The 2013 Alberta Flood

A Sign of Change in Cold Regions

Here is the story of the flood, based on select CCRN observations and analysis.

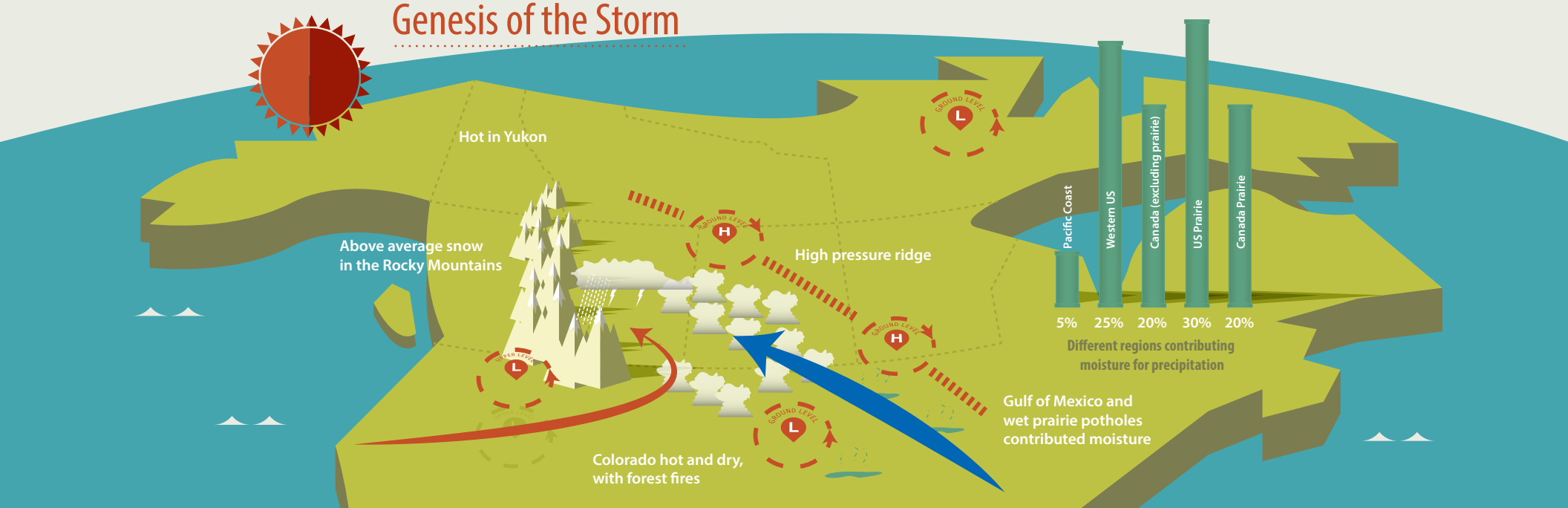
In June 2013, five people lost their lives when a combination of heavy rainfall and rapidly melting alpine snow triggered severe flooding in the Oldman, Bow and Red Deer River basins of Alberta and the Elk River basin of British Columbia, Canada.

The heavy precipitation and ensuing floods led to the evacuation of 100,000 people across three provinces, caused over $6 billion of damage to roads, bridges and homes, and severely damaged scientific monitoring equipment.

What made this storm event unique:

- Atmospheric moisture converged from the Pacific and from the abnormally wet US Great Plains and Canadian Prairies
- Substantial thunderstorms developed east of the Rockies
- The storm later transitioned to more widespread precipitation covering the mountains from the US border into Jasper National Park
- Heavy rain fell at all elevations in the mountains and foothills
- Rain fell on an above normal, late-lying snowpack at high elevations in the mountains inducing rain-on-snowmelt and enhancing runoff generation
- Rainfall turned to snowfall at high elevations towards the end of the storm, slowing runoff generation
- A blocking pattern caused the weather system to stall over Southern Alberta for three days

Genesis of the Storm



Key Science Messages: A number of things came together to create the Alberta June 2013 Flood event:

- There was an exceptionally large spring storm drawing moisture from the very wet Prairies where severe thunderstorms developed
- The amounts of rainfall were extraordinarily high in the foothills and front ranges and covered an area from the US border to Jasper for three days
- A cold spring left a remnant snowpack in the high mountains and with heavy rainfall produced the highest amount of runoff from this snow-covered alpine zone
- A transition from rainfall to snowfall in the mountains on the third day likely reduced the size of the flood
- Although a flood of this magnitude occurs about three times a century and similar floods have previously been recorded on the Bow River, many communities that were considered outside the anticipated floodplain were inundated by floodwaters

Changing trends: Where do we go from here?

- Scientists have observed rapid climate warming and deglaciation in the Rocky Mountain headwaters, along with earlier spring runoff and diminished late summer streamflows.

- The exceptionally high streamflows in 2012 and 2013 are similar to those noted in the late 1800s and early 1900s, but occur in a vastly changed climate and affect communities which have grown substantially since that time.

- The 2013 flood stresses the need for better coordination between the federal government and provinces to integrate weather and water information when forecasting floods, stream flows, lake levels and water supply.

- A coordinated response to future flood requires better prediction, avoidance and active mitigation.

- There is a long term trend for increased clustering of large multiple day rainfall events in the Prairie Provinces; society needs to be resilient to events of this magnitude.

The Changing Cold Regions Network (CCRN) includes over 50 researchers from universities and government agencies across Canada and in Germany, France, the US, the UK and China. Administered by the Global Institute for Water Security at the University of Saskatchewan, Canada, CCRN aims to understand, diagnose and predict the rapid environmental change experienced by the interior of Western Canada. CCRN is funded through the Natural Sciences and Engineering Research Council of Canada.

CCRN
Changing Cold Regions Network
www.ccrnetwork.ca