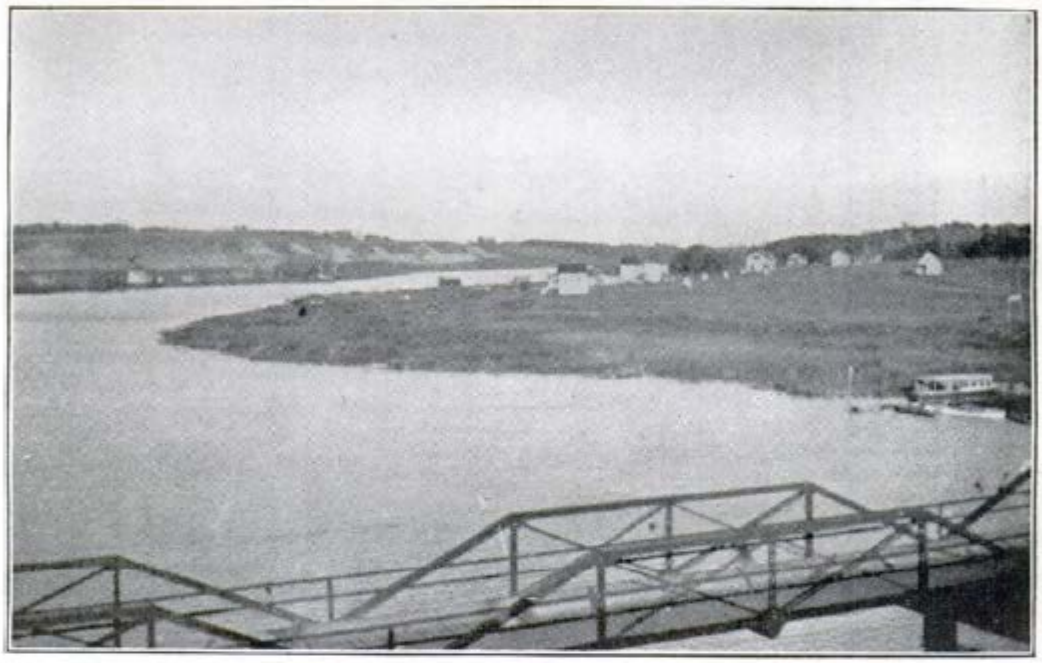


RIVERS AND LAKES COMMISSION.

Hydrograph of the Fox River at Sheridan, Ill. 1905-1906.
Drainage area, 2,190 sq. mi.

rainfall and physical characteristic are similar and where there are more nearly complete records of discharge. By comparison of the Fox and Rock rivers we find a marked similarity exists. Both are fed by numerous lakes and have similar feeders. The geological conditions of the two drainage areas are similar, and if the rainfall is also similar and its distribution throughout the year about the same in each case, it is reasonable to assume that the run-off into the streams is similar and consequently that the discharge of the two rivers is proportional to their drainage areas.

There are available precipitation records for Antioch, Aurora, Elgin, St. Charles, Ottawa, and Wheaton and these are given in Report of Rivers and Lakes Commission, 1914*. The means are given



Cary, Ill., looking upstream, 1915.

in Table XXIII and the average mean precipitation shown for each month. The entire drainage basin is covered with glacial drift containing much limestone. Elevations above sea-level along the river are: Pewaukee Lake, Wis., 848 ft.; Waukesha, Wis., 794 ft.; Ottawa,

TABLE XXIII.

MEAN ANNUAL PRECIPITATION ON THE FOX RIVER BASIN.

Location.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
Aurora.....	2.20	2.26	2.62	2.97	4.08	4.11	3.47	3.52	3.66	2.54	2.45	1.98	35.96
Antioch.....	1.71	1.52	2.03	3.44	3.92	3.18	3.38	4.58	4.15	1.79	2.18	1.58	34.71
Elgin.....	2.25	2.18	2.61	2.67	4.44	3.56	3.56	3.62	3.74	2.39	2.45	1.20	34.09
St. Charles...	1.97	2.34	3.13	2.83	4.12	3.20	3.98	3.90	4.52	2.02	2.52	1.95	37.13
Ottawa.....	2.20	2.08	2.77	2.94	4.10	3.48	3.76	3.27	3.51	1.94	2.36	1.98	34.49
Wheaton....	2.55	2.29	3.83	3.22	4.26	2.85	3.38	3.87	3.38	2.19	3.18	2.12	37.46
Average...	2.14	2.11	2.83	3.01	4.15	3.40	3.59	3.63	3.83	2.14	2.52	1.80	35.64

* Water Resources of Illinois. Report of Rivers and Lakes Commission of Illinois, 1914.

460 ft. About 30 per cent of the basin in Wisconsin is forested, practically none in Illinois is forested. The mean temperature is 47 degrees. The winters in Wisconsin are severe, snowfall is heavy, and ice forms a foot or more thick on the streams. The winters in Illinois are milder. By Table XXIII it is seen that the mean annual rainfall on the Fox River basin is 35.64 inches.

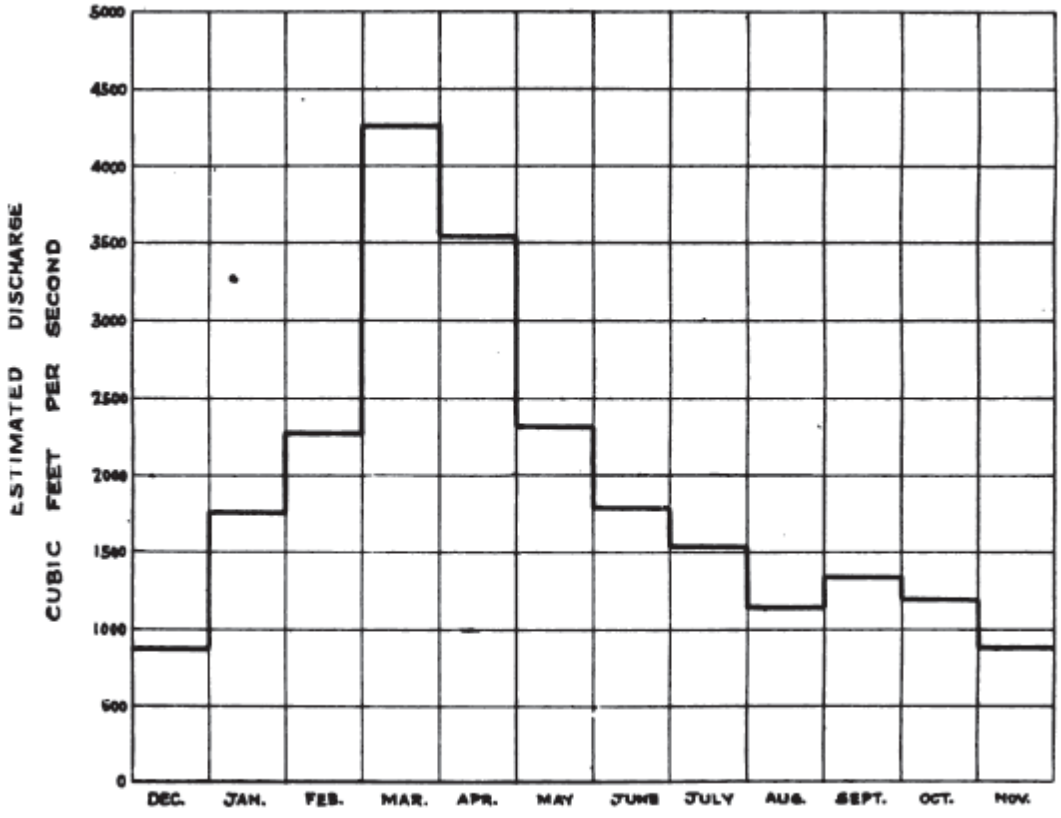
A comparison of rainfall per month for the Rock River and Fox River basins is shown graphically on Plate I. This is taken from the records of the United States weather reports for stations within these areas. It will be seen that there is slightly more precipitation in the

View along the Fox River near Aurora.

Fox River basin fairly well distributed throughout the year. Each gets its maximum rainfall during May and again in September there is a heavy fall. The Fox River basin, however, has a nearly constant precipitation during June, July and August, while along the Rock River it decreases steadily during these months. With the exception of small differences, however, they agree fairly well in general distribution, bearing in mind that the Rock River basin is generally dryer than that of the Fox River.

The drainage basin of the Rock River at Rockton is 6,290 square miles, and that of the Fox River at Wedron, Illinois, is 2,500 square miles or 0.4 as large. If the amount of water reaching these streams per square mile of drainage basin is the same in each case, as is a fair assumption from the foregoing discussion, then the average monthly discharge of the Fox River would be as shown on the hydrograph Plate VII. As Wedron is close to the mouth of the river, the flow at that point may be taken as representing the total discharge of this stream. From a study of this information it is apparent that

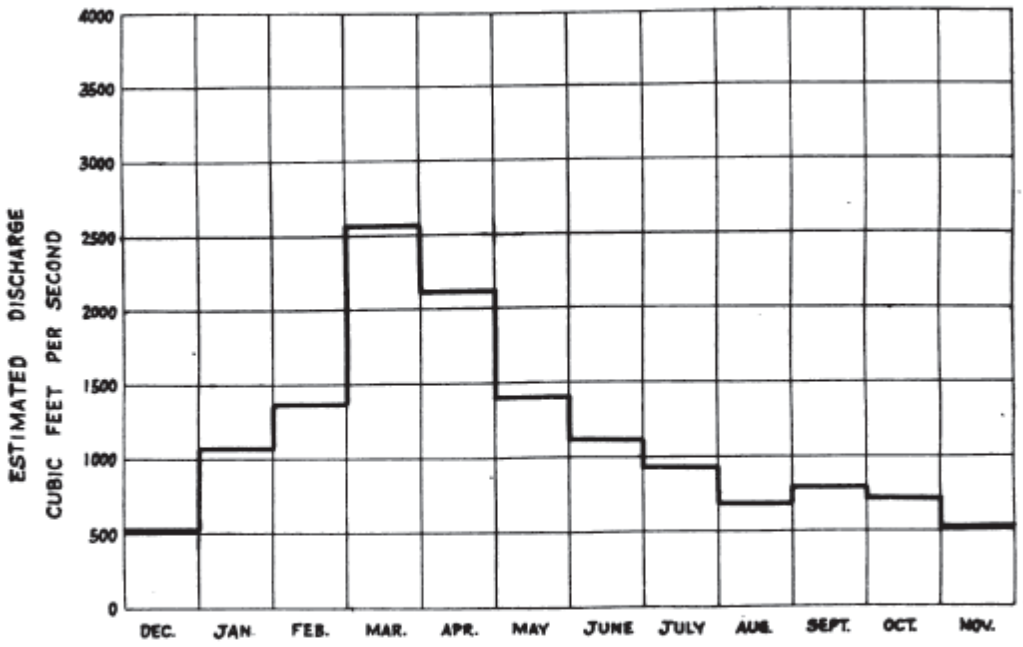
PLATE VII.



RIVERS AND LAKES COMMISSION.

Hydrograph of Fox River at Wedron, based on Rock River at Rockton. 1903-1909. Drainage area, 2,500 sq. mi.

PLATE VIII.



RIVERS AND LAKES COMMISSION.

Hydrograph of the Fox River at South Elgin, based on Rock River at Rockton. 1903-1909. Drainage area, 1,500 sq. mi.

the minimum flow generally occurs in November and December and averages 870 cubic feet per second. This rapidly increases until it reaches a maximum of 4,250 cubic feet per second in March and then drops rapidly until in May there is 2,300 cubic feet per second. During the summer the flow gradually diminishes to 1,140 cu. ft. per sec. in August, rises slightly in September and then drops lower in the fall of the year. The mean average flow of the river at this point is shown to be 1,945 cu. ft. per second.

View of Fox Lake, Illinois.

The probable hydrograph for the Fox River at South Elgin can be determined in the same way. The area of the drainage basin in this case is 1,500 square miles, or practically 24 per cent of that of the Rock River at Rockton. This probable hydrograph is shown on Plate VIII. The maximum discharge is here seen to be 2,555 cu. ft. per sec. in March and a minimum of about 525 c. f. s. in November and December. The mean average flow for the year is 1,150 cu. ft. per sec. This does not mean, of course, that 2,555 c. f. s. is the maximum and 525 c. f. s. the minimum flow. In some years of flood it will greatly exceed this figure.

The average flow in the Rock River at Rockton for March, 1904, was 14,300 c. f. s. On March 23, 1904, the Rock River had a discharge of 27,100 c. f. s. at Rockton. Although probably not the greatest in height, this flood of 1904, produced an unusual flow rate. This flow is 2.55 times the average flow for March. Likewise the minimum flow on the Rock River is 950 c. f. s. on August 16, 1904, or 42 per cent of the minimum flow for December. On the basis of proportional watersheds, the 1904 flow at Wedron on the Fox River would have been 10,840 c. f. s. and 380 c. f. s. as the minimum flow

in August of the same year. At Elgin these figures would have been 6,500 c. f. s. maximum, and 230 c. f. s. minimum for 1904.

Although the records are not complete it seems to be pretty well established that there have been great floods on the Fox River in 1849, 1857, 1872, 1882 and 1902.

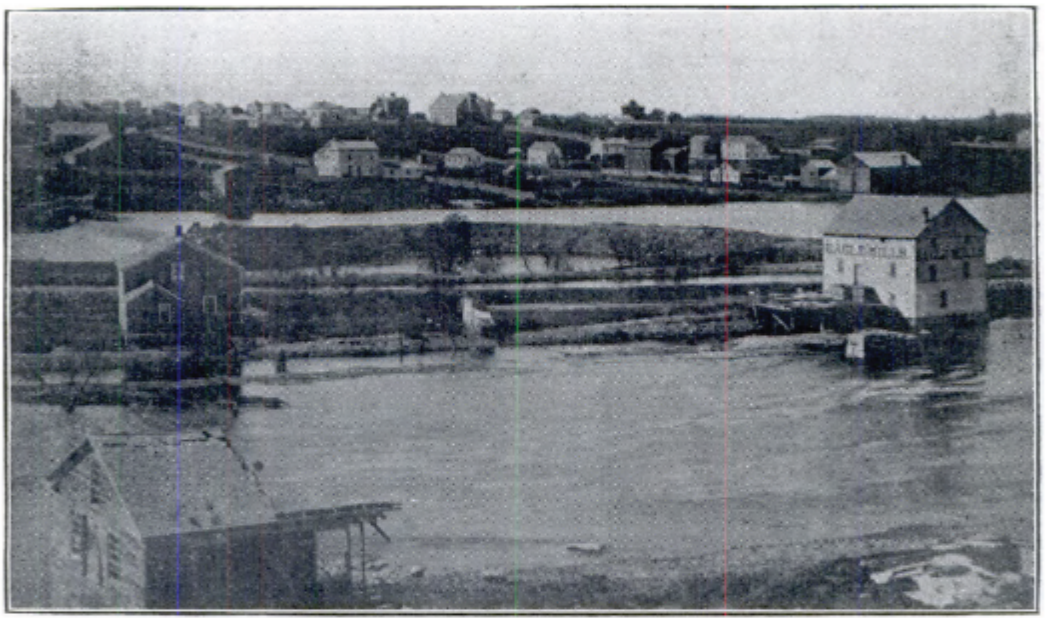
On Sunday night, March 11, 1849, and the Monday following, a great flood occurred on the Fox River caused by the sudden melting of immense quantities of snow and ice in the upper Fox River valley. The ice was very heavy and the damage was great. At Elgin the dam and bridge were washed out; at St. Charles the dam was badly

View of the Fox River after 1857 flood, looking S. W. from Fox Street (bridge in foreground).

injured and bridge destroyed; at Geneva a two hundred foot section of dam was removed and the bridge was damaged; at Batavia part of the upper bridge was washed out and the dam was injured; at Aurora McCarty's east dam and Hoyt's dam were injured; Hoyt's mill race was obliterated, the island was inundated, damaging Stolp's new raceway, and a small building near Gates' Brewery was washed out; at Montgomery the embankment was washed away and the paper mills and machine shop threatened by the high water; at Bristol the dam was entirely swept away; at Ottawa the bridge was washed away and the aqueduct was damaged.

Of all the floods, however, the one of 1857 seems to have been the most pronounced. Hicks' History of Kendall County states that it was the largest flood in this valley before or since that date. It was very destructive, especially in the lower reaches of the river. Heavy

rain on February 6, 1857, melted the accumulated snow and broke up the ice. All the bridges from Batavia to Ottawa were washed out and several dams upstream gave way. The only record of the height of the water is the statement that "the water was waist deep in Millington and many lives were lost." The present ground surface in Millington is fairly level and at elevation 569 to 570 M. D., approximately. This latter is the elevation of the C. B. & Q. R. R. tracks at the depot. This would make the flood waters of 1857 about Elev. 572 M. D. On November 4, 1915, the water surface at the Millington highway bridge was 545.7 M. D., and the water was approximately 2.7 feet deep under the bridge. Accordingly the high flood of 1857



Looking west to Stolp's Island, Aurora, from Main Street, after the flood of 1857. Note high-water mark on Eagle Mills.

would give a depth of thirty feet at this bridge, or approximately six feet over the floor of the present bridge.

The flood of 1872 was not as destructive as that of 1857, and the water was lower. Several dams in the lower reaches of the river were washed out, but there is no present record of the height of the water.

In the Fox Lake region reference is still found of the flood of 1882. At McHenry residents state that boats went around the ends of the McHenry highway bridge. On October 19, 1915, the water surface above this bridge was about Elev. 744 O. M. D. Then the flood waters in 1882 were at least at Elev. 750 M. D., and probably higher than this.

The high water of 1902 washed out some structures along the Fox River and did considerable damage, but there seems to be no authentic record of the height of the water.

There seems to have been many more floods in the days of the early settlement of the Fox River valley than in later years, although there were plenty of forested areas then while now there is practically no timber. In the early records frequent mention is found to washing out of dams and bridges year after year. The explanation for this is very likely due to the fact that originally the bridges were low wooden structures and the dams were crude affairs whose main reliance for stability consisted of logs across the channel. These were insecure affairs, and high water floated them away. Most of the early bridges were built by private subscription and at great sacrifice

Aurora, Ill., flood of 1857. Main Street Bridge washed out. People in foreground are on old bridge approach.

of time and money to the pioneer settlers. Often they were no sooner erected than a freshet would wash them away.

Then again the banks of the river have been raised through the towns and cities. Avaricious citizens, or the cities themselves, have dumped and filled in along the stream, widened and raised the banks, and so acquired valuable property areas. The later bridges and buildings along the streams have been built much higher and so are farther above the high-water elevation. Later construction has been of steel, brick, stone and concrete on rock foundations and is secure against floods that would originally have caused great damage and inconvenience. As the dams along the river were built, they withstood the floods and themselves acted as breakers to the force of the flood. The pools above the dams act as buffers to the floods and tend to retain the water and allow it to discharge gradually. This not only keeps the height of water down but reduces the velocity which in turn spreads the flow over a longer period of time. This is prob-

ably the reason why, of later years, few floods are noted along the Fox River even though the cutting off of the timber, the cultivation of land, and the consequent increased facility for rapid run-off of heavy precipitation is now much better than when the valley was originally settled and when frequent damaging floods were recorded. This is particularly true of the so-called "spring freshets" and what might be termed the average flood.

However, in great floods and great depths of water, when the dams are overtopped and drowned out, their effect on the height of the water becomes nearly negligible. The amount that the dam will raise the water, obstruct the flow and act as a safety valve, decreases as the water rises over the dam crest, until finally a slight ripple on the

Main Street, Aurora, looking upstream after the flood of 1857.

surface is the only evidence of its existence. In such a case the waters will have risen far over the river banks, flooded over the valley, and the area of the total cross section of the stream is so far in excess of the area near the river bottom which the dam affects, that the water passes downstream practically unaffected by the comparatively small structure in its original channel. The frequency of these large floods is very hard to determine. Two may occur close together and again it may be a century between them. So many factors enter into their production that a combination of protracted extraordinary precipitation, moderate temperature, quick run-off to the channel, geologic conditions making a comparatively impervious watershed, etc., may produce a great flood at any time, while the absence of any one factor may so modify the effect that no flood will occur.

During the survey of 1914 various high-water marks were noted along the stream. These were in the nature of ordinary floods as

distinguished from a great flood. These are shown in Table XXIV by sounding station and corresponding H. W. Elev., as noted. Sounding stations are platted on the detail sheets showing the survey.

TABLE XXIV.

HIGH WATER MARKS NOTED DURING 1914 SURVEY.

Sounding Stations.	High Water Elevation, M. D.	Sounding Stations.	High Water Elevation, M. D.	Sounding Stations.	High Water Elevation, M. D.
7	467.0	140	577.0	241	922.0
18	479.0	150	593.0	251	732.0
36	497.0	160	609.5	261	742.0
42	506.5	170	627.0	274	740.0
49	519.0	190	676.0	281	741.5
53	518.0	204	694.5	292	742.0
81	535.0	212½	697.C	301	743.0
89	543.5	220	710.0	314	745.0
100	545.5	230	719.0	324	745.5
110	554.0				

NOTE.—Location of sounding stations shown on Detail Sheets Nos. 1 to 50.

On the basis of the depth of water being waist deep in Millington during the flood of 1857 or practically 30 feet deep, by Kutter's formula the discharge would be approximately 112,350 c. f. s. In this computation it was borne in mind that at the early date of this great flood there was much more timber standing on the overflowed ground, and the obstruction to flow offered by the dams was less than at present.

The ordinary flood height at the same place is elevation 554 M. D., or 12 feet of water at Millington bridge. On the basis of Kutter's formula as above, the ordinary flood discharge at Millington at present would be about twenty-eight thousand cubic feet per second.

Aurora after the 1857 flood. Fox Street Bridge built.

Mr. Weston E. Fuller, M. Am. Soc. C. E., has made a very careful examination of floods on many streams and deduces the following formulæ as representing the results of his investigation:

If Q = the greatest average rate of flow for twenty-four consecutive hours during a period of years, in cubic feet per second.

Q (Max.) = the maximum rate of discharge of a flood in cubic feet per second.

T = the number of years in the period considered.

A = the catchment area of the river in square miles.

C = a coefficient which is constant for the river at the point of observation.

Then

$Q = CA^{0.8}$ (1 plus 0.8 log T).

Q (Max.) = A (1 plus $2A^{-0.3}$).

He gives the following table showing the relation between the maximum flood and the average twenty-four-hour flood on drainage areas of different sizes:

Relation between max. flood and average twenty-four-hour flood.

Q — (Max.) = Q (1 plus $2A^{-0.3}$).

Catchment area, square miles.	Ratio of max. flood to average twenty-four-hour flood.
0.1	5.0
1.0	3.0
5.0	2.23
10	2.00
50	1.62
100	1.50
500	1.31
1000	1.25
5000	1.15
10000	1.12
50000	1.08
100000	1.06

And also

Relation between flood to be expected in a series of years and the average yearly flood. (Based on the time interval.)

Q = Q (Ave.) (1 plus 0.8 log T).

Time in years.	Ratio of largest flood to average yearly flood.
1	1
5	1.56
10	1.80
25	2.12
50	2.36
100	2.60
500	3.16
1000	3.40

Using the value of 28,000 cubic feet per second previously given as the probable ordinary flood flow at Millington, then the maximum great flood that may occur each century according to Mr. Fuller's investigations would be about 73,000 cubic feet per second per

twenty-four-hour average and about 88,000 c. f. s. as the maximum rate of flow. This gives a value of "C" in his formula, equal to 61 when the corresponding value of "A" is 2,100 square miles at Millington. Owing to the uncertainty of the accuracy of the water elevation during the 1857 flood, it is probable that the previous value of 112,350 is too high.

In "Notes on Hydrology" by Daniel W. Mead, Mem. Am. Soc. C. E., after considering the flood records on a great many streams, the following formulæ are given as conclusions of the investigations:

(1) Q = (44,000 divided [M plus 170]) plus 20.
(2) Q = (127,000 divided [M plus 370]) plus 7.4.
M = drainage area in square miles.

Aurora, Ill. Flood of 1857, showing Stolp's Island under water. View near Fox Street.

No. 1 corresponds to floods which may occur occasionally and No. 2 to floods which may occur rarely. "Q" above is the maximum rate of discharge in second-feet per square miles of drainage basin. This would give 39.4 c. f. s. per square mile as rate of discharge for occasional floods and 58.8 c. f. s. per square mile as discharge for rare floods at Millington. Owing to the 40 square miles of lake pondage in the upper reaches of the Fox River, this value would be modified. The main group of lakes above McHenry have a combined area of 17.0 square miles. In Wisconsin there are six large lakes near the headwaters of tributary creeks. If we consider the Fox Lake group above McHenry as the main storage basin controlling the flow of the river over the dam at this point, and that the flood waters of the entire basin will enter this storage reservoir at practically the same time, then the run-off of each cubic foot per square mile above

McHenry would raise the level of the Fox Lake reservoir 2.6″ per day. From observations of the river valley the constructed point near McHenry for an overbank stage of the Fox River would be about 1,000 feet wide. The fall from the State line to McHenry is one foot in 17 miles. In 24 hours at 39.4 c. f. s. per square mile above McHenry the depth of water would be 8½ feet and the discharge of river below McHenry would then be 6,500 c. f. s. The drainage area below McHenry and above Millington, or 850 square miles, is not affected by the lake pondage, and at 39.4 c. f. s. per square mile would produce 33,490 c. f. s. at Millington. Owing to the much steeper slope of the river bed below McHenry it is most probable that

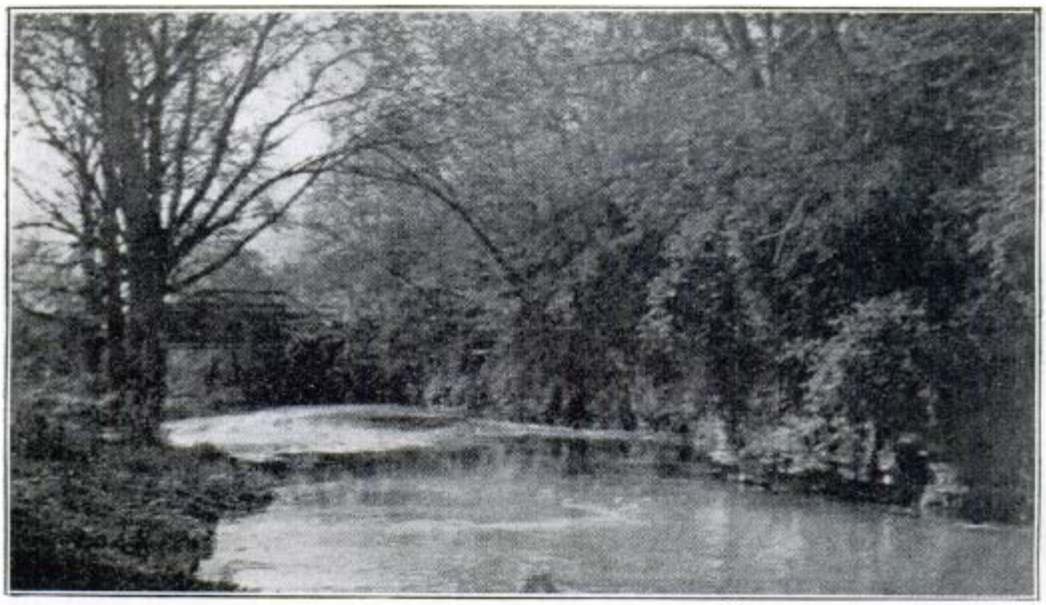
Looking north from Broadway, Aurora, Ill., after the flood of 1857.

the precipitation below McHenry would run off downstream prior to the lake waters reaching this point, and that the effect of the lake region would be simply to prolong the period of high water.

The rare flood discharge from the territory between McHenry and Millington would be 47,339 c. f. s. In the case of a rare flood the worst possible conditions should be anticipated, so that presumably the run-off will occur over a long enough time that the lake region flow will also tend to add to the height. The corresponding rise for 58.8 c. f. s. per square mile above McHenry would produce 12¾ feet depth in the river at McHenry, or a discharge of 13,500 c. f. s. below McHenry. This would give as the maximum discharge for a rare flood at Millington 61,000 c. f. s. approximately.

Discussions of rare flood flows are more or less uncertain, but from the foregoing we may conclude: That the ordinary flood at Millington will produce about 25,000 c. f. s. flow; that the rare flood that

may occur at any time, but probably will occur once in a century, will produce about 90,000 c. f. s. flow; that the corresponding rare flood that will occur once in fifty years will produce about 60,000 c. f. s. flow.



Mill Creek, near Aurora, Ill.

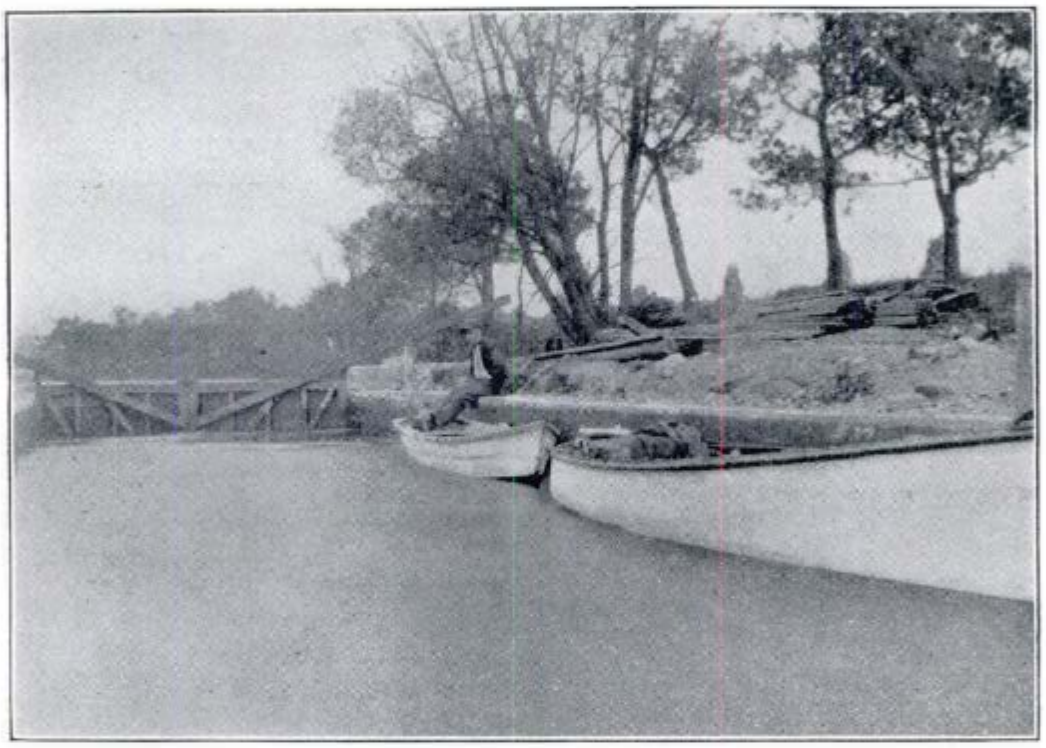
Lotus Beds in Grass Lake.

Based on direct proportion of drainage areas at Wedron for the entire river, the probable maximum great flood would produce a discharge of about 105,000 cubic feet per second. The ordinary flood flow would likewise probably be about 30,000 c. f. s.

CHAPTER IV.

Dams and Water Power.

The Fox River valley was settled by the white race from 1830 to 1850. Pioneers looking for homesteads were impressed by the beauties of the valley, the abundance of clear water supplied by the river and the opportunities for securing water power from this stream. One of the first thoughts of the early settler was to start a saw or grist mill, the former to cut timber for buildings for family and cattle, and the latter in order to feed both himself and his stock.



Lock at McHenry Dam, 1915.

Otherwise long journeys over trackless forest and prairie were required before the early family could have flour or meal. The history of the early settlements in the Fox River valley shows that practically the first thing done in every case, after building a house, was to build a dam and put up a water-wheel-driven mill. These dams were very crude timber structures, built of logs and slabs, and generally washed out or were seriously damaged by high water. If we had a complete history of the river from 1821 to the present time, we would undoubtedly find records of many water-power plants, some of

which were crude in construction but answering the requirements of the time, as local flour, saw and woolen mills were positively needed. Some of the pioneers of these plants have been succeeded by more modern structures and are to-day doing duty in various lines of manufacturing.

Water power was formerly utilized more extensively in proportion to the population than at present. The following table gives the data on the dams now in existence:

TABLE XXV.

PRESENT DAMS AND POWER DEVELOPED ON THE FOX RIVER.

Location.	Available Head.	Average H.P. Developed.	Product.	Remarks.
Carpentersville	6.0	427	Iron and steel articles	Auxiliary plant used.
Elgin	7.0	842	Dairy products and manufacturing	Auxiliary plant used.
South Elgin	7.0	351	Flour and crude drugs	No auxiliary plant used.
St. Charles	7.0	402	General manufacturing	No auxiliary plant used.
.....	6.0	145	Flour and glucose	.....
Geneva	7.0	60	Sadirons	Auxiliary plant used.
Batavia	9.5	500	Wagons, windmills, machine shops and foundry	Auxiliary plant used.
N. Aurora	7.0	135	Foundry and machine shop. Planing mill and sash factory. Brass foundry	Auxiliary plant used.
Aurora	6.0	80	Manufacturing, wood working machinery	Auxiliary plant used.
Aurora	.....	.....	Flour	.....
S. Batavia	3.0	.....	Electric current	A. E. & C. Electric Railway Water impounded for steam condensers.
Montgomery	7.0	150	Mica and mineral for roofing	.....
Yorkville	5.0	.....	.....	Mill buildings destroyed.
McHenry	2.5	.....	.....	Used to improve navigation above dam.
Algonquin	4.0	.....	Flour and Feed	Electric current purchased for use in mill.

NOTE.—At the McHenry dam there is a lock for the passage of boats, in fact the only lock on the river. At all the other dams a portage must be made by boats passing these obstructions to navigation.

At Carpentersville a sawmill dam was originally built in 1837-38 by Thomas L. Shields. Walnut lumber was sawed at this mill and sent to Chicago in considerable quantity. A carding and cloth dressing concern had been built in Dundee in 1844 by William Dunton. This was purchased by J. A. Carpenter and removed to Carpentersville. It was later increased to include the manufacturing of flannel and of cotton yarn. In 1866 it was made a joint stock company and run to full capacity. In 1851 a grist-mill was erected at the east end of the dam. The Illinois Iron and Bolt Co. at Carpentersville, now using the water power, was originally a reaper concern and was opened in 1853 by George Marshall. In 1864 it became a stock company, was remodeled, enlarged and commenced the manufacture of many kinds of iron wares. A brick addition was built in 1871 and a foundry in 1875. The planing mill was built in 1864. The Star Manufacturing Company was built in 1873 by J. A. Carpenter.

At Elgin the first dam was built by Folsom Bean in 1836-37 and a sawmill was erected and began operations in 1837. James T. Gifford erected a grist-mill also in 1837 on the east side of the dam at the head of the race. This mill was destroyed by fire many years later. In 1845 Samuel J. Kimball built a stone mill on the west side of the dam, known as Waverly Mills. These mills soon were known far and wide for the excellent character of their product.

The dam at South Elgin was built in 1836 by Gilbert & Tefft about a quarter of a mile below the present site. This dam was washed out the next spring. In 1837-38 they rebuilt it higher up the stream and on rock bottom. A sawmill was built in 1838 on the east side of the dam. This settlement was then known as Clinton. In 1848 G. M.

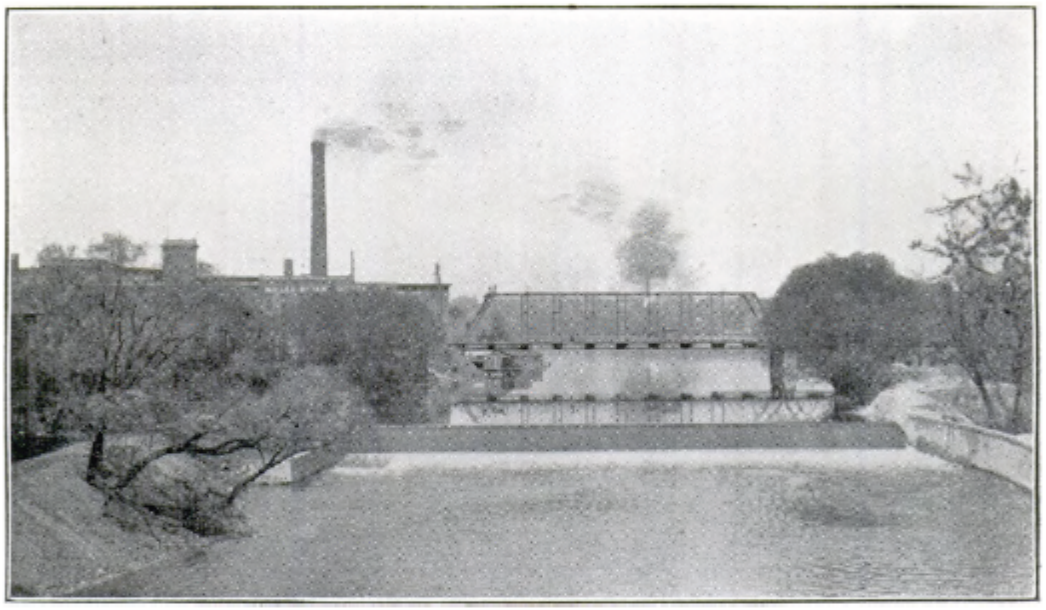
Dam at St. Charles, 1914.

Woodbury took over the dam and power rights and built a stone mill on the east side of the river 40′ by 60′ and three stories high. In 1850 a stone distillery was added, and about the same time H. Brown erected a mill on the west side.

At Batavia in 1834 Titus Howe built a dam and sawmill at the lower end of the island. In 1835 William Van Northwick and his son bought out Howe and moved this dam to the head of the island. They operated a saw and grist mill. For some years their grist-mill chiefly supplied the young city of Chicago with flour and meal. William Van Northwick & Son in 1844 built a sawmill and also the lower dam at Batavia. The first bridge at Batavia was built by Howard Brothers, of St. Charles. It washed out and another was erected in 1843. When this one was carried downstream a stone bridge was built in 1844 at a cost of $9,000.

Aurora dam was built originally by Joseph McCarty. He settled at Aurora in April, 1834, and shortly thereafter began work on a

dam. His brother David McCarty joined him in November, 1834, and bought a one-half interest in the dam and mill property. The dam was begun at the head of the island in the summer of 1834, was three feet high and extended at first across the east channel only. This mill was operated from the dam and sawed the first lumber on June 8, 1835. This mill stood near the McCarty shanty and in the rear of the present City Mills and was swept away by the freshet of February 9, 1876. In 1841 Charles Hoyt purchased water rights on the Fox River and erected a dam and mill on the west bank of the river known as the Black Hawk Mills. The Black Hawk brand of flour was known far and wide and was a favorite in the New York markets as well as those of Chicago. The first bridge at Aurora was built by Joseph and David McCarty in 1836 and connected Main



Aurora Dam.

and Galena Streets, touching the north end of the island. It was washed out in the spring of 1837 but was rebuilt in 1838-39, and this was in turn washed out a couple of years later.

At North Aurora Peter Schneider built sawmills and dams in 1833-34 at the mouth of Blackberry Creek and at North Aurora. A flouring mill was operated at the west end of the North Aurora dam by him and this locality took the name of Schneider's Mill.

At Montgomery in 1836 Daniel Gray became a settler, arriving from Montgomery County, New York. For a long time this locality was known as "Graytown." Gray soon began extensive improvements, erecting a store, foundry, reaper and header manufacturing plant, etc. Later a second foundry and a large stone grist-mill were built. The mill was begun in 1851 and finished in 1853. Later on the name of the settlement was changed to Montgomery after the home county in New York State.

At McHenry an association called the Fox River Navigable Waterway Association was formed to get through the project to raise the water level in the Fox Lake district. This association secured a federal permit in 1907 and built a dam about three miles below McHenry. This dam was built of wood and rotted out. It was rebuilt in permanent form of steel sheet piling three feet above the bottom, and is provided with flash boards that permit it being raised three feet higher. This dam is 230 feet long, and is provided with a lock. This is the only lock on the Fox River and is substantially built of concrete, is 15′ by 70′ and has the bottom of the lock on a level with the bottom of the river. This dam is not intended to develop power, but simply to regulate the level of water in the Fox

Dam over the East Fork at Aurora, Ill.

Lake region and assure a sufficient depth at all times to permit motor boats to navigate these lakes.

In addition to the existing dams on the river there have been many one-time flourishing industrial and power plants that have been abandoned, and many of them exist now only in the memory of the old inhabitants or in early records, all present evidence of their existence having entirely disappeared. Abandoned water-power sites on the Fox River are on a par with the abandoned farm proposition of some of the eastern States, that is a lack of appreciation of local advantages. In early times the power along the river was used by saw or flour mills and small manufacturing plants, the products being largely locally consumed. Generally speaking, the business reached the mill owner without solicitation and as his necessities were few it had a deadening effect on his energies, and when a more enterprising

neighboring competitor entered the field the less energetic mill man felt himself unequal to the task of building up a permanent business for himself and sooner or later succumbed.

Of the abandoned water-power sites, that at Dayton would naturally have a greater interest than the ordinary on account of its use in diverting the water from the river to the feeder of the Illinois and Michigan canal, which connected the canal proper at Ottawa. The head of the feeder was located about half a mile north of Dayton, where the State constructed the dam. Edward B. Talcott, resident engineer, in his report of December 10, 1840, referring to the Fox River dam, lock and section of the feeder, says this work was finished in September, 1839. This improvement was maintained until 1902, when the dam was washed out, since which time the feeder has been abandoned as well as other interests dependent on this water power. In addition to its use as a feeder for the Illinois and Michigan Canal, a reservation was made between the Canal Commissioners and the owners of the mill property at Dayton that the latter were to have the use of one-fourth the supply created by the improvement, "the same shall be drawn out of said feeder within seven-eighths of a mile from the head of the guard lock" under direction of the Canal Commissioners. This gave the required power for manufacturing interests, but with the passing of the dam and power all else was abandoned, as shown by the large four-story stone building stripped of all machinery.

The first dam at Dayton was built in 1830 by John Green and was erected to furnish power for a grist-mill. It is claimed that this mill was the first one in the State to be operated by water power.

The second dam built by the State in 1839 was about fourteen feet high and was constructed of stone with a wooden crest. It developed about 2,000 horse-power, part of which was distributed —

120	horse-power to paper mills.
40	horse-power to tannery.
34	horse-power to tile factory.
120	horse-power to grist-mill.
40	horse-power to collar factory.
120	horse-power to brick factory.
474	horse-power.

One-fourth of the power was to be used on the east bank of the river and one-half the total developed power was to be used in Ottawa. The present stone mill building was built in 1864 by Jesse Green, at a cost of $65,000, and was operated as a woolen mill until 1882, when it was sold to a pressed brick company who operated it until 1901, when financial reverses caused the owners to close the mill.

There was also a dam at Ottawa, all traces of which have disappeared. It was located near the present aqueduct crossing. The contract for this dam was awarded in 1869 to Col. W. H. W. Cushman, and the structure was completed in 1871 by Colwell, Clark & Co. This dam was 490 feet long and 15½ feet high, and was to be

Dam at Aurora, Ill., Fox River.

Dam at Carpentersville, 1915.

used in connection with a dam on the Illinois River built at the same time and connected with this dam by a large channel. The two dams were expected to develop 12,000 horse-power. Both these dams were wrecked by the high water of 1872 before the power could be developed.

The surveys of 1837 and 1838 show that there was a dam across the river at Yorkville and one near the mouth of Blackberry Creek with a mill at each place. There were also dams and mills at Oswego, Aurora, North Aurora; two between these two points, also at Batavia, St. Charles, South Elgin, Elgin, and Carpentersville. At Yorkville the dam on the Fox River is in good repair, but the mill buildings were destroyed by fire and the local requirements are cared for by the mill on Blackberry Creek. This dam on Blackberry Creek was built in 1857 by Lane and Arnold and was operated extensively until 1910. Since that date it has been used very little.

The original Millhurst dam was finished in 1870 by Frederick Post. It was 12 feet thick and 8 feet high and laid up in cement. Brownell Wing bought a one-half interest in this dam and built the flour-mill with four turbine water wheels. On account of the C. B. & Q. R. R. going one-half mile away from this mill the business did not pay and it was sold out to the Valley Power Company.

At Millhurst, in 1911, Simpson Brothers, of Aurora, began the erection of a modern concrete dam which was intended to develop power for lighting near-by towns and for an electric line. They purchased the land along each bank of the Fox River as far up as Plano bridge. This dam was to have a 12-foot head. The water rights were purchased from Albert Sears who owned and at one time operated the mill at Millhurst, using power from an old dam on the site of the present structure. Simpson Brothers sold out to the Public Service Company of Northern Illinois, and since that time work has been abandoned. At present there is a fine large frame mill building standing on the west end of a partially constructed modern concrete dam.

At Millington a dam was built some time between 1845 and 1850 and furnished power to woolen mills, sawmills and grist-mill. The woolen mill was started in 1868 and later failed. This dam was 10 feet high and was washed out about 1870. In 1868 Hon. J. W. Eddy obtained a charter for the Valley Power Company. After a delay of six years they started work in August of 1872 to build a canal 250 feet wide and 8 feet deep. A route was surveyed to Pott's dam in 1867 by Eddy and George Stewart. The distance was 4½ miles with a fall of 21 feet. They had in prospect a plate glass factory to employ some 400 men, and also a grist-mill.

In 1836 John Van Fleet built a dam about one mile south of North Aurora to furnish power for a sawmill. In the early days there was a large amount of good standing timber. When the timber gave out the mill was moved. The dam was washed out in the flood of 1857.

There were also dams at Millbrook and at Oswego which were washed out some years ago and no effort has been made to replace

them. There were doubtless many other dams, especially in the early days, record of which has been lost.

Many of the best sites on the river are abandoned or only partially used. At the present time there is about 3,100 horse-power being developed and used in that portion of the river within the State of Illinois.

There have been various projected water-power developments that for one reason or another have never materialized. There have been several reports made on water-power development at various points along the Fox River. An investigation was made for D. R. Sperry at North Aurora in 1907, and the conclusions reached were as follows:

Batavia, Ill., Concrete Dam.

For low-water conditions, no pondage or auxiliary power, there would be 150 horse-power available; for perfect pondage and no auxiliary power there would be 360 horse-power; no pondage and 80 horse-power auxiliary for a few weeks during July, August, and September, there would be 250 horse-power available; perfect pondage and 192 horse-power auxiliary there would be 600 horse-power available. Under average flow conditions it was estimated that perfect pondage would give 480 horse-power without auxiliary and 720 horse-power with 240 horse-power auxiliary steam plant to tide over the low-water period.

A report on the power available at Montgomery, Illinois, was made by Mr. J. W. Richey, of Minneapolis, Minnesota. He estimated that there would be 3,773 kilowatt months available, assuming the year 1904 as an example, or 2,750,000 kilowatt hours per year based on utilizing the entire flow of the river up to 720 kilowatt capacity,

twenty-four hours per day. However, due largely to the fluctuations in the stream flow, Mr. Richey advised against installing a hydro-electric plant at Montgomery on the basis that it would not be justifiable with cheap fuel available.

This report was based on a discharge of 250 second-feet occurring frequently during the months of June and July, at which times only 80 kilowatt per twenty-four hours, or with pondage 500 kilowatt for 2¼ hours, could be secured, after which it would be necessary to wait until the pond had refilled. This kind of operation is very expensive and leads to the conclusion above mentioned.

Mr. R. S. Feurtado, of Chicago, made a report in 1910 on the proposed hydro-electric development of the Fox River near Dayton

Dam above Dundee, Ill., near Carpentersville.

and Wedron. This report is in considerable detail and has gone into the question of power development at these two locations thoroughly. The minimum flow of the river is taken at 620 second-feet, but by building dams across Indian and Somonauk Creeks and holding the flood waters in the reservoirs thus created and discharging same into the Fox, a minimum flow of 933 second feet is obtained. On this basis the river alone at Dayton, with a 31-foot head, would furnish 1,740 horse-power constantly. With the two reservoirs proposed and the mill pond at Wedron to add additional water during the periods of low water, Mr. Feurtado estimates the total installation at the Dayton power house would be 6,220 horse-power.

Likewise at Wedron he gets 3,540 horse-power available and 2,000 horse-power at Indian Creek and 490 horse-power at Somonauk Creek. This makes a total available horse-power of 12,270 from the combined development.

In this proposed development it was intended to build a 19-foot dam near Dayton that would create a pond of 209½ acres and have a capacity of 80,864,000 cubic feet. The Wedron mill pond would have an area of 950 acres, that at Indian Creek would have 680 acres, and that at Somonauk Creek would have 550 acres area. This would make a total reservoir of 2,370 acres.

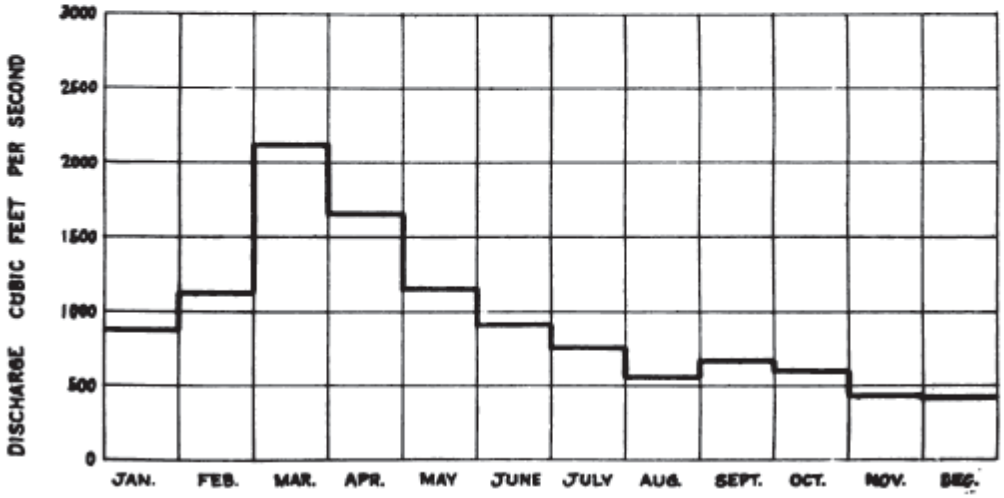
By reference to the profile of the Fox River it will be seen that there is a sharp drop in the river bed just above Dayton, giving a large head for a dam located at the foot of this slope. Near Wedron the river bed flattens out, giving a better storage location. This, combined with the fact that Indian Creek and Somonauk Creek valleys form natural reservoir basins, tends to make this an exceptional location for power development. Owing to these natural advantages and also that there is a good district surrounding Dayton for marketing electrical power, all contribute to make this one of the best locations for development of a hydro-electric plant in this part of the State.

In all these reports, although the data have been scanty, nevertheless each investigator has concluded that the low summer flow in the Fox River will require large ponding auxiliaries in order to produce any steady output of power. These are provided either by the ponding in the river itself above the proposed dams, or else in reservoirs formed in the valleys of tributary creeks. The amount of this pondage and its importance varies directly with the determined low-water flow in the river. However, it is also possible to arrive at the same results by increasing the low-water flow in the river. The large lake area at the upper portion of this river offers exceptional opportunities for such a procedure. The area of the lakes along the upper portion of the river is practically 40 square miles. Each one inch in height of water throughout this area would aggregate about ninety-three million cubic feet of storage. By reference to Plate I we find that there is a fall of rain from May to September above the average, followed by five months of least fall from October to February, inclusive. During March and April the rainfall is nearly normal. The rainfall for the five wet months aggregates about 19 inches, and for the five dry months it amounts to 11¼ inches. The excess rainfall during the wet months from May to September is roughly 4 inches over the monthly average per year. During the five dry months following, the rainfall is about 4 inches under the mean monthly average. If the rainfall during the wet months could be stored by ponding and discharged during the dry months, the flow of the river below the storage basin would be practically constant.

The drainage basin above McHenry is 1,245 square miles, and on the basis of comparison of watersheds the hydrograph of the Fox River at McHenry would be as given in Plate IX. From this we see that the mean average flow is 970 cubic feet per second, and that the minimum average flow in December is about 420 cubic feet per second, and the maximum average is 2,120 cubic feet per second, and occurs in March. From June until December the flow is below the average. The excess rainfall is 4 inches during the wet months. This, in the

entire basin of 1,245 square miles and allowing 25 per cent of the rainfall to reach the channel, would give 2,323,000 cubic feet per square mile, or 2,902,000,000 cubic feet from the entire basin. This would give 200 cubic feet per second additional flow during the dry

PLATE IX.



RIVERS AND LAKES COMMISSION.

Hydrograph of the Fox River at McHenry, based on Rock River at Rockton. 1903-1909. Drainage area, 1,245 sq. mi.

months, if it could all be stored perfectly and allowed to discharge as the natural flow dropped. Of course, this is not practical in actual conditions due to evaporation, seepage, etc. If it were practical, it would raise the flow for the months of August to December to 720 cubic feet per second average, and this would become the average

Pistakee Bay, Fox Lake Region, Illinois.

minimum flow. To see what an improvement this ponding would be it is only necessary to refer to the flow measurements at South Elgin in 1914, where in August the daily discharge fell below 100 cubic feet per second for a great part of the month. Neglecting evaporation, perfect pondage would give around 700 cubic feet per second as the average minimum flow, with it somewhat larger at Elgin due to intermediate feeders south of McHenry. Likewise a minimum flow of 720 cubic feet per second would accommodate the sewage from a population of 240,000 people without danger. This is nearly twice the total population of all the townships, cities and villages bordering the Fox River within the State of Illinois.

This, of course, is the ideal case if all conditions were perfect. This can only be approximated under actual conditions. The present dam at McHenry raises the water level beyond the Illinois-Wisconsin State line. Inasmuch as this survey stops at the State line, it is impossible to say just what is the northern limit of this backwater. The area of the lakes tributary to the Fox and within this State is approxi-

A. E. & C. Power Dam below Batavia, Ill.

mately seventeen square miles. If the river itself adds two square miles more, then there is nineteen square miles total water surface above the McHenry dam. That is, to store the excess run-off during the wet months will raise the level of the water surface about 2.6 feet. This is probably well on the safe side, because as the water rises in height the water surface itself increases, due to flooding the marshes.

While these estimates are only approximate, and the data at hand are not adequate to make a very careful estimate, nevertheless it would

appear from the foregoing that by raising the height of the McHenry dam about three feet and providing flash boards or regulating gates of some kind, sufficient water could be stored in the lake region to provide a uniform average flow of over 700 cubic feet per second below the dam. This would give a minimum flow that would remove all danger of excess pollution, and would assure a larger minimum flow for power purposes farther downstream. This would also increase the size of the lakes and cover much of the swamps and marshes in the lake district and tend to improve this territory in appearance. By raising this dam McHenry would become a good

Algonquin Dam, summer low water.

location for water-power development. With a minimum flow of 720 cubic feet per second, the power available at 80 per cent efficiency would be 360 horse-power with 5½ feet available head. At Algonquin, where the slope is greater, the head would be about 6 feet and the power available would be about 400 horse-power. By raising the Algonquin dam to pond the water to a height of 3 feet above the present McHenry dam, a head of about 12 feet is secured, and there would be approximately 800 horse-power available. Owing to the water rising about 8 feet in this case, the damages to submerged property would likely make this prohibitive. However, there is not so much chance for this to be the case if the McHenry dam is raised, as the water's level is lifted only 3 feet and large portions of the low land that would be affected by this raise are now swampy and of very little value. In a general way, therefore, we may conclude that a great benefit could be secured to the inhabitants of the Fox River valley by increasing the height of either the McHenry or Algonquin dam so as to store the excess rainfall of the wet season and by means of regulating gates distribute it in the form of a more uniform flow during the dry months. Such a procedure would improve the appear-

ance and value of the lake district for pleasure purposes, would remove the danger of overpollution from the towns and cities along the banks of this river, and would assure to the power users a more uniform flow and larger development at reduced expense.

The main objection to this procedure is the probable damage that would result from raising the water elevation throughout the lake region. At many points the banks are ample to accommodate this much increase in water level. At others swampy land would be flooded and the damage would be small. Undoubtedly some valuable

Lighthouse, Pistakee Bay, Fox Lake Region.

land would be rendered useless. With such a small raise it would be possible in many places to build low levees where the value of the flooded property would justify it. In estimating the amount of possible damage it must also be borne in mind that there have been and will continue to be many times when the water will naturally rise to this height, and that without additional height at the McHenry dam there will be occasions when this property will be flooded. That such a project is feasible, and that the results in increasing the minimum flow of the river will be of immense value to the cities and the power-users downstream is very apparent. This is especially so in the case of those cities which are already polluting this river excessively at the present summer flow, and which must consider some method to purify their sewage. If the low-water flow is increased sufficiently, the dilution will become so great that there will be no danger of an epidemic, at least for many years.

It does not fall within the scope of this report to determine the damage to property nor the cost of such an improvement. Attention, however, is called to this phase of the probable development of this stream and that the cost, if distributed to those who would benefit thereby, would be small in comparison with the benefits received.

CHAPTER V.

Pollution.

In its natural state the Fox River was a beautiful, clear stream, abounding in fish and flowing through a veritable garden of flowered and timbered valley. Now it is in low summer flow a dirty, evil smelling waterway near the cities. Out in the less populated portions it still retains much of its natural beauty, but near the factories and denser populated spots it is foul and dirty. During periods of high water this condition is not so apparent, but during a hot dry summer it is quite pronounced. Most of the game fish have disappeared, although the State Game and Fish Conservation Commission has

View of Fox River, near Batavia, Ill.

closed this river to any but hook and line fishing and is trying gradually to build up the stream for fishing purposes.

A large part of the cause of this deterioration of the Fox River is due to the increased use of this stream as a dumping ground for all manner of sewage and refuse. There has been a decided improvement in this respect during the past two years, due to the activities of this Commission, but as the population of the Fox River valley increases and more manufacturing plants and more people locate upon this drainage area additional precautions will have to be taken in

order to prevent an overpollution of these waters and the consequent epidemic of disease sure to follow such a condition.

The pollution of the Fox River first came officially to the attention of the Rivers and Lakes Commission through a complaint from Edward F. Gorton et al. vs. the City of Elgin et al. Hearings were held and witnesses summoned. The testimony showed that in the summer the river many times was "practically dry," that many cattle were of necessity watered from this stream, that it was used extensively for bathing in warm weather, that many thousand tons of ice were annually harvested all along the river. The witnesses also declared that there was very great pollution of the water, that it was often offensive in smell, that the ice in many places was not clear, that clots of sewage often floated on the surface, that at times cattle became sick from drinking river water, and at certain places stock got sore mouths from acid wastes discharged by factories. The City of Aurora admitted emptying raw sewage into the Fox River, but promised to coöperate to better the general condition. Witnesses declared that fish were killed by trade wastes from manufacturing plants. The city of Elgin also admitted dumping raw sewage into the river, but thought the expense of installing septic tanks or purifying the city sewage would be very heavy. The State Training School and Alms House also pleaded guilty of polluting the river, but expressed their willingness to purify their sewage. The city of Batavia also acknowledged it was polluting the river waters. In other words, at the first hearing it was generally acknowledged that the majority of the cities and manufacturing plants along the banks of the Fox River were discharging objectionable matter into this stream.

Mr. Ralph Hilscher made a detailed report of the pollution of the Fox River from its source. He concluded that the sewage from 75,000 people was being discharged into this river, and that there was a prospect of 15,000 more so discharging in the near future. He found that the river is practically clear on leaving Pistakee Lake, that the remaining sewage is discharged in a raw state into the river between Dundee and Aurora, in about thirty miles. The contributing population in this territory was 58,600 and including those towns immediately contemplating sewerage, would be 65,000. There were 36,000 people using the river above Batavia and 27,500 above Elgin.

John W. Alvord, Hydraulic Engineer, of Chicago, and Edward Bartow, Director of the State Water Survey, made a report on conditions at Geneva in November, 1911. They found that at times the flow in the river at North Aurora sometimes got as low as 80 cubic feet per second, and at Batavia was frequently 120 cubic feet per second, and at Geneva the minimum flow was about 90 cubic feet per second. As a conservative statement, they concluded the flow at Geneva was often less than 100 cubic feet per second, and sometimes for a week or so fell below 80 cubic feet per second. They concluded that there was only 2.8 cubic feet per second of water available at low-water periods during the summer season for each 1,000 persons

tributary to that part of the river near Geneva. They also concluded that from 3 cubic feet per second to 7 cubic feet per second of fresh water is necessary to oxidize in an unobjectionable manner the sewage of each 1,000 persons tributary to the outlet, and that a limit of 4 cubic feet per second per 1,000 persons would be a wise minimum for the Fox River, if satisfactory conditions are to be maintained.

Below Wedron, Ill.

It being apparent to the Rivers and Lakes Commission that the Fox River was being excessively polluted, on June 9, 1914, the Commission entered an order against the cities of Elgin, Geneva, Batavia. Aurora, and St. Charles, and the Fox River Packing Company and the Kerber Packing Company, commanding them to discontinue and stop the discharging or permit the emptying into the Fox River, or any tributary thereof, at or near the said cities, from the several outfall sewers, pipes, or other outlets, sewage, industrial wastes and other injurious substances.

Notice of the appeal from this order was given the Commission by the cities of Aurora, Batavia and Elgin, and the Fox River Packing Company to the Circuit Court of Sangamon County. This appeal was later adjusted, and the cities and packing companies affected by the order of the Commission have taken steps to comply therewith.

There are several remedies for an over-polluted stream. By an over-polluted stream is meant one in which the amount of dissolved oxygen is insufficient to properly break up the organic sewage. It is generally known that fresh flowing water contains a certain proportion of dissolved oxygen which will unite with the organic sewage so as to break it up into simpler and harmless forms. Where the amount of organic matter is not excessive for the stream the sewage is oxidized

and no odors result. It must be remembered, however, that this process of oxidation does not necessarily destroy the bacterial life, at least for several days, and an odorless stream and one apparently clear and pure may nevertheless carry disease producing organisms and the water be unfit for human consumption.

When the amount of sewage is too great for the oxygen in a stream to purify, then the stream becomes foul, dirty and a general nuisance. In such a condition there are two courses open, either to change the ratio of sewage to stream flow, or else to purify the sewage before it empties into the stream. The ratio of sewage to stream flow can be changed by keeping out a part of the sewage, or else by increasing the flow of the stream. The former is no remedy, because withholding a part of the sewage from the stream simply means it must be cared for in some other way. In Chapter IV, mention is made of the peculiar natural conditions that make it easy to control the low-water flow in the Fox River by increasing the height of the McHenry dam and providing gates such that the excess wet season precipitation can be stored and allowed to discharge gradually during the dry months.

Scene along the Fox River, near Batavia.

As naturally the greatest nuisance and greatest danger from pollution occur in the dry season when the river flow is the least, it is apparent that any increase in the minimum flow will be a betterment of these conditions. Assuming that a minimum flow of 600 to 700 cubic feet per second could be secured, as seems probable from the discussion in Chapter IV, then at 3 cubic feet per second per 1,000 population, the river flow would accommodate 200,000 to 233,000 people, and at 4 cubic feet per second per 1,000 population, as recommended by

Alvord and Burdick, the river would accommodate 150,000 to 175,000 people. At the time of Hilscher's report less than half this population was using the Fox River, and the pollution was becoming serious. It is seen, therefore, that by securing a minimum flow of 600 cubic feet per second, no serious condition of pollution would probably exist for many years.

The second method of purifying a polluted stream is by the artificial treatment of the sewage before it enters the stream. This is the most common method used because very seldom does a stream readily admit of increasing its minimum flow. Where a river is not used for a

Fox River, near Batavia.

source of water supply, the artificial treatment can be carried on to such a point that the river will oxidize and complete the purification. Care must be taken that the artificial purification is carried far enough that the resulting sewage will not overburden the river. In artificial purification of sewage, the solids are first withdrawn, as far as possible, generally near the outfall of the sewer. These solids are retained and the balance of the liquid may either be purified by the oxidation of the stream, or by further artificial means. This latter is generally done by filtration through beds of graded sand or stone, or by repeated filling and emptying of contact filters. It is needless to say that when artificial purification is necessary, that the less the quantity of sewage to be treated, the smaller the required treating plant and the cheaper the cost of operation and original construction. This end can be secured by installing what is known as separate sewers. That is, a separate system of sewers is constructed for the storm water and the sewers for the sanitary wastes are distinct from

the storm sewers. By this means, only the sanitary sewage is admitted to the purification plant. Along such a stream as the Fox River, especially at the present time when the summer flow drops very low, it is especially advisable that all the towns and cities using this stream as an outlet for wastes should provide a means of artificial purification. This fact should be borne in mind and the sewer plans so designed that such an artificial purification plant can be added when the conditions make it necessary.

CHAPTER VI.

Riparian Rights, Meander Lines, Permits Issued, Federal and State Jurisdiction.

After the original acquisition of the land by the white race, either by purchase from the Indians, conquest, or treaty, it soon became necessary to have proper surveys made to determine the holdings of the various claimants and to properly record such holdings for purposes of transfer and title. Accordingly early land surveyors were employed to mark out the land. These early surveys were very crude affairs, measured by the present standards of accuracy. When there was such an abundance of land and generally of small market value,

Fox River from Glenwood Park, Batavia.

a foot or a rod more or less was a small matter. The original instruments used were themselves capable of only a rough degree of accuracy, and trees, rocks, etc., were used for corners or permanent points. Most of these trees have since disappeared, and to start from a rock, probably itself three feet in diameter, is not close enough to determine a line or location when valuable property is involved. The result has been that it is generally hard to retrace an old-time survey and many peculiar results are obtained in doing so. Nevertheless, it

is often imperative to do so as these surveys are the basis of many important transactions.

The Fox River is no exception in this respect. The land along the Fox River from Ottawa to Yorkville was surveyed in 1821 and 1822, as shown by plats of the U. S. Surveyor of Public Lands of the States of Illinois and Missouri. From Yorkville to the north State line surveys were made in 1837 and 1838. In 1840 the river was declared a navigable stream by act of the Legislature. As property holdings increased in value and the transfer of land from owner to owner occurred, the question of ownership along the shores of streams and

View of Channel Lake, Ill.

lakes arose. Owing to the difficulty of following all the sinuosities of the shore, and owing to the fact, also, that these sinuosities change with the varying heights of the water, it has become the practice to run so-called "meander lines" to determine the probable area of land to be conveyed. The methods, rules and regulations governing the survey of the original meander lines were formulated in conformity with law by the Commissioner of the General Land Office, and are incorporated as a reprint in a volume entitled "Manual of Surveying Instructions for the survey of the public lands of the United States and private land claims," under date of January 1, 1902. On page 62 et seq. of this manual, which is known as the "Manual of 1902," will be found the instructions under which the meander lines were established. In the language of the manual, the instructions and other details pertinent to this report are as follows:

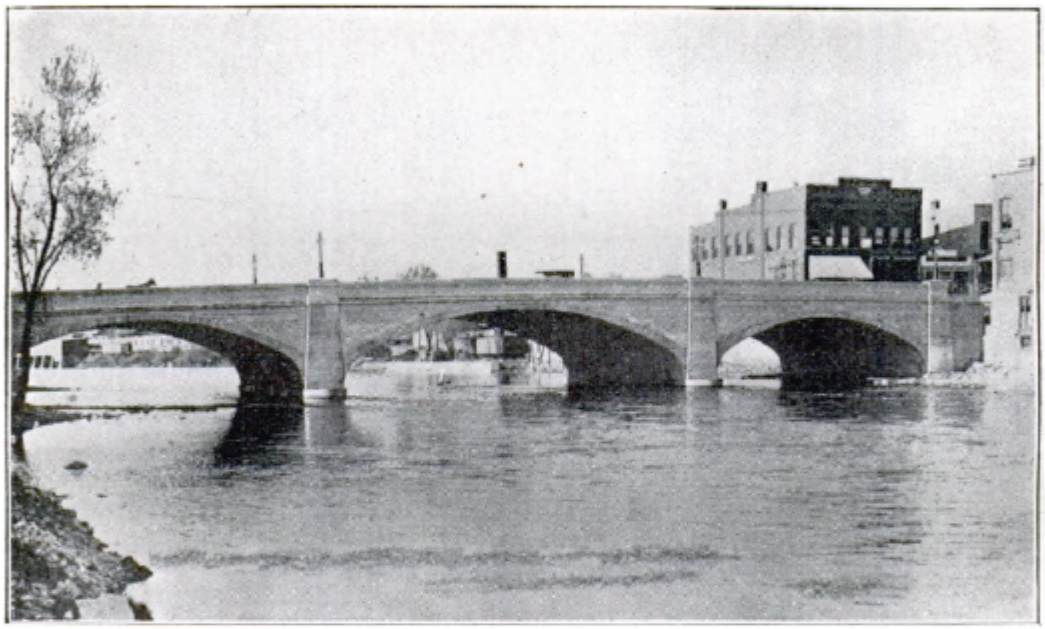
"153. The running of meander lines has always been authorized in the survey of public lands fronting on large streams and other bodies of water, but does not appear to have been proper in other cases. The mere fact that an irregular or sinuous line must be run as in case of a reservation boundary, does not entitle it to be called a meander line, except where it closely follows a stream or lake

shore. The legal riparian rights connected with meander lines do not apply in case of other irregular lines, as the latter are strict boundaries.

"154. Lands bounded by waters are to be meandered at mean high-water mark. This term has been defined in a State decision (47 Iowa, 370) in substance as follows: 'High-water mark in the Mississippi River is to be determined from the river bed, and that only is river bed which the river occupies long enough to wrest it from vegetation.'

"In another case (14 Penn. St., 59) a bank is defined as the continuous margin where vegetation ceases, and the shore is the sandy space between it and low-water mark.

"155. Inasmuch as it is not practicable to public land surveys to meander in such a way as to follow and reproduce all the minute windings of the high-water line, the U. S. Supreme Court has given the principles governing the use and purpose of meandering shores in its decision in a noted case (R. R. Co. v. Schurmeier & Wallace 286-7) as follows:



Concrete Arch Bridge, Batavia, Ill.

"'Meander lines are run in surveying fractional portions of the public lands bordering on navigable rivers, not as boundaries of the tract, but for the purpose of defining the sinuosities of the banks of the stream, and as the means of ascertaining the quantity of land in the fraction subject to sale, which is to be paid for by the purchaser. In preparing the official plat from the field notes, the meander line is represented as the border line of the stream and shows to a demonstration that the water course, and not the meander line as actually run on the land, is the boundary.

"'In cases where the deputy finds it impossible to carry his meander line along mean high-water, his notes should state the distance therefrom and the obstacles which justify the deviation.'

"156. Proceeding down stream, the bank on the left hand is termed the left bank and that on the right hand the right bank. These terms will be universally used to distinguish the two banks of a river or stream.

"157. Navigable rivers, as well as all rivers not embraced in the class denominated 'navigable,' the right angle width of which is three chains and upwards, will be meandered on both banks at the ordinary mean high-water mark by taking the general courses and distances of their sinuosities, and the same will be entered in the field book. Rivers not classed as navigable will not be

meandered above the point where the average right angle width is less than three chains, except that streams which are less than three chains wide and which are so deep, swift and dangerous as to be impassable through the agricultural season, may be meandered where good agricultural lands along the shore require their separation into fractional lots for the benefits of settlers. But such meander surveys shall be subject to rejection if proved unnecessary by field inspection.

"158. Shallow streams, without any well-defined channel or permanent banks, will not be meandered except tide-water waters, whether more or less than three chains wide, which should be meandered at ordinary high-water mark as far as tide water extends.

"168. Meander lines will not be established at the segregation line between dry and swamp or overflowed land, but at the ordinary high-water mark of the actual margin of the rivers or lakes on which such swamp or overflowed lands border."

The views of the general land office and the decisions of the courts as expressed in the foregoing paragraphs are not at variance. The courts have held adversely to the meander line as a boundary line because, being a straight line, it did not locate all of the sinuosities of the stream and because, being a fixed line, it could not follow all of the changes of the line of mean water due to natural causes.

Effect of Meander Line.

The meander line may or may not be the boundary according as it does or does not coincide with the line of mean high water and according to the intention of the department at the time such survey was made.

In the case of the Albany Bridge Company v. The People, 197 Ill., 199, the law concerning the effect of meander lines is stated with reference to streams, and in the case of The People v. The Economy Power Company in the 241 Ill., 290, the court says:

"Appellant also contends that since the undisputed evidence shows that the Des Plaines River was meandered by the government surveyors such meander line is the boundary of riparian proprietors.

"A meander line is not a boundary line, but is designed to point out the sinuosities of the bank or shore, and the means of ascertaining the quantity.

Whittaker v. McBridge, 197 U. S., 570.
Albany Bridge Co. v. People, 197 Ill., 199.

An exception to this rule seems to be recognized where the meander line is run and monuments are erected."

The instructions, however, under which the meander line was established, expressly stipulated that it should define the sinuosities of the stream, and that it should mark the line of mean high-water; or in cases where this was not possible, the original field notes were to set forth the amount of deviation from the line of mean high-water.

We may for the time being disregard the question whether or not the meander line is or is not a boundary line, but if the meander line designated the line of mean high water in the navigable rivers of Illinois, then this line must be considered for the purpose of discovering what, if any, encroachments have been made upon the rights of

the public to freely use navigable streams. In the case of a lake, the same rule does not apply, and the case of Fuller v. Sheed, 161 Ill., 662 declares:

"Whether a riparian proprietor on a lake takes the bed of the lake is a question on which the decisions of the different states are conflicting. Whilst the riparian proprietor takes to the center of a stream, the stream will still exist, notwithstanding changes by accretions, etc. The same reason for the rule does not exist where land borders on a lake, as by recession of the water the bed of the lake may become dry land and the lake cease to exist. The grant of land on a lake would, on the instant of the grant, be a conveyance to the center of the lake, if the same rule existed as with reference to rivers. The determination of boundary lines to the center of the river is not attendant with any serious difficulty, but the irregular borders of a lake would render the determination of lines in the bed of the lake between riparian proprietors of almost impossible solution. This, as well as the injustice of holding that the purchaser as a small rim of the lake consisting of but a few acres, would at once become the owner of thousands of acres of a non-navigable lake, has caused many courts to hold the riparian proprietor takes only to the water's edge." As declaring this rule, we cite the following cases among others:

In State v. Gillmanton, 9 N. H., 461, the question involved being the boundary of the town, it was said: "The rule for the construction of grants bounding on rivers is where a grant is made extending to a river and bounding upon it, the center of the stream is the line of the boundary, if there are no limitations in the grant itself. But in relation to grants on ponds, lakes, or other bodies of standing fresh water, that principle does not apply, but the grant extends only to the water's edge."

In Marriner v. Schultz, Wis., 692, the court approved the instruction of the inferior court, which directed that in a grant of land bordering upon a pond, the title did not extend beyond the natural shore.

In Diedrich v. N. W. H. R. Ry. Co., 42 Wis., 248, the court says: "The rule that the title of the riparian owner upon a natural lake or pond does not extend beyond the natural shore, appears to be very generally, almost universally, recognized and discussed by Cole, C. J., in Deleplaine v. Railway Co., supra. It is unnecessary to repeat here what is there said and in which we all concur. Indeed, the position was affirmed in this court as far back as Marriner v. Schultz, 13 Wis., 692."

A different rule prevails where land is conveyed bounded on large natural ponds or lakes. In such case the grant extends to the water's edge, or if the . . . . lake or pond has a definite low-water mark, the grant will extend to low-water mark.

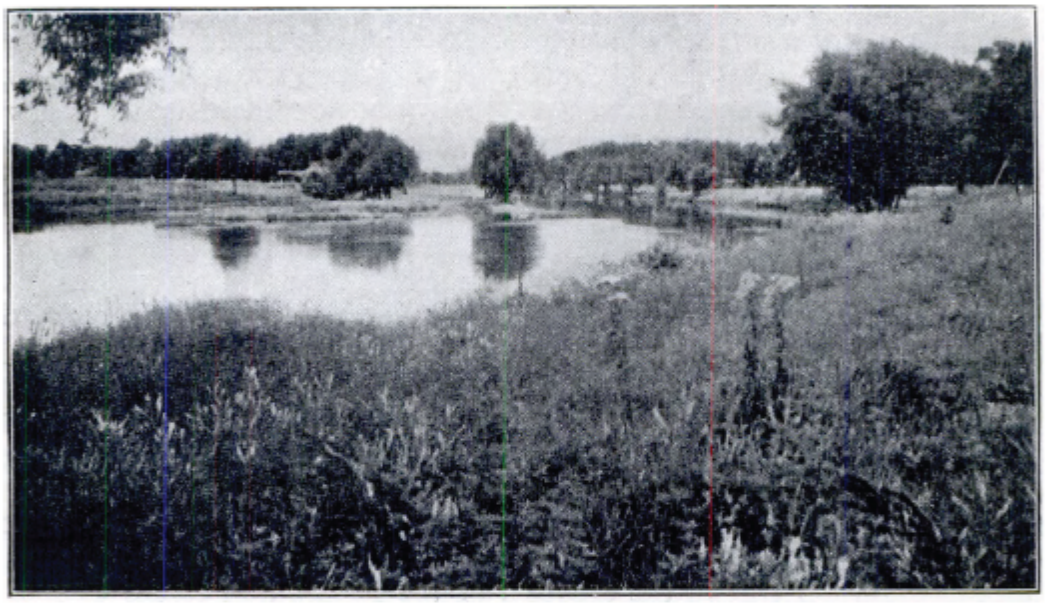
Angell on Water Courses (Sec. 41) says: "When land is conveyed bounding upon a lake or pond, if it is a *natural* pond, the grant extends only to the water's edge."

The general practice in the State of Illinois is summed up by Attorney-General P. J. Lucey and is stated briefly in the following abstracts:

PISTAKEE LAKE — OWNERSHIP OF ISLANDS.

Attorney-General P. J. Lucey's Opinions (July 31, 1913, page 3):

"The fundamental proposition is that the title to the beds of the lakes, generally speaking, is in the State, while as to rivers and streams the title to the bed is in the adjoining land owners. If this body of water is, in fact, a lake, and especially if it is a large lake, the title to the bed thereof is in the State of Illinois, and it would



Scene along Fox River, near Aurora.

follow that the title to an island or lands formed in the lakes would also be in the State."

RIPARIAN RIGHTS.

Attorney-General P. J. Lucey's Opinions (December 10, 1913, page 2);

"The riparian owner, whether such stream be navigable or non-navigable, owns the title to the bed of the stream to the middle or center thread of the stream. . . . . While the property of the riparian owner in the bed of the stream to the middle or center thread thereof, in the case of a navigable stream, is subservient to the use of the public as a highway for purposes of navigation, still the banks of the stream are not under or subject to that servitude. . . . . The riparian owner having the right to the exclusive use of the banks, a person navigating the stream can not land against the will of the riparian owner and becomes a trespasser if he does so without his consent. The absolute rights of persons in the use of the stream for the purposes of navigation extend alone to the bed of the stream

and not to the appropriation of the soil of the banks, either permanently or temporarily, to their own use. It has been held in a number of cases, and I think it is the law, that a navigator may temporarily use a bank or shore in case of peril or emergency."

The practice in this State is also shown by the following:

"Extracts from an act entitled 'An Act to amend the several laws in relation to the Illinois and Michigan Canal.' Approved February 26, 1839."

Section 2. In all sales of lots and lands under the provision of this act, the following conditions shall be annexed and shall compose part of the contract.

Paragraph II of Section 2:

Lands situated upon streams which have been meandered by the surveys of public lands by the United States shall be considered as bounded by the lines of those surveys and not by the stream.

Section 18. Islands and inundated lands situated within the limits of sections of land granted to the State by the United States shall be deemed occupied and held as canal land.

The question of the ownership of the bed of streams and lakes is not the only one material, but there must be taken into consideration also what, if any, invasions have been made upon any navigable body of water. These navigable bodies of water belong to the public, belong to the people in their entirety, and it is not for the riparian owner to say how much of the stream is required for the use of the public and then to appropriate the rest for himself. The Attorney-General (December 18, 1913, page 3) says: "A riparian owner can not 'dock out,' or 'wharf out,' or erect structures out to navigable waters over the submerged lands without the consent of the State or its grantees." Prior to the creation of the Rivers and Lakes Commission the U. S. Federal Government exerted full authority over the Fox River, and all questions were referred to the U. S. Army Engineer Corps. At the present time all questions are also referred to and acted upon by the Rivers and Lakes Commission. In order to secure a permit for any improvement over the waters of lakes or streams in the State of Illinois, a written application for same must be presented to the Rivers and Lakes Commission and must be accompanied by plans and specifications, or other explanatory information that would make clear the location, object of the structure, and whether or not same would be detrimental to the public welfare. The same rule applies to structures erected before the Rivers and Lakes Commission was created, and unless a permit is obtained the structure must be removed upon order of the Commission.

The following is a list of permits issued by the Rivers and Lakes Commission on the Fox River and tributaries:

Illinois Highway Commission request for permit for bridge across the Fox River in Aurora. Permit granted March 26, 1912.

Ernst F. Smith request for permit to construct a river wall on Fox River in St. Charles Township, Kane County. Permit granted March 18, 1915.

Col. George Fabyan request for a permit for a dyke, concrete bridge, wooden truss bridge and a guard wall on the Fox River south of Geneva. Permit granted April 13, 1915.

Board of Park Commissioners of Geneva Township request for permission to construct a foot bridge between State street bridge and Harrington's Island, Geneva Township, Kane County. Permit granted April 26, 1915.

R. D. Metcalf request for permission to construct a concrete and brick addition to building in St. Charles, Illinois. Permit granted April 26, 1915.

B. P. Alschuler request for permission to construct a retaining wall at or near Stolp's Island, Aurora, Illinois. Three petitions denied; fourth petition taken under advisement.

State Highway Commissioners request for permission to construct a highway bridge across the Fox River in Nunda Township. Permit granted June 30, 1915.

C. B. & Q. Railroad request for permit to construct two reinforced concrete bridges across the Fox River at Hurd's Island, Aurora, Ill. Permit granted July 19, 1915.

Henry J. Klapperich, McHenry, Illinois, was ordered June 10, 1915, to remove a fence obstructing Nippersink Creek.

The Chicago, Milwaukee & St. Paul Railway was ordered on April 9, 1915, to remove obstructions at the east end of the bridge at the head of Pistakee Lake and have complied with the order.

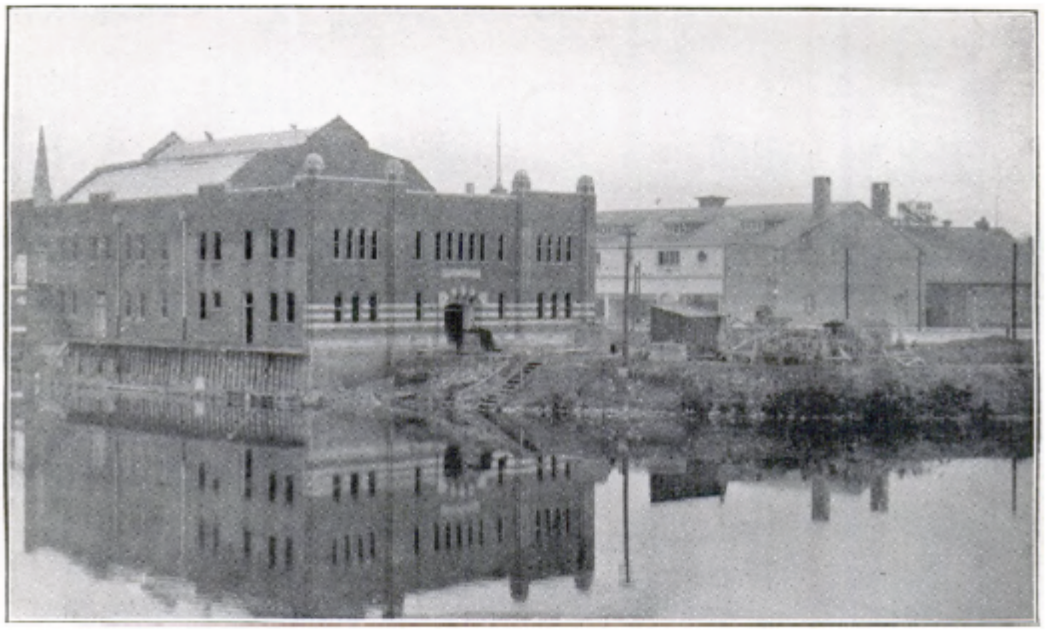
The Highway Commissioners of McHenry Township, McHenry County, were ordered on July 20, 1915, to remove old piling, that now obstructs the Fox River, on or before September 1, 1915.

Federal and State Jurisdiction.

There is some disagreement between the State rulings and those of the Federal Government in regard to ownership and jurisdiction in the case of rivers and islands. When the State of Virginia entered the Union of the original thirteen States, it transferred to the Central, or Federal Government, all the unsold land or all lands not previously disposed of by it prior to that time (1787). Each of the thirteen States did likewise. In the case of Virginia, however, all that territory from which the central States were later created was transferred to the Federal Government as a common fund, with the exception of certain noted reservations, and the navigable rivers were corrspondingly reserved for the general use. This means that in practically all of the State of Illinois the title to the land lay in the Federal Government and not in the State itself. The State itself is a judicial boundary for legal and government purposes. In the case of the thirteen States the original title to the land lay with the State, and was largely disposed of by the State prior to the formation of the United States. Consequently upon the admission of Illinois to the Union it was admitted on an equality into "the halls of Congress," but itself never possessed title to the territory of which it is composed.

This all means that title to land in Illinois must go back to the original Federal holding excepting certain reservations made by Virginia upon its joining in the creation of the Union.

The State of Virginia in turning over this territory to the Federal Government transferred certain lands included in a survey which was a meander of the Great Lakes in the North. Being a meander line it did not go to the water's edge, and consequently there were in places strips of shore land outside this meander line and above the water line. Squatters on these strips, claiming this was not a part of the Federal owned lands, themselves claimed the title. A notable instance of this is the case of Captain Streeter, in Chicago. He holds and claims valuable real estate, and bases his claim on this point.



Aurora, Ill., showing buildings erected on Stolp's Island in the Fox River.

From time to time certain lands within the State of Illinois were transferred to the State, such as the swamp lands and the strip along the old Illinois and Michigan Canal. The remaining untransferred lands, however, are still claimed by the Federal Government. These consist chiefly of islands within the lakes and rivers of the State. Even such a body of eminent jurists and lawyers as the Illinois Constitutional Convention of 1869-70 debated several days and discussed minutely as to whether the State had any control or jurisdiction over the rivers of the State. On January 27, 1870, page 310, Volume 1 of the proceedings of that convention, the Committee on Canals and Rivers made all State powers relating to navigable rivers subject to existing or prior rights and recognized the necessity of Federal coöperation in the improvement and use of such rivers. After much discussion, on the 32d day of the session, on February 4, 1870, by a vote of 59 to 3, the words "and the navigable waters of the State" were stricken out of the report of this Committee for the

reason that the State owned no such waters and that in the discussion it was held that the reservation of these river beds by the Federal Government, when the State of Virginia entered the Union, in no way interfered with the sovereignty of the State of Illinois, and that it would be as reasonable to suppose that all of the primarily unsold lands passed presumptively to the State of Illinois on its entrance to the Union, as it would be to suppose that the meandered river beds did. This body of jurists, therefore, practically disclaimed any right to the meandered river beds as lying in the State of Illinois, but decided that such right belonged to the Federal Government.

The Federal Government, through the General Land Office, is still exercising these rights in the sale of certain lands. Near Aurora, below Island No. 138 of this survey or what is known as Hurd's Island, lies another island which had been used by Dr. F. M. Elliott's family for seventy years, and lay opposite their property on both banks of the river. The Federal Government surveyed this island and offered it for sale October 29, 1891, over the protest of the Elliott family who claimed it as a riparian right. The island was purchased by Senator H. H. Evans for approximately $875. Later Senator Evans applied for a refund of the purchase price, alleging that by a ruling of the Land Office an island had to have been known to be in existence at the time of the township survey, or when the State came into the Union, and that this island was not in the Federal plats and consequently his title was invalid. On April 26, 1912, his contention was overruled on the ground that the Federal Government had itself sold this island and given title to the same.

Application was made by the city of Aurora for the purchase of an island in the Fox River as a location for the city water plant. Commissioner Sparks of the Land Office in this case, in a letter December, 1886, refused to survey this island for the city, alleging such was "deemed disadvantageous to public interest." Upon this refusal the Forty-ninth Congress (H. R. 10233 Rept. No. 4010) thereupon confirmed the island to the city of Aurora (December 15, 1886, read and ordered printed February 10, 1887. Committee of the Whole passed and ordered printed, passed and approved March 3, 1887). The Federal Government thereupon had this island surveyed and patented to the city of Aurora.

There is an interesting case now pending in this same locality. Mr. J. M. Spiker, of Aurora, claims title to what is now the upper part of island No. 139 at Aurora, known better as Stolp's Island. He states that there were originally two islands where there now is one. The upper island and the one to which McCarty's Dam was originally built over the east channel and where the present East Dam stands, was originally separated from the lower island belonging to Stolp by a channel about 75 feet wide. After McCarty's dam was built Stolp secured permission and cut into the east channel above the dam and banked up this 75-foot channel on the sides, blocked off its lower outlet and used it as a head race to operate mills on his lower island. Stolp purchased this lower island from the Government and

had it surveyed. As time went on and the city of Aurora grew, this narrow 75-foot channel was filled in until the upper island lost its identity and the two islands became one larger island. This land is now occupied by various parties and claimed by them on the basis of a quit claim deed from the Stolp estate. This property now lies in the heart of the city of Aurora and is covered with valuable buildings

Fox Street Bridge, Aurora.

besides itself being very valuable. Mr. Spiker has filed, in two separate claims, Porterfield and Girard scrip for this upper island. Porterfield and Girard scrip are promises to pay in any unsold Federal lands, the face area of the scrip. These were issued by the Government in the early days when land was cheap and money was scarce, and they are negotiable. On the basis of his contention that

the Federal Government never sold or surveyed this upper island, Mr. Spiker claims that the title rests still in the Federal Government, and upon his filing the mentioned scrip must be, therefore, transferred to him. This case has been in continuance some eight years. The scrip has been accepted by the Government, but the survey has not yet been made nor the title transferred.

In the first of these mentioned cases, the General Land Office exercised jurisdiction over an island and denied a riparian claim. In the second case the Congress of the United States exercised jurisdiction and transferred title to an island, thereby stating that the title previously existed in the Federal Government. If it exists in one case,

Fox Street Bridge, East Channel, Aurora, Ill.

presumably it exists in all cases where previous transfer by the Federal Government has not been made.

It is seen, therefore, that the State and the Federal Government are not fully in accord in their rulings and jurisdiction over navigable waters. This state of affairs has led to much confusion, and the lack of the definiteness of jurisdiction has permitted many cases of violation of the public right and the occupation of public lands by private persons or corporations who haye only their own interests to further. The necessity of having these conflicting claims settled is urgent. A test case should be made and promptly carried to the Supreme Court of the United States so that the rights of the State and of the Federal Government may authoritatively and decisively be defined. With the Federal and the State powers clearly defined, each could properly proceed toward the preservation of the public interests in the streams before these valuable interests have been acquired by those to whom they do not properly belong.

CHAPTER VII.

Obstructions and Encroachments.

The examination of the Fox River valley at the time of this survey disclosed the fact that there are numerous obstructions and many encroachments along the channel. Especially have encroachments occurred in the larger cities, where the high value of land has caused many people to add to their property by filling within the flow lines. Obstructions, consisting of low bridges, wire and pipe crossings, dams, abandoned piers, etc., block the passage of this stream. In the first eighty miles above the mouth it would not be possible to go ten miles in the smallest motor boat without carrying the boat around some

Dundee, Ill.

obstruction. Between the Wisconsin State line in the north and the mouth of the river at Ottawa there are fifty-six bridges and fourteen dams. All of the dams, except the one near McHenry, Illinois, were built without locks, and the only method of getting by them is to carry around. Some of the bridges are low concrete arches, and in times of high water it is doubtful whether even a rowboat could pass under them.

The river is used as a dumping-place for all kinds of refuse by nearly every town situated on it, and between towns the abutting land owners do the same. This is gradually transferring a beautiful stream into a sewer whose banks in places are lined with unsightly waste, and

whose channel has been so restricted at some points until it will not accommodate the flood flow without doing serious damage. In places the river bank was filled and buildings erected on the fill, then more filling done and more buildings built. This is especially noticeable in Aurora and Elgin. At Elgin a comparison of the present bank lines with the maps of 1850 shows the river to have been narrowed more than 150 feet, and the high-water cross section is less than one-half of what it was in its natural state. At Aurora also there has been extensive filling, and the postoffice, city hall and a number of business houses are located on ground formed by filling in an original chain of islands in the river. Numerous bridges in this same locality have further narrowed the channel until there is danger of a great flood doing immense damage.

Surveys have been made in Aurora, showing the locations of buildings in reference to the United States meander lines of 1829 and of the recorded lines showing the water's edge in 1842, 1856 and 1859.

The list of these encroachments has been divided into four classes, as follows:

"A." Where filling is now being made along and in the water of the river.

"1." Structures or filling made in the water with dates when made.

"2." Structures or filling apparently and *probably* made in the water with dates.

"3." Structures built between meander lines and old natural shore lines (as recorded on subdivision plats) with dates.

Under Class "A" we have the following list:

Aurora Brewing Company.—Filling with earth, manure and other refuse above the Brewery Company's icehouse, between the tracks of the C. & N. Railway Company and the river.

American Wood Working Machinery Company.—Cinders and refuse from the foundry and machine shops are being dumped along the water line of the river opposite the property of the company.

Western United Gas and Electric Company.—At the old plant at River Street and North Avenue cinders and other refuse are dumped along the bank of the river, and at their plant at Washington and Stone Avenues. The cinders and refuse are being used to raise the ground in the rear of the plant and along the edge of the river bank.

At the plant of the American Well Works on Broadway the refuse of all kinds is dumped on a small island opposite the plant by means of a cable way from the mainland to the island.

Under Class 1 we have:

The Aurora Cotton Mills.—Brick buildings and wall erected about 1900 and encroached on the water of Fox River, and the area enclosed has been filled and used as private property. Area of encroachment, 11,200 square feet. Greatest encroachment beyond U. S. meander line, 60 feet.

The Fox River Dye and Cleaner Company.—Brick building was erected in 1912, and filling placed in water along said building. Area of encroachments, 1,706 square feet. Greatest encroachment U. S. meander line, 35 feet. Greatest encroachment line of 1842, 18 feet.

The American Wood Working Machinery Company.—Brick building in the water of Fox River in about 1905, and land reclaimed from the river by additional filling until the present time. Area of encroachment, 56,250 square feet. Greatest encroachment U. S. meander line, 140 feet. Greatest encroachment 1842 line, 80 feet.

Y. W. C. A. Building.—Brick building built into or over the river and partially supported on concrete pillars in the water. The building was erected in 1911-13. Area of encroachment, 5,625 square feet. Greatest encroachment U. S. meander line, 140 feet. Greatest encroachment 1842 line, 75 feet.

W. S. Frazer Estate.—Brick building erected in 1911 fronting Fox Street. The rear building was erected twenty-five years ago. Filling made alongside of building in 1911 and 1912. Area of encroachment, 17,250 square feet. Greatest encroachment U. S. meander line, 80 feet. Greatest encroachment 1842 line, 20 feet.

Frank Mall Lumber Company.—Brick building erected 1914 and foundation wall built into the river. Area of encroachment, 3,200 square feet. Greatest encroachment U. S. meander line, 35 feet.

The I. N. G. Armory was built in 1914 into the river on the upper end of Stolp's Island. Area of encroachment beyond survey of 1914, 1,650 square feet. Greatest encroachment beyond survey of 1914, 25 feet.

The "Hipp Sky Dome," an open-air theatre, is occupying ground made by building a wall, built in 1914, on the south side of Stolp's Island at and below the dam. Owned by Harry Hargrave. Area of encroachment, 2,200 square feet. Greatest encroachment, 25 feet. Referred to 1914 survey.

The Syloandell Amusement Company building is also built on ground reclaimed from the river on Stolp's Island. The building was erected in 1914. The south side of the building very closely approaches the shore line of 1914, but encroaches over the meander line 5,000 square feet and greatest distance 50 feet.

Under Class 2 we have:

The Standard Oil Company, who built a brick barn in about 1907, and the yard at barn was made on filled ground. Area of encroachment, 5,600 square feet. Greatest encroachment U. S. meander line, 70 feet. Greatest encroachment 1856 line, 5 feet.

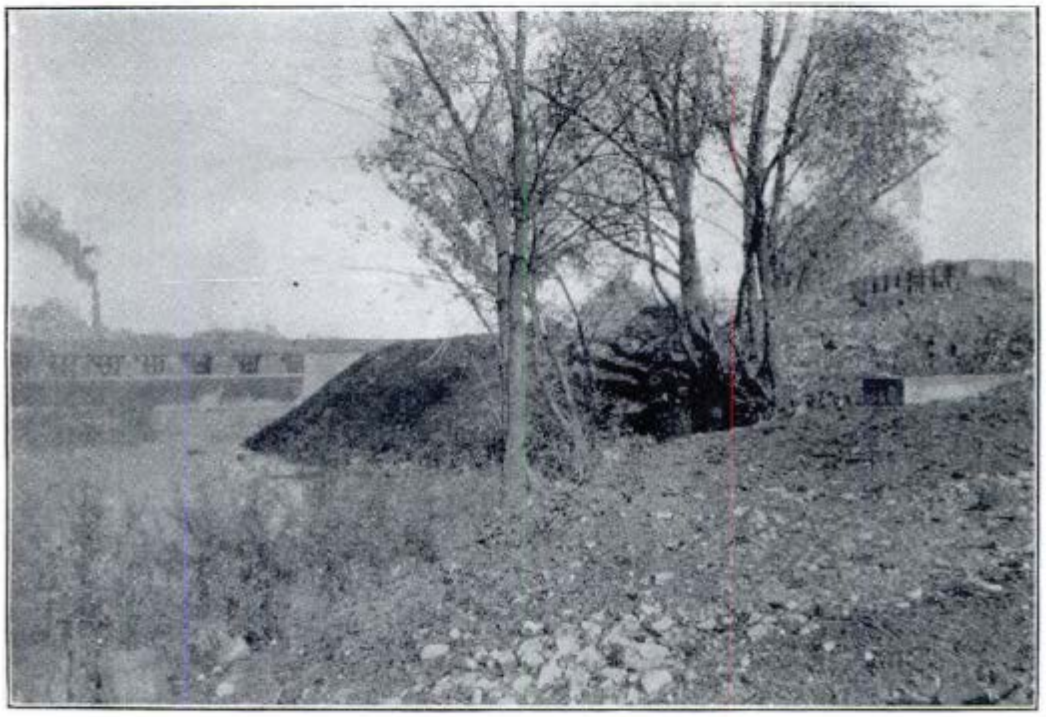
The American Well Works have brick buildings erected that encroach on the river. The buildings were erected at various dates, the last being in 1914. Area of encroachment, 25,000 square feet. Greatest encroachment U. S. meander line, 55 feet.

S. A. Stark Co. (John Jamison, owner). A part of the coal sheds and yard are undoubtedly on filled ground. Area of encroachment

22,000 square feet. Greatest encroachment on U. S. meander line, 110 feet. Greatest encroachment 1856 line, 50 feet.

The Western United Gas & Electric Company. At the old plant at the corner of River Street and North Avenue, the brick addition on North Avenue and the frame barn farther south are partly on filled ground. Area of encroachment, 6,500 square feet. Greatest encroachment U. S. meander line, 40 feet. Greatest encroachment 1859 line, 00 feet.

Brick buildings southwest corner of Water and Main Streets. J. Plain estate encroachment, 3,500 square feet. E. D. Briggs



View upstream at Elgin, Ill., showing filling of river bed by private parties. 1915.

encroachment, 1,000 square feet and over 40 feet over meander line. H. H. Evans encroachment, 775 square feet, and 30 feet over meander line.

Under Class 3 we have:

The Western United Gas & Electric Company at North Avenue and River Street, where we have in addition to the meander line the river line as shown by plat of Wagoner's subdivision, recorded in 1859, showing where encroachments exist.

S. A. Stark & Co., with coal sheds and yard. Here we have the meander line and the shore line given on Hall's Addition, and recorded in 1856 as authority for the claim.

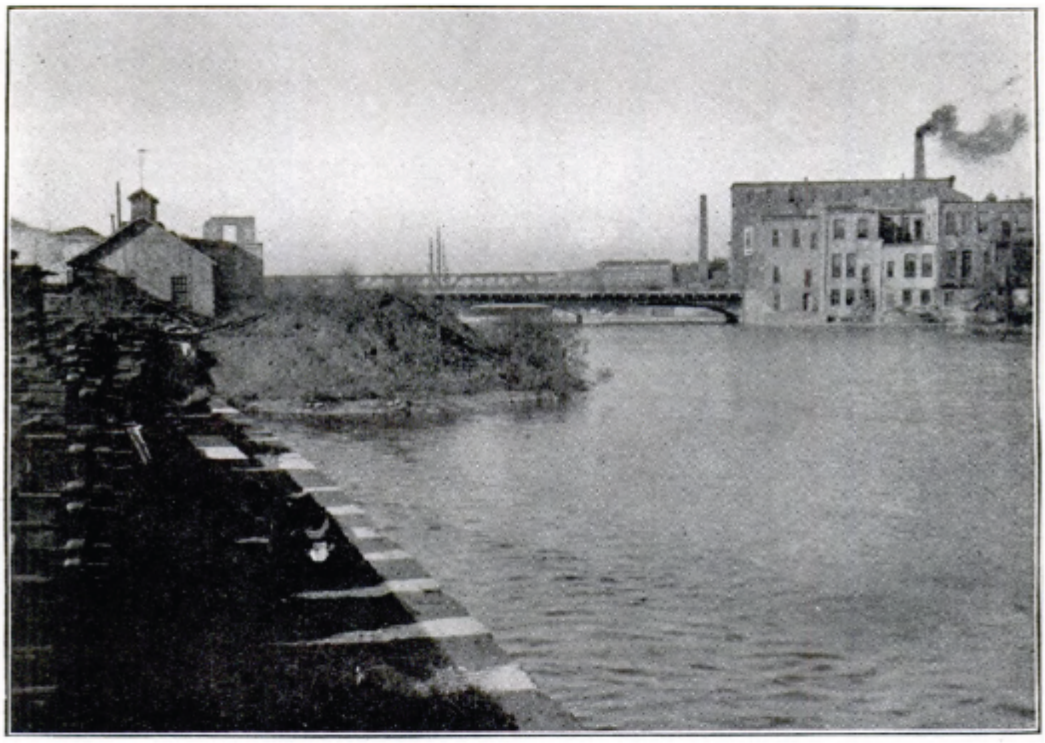
W. S. Frazer estate. Here the meander line is overstepped on an average of 75 feet, and it also encroaches on the river an average of

20 feet beyond the shore line of plat of West Aurora, recorded in 1842.

The Y. W. C. A. Building has been erected about 60 feet beyond the meander line, but also beyond the line as recorded in 1842 on plat of West Aurora.

American Wood Working Machinery Company have built 100 feet beyond the meander line, and have encroached about 50 feet on the river as shown by the plat of West Aurora, recorded in 1842.

The Fox River Dye & Cleaner Company have not only gone beyond the meander line but also that of 1842.



Main Street Bridge over Fox River, St. Charles, Ill. Note the filling placed in the channel.

The Aurora Cotton Mills have encroached beyond the meander line with a wall and buildings.

The same is true of the American Well Works, the Frank Mall Lumber Company, and the buildings at the northwest corner of Main and South Water Streets.

There is a stable belonging to the Aurora Fuel Company, a frame warehouse of the James Furniture Company, the buildings and tanks and stables of the Indian Refining Company, the Aurora Oil Company, the two-stall frame roundhouses and turntable of the C. & N. W. Railway Company, that are located between the meander line and the present shore of the river; also the icehouse and wagon-shed of the Aurora Brewing Company that are built across the meander line. All of these are located above the Aurora Cotton Mills and south of

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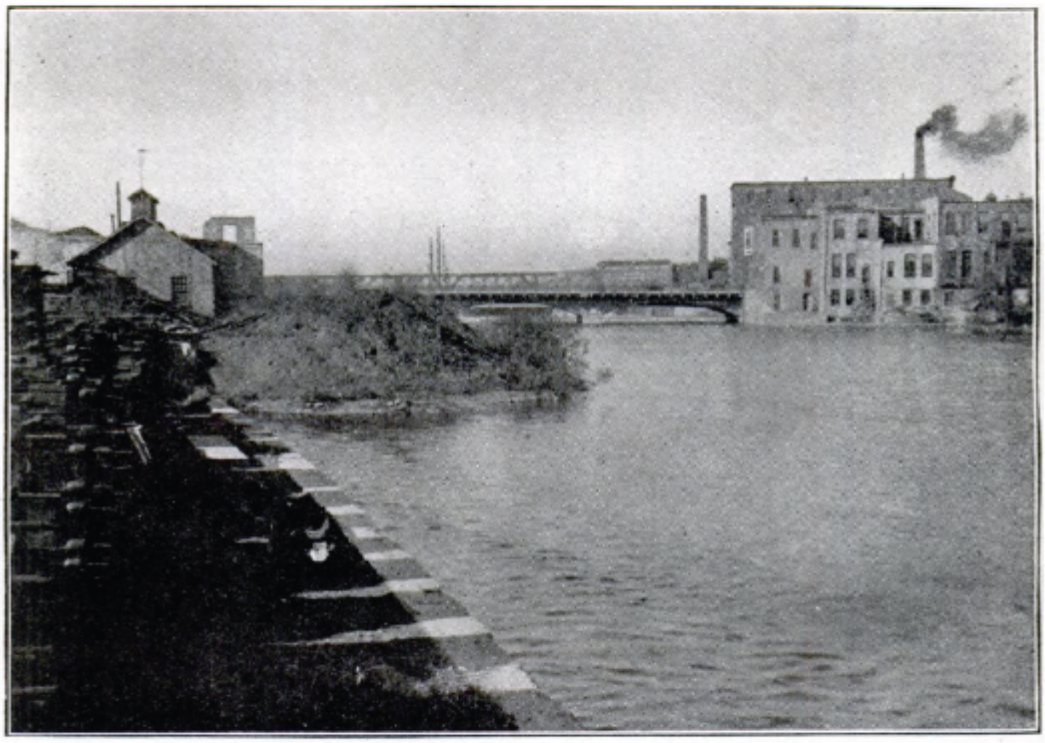

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the C. & N. W. Railway Company tracks, but from the nature of the ground it is impossible to say from examination whether or not there has been any encroachment on the river other than from natural accretions; but above and adjacent to the icehouse the Aurora Brewing Company has been filling along and in the river.

There has been considerable litigation in reference to the reclaiming of land around the shore of Stolp's Island in Aurora. (See Chapter VI). It has been claimed that what is now known as Stolp's Island was formerly two or more islands, and the old maps would tend to uphold this view of the case. Both the city of Aurora as well as private interests have filled in and added to the original area of this island.

Fishing at McHenry Dam, Fox River.

In 1914 Mr. Harry L. Wells was employed to make a survey of a portion of Aurora, and the plat of his survey shows the section and the United States meander line and shore lines as recorded when the subdivisions were platted in 1842, 1856 and 1859. On this plat are shown the principal structures that have been erected in violation of the law.

The Rivers and Lakes Commission, at the time this report goes to press, is completing a map of Elgin, showing the meander lines and the structures that have been erected beyond these boundaries. However, this work is not in a sufficiently advanced state to permit this information to be included in this report.

The results of encroachments on the banks and into the channel of a stream are twofold: such encroachments are generally occupation of public property, and, secondly, they constitute a restriction of the stream area that in times of flood may lead to a damming up

of water, overflow of adjacent territory, and consequent damage and possible loss of life. This overflow of the banks may not occur at the point of obstruction, due to the banks having been raised at that point, but the high-water produced by the obstruction may overflow at other points where the banks remain nearly at their natural height, with the result that the damage will be done to innocent parties. In any case, whether the offender himself suffers or not, others are sure to be involved as a result of his actions. Such acts are a menace to public safety and as such must be prevented.

The fact that great floods generally occur at long separated intervals leads the occupants of river property to feel secure, and the desire for additional area urges them to fill in more and more and encroach on the river channel. During the long interval generally existing between great floods this flood channel may become overgrown, and all evidence that it was submerged will have disappeared except from the memory of the old residents. Additional filling is made, structures are erected where the flood waters once flowed, until another period of heavy precipitation and extraordinary run-off produces another great flood. Then the constriction in the flood channel acts as a dam to increase the height of the water and spread it over a greater area. Property is destroyed, bridges are washed out, transportation lines are crippled, lives are lost, and the whole population of the river valley pays heavily for the carelessness and shortsightedness of a few owners of river-bank property. The memory of the recent great floods in the Ohio River basin is an urgent warning to all who live along the Fox River that unless free passage for the flood waters is secured, all residents of the Fox River valley may be forced to pay for the faults of a few. Public opinion is the strongest factor in our government, and when the entire population of a river valley appreciate the importance of keeping an open-flood channel, the efforts of the Rivers and Lakes Commission to prevent further encroachments and remove the existing obstructions in the river channels will be backed strongly by public opinion, and this important phase of their work will be immensely facilitated.

CHAPTER VIII.

Navigation, Improvements and Conclusions.

When the Fox River valley was first settled the river was the principal highways for the Indians and the white settlers. The four main traveled water routes from the north were from the lakes by portage into the Wisconsin and down that stream into the Mississippi; also by way of the Calumet and Desplaines to the Illinois and Mississippi; also via the Kankakee to the Illinois and via the Fox River to the Illinois. That these water routes were considered of great importance, as well as the other navigable streams, is attested by the clause in the Ordinance of 1787 when the Union was formed, which says: "The navigable waters leading into the Mississippi and the St. Lawrence, and the carrying places between the same, shall be common highways and forever free as well to the inhabitants of the said territory as to the citizens of the United States, and those, if any, other States that may be admitted into the Confederacy, without any tax, import or duty therefor."

That the Fox River was considered an important highway for many years after the passage of the Ordinance of 1787 is borne out by the movement in 1846 to connect the Fox River with Lake Michigan by a canal at the upper reaches in Wisconsin, and to open the Fox River itself by dredging, etc. Public meetings were held in northern Illinois and southern Wisconsin to discuss the feasibility and importance of this project. The citizens of Kane County, Illinois, held a meeting at Geneva, June 6, 1846, and adopted a report that the interests of the people required better means of communication with Lake Michigan, and expressed their conviction that it was possible to make the Fox River navigable; that the cost of constructing locks and dams could be partly paid by the sale of water power and the balance easily made up by the citizens, and that if the river was opened the people of Wisconsin would connect the river and Lake Michigan by a canal. They also stated that the distance by this project would be less than by the Fox River feeder and the Illinois and Michigan Canal. They concluded that the expense of transporting the last crop of wheat at 10 cents per bushel would be enough to open the river to the south line of Kane County—a distance of 60 miles. In 1845, the report continues, the average yield of wheat per township equaled 39,640 bushels, and in the 100 townships affected by the proposed improvement, at 37½ cents per bbl., by 1849 the revenue would amount to a total of $300,000 on wheat alone.

On June 27, 1846, a similar meeting was held by the citizens of McHenry County, and they also passed a resolution strongly endors-

ing this project. On August 10, 1846, the citizens in the Fox River valley in Wisconsin held a public meeting at Rochester and enthusiastically adopted resolutions favoring the scheme.

The history of these meetings shows that the river was held in high esteem as a highway as late as 1850, and probably some time thereafter.

The most pretentious attempt at river navigation was made shortly after the close of the Civil War. Octave Leundry secured a charter about 1867 to navigate the Fox River from the mouth to Elgin. The exact name of this company is not known, and the charter has disappeared. A steamboat of about 20 feet beam and 60 feet long was built and launched above the dam at Aurora. This boat was named the "Mayflower," and was operated for several years from Aurora

The Cut, Fox Lake, Ill.

to Batavia. It was the intention to run between Aurora and Elgin, but the owners of the Batavia dam refused to put in locks or an incline so that the boat could get past, and the trip was limited to the distance from Aurora to Batavia. This boat was provided with wheels on the sides so that it could be dragged over the dams. Many people now living remember it and some old pictures of it are still treasured by residents of Aurora.* Leundry sold out June 30, 1877, to his partner John St. Martin, and later Martin sold the boat and it was taken to the Fox Lake region. The name was changed, and it was operated in that district. Old residents of McHenry remember when the Mary Griswold made regular trips in the 70's and 80's, and it is very likely that this was the old "Mayflower."

* John Linden, 36 Fox Street, Aurora, and others.

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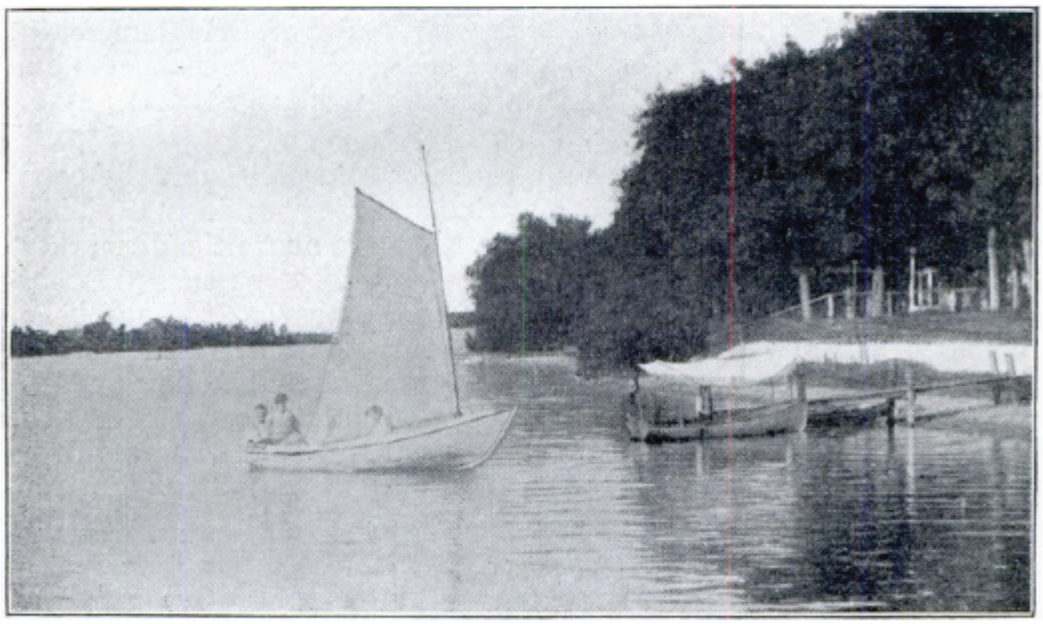
At present there are numerous power boats, rowboats and canoes in the upper parts of the Fox River in the summer season. It has been estimated by those who are best acquainted with the conditions that there are about 4,000 boats in the Fox Lake region and above Algonquin. There are also numerous boating clubs and boats in the pools above each dam further downstream. These are not as numerous, because they are generally confined to a few miles of river in the local pool. A conservative estimate for the whole river would be 5,000 to 6,000 boats. The majority of these are owned by the large population of summer vacationists who go from the cities to the Fox River valley every summer. Fox Lake, McHenry, Cary and Algonquin are



Fox River, near McHenry, Ill.

to a large extent dependent on the summer trade, and do a thriving business in supplying campers and summer people.

The Fox Lake region and as far down as Algonquin is dotted with summer camps, cottages and more pretentious homes. Practically all the good banks and shores are occupied, and only the swampy stretches, of which there are a great many, remain unused for outing purposes. A very noticeable change is observed below Algonquin. The dam at Algonquin is not passable except by portage around the end, and the result is seen in the absence of cottages and summer homes below the dam. There are practically no permanent cottages for many miles below the Algonquin dam, except a few small boathouses. The next place where there has been any effort to build permanent cottages is at St. Charles. These cottages, however, are distinct and separated from the upper river region by impassable dams at South Elgin, Elgin, Carpentersville and Algonquin.

Some of the best locations along the river are below Algonquin. There are numerous groves with good banks, and the rolling hills

make this a beautiful valley. A good part of the valley above Algonquin is low and swampy and good locations for summer cottages are comparatively scarce. If the river could be made navigable for power boats below Algonquin, as well as above, a large part of the best portions of the Fox River valley would be open to summer residents. The land transportation facilities also are better below Algonquin than above.

With a view to determining the feasibility of opening the Fox River for boats of light draft, G. E. McCurdy and J. N. Shere navigated the river from the Fox Lake region to the mouth at Ottawa, in a flat-bottom boat equipped with detachable boat motor. This trip was made in the fall of 1915 at comparatively low water, although the water at that time was one to two feet higher than during the 1914 survey. Obstacles to navigation, such as bars, rocks, dams and bridges were noted and water elevations secured from B. M.'s at the bridge abutments.

As a rule there is a stretch of shallow water immediately below each dam. At very low water these shallow stretches are not navigable for even a flat-bottom rowboat. In the pools above the dams there are gravel bars of varying width that offer an obstruction to probable navigation. Then the dams themselves, excepting the one below McHenry, are not equipped to allow boats to pass. However, all these obstacles are comparatively easy of removal. The dams can be passed by a simple form of marine railway built at small cost. The shallows can be dredged out and channels cut through the bars. From the Fox Lake region to Aurora could be opened without undue trouble. Some places below Aurora could be opened easily until further downstream the rocky ledges would make rock cutting necessary. In the lower reaches, the probable best method to open the river would be in connection with some power development project that would dam the water so that the depth to operate small boats would be readily secured.

Plate X shows a type of marine railway that is comparatively cheap and can be used at all the dams along the Fox River by modification to suit each particular condition. Where there is a head race, the marine railway can be located at some distance down it and avoid the shallows generally occurring below the dam. In practically no case will the railway go directly over the dam, as shown in Plate X. In most cases the lift from the pool above the dam will be upon the bank at the end of the dam proper. Thence the car "B" will run on narrow-gage track to some suitable point below the dam where the boat will be lowered into the lower level. It will generally be necessary, excepting in a few cases where the head race can be utilized, to dredge a channel below the dam with a small pool into which boats will be lowered when going downstream, and vice versa going upstream. Where electric power is available, a small motor can be installed to operate the hoisting apparatus. This consists simply of a drum and cable with proper dogs and brake. Car "A," Plate X, is hoisted and carrier "B" rolled off and on to car "C." Hook and

cable are transferred to "C" previously and this car is lowered until boat floats into lower pool. Where electric power is not available, the hoisting drum can be worked by hand. At a majority of the dams electric power can be readily secured. It is estimated that the cost of installing this marine railway for hand operation will be $700 and for electric operation $1,000. As previously stated, each individual case will vary somewhat. These estimates are for average conditions.

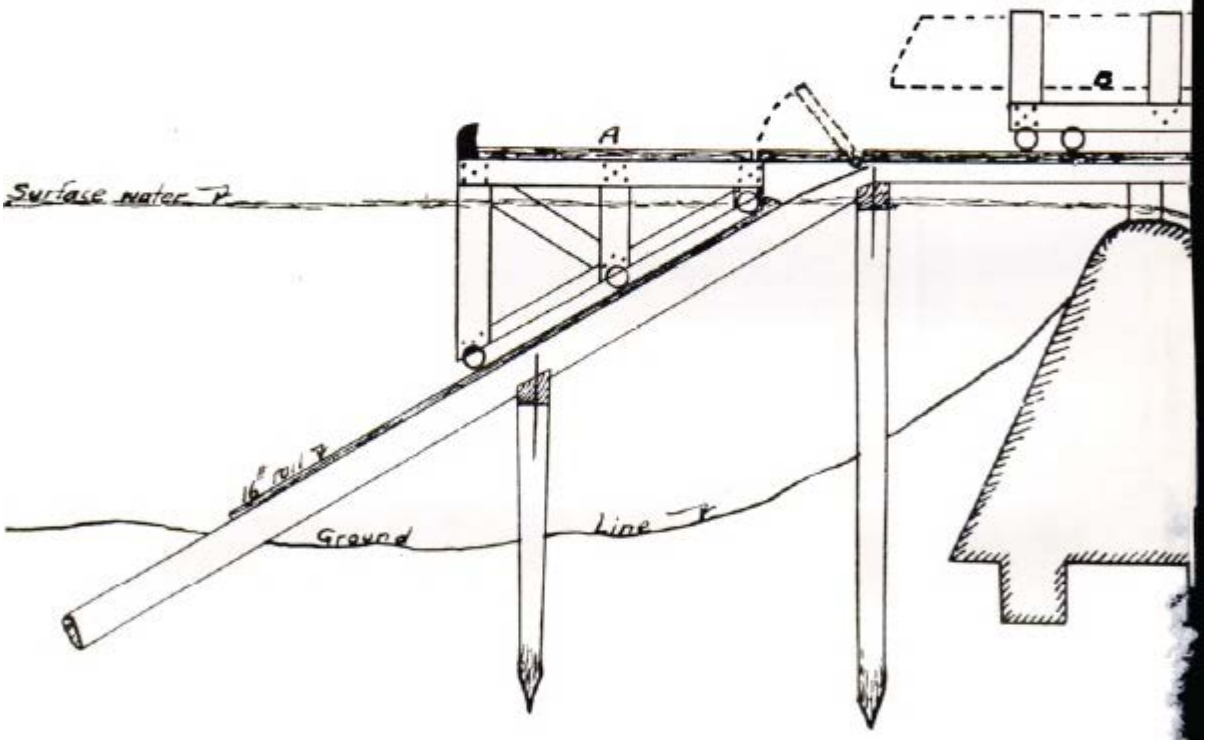
Table XXVI shows the cubic yards of dredging required, and the estimated cost of each section between dams from Algonquin to Yorkville. Owing to the rock and expensive nature of constructing a channel below Yorkville, the best method of securing sufficient depth would be secured by constructing dams. The concrete dam at Millhurst could be completed or the present gaps closed by a timber crib at very small cost and the water raised almost to Yorkville. There are also the remains of an old dam below Montgomery and above Oswego. There are islands in the river at this point, and the remains of an old mill on the right bank. By using the old stone walls of this mill, a dam, to raise the water four or five feet, could be constructed at very little expense, and would secure sufficient depth for small boats as far up as the Montgomery dam. There are long stretches of fairly deep water between Yorkville and Wedron, but they are separated by shallows, generally where the water flows over ledge rock. By putting in a dam, such as the one at Millhurst, or closing the gaps in it with a timber crib, and leading a head race from one side of the dam along the bank, the pool formed by the dam can be utilized not only to back the water upstream but by means of the head race boats can be floated on it for a considerable distance below the dam and lowered into the river below the shallows. This head race can be made to pay for its cost by utilizing the power developed by the difference in level of the water in the race and the water in the river below the dam. With a head of ten feet, for example, at the Millhurst dam, and a head race along the left bank, there would be cheap power for numerous small mills along the river, and switch-

TABLE XXVI.

ESTIMATED COST OF IMPROVING THE FOX RIVER FOR NAVIGATION OF SMALL BOATS. PROPOSED CHANNEL 20x3 FEET MINIMUM WITH MARINE RAILWAYS AT THE DAMS.

From Dam At.	To Dam At.	Dredging, Cu. yds.	Cost.	Marine Ry. Cost.	Total Cost.
Algonquin	Carpentersville	5,500	$ 2,200	$ 1,000	$ 3,200
Carpentersville	Elgin	11,000	4,400	1,000	5,400
Elgin	S. Elgin	9,000	3,600	1,000	4,600
S. Elgin	St. Charles	20,000	8,000	1,000	9,000
St. Charles	Geneva	9,500	3,800	1,000	4,800
Geneva	Batavia	12,300	4,920	1,000	5,920
Batavia	A. E. & C. Dam	3,500	1,400	1,000	2,400
A. E. & C. Dam	N. Aurora	11,000	4,400	1,000	5,400
N. Aurora	Aurora	19,100	7,640	1,000	8,640
Aurora	Montgomery	9,000	3,600	1,000	4,600
Montgomery	Yorkville	25,000	10,000	1,000	11,000
Totals		134,900	$53,960	$11,000	$64,960
Algonquin to Aurora. Totals		$100,900	$40,360	$9,000	$49,360

Pla



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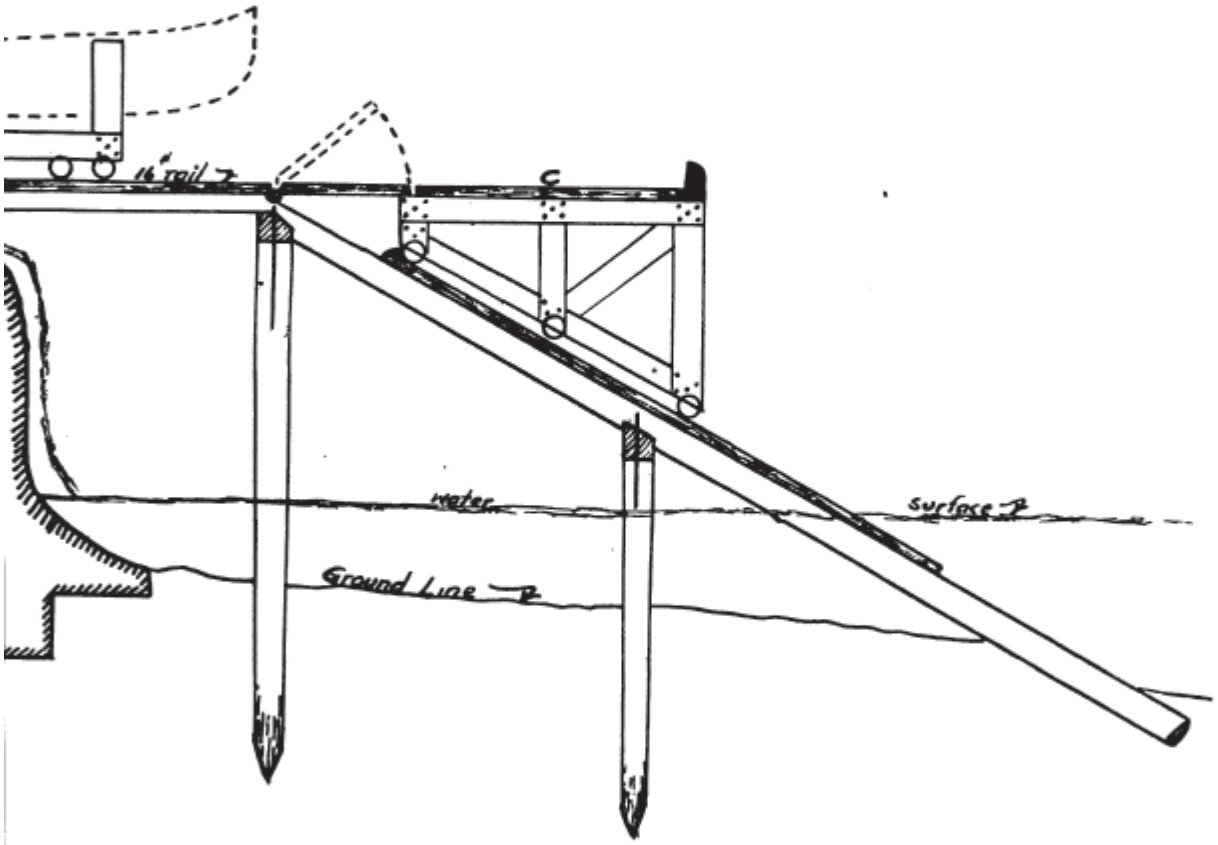


AND LAKES COMMISSION.
for Improvement of the Fox River.
er, 1915.

ing connections with the C. B. & Q. R. R. available. An average flow of 1,000 second-feet would give theoretically over 1,200 horse-power available. The extreme low water would lower this materially, depending upon the amount of pondage, etc., but with a small auxiliary steam plant for the very dry season there would still be a large amount of cheap power and fair transportation facilities.

What is true at Millhurst is true in a larger sense at Wedron and Dayton. Mention has already been made in Chapter IV of the proposed developments at these places. When this section of the river is ultimately developed, and small boats can go below Yorkville, one of the most beautiful parts of the Fox River valley will become better known. The rocky bluffs, rolling hills and timbered slopes, combined with gravel and rock bed, make this portion of the river especially attractive for summer homes. Owing to the comparatively poor transportation facilities this part of the Fox River valley is practically

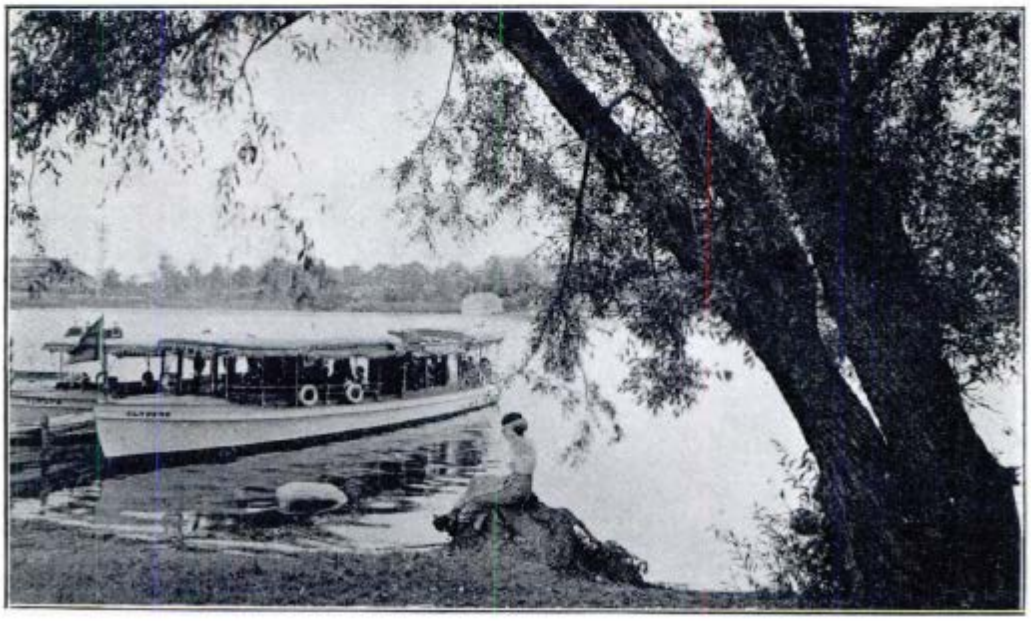
Yacht Club Pier, Fox Lake, Ill.

unknown to the summer camper and has not been developed, but is very much nearer its natural condition than the popular Fox Lake district. Here the banks are much higher, there are no swampy stretches, the country is more rugged, the fall of the river is greater, no factories pollute the stream, towns are small and far apart, and the conditions, from the point of view of the camper, are more nearly ideal. The opening of the river for small boats would open a large part of the best part of the valley, now isolated, and would furnish a delightful recreation ground for the city dweller and bring a large additional trade to the local population.

As shown in Table XXVI, the cost of opening the Fox River from Algonquin to Aurora would be approximately $50,000. On the basis of 5,000 boats this would be a pro rata charge of $10 per boat. On

the basis of the six townships in Kane County bordering the Fox River between Algonquin and Aurora, having a total population of 80,785, the cost would be 62 cents each. All the territory above

Fox River, below Wedron, Ill.



Boat Landing at McHenry, Fox River.

Algonquin would also benefit from such an improvement, or a total population of 97,756. The pro rata cost would be 51 cents for this population. This improvement would open sixty-five miles in the

State of Illinois and add over thirty miles to the river valley available for summer outing purposes. Elgin and Aurora would be convenient to the upper lake region by small boat, and residents of these cities could take a delightful ride on the Fox River when going back and forth between business and pleasure. Campers conveniently could visit these cities for supplies or an evening's pleasure. Added value would be given to the locations above Algonquin and a large section of the valley and many of the best locations below Algonquin would be opened for future settlement and added to this recreation district. There are numerous boat clubs in this territory, and to them properly belongs the initiative in securing such an improvement. By means of a central committee, or any other means, if they act in concert, this undertaking could be pushed to a successful accomplishment. With the coöperation of the Rivers and Lakes Commission in the plans and construction, this work could be carried through at the minimum of expense, and a long step taken toward the ultimate improvement of one of the most beautiful valleys in the State.

Conclusions.

From this survey and examination of the Fox River valley several points of especial importance should be emphasized. They are:

(a) That the Fox River is one of the best water-power sites in the State, and capable of extensive development.

(b) That the safe limit for the natural dilution of raw sewage has been reached, and future sewer developments should provide artificial purification of the sewage before it is discharged into this river.

(c) That the Federal and State jurisdiction over navigable waters should be clearly defined by a ruling from the Supreme Court of the United States so that more concerted action may be taken to prevent infringement of the public rights.

(d) That numerous obstructions and encroachments have occurred along the Fox River, and are a menace to public safety in periods of high water. That many private interests have occupied ground belonging to the public, and that the efforts of the Rivers and Lakes Commission to remove the obstructions and secure the public title in these lands is an important work and deserving of public help and recognition.

(e) That the Fox River can be made navigable for small boats for the majority of its length at reasonable cost, and that such an improvement would be of great value to those residing permanently within the valley, and to the large population who use this district as a summer recreation ground.

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