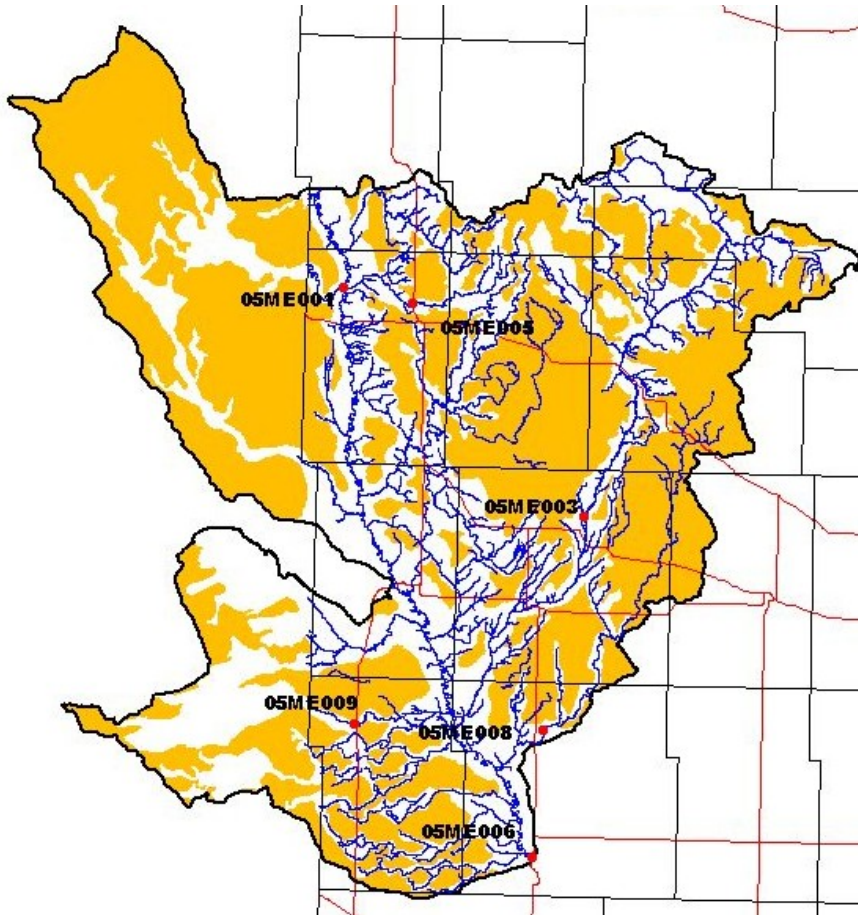


Birdtail Creek Watershed Hydrology

Hydrometric Data – Peak Flows



There are 6 Water Survey of Canada streamflow gauging stations located in the watershed and are located as shown above. Streamflow data has been collected at these stations within the Birdtail Creek Watershed for varying time periods since 1913.

A statistical frequency analysis of data collected at each station was conducted to determine peak daily flow rates for varying flow frequencies. This data is summarized and presented in Table 2.

| Station Name | Station Number | Period Of Record | Years of Data | Gross Area (mi ²) | Maximum Daily Discharges (cfs) | | | | | | | |
|--------------------------------|----------------|--|---------------|-------------------------------|--------------------------------|-------|-------|-------|-------|------|------|------|
| | | | | | 1% | 2% | 3% | 5% | 10% | 20% | 30% | 50% |
| Assiniboine River Near Russell | 05ME001 | 1913-1932,1943-1968 R 1969-1998 C | 75 | 7454 | 22100 | 18200 | 16000 | 13400 | 10100 | 7000 | 5320 | 3300 |
| Assiniboine River Near Miniota | 05ME006 | 1913-1960 C, 1961-1968 R 1969-1998 Mod. | 85 | 29390 | 23940 | 20550 | 18540 | 16070 | 12710 | 9360 | 7420 | 4910 |
| Birdtail Creek Near Birtle | 05ME003 | 1954-2002 R 1914-1973 C | 55 | 434.6 | 2684 | 2270 | 2037 | 1748 | 1374 | 1010 | 802 | 540 |
| Conjuring Creek Near Russell | 05ME005 | 1959-2002 R | 44 | 34 | 544 | 445 | 388 | 325 | 240 | 166 | 127 | 78 |
| Minnewasta Creek Near Beulah | 05ME008 | 1977-1994 R 1959-1976, 1993 C | 37 | 139.8 | 367 | 314 | 285 | 245 | 193 | 141 | 109 | 72 |
| Scissor Creek Near McAuley | 05ME009 | 1977-1993 R 1959-1976 C | 34 | 712.7 | 724 | 600 | 537 | 455 | 353 | 262 | 212 | 148 |

Note: R - recorded
C - calculated

The water survey gauging stations were operated annually during the period March through October up until the mid 1990s. In 1994, the operating period was reduced to the spring freshet period only, namely March through May.

Streamflow Characteristics

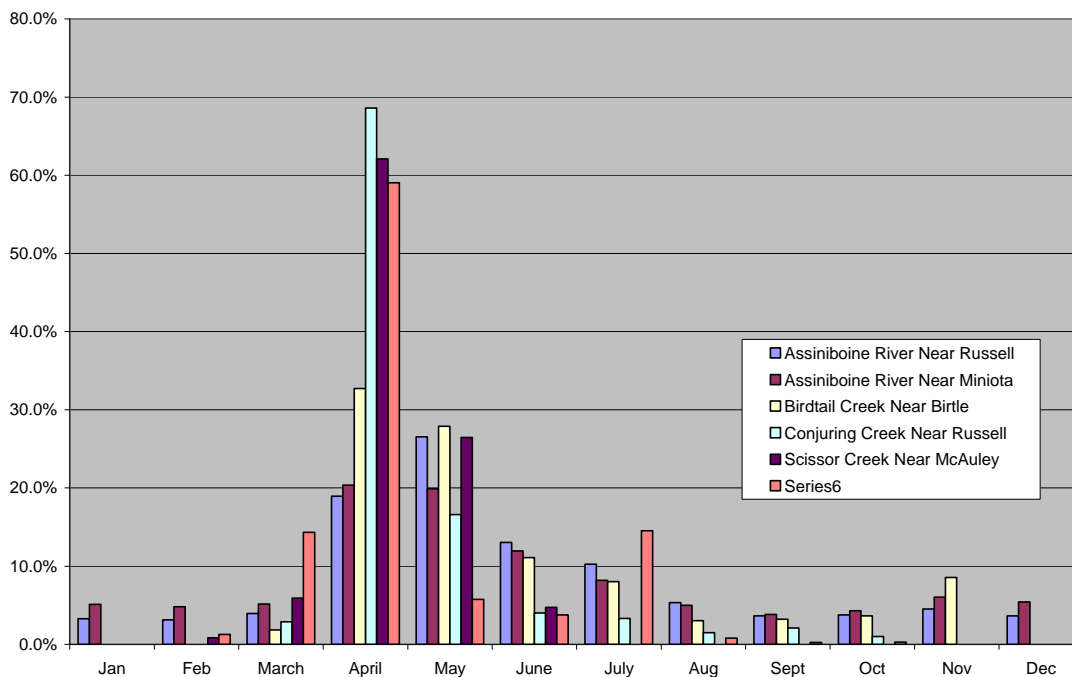
The daily discharge data for the gauging stations were statistically analyzed to determine runoff characteristics for the watershed. Table 1 lists the effective and gross drainage areas associated with the gauging stations located in the watershed.

The gross drainage area boundary is defined as the topographic limit of the watershed, commonly called the drainage divide. This area might be expected to entirely contribute runoff under extremely wet conditions. The effective drainage area is that portion of the watershed which can be expected to contribute runoff to the main stream during a median (1:2 year event) runoff year. This area excludes marsh and slough area and other natural storage areas, which would prevent runoff from reaching the main stream in a year of average runoff. The effective to gross drainage area ratio is an indication of how well an area is drained.

| Station Name | Station Number | EDA (mi2) | GDA (mi2) | EDA/GDA Ratio |
|--------------------------------|----------------|-----------|-----------|---------------|
| Assiniboine River Near Russell | 05ME001 | 2960 | 7454 | 0.4 |
| Assiniboine River Near Miniota | 05ME006 | 10780 | 29340 | 0.37 |
| Birdtail Creek Near Birtle | 05ME003 | 224.1 | 434.6 | 0.51 |
| Conjuring Creek Near Russell | 05ME005 | 22.9 | 34 | 0.67 |
| Minnewasta Creek Near Beulah | 05ME008 | 27 | 139.8 | 0.19 |
| Scissor Creek Near McAuley | 05ME009 | 441.3 | 712.7 | 0.62 |

Figure 2 illustrates the distribution of runoff for the gauging stations located in the watershed. It can be seen from this graph that the majority of the runoff occurs during the months of March-May, and that there is very little flow in the fall and winter months.

Distribution of Annual Flow



Streamflow on the prairies varies considerably over the months and years. It can be seen from Figure 2, that most of the watercourses are intermittent prairie streams, in that they flow very briefly in the springtime and only after exceptional rainfalls only in most years. The Assiniboine River is a perennial stream in that it flows throughout the year, and every year. A review of the flow data revealed that Minnewasta Creek near Beulah was the only station that recorded years of no flow, these occurring in 1977 and 1981.

Timing of Runoff Peak

The recorded data was reviewed to determine when the maximum flow occurred each year. The majority of the time, the annual peak occurs in the month of April. A summary of this analysis and the time peak occurred is shown in the table below.

| Station Name | Station Number | Time Peak Occurred | | | |
|--------------------------------|----------------|--------------------|--------|------|-------|
| | | Spring | Summer | Fall | Total |
| Assiniboine River Near Russell | 05ME001 | 68 | 7 | 0 | 75 |
| Assiniboine River Near Miniota | 05ME006 | 83 | 2 | 0 | 85 |
| Birdtail Creek Near Birtle | 05ME003 | 40 | 5 | 1 | 46 |
| Conjuring Creek Near Russell | 05ME005 | 41 | 0 | 0 | 41 |
| Minnewasta Creek Near Beulah | 05ME008 | 18 | 0 | 0 | 18 |
| Scissor Creek Near McAuley | 05ME009 | 22 | 1 | 0 | 23 |

On the major watercourses, spring flooding is more significant than flooding from summer precipitation events. Smaller drainage areas (less than 10 mi²) are sensitive to rainfall events, and localized flooding can occur in the smaller poorly drained areas of the watershed from excessive rainfall.

Water Allocation

With the exception of the Assiniboine River, aquifer or stream water budgets have not been established for the Birdtail Creek Watershed, therefore, the total amount of water available for allocation in the watershed has not been determined. The water supplies in the watershed include the Assiniboine River and its many tributaries, as well as the Assiniboine Buried Valley Aquifer and the Rocanville Buried Valley Aquifer. Residents of this watershed generally use surface water; however, the buried valley aquifers offer significant groundwater development potential. At Brandon, a supplementary (for emergency purposes) groundwater supply for the City has been developed from an extension of the Assiniboine Buried Valley Aquifer, and industries east of Brandon have

also developed groundwater supplies from similar aquifer units.

There are presently 13 surface water projects on file with the Water Licensing Branch in this watershed, eight of which are for irrigation purposes, one agricultural project, one industrial, one application for other purposes, and two surface water sourced municipal systems in the watershed, including a rural distribution pipeline which is allocated 1260 ac-ft per year. There are presently twenty-one groundwater projects on file with the Water Licensing Branch in this watershed of which fourteen of these projects are for livestock watering, three irrigation applications, and four groundwater sourced municipal systems in the watershed, including Rossburn, Russell, McAuley, and Angusville, which use anywhere from 11 to 173 ac-ft per year.

The following tables present all of the projects on file with the Water Licensing Branch for licensing in the Birdtail – Assiniboine River watershed:

Licences:

| Purpose | Licences Issued | | Total Licences |
|--------------|-----------------|---------------|----------------|
| | Groundwater | Surface Water | |
| Agricultural | 11 | 0 | 11 |
| Industrial | 0 | 1 | 1 |
| Irrigation | 0 | 3 | 3 |
| Municipal | 2 | 2 | 4 |
| Other | 0 | 0 | 0 |
| Total | 13 | 6 | 19 |

Applications:

| Purpose | Applications | | Total Applications |
|--------------|--------------|---------------|--------------------|
| | Groundwater | Surface Water | |
| Agricultural | 3 | 1 | 4 |
| Industrial | 0 | 0 | 0 |
| Irrigation | 3 | 5 | 8 |
| Municipal | 2 | 0 | 2 |
| Other | 0 | 1 | 1 |
| Total | 8 | 7 | 15 |

Allocations:

| Purpose | Allocated Under License (ac-ft) | | Total Allocation (ac-ft) |
|----------------|--|----------------------|---------------------------------|
| | Groundwater | Surface Water | |
| Agricultural | 78.4 | 0 | 78.4 |
| Domestic | 0 | 32.4 | 32.4 |
| Industrial | 0 | 170.0 | 170.0 |
| Irrigation | 0 | 290.0 | 290.0 |
| Municipal | 102.2 | 1534.8 | 1637.0 |
| Other | 0 | 0 | 0 |
| Total | 180.6 | 2027.2 | 2207.8 |

State of the Watershed Report Assessment:

With the exception of the Assiniboine River, no allocation limits have been set for the major watercourses in this watershed. Current allocations are believed to be below the sustainable yield of the major streams, based on site specific water budget evaluations carried out during the course of issuing water rights licenses.

Recommended Actions – Allocation limits need to be established for this watershed. As well, a review of present water allocations should be reviewed to ensure the ecological needs of the watercourse are met throughout the entire year.