

# Water Resource Management Modeling - Battle River Basin

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# Modeling Goals

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- **To assist BRWAG and Planning staff in making water management decisions.**
- **Evaluate current management of the BRB.**
- **Evaluate alternative management options for the BRB.**

# Description of WRMM

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- The WRMM is a large computer model
  - a planning tool
  - used to analyze water use within a watershed

**FOR MORE INFO...**

<http://www3.gov.ab.ca/env/water/regions/ssrb/wrmmoutput/WRMM/index.asp>

# Description of WRMM

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- **For INPUTS, the WRMM uses:**
  - natural flow data (recorded flow + estimated water use)
  - current or proposed water allocation priorities
  - current or proposed structures (dams, weirs, diversions, etc.).
- **The BR has 90 years of record, from 1912 - 2001**

# Description of WRMM

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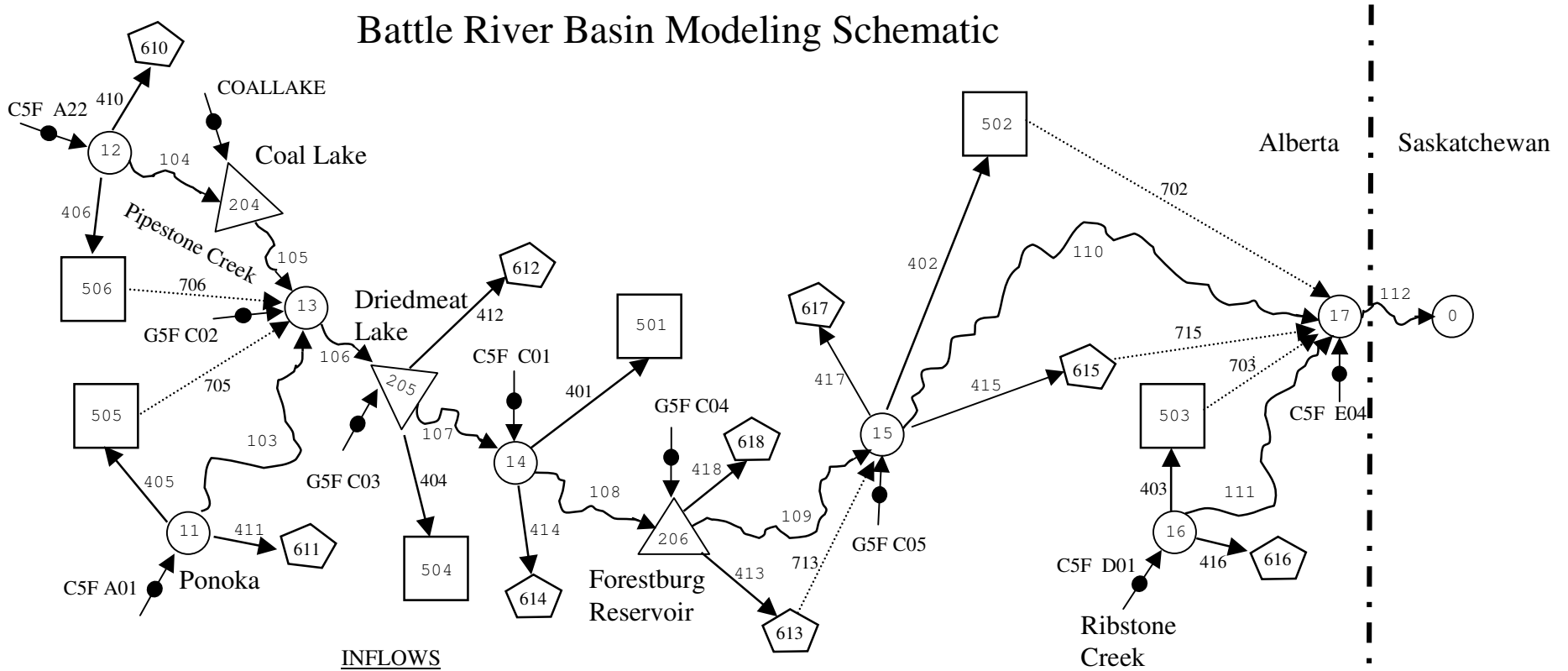
- **WRMM OUTPUT** shows the response of the river basin to differing:
  - natural conditions
  - water allocation priorities
  - structures (and how they are operated)

# Modeling Components

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- **Water sources both natural and man-made**
- **Water stored in reservoirs**
- **Natural streams and diversion channels**
- **Hydropower**
- **Consumptive demands with return flows**
- **Consumptive demands with no return flows**



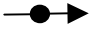




# Battle River Basin Modeling Schematic



## INFLOWS

- C5F A01 Battle River near Ponoka
- C5F A22 Pipestone Creek
- G5F C02 Battle River above Pipestone Creek
- G5F C03 Battle River at outlet of Driedmeat Lake
- C5F C01 Battle River near Forestburg
- G5F C04 Battle River at outlet of Forestburg Reservoir
- G5F C05 Battle River below Iron Creek
- C5F D01 Ribstone Creek at Mouth
- C5F E04 Battle River near the Saskatchewan Boundary

## LEGEND:

-  Reservoir
-  Urban / Rural Water Use
-  Inflow
-  Irrigation
-  Natural Channel Reach
-  Diversion Channel
-  Return Flow

# WRMM Results

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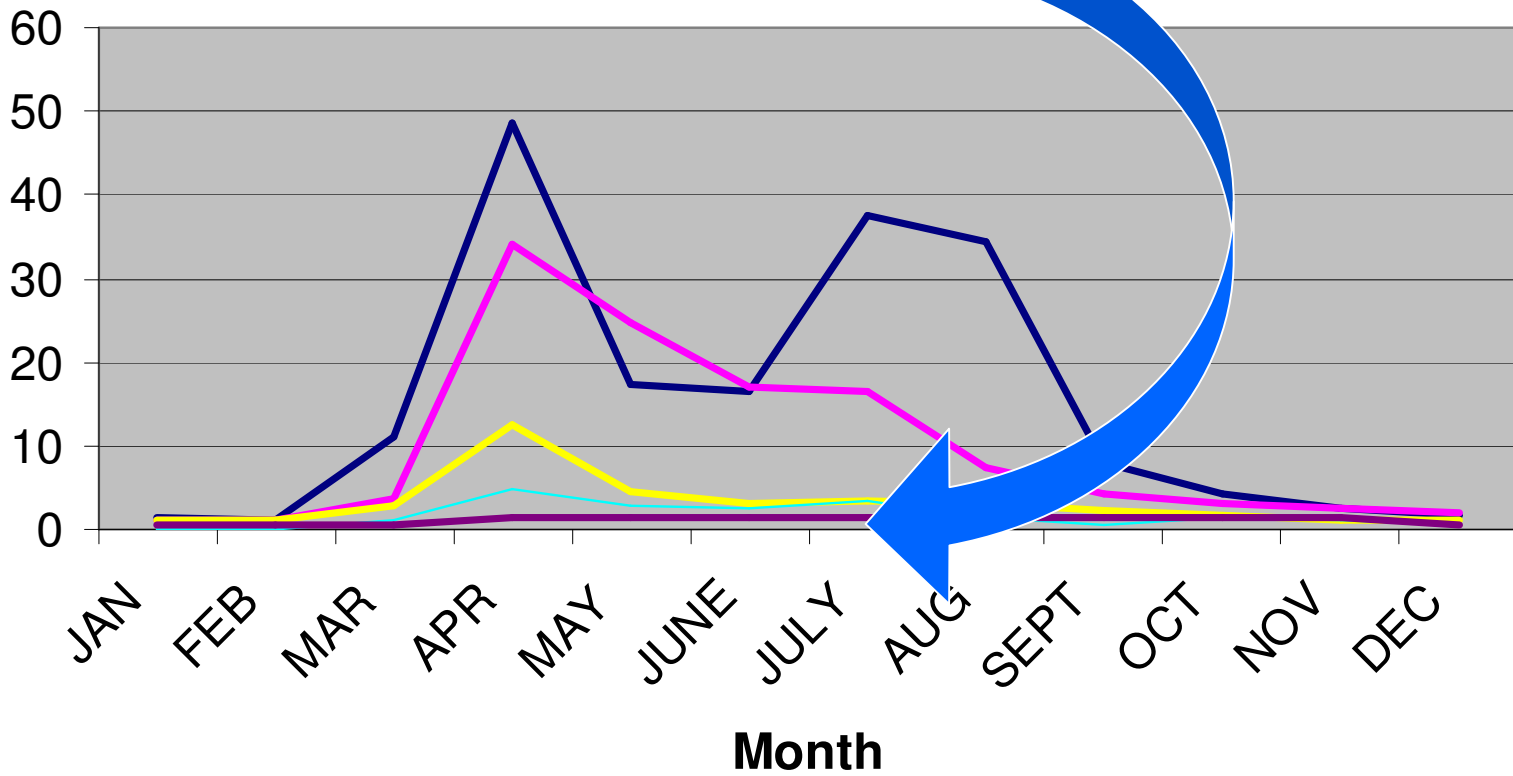
- **Three scenarios were run;**
  - Current management (minimum use of storage)
  - Greater use of Storage Scenario: greater use of **existing** storage to meet licensed demands
  - Minimum Flow Scenario, or high priority on meeting the 25 cfs and 50 cfs minimums (instream objective)

# Battle River near the Saskatchewan border

## Monthly Runoff Volumes



Volume of Water, cubic metres per second



# WRMM Results:

## Current Management Scenario

- **Model run assuming that license & storage situation is as it is today**

# WRMM Results:

## Current Management Scenario

- **Over the 90 Year period of record**
  - **Apportionment**
    - **4 years in 90 we did not meet Apportionment**
    - **Deficit range: 0.5% - 19%**

# WRMM Results:

## Current Management Scenario

- **Over the 90 Year period of record**
  - **Water licenses (approved use)**
    - **In some years and locations water was insufficient to meet all license allocations**
    - **Average deficit: 1.17% - 13.18% of total licensed volume**

# WRMM Results:

## Current Management Scenario

### – Most impacted areas:

- Ribstone Creek
- Battle R. upstream of Pipestone

# WRMM Results:

## Greater Use of Storage Scenario

- **Model run assuming we will increase our use of existing storage**

# WRMM Results:

## Greater Use of Storage Scenario

- **Over the 90 Year period of record**
  - **Apportionment**
    - **9 years in 90 where we did not meet Apportionment**
    - **Deficit range: 0.2% to 20%**

# WRMM Results:

## Greater Use of Storage Scenario

- **Over the 90 Year period of record**
  - **Water licenses (approved use)**
    - **In some years and locations water was insufficient to meet all license allocations**
    - **Average deficit : 0.33% - 12.09% of total licensed volume**

# WRMM Results: Greater Use of Storage Scenario

- **Most impacted area:**
  - Ribstone Creek

WRMM Results:

## Minimum Flow Scenario

- Model run assuming that maintaining minimum flow (instream objective) has priority over licenses & storage

# WRMM Results:

## Minimum Flow Scenario

- **Over the 90 Year period of record;**
  - **Apportionment**
    - **0 years in 90 where we did not meet Apportionment**

## WRMM Results:

### Minimum Flow Scenario

- **Over the 90 Year period of record;**
  - **Water licenses (approved use)**
    - **In some years and locations water was insufficient to meet all license allocations**
    - **Average deficit : 10% - 23%, of total licensed volume**

# WRMM Results:

## Minimum Flow Scenario

### – Most impacted areas:

- Ribstone Creek,
- Battle R. upstream of Pipestone
- Battle R. near Ponoka

# WRMM Results

- **Overall conclusions:**
  - Battle River is highly allocated in some areas (i.e. Ribstone Creek and u/s of Pipestone)
  - Cannot meet even basic minimum flows without impacting some licence holders
  - Increased operations of existing storage shows promise
  - However may create increasing risk to Apportionment.