Mountain Snow Conditions and Water Supply Forecasts for Alberta

June 2001

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Notes

Alberta Environment publishes the **"Mountain Snow Conditions and Water Supply Forecasts for Alberta"** monthly, usually from February to August. These reports are prepared by the Water Sciences Branch, Hydrology/Forecasting Section of the Department's Water Management Division.

Alberta Environment is grateful for the assistance of Environment Canada's Climatological Services Unit and Water Resources Branch in providing weather, precipitation and streamflow data. Snow survey data are also provided by the United States, Soil Conservation Service of Montana and the British Columbia Ministry of Environment, Lands and Parks. The assistance of a number of private citizens who diligently report observations of precipitation and other data is also appreciated.

Alberta Environment and the National Resources Conservation Service (NRCS) from Portland, Oregon are collaborating on the Water Supply Forecasts for the Milk and St. Mary Rivers. Water Supply forecasts for the Western United States are available through the NRCS web page:
http://www.wcc.nrcs.usda.gov/water/w_qnty.html

All data summarized in this publication are preliminary and subject to revision.

Data used in this report are available on request from: Alberta Environment, Water Sciences Branch, Hydrology/Forecasting Section, 10th Fl, Oxbridge Place, 9820 -106 Street, Edmonton, Alberta, T5K 2J6, Fax: (780) 422-8606

This report is also available through Alberta Environment's automated streamflow information/fax-on-demand service. To access this service toll-free, please call the Alberta Government RITE Operator at 310-0000, available 24 hours a day from anywhere in the province. At the prompt, enter the phone number **207-2718** for our streamflow information/fax on demand service.

Historical Streamflow Information: Environment Canada, Calgary, (403) 292-5317

Equivalents of Measure

Parameter	Metric Unit	Conversion to Imperial Units
Snow depth	centimetres	2.54 cm = 1 inch
Water Equivalent	millimetres	25.4 mm = 1 inch
Elevation	metres	1 m = 3.2808 feet
Streamflow	cubic metres per second	1 cms = 35.3 cfs
Volume	cubic decametre (dam^3)	1 dam^3=1000 m^3= 0.8107 acre-feet

Explanation of Descriptions

Much-above-average	In the upper 15% of recorded values
Above-average	Between the upper 15% and 35% of recorded values
Below-average	Between the lower 15% and 35% of recorded values
Much-below-average	In the lower 15% of recorded values

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Overview

Above-normal precipitation was recorded in the northern portion of the province in May. Areas south of Slave Lake received much-below-normal precipitation during May with the exception of the Cold Lake and Lloydminster regions, which received normal to above-normal precipitation. A heavy rain event occurred in southern Alberta during the first few days of June producing between 20 and 100 mm, with the larger amounts in the southwest corner of the province. Precipitation amounts from this storm brought the total precipitation of May to near normal values in southern Alberta. Current predictions from Environment Canada are for below-normal precipitation for the June to August period in southern Alberta.

As of June 1, 2001 water levels in Alberta Groundwater Observation wells were predominantly found to have below-normal to much-below-normal conditions throughout the province .

Water storage as of June 1, 2001 in the major irrigation and hydroelectric reservoirs in the Bow, Red Deer and North Saskatchewan River basins is normal for this time of the season. The exceptions are: Lake Abraham, which is above-normal and Lake Newell which is below-normal. In the Oldman River basin, reservoirs are below-normal except for Keho Lake, which is normal.

As of June 1, 2001, June to September natural streamflow volume is forecast to be much-below-average for the Milk, Oldman, Bow, Red Deer, and North Saskatchewan River headwaters.

May Climatic Conditions

Above-normal precipitation was recorded in the northern portion of the province in May (Figure 1). Areas south of Slave Lake received much-below-normal precipitation during May with the exception of the Cold Lake and Lloydminster regions, which received normal to above-normal precipitation (Figures 1 and 2). A heavy rain event occurred in southern Alberta during the first few days of June producing between 20 and 100 mm, with the larger amounts in the southwest corner of the province (Figure 3). Precipitation amounts from this storm brought the total precipitation of May to near normal values in southern Alberta. Temperatures were normal to above-normal in the province during May.

Long-Lead Precipitation Outlook

Environment Canada is forecasting below-normal precipitation in the June to August period for southern two-thirds of Alberta, normal in northwest and above-normal in the northeastern corner of the province. The National Oceanic and Atmospheric Administration (NOAA) is forecasting normal precipitation for June. Preliminary forecasts by Environment Canada for the 2001 fall (September to November) are for above-normal precipitation in the northern two-thirds of Alberta and normal in the southern third of the province, while NOAA is predicting normal precipitation across the province. There currently is no discernible signal in the ENSO cycle.

Groundwater Conditions

As of June 1, 2001 water levels in Alberta Groundwater Observation wells were predominantly found to have below-normal to much-below-normal conditions throughout the province (Table 1). South of Calgary, wells were much-below-normal to below-normal with the exception of three deep wells which were normal to much-above-normal. In the Brooks and Coronation regions, water levels were below-normal to much-below-normal, with the exception of two deep wells which were normal, and one that was much-above-normal. In the Edmonton to northeastern parts of the province, conditions were much-below-normal, with the exception of one well near Cold Lake, which was above-normal. In the Athabasca-Peace region, water levels were much-below-normal to below-normal. Shallow wells are less than 30 metres deep.

Table 1 Groundwater Conditions as of June 1, 2001

AREA	WELL NAME	AQUIFER	OBSERVATION WELL GROUNDWATER LEVEL
Milk River	Del Bonita 70-3	Deep	much-below-normal
Milk River	Milk River 2479E	Shallow	much-below-normal
Milk River	Cressday	Deep	above-normal
Cypress Hills	Cypress	Shallow	much-below-normal
Lethbridge – Medicine Hat	Pakowki	Deep	much-above-normal
Medicine Hat	Ross Creek 2288E	Deep	below-normal
Lethbridge	Barons 615E	Shallow	normal
Pincher Creek	Oldman Dam	Shallow	much-below-normal
Calgary	Okotoks 2378E	Deep	much above-normal
Calgary	Cluny 85-2 (South)	Shallow	above-normal
Bowden	Dickson Dam 4015A	Shallow	normal
Brooks	Cavendish	Shallow	much-below-normal
Brooks	Duchess 2564E	Shallow	much-below-normal
Brooks	Buffalo North 85-2	Deep	much-above-normal
Coronation-Brooks	Big Stone	Deep	normal
Coronation-Brooks	Sibbald 85-2	Deep	normal
Coronation-Brooks	Sounding Creek	Deep	below-normal
Coronation	Kirkpatrick Lake 86-3	Shallow	much-below-normal
Provost	Metiskow 88-3	Shallow	much-below-normal
Camrose – Lloydminster	Killam	Shallow	normal
Lloydminster	Innisfree 2403E	Shallow	much-above-normal
Vegreville	Vegreville	Deep	below-normal
Edmonton	Devon #2 (North)	Shallow	much-below-normal
Elk Point	Derwent 2408E	Shallow	much-below-normal
Cold Lake	Esso Seismic Stn.5	Shallow	above-normal
Whitecourt – Athabasca	Barrhead	Deep	much-below-normal
Athabasca	Narrow Lake 2229E	Shallow	much-below-normal
Grande Prairie – Peace River	Watino 2353E	Shallow	much-below-normal
Peace River	Grimshaw Kerndale	Shallow	below-normal
La Crete	La Crete	Shallow	much-below-normal

Summer Water Supply Volume Forecast

Mountain Snowpack

As of June 1, most of the mountain snowpack had been depleted. Most rivers originating in the mountain and foothill areas experienced their peak runoff from snowmelt during the last few days of May. Most snow measurements completed at the end of May indicated little or no snow remaining except at the higher elevations.

Water Supply Volume Forecasts

As of June 1, 2001, much-below-average June to September natural streamflow volume is forecast for the Milk, Oldman, Bow, Red Deer, and North Saskatchewan River headwaters. These forecasts assume that precipitation

over the summer period will be normal. The natural streamflow volume forecasts for June to September 2001 and the actual March to May 2001 volumes are presented in Table 2.

Table 2 Water Supply Volume Forecasts as of June 1, 2001

Location	June to September 2001 Natural Streamflow Volume Forecasts as a percent of Average	March to May 2001 Actual Natural Streamflow Volumes as a percent of Average
Milk River at Milk River*	26*	31*
Oldman River at Lethbridge	57	55
Bow River at Calgary	72	82
Red Deer River at Red Deer	57	59
North Saskatchewan River at Edmonton	69	69

* The value for Milk River is compared to the median

Precipitation will have a major impact on the summer water supply forecast between now and the end of September. Check our Forecaster's Comments web page throughout the month for updated information regarding runoff conditions.

Milk River Basin

Precipitation during May was much-below-normal in the Milk River basin (Figures 1 and 2). The basin received around 10 mm of precipitation from the storm in early June (Figure 3).

Much-below-average natural runoff volumes are forecast for the June to September 2001 period (Table 3). Forecasted values in June are six to ten percent lower than the May forecast due to the much-below-normal precipitation in May. Current forecasted values for the June to September period for the Milk River at Milk River would rank fifth lowest in 84-years of record (1912-95). Figure 4 shows the June to September forecast combined with natural runoff to date (March to May).

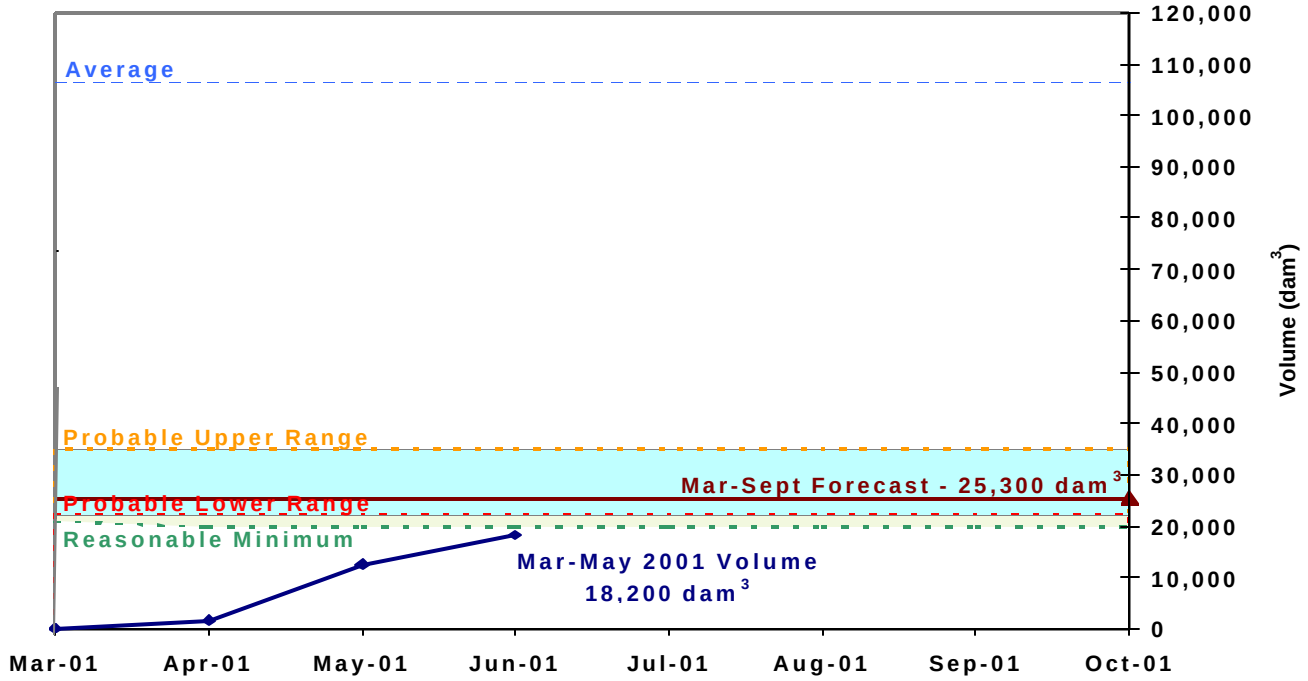
Table 3 Water Supply Forecast as of June 1, 2001 - Milk River Basin (Natural Flows)

Locations	Volume Forecast for June 1 to September 30						Actual March-May 2001 Volume as a % of Median
	Volume in dam^3	Volume in acre-feet	Volume as a % of Median	Probable Range as a % of Median	Reasonable Minimum As % of Median	Forecast Ranking (lowest to highest)	
Milk River at Western Crossing	2,300	1,800	15	10-61	3	10	34
Milk River at Milk River	7,100	5,800	26	15-66	10	5	31
Milk River at Eastern Crossing	7,500	6,100	27	15-60	11	3	N/A

Median is calculated for the May 1 to September 30 period from 1912 to 1995

NOTE: There is: a 50% chance that the actual natural flow will fall within the probable range given; a 25% chance that the actual flow will be less than the lower bound of the probable range given; and a 10% chance that the actual natural flow will be less than the reasonable minimum. Actual day to day streamflow conditions may vary throughout the season as a result of the effects of streamflow diversion and reservoir storage.

Figure 4 Water Supply Forecast as of June 1, 2001 for the Milk River at Milk River



**-The Probable Range, Reasonable Minimum and Average shown on the graph are for the March to September forecast period. The current month's forecast is determined by taking the difference between the March to September forecast and the volume that has occurred this year.

Oldman River Basin

Much-below-normal precipitation was recorded in the Oldman River basin during the month of May (Figures 1 and 2). The peak from mountain snowmelt occurred in the last week of May. Rainfall during the first few days of June provided the basin with some much needed moisture (Figure 3). The Waterton-St. Mary-Belly River basins recorded the most precipitation, with some areas receiving over 100 mm. In most cases, the precipitation from the June storm brought May precipitation totals back to normal or slightly above-normal.

Much-below-average natural runoff volumes are forecast for the June to September 2001 period. These forecasts assume normal precipitation over the summer period. Precipitation values from the June 3-4 storm event were included into May's precipitation totals for this month's volume forecast. Forecasted values have decreased two to three percent from last month's forecast despite the storm event in early June. Current forecasted values for the Oldman River near Lethbridge during the June to September period would rank thirteenth lowest in the recorded values over an 84-year period (1912-95). Natural volume forecasts for the June to September volumes are located in Table 4. Figure 5 shows the June to September forecast combined with natural runoff to date.

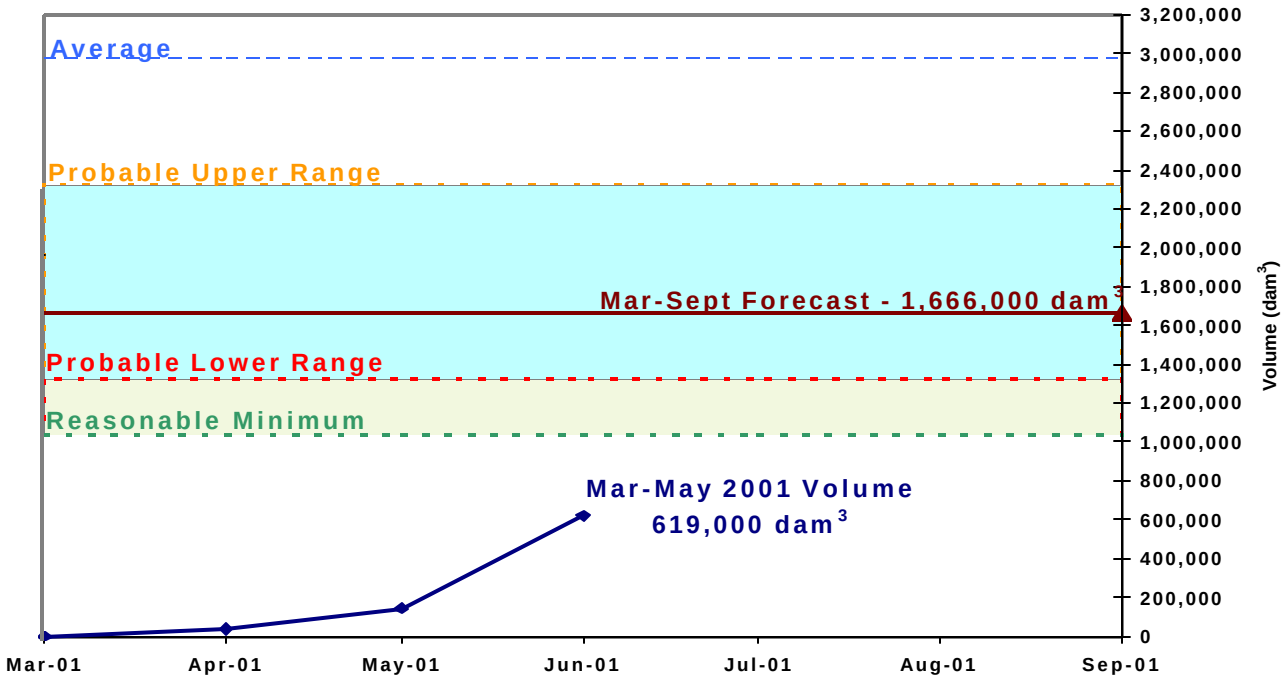
Table 4 Water Supply Forecast as of June 1, 2001 - Oldman River Basin (Natural Flows)

Locations	Volume Forecast for June 1 to September 30						Actual March-May 2001 Volume as a % of Average
	Volume in dam^3	Volume in acre-feet	Volume as a % of Average	Probable Range as a % of Average	Reasonable Minimum as a % of Average	Forecast Ranking (lowest to highest)	
St. Mary River	304,000	246,000	61	45-85	35	13	58
Belly River	120,000	97,200	74	64-92	54	16	76
Waterton River	286,000	232,000	69	56-87	42	16	65
Oldman River near Brocket	300,000	243,000	47	41-72	33	7	48
Oldman River near Lethbridge	1,048,000	849,000	57	45-78	35	13	55

Average is calculated for the period 1912 to 1995

NOTE: There is: a 50% chance that the actual natural flow will fall within the probable range given; a 25% chance that the actual flow will be less than the lower bound of the probable range given; and a 10% chance that the actual natural flow will be less than the reasonable minimum. Actual day to day streamflow conditions may vary throughout the season as a result of the effects of streamflow diversion and reservoir storage.

Figure 5 Water Supply Forecast as of June 1, 2001 for the Oldman River at Lethbridge



**-The Probable Range, Reasonable Minimum and Average shown on the graph are for the March to September forecast period. The current month's forecast is determined by taking the difference between the March to September forecast and the volume that has occurred this year.

Water storage in the major irrigation reservoirs of the Oldman River basin is below-normal for this time of the season, except for Keho Lake which is normal (Table 5).

Table 5 Status of Major Water Storage Reservoirs as of June 1, 2001 - Oldman River Basin

Reservoirs	Current Live Storage			Remarks	June 1, 2000 Live Storage	
	Volume in dam^3	Volume in acre-feet	Volume as % of Capacity		dam^3	acre-feet
Keho Lake	82,900	67,200	87	normal	86,400	70,000
Waterton Reservoir	118,000	97,800	70	below-normal	89,000	72,200
St. Mary Reservoir	123,000	99,500	31	below-normal	219,000	178,000
Ridge Reservoir	44,500	36,100	35	below-normal	96,400	78,200
Total	285,000	231,000	41	below-normal	405,000	328,000
Chin Reservoir	76,900	62,400	40	below-normal	160,000	130,000
Forty Mile Reservoir	33,500	27,100	39	below-normal	78,800	63,900
Total	110,000	89,500	40	below-normal	238,900	193,700
Oldman Reservoir	318,000	258,000	64	below-normal	456,000	369,000

Bow River Basin

Precipitation was much-below-normal in the Bow River basin during May (Figures 1 and 2) as precipitation values ranged from 18 to 76% of normal. On June 3-4, a storm provided the basin with 30 to 60 mm of precipitation (Figure 3). This precipitation brought the total precipitation for May up to normal values. The peak from mountain snowmelt was experienced in the last week of May.

Much-below-average natural runoff volumes are forecast for the June to September 2001 period (Table 6). These forecasts assume normal precipitation over the summer period. Precipitation from the June 3-4 storm was added to the precipitation received in May. The only significant change in the volume forecast from last month is the Lake Minnewanka Inflow, which decreased eight percent. The remaining forecasts did not change significantly from last month's forecast. Current forecasted values for the Bow River at Calgary during the June to September period would rank eighth lowest on record (1912-95 period). Figure 6 shows the June to September forecast combined with natural runoff to date.

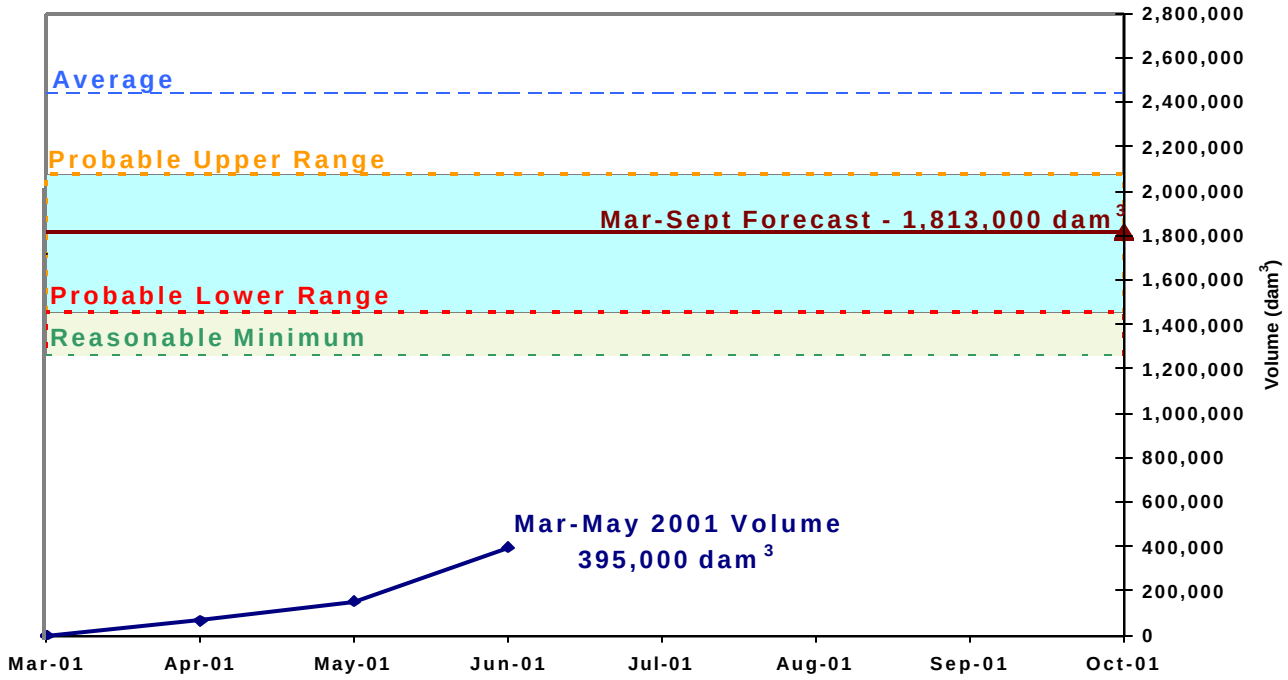
Table 6 Water Supply Forecast as of June 1, 2001 - Bow River Basin (Natural Flows)

Locations	Volume Forecast for June 1 to September 30						Actual March-May 2001 Volume as a % of Average
	Volume in dam^3	Volume in acre-feet	Volume as a % of Average	Probable Range as a % of Average	Reasonable Minimum as a % of Average	Forecast Ranking (lowest to highest)	
Bow River at Banff	698,000	565,000	79	66-87	57	11	82
Lake Minnewanka Inflow	92,800	75,200	63	52-86	45	6	87
Spray Lake near Banff	213,000	172,000	73	58-84	53	9	65
Kananaskis River	246,000	200,000	74	63-87	54	12	69
Bow River at Calgary	1,419,000	1,150,000	72	60-85	52	8	82
Elbow River	88,300	71,600	56	50-82	33	8	71
Highwood River	176,000	143,000	42	34-75	25	6	54

Average is calculated for the period 1912 to 1995

NOTE: There is: a 50% chance that the actual natural flow will fall within the probable range given; a 25% chance that the actual flow will be less than the lower bound of the probable range given; and a 10% chance that the actual natural flow will be less than the reasonable minimum. Actual day to day streamflow conditions may vary throughout the season as a result of the effects of streamflow diversion and reservoir storage.

Figure 6 Water Supply Forecast as of June 1, 2001 for the Bow River at Calgary



**-The Probable Range, Reasonable Minimum and Average shown on the graph are for the March to September forecast period. The current month's forecast is determined by taking the difference between the March to September forecast and the volume that has occurred this year.

Water storage in most of the major hydroelectric and irrigation reservoirs is normal for the season with the exception of Lake Newell, which is below-normal (Table 7).

Table 7 Status of Major Water Storage Reservoirs as of June 1, 2001 - Bow River Basin

Reservoirs	Current Live Storage			Remarks	June 1, 2000 Live Storage	
	Volume in dam^3	Volume in acre-feet	Volume as a % of Capacity		dam^3	Acre-feet
Lake Minnewanka	104,000	84,300	47	normal	65,200	52,900
Spray Lake	40,100	32,500	23	normal	19,300	15,700
Upper Kananaskis Lake	18,200	14,700	18	normal	14,100	11,400
Lower Kananaskis Lake	15,500	12,600	25	normal	8,770	7,110
Total	178,000	144,000	31	normal	107,000	87,100
Lake McGregor	249,000	202,000	68	normal	265,000	215,000
Travers Reservoir	99,900	81,000	95	normal	99,900	81,000
Total	348,000	282,000	74	normal	365,000	296,000
Lake Newell	129,000	104,000	72	below-normal	138,000	112,000
Crawling Valley Reservoir	96,700	73,400	86	normal	104,000	83,900
Total	225,000	183,000	78	normal	242,000	196,000

Red Deer River Basin

The Red Deer River basin recorded much-below-normal to normal precipitation in May (Figures 1 and 2). Precipitation values ranged from 29% to 70% of normal in the basin during May. The peak from mountain snowmelt occurred during the last week of May. The June 3-4 storm produced 20 to 40 mm of precipitation in the headwaters of the Red Deer River basin. This precipitation brought the total precipitation for the month of May to near normal values.

Much-below-average natural runoff volumes are forecast for the June to September 2001 period. These forecasts assume normal precipitation over the summer period. The June forecast has included the precipitation from the June 3-4 storm event into the total precipitation for May. This month's forecasted values are relatively unchanged from last month. Current forecasted values for the June to September period in the Red Deer River basin would rank eighteenth lowest in the recorded values over an 84-year period (1912-95). Natural volume forecasts for the June to September volumes are located in Table 8. Figure 7 shows the June to September forecast combined with the natural runoff that has occurred this year.

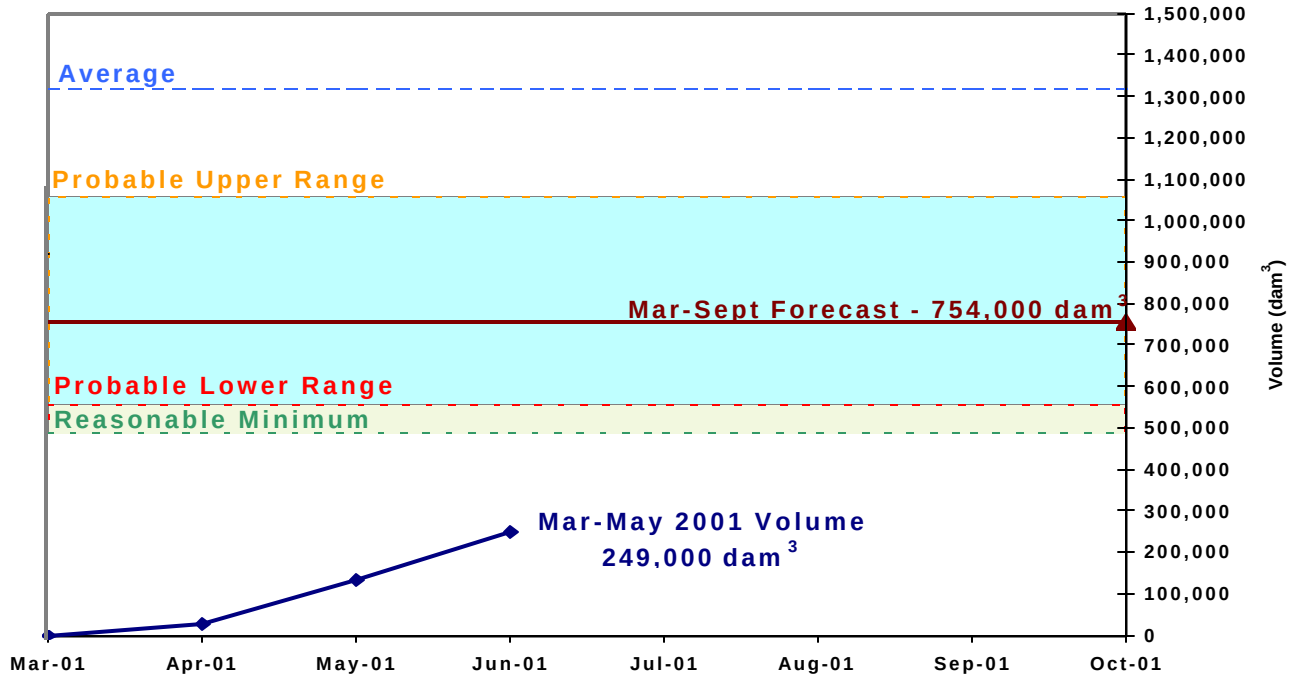
Table 8 Water Supply Forecast as of June 1, 2001 - Red Deer River Basin (Natural Flows)

Locations	Volume Forecast for June 1 to September 30						Actual March-May 2001 Volume as a % of Average
	Volume in dam^3	Volume in acre-feet	Volume as a % of Average	Probable Range as a % of Average	Reasonable Minimum as % of Average	Forecast Ranking (lowest to highest)	
Glennifer Lake	430,000	349,000	62	52-90	44	14	83
Red Deer River at Red Deer	506,000	410,000	57	42-80	37	18	59

Average is calculated for the period 1912 to 1995

NOTE: There is: a 50% chance that the actual natural flow will fall within the probable range given; a 25% chance that the actual flow will be less than the lower bound of the probable range given; and a 10% chance that the actual natural flow will be less than the reasonable minimum. Actual day to day streamflow conditions may vary throughout the season as a result of the effects of streamflow diversion and reservoir storage.

Figure 7 Water Supply Forecast as of June 1, 2001 for the Red Deer River at Red Deer



**-The Probable Range, Reasonable Minimum and Average shown on the graph are for the March to September forecast period. The current month's forecast is determined by taking the difference between the March to September forecast and the volume that has occurred this year.

Water storage in Glennifer Lake is normal for this time of the season (Table 9).

Table 9 Status of Major Water Storage Reservoirs as of June 1, 2001 – Red Deer River Basin

Reservoirs	Current Live Storage			Remarks	June 1, 2000 Live Storage	
	Volume in dam^3	Volume in acre-feet	Volume as a % of Capacity		dam^3	acre-feet
Glennifer Lake	144,000	117,000	71	normal	100,000	81,000

North Saskatchewan River Basin

Precipitation during May was below-normal in the North Saskatchewan River basin (Figures 1 and 2). Precipitation from the June 3-4 storm provided near 20 mm to the Edmonton area with lesser amounts towards the foothills. The mountain snowmelt peak in the basin occurred at the end of May.

Much-below-average natural runoff volumes are forecast for the June to September 2001 period (Table 10). Forecasted values dropped six to seven percent from those produced last month due to below-normal precipitation in the headwater portion of the basin during May. Current forecasted values for the June to September period in the North Saskatchewan River at Edmonton would rank sixth lowest in 84-years (1912-95). Figure 8 shows the June to September forecast combined with the natural runoff that has occurred this year.

Table 10 Water Supply Forecast as of June 1, 2001 - North Saskatchewan River Basin (Natural Flows)

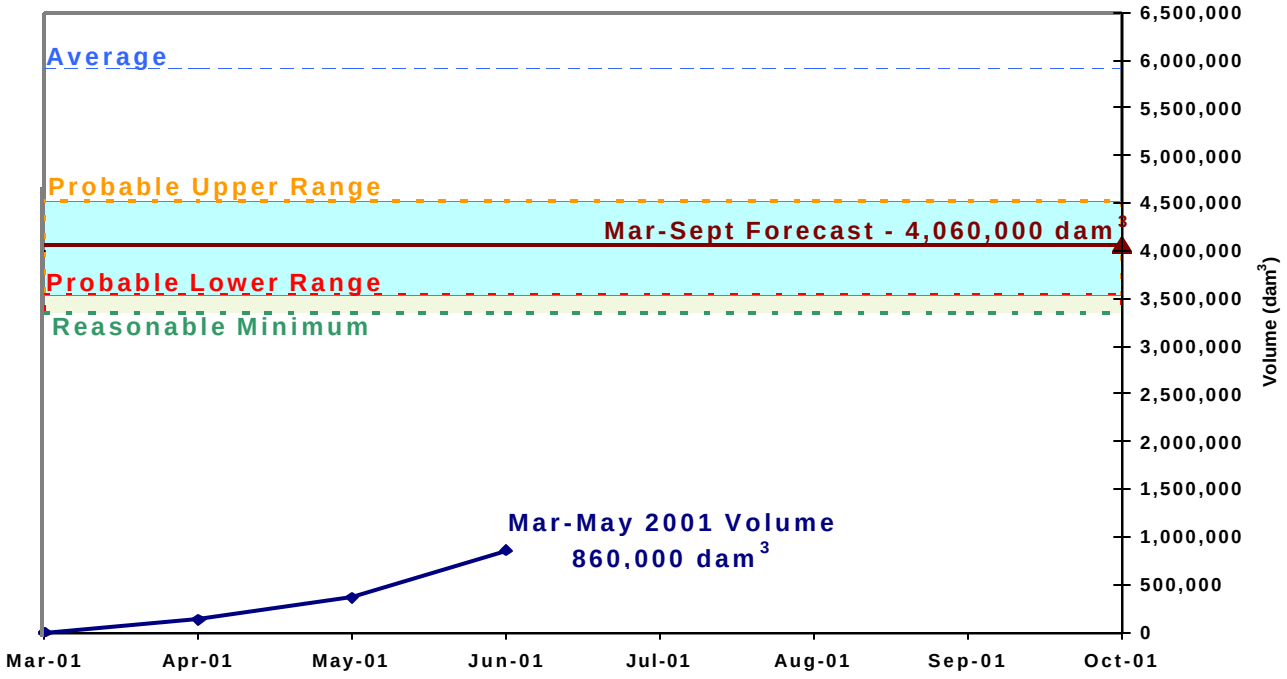
Locations	Volume Forecast for June 1 to September 30						Actual March-May 2001 Volume as a % of Average
	Volume in dam^3	Volume in acre-feet	Volume as a % of Average	Probable Range as a % of Average	Reasonable Minimum as a % of Average	Forecast Ranking (lowest of highest)	
Lake Abraham Inflow	1,546,000	1,253,000	79	73-83	69	1*	124
Brazeau Reservoir Inflow	733,000	594,000	66	53-79	47	4**	70
North Saskatchewan River at Edmonton	3,200,000	2,594,000	69	58-79	53	6	69

Average is calculated for the period from 1912 to 1995

* Lake Abraham ranking based on 31 years of record
** Brazeau Reservoir ranking based on 32 years of record

NOTE: There is: a 50% chance that the actual natural flow will fall within the probable range given; a 25% chance that the actual flow will be less than the lower bound of the probable range given; and a 10% chance that the actual natural flow will be less than the reasonable minimum. Actual day to day streamflow conditions may vary throughout the season as a result of the effects of streamflow diversion and reservoir storage.

Figure 8 Water Supply Forecast as of June 1, 2001 for the North Saskatchewan River at Edmonton



**-The Probable Range, Reasonable Minimum and Average shown on the graph are for the March to September forecast period. The current month's forecast is determined by taking the difference between the March to September forecast and the volume that has occurred this year.

Water storage in the North Saskatchewan major hydroelectric reservoirs is above-normal at Lake Abraham and normal at Brazeau Reservoir (Table 11).

Table 11 Status of Major Water Storage Reservoirs as of June 1, 2001 – North Saskatchewan River Basin

Reservoirs	Current Live Storage			Remarks	June 1, 2000 Live Storage	
	Volume in dam^3	Volume in acre-feet	Volume as a % of Capacity		dam^3	Acre-feet
Lake Abraham	358,000	290,000	25	above-normal	126,000	102,000
Brazeau Reservoir	101,000	81,700	21	normal	100,000	81,400
Total	459,000	372,000	24	above-normal	226,000	183,000

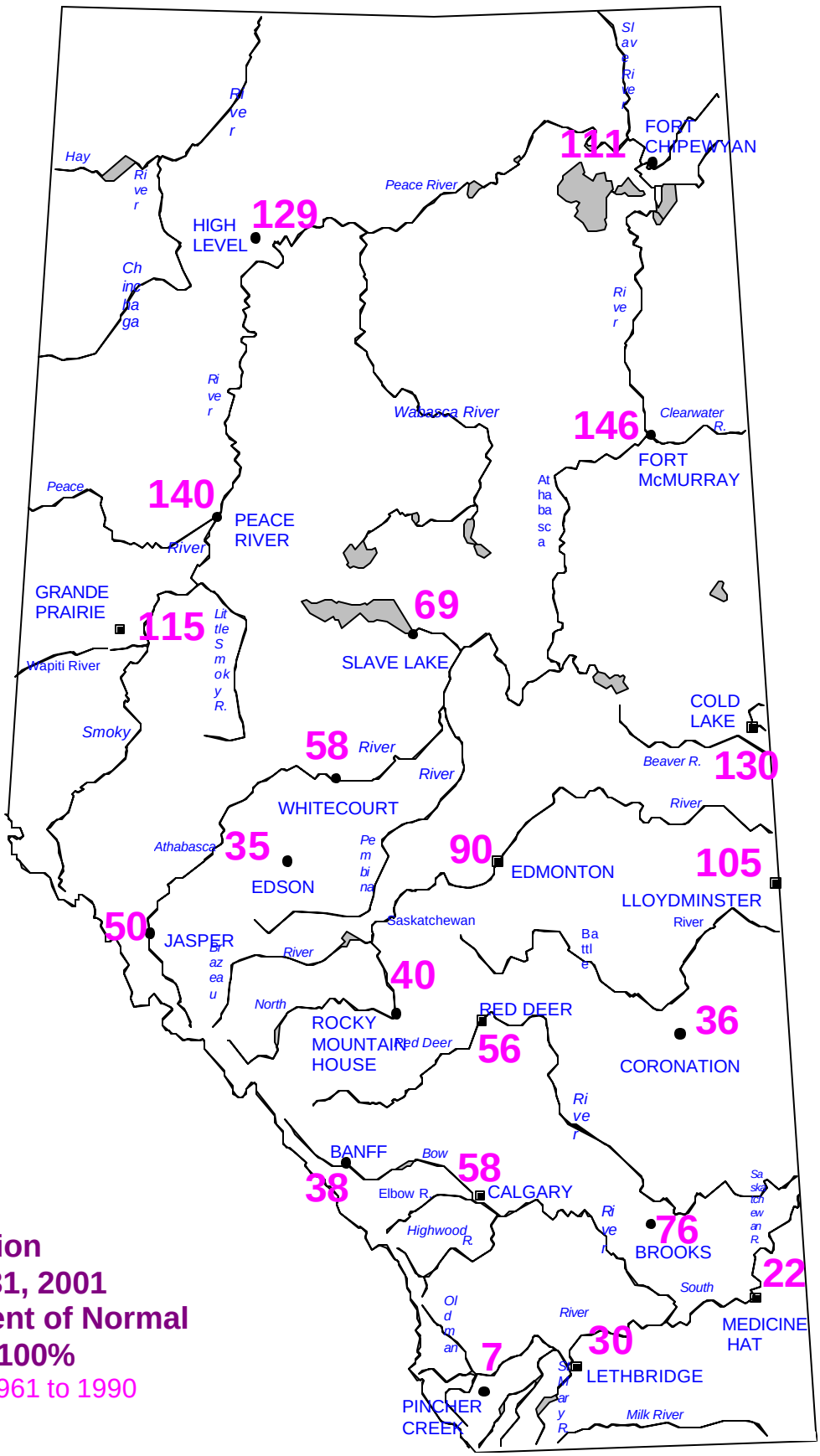


Figure 1
Precipitation
May 1 to 31, 2001
as a percent of Normal
Normal = 100%
(based on 1961 to 1990

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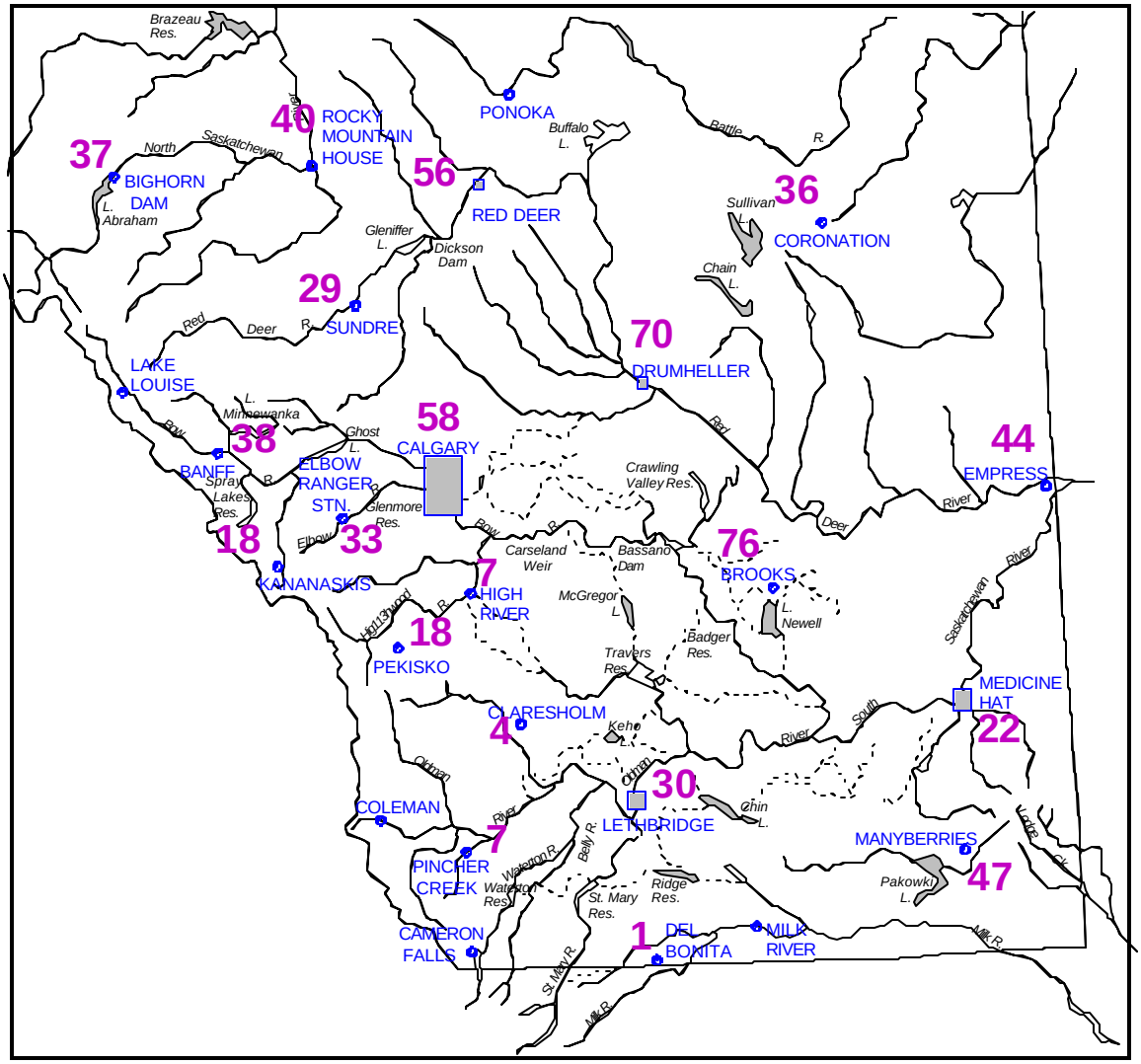

Figure 2
Precipitation
Southern Alberta
May 1 to 31, 2001
as a percent of Normal
Normal = 100%
(based on 1961 to 1990 data)

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Figure 3
June 3-4, 2001
Precipitation Map