

*Alberta*

# Flood Forecasting Methodology in Alberta

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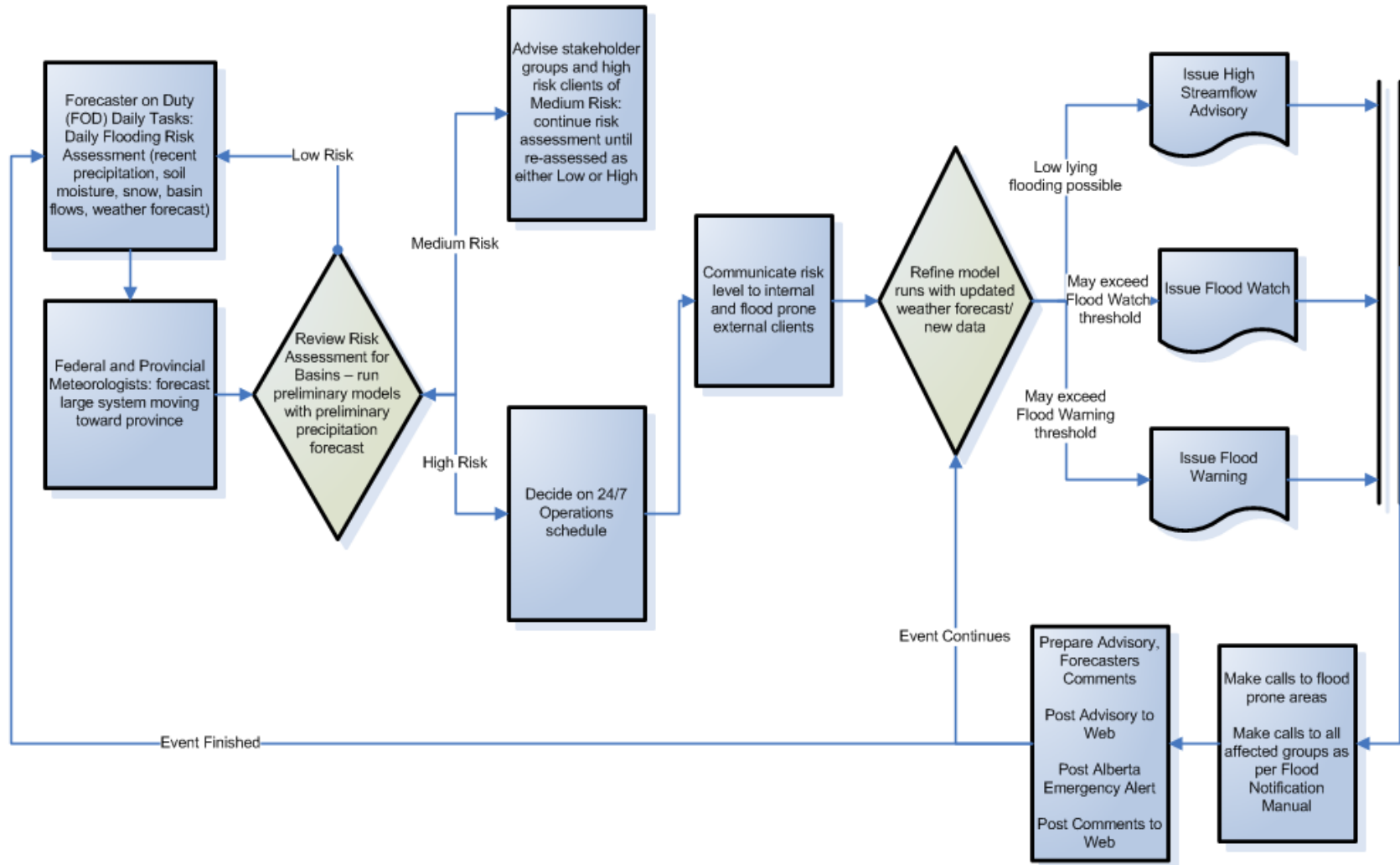
February 11, 2014

# River Forecast Team Mandate

- To provide Albertans with information related to current and future river or river ice conditions to enable Albertan's to make decisions related to water supply, and emergency response planning.
  - Real-time flow forecasting and support to partners (public, provincial staff, Municipal Emergency Managers, Industry, Provincial Parks, National Parks, Prairie Provinces)
  - Near real-time data quality management; enter WSC and Provincial field measurement; assist in prioritized field maintenance of monitoring network
  - Daily Natural Flow Forecasting
  - Water Supply



# RFC Flood Operations Methodology



# Open Water Forecasting Operations - General

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- Primary river flooding concerns are caused by:
  - Significant rainfall events and significant rain on snow events
- Based on weather and river conditions, the River Forecast Centre will enter 24 x 7 operations to provide forecasting services as required
- Rotation period: mid-March to mid October
- **Typical Critical Time Period:** mid-May to mid-July



Red Deer River 2013



Waiparous Creek 2013  
(June 20<sup>th</sup> and 21<sup>st</sup>)



Highwood River upstream of High River 2013

# Open Water Forecasting Operations - Data Quality Assurance

- 400+ Hydrometric stations – 146 model forecast points
- 630 Meteorological stations (~300 FIRES)



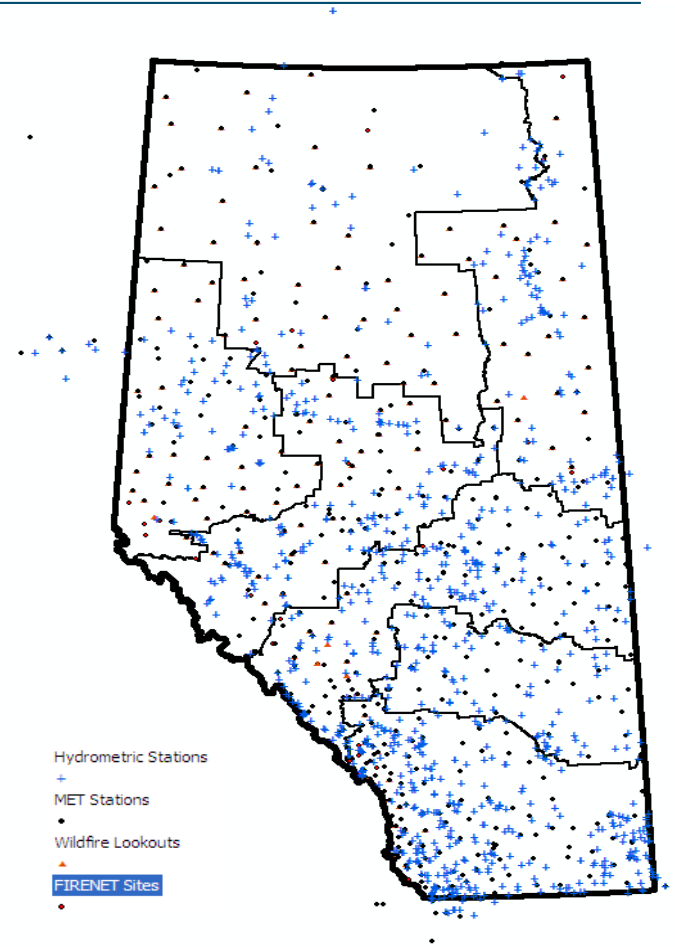
AESRD Temporary Station – Medicine Hat 2013



Elbow River at  
Bragg Creek 2013



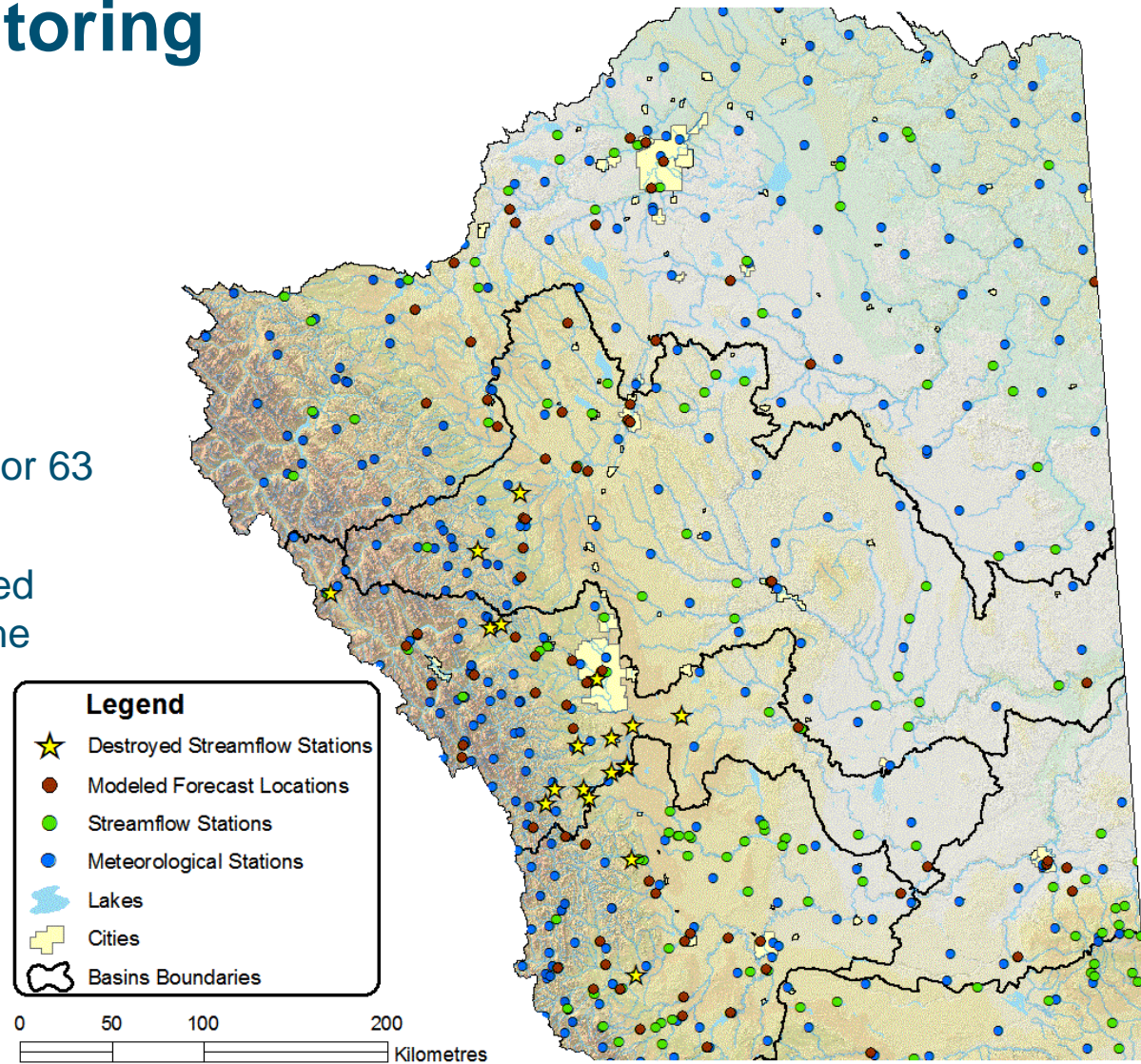
Elbow River below  
Glenmore Reservoir 2013



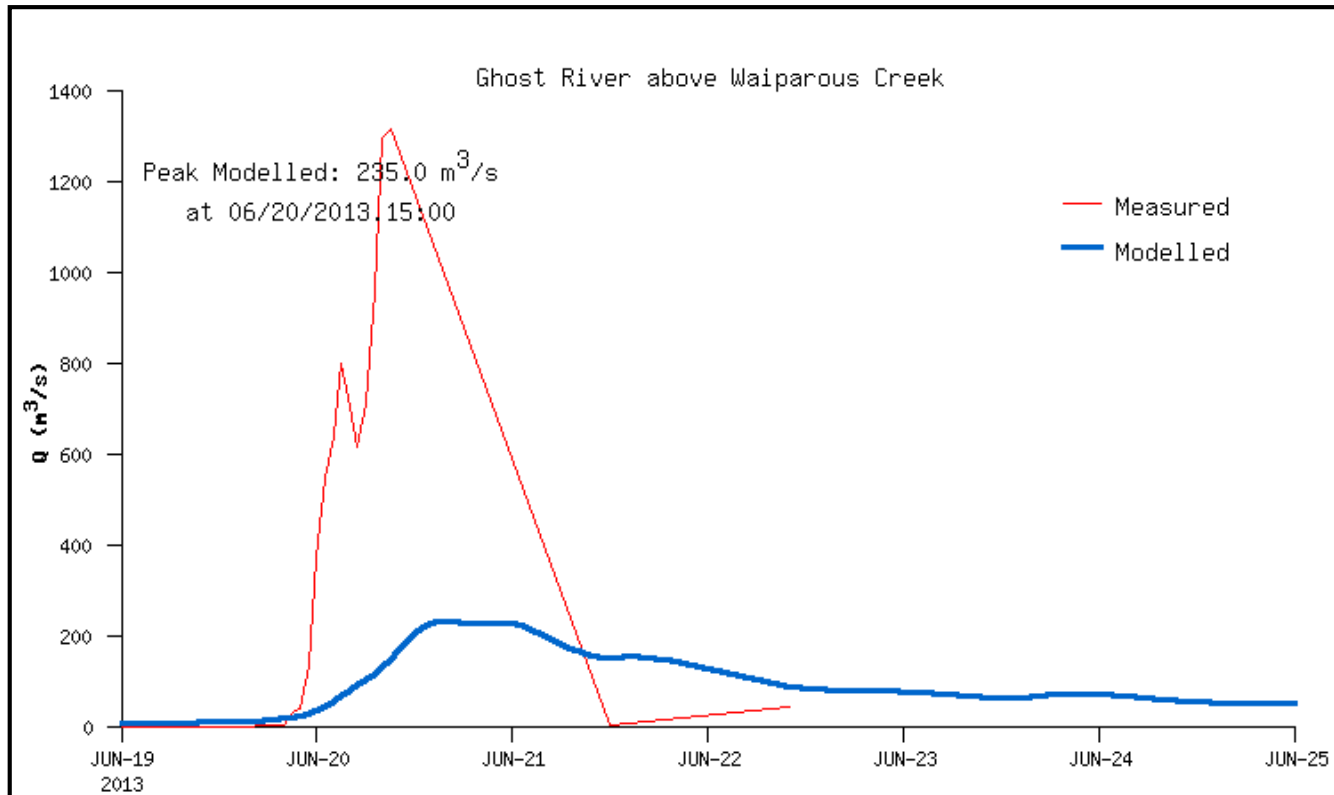
- Hydrometric Stations
- MET Stations
- Wildfire Lookouts
- FIRENET Sites

# 2013 Flood Monitoring Network

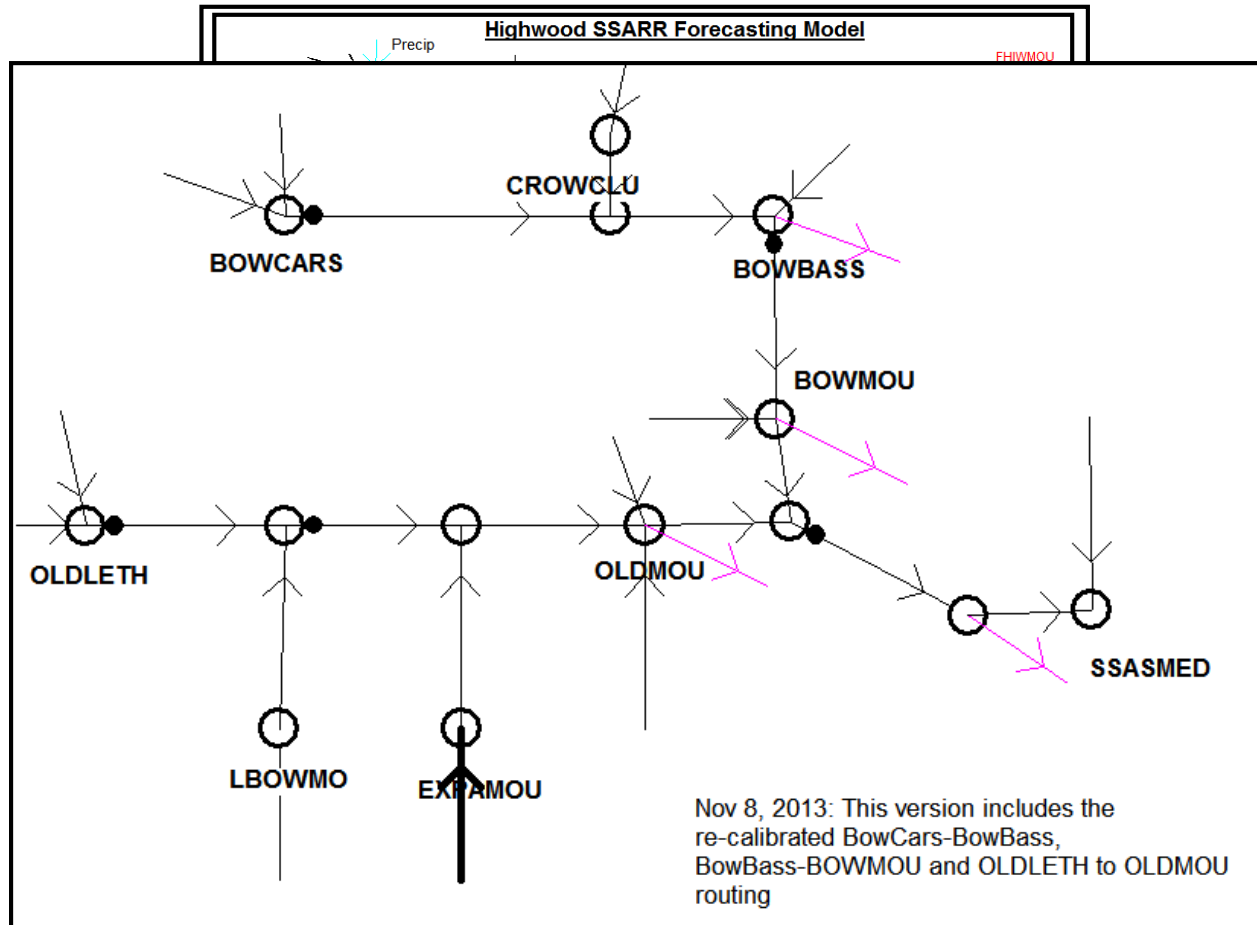
- 110 Hydrometric and 179 Meteorological stations under constant review
  - 208 Hydro and ~300 Met in the 5 effected basins
- Constantly refining forecasts for 63 different forecast locations
- 13 hydro gauges lost/destroyed at various forecast points in the Bow, Oldman and Red Deer basins; another 13 had equipment, erosion, damage issues



# Missing Data ....or is something VERY VERY wrong....



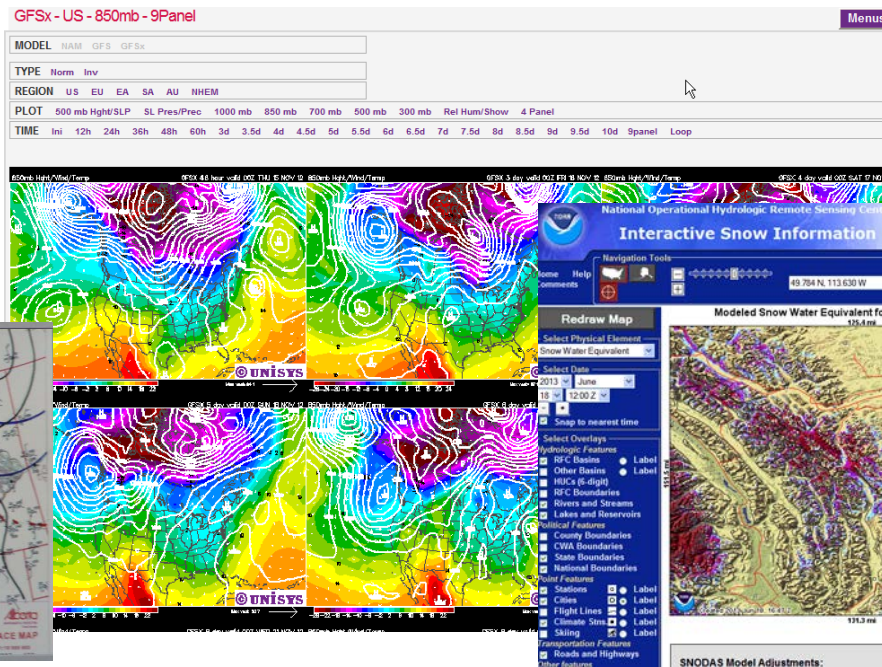
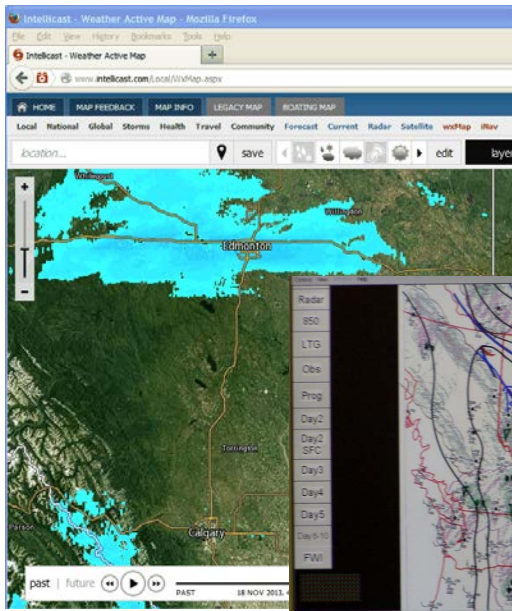
# Forecast Model (eg Bow River)





# Open Water Forecasting Operations - Weather Forecasts

- Alberta Environment and Sustainable Resource Development (ESRD)
  - Fire Weather Office – twice daily briefings; duty forecaster
- Environment Canada – Regional and Global models, Significant Weather Discussions issued by the Prairie and Arctic Storm Prediction Center, NOAA – Modeling and Guidance, Unisys, Intellicast, Weather Network, etc



# River Forecast Centre Event Operations: Stage 1 – Anticipation of Major Storm

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- Discuss weather forecast and model results, assess basins for areas of concern
- Allocate RFC staff to support 24/7 Operations
- Notify GOA water managers and support teams, as well as municipal authorities with an identified flood sensitivity
- Due to uncertainty surrounding weather model results, advisories are not typically issued until rain is on the ground and the storm centre and its path are identified
- Information in FYI email's (internal), Forecaster's Comments



Sheep River at  
Black Diamond 2013

# River Forecast Centre Event Operations: Stage 1 – Anticipation of Major Storm (2013)

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- Saturday June 15<sup>th</sup>: Related initial forecast of large system with a very good moisture feed to WMO managers and City of Calgary. Forecast was still very general with no specific high intensity location. (100mm storm total basin wide, 200mm locally due to convection very possible).
- Monday June 17<sup>th</sup>: Started to contact monitoring groups and municipalities prone to flooding (prepared them for the likelihood of a 2005 type event).
- Tuesday June 18<sup>th</sup>: Primary forecast location has been determined and precipitation totals refined based on most recent weather model runs: runoff model runs completed based on basin averages of between 80mm and 160 mm (48 hour weather forecast total) with 50 mm as maximum 12 hour total.

# River Forecast Centre Event Operations: Stage 2 – Flood Event

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- Alert internal and external clients
  - Directly call municipal emergency managers and water managers
  - Flood Watches or Flood Warnings via Alberta Emergency Alert – Local Authorities, Media
- **Quantitative Forecasts**
  - Time and peak flow rate range
- Continuous support to emergency management groups, public, comm.
- Continue to provide situational updates
- 24x7 operations: QA/QC, data monitoring field coordination, alerts, comments, FYI email's (internal).

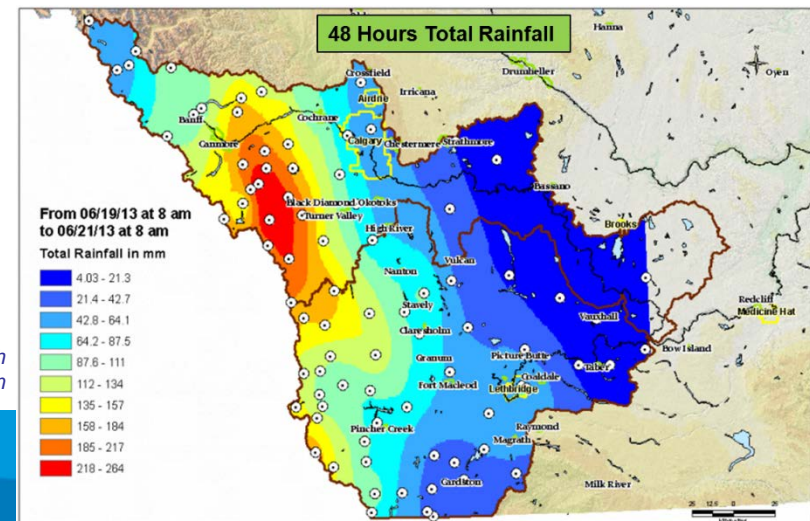
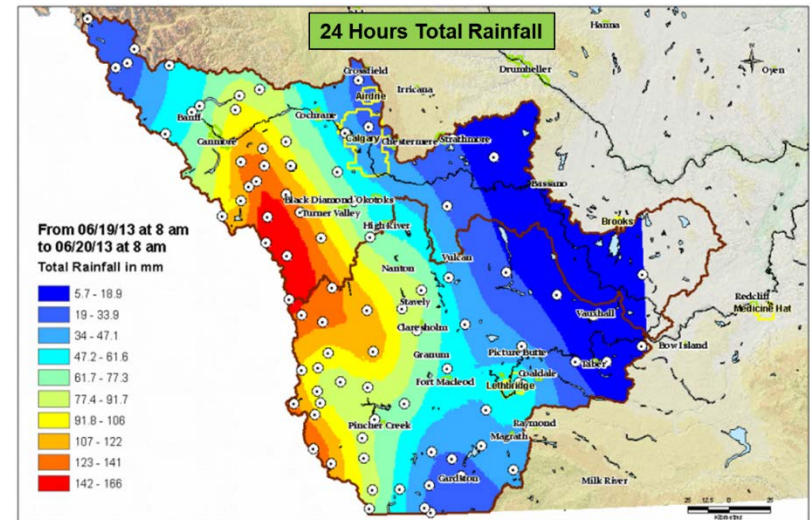


Red Deer River near Sundre 2013

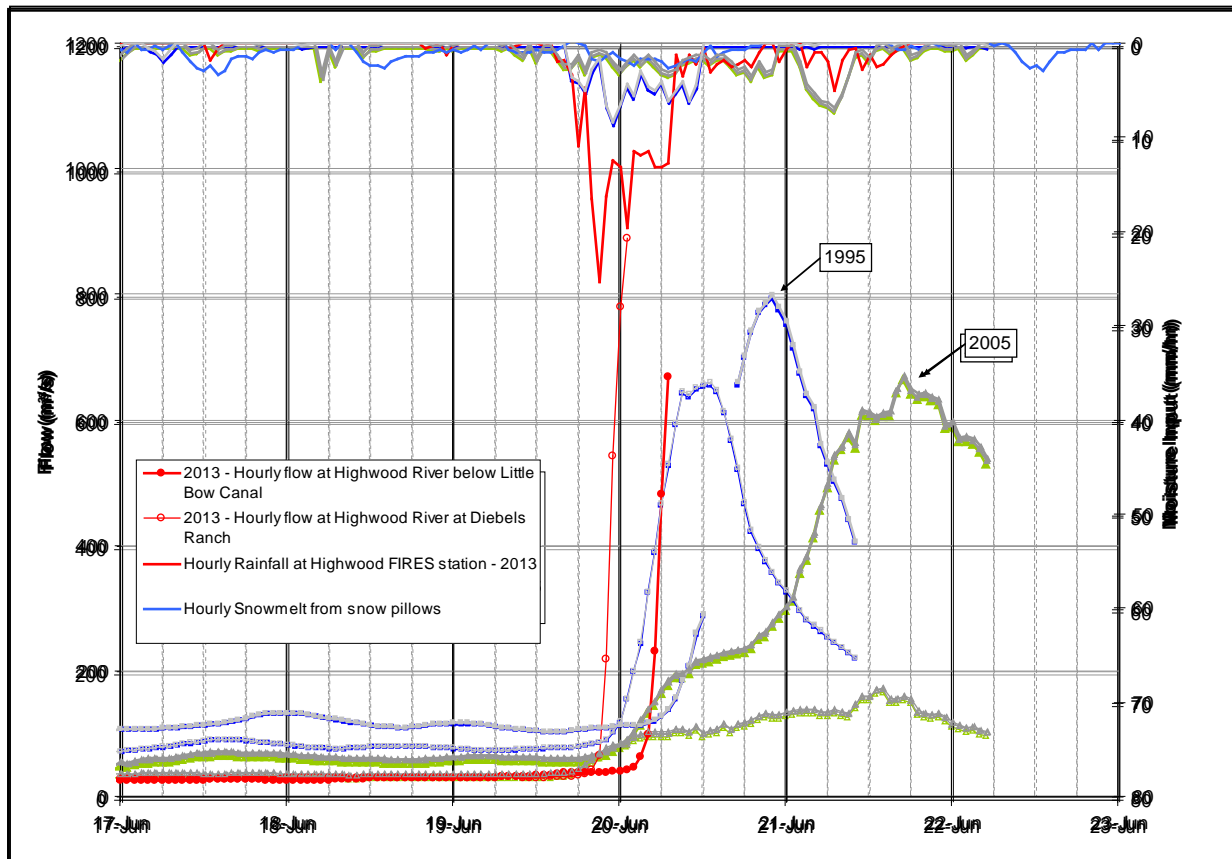
# River Forecast Centre Event Operations: Stage 2 – Flood Event (2013)

- As rain fell, flood advisories were issued Wed night and early Thursday morning.
- Morning weather model runs showed that the storm was still expected to bring rain for the next 36 hours.
- On average, the Elbow, Sheep and Highwood River basins received 12 hour totals of between 115 and 140 mm; approx 1.5 times the 1:100 year value
- Typical large system rainfall rates are between 3 and 5 mm/hr; 2013 - 10 to 20 mm/hr for a continuous 14 hours.
- Up to 250 mm rain fell in 24 hours in some locations

*Courtesy of South Saskatchewan Region*

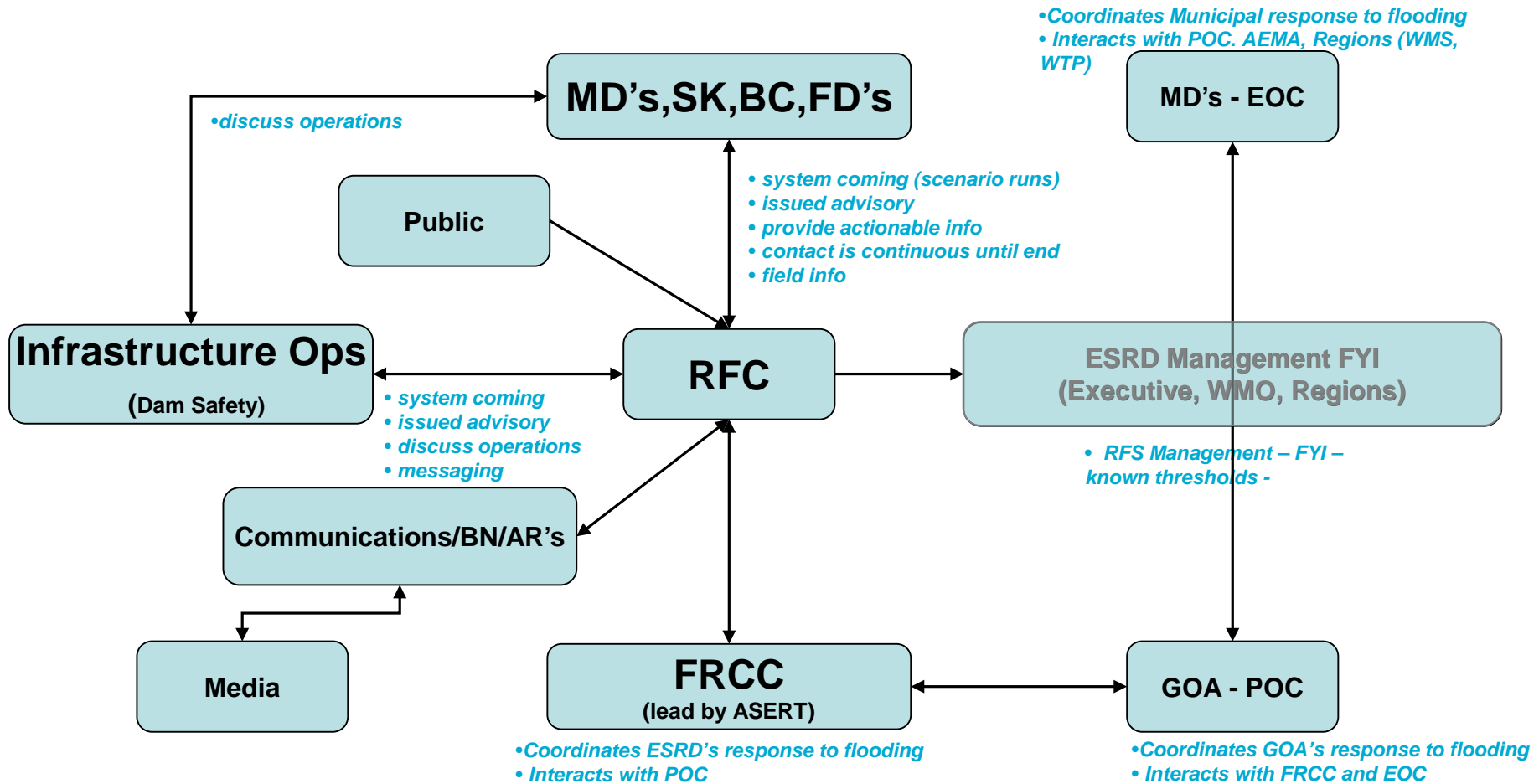


# River Forecast Centre Event Operations: Stage 2 – Flood Event (2013)



\*\*all numbers are preliminary

# Communication Flow:



# 2014 Projects

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- **RFS Managed Contracts**

- Lessons Learned and Partner Engagement Workshops – Feb 2014
- Performance Measures – May 2014
- Weather Forecast Uncertainty Project – May 2014
- Event Reviews (Oldman/Red Deer) – May 2014
- Precip/Runoff Temporal Variability Study

- **Environment Canada Collaboration**

- Converting gridded weather model data to model input/web interface



Medicine Hat WSC shack:  
High water mark and 5500  
m<sup>3</sup>/s predicted level est.



# 2014 Projects Cont'd

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- **Partnerships and Working Groups**

- FloodNET – NSERC – Flood/Modeling Research – letter of support
- AI-IEEE, WaterSMART– Flood Forecasting Workshop
- UBC/Canmore: Canmore Statistical Forecast Model Research Project
- City of Calgary: River Flood Mitigation Program - Event Forecasting

- **Advisory/Basin Data App** – development has started

- **WISKI Alarm Manager** – Rainfall Intensity Alarms



Drumheller 2013

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**Questions**