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Report to

THE INTERNATIONAL JOINT COMMISSION

on

THE DIVISION AND USE MADE OF THE WATERS OF
ST. MARY AND MILK RIVERS

by

L. B. LEOPOLD

representing United States

and

J. D. McLEOD

representing Canada

1961

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International Joint Commission,
Washington, D.C., and Ottawa, Ontario.

Gentlemen:

In compliance with the Provisions of Clause VIII (c) of your Order of the 4th October, 1921, directing the division of the waters of St. Mary and Milk Rivers between the United States and Canada, we are transmitting herewith a report on the operations during the irrigation season ended October 31, 1961.

Respectfully submitted,

L. B. Leopold
Accredited Officer of the United States.

J. D. McLeod
Accredited Officer of Her Majesty.

APR 27 , 1962.
(date)

CONTENTS

	<u>Page</u>
Letter of Transmittal to the Commission	
Introduction	1
Summary of the Division of St. Mary River and Eastern Tributaries of Milk River and Reservoir Storage	2
Water Supply - St. Mary River	3
Milk River - and its Eastern Tributararies	3
Division of Water - St. Mary River	5
Milk River	7
Eastern Tributaries of Milk River	7
Appendix	9

TABLES

	<u>Table No.</u>
Natural Flow of St. Mary River at International Boundary and its Division between Canada and the United States	1
Summary of Mean Monthly Natural Flow of St. Mary River at International Boundary	2
Summary of Mean Monthly United States Share of Natural Flow of St. Mary River at International Boundary	3
Summary of Mean Monthly Canadian Share of Natural Flow of St. Mary River at International Boundary	4
Division of Flow of St. Mary River and its use by Canada Division of Flows of St. Mary and Milk Rivers and their use by the United States	5
Determination of Natural Flow of Battle Creek at International Boundary	6
Determination of Natural Flow of Frenchman River at International Boundary	7
Determination of Natural Flow of Lodge Creek at International Boundary	8
Diversions from the Eastern Tributaries of Milk River in Canada	9
Measured Diversions from the Eastern Tributaries of Milk River in United States	10
Measured Run-off in Acre-feet of Eastern Tributaries of Milk River at International Boundary	11

.....
List of gauging stations with map showing their locations
in the river basins.

Introduction

The field work incidental to the division and administration of the waters of the St. Mary and Milk Rivers in Alberta, Saskatchewan and Montana was conducted during the irrigation season of 1961 by representatives of the United States Geological Survey and the Water Resources Branch (Canada).

Dr. L. B. Leopold, Chief Hydraulic Engineer, United States Geological Survey, as accredited officer of the United States, was represented in the field by Mr. F. Sermitz, District Engineer, Helena, Montana. Mr. J. D. McLeod, Chief Engineer, Water Resources Branch, Department of Northern Affairs and National Resources, acting in the capacity of accredited officer of Her Majesty, was represented in the field by Mr. R. D. May, District Engineer, Calgary, Alberta.

This report has been prepared jointly by Mr. F. Sermitz and Mr. R. D. May.

The waters of the two rivers were divided between the two countries in accordance with the Order of the International Joint Commission dated at Ottawa, Canada, on the 4th day of October, 1921.

The hydrometric data upon which this report is based were collected and compiled jointly for 36 international stations. Data for another 23 stations in Canada and 8 stations in the United States were collected independently by the same engineers in their respective countries. The United States Bureau of Reclamation furnished data for 8 canal and 2 reservoir stations and the United States Bureau of Indian Affairs furnished data for one other canal station in Montana.

Summary data on the division of water during the 1961 irrigation season and on reservoir storage are given in the tables on page 2.

Summary of Division of Water during 1961 Irrigation Season

St. Mary River.....April to October

Eastern Tributaries of Milk River...March to October

Quantities in acre-feet

Stream	Natural Flow at International Boundary	Canada			United States		
		Share	Received	Deficit (-) Surplus (+)	Share	Received	Deficit (-) Surplus (+)
St. Mary River	566,800	343,000	374,800	+31,800	223,700		
Lodge Creek	1,790 ✓ 570	895 285	957 - 263	+62 - 548	895 285	833	- 62 + 548
Battle Creek	5,650	2,820			2,820	4,460	+1,640
Frenchman River	18,700	9,350			9,350	9,310	- 40

Summary of Reservoir Storage
at end of 1960 and 1961 Irrigation Seasons

Quantities in acre-feet

	F.T.L.	Dead Storage	Total Storage	
			Oct. 31, 1960	Oct. 31, 1961
Lake Sherburne	66,200	negligible	7,560	7,320
St. Mary Reservoir	320,000	35,000	119,300	236,400
Fresno Reservoir	127,200	1,860	32,690	19,650
Nelson Reservoir	66,800	18,650	45,930	18,250
Middle Creek Reservoir	18,000	2,200	11,430	3,490
Altawan Reservoir	5,800	negligible	85	69
Cypress Lake	110,300	30,500	80,480	56,600
Eastend Reservoir	1,470	negligible	532	532
Val Marie West Reservoir	3,800	negligible	301	65
Val Marie Reservoir	11,400	140	2,000	1,720

Water Supply

St. Mary River

The total natural flow of the St. Mary River at the international boundary for the year 1 November 1960 to 31 October 1961 was 625,300 acre-feet. Of this total, 566,900 acre-feet occurred during the irrigation season 1 April to 31 October. The natural flow during the irrigation season was 96 percent of 588,300 acre-feet, the average of the previous 58 years of record. 418,700 acre-feet was delivered to Canada during the year with 374,800 being delivered during the irrigation season.

The fortieth annual international survey of snow conditions in the St. Mary River drainage basin was conducted on 2 and 3 May 1961. The survey provided advance information on the probable run-off during the irrigation season. The tabulated results of the forecasts and measured discharge at three locations are shown below.

Location	Period of Correlation	Forecast of 1961 Run-off		Measured Run-off	
		Acre-Feet	% of Average	Acre-feet	% of Average
Swiftcurrent Creek at Many Glacier	1923-60	84,400 (May to July)	(1923-60) 123	73,720 (May to July)	(1923-60) 108
Natural Flow Swiftcurrent Creek at Sherburne	1922-60	143,000 (May to Sept.)	(1922-60) 124	119,800 (May to Sept.)	(1922-60) 105
Natural Flow St. Mary River at International Boundary	1922-60	644,000 (May to Sept.)	(1922-60) 128	501,600 (May to Sept.)	(1922-60) 100

Milk River

The estimated natural flow of Milk River at its eastern crossing of the international boundary, during the period 1 March to 31 October 1961, was ³⁸⁰⁰⁰~~36,000~~ acre-feet or ³³~~31~~ percent of 116,000 acre-feet, the average of estimated natural flows of the previous 49 years of record.

Eastern Tributaries of Milk River

The total quantity of water delivered to the United States by the eastern tributaries of Milk River during the period, 1 March to 31 October 1961, was 22,280 acre-feet or 15 percent of 144,300 acre-feet, the average of the previous 34 years. The quantities delivered to the United States by the various tributaries are listed in Table 11.

During the season a total of 13,540 acre-feet was diverted from the eastern tributaries in Canada to irrigation canals or storage.

These diversions are listed in Table 9. The consumptive use by Canada was 8,530 acre-feet. Measured diversions in Montana amounted to 10,960 acre-feet. These are listed in Table 10.

The ninth annual snow survey in the basins of the eastern tributaries of Milk River was conducted by the Water Resources Branch, Canada from 28 February to 2 March 1961. The correlation of snow survey data and subsequent run-off will be attempted after several more years record have been obtained. For comparison purposes the average snow cover and the average water content for the history of the survey are listed below:

<u>Year</u>	<u>Average Snow Cover</u>	<u>Average Water Content</u>
1953	10.3 inches	2.1 inches
1954	4.4 "	1.2 "
1955	10.4 "	2.8 "
1956	13.0 "	3.4 "
1957	7.7 "	2.1 "
1958	7.9 "	1.2 "
1959	9.3 "	3.4 "
1960	9.1 "	2.4 "
1961	4.7 "	1.8 "
1962	5.0 "	1.2 "

Division of Water

St. Mary River

The division of the waters of the St. Mary River was carried out in accordance with the Order of the International Joint Commission dated October 4, 1921.

The daily natural flow of the St. Mary River was determined in the following manner. Daily records were obtained at United States St. Mary Canal at St. Mary Crossing, near Babb, St. Mary River at International Boundary, Lake Sherburne at Sherburne and, an Evaporation and Precipitation station near Babb, Montana.

The natural flow of the St. Mary River at the international boundary was considered to be the sum of the quantities measured at the United States St. Mary Canal at St. Mary Crossing, St. Mary River at International Boundary and, addition of storage or subtraction of release corrected for evaporation at Lake Sherburne.

A one-day time lag was applied to stored and released quantities from Lake Sherburne to synchronize the flow with flow quantities at the international boundary.

The natural flow of the St. Mary River having been determined, the division of its waters was carried out in accordance with the above order.

During the irrigation season, 1 April to 31 October, field engineers of both countries made frequent computations of the daily natural flow of the river and each country's share thereof, in order that any appropriation by the United States in excess of their share could be adjusted by a subsequent delivery to Canada of an equivalent amount at the earliest opportunity.

Regular interim reports on the progress of the division of the natural flow at the international boundary were made to interested agencies throughout the irrigation season.

During the non-irrigation season, 1 November 1960 to 31 March 1961, no interim reports were made as the only United States use during this period was storage in Lake Sherburne where the contributing drainage area is about 14 percent of the total area of the St. Mary River drainage basin in the United States.

Storage in Lake Sherburne was 7,560 acre-feet on 31 October 1960 and had increased to 22,080 acre-feet by 31 March 1961 and to 66,370 acre-feet by 30 June 1961. On 31 October 1961 the storage was 7,320 acre-feet.

The United States St. Mary Canal was operated between 3 April and 20 October and water was delivered to the North Branch of the Milk River from 5 April to 22 October.

Seepage from the canal between the point of diversion and the crossing of the St. Mary River is assumed to return to the river and eventually become available to Canada. The discharge of 205,100 acre-feet which passed the gauging station on the United States St. Mary Canal at St. Mary Crossing between 3 April and 20 October was considered to be the quantity diverted from the St. Mary River by the United States. A total of 197,400 acre-feet was delivered to the North Branch of Milk River at Hudson Bay Divide during the season, from where it was conveyed to irrigation projects in Montana via the Milk River.

Canada diverted 412,400 acre-feet of water from the St. Mary River Reservoir in 1961 as measured at the Canadian St. Mary Canal and Magrath Irrigation District Canal gauging stations near Spring Coulee.

Milk River

No division of the flow of Milk River at Eastern Crossing was made in 1961. Except for a few small unmeasured diversions above the eastern crossing of the international boundary, the entire natural flow of the Milk River at that point was delivered to the United States.

The United States Geological Survey began stream flow record collection in 1961 on the South Fork Milk River near Rabb to assist in studying the utilization of waters in the Milk River Basin within the Blackfeet Indian Reservation.

The expressed concern and complaint within Canada has been the occasional and sometimes prolonged lack of adequate supply for stock-watering along the Milk River above the mouth of the North Milk River.

The Milk River ceased flowing at the western crossing of the international boundary on 21 August and resumed flowing on 21 September. The second annual inspection by representatives of Canada and the United States revealed no significant change in water use for irrigation and beaver activity still appears to be a factor in stream regimen. Continuation of annual inspection, preferably during the irrigation season, and the collection of sufficient data on stream flow is favored.

Eastern Tributaries of Milk River

Minor Diversions:

Estimates for a number of small diversions from the eastern tributaries of Milk River in Saskatchewan were provided by the Water Rights Division of the Province of Saskatchewan and are based on reports ^{licensed} from the individual irrigators. These estimates are not used in the Battle Creek and Lodge Creek division computations in Tables ² 6 and 8, except as an adjustment to the totals for the season. The estimated quantities reported to date for 1961 are, however, shown in Table 9 and also detailed in the appendix to this report.

Battle Creek

The computed natural flow of Battle Creek at the international boundary for the period 1 March to 31 October 1961 was 5,650 acre-feet, of which each country was entitled to fifty per cent. The details of this division are shown in Table 6 of this report. Canada diverted a net of 8,537 acre-feet to irrigated land, after adjustment for return flow, but as 8,412 acre-feet were released from storage in Cypress Lake the net use by Canada of the natural flow of Battle Creek was only 119 acre-feet. Four thousand four hundred and sixty acre-feet were delivered to the United States.

Frenchman River

This year a new method of computation was introduced in an attempt to account for periods of apparent "negative natural flow", which occurred frequently using the previous method of computation. The major changes made were in revisions of return flow and minor diversion computations, and this year the effect of channel losses was introduced. The introduction of channel losses was felt justified since some allowance for them, even in the form of an estimate, would probably produce natural flow figures in smaller error than those produced on the even more erroneous assumption that there are no channel losses in stored or released water.

The computed natural flow of the Frenchman River at the international boundary for the period 1 March to 31 October 1961 was 18,700 acre-feet, of which each country was entitled to fifty per cent. The details of this division are shown in Table 7 of this report. Canada used 8,550 acre-feet, including 890 acre-feet in minor diversions as computed in Table 7, and delivered 9,310 acre-feet to the United States.

Lodge Creek

Computation of the natural flow of Lodge Creek at the international boundary was initiated in 1961 and formal division in the field began in 1961.

The computed natural flow of Lodge Creek at the international boundary for the period 1 March to 31 October, 1961 was 1,790 acre-feet, of which each country was entitled to fifty per cent. The details of this division are shown in Table 8 of this report. Canada diverted 1,705 acre-feet to irrigated land, but since 1,833 acre-feet were released from storage in Middle Creek reservoir Canada did not in fact use any of the natural flow of Lodge Creek. Eight hundred and thirty-three acre-feet were delivered to the United States.

Middle @ Alta Bar
Lodge @ Alta " "
Minor Diversion

Note - No reference to
Table # 9

Appendix

An appendix, submitted with this report, under separate cover, contains the result of discharge measurements, summary of monthly discharge and the daily gauge height and discharge data for 55 gauging stations operated during 1961 in the St. Mary and Milk River drainage basins. Details of the Canadian minor diversions, as grouped in Table 9 of the report, are included.

NATURAL FLOW OF ST. MARY RIVER AT INTERNATIONAL BOUNDARY AND ITS DIVISION BETWEEN CANADA AND UNITED STATES (Cu. ft. per sec.)

1961 Day APRIL	Computed Natural Flow St. Mary River at Int. Bdry.	Canada's share of St. Mary River Natural Flow	Recorded Flow of St. Mary River near Int. Bdry.	Canada received more (+) or less (-) or than share		U.S. share of St. Mary River	Storage Factors Lake Sherburne (1-day lag applied)		Diverted by U.S. St. Mary Canal	Net Used by United States	U.S. Used more (+) or less (-) or than share	
				+	-		Stored	Released			+	-
1	260	195	220	25		65	40		0	40		25
2	215	161	291	130		54		76	0	-76		130
3	102	76	284	208		26		257	75	-182		208
4	201	151	155	4		50		308	354	46		4
5	293	220	134		86	73		348	507	159	86	
6	365	274	201		73	91		389	553	164	73	
7	365	274	304	30		91		518	579	61		30
8	335	251	366	115		84		639	608	-31		115
9	348	261	406	145		87		668	610	-58		145
10	395	296	399	103		99		626	622	-4		103
11	439	329	360	31		110		568	647	79		31
12	408	306	328	22		102		567	647	80		22
13	504	378	310		68	126		456	650	194	68	
14	486	364	304		60	122		463	645	182	60	
15	430	322	279		43	108		492	643	151	43	
16	416	312	251		61	104		474	639	165	61	
17	416	312	240		72	104		461	637	176	72	
18	510	382	229		153	128		345	626	281	153	
19	526	394	240		154	132		326	612	286	154	
20	550	412	347		65	138		318	521	203	65	
21	433	325	412	87		108		392	413	21		87
22	434	326	386	60		108		360	408	48		60
23	396	297	373	76		99		383	406	23		76
24	481	361	316		45	120		232	397	165	45	
25	596	447	263		184	149		59	392	333	184	
26	539	404	224		180	135		57	372	315	180	
27	547	410	366		44	137		28	209	181	44	
28	511	383	380		3	128		13	144	131	3	
29	474	356	347		9	118		13	140	127	9	
30	474	356	347		9	118		13	140	127	9	
31												
Total Sec.-ft.	12,449	9,335	9,062	(1,036)	(1,309) 273	3,114	40	9,849	13,196	3,387	(1,309) 273	(1,036)
Mean	415	311	302		9.10	104	1.33	328	440	113	9.10	
Ac.-ft.	24,692	18,516	17,974		541	6,177	79	19,535	26,174	6,718	541	

NATURAL FLOW OF ST. MARY RIVER AT INTERNATIONAL BOUNDARY AND ITS DIVISION BETWEEN CANADA AND UNITED STATES (Cu. ft. per sec.)

1961 Day MAY	Computed Natural Flow St. Mary River at Int. Bdry.	Canada's share of St. Mary River Natural Flow	Recorded Flow of St. Mary River near Int. Hwy.	Canada received more (+) or less (-) or than share + -	U.S. share of St. Mary River	Storage Factors Lake Superior (1-day lag applied)	Diverted by U.S. St. Mary Canal	Net Used by United States	U.S. Used more (+) or less (-) or than share + -		
					Stored	Released					
1	483	362	341	21	121	9	133	142	21		
2	516	387	366	21	129	27	123	150	21		
3	592	444	392	52	148	78	122	200	52		
4	600	450	426	24	150	50	124	174	24		
5	694	514	487	27	180	81	126	207	27		
6	732	533	582	49	199	24	126	150	49		
7	729	531	620	89	198	15	124	109	89		
8	775	554	628	74	221	2	149	147	74		
9	822	578	590	12	244	7	239	232	12		
10	966	650	678	28	316	36	252	288	28		
11	1,086	710	678	32	376	80	328	408	32		
12	1,230	782	712	70	448	153	365	518	70		
13	1,270	802	791	11	468	107	372	479	11		
14	1,265	799	830	31	466	38	397	435	31		
15	1,362	848	860	12	514	45	457	502	12		
16	1,579	956	922	34	623	110	547	657	34		
17	1,738	1,036	1,020	16	702	112	606	718	16		
18	1,755	1,044	944	100	711	205	606	811	100		
19	1,757	1,045	890	155	712	265	602	867	155		
20	1,776	1,055	944	111	721	228	604	832	111		
21	2,048	1,191	1,100	91	857	340	608	948	91		
22	2,561	1,447	1,400	47	1,114	541	620	1,161	47		
23	3,153	1,743	1,700	43	1,410	799	654	1,453	43		
24	3,774	2,054	2,030	24	1,720	1,061	683	1,744	24		
25	4,354	2,344	2,420	76	2,010	1,242	692	1,934	76		
26	4,830	2,582	2,770	188	2,248	1,358	702	2,060	188		
27	5,319	2,826	3,260	434	2,493	1,353	706	2,059	434		
28	5,520	2,927	3,420	493	2,593	1,400	700	2,100	493		
29	5,242	2,788	3,330	542	2,454	1,208	704	1,912	542		
30	5,066	2,700	3,350	650	2,366	1,014	702	1,716	650		
31	5,321	2,828	3,490	662	2,493	1,129	702	1,831	662		
Total Sec.-ft.	68,915	39,510	41,971	(3,340) 2,461	(879)	29,405	13,093	24	13,875	(879)	(3,340) 2,461
Mean	2,223	1,275	1,354	79.4		949	422	0.77	448	869	79.4
Ac.-ft.	136,691	78,367	83,248	4,881		58,324	25,970	48	27,521	53,443	4,881

NATIONAL FLOW OF ST. MARY RIVER AT INTERNATIONAL BOUNDARY AND ITS DIVISION BETWEEN CANADA AND UNITED STATES (Cu. ft. per sec.)

1961 Day JUNE	Computed Natural Flow St. Mary River at Int. Bdry.	Canada's share of St. Mary River Natural Flow	Recorded Flow of St. Mary River near Int. Bdry.	Canada received more (+) less (-) than share		U.S. share of St. Mary River	Storage Factors Lake Sherburne (1-day lag applied)	Diverted by U.S. St. Mary Canal	Net Used by United States	U.S. Used more (+) less (-) or than share	
				+	-					+	-
1	5,009	2,672	3,260	588		2,337	1,053		696	1,749	588
2	4,777	2,555	3,080	525		2,222	1,008		689	1,697	525
3	4,601	2,467	2,970	503		2,134	944		687	1,631	503
4	4,622	2,478	2,910	432		2,144	1,025		687	1,712	432
5	4,656	2,495	2,950	455		2,161	1,017		689	1,706	455
6	4,910	2,622	3,080	458		2,288	1,141		689	1,830	458
7	5,113	2,724	3,190	466		2,389	1,229		694	1,923	466
8	5,191	2,762	3,220	458		2,429	1,277		694	1,971	458
9	4,693	2,513	3,020	507		2,180	984		689	1,673	507
10	4,288	2,311	2,710	399		1,977	891		687	1,578	399
11	3,778	2,056	2,440	384		1,722	659		679	1,338	384
12	3,687	2,010	2,300	290		1,677	714		673	1,387	290
13	3,759	2,046	2,220	174		1,713	862		677	1,539	174
14	3,530	1,932	2,360	428		1,598	481		689	1,170	428
15	3,365	1,849	2,210	361		1,516	466		689	1,155	361
16	3,592	1,963	2,080	117		1,629	827		685	1,512	117
17	3,686	2,010	2,080	70		1,676	921		685	1,606	70
18	3,809	2,071	2,150	79		1,738	974		685	1,659	79
19	3,961	2,147	2,420	273		1,814	849		692	1,541	273
20	3,532	1,933	2,730	797		1,599	106		696	802	797
21	3,628	1,981	2,730	749		1,647	200		698	898	749
22	3,484	1,909	2,620	711		1,575	168		696	864	711
23	3,169	1,751	2,380	629		1,418	97		692	789	629
24	3,044	1,689	2,040	351		1,355	321		683	1,004	351
25	2,853	1,593	1,910	317		1,260	264		679	943	317
26	2,695	1,514	1,800	286		1,181	216		679	895	286
27	2,689	1,511	1,660	149		1,178	352		677	1,029	149
28	2,532	1,433	1,570	137		1,099	285		677	962	137
29	2,336	1,335	1,540	205		1,001	121		675	796	205
30	2,217	1,275	1,550	275		942		10	677	667	275
31											
Total Sec.-ft.	113,206	61,607	73,180	11,573		51,599	19,452	10	20,584	40,026	11,573
Mean	3,774	2,054	2,439	386		1,720	648	0.33	686	1,334	386
Ac.-ft.	224,541	122,196	145,150	22,955		102,345	38,582	20	40,828	79,390	22,955

NATURAL FLOW OF ST. MARY RIVER AT INTERNATIONAL BOUNDARY AND ITS DIVISION BETWEEN CANADA AND UNITED STATES (Cu. ft. per sec.)

1961 Day JULY	Computed Natural Flow St. Mary River at Int. Bdry.	Canada's share of St. Mary River Natural Flow	Recorded Flow of St. Mary River near Int. Bdry.	Canada received more (+) or less (-) or than share		U.S. share of St. Mary River	Storage Factors Lake Sherburne (1-day lag applied)		Diverted by U.S. St. Mary Canal	Net Used by United States	U.S. Used more (+) or less (-) or than share
				+	-		Stored	Released			
1	1,735	1,034	1,650	616		701		594	679	85	616
2	1,704	1,019	1,340	321		685		309	673	364	321
3	1,750	1,042	1,010		32	708	76		664	740	32
4	1,695	1,014	782		232	681	249		664	913	232
5	1,616	975	678		297	641	282		656	938	297
6	1,634	984	747		237	650	229		658	887	237
7	1,553	943	840		103	610	51		662	713	103
8	1,578	956	911		45	622		1	668	667	45
9	1,537	935	955	20		602		89	671	582	20
10	1,518	926	966	40		592		119	671	552	40
11	1,523	928	977	49		595		127	673	546	49
12	1,462	898	944	46		564		153	671	518	46
13	1,407	870	900	30		537		161	668	507	30
14	1,285	809	870	61		476		251	666	415	61
15	1,265	799	850	51		466		251	666	415	51
16	1,365	849	900	51		516		201	666	465	51
17	1,399	866	890	24		533		159	668	509	24
18	1,367	850	911	61		517		212	668	456	61
19	1,295	814	890	76		481		263	668	405	76
20	1,217	775	860	85		442		309	666	357	85
21	1,148	741	850	109		407		368	666	298	109
22	1,097	715	820	105		382		385	662	277	105
23	1,109	721	820	99		388		373	662	289	99
24	1,132	733	800	67		399		330	662	332	67
25	1,051	692	774	82		359		383	660	277	82
26	1,037	685	738	53		352		359	658	299	53
27	1,003	668	678	10		335		329	654	325	10
28	915	624	653	29		291		392	654	262	29
29	907	620	628	8		287		371	650	279	8
30	884	609	597		12	275		360	647	287	12
31	843	588	574		14	255		376	645	269	14
Total Sec.-ft.	41,031	25,682	26,803	(2,093)	(972)	15,349	887	7,225	20,566	14,228	(972) (2,093) 1,121
Mean	1,324	828	865	36.2		495	28.6	233	663	459	36.2
Ac.-ft.	81,384	50,940	53,163	2,223		30,444	1,759	14,331	40,792	28,221	2,223

NATURAL FLOW OF ST. MARY RIVER AT INTERNATIONAL BOUNDARY AND ITS DIVISION BETWEEN CANADA AND UNITED STATES (Cu. ft. per sec.)

1961 Day AUGUST	Computed Natural Flow St. Mary River at Int. Bdry.	Canada's share of St. Mary River Natural Flow	Recorded Flow of St. Mary River near Int. Bdry.	Canada received more (+) or less (-) than share		U.S. share of St. Mary River	Storage Factors Lake Sherburne (1-day lag applied)	Diverted by U.S. St. Mary Canal	Net Used by United States	U.S. Used more (+) or less (-) than share	
				+	-					+	-
1	793	563	551		12	230		401	643	242	12
2	717	525	537	12		192		461	641	180	12
3	712	523	523	0		189		452	641	189	0
4	718	526	508		18	192		429	639	210	18
5	673	503	516	13		170		482	639	157	13
6	643	482	523	41		161		517	637	120	41
7	650	488	516	28		162		509	643	134	28
8	659	494	501	7		165		500	658	158	7
9	650	488	559	71		162		573	664	91	71
10	712	523	551	28		189		503	664	161	28
11	679	506	530	24		173		513	662	149	24
12	616	462	501	39		154		545	660	115	39
13	582	436	473	37		146		547	656	109	37
14	558	418	460	42		140		558	656	98	42
15	526	394	439	45		132		571	658	87	45
16	544	408	426	18		136		546	664	118	18
17	526	394	406	12		132		542	662	120	12
18	496	372	386	14		124		548	658	110	14
19	519	389	380		9	130		519	658	139	9
20	551	413	366		47	138		473	658	185	47
21	484	363	347		16	121		521	658	137	16
22	504	378	335		43	126		487	656	169	43
23	446	334	328		6	112		538	656	118	6
24	454	340	335		5	114		537	656	119	5
25	465	349	341		8	116		532	656	124	8
26	473	355	341		14	118		524	656	132	14
27	485	364	335		29	121		506	656	150	29
28	477	358	322		36	119		499	654	155	36
29	399	299	328	29		100		583	654	71	29
30	400	300	328	28		100		582	654	72	28
31	435	326	328	2		109		549	656	107	2
Total Sec.-ft.	17,546	13,073	13,320	(490) 247	(243)	4,473		16,047	20,273	4,226	(243) 247
Mean	566	422	430	7.97		144		518	654	136	7.97
Ac.-ft.	34,802	25,930	26,420	490		8,872		31,829	40,211	8,382	490

NATURAL FLOW OF ST. MARY RIVER AT INTERNATIONAL BOUNDARY AND ITS DIVISION BETWEEN CANADA AND UNITED STATES (Cu. ft. per sec.)

1961 Day SEPTEMBER	Computed Natural Flow St. Mary River at Int. Bdry.	Canada's share of St. Mary River Natural Flow	Recorded Flow of St. Mary River near Int. Bdry.	Canada received more (+) or less (-) or than share	U.S. share of St. Mary River	Storage Factors Lake Sherburne (1-day lag applied)	Diverted by U.S. St. Mary Canal	Net Used by United States	U.S. Used more (+) less (-) or than share			
	+ -	-	Stored	Released	+ -	-	+ -	-	+ -			
1	445	334	328	6	111	539	656	117	6			
2	585	439	366	73	146	441	660	219	73			
3	567	425	360	65	142	453	660	207	65			
4	500	375	328	47	125	486	658	172	47			
5	395	296	310	14	99	571	656	85	14			
6	421	316	304	12	105	539	656	117	12			
7	426	320	285	35	106	513	654	141	35			
8	437	328	279	49	109	494	652	158	49			
9	390	292	268	24	98	530	652	122	24			
10	363	272	279	7	91	572	656	84	7			
11	424	318	297	21	106	529	656	127	21			
12	410	308	263	45	102	505	652	147	45			
13	384	288	235	53	96	496	645	149	53			
14	357	268	215	53	89	501	643	142	53			
15	299	224	196	28	75	538	641	103	28			
16	274	206	215	9	68	563	622	59	9			
17	269	202	274	72	67	520	515	-5	72			
18	395	296	285	11	99	274	384	110	11			
19	435	326	291	35	109	146	290	144	35			
20	444	333	229	104	111	68	283	215	104			
21	437	328	224	104	109	43	256	213	104			
22	440	330	263	67	110	11	188	177	67			
23	416	312	322	10	104	14	108	94	10			
24	415	311	316	5	104	2	101	99	5			
25	402	302	304	2	100	1	97	98	2			
26	348	261	285	24	87	34	97	63	24			
27	349	262	268	6	87	14	95	81	6			
28	377	283	263	20	94	19	95	114	20			
29	395	296	251	45	99	48	96	144	45			
30	385	289	263	26	96	27	95	122	26			
31												
Total Sec.-ft.	12,184	9,140	8,366	(149) 774	(923) 774	3,044	95	9,396	13,119	3,818	(923) 774	(149)
Mean.	406	305	279		25.8	101	3.17	313	437	127	25.8	
Avg.-ft.	24,167	18,129	16,594		1,535	6,038	188	18,637	26,021	7,573	1,535	

NATURAL FLOW OF ST. MARY RIVER AT INTERNATIONAL BOUNDARY AND ITS DIVISION BETWEEN CANADA AND UNITED STATES (Cu. ft. per sec.)

1961 Day OCTOBER	Computed Natural Flow St. Mary River at Int. Bdry.	Canada's share of St. Mary River Natural Flow	Recorded Flow of St. Mary River near Int. Bdry.	Canada received more (+) or less (-) or than share	U.S. share of St. Mary River	Storage Factors		Diverted by U.S. St. Mary Canal	Net Used by United States	U.S. Used more (+) or less (-) or than share	
						+ ↓	-				
1	358	268	263	5	90	1		94	95	5	
2	330	248	257	9	82		20	93	73	9	
3	315	236	257	21	79		35	93	58	21	
4	326	244	257	13	82		24	93	69	13	
5	340	255	251	4	85		4	93	89	4	
6	459	344	279	65	115	92		88	180	65	
7	397	298	322	24	99		15	90	75	24	
8	569	427	360	67	142	119		90	209	67	
9	573	430	419	11	143	66		88	154	11	
10	490	368	446	78	122		44	88	44	78	
11	512	384	453	69	128		29	88	59	69	
12	593	445	460	15	148	45		88	133	15	
13	646	484	501	17	162	57		88	145	17	
14	556	417	508	91	139		40	88	48	91	
15	670	502	537	35	168	45		88	133	35	
16	796	565	628	63	231	80		88	168	63	
17	953	643	791	148	310	71		91	162	148	
18	1,040	687	890	203	353	60		90	150	203	
19	970	652	922	270	318		41	89	48	270	
20	1,244	789	870	81	455	314		60	374	81	
21	1,061	697	860	163	364	201		0	201	163	
22	975	654	765	111	321	210		0	210	111	
23	875	604	695	91	271	180		0	180	91	
24	810	572	645	73	238	165		0	165	73	
25	729	531	597	66	198	132		0	132	66	
26	715	524	590	66	191	125		0	125	66	
27	712	523	559	36	189	153		0	153	36	
28	646	484	494	10	162	152		0	152	10	
29	603	452	487	35	151	116		0	116	35	
30	558	418	466	48	140	92		0	92	48	
31	586	440	446	6	146	140		0	140	6	
Total Sec.-ft.	20,407	14,585	16,275	(1,842) 1,690	(152)	5,822	2,616	252	1,768	(152) 1,690	
Mean	658	470	525	54.5		188	84.4	8.13	57.0	133	54.5
Ac.-ft.	40,477	28,929	32,281	3,352		11,548	5,189	500	3,507	8,196	3,352

Historical Summary
of
Natural Flow of St. Mary River at International Boundary

TABLE 2

Year	Mean Monthly Discharge In Cubic feet per second During Irrigation Season April - October								Run-off in Acre-feet Non Irrigation Season Nov.-Mar. Irrigation Season Apr.-Oct. For Year Nov.-Oct.		
	April	May	June	July	August	September	October				
1901-02	-	-	-	-	-	618 d	477 d	-	66,111 z	66,111 z	
1902-03	568	1726	5200	2924	1404	1109	917	57,965	837,816	895,781	
1903-04	724	2022	2936	1903	933	420	221	96,361	555,162	651,523	
1904-05	304	1215	2461	1642	847	371	772	39,128	461,855	500,983	
1905-06	481	1504	2285	1826	946	628	756	51,592	511,307	562,899	
1906-07	489	1931	4259	3117	1335	1214	632	124,082	785,988	910,070	
1907-08	844	2485	7500	2488	834	462	431	62,436	910,631	973,067	
1908-09	350	1904	5169	3000	1460	640	550	65,276	785,464	850,740	
1909-10	1188	2315	2243	1175	580	553	1036	87,729	551,042	638,771	
1910-11	520	2035	3470	1679	1053	1380	621	97,349	650,360	748,209	
1911-12	542	2031	2347	1582	887	524	423	57,072	505,795	564,887	
1912-13	749	1913	4519	2024	1162	574	448	60,604	688,735	758,339	
1913-14	637	2230	2298	1430	719	584	841	50,504	530,307	588,871	
1914-15	575	1644	2251	1722	969	842	739	83,970	530,287	614,257	
1915-16	664	1707	4634	3463	1228	947	391	109,773	789,058	898,831	
1916-17	453	2215	4104	2427	759	470	378	58,828	654,520	713,348	
1917-18	661	1875	3093	1185	763	489	394	91,256	511,779	153,798	603,035
1918-19	340	1978	2116	919	498	336	186	49,684	386,325	436,009	
1919-20	429	1720	3133	2355	800	572	557	61,025	579,977	641,002	
1920-21	646	2664	3713	1809	755	416	499	72,117	636,167	708,284	
1921-22	282	2293	3835	1578	642	420	301	64,657	565,880	630,537	
1922-23	422	2286	3359	1726	788	482	560	47,191	583,204	630,395	
1923-24	393	2080	3152	1534	728	397	302	51,406	520,145	571,551	
1924-25	1272	3461	3512	1893	807	542	406	78,619	720,710	799,329	
1925-26	670	1264	1078	818	405	751	1141	49,198	371,837	421,035	
1926-27	600	2685	5434	2112	1274	1509	1143	74,838	935,423	1,010,261	
1927-28	546	3695	2940	2594	921	513	863	112,116	734,376	846,492	
1928-29	314	1837	2554	1272	493	291	289	66,040	427,448	493,488	
1929-30	1477	2425	2489	1264	511	370	314	52,374	535,575	587,949	
1930-31	224	1957	1838	796	592	464	294	38,856	374,033	412,039	
1931-32	567	2497	2396	1409	595	307	240	83,750	515,819	599,569	
1932-33	416	1764	4339	2169	760	492	685	67,488	643,242	710,730	
1933-34	1734	3441	2929	1155	540	323	269	168,272	629,044	797,316	
1934-35	392	1841	2716	1516	630	387	235	136,576	467,568	604,144	
1935-36	617	2417	2157	823	420	252	162	30,004	414,845	444,849	
1936-37	267	1797	3752	1409	475	298	285	34,013	500,701	534,714	
1937-38	696	2611	3323	1622	510	360	322	65,262	571,333	637,245	
1938-39	640	2271	1721	1069	459	292	188	59,359	402,996	462,355	
1939-40	381	1860	1802	737	382	427	415	37,815	364,056	401,871	
1940-41	364	1333	1429	879	359	520	635	32,842	334,846	367,688	
1941-42	676	1890	2773	1824	754	526	397	94,304	535,668	629,972	
1942-43	1240	1996	3722	2691	810	376	328	63,366	675,767	739,133	
1943-44	197	1273	1634	809	536	424	374	36,343	318,121	354,464	
1944-45	153	2000	3382	1455	457	486	421	46,471	505,676	552,147	
1945-46	658	2361	2731	1500	571	495	521	76,816	535,571	612,387	
1946-47	913	2729	2585	1634	657	526	1250	86,866	624,962	711,828	
1947-48	621	2963	5486	1576	758	329	266	71,379	725,024	796,403	
1948-49	526	2337	2272	991	471	532	404	35,419	456,637	492,056	
1949-50	462	1969	4537	3159	1100	492	929	96,111	766,778	862,889	
1950-51	819	3366	3431	3230	1128	1209	1390	141,366	885,233	1,026,599	
1951-52	969	2408	2204	1433	839	409	264	82,832	517,093	599,925	
1952-53	635	2716	5534	2519	887	438	283	62,545	786,960	849,505	
1953-54	435	3237	3637	3184	1100	771	736	62,618	795,874	858,492	
1954-55	267	1491	3755	2248	799	363	810	79,260	589,738	668,998	
1955-56	525	2793	3631	2027	828	441	513	89,020	652,395	741,415	
1956-57	275	3569	2947	1077	478	303	332	59,363	545,264	604,627	
1957-58	401	2754	2847	1182	556	482	529	58,512	530,645	589,157	
1958-59	702	2110	4056	2125	799	1035	979	93,513	714,693	803,206	
1959-60	688	1387	3049	1604	646	374	237	95,385	482,907	578,292	
1960-61	415	2223	3774	1321	566	406	653	58,502	56,754	625,256	
Average	593	2212	3271	1785	762	548	532	71,805	587,94		

Historical Summary
of United States Share of
Natural Flow of St. Mary River at International Boundary

TABLE 3

Year	Mean Monthly Discharge In Cubic feet per second During Irrigation Season April - October								Run-off in Acre-feet		
	April	May	June	July	August	September	October	Non Irrigation Season Nov.-Mar.	Irrigation Season Apr.-Oct.	For Year Nov.-Oct.	
1901-02	-	-	-	-	-	156 ^d	119 ^d	-	16,637 ^z	16,637 ^z	
1902-03	170	696	2433*	1306	535	388	295	28,983	352,098	381,081	
1903-04	221	844	1301	784	302	105	55.2	48,180	218,938	267,118	
1904-05	79.4	442	1064	654	268	92.4	241	19,564	172,185	191,749	
1905-06	144	586	976	746	306	174	221	25,796	191,286	217,082	
1906-07	122	801	1962	1392	500	440	174	62,041	326,525	388,566	
1907-08	302	1076	3583	1077	256	115	120	31,218	393,572	424,790	
1908-09	38	785	2418	1333	563	174	112	32,638	331,192	363,830	
1909-10	430	991	954	421	150	150	351	43,865	208,947	252,812	
1910-11	130	851	1568	672	360	523	170	48,674	258,357	307,031	
1911-12	139	849	1006	624	280	131	106	29,546	190,175	219,721	
1912-13	244	789	2092	845	414	150	112	34,802	280,792	315,594	
1913-14	192	940	982	548	197	154	253	29,282	198,764	228,046	
1914-15	167	655	958	694	318	256	205	41,985	197,290	239,275	
1915-16	172	686	2150	1565	447	314	97.8	54,886	328,788	383,674	
1916-17	116	949	1885	1047	215	117	94.6	29,414	267,802	297,216	
1917-18	191	782	1380	426	218	122	98.4	45,628	194,448	240,076	
1918-19	90.7	822	891	295	125	84.0	46.5	24,842	142,621	167,463	
1919-20	116	699	1400	1011	241	146	142	30,512	227,566	258,078	
1920-21	180	1165	1690	738	219	104	126	36,059	255,689	291,748	
1921-22	75.8	980	1750	622	170	105	75.0	32,328	228,434	260,762	
1922-23	109	976	1513	696	232	122	146	23,596	229,333	253,429	
1923-24	98.7	878	1409	600	200	99.0	75.5	25,703	203,399	229,102	
1924-25	470	1564	1589	779	238	136	102	39,310	295,509	334,819	
1925-26	226	465	372	251	101	214	410	24,599	123,780	148,379	
1926-27	208	1176	2550	1239	470	588	405	37,419	401,387	438,806	
1927-28	152	1681	1303	1130	296	130	282	56,058	302,731	358,789	
1928-29	78.5	752	1112	469	124	72.8	72.2	33,020	162,343	195,363	
1929-30	572	1046	1078	465	128	92.5	78.8	26,187	209,274	235,461	
1930-31	56.1	813	752	233	168	116	73.5	19,428	134,186	153,614	
1931-32	153	1082	1281	537	151	76.8	59.9	41,875	202,453	244,328	
1932-33	116	715	2003	918	220	123	223	33,744	261,031	294,775	
1933-34	710	1554	1298	411	139	82.5	67.3	84,136	257,770	341,906	
1934-35	103	754	1191	591	171	96.7	58.9	68,288	179,546	247,834	
1935-36	191	1042	910	250	105	62.9	40.5	15,002	157,613	172,615	
1936-37	66.8	734	1709	538	121	74.5	71.3	17,006	200,099	217,105	
1937-38	225	1139	1495	644	129	90.1	80.5	32,631	230,229	262,860	
1938-39	202	969	694	368	115	72.9	47.0	29,680	149,764	179,444	
1939-40	95.9	764	734	208	95.5	109	104	18,907	127,835	146,742	
1940-41	93.4	500	548	281	89.7	133	167	16,421	109,876	126,297	
1941-42	215	778	1219	746	221	134	99.6	47,152	206,753	253,905	
1942-43	465	831	1694	1179	251	94.0	82.1	31,683	278,134	309,817	
1943-44	49.2	475	650	254	136	106	93.4	18,172	106,824	124,996	
1944-45	38.3	841	1524	501	115	123	105	23,235	200,071	223,306	
1945-46	211	1014	1199	583	149	124	135	38,408	206,912	245,320	
1946-47	305	1198	1126	650	176	136	458	43,433	245,373	289,306	
1947-48	201	1315	2576	621	223	82.1	66.6	35,690	306,970	342,660	
1948-49	148	1002	969	329	118	143	101	17,709	170,269	187,978	
1949-50	116	827	2102	1413	383	127	325	48,056	320,765	368,821	
1950-51	251	1516	1549	1448	307	438	528	70,683	372,351	443,034	
1951-52	348	1037	935	550	260	102	66.1	41,416	200,079	241,495	
1952-53	218	1191	2600	1093	281	109	70.7	31,272	336,248	367,520	
1953-54	111	1462	1652	1425	383	227	214	31,309	332,634	363,943	
1954-55	66.9	590	1711	957	245	90.6	265	39,630	237,646	277,276	
1955-56	153	1230	1649	847	250	111	130	44,510	264,855	309,365	
1956-57	70.2	1618	1306	372	120	75.8	82.9	29,682	221,248	250,930	
1957-58	100	1215	1257	424	143	128	132	29,256	206,065	235,321	
1958-59	201	888	1861	897	237	351	325	46,756	287,954	334,710	
1959-60	191	529	1358	635	183	93.6	59.3	47,693	184,278	231,971	
1960-61	104	949	1720	495	144	101	188	29,251	223,748	252,999	
Average	184	941	1468	727	234	156	156	35,903	234,132	270,035	

This table contains revisions to formerly reported data.

Natural flow records computed on basis of Lake Sherburne storage and release records as published in the original reports to the International Joint Commission.

d - 1902 data not used.

z - Partial record not included in average.

Historical Summary
of Canadian Share of
Natural Flow of St. Mary River at International Boundary

TABLE 4

Year	Mean Monthly Discharge In Cubic feet per second During Irrigation Season April - October								Run-off in Acre-feet		
	April	May	June	July	August	September	October	Non Irrigation Season Nov.-Mar.	Irrigation Season Apr.-Oct.	For Year Nov.-Oct.	
1901-02	-	-	-	-	-	462 d	358 d	-	49,474 z	49,474 z	
1902-03	398	1030	2767	1618	869	721	622	28,982	485,718	514,700	
1903-04	504	1178	1635	1118	631	315	166	48,181	336,224	384,405	
1904-05	225	773	1397	988	580	278	531	19,564	289,670	309,234	
1905-06	336	919	1309	1079	640	454	535	25,796	320,021	345,817	
1906-07	366	1130	2296	1726	834	774	457	62,041	459,463	521,504	
1907-08	542	1410	3917	1411	578	346	361	31,218	517,059	548,277	
1908-09	262	1119	2752	1667	897	466	338	32,638	454,272	486,010	
1909-10	757	1325	1288	754	430	403	685	43,864	342,095	385,959	
1910-11	390	1185	1902	1006	694	857	452	48,675	392,503	441,178	
1911-12	403	1182	1340	958	608	393	317	29,546	315,620	345,166	
1912-13	506	1123	2426	1179	748	424	336	34,802	407,942	442,744	
1913-14	444	1282	1316	882	522	430	587	29,282	331,543	360,825	
1914-15	408	989	1292	1028	652	586	534	41,985	332,397	374,982	
1915-16	492	1020	2484	1899	781	633	294	54,887	460,270	515,157	
1916-17	337	1266	2219	1380	545	352	284	29,414	386,717	416,131	
1917-18	470	1094	1713	759	545	367	295	45,628	317,332	362,960	
1918-19	249	1156	1225	625	374	252	140	24,842	243,703	268,545	
1919-20	313	1021	1733	1344	559	426	415	30,513	352,411	382,924	
1920-21	466	1499	2023	1071	535	312	373	36,058	380,477	416,535	
1921-22	206	1313	2085	956	472	315	226	32,329	337,446	369,775	
1922-23	313	1310	1846	1030	556	360	414	23,595	353,351	376,364	
1923-24	295	1202	1743	934	529	298	226	25,703	316,746	342,449	
1924-25	302	1898	1923	1113	569	406	305	39,309	425,201	464,510	
1925-26	444	799	706	568	304	537	731	24,599	248,057	272,656	
1926-27	392	1509	2884	1573	804	921	738	37,419	534,036	571,455	
1927-28	394	2014	1637	1464	625	383	581	56,058	431,645	481,703	
1928-29	236	1035	1446	803	368	218	217	33,020	265,105	298,125	
1929-30	906	1380	1411	799	383	278	235	26,187	326,301	352,488	
1930-31	168	1144	1086	563	424	348	221	19,428	239,397	259,325	
1931-32	415	1415	1615	872	444	230	180	41,875	313,367	355,242	
1932-33	300	1049	2336	1251	546	369	462	33,744	382,211	415,955	
1933-34	1024	1887	1631	744	401	242	201	84,136	371,274	455,410	
1934-35	290	1087	1525	925	459	290	177	68,268	288,022	356,310	
1935-36	426	1376	1243	574	315	189	122	15,002	257,232	272,234	
1936-37	200	1063	2043	871	354	224	214	17,007	300,603	317,610	
1937-38	471	1473	1828	978	380	270	241	32,631	341,754	374,385	
1938-39	438	1302	1027	701	344	219	141	29,679	253,732	282,011	
1939-40	285	1096	1068	530	287	319	311	18,908	236,221	255,129	
1940-41	271	833	881	598	269	387	468	16,421	224,969	241,390	
1941-42	461	1112	1553	1079	533	392	297	47,152	328,915	376,067	
1942-43	775	1165	2028	1512	559	282	246	31,683	397,632	429,315	
1943-44	148	798	984	555	400	318	280	18,171	211,297	229,458	
1944-45	115	1158	1858	894	342	363	316	23,236	305,605	328,841	
1945-46	446	1347	1532	917	422	371	386	38,408	328,659	367,067	
1946-47	607	1531	1459	984	481	390	791	43,433	379,089	422,522	
1947-48	420	1649	2910	955	535	247	201	35,689	418,054	453,743	
1948-49	378	1335	1303	662	353	300	303	17,710	286,368	304,078	
1949-50	346	1143	2435	1746	717	364	604	48,055	446,013	494,068	
1950-51	568	1850	1882	1782	731	771	862	70,683	512,882	583,565	
1951-52	621	1371	1269	883	578	307	198	41,416	317,014	358,430	
1952-53	417	1525	2934	1426	606	328	212	31,273	450,712	481,985	
1953-54	325	1775	1985	1759	717	544	522	31,309	463,240	494,549	
1954-55	200	901	2044	1291	554	272	545	39,630	352,094	391,724	
1955-56	372	1563	1982	1180	578	330	383	44,510	387,538	432,048	
1956-57	205	1951	1640	705	358	227	249	29,681	324,016	353,697	
1957-58	300	1539	1590	758	413	354	397	29,256	324,581	353,837	
1958-59	501	1222	2195	1231	562	684	654	46,757	426,738	473,495	
1959-60	496	858	1691	969	463	281	178	47,692	298,629	346,321	
1960-61	311	1275	2054	828	422	305	470	29,251	343,007 ^{b32}	372,258	
Average	409	1271	1802	1059	528	392	377	35,903	353,810	389,713	

This table contains revisions to formerly reported data.

Natural flow records computed on basis of Lake Sherburne storage and release records as published in the original reports to the International Joint Commission.

d - 1902 data not used.

z - Partial record not included in average.

DIVISION OF FLOW OF ST. MARY RIVER
1961

Water Available to Canada at Spring Coulee from St. Mary River
(Acre-feet)

Month	St. Mary River Int. Boundary	Rolph Creek Kimball	Lee Creek Cardston	Total Available at Spring Coulee
April	17,974	254	1,300	19,528
May	83,248	974	7,890	92,112
June	145,150	109	5,040	150,299
July	53,163	33	1,500	54,696
August	26,420	30	648	27,098
September	16,594	158	1,200	17,952
October	32,281	149	1,450	33,880
Total	374,830	1,707	19,028	395,565

other water available resulting from diversion from adjacent basins = 80,000

water available to Canada
DISPOSITION OF CANADIAN SHARE

Water Used in St. Mary and Milk Rivers Development
(Acre-feet)

X	Month	Canada's Share Natural Flow: Int. Boundary	Canadian St. Mary Canal: Spring Coulee	Magrath I.P. Canal: Spring Coulee	Total Diverted to S.M.R.D.
	April	18,516	0	6	6
	May	78,367	40,110	540	40,650
	June	122,196	140,300	3,440	143,740
	July	50,940	87,730	3,400	91,130
	August	25,930	53,810	2,080	55,890
	September	18,129	58,010	1,200	59,210
	October	28,929	21,180	567	21,747
	Total	343,007	401,140	11,233	412,373

Storage in St. Mary Reservoir March 31, Elev. 3598.37 - 170,600 acre-feet
October 31, Elev. 3609.52 - 236,400 acre-feet

stored - 65,800

total used or stored
available from other basins

65,800

478,173

80,000

398,173

DIVISION OF FLOWS OF ST. MARY AND MILK RIVERS
1961

Water Available to the United States in Milk River at Eastern Crossing
including diversion from St. Mary River
(Acre-feet)

Month	X	St. Mary River Basin				Milk River Basin	
	United States Snare Nat. Flow	Lake Sherburne	Total Available for Diversion	Diverted to Milk River Basin	Excess S.M. Unused	Measured Flow at Eastern Crossing*	
	Nat. Flow	Stored	Rlsd.	Diversion	Milk River Basin	Unused	
April	6,177	79	19,535	25,633	26,174	-541	26,780
May	58,324	25,970	48	32,402	27,521	4,881	35,660
June	102,345	38,582	20	63,783	40,828	22,955	42,250
July	30,444	1,759	14,331	43,016	40,792	2,224	37,270
Aug.	8,872	0	31,829	40,701	40,211	490	36,340
Sept.	6,038	188	18,637	24,487	26,021	-1,534	30,610
Oct.	11,548	5,189	500	6,859	3,507	3,352	7,760
Total	223,748	71,767	84,900	236,881	205,054 <i>17,000</i>	31,827	216,670 <i>19,1,800</i>

* Represents natural flow of Milk River and diversion from St. Mary River Basin.

Lake Sherburne quantities are corrected for evaporation.

Storage in Lake Sherburne on March 31 = 22,080 acre-feet.
October 31 = 7,320 acre-feet.

Storage in Fresno Reservoir on March 31 = 34,140 acre-feet.
October 31 = 19,650 acre-feet.

MAJOR DIVERSIONS FROM MILK RIVER
IN THE UNITED STATES
1961

(Acre-feet)

DIVERSION	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Total
Fort Belknap Canal	0	0	15,280	15,700	17,970	8,870	6,600	0	0	64,420
Paradise Canal	0	0	6,620	6,060	7,030	5,310	2,850	0	0	27,870
Harlem Canal	0	0	4,130	3,490	5,160	3,610	2,460	0	0	18,850
Harlem No. 2	0	0	1,090	791	1,770	1,170	264	0	0	5,085
Agency Canal	0	3,470	7,710	5,290	6,330	3,710	2,040	0	0	28,550
Dodson North	0	0	5,840	4,960	8,810	5,180	2,800	0	0	27,590
Dodson South	536	1,480	7,510	15,620	13,810	14,910	12,900	3,370	0	70,136
Vandalia Canal	0	0	7,540	10,300	9,150	8,140	4,550	2,740	0	42,420
Wiota Pumping Plant	0	1,060	1,950	2,090	1,440	1,250	207	2,100	0	10,097
Totals	536	6,010	57,670	64,301	71,470	52,150	34,671	8,210	0	295,018

Storage in Nelson Reservoir on March 31, 39,550
on October 31, 18,250

Lake Sherburne
Fresno Res

DETERMINATION OF NATURAL FLOW OF BATTLE CREEK
AT INTERNATIONAL BOUNDARY
1961

Period at International Boundary	Diversion to Cypress Lake Quantities in c.f.s. days					Net Diversion to Cypress Lake
	West Inflow Canal	West Inflow Canal Drain	Diversion to Cypress Lake	West Outflow Canal		
Feb. 23 - Mar. 4	0	0	0	0	0	0
Mar. 5 - Mar. 14	0	0	0	0	0	0
Mar. 15 - Mar. 25	210	22	188	3	185	
Mar. 26 - Apr. 4	71	3	68	0	68	
Apr. 5 - Apr. 14	0	1	-1	1	-2	
Apr. 15 - Apr. 24	0	0	0	46	-46	
Apr. 25 - May 4	0	0	0	193	-193	
May 5 - May 14	0	0	0	403	-403	
May 15 - May 25	0	0	0	463	-463	
May 26 - June 4	0	0	0	603	-603	
June 5 - June 14	0	0	0	555	-555	
June 15-June 21	0	0	0	356	-356	
June 25-July 4	0	0	0	58	-58	
July 5-July 14	0	0	0	389	-389	
July 15-July 25	0	0	0	791	-791	
July 26-Aug. 4	0	0	0	453	-453	
Aug. 5 - Aug. 14	0	0	0	34	-34	
Aug. 15 - Aug. 25	0	0	0	8	-8	
Aug. 26 - Sept. 4	0	0	0	5	-5	
Sept. 5-Sept. 14	0	0	0	10	-10	
Sept. 15-Sept. 24	0	0	0	8	-8	
Sept. 25-Oct. 4	0	0	0	5	-5	
Oct. 5 - Oct. 14	0	0	0	21	-21	
Oct. 15 - Oct. 25	0	0	0	92	-92	
Oct. 26 - Oct. 31	0	0	0	2	-2	
Total	281	26	255	4,499	-4,244	
Acre-feet	557	52	506	8,924	-8,418	

DETERMINATION OF NATURAL FLOW OF BATTLE CREEK
AT INTERNATIONAL BOUNDARY
1961

Diversion to Irrigated Lands
Quantities in c.f.s. days

Period at International Boundary	Stirling & Nash Ditch	McKinnon Ditch	Richardson Ditch	Vidora Ditch	Total Diverted	Return Flow	Net Diversion to Irrigated Land
Feb. 23 - Mar. 4	0	0	0	0	0	0	0
Mar. 5 - Mar. 14	0	0	0	0	0	0	0
Mar. 15 - Mar. 25	92	0	0	0	92	18	74
Mar. 26 - Apr. 4	107	0	0	0	107	21	86
Apr. 5 - Apr. 14	127	0	0	0	127	25	102
Apr. 15 - Apr. 24	79	14	0	0	93	19	74
Apr. 25 - May 4	144	84	0	0	228	46	182
May 5 - May 14	175	69	3	156	403	81	322
May 15 - May 25	66	78	200	244	588	118	470
May 26 - June 4	0	161	270	179	610	122	488
June 5 - June 14	0	185	84	224	493	99	394
June 15 - June 24	0	68	38	184	290	58	232
June 25 - July 4	0	4	1	37	42	8	34
July 5 - July 14	0	140	172	68	380	76	304
July 15 - July 25	0	212	252	352	816	163	653
July 26 - Aug. 4	0	221	124	64	409	82	327
Aug. 5 - Aug. 14	0	10	0	0	10	2	8
Aug. 15 - Aug. 25	0	0	0	0	0	0	0
Aug. 26 - Sept. 4	0	0	0	0	0	0	0
Sept. 5 - Sept. 14	0	0	0	0	0	0	0
Sept. 15 - Sept. 24	0	0	0	0	0	0	0
Sept. 25 - Oct. 4	0	0	0	0	0	0	0
Oct. 5 - Oct. 14	0	6	0	0	6	1	5
Oct. 15 - Oct. 25	6	2	0	16	24	5	19
Oct. 26 - Oct. 31	1	0	0	0	1	0	1
Total	797	1,254	1,144	1,524	4,719	944	3,775
Acre-feet	1,581	2,487	2,269	3,023	9,360	1,872	7,488

Return flow assumed to be 20 per cent of diverted quantities.

Maple #6 Lodge Creek

Table 6
Page 3

DETERMINATION OF NATURAL FLOW OF BATTLE CREEK AT INTERNATIONAL BOUNDARY 1961

Quantities in c.f.s. days

Period at International Boundary	Net Diversion to Cypress Lake	Net Diversion to Irrigated Land	Total Used by Canada	Battle Creek		United States Share	Received in Excess of Share
				Flow at Int'l Boundary	Natural Flow		
Feb. 23 - Mar. 4	0	0	0	340	0	0	0
Mar. 5 - Mar. 14	0	0	0	238	238	119	119
Mar. 15 - Mar. 25	185	74	259	1,024	1,283	642	382
Mar. 26 - Apr. 4	68	86	154	116	270	135	-19
				1378			
Apr. 5 - Apr. 14	-2	102	100	83	183	92	-9
Apr. 15 - Apr. 24	-46	74	28	38	66	33	5
Apr. 25 - May 4	-193	182	-11	48	37	18	30
May 5 - May 14	-403	322	-81	90	9	4	86
May 15 - May 25	-463	470	7	109	116	58	51
May 26 - June 4	-603	488	-115	208	93	46	162
June 5 - June 14	-555	394	-161	64	(-97) 0	0	64
June 15 - June 24	-356	232	-124	149	25	12	137
June 25 - July 4	-58	34	-24	10	(-14) 0	0	10
July 5 - July 14	-389	304	-85	0	(-85) 0	0	0
July 15 - July 25	-791	653	-138	0	(-138) 0	0	0
July 26 - Aug. 4	-453	327	-126	58	(-68) 0	0	58
Aug. 5 - Aug. 14	-34	8	-26	16	(-10) 0	0	16
Aug. 15 - Aug. 25	-8	0	-8	0	(-8) 0	0	0
Aug. 26 - Sept. 4	-5	0	-5	0	(-5) 0	0	0
Sept. 5 - Sept. 14	-10	0	-10	0	(-10) 0	0	0
Sept. 15 - Sept. 24	-8	0	-8	0	(-8) 0	0	0
Sept. 25 - Oct. 4	-5	0	-5	0	(-5) 0	0	0
Oct. 5 - Oct. 14	-21	5	-16	0	(-16) 0	0	0
Oct. 15 - Oct. 25	-92	19	-73	0	(-73) 0	0	0
Oct. 26 - Oct. 31	-2	1	-1	0	(-1) 0	0	0

Total Acre-feet	-4,244	3,775	-469	2,251	2,320	1,159	1,092
	-8,418	7,488	-930	4,465	4,602	2,299	2,166

Estimated acre-feet total of minor diversions detailed in appendix to this report.

34	2,251	2,320	1,159	1,092
1,049	4,465	4,602	2,299	2,166
119	5,651			

incorrect
1st period
missing

DETERMINATION OF NATURAL FLOW OF
FRENCHMAN RIVER AT INTERNATIONAL BOUNDARY
1961

Table 7
Page 1

Cypress Lake Storage and Diversion
Quantities in c.f.s.-cays

Period at International Boundary	Belanger Creek Diversion to Cypress Lake	Cypress Lake East Outflow Canal	Net Belanger Creek Diversion	Cypress Lake Natural Overflow	Gross Depletion at Cypress Lake	Adjustment for Channel Losses to International Boundary	Net Depletion at Cypress Lake
						computed	
Mar. 1 - 10	0	5 ^e	-5	0	-5	-5	0
Mar. 11 - 20	0	10	-10	0	-10	-10	0
Mar. 21 - 31	202	37	+165	0	+165	+78	+87
Apr. 1 - 10	234	97	+137	0	+137	+69	+68
Apr. 11 - 20	79	63	+16	0	+16	+16	0
Apr. 21 - 30	72	58	+14	0	+14	+14	0
May 1 - 10	39	437	-398	0	-398	-121	-277
May 11 - 20	12	802	-790	0	-790	-279	-511
May 21 - 31	0	163	-163	0	-163	-95	-68
June 1 - 10	0	79	-79	0	-79	-66	-13
June 11 - 20	0	30	-30	0	-30	-30	0
June 21 - 30	0	238	-238	0	-238	-145	-93
July 1 - 10	18	592	-574	0	-574	-307	-267
July 11 - 20	3	299	-296	0	-296	-173	-123
July 21 - 31	0	19	-19	0	-19	-19	0
Aug. 1 - 10	0	222	-222	0	-222	-138	-84
Aug. 11 - 20	0	59	-59	0	-59	-59	0
Aug. 21 - 31	0	0	0	0	0	0	0
Sept. 1 - 10	0	61	-61	0	-61	-60	-1
Sept. 11 - 20	0	38	-38	0	-38	-38	0
Sept. 21 - 30	0	0	0	0	0	0	0
Oct. 1 - 10	0	0	0	0	0	0	0
Oct. 11 - 20	0	0	0	0	0	0	0
Oct. 21 - 31	0	1	-1	0	-1	-1	0
Total	659	3,310	-2,651	0	-2,651	-1,369	-1,282
Acre-feet	1,307	6,565	-5,258	0	-5,258	-2,715	-2,543

DETERMINATION OF NATURAL FLOW OF
FRENCHMAN RIVER AT INTERNATIONAL BOUNDARY
1961

Table 7
Page 2

East End Reservoir Storage and Diversion Quantities in c.f.s.-days

Return flow assumed to be 20 per cent of diverted quantities.

DETERMINATION OF NATURAL FLOW OF
FRENCHMAN RIVER AT INTERNATIONAL BOUNDARY
1961

Val Marie Storage
Quantities in c.f.s.-days

Period at International Boundary	Val Marie West Reservoir		Val Marie Reservoir		Total Change in Reservoir Contents at Val Marie	
	Stored	Released	Stored	Released	Stored	Released
Mar. 1 - 10	16		253		269	
Mar. 11 - 20	42		532		574	
Mar. 21 - 31	91		1,976		2,067	
Apr. 1 - 10	587			57	530	
Apr. 11 - 20	165			216		51
Apr. 21 - 30	574			375	199	
May 1 - 10	208			324		116
May 11 - 20	126		342		468	
May 21 - 31		290		256		546
June 1 - 10		293		621		914
June 11 - 20		183		411		594
June 21 - 30	48			276		228
July 1 - 10		6		245		251
July 11 - 20		349		126		475
July 21 - 31		478	17			461
Aug. 1 - 10		182	18			164
Aug. 11 - 20		35		63		98
Aug. 21 - 31		5		6		11
Sept. 1 - 10	1			20		19
Sept. 11 - 20	1			17		16
Sept. 21 - 30		2		32		34
Oct. 1 - 10		3		173		176
Oct. 11 - 20		1		92		93
Oct. 21 - 31	16			23		7
Total	1,875	1,827	3,138	3,333	4,107	4,254
Acre-feet	3,719	3,624	6,224	6,611	8,146	8,438

DETERMINATION OF NATURAL FLOW OF
 FRENCHMAN RIVER AT INTERNATIONAL BOUNDARY
 1961

 Diversion to Irrigated Lands
 Quantities in c.f.s.-days

Period at International Boundary	Val Marie West Gravity Canal	Val Marie West Pumping Canal	Val Marie Main Canal	Electric Pumps	Total Canal Diversion at Val Marie	Return Flow from Val Marie Projects computed	Gross Depletion at Val Marie	Adjustment for Channel Losses to International Boundary computed	Net Depletion at Val Marie
Mar. 1 - 10	0	0	0	0	0	0	+269	+30	+239
Mar. 11 - 20	0	0	0	0	0	0	+574	+42	+532
Mar. 21 - 31	0	0	0	0	0	0	+2,067	+104	+1,963
Apr. 1 - 10	0	0	0	0	0	0	+530	+51	+479
Apr. 11 - 20	0	0	0	0	0	0	-51	-22	-29
Apr. 21 - 30	0	0	0	0	0	0	+199	+30	+169
May 1 - 10	0	0	0	0	0	0	-116	-30	-86
May 11 - 20	1	38	0	22	61	12	+517	+70	+447
May 21 - 31	270	244	352	41	907	181	+180	+38	+142
June 1 - 10	200	217	667	30	1,114	223	-23	-20	-3
June 11 - 20	140	200	547	32	919	184	+141	+39	+102
June 21 - 30	20	3	285	5	313	63	+22	+20	+2
July 1 - 10	0	0	210	15	225	45	-71	-28	-43
July 11 - 20	190	110	112	20	432	86	-129	-37	-92
July 21 - 31	275	227	59	17	578	116	+1	+1	0
Aug. 1 - 10	20	192	72	13	297	59	+74	+29	+45
Aug. 11 - 20	0	17	22	6	45	9	-62	-27	-35
Aug. 21 - 31	0	0	1	0	1	0	-10	-10	0
Sept. 1 - 10	0	0	0	0	0	0	-19	-19	0
Sept. 11 - 20	0	0	0	0	0	0	-16	-16	0
Sept. 21 - 30	0	0	0	0	0	0	-34	-21	-13
Oct. 1 - 10	0	0	0	0	0	0	-176	-29	-147
Oct. 11 - 20	0	0	0	0	0	0	-93	-24	-69
Oct. 21 - 31	0	0	0	0	0	0	-7	-7	0
Total	1,116	1,248	2,327	201	4,892	978	+3,767	+164	+3,603
Acre-feet	2,214	2,475	4,616	399	9,703	1,940	+7,472	+325	+7,146

Return flow assumed to be 20 per cent of diverted quantities.

Table 7
Page 5

DETERMINATION OF NATURAL FLOW OF
FRENCHMAN RIVER AT INTERNATIONAL BOUNDARY
1961

Period at International Boundary	Net Depletion in Canada	Frenchman River at International Boundary	Apparent Natural Flow of Frenchman River at International Boundary	Adjustment for Minor Diversions in Canada	Quantities in c.f.s.-days			Received in Excess of Share by U.S.A.	
					Frenchman River at International Boundary				
					Natural Flow	United States Share			
				computed					
Mar. 1 - 10	+239	70	309	15 16	325 324	162 162	-92 -92		
Mar. 11 - 20	+532	1,652	2,184	45 109	2,293 2229	1,147 114	+505 +534		
Mar. 21 - 31	+2,050	1,536	3,586	85 179	3,765 3671	1,883 1834	-347 -300		
Apr. 1 - 10	+860	90	950	142 48	998 1092	499 546	-409 -426		
Apr. 11 - 20	+241	164	405	121 20	425 526	212 263	-48 -99		
Apr. 21 - 30	-138	316	178	28 9	187 206	94 102	+222 +213		
May 1 - 10	-5	241	236	73 12	248 309	124 1154	+117 +87		
May 11 - 20	+84	142	226	44 11	237 270	118 135	+24 +7		
May 21 - 31	+146	107	253	53 13	266 306	133 153	-26 -46		
June 1 - 10	+42	123	165	4 8	173 169	86 24	+37 +19		
June 11 - 20	+111	133	244	3 12	256 247	128 124	+5 +9		
June 21 - 30	+42	60	102	16 5	107 114	54 59	+6 +1		
July 1 - 10	-47	22	(-25)	0	37 0	0 12	0 6	+22 +16	
July 11 - 20	-110	4	(-106)	0	11 0	0 -	0 0	+4 +4	
July 21 - 31	0	0	0	8 0	0 -	0 0	0 0		
Aug. 1 - 10	+26	36	62	3	65	32	+4 +4		
Aug. 11 - 20	-35	0	(-35)	0	0	0	0		
Aug. 21 - 31	-26	0	(-26)	0	0	0	0		
Sept. 1 - 10	+26	0	26	1	27 -	14	-14 -14		
Sept. 11 - 20	+52	0	52	3	55 52	28 26	-28 -26		
Sept. 21 - 30	-13	0	(-13)	0	0	0	0		
Oct. 1 - 10	-147	0	(-147)	0	0	0	0		
Oct. 11 - 20	-69	0	(-69)	0	0	0	0		
Oct. 21 - 31	0	0	0	0	0	0	0		
Total	+3,861	4,696	(8557)	8,978	686 449	9,427	4,714	-18 -15	
Acre-feet	+7,658	9,314		17,808	1373 890	18,698	9,349	-36 250	

Table 8

DETERMINATION OF THE NATURAL FLOW OF
LODGE CREEK
AT INTERNATIONAL BOUNDARY
1961

Period at International Boundary	Middle Creek near Alberta Boundary	Middle Creek near Battle Creek	Walburger Coulee below Diversions	Middle Creek Reservoir and Bedford Slough Areas	Lodge Creek at Alberta Boundary	Lodge Creek below Spangler Project	Stored or Diverted at Spangler Project	Lodge Creek at Inter- national Boundary	Measured Flows below Major Projects in Canada	Natural Run-off from Project Areas in Canada	United States							
											Received in Excess of Share							
											Comp.	Use						
Mar. 1 - Mar. 10	0	3	0	3	-3	0	0	0	3	-2	0	-5	0	-2	0	+2	0	
Mar. 11 - Mar. 20	17	18	4	22	-5	168	0	+168	138	18	+72	72	+373	373	+186	186	-48	-48
Mar. 21 - Mar. 31	9	20	0	20	-11	278	0	+278	22	20	+1	1	+290	290	+145	145	-123	-123
Apr. 1 - Apr. 10	4	10	0	10	-6	5	0	+5	2	10	-5	0	-4	0	-2	0	+4	+2
Apr. 11 - Apr. 20	4	8	1	9	-5	1	0	+1	0	8	-5	0	-9	0	-4	0	+4	0
Apr. 21 - Apr. 30	4	120	0	120	-116	0	0	0	194	120	+44	44	+122	122	+61	61	+133	133
May 1 - May 10	4	11	0	11	-7	0	0	0	32	11	+13	13	+38	38	+19	19	+13	+13
May 11 - May 20	5	13	127	140	-135	109	0	+109	17	13	+2	2	-7	0	-4	0	+21	+17
May 21 - May 31	4	9	0	9	-5	1	0	+1	1	9	-5	0	-8	0	-4	0	+5	+1
June 1 - June 10	4	6	0	6	-2	0	0	0	14	6	+5	5	+17	17	+8	9	+6	+5
June 11-June 20	4	6	0	6	-2	0	0	0	0	6	-4	0	-6	0	-3	0	+3	0
June 21-June 30	3	7	116	123	-120	58	0	+58	0	7	-4	0	-66	0	-33	0	+33	0
July 1-July 10	2	5	102	107	-105	76	0	+76	0	5	-3	0	-32	0	-16	0	+16	0
July 10-July 20	1	5	78	83	-82	56	0	+56	0	5	-3	0	-29	0	-14	0	+14	0
July 21-July 31	1	32	43	75	-74	47	0	+47	0	32	-19	0	-46	0	-23	0	+23	0
Aug. 1 - Aug. 10	1	196	0	196	-195	0	0	0	0	196	-118	0	-313	0	-156	0	+156	0
Aug. 11 - Aug. 20	1	11	0	11	-10	0	0	0	0	11	-7	0	-17	0	-8	0	+8	0
Aug. 21 - Aug. 31	1	13	0	13	-12	0	0	0	0	13	-8	0	-20	0	-10	0	+10	0
Sept. 1-Sept. 10	1	9	0	9	-8	0	0	0	0	9	-5	0	-13	0	-6	0	+6	0
Sept. 11-Sept. 20	1	7	0	7	-6	0	0	0	0	7	-4	0	-10	0	-5	0	+5	0
Sept. 21-Sept. 30	2	6	0	6	-4	0	0	0	0	6	-4	0	-8	0	-4	0	+4	0
Oct. 1 - Oct. 10	1	6	0	6	-5	0	0	0	0	6	-4	0	-9	0	-4	0	+4	0
Oct. 11 - Oct. 20	2	6	0	6	-4	0	0	0	0	6	-4	0	-8	0	-4	0	+4	0
Oct. 21 - Oct. 31	2	7	0	7	-5	0	0	0	0	7	-4	0	-9	0	-4	0	+4	0
Total	78	534	471	1,005	-927	799	0	+799	420	534	-71	137	+221	840	+113	420	+307	0
Acre-feet	155	1,059	934	1,993	-1,838	1,585	0	+1,585	833	1,059				1,666		833		0
Estimated acre-feet total of minor diversions detailed in appendix to this report													120	60				
													1,786					

Table 9

Determination & Division of Natural Flow

DIVERSIONS FROM THE EASTERN TRIBUTARIES
OF MILK RIVER IN CANADA
1961

Quantities in Acre-feet

Battle Creek Tributary Basin

Net Diversion to Cypress Lake	- - - - -	-8,418
Total Diversion to Irrigation	- - - - -	9,360
Estimated Return Flow from Irrigated Lands	- - - - -	1,872
Total of 37 Minor Diversions Detailed in Appendix	- - - - -	7,488
Total Used by Canada	- - - - -	1,049

Natural Flow

Total flow (Battle Creek at International Boundary = 4,465 acre-feet)

excess U.S. share

Frenchman River Tributary Basin

Net Depletion at Cypress Lake	- - - - -	-2,543
Stored in Eastend Reservoir	- - - - -	4,225
Released from Eastend Reservoir	- - - - -	3,788
Eastend Canal	5,970	437
Adjustment for Channel Losses to International Boundary	- - - - -	2,158
Stored in Val Marie Reservoirs	- - - - -	8,146
Released from Val Marie Reservoirs	- - - - -	8,438
Total Canal Diversion at Val Marie	9,703	-292
Adjustment for Channel Losses to International Boundary	- - - - -	325
Estimated Return Flow from Irrigated Lands	- - - - -	9,378
Adjustment for Minor Diversions in Canada	- - - - -	-3,134
Total Used by Canada	- - - - -	890

incorrect first period missing

Total of 63 Minor Diversions in Frenchman Basin as provided by the Water Rights Division of the Province of Saskatchewan
Detailed in Appendix = 1,373^a acre-feet.

a - Excluding 863 acre-feet of diversions from War Lodge, Oxarat and Sucker Creeks which did not affect Frenchman River.

total flow (Frenchman River at International Boundary = 9,314 acre-feet)
Nat. Share
excess Lodge Creek Tributary Basin

Middle Creek near Alberta Boundary	155	1,059
Middle Creek near Battle Creek	-	934 ^b
Walburger Coulee below Diversions	12	1,238
Total of 5 Minor Diversions Detailed in Appendix	1,585	-1,838
Lodge Creek at Alberta Boundary	-	120 ^c
Lodge Creek below Spangler Project	0	1,585
Total Used by Canada	-	-133

b - Released from Middle Creek Reservoir via Bedford Slough.

c - 635 acre-feet diverted by Mitchell Ranching Co. is diverted above Middle Creek near Battle Creek gauging station and therefore this diversion is not included in total of 5 minor diversions above as it is already charged to Canada.

Flow from Project areas Used by Canada	272	137
+ 139	- 71	67
140	- 273	140

Total flow (Lodge Creek below McRae Coulee at International Boundary = 833 acre-feet)

Nat Flow

U.S. Share

excess U.S. received

MEASURED DIVERSIONS FROM THE EASTERN TRIBUTARIES

OF MILK RIVER IN THE UNITED STATES

1961

(Quantities in Acre-feet)

Irrigator	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
<u>Lodge Creek</u>									
North Chinook Canal	172	178	80	0	0	0	0	0	430
<u>Battle Creek</u>									
Matheson Canal Pumping	-	-	-	-	-	-	-	-	0 a2,760
<u>Frenchman River</u>									
Frenchman Canal	484	1,170	1,550	1,880	1,780	907	0	0	7,770
Total	-	-	-	-	-	-	-	-	10,960

a - Estimated use by pumping from Battle Creek to land under the Matheson Canal.

MEASURED DIVERSIONS FROM THE EASTERN TRIBUTARIES
OF MILK RIVER IN THE UNITED STATES

1961

(Quantities in Acre-feet)

Irrigator	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
<u>Lodge Creek</u>									
North Chinook Canal	172	178	80	0	0	0	0	0	430
<u>Battle Creek</u>									
Matheson Canal Pumping	-	-	-	-	-	-	-	-	0 a? 2,760
<u>Frenchman River</u>									
Frenchman Canal	484	1,170	1,550	1,880	1,780	907	0	0	7,770
Total	-	-	-	-	-	-	-	-	10,960

a - Estimated use by pumping from Battle Creek to land under the Matheson Canal.

Measured Run-off of Eastern Tributaries of Milk River
at International Boundary for period March to October, 1961
(Quantities in Acre-feet)

STREAM	March	April	May	June	July	Aug.	Sept.	Oct.	Total
Lodge Creek	318	388	99	28	0	0	0	0	833
Woodlark Coulee	426	1	0	0	0	0	0	0	427
Entwistle Creek	2,730	355	600	699	1	147	0	0	4,530
Lyons Coulee	725	0	0	0	0	0	0	0	725
East Br. Murtle Cr.	411	0	0	0	0	0	0	0	411
Whiteman's Creek	3,950	21	11	306	2	0	0	6	4,300
François River	6,460	1,130	972	628	51	72	0	0	9,310
Kodachrome Creek	2	0	0	0	0	0	0	0	2
Hornby Creek	48	0	0	3	0	0	0	0	51
Rock Creek	834	420	307	80	13	0	0	40	1,690
Total	15,900	2,320	1,990	1,740	67	219	0	46	22,280

GAUGING STATIONS OPERATED JOINTLY BY
CANADA AND UNITED STATES
IN ST. MARY AND MILK RIVER DRAINAGE BASINS

- 1961 -

Map Index	Stream and Location	Remarks
<u>St. Mary River Basin</u>		
SAE ₂₇	St. Mary River at International Boundary	Int. ^a
SAE _{0.5}	Swiftcurrent Creek at Many Glacier, Montana	Int. ^a
SAE _{0.9}	Lake Sherburne at Sherburne, Montana	Int.R ^a
SAE _{0.6}	Swiftcurrent Creek at Sherburne, Montana	Int. ^a
SAE _{0.2}	St. Mary Canal at St. Mary Crossing, near Babb, Montana (United States St. Mary Canal at St. Mary Crossing)	Int. ^a
SAE _{0.3}	St. Mary Canal at Hudson Bay Divide, near Browning, Mont. (United States St. Mary Canal at Hudson Bay Divide)	Int. ^a
<u>Milk River Basin</u>		
11AA ₅	Milk River at Milk River, Alberta	Int. ^a
11AA _{0.2}	Milk River at Eastern Crossing of International Boundary	Int. ^a
11AA _{0.3}	North Fork Milk River above St. Mary Canal, near Browning, Montana (formerly as below but North Branch of) (North Fork of Milk River above Outlet of United States St. Mary Canal)	Int. ^a
11AA ₁	North Milk River near International Boundary (formerly North Branch of)	Int. ^a
11AA ₂₅	Milk River at Western Crossing of International Boundary (formerly South Branch of Milk River)	Int. ^a
11AD _{0.1}	Whitewater Creek near International Boundary	Int. ^a
<u>Lodge Creek Tributary Basin</u>		
11AB ₈₃	Lodge Creek below McRae Coulee at International Boundary	Int. ^a
<u>Battle Creek Tributary Basin</u>		
11AB ₇₆	Battle Creek above Cypress Lake West Inflow Canal, Saskatchewan	Int. ^a
11AB ₂₇	Battle Creek at International Boundary	Int. ^a

Map Index	Stream and Location	Remarks
<u>Battle Creek Tributary Basin</u>		
11AB _{0.1}	Woodpile Coulee near International Boundary	Int. ^a
11AB _{0.3}	East Fork Battle Creek near International Boundary (formerly East Branch of Battle Creek near International Boundary)	Int. ^a
11AB ₇₅	Lyons Coulee at International Boundary	Int. ^a
11AB ₇₈	Cypress Lake West Inflow Canal	Int. ^a
11AB ₇₇	Cypress Lake West Outflow Canal	Int. ^a
<u>Frenchman River Tributary Basin</u>		
11AC ₃₇	Cypress Lake, Saskatchewan	Int.R ^a
11AC ₆₄	Belanger Creek Diversion to Cypress Lake	Int. ^a
11AC ₆₀	Cypress Lake East Outflow Canal	Int. ^a
11AC ₁₈	Frenchman River above Eastend Reservoir	Int. ^a
11AC ₅₅	Eastend Reservoir at Eastend, Saskatchewan	Int.R ^a
11AC ₅₂	Eastend Canal at Eastend, Saskatchewan	Int. ^a
11AC ₁	Frenchman River below Eastend Reservoir	Int. ^a
11AC ₆₃	Val Marie West Reservoir, Saskatchewan	Int.R ^a
11AC ₆₅	Val Marie West Gravity Canal	Int. ^a
11AC ₅₆	Val Marie Reservoir, Saskatchewan	Int.R ^a
11AC ₅₄	Val Marie Main Canal	Int. ^a
11AC ₄₁	Frenchman River at International Boundary	Int. ^a
<u>Rock Creek Tributary Basin</u>		
11AE _{0.2}	Rock Creek at International Boundary	Int. ^a
11AE _{0.6}	Rock Creek below Horse Creek near International Boundary	Int. ^a
11AE _{0.3}	Horse Creek at International Boundary	Int. ^a
11AE _{0.4}	McEachern Creek at International Boundary	Int. ^a

GAUGING STATIONS OPERATED INDEPENDENTLY
BY CANADA OR UNITED STATES
IN ST. MARY AND MILK RIVER DRAINAGE BASINS

- 1961 -

Map Index	Stream and Location	Remarks
<u>St. Mary River Basin</u>		
139	Grinnell Creek at Grinnell Glacier near Many Glacier, Montana	U.S. ^c
140	Grinnell Creek near Many Glacier, Montana	U.S. ^c
175	St. Mary River near Babb, Montana	U.S. ^c
135	St. Mary Lake near St. Mary, Montana	U.S. ^c
5AE ₆	St. Mary River near Lethbridge, Alberta	Canada ^c
5AB ₅	Rolph Creek near Kimball, Alberta	Canada ^a
5AE ₂	Lee Creek at Cardston, Alberta	Canada ^a
5AE ₂₅	St. Mary Reservoir near Spring Coulee, Alberta	Canada R ^a
5AE ₂₆	Canadian St. Mary Canal near Spring Coulee, Alberta	Canada ^a
5AF ₂₈	Canadian St. Mary Canal at Drop No. 1	Canada ^c
5AE ₂₁	Magrath Irrigation District Canal near Spring Coulee, Alberta	Canada ^a
<u>Milk River Basin</u>		
<u>Lodge Creek Tributary Basin</u>		
11AB ₈₂	Lodge Creek at Alberta Boundary	Canada ^a
11AB ₈₈	Lodge Creek below Spangler Project	Canada ^a
11AB ₈₆	Walburger Coulee below Diversions	Canada ^a
11AB ₉	Middle Creek near Alberta Boundary	Canada ^a
11AB ₈₇	Middle Creek near Battle Creek	Canada ^a
11AB ₈₀	Middle Creek Reservoir	Canada R ^a
11AB ₈₉	Altawan Reservoir near Govenlock, Saskatchewan	Canada R ^a
11AB ₆₀	Spangler Ditch near Govenlock, Saskatchewan	Canada ^a
1322	South Fork of Milk River near Babb, Montana	U.S. ^c
1460	North Chinook Canal near Havre, Montana	U.S. ^b

Map Index	Stream and Location	Remarks
<u>Battle Creek Tributary Basin</u>		
11AB ₈₁	Battle Creek at Ranger Station	Canada ^c
11AB ₈₅	Cypress Lake West Inflow Canal Drain	Canada ^a
11AB ₈₄	Vidora Ditch near Consul, Saskatchewan	Canada ^a
11AB ₅₈	Richardson Ditch near Consul, Saskatchewan	Canada ^a
11AB ₄₄	McKinnon Ditch near Consul, Saskatchewan	Canada ^a
11AB ₁₈	Stirling and Nash Ditch near Consul, Saskatchewan	Canada ^a
1525	Matheson Canal near Chinook, Montana	U.S. ^b
<u>Frenchman River Tributary Basin</u>		
11AC ₅₁	Frenchman River below Val Marie, Saskatchewan	Canada ^c
11AC ₆₆	Val Marie West Pumping Canal, Saskatchewan	Canada ^a
1645	Frenchman Canal near Saco, Montana	U.S. ^b

Int. - International Gauging Station

Int.R - International Station on Reservoir

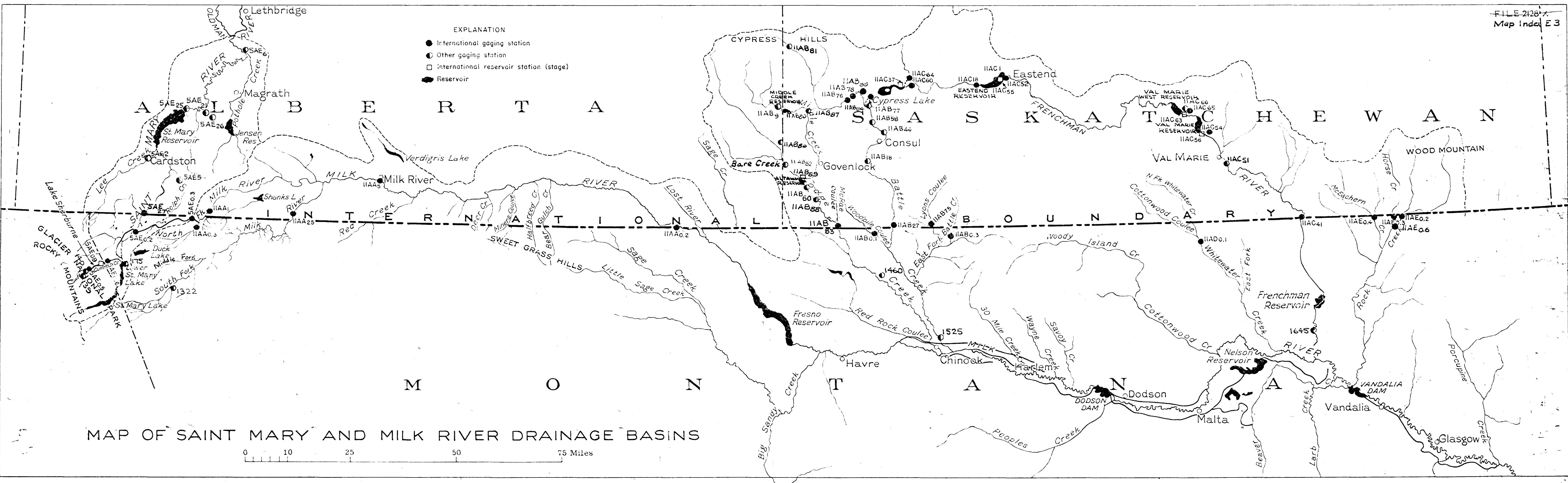
U.S. - Denotes operation by United States Geological Survey.

Canada - Denotes operation by Water Resources Branch, Canada.

a - Monthly and daily discharge data and stream measurements contained in Appendix.

b - Monthly Discharge data only tabulated in this report.

c - Data not included in this report or appendix.



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