

PRAIRIE PROVINCES WATER BOARD

Report #2

STREAM FLOW
AT
THREE SELECTED POINTS
ON
SOUTH AND MAIN SASKATCHEWAN RIVERS
AFTER
ALBERTA'S 1949 REQUEST

Regina, Saskatchewan, December 1950.

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STREAM FLOW AT THREE SELECTED POINTS
ON THE SOUTH AND MAIN SASKATCHEWAN RIVER
AFTER ALBERTA'S 1949 REQUEST

GENERAL

In March, 1949, the Province of Alberta requested the Prairie Provinces Water Board to recommend an allocation of water from the South Saskatchewan drainage basin for use on Alberta's existing irrigation projects and on extensions to existing projects. The amount of water requested was 2,237,000 acre-feet per year as set out in the following tabulation:

Irrigation Project	Acres	Request-Ac. Ft.
St. Mary & Milk River Development	455,000	796,000
Western Irrigation District	50,000	85,700
Eastern Irrigation District	281,000	562,000
Bow River Irrigation Development	240,000	478,534
United Irrigation Development	34,000	51,000
Lethbridge Northern District	96,135	150,000
Mountain View Irrigation District	3,600	6,000
Leavitt Irrigation District	4,400	7,000
Aetna Irrigation District	7,300	13,000
Macleod Irrigation District	5,000	8,000
Private Projects	70,000	80,000
TOTAL	1,256,435	2,237,234

A study has been completed which indicated how the full development of the above projects would affect the stream flow at the following points in the drainage basin for the period 1923-48:

1. South Saskatchewan River at the Alberta-Saskatchewan Boundary
2. South Saskatchewan River at Saskatoon
3. Saskatchewan River at Le Pas.

It is interesting to compare the average annual flows obtained in this study with the natural and recorded flows obtained in the previous study of the Board (Report dated November 1950). The following table sets out the comparison:

Character of Flow	Average Annual flow - ac.ft. (1923-48)	
	Alta-Sask. Bury.	Le Pas
Natural	6,966,000	16,278,000
Recorded	6,305,000	15,620,000
After Alta.	5,008,000	14,318,000

It will be noted that, although Alberta requested 2,237,000 acre-feet annually, the average net diversion would only amount to 1,958,000 acre-feet. For any particular year the net diversion would vary between a minimum of 1,460,000 acre-feet (1940-41) and a maximum of 2,281,000 acre-feet (1941-42). The annual variations are primarily caused by return flows, irrigation storage operations and by the operations of the Calgary Power Ltd.

Because of the operations of Calgary Power Ltd., the extreme low water flows are increased. The overall effect of full development of Alberta's existing projects is graphically illustrated in Figures 1 and 2, being flow-duration curves at the Alberta-Saskatchewan Boundary and at Le Pas.

The following sections of the report briefly set out the assumptions used in the study. Information on the detailed methods and procedures followed may be obtained by applying to the Prairie Provinces Water Board's office.

ALBERTA-SASKATCHEWAN BOUNDARY

Table 24 sets out the calculations used in obtaining the flow at the Boundary after full development of Alberta's existing projects. All flow figures given are in second-foot-months.

The natural flow used is the natural flow set out in the Water Board Report #1 dated November, 1950.

The S.M.M.R.D. diversions are those obtained from the "St. Mary-Milk River Project - Progress Report", December, 1949 by Mr. W. L. Foss. It should be noted that Mr. Foss assumed a development of 495,000 acres to be served by the St. Mary, Belly and Waterton Rivers. His assumption left very little water unused in these streams. If, however, the U.S.A. obtains a right to part of the Belly and/or Waterton Rivers and obtains delivery to it, such delivery would not affect the water shown as available at the Boundary but would only decrease the ultimate size of the S.M.M.R. Development.

The column headed "U.I.D. - M.I.D." includes the diversions from the United, Mountain View, Leavitt and Aetna Irrigation Districts. The total amount required is 77,000 acre-feet and this was distributed over the five summer months.

The Lethbridge Northern Irrigation District's requirements were distributed on a 5%-15-25-25-15-10-5% monthly basis. These requirements (plus Macleod's) were then roughly checked on a month to month basis with the available flow in the river. In the few cases where there was insufficient water in the river, it was assumed that the deficiency would be made up from storage and the diversions were adjusted accordingly.

The column headed "Irr. Bow R." includes the diversions required for the Bow River Development Project and the Western and Eastern Irrigation Districts. A rough month-to-month study was done on the Bow River, assuming fairly complete regulation by Calgary Power Ltd., (see column 11 and remarks). In

the months when there was insufficient flow, irrigation storage was called upon and the deficiency was made up in the following year whenever possible. Monthly diversions were adjusted accordingly.

The "Theoretic Totals" are the gross irrigation diversions before allowing for return flows.

The "Wet Years Return" is an allowance for possible reductions in irrigation water requirements due to above-normal summer precipitation. When the average total April to September precipitation at Lethbridge, Brooks and Strathmore was less than 11.5 inches, no allowance was made. The following table shows the reductions allowed for summer rainfalls greater than 11.5 inches:

April-Sept. Precip.	Allowance	April-Sept. Precip.	Allowance
0 - 11.49"	100%	14.0" - 14.49"	92.5%
11.5 - 11.99	98.75	14.5 - 14.99	91.25
12.0 - 12.49	97.5	15.0 - 15.49	90.0
12.5 - 12.99	96.25	15.5 - 15.99	88.75
13.0 - 13.49	95.0	16.0 - 16.49	87.5
13.5 - 13.99	93.75		

Return flow under usual conditions was assumed to be 240,000 acre-feet annually. This was distributed as shown in column 9.

Although officials of Calgary Power Ltd. have tentatively agreed to make a study showing how their works, under full development, would affect the flow of the Bow River, this has not as yet been received. It was therefore necessary for us to make such a study. Works assumed to be in operation were:

Ghost	73,000 ac.ft.
Lake Minnewanka	180,000
Interlakes	100,000
Barrier	15,000
Spray Lakes	160,000
Bearspaw	8,000

536,000 acre-feet

A rough month by month study was undertaken based on the assumption that it was desirable to have a fairly constant winter flow at Calgary of about 2,200 to 2,300 c.f.s. This was accomplished (except that for two winter seasons the flow was decreased to about 1,900 c.f.s.), although it was necessary in some years to draw from irrigation storage (referred to in a preceding paragraph). Column 11 gives the resulting regulation at Calgary.

The balance at the Boundary (Column 12) is summarized in Table 21.

SASKATOON

The balance available at Saskatoon after Alberta's existing projects are fully developed was obtained by -

taking

Balance at Alberta-Saskatchewan Boundary (Table 21)

plus

Natural flow Swift Current Creek (Water Board Report #1)

plus

Net inflow or loss between Empress and Saskatoon (Water Board Report #1)

The resulting flows at Saskatoon are summarized in Table 22.

LE PAS

The balance available on the Saskatchewan River at Le Pas after Alberta's existing projects are fully developed was obtained by -

taking

Natural flow at Le Pas (Table 12, Report #1)

and subtracting difference between

Natural flow at Saskatoon (Table 4, Report #1)

and

Balance at Saskatoon after Alberta's request (Table 22)

offset one month.

The resulting flows at Le Pas are summarized in Table 23.

FLOW DURATION CURVES OF SOUTH SASKATCHEWAN RIVER AT ALTA-SASK. BOUNDARY

(for period 1923-1948)

LEGEND

NATURAL FLOW ———
AFTER ALTA REQUEST - - -

DISCHARGE - 1000 CFS

PERCENT OF TIME

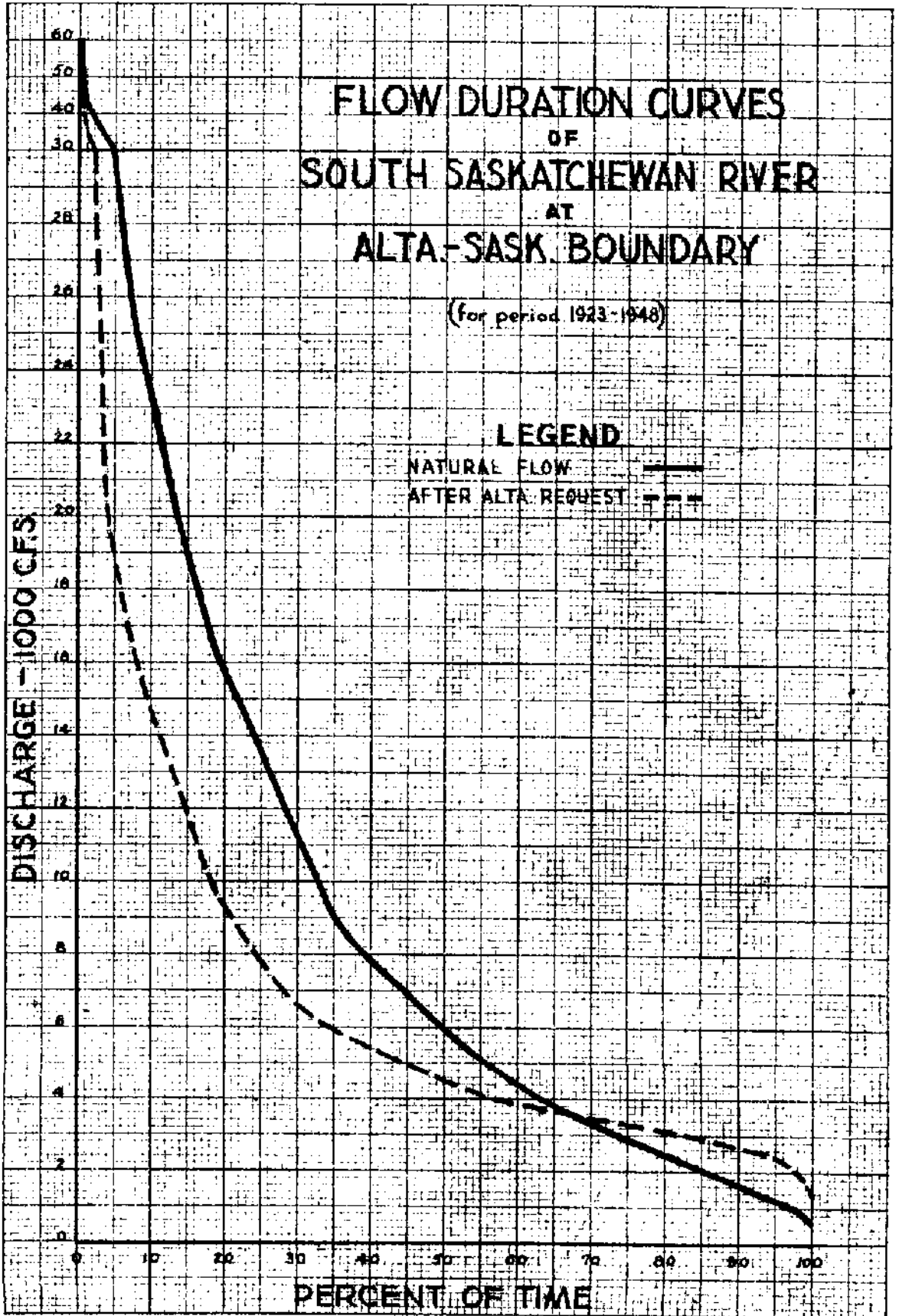


Fig. 1

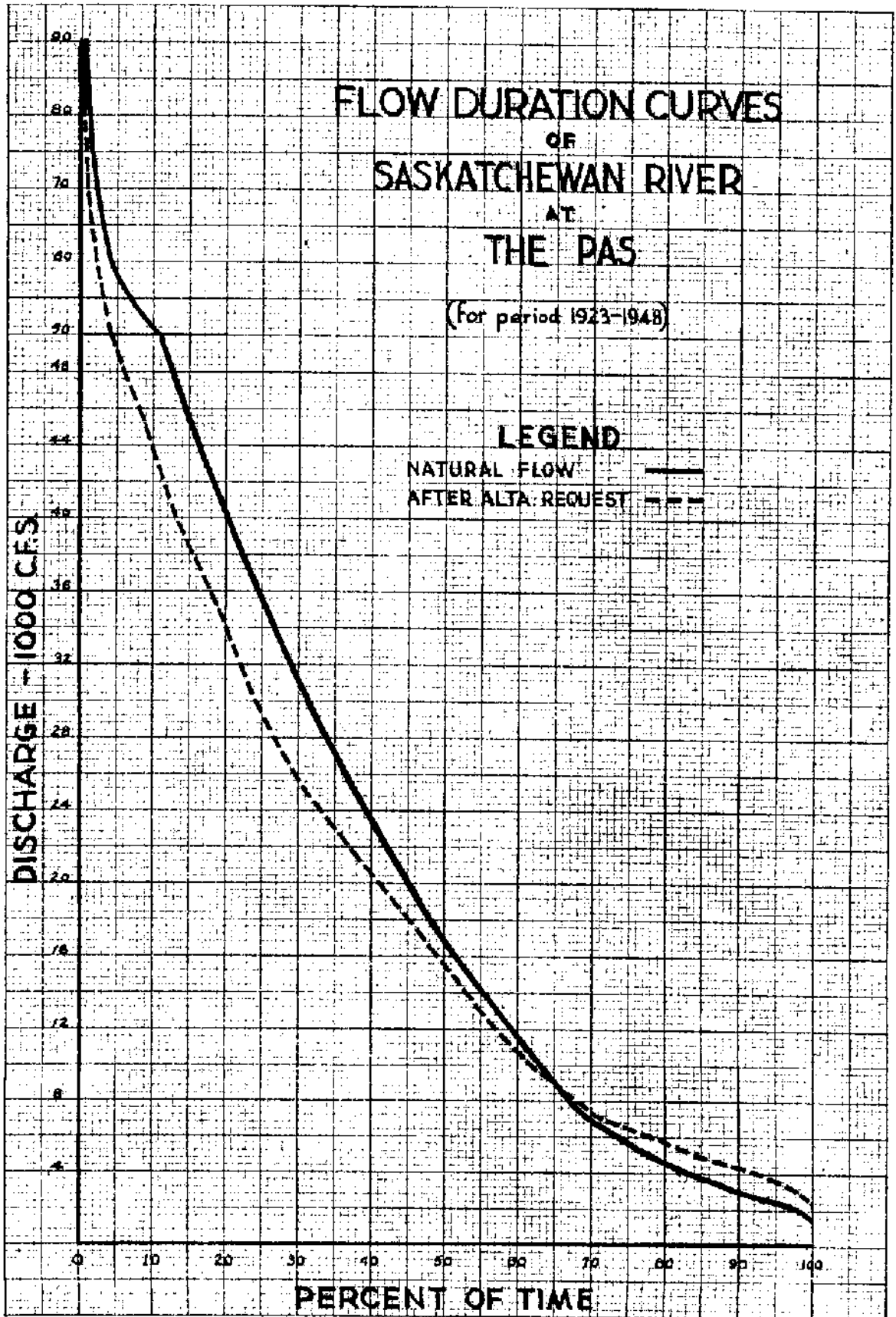


Fig. 2

SOUTH SASKATCHEWAN RIVER AT THE ALBERTA-SASKATCHEWAN BOUNDARY AFTER ALBERTA'S 1949 REQUEST (Sec. Ft.)
Condition #

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total An. Ft.
1923	-	-	-	2,792	2,438	3,560	4,282	6,292	11,060	13,171	10,874	6,446	6,381,000
1924-24	5,000	3,212	3,438	2,952	3,438	3,563	2,462	7,652	13,901	8,261	9,689	5,151	4,208,000
1924-25	3,342	3,417	3,536	3,206	3,536	7,823	15,612	12,730	14,914	7,698	7,228	7,238	5,467,000
1925-26	8,470	4,311	3,529	5,549	3,529	9,239	7,260	3,232	6,264	6,663	4,811	19,600	4,964,000
1926-27	12,895	4,956	3,915	4,020	3,915	5,938	14,192	17,626	38,898	21,317	15,367	17,581	9,885,000
1927-28	10,372	4,925	5,312	7,970	5,312	13,433	9,516	13,986	36,752	30,273	8,097	5,982	9,260,000
1928-29	5,798	3,468	3,668	3,909	3,668	6,205	3,809	11,558	24,293	3,079	2,541	2,559	4,581,000
1929-30	5,175	3,577	3,976	3,104	3,976	5,635	7,626	8,622	10,831	7,115	3,009	3,144	3,924,000
1930-31	3,602	3,731	3,019	3,223	3,019	3,099	2,385	2,520	5,830	4,994	2,209	2,834	2,496,000
1931-32	4,101	2,829	2,740	2,798	2,740	3,906	5,838	11,421	29,487	8,538	3,115	5,202	5,007,000
1932-33	3,774	3,654	3,216	3,278	3,216	4,132	6,169	19,340	16,596	6,702	2,109	2,469	4,569,000
1933-34	2,220	4,096	4,031	4,281	4,031	5,019	8,498	15,567	17,161	4,260	1,868	2,271	4,546,000
1934-35	3,991	3,515	4,498	3,536	4,498	4,004	5,976	5,845	12,509	8,405	5,143	3,304	3,991,000
1935-36	3,216	2,773	2,678	2,363	2,678	3,744	13,524	6,521	7,635	2,143	1,906	1,903	3,242,000
1936-37	1,834	1,648	2,212	1,844	2,212	3,224	4,123	2,659	11,624	3,029	2,215	2,787	2,392,000
1937-38	3,325	3,733	2,821	3,485	2,821	5,159	7,345	11,469	16,798	10,917	4,303	4,616	4,736,000
1938-39	4,287	3,325	2,576	2,862	2,576	5,090	4,458	3,824	14,826	7,448	2,605	3,113	3,515,000
1939-40	3,143	2,931	2,421	2,757	2,421	4,753	12,132	8,946	5,076	3,060	3,108	4,773	3,503,000
1940-41	5,035	2,421	3,058	2,846	3,058	3,558	4,358	2,028	3,656	3,341	2,964	4,376	2,715,000
1941-42	4,833	2,905	2,356	2,793	2,356	3,055	3,896	17,111	26,732	20,200	12,328	9,848	6,656,000
1942-43	7,022	3,471	3,097	3,097	3,097	5,457	21,877	6,407	15,079	12,907	4,830	2,626	5,562,000
1943-44	2,977	3,072	2,649	2,967	2,649	3,114	3,313	2,032	5,063	5,607	7,392	3,553	2,963,000
1944-45	2,628	3,015	2,797	2,732	2,797	4,858	3,237	7,456	19,679	10,168	3,795	5,055	4,141,000
1945-46	5,952	3,070	3,529	3,529	3,529	7,392	6,717	6,398	20,179	9,407	3,368	7,230	4,924,000
1946-47	2,568	4,573	4,092	4,092	4,092	13,475	14,192	17,790	17,200	10,730	5,599	7,357	6,672,000
1947-48	5,937	4,200	3,323	3,742	3,323	5,602	26,536	48,509	49,178	13,207	11,272	4,221	11,262,000
TOTAL	126,698	102,423	88,788	85,330	87,169	145,547	215,351	271,399	444,547	230,083	130,869	139,103	125,209,000
AVERAGE	5,008	4,337	3,552	3,443	3,487	5,822	6,614	10,856	17,792	9,203	5,235	5,504	5,008,000
													→ 5,008,000

SOUTH SASKATCHEWAN RIVER AT DAKOTA - After Alberta's 1949 Request (Sec. Ft.)
Condition A

Year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total Ac.Ft.
1923				2,705	2,332	2,527	2,565	3,025	41,805	23,871	10,699	7,979	6,075,000
1924-24	4,912	3,908	3,732	2,931	3,112	3,421	2,929	2,094	11,811	11,074	5,836	0,945	4,427,000
1924-25	4,192	3,322	3,385	2,852	3,310	4,330	21,861	5,890	15,625	12,148	7,507	7,987	5,725,000
1925-26	7,185	2,780	4,304	3,673	3,558	9,746	9,338	5,223	1,499	11,093	5,780	15,407	5,000,000
1926-27	14,633	6,786	4,613	3,852	3,728	2,758	22,331	45,092	38,718	27,363	16,263	13,406	10,832,000
1927-28	15,251	6,512	5634	9,289	2,143	9,397	12,854	11,678	32,642	36,426	11,148	6,216	10,082,000
1928-29	2,140	2,532	3,756	3,980	3,441	6,206	6,482	7,340	28,163	6,988	3,581	3,338	5,067,000
1929-30	3,618	3,297	2,608	3,069	2,645	6,955	8,634	7,552	10,857	8,735	5,079	4,262	4,155,000
1930-31	3,651	4,506	3,973	3,040	3,541	3,227	3,676	698	2,180	6,394	3,649	3,604	2,573,000
1931-32	4,076	2,743	2,469	2,415	2,170	3,086	7,341	10,912	29,183	12,731	3,937	6,765	5,333,000
1932-33	4,425	3,921	3,674	3,127	2,589	3,302	10,562	11,091	16,142	11,125	4,453	4,862	4,813,000
1933-34	3,021	2,628	3,636	3,341	4,865	5,699	6,501	13,378	15,056	6,049	2,362	2,984	4,370,000
1934-35	4,214	4,002	3,945	2,276	3,312	4,264	6,941	4,390	11,147	10,343	7,443	4,034	4,077,000
1935-36	2,916	2,988	2,977	2,151	2,027	4,550	2,514	8,073	9,073	3,293	2,016	2,898	3,426,000
1936-37	2,326	4,967	1,602	1,734	2,072	2,013	5,359	1,104	7,988	6,074	2,785	3,067	2,295,000
1937-38	3,595	3,628	3,543	2,805	2,628	3,074	11,189	5,301	22,309	15,717	5,392	4,386	5,046,000
1938-39	4,327	3,510	3,085	2,732	2,526	3,087	5,457	2,643	10,058	16,188	3,295	3,518	3,877,000
1939-40	3,438	2,956	2,591	2,657	2,542	4,707	15,004	10,079	7,827	3,546	4,093	3,483	3,701,000
1940-41	6,366	3,833	3,736	3,279	3,215	3,147	10,105	2,258	3,117	3,834	2,461	4,544	2,988,000
1941-42	4,810	3,952	2,628	2,413	2,114	2,607	4,485	8,744	26,679	22,581	13,292	9,563	6,255,000
1942-43	8,005	3,981	2,937	2,834	3,228	3,705	22,556	7,514	13,587	14,704	7,223	3,762	5,700,000
1943-44	3,117	3,256	2,702	2,612	2,979	3,116	5,325	1,531	5,942	7,657	6,382	5,063	3,016,000
1944-45	3,298	2,778	2,735	2,287	3,087	3,935	4,701	3,232	17,228	14,188	4,295	4,135	3,976,000
1945-46	5,725	1,870	4,940	3,629	3,306	6,341	7,321	3,567	17,558	13,107	3,878	7,570	4,691,000
1946-47	5,518	3,943	3,853	3,532	3,062	-1,864	20,311	15,878	17,831	12,730	5,499	6,647	6,751,000
1947-48	8,717	6,926	4,650	4,077	3,183	3,866	22,999	45,675	51,076	18,207	11,442	5,921	11,334,000
TOTAL	136,007	103,614	85,928	80,591	78,882	120,643	280,696	219,251	423,296	314,405	151,991	150,667	129,621,000
AVERAGE	5,440	4,145	3,437	3,224	3,155	4,826	11,228	8,770	16,932	12,576	6,080	6,027	5,185,000

SASKATCHEWAN RIVER AT LE PAS AFTER ALBERTA'S 1949 REQUEST (Sec. Ft.)

YEAR	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total Ac.Ft.
1923	-	-	-	5,391	5,205	5,062	13,577	30,345	41,435	65,905	56,471	40,499	16,066,000 z
1923-24	21,467	8,562	6,118	4,492	4,601	5,002	7,121	31,409	27,994	34,811	26,374	25,836	12,374,000
1924-25	16,175	6,725	6,675	5,725	4,752	5,406	25,480	40,761	40,190	44,125	33,748	39,787	16,323,000
1925-26	29,867	14,875	9,030	6,754	6,563	8,078	20,316	34,138	20,583	29,769	21,693	34,080	14,278,000
1926-27	40,807	27,233	7,646	8,103	6,553	6,898	18,188	61,131	56,892	63,318	61,363	49,763	24,740,000
1927-28	45,206	25,351	13,438	11,194	9,809	9,983	26,297	49,654	38,278	69,242	56,126	27,948	23,248,000
1928-29	13,126	5,940	4,382	3,736	4,270	4,841	13,046	27,352	36,140	25,563	13,688	13,041	10,111,000
1929-30	8,268	5,488	3,437	3,268	3,369	3,265	23,285	24,134	28,258	30,357	21,435	16,119	10,367,000
1930-31	11,342	8,651	5,616	5,023	4,780	5,241	17,707	14,616	14,048	28,780	23,994	21,049	9,740,000
1931-32	18,304	11,996	4,023	4,779	3,798	5,440	22,496	39,011	47,912	48,883	32,431	25,707	16,051,000
1932-33	17,395	12,425	7,141	7,104	6,707	6,529	19,062	48,562	47,391	42,542	24,925	22,253	15,871,000
1933-34	13,732	10,691	8,448	6,886	7,761	9,005	24,709	51,301	43,578	47,356	31,249	21,482	16,737,000
1934-35	16,264	15,392	10,822	7,675	6,186	8,322	19,824	35,841	33,220	40,047	37,523	19,443	15,197,000
1935-36	11,784	5,766	5,698	4,577	4,201	4,117	16,650	55,314	37,873	40,047	19,724	10,575	8,455,000
1936-37	9,188	6,346	3,877	2,725	2,744	3,222	18,373	21,169	18,444	23,088	19,724	20,312	12,830,000
1937-38	10,467	8,555	3,878	4,753	3,575	4,398	43,434	21,789	29,401	36,809	24,917	14,425	12,478,000
1938-39	14,446	8,807	4,070	4,135	3,652	3,756	45,997	22,757	20,073	41,458	22,588	13,253	11,059,000
1939-40	10,678	10,058	4,476	4,121	3,617	3,725	26,657	43,234	26,849	17,747	18,156	13,281	7,555,000
1940-41	13,563	6,566	5,173	4,606	3,799	3,905	22,657	12,805	10,208	13,787	14,594	31,882	13,644,000
1941-42	9,204	9,090	3,262	2,338	2,953	2,994	15,607	17,325	35,754	48,569	46,181	20,323	15,915,000
1942-43	21,093	10,745	6,911	5,917	5,224	5,948	37,195	45,056	30,314	42,187	31,604	25,512	12,970,000
1943-44	11,632	10,087	4,746	4,482	4,342	4,439	21,796	15,685	29,331	45,642	36,317	19,235	12,644,000
1944-45	14,883	7,418	5,068	4,025	4,677	5,407	18,725	27,831	38,282	38,738	24,498	18,518	13,713,000
1945-46	18,425	10,465	6,780	6,630	6,499	7,216	36,231	23,211	28,607	39,218	24,877	23,069	15,227,000
1946-47	15,600	8,698	4,623	6,083	5,942	6,462	29,244	48,381	39,068	37,301	26,970	30,312	24,273,000
1947-48	21,807	15,407	9,776	9,590	7,627	6,773	12,236	77,129	92,433	69,856	47,157	593,271	357,962,000
TOTAL	434,723	271,337	155,114	138,721	128,001	140,972	582,333	889,596	873,121	981,066	738,785	23,730	14,318,000 ↓
AVERAGE	17,388	10,853	6,204	5,548	5,120	5,638	23,293	35,564	34,924	39,242	29,551	→	14,318,000

BALANCE AT THE ALBERTA-SASKATCHEWAN BOUNDARY (after Alberta's 1949 request)

Year	Natural flow Alta-Sask Boundary	St. Mary Irr. Dist.	U.I.D. M.I.D.	L.N.I.D. and Macleod	Irr. Bow R.	IRIGATION DIVERSIONS			Wet Years Return	Return Flow	Total	Calgary Power Regulations	Balance at Alta-Sask Boundary
						Private	Theoretic Total	7					
	1	2	3	4	5	6	7	8	9	10	11	12	
1923													
Jan.	1,455	161 k					161	2		159	1,496		2,792
Feb.	1,149	191 k					191	2		189	1,478		2,438
Mar.	2,071	101 k					101	1		100	1,589		3,560
Apr.	5,234	1,040 k	128	130	946	67	2,183	27		2,156	1,204		4,262
May	13,011	3,358 k	322	395	2,747	130	6,399	80	400	5,919	-700		6,392
June	65,601	2,225 k	450	645	4,578	403	9,459	118	800	8,241	-6,000		51,060
July	27,427	1,671 k	258	395	2,747	260	8,158	102	800	7,256	-2,000		18,171
Aug.	15,468	608 k	128	260	1,892	134	5,321	67	800	4,464	-130		10,874
Sept.	8,631			260			3,022	38	800	2,184	0		6,447
1923-24													
Oct.	6,072	432 a		130	916	65	1,543		400	1,143	71		5,000
Nov.	3,476	53 a					53			53	779		4,202
Dec.	1,993	16 a					16			16	1,235		3,212
Jan.	1,403	18 a					18			18	1,567		2,952
Feb.	2,145	130 a					130			130	1,423		3,438
Mar.	2,347	181 a					181			181	1,397		3,563
Apr.	4,403	1,924 a	128	130	946	67	3,067			3,067	1,126		2,462
May	15,682	3,430 a	322	395	2,747	130	6,830		400	6,430	-1,600		7,652
June	25,002	3,200 a	450	645	4,731	403	9,301		800	8,501	-2,600		13,901
July	17,446	2,052 a	322	395	4,578	260	7,985		800	7,185	-2,000		8,261
Aug.	15,587	1,620 a	258	395	2,747	260	5,280		800	4,480	-1,418		9,089
Sept.	7,381	616 a	128	260	1,892	134	3,030		800	2,230	0		5,151
1924-25													
Oct.	4,755	1,192 b		130	916	65	2,303		400	1,759	346		3,342
Nov.	3,315	440 b					440	144		412	946		3,849
Dec.	2,273	207 b					207	28		194	1,338		3,417
Jan.	2,299	268 b					268	13		251	1,158		3,206
Feb.	2,259	173 b					173	17		162	1,439		3,536
Mar.	6,689	208 b					208	11		195	1,329		7,823
Apr.	18,108	2,101 b	128	130	946	67	3,244	13		3,042	546		15,612
May	19,389	1,996 b	322	395	2,747	130	5,396	202		4,659	-2,000		12,730
June	26,833	2,200 b	450	645	4,731	403	9,301	337	400	7,919	-4,000		14,730
July	17,345	2,010 b	322	395	4,578	260	7,985	582	800	6,647	-4,000		14,648
Aug.	11,476	1,615 b	258	395	2,747	260	5,280	429	800	4,146	-1,102		7,228
Sept.	9,300	638 b	128	260	1,892	134	3,052	190	800	2,062	0		7,238

a - from 1929-30; b - from 1933-34; k - from 1934-35 (diversions)

	1	2	3	4	5	6	7	8	9	10	11	12
<u>1925-26</u>												
Oct.	9,811	630 c		130	916	65	1,741		400	1,341	0	8,470
Nov.	5,298	198 c					198			198	230	5,330
Dec.	3,703	187 c					187			187	795	4,311
Jan.	2,279	145 c					145			145	1,415	3,549
Feb.	2,308	108 c					108			108	1,329	3,529
Mar.	8,082	102 c					102			102	1,259	9,239
Apr.	8,700	767 c		130	946	67	1,910			1,910	470	7,260
May	8,954	2,292 c	128	395	2,747	130	5,692		400	5,292	-380	3,282
June	14,155	2,170 c	322	645	4,631	403	8,171		800	7,371	-520	6,264
July	13,163	967 c	450	645	4,378	260	6,700		800	5,900	-600	6,663
Aug.	7,281	410 c	258	395	1,947	260	3,270		800	2,470	0	4,811
Sept.	24,691	742 c	128	260	1,892	134	3,156		800	2,356	-2,735	19,600
<u>1926-27</u>												
Oct.	15,447	819 d		130	916	65	1,930		400	1,289	-1,262	12,895
Nov.	7,006	348 d					348			304	234	6,936
Dec.	4,407	142 d					142			124	673	4,956
Jan.	2,961	219 d					219			192	1,251	4,020
Feb.	2,544	72 d					72			63	1,434	3,915
Mar.	4,907	337 d					337			295	1,326	5,938
Apr.	16,178	1,205 d		130	1,346	67	2,748			2,404	418	14,192
May	24,169	4,534 d	128	395	2,747	130	7,934		400	6,543	0	17,626
June	50,586	3,200 d	322	645	5,131	403	9,701		800	7,688	-4,000	38,898
July	29,571	3,200 d	450	645	4,878	260	9,433		800	7,454	-1,000	21,317
Aug.	19,800	1,937 d	258	395	2,747	260	5,597		800	4,097	-336	15,367
Sept.	20,384	1,705 d	128	260	1,892	134	4,119		800	2,803	0	17,581
<u>1927-28</u>												
Oct.	12,878	819		130	916	65	1,930		400	1,506	0	10,372
Nov.	6,503	348					348			344	59	6,318
Dec.	4,185	142					142			140	880	4,925
Jan.	7,479	219					219			216	707	7,670
Feb.	4,262	72					72			71	121	5,312
Mar.	13,638	337					337			333	128	13,433
Apr.	11,360	1,205		130	946	67	2,348			2,319	475	9,516
May	21,430	3,234	128	395	2,747	130	6,934		490	6,447	-997	13,986
June	46,637	3,200	322	645	4,731	403	9,301		800	8,385	-1,500	36,752
July	39,365	3,200	450	645	4,578	260	9,133		800	8,219	-1,673	30,273
Aug.	12,330	1,937	258	395	2,247	260	5,097		800	4,233	0	8,097
Sept.	8,756	1,705	128	260	1,392	134	3,619		800	2,774	0	5,982

c - diversions from 1940-41; d - from 1927-28

	1	2	3	4	5	6	7	8	9	10	11	12
<u>1928-29</u>												
Oct.	7,475	1,290		130	916	65	2,401	-	400	2,001	324	5,798
Nov.	4,400	216					216	-	-	216	938	5,122
Dec.	2,121	90					90	-	-	90	1,437	3,468
Jan.	1,949	-333					-333	-	-	-333	1,627	3,909
Feb.	1,750	-348					-348	-	-	-348	1,570	3,668
Mar.	4,658	-191					-191	-	-	-191	1,356	6,205
Apr.	4,769	692					692	-	-	692	1,835	3,809
May	18,177	2,419	128	130	946	67	1,835	100%	400	1,835	1,875	11,558
June	39,294	3,200	322	395	2,747	130	5,819	-	800	5,419	-1,200	24,293
July	10,813	2,101	450	645	5,231	403	9,801	-	800	9,001	-6,000	3,079
Aug.	6,347	1,446	258	395	4,578	260	8,034	-	800	7,234	-500	2,541
Sept.	4,774	274	128	260	2,247	260	4,606	-	800	3,806	0	2,559
					1,692	134	2,488	-	800	1,688	-527	
<u>1929-30</u>												
Oct.	3,503	432		130	916	65	1,543	-	400	1,143	813	3,173
Nov.	2,258	53					53	-	-	53	1,191	3,396
Dec.	2,252	16					16	-	-	16	1,341	3,577
Jan.	1,488	18					18	-	-	18	1,634	3,104
Feb.	4,412	130					130	-	-	130	1,694	5,576
Mar.	4,195	181					181	-	-	181	1,621	5,635
Apr.	10,157	1,924	128	130	946	67	3,067	100%	400	3,067	536	7,626
May	15,252	3,430	322	395	2,747	130	6,830	-	800	6,430	-200	8,622
June	24,532	3,200	450	645	5,431	403	10,001	-	800	9,201	-4,500	10,831
July	17,700	2,052	450	645	4,578	260	7,985	-	800	7,185	-3,400	7,115
Aug.	8,219	1,620	258	395	2,747	260	5,280	-	800	4,480	-730	3,009
Sept.	5,374	616	128	260	1,892	134	3,030	-	800	2,230	0	3,144
<u>1930-31</u>												
Oct.	4,355	407		130	916	65	1,518	-	400	1,118	565	3,802
Nov.	2,533	73					73	-	-	73	1,250	3,710
Dec.	2,114	17					17	-	-	17	1,634	3,731
Jan.	1,994	7					7	-	-	7	1,236	3,223
Feb.	1,784	43					43	-	-	43	1,278	3,019
Mar.	1,729	47					47	-	-	47	1,417	3,099
Apr.	3,066	674	128	130	1,246	67	2,117	100%	400	2,117	1,436	2,385
May	9,389	2,979	322	395	2,747	130	6,379	-	800	5,979	-890	2,520
June	17,353	2,536	450	645	4,431	403	8,357	-	800	7,537	-3,986	5,830
July	12,712	1,014	450	645	4,378	260	6,747	-	800	5,947	-1,771	4,994
Aug.	6,313	540	258	395	2,047	260	3,500	-	800	2,700	-1,404	2,209
Sept.	5,683	470	128	260	1,892	134	2,884	-	800	2,084	-765	2,834

	1	2	3	4	5	6	7	8	9	10	11	12
<u>1931-32</u>												
Oct.	4,352	346		130	916	65	1,457	(109	400	948	697	4,101
Nov.	2,044	424					424	32		392	1,378	3,030
Dec.	1,720	201					201	15		186	1,295	2,829
Jan.	1,280	74					74	6		68	1,586	2,798
Feb.	1,765	445					445	33		412	1,746	2,746
Mar.	3,015	607					607	46		561	1,393	3,906
Apr.	6,850	963				67	2,206	165		2,041	1,452	5,838
May	18,906	3,443	128	130	1,046	130	7,443	158	400	6,485	1,029	11,421
June	43,824	3,577	322	395	3,347	130	9,878	171	800	8,337	-1,000	29,487
July	16,314	2,157	450	645	4,931	403	8,190	614	800	6,776	-6,000	8,538
Aug.	8,108	1,707	258	395	2,747	260	5,367	402	800	4,165	-1,000	3,113
Sept.	7,142	1,548	128	260	1,892	134	2,962	222	800	1,940	-830	5,202
<u>1932-33</u>												
Oct.	4,402	300		130	916	65	1,411		400	1,011	383	3,774
Nov.	3,377	160					160			160	914	4,131
Dec.	2,408	111					111			111	1,357	3,654
Jan.	2,047	85					85			85	1,316	3,278
Feb.	1,814	16					16			16	1,418	3,216
Mar.	2,838	60					60			60	1,354	4,132
Apr.	7,620	1,053				67	2,396			2,396	945	6,169
May	25,822	3,082	128	130	1,146	130	6,682		400	6,282	-200	19,340
June	30,216	4,319	322	395	2,947	403	10,420		800	9,620	-4,000	16,596
July	17,547	2,712	450	645	4,731	260	8,645		800	7,845	-3,000	6,702
Aug.	7,037	1,781	258	395	2,547	260	5,241		800	4,441	-487	2,109
Sept.	5,599	1,516	128	260	1,892	134	3,930		800	3,130	0	2,469
<u>1933-34</u>												
Oct.	3,703	1,192		130	916	65	2,303		400	1,903	420	2,220
Nov.	5,170	440					440			440	848	5,1578
Dec.	3,058	207					207			207	1,245	4,096
Jan.	3,360	268					268			268	1,189	4,281
Feb.	3,445	173					173			173	1,359	4,631
Mar.	3,862	208					208			208	1,220	5,019
Apr.	11,622	2,101				67	3,344			3,344	-3,106	8,498
May	23,769	1,996	128	130	2,847	130	5,496		400	5,096	-3,200	15,567
June	28,662	3,200	322	395	4,731	403	9,301		800	8,501	-3,340	17,161
July	11,749	2,010	450	645	4,578	260	7,943		800	7,143	0	4,266
Aug.	6,143	1,615	258	395	2,547	260	5,075		800	4,275	0	1,868
Sept.	4,521	638	128	260	1,892	134	3,052		800	2,252	2	2,271

	1	2	3	4	5	6	7	8	9	10	11	12
1934-35												
Oct.	4,170	477		130	916	65	1,588	(	400	1,188	1,009	3,991
Nov.	5,014	537					537	(	-	537	1,025	5,502
Dec.	2,237	140					140	(	-	140	1,418	3,515
Jan.	2,241	161					161	(	-	161	1,456	3,536
Feb.	2,287	191					191	(	-	191	1,392	4,488
Mar.	2,656	101					101	(	-	101	1,449	4,004
Apr.	7,182	1,040		130	1,046	67	1,040	(	-	2,283	1,077	4,976
May	11,839	2,999	128	395	2,747	130	2,283	(	400	5,999	5	5,845
June	25,268	3,358	322	645	4,831	403	6,399	(	800	8,759	-4,000	12,509
July	19,263	2,225	450	645	4,578	260	9,559	(	800	7,358	-3,500	8,405
Aug.	11,007	1,671	258	395	2,747	260	8,158	(	800	4,531	-1,333	5,143
Sept.	5,526	608	128	260	1,892	134	5,331	(	800	2,222	0	3,304
							3,022	(
1935-36												
Oct.	3,528	299		130	916	65	1,410	(	400	1,010	698	3,216
Nov.	2,117	14					14	(	-	141	1,194	3,297
Dec.	1,454	10					10	(	-	10	1,329	2,773
Jan.	1,272	12					12	(	-	12	1,503	2,763
Feb.	1,939	-15					-15	(	-	-15	1,724	2,678
Mar.	4,372	79					79	(	-	79	1,451	5,744
Apr.	14,962	1,226		130	946	67	2,369	(	-	2,369	931	13,524
May	15,070	3,294	128	450	2,747	130	6,749	(	400	6,349	-2,200	6,521
June	19,524	2,838	322	745	4,731	403	9,039	(	800	8,239	-3,600	7,685
July	7,923	1,813	450	589	3,178	260	6,290	(	800	5,490	-290	2,143
Aug.	5,654	520	258	296	2,247	260	3,581	(	800	2,781	-967	1,906
Sept.	4,190	217	128	260	1,892	134	2,631	(	800	1,831	-456	1,903
								(
1936-37												
Oct.	2,212	196		130	916	65	1,307	(	400	907	529	1,834
Nov.	1,550	10					10	(	-	10	1,037	2,577
Dec.	470	34					34	(	-	34	1,212	1,648
Jan.	442	22					22	(	-	22	1,424	1,844
Feb.	930	26					26	(	-	26	1,308	2,212
Mar.	2,021	41					41	(	-	41	1,244	3,224
Apr.	5,416	656		130	1,246	67	2,099	(	-	2,099	806	4,123
May	9,311	3,513	128	395	2,647	130	6,813	(	400	6,413	-239	2,659
June	24,813	4,181	322	645	5,131	403	10,682	(	800	9,882	-3,277	11,654
July	12,798	2,184	450	645	4,378	260	7,917	(	800	7,117	-2,652	3,029
Aug.	7,956	1,615	258	395	2,447	260	4,975	(	800	4,175	-1,566	2,215
Sept.	5,419	638	128	260	1,892	134	3,052	(	800	2,252	-380	2,787

	1	2	3	4	5	6	7	8	9	10	11	12
<u>1937-38</u>												
Oct.	4,120	477		130	916	65	1,588	(	400	1,188	393	3,325
Nov.	3,562	147					147	(		147	673	4,088
Dec.	2,405	77					77	(		77	1,405	3,733
Jan.	2,101	65					65	(		65	1,449	3,485
Feb.	1,460	50					50	(		50	1,511	2,821
Mar.	3,809	66					66	(		66	1,416	5,159
Apr.	9,155	1,294		130	1,246	67	2,737	(		2,737	1,227	7,645
May	19,345	3,576	128	395	2,947	130	7,176	(	400	6,776	-1,100	11,469
June	31,214	3,815	322	645	5,031	403	10,216	(	800	9,416	-5,000	16,798
July	21,257	2,407	450	645	4,878	260	8,640	(	800	7,840	-2,500	10,917
Aug.	9,209	1,609	258	395	2,947	260	5,469	(	800	4,669	-237	4,303
Sept.	7,252	1,922	128	260	1,992	134	3,436	(	800	2,636	0	4,616
<u>1938-39</u>												
Oct.	4,955	407		130	916	65	1,518	(	400	1,118	450	4,287
Nov.	2,719	116					116	(		116	1,247	3,850
Dec.	1,677	46					46	(		46	1,694	3,325
Jan.	1,329	35					35	(		35	1,568	2,862
Feb.	3,996	30					30	(		30	1,610	2,576
Mar.	3,931	142					142	(		142	1,301	5,090
Apr.	5,949	1,238	128	130	1,046	67	2,481	(		2,481	1,990	4,458
May	11,066	3,144	128	395	2,847	130	6,644	(	400	6,244	-998	3,824
June	26,651	2,524	322	645	4,731	403	8,625	(	800	7,825	-4,000	14,826
July	17,264	1,683	450	645	4,278	260	7,616	(	800	6,816	-3,000	7,448
Aug.	6,783	458	258	395	2,747	260	4,118	(	800	3,318	-860	2,605
Sept.	5,001	274	128	260	1,892	134	2,688	(	800	1,888	0	3,113
<u>1939-40</u>												
Oct.	3,949	313		130	916	65	1,424	(	400	1,006	200	3,143
Nov.	3,463	230					230	(		227	700	3,936
Dec.	1,774	246					246	(		243	1400	2,931
Jan.	1,191	136					136	(		134	1,700	2,757
Feb.	1,351	128					128	(		126	1,500	2,725
Mar.	3,629	239					239	(		236	1,400	4,793
Apr.	13,146	697					2,040	(		2,014	1,000	12,132
May	17,138	3,075	128	130	1,146	67	6,675	(	400	6,192	-2,000	8,946
June	15,896	2,628	322	395	2,947	130	8,729	(	800	7,820	-3,000	5,076
July	10,686	1,173	450	645	4,731	403	6,906	(	800	6,020	-1,000	3,666
Aug.	6,921	404	258	395	2,747	260	4,064	(	800	3,213	-600	3,108
Sept.	8,180	530	128	260	1,892	134	2,944	(	800	2,107	-1,300	4,773

	1	2	3	4	5	6	7	8	9	10	11	12
<u>1940-41</u>												
Oct.	6,034	630		130	916	65	1,741	-	400	1,341	342	5,035
Nov.	3,222	198					198	-	-	1,198	1,229	4,353
Dec.	2,175	187					187	-	-	187	1,433	3,421
Jan.	1,431	145					145	-	-	145	1,560	2,846
Feb.	1,455	108					108	-	-	108	1,711	3,058
Mar.	4,424	102					102	-	-	102	1,236	5,558
Apr.	5,279	767					767	-	-	2,110	1,189	4,358
May	7,520	2,292	128	130	1,146	67	2,110	-	-	5,292	-200	2,028
June	13,027	2,170	322	395	2,747	130	5,692	-	400	6,771	1,000	3,656
July	9,599	967	450	645	3,678	403	7,571	-	800	5,258	-2,600	3,341
Aug.	7,176	410	258	317	2,747	260	6,058	-	800	3,212	-1,000	2,964
Sept.	7,532	742	128	260	1,892	134	4,012	-	800	2,356	-800	4,376
<u>1941-42</u>												
Oct.	6,272	1,014		130	916	65	2,125	(186)	400	1,539	100	4,833
Nov.	3,567	450					450	(39)	-	441	700	3,856
Dec.	2,358	540					540	(47)	-	493	1,000	2,865
Jan.	1,917	355					355	(31)	-	324	1,200	2,793
Feb.	1,351	181					181	(16)	-	165	1,200	2,386
Mar.	2,188	146					146	(13)	-	133	1,000	3,055
Apr.	5,691	1,282					2,625	(230)	-	2,395	600	3,896
May	24,474	3,154	128	130	1,146	67	6,754	(591)	400	5,763	-1,600	17,111
June	36,275	3,738	322	395	2,947	130	10,239	(896)	800	8,543	-3,000	26,732
July	31,330	2,557	450	645	4,778	403	8,690	(760)	800	7,130	-4,000	20,200
Aug.	17,077	1,752	258	395	3,047	260	5,752	(503)	800	4,449	-300	12,328
Sept.	12,928	1,738	128	260	1,992	134	4,252	(372)	800	3,080	0	9,848
<u>1942-43</u>												
Oct.	8,323	590		130	916	65	1,701	-	400	1,301	0	7,022
Nov.	3,759	129					129	-	-	129	1,000	4,630
Dec.	2,286	115					115	-	-	115	1,300	3,471
Jan.	1,650	53					53	-	-	53	1,500	3,097
Feb.	2,506	58					58	-	-	58	1,400	3,848
Mar.	2,038	81					81	-	-	81	1,500	6,457
Apr.	24,982	1,762					3,105	-	-	3,105	0	21,877
May	12,766	3,179	128	130	1,146	67	6,779	-	400	6,379	0	6,407
June	26,518	4,158	322	395	2,947	130	10,239	-	800	9,439	-2,000	15,079
July	24,756	3,206	450	645	4,731	403	9,139	-	800	8,339	-3,510	12,507
Aug.	10,481	1,791	258	395	2,747	260	5,451	-	800	4,651	-1,000	4,830
Sept.	5,685	1,445	128	260	1,692	134	3,659	-	800	2,859	-190	2,636

	1	2	3	4	5	6	7	8	9	10	11	12
<u>1943-44</u>												
Oct.	3,447	389			916	65	1,370		400	970	500	2,977
Nov.	1,909	64					64			64	1,200	3,045
Dec.	1,699	27					27			27	1,400	3,072
Jan.	1,462	0					0			0	1,500	2,962
Feb.	1,253	4					4			4	1,600	2,849
Mar.	1,637	23					23			23	1,500	3,114
Apr.	4,309	653		130	1,146	67	1,996			1,996	1,000	3,313
May	7,682	2,250	128	395	2,547	130	5,450	100%	400	5,050	-600	3,032
June	19,798	2,534	322	645	4,331	403	8,235		800	7,435	-3,300	9,063
July	12,109	969	450	645	4,178	260	6,502		800	5,702	-800	5,607
Aug.	12,790	538	258	395	2,747	260	4,198		800	3,398	-2,000	7,392
Sept.	6,591	424	128	260	1,892	134	2,838		800	2,038	-1,000	3,553
<u>1944-45</u>												
Oct.	3,665	486		130	916	65	1,597		400	1,137	100	2,628
Nov.	2,375	246					246			237	1,000	3,138
Dec.	1,617	137					137			132	1,530	3,015
Jan.	1,362	135					135			130	1,500	2,732
Feb.	1,364	173					173			167	1,600	2,797
Mar.	3,623	140					140			135	1,400	4,888
Apr.	3,839	214		130	1,046	67	1,457			1,402	800	3,237
May	14,712	3,182	128	395	3,247	130	7,082		400	6,416	-800	7,496
June	33,317	4,024	322	645	4,931	403	10,325	98	800	9,138	-4,500	19,679
July	20,267	2,282	450	645	4,778	260	8,415	(387)	800	7,299	-2,800	10,168
Aug.	8,402	1,615	258	395	2,747	260	5,275	(316)	800	4,277	-330	3,795
Sept.	8,112	1,074	128	260	1,892	134	3,488	(198)	800	2,557	-500	5,055
								(131)				
<u>1945-46</u>												
Oct.	7,289	723		130	916	65	1,834		400	1,434	100	5,955
Nov.	3,321	581					581			581	1,000	3,740
Dec.	2,855	85					85			85	1,300	4,070
Jan.	2,479	50					50			50	1,500	3,929
Feb.	2,189	47					47			47	1,300	3,442
Mar.	5,979	87					87			87	1,500	7,392
Apr.	8,258	1,398		130	946	67	2,541			2,541	1,000	6,717
May	14,708	3,310	128	395	2,747	130	6,710	100%	400	6,310	-2,000	6,398
June	32,940	3,458	322	645	4,731	405	9,561		800	8,761	-4,000	20,179
July	17,793	2,251	450	645	4,1578	260	8,184		800	7,384	-1,000	9,409
Aug.	8,385	1,657	258	395	2,547	260	5,117		800	4,317	-700	3,368
Sept.	10,091	947	128	260	1,892	134	3,361		800	2,561	0	7,530

	1	2	3	4	5	6	7	8	9	10	11	12
Oct.	6,957	908		130	916	65	2,019	-	400	1,619	200	5,568
Nov.	3,637	204					204	-		204	1,100	4,533
Dec.	3,476	103					103	-		103	1,300	4,673
Jan.	2,675	83					83	-		83	1,500	4,092
Feb.	3,820	140					140	-		140	1,300	4,980
Mar.	12,342	207					207	-		207	1,300	13,475
Apr.	16,268	1,573		130	946	67	2,716	-		2,716	1,700	14,192
May	27,634	3,644	128	395	2,947	130	7,244	-	400	6,844	-3,000	17,790
June	30,224	2,417	322	645	4,731	403	9,518	-	800	8,718	-4,000	17,506
July	18,591	2,368	450	645	4,578	260	8,301	-	800	7,501	-400	10,730
Aug.	19,162	1,703	258	395	2,747	260	5,363	-	800	4,563	0	5,599
Sept.	18,375	1,404	128	260	1,892	134	3,818	-	800	3,018	0	7,357
1947-48												
Oct.	12,564	1,916		130	916	65	3,027	-	400	2,627	0	9,937
Nov.	6,181	235					235	-		235	490	6,376
Dec.	3,219	119					119	-		119	1,100	4,200
Jan.	2,657	55					55	-		55	1,140	3,742
Feb.	1,936	33					33	-		33	1,420	3,323
Mar.	4,002	55					55	-		55	1,655	5,602
Apr.	28,051	1,262		130	946	67	2,405	-		2,405	890	26,956
May	56,066	1,937	128	395	2,747	130	5,337	-	400	4,937	-2,500	48,569
June	60,679	3,200	322	645	4,731	403	9,301	-	800	8,501	-3,000	49,178
July	21,488	2,448	450	645	4,578	260	8,381	-	800	7,581	-700	13,207
Aug.	16,374	1,807	258	395	2,747	260	5,467	-	800	4,667	-435	11,272
Sept.	6,868	1,033	128	260	1,892	134	3,447	-	800	2,647	0	4,221