



Hatfield
CONSULTANTS

Environmental Specialists Since 1974

RAPID RADAR MAPPING TO SUPPORT WILDFIRE RESPONSE AND RECOVERY OPERATIONS

- PROJECT SUMMARY

*Hatfield Consultants
August 2017*

Presentation Outline

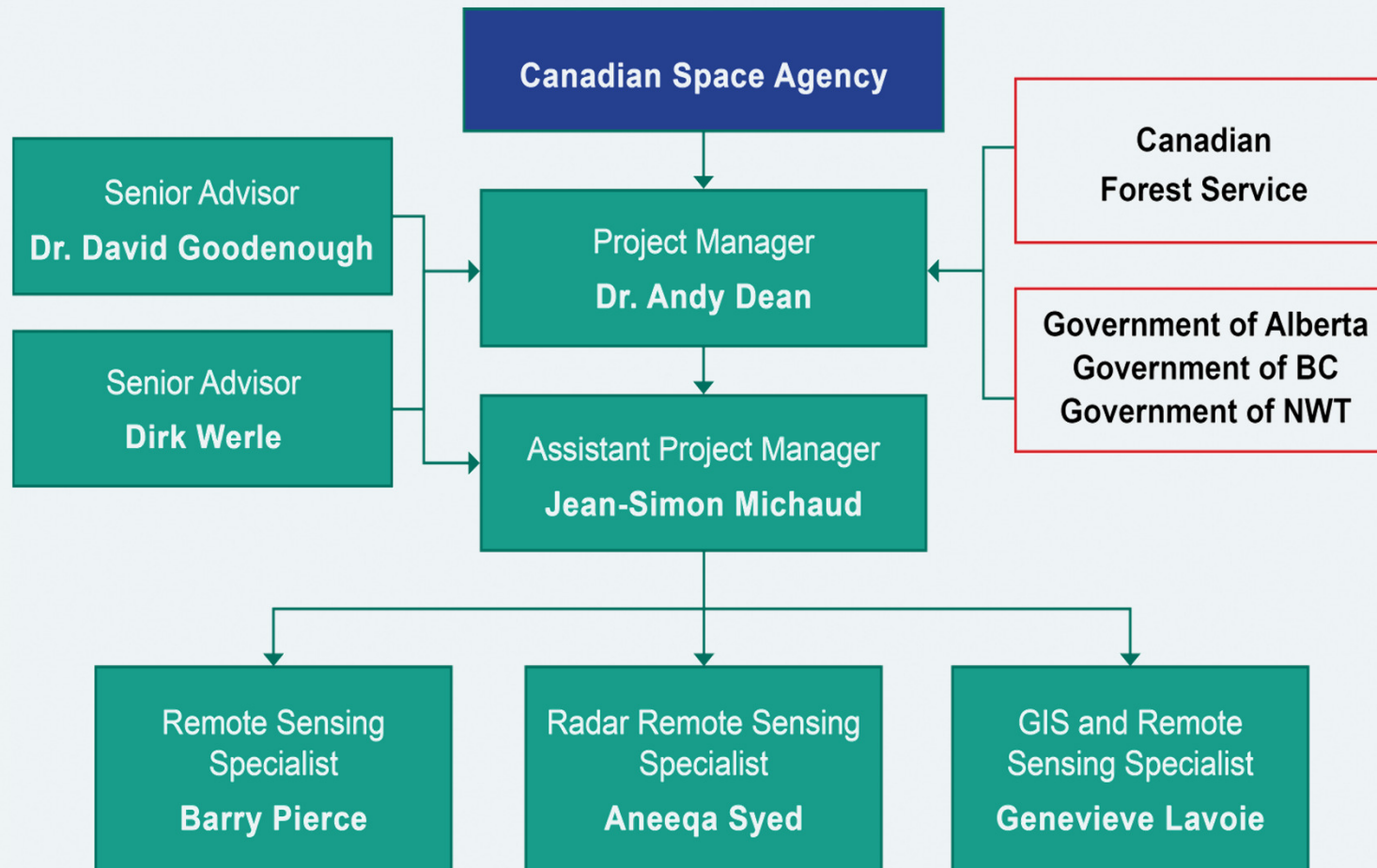
Rapid radar mapping to support wildfire response and recovery operations:

- › Project team
- › Project objectives
- › Study area and data plan
- › R-BAM approach and products

Hatfield Team

- › Hatfield has provided environmental services to industry and government for over 40 years;
- › 100 professional staff in offices in Canada (British Columbia and Alberta);
- › Offices in Indonesia, Laos, and Botswana and business partners in Chile and Thailand;
- › In response to the Fort McMurray Wildfire, Hatfield provided emergency tasking under DigitalGlobe's FirstLook program of a constellation of high resolution VNIR satellites for the Alberta Government.

Project team



Canadian Space Agency - Development of Applications for disaster management.

- › Contract awarded through the Canadian Space Agency's (CSA's) Earth Observation (EO) Applications Development Program (EOADP) to:
 1. Develop innovative Earth Observation solutions that address disaster management application needs in a Canadian context; and
 2. Demonstrate the added-value of the EO solution, relative to existing practices and plan its operationalization.

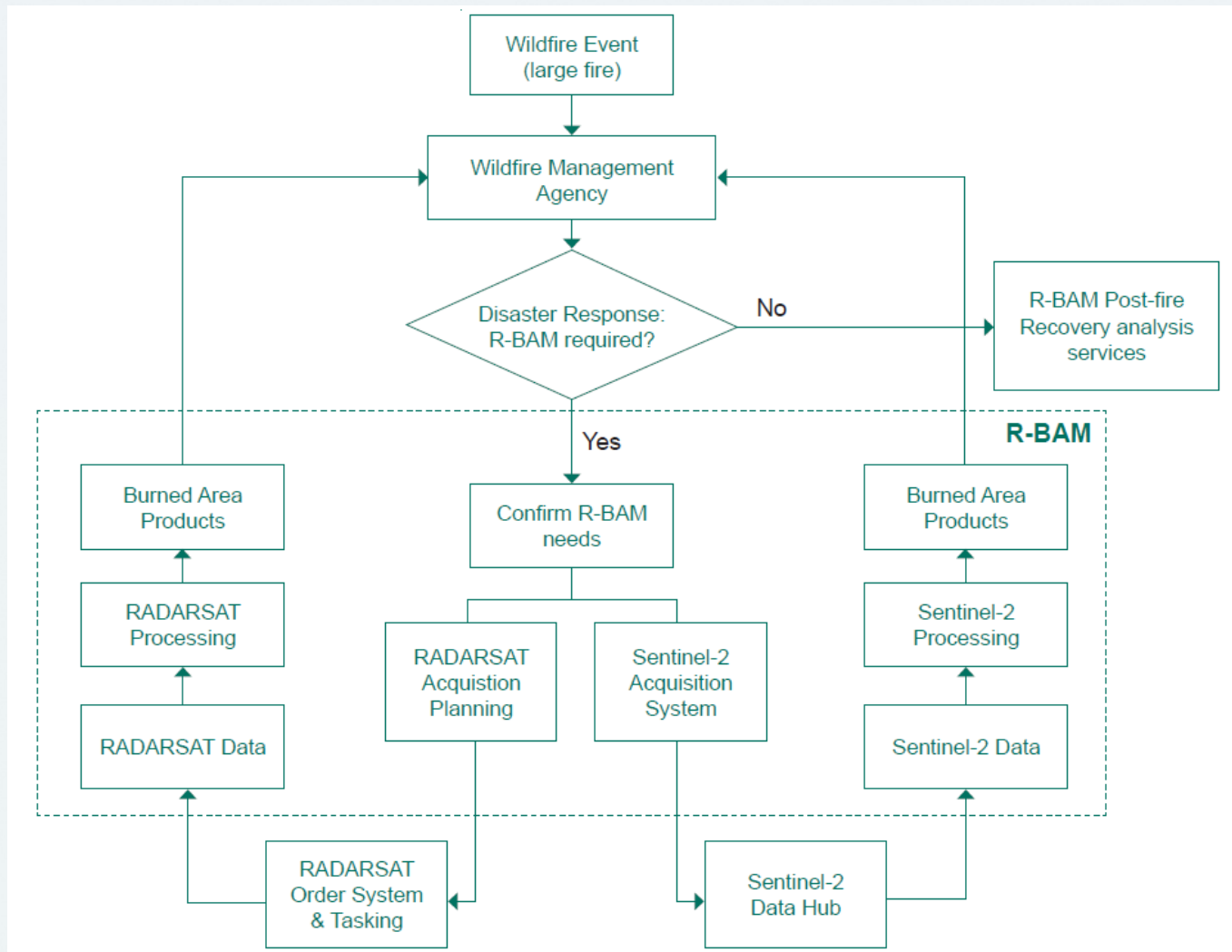
Rapid radar mapping to support wildfire response and recovery operations

- › The project addresses the **response** and **recovery** phases of disaster risk management for **wildfire**.
- › Project Objectives:
 1. Develop and demonstrate innovative RADARSAT and Sentinel burned area mapping solutions;
 2. Demonstrate the added-value of RADARSAT and Sentinel to provide timely burned area data for wildfire disaster response, as a complimentary observation method to existing practices; and
 3. Optimize the use of RADARSAT and Sentinel data with complimentary datasets in wildfire disaster management and plan for RADARSAT Constellation Mission (RCM).

Enhanced information from SAR and VNIR: beneficial for wildfire management

- › Increased uses of EO data is an opportunity to reduce costs for wildfire burned area mapping, since aerial surveys are expensive.
- › Synthetic Aperture Radar (SAR) sensors provide data acquisition independent of cloud, smoke, and sun illumination conditions.
- › Radar acquisition and processing has proven near-real-time capabilities for rapid availability.
- › RADARSAT-2 is available for Canadian government users and RCM will go into operation in 2018/2019.

Rapid-Burned Area Mapping (R-BAM)

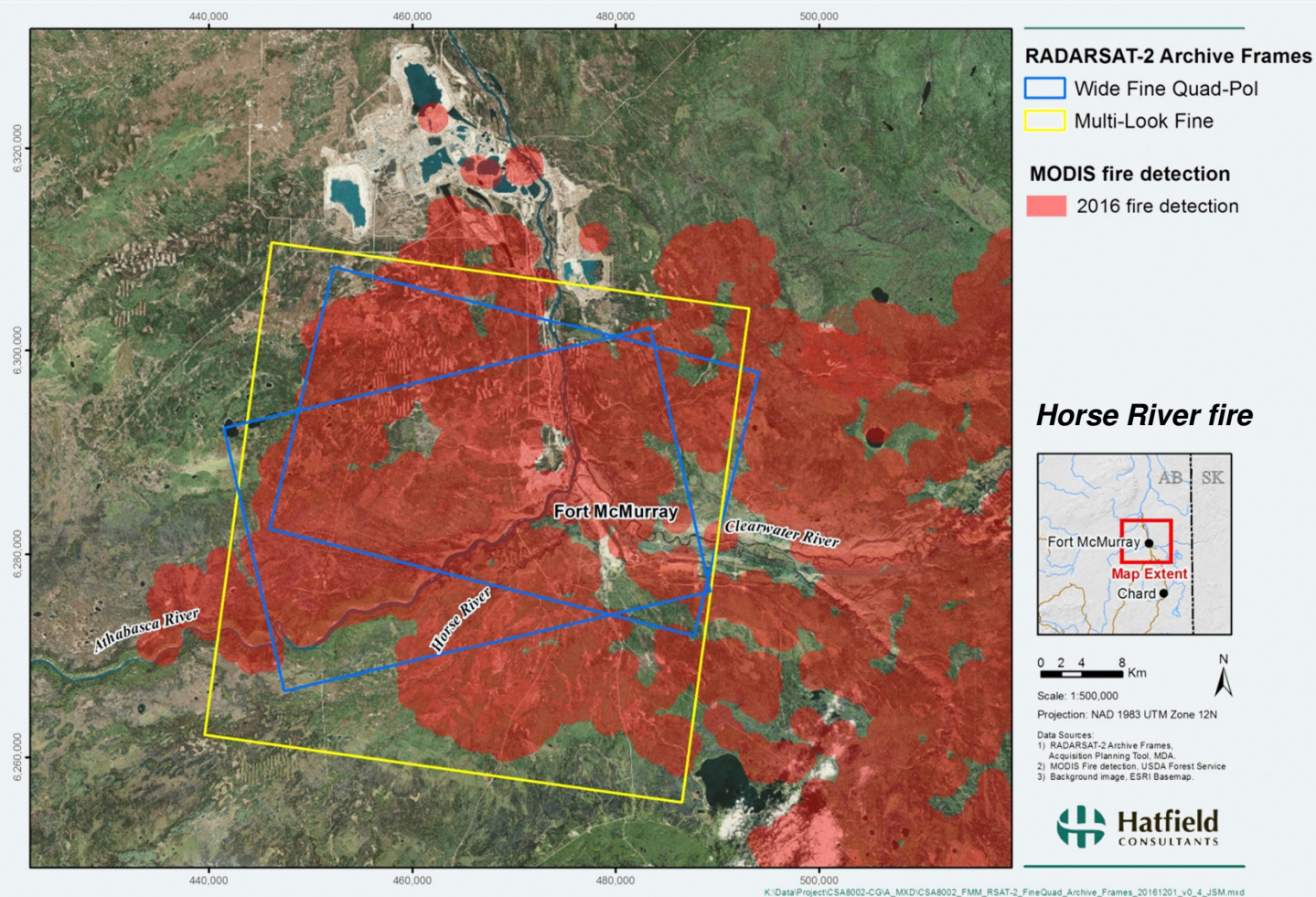


Case Study #1: Fort McMurray Wildfire

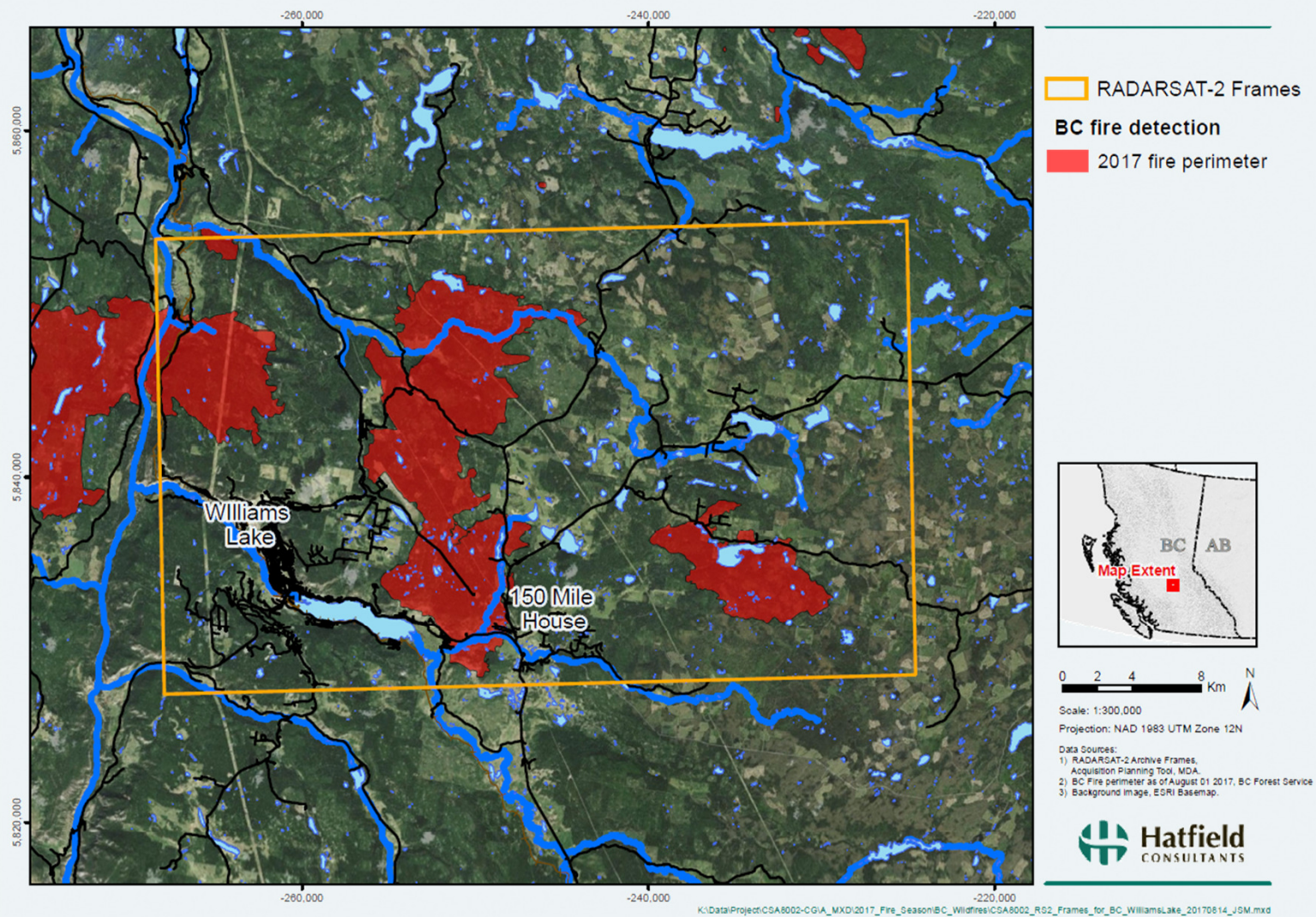
- › Large fire impacting urban area
 - › Estimated to be the costliest disaster for insurers in Canadian history.
 - › Largest wildfire evacuation in Albertan history.
- › Good availability of archived satellite images, both SAR and VNIR.
- › How could wildfire managers improve use of near real-time satellite image products, including radar?



Case Study #1 – Fort McMurray, AB (May 2016)



Case Study #2: 150 Miles House, BC (July 2017)



Proposed Data Plan

RADAR over Case Study #1

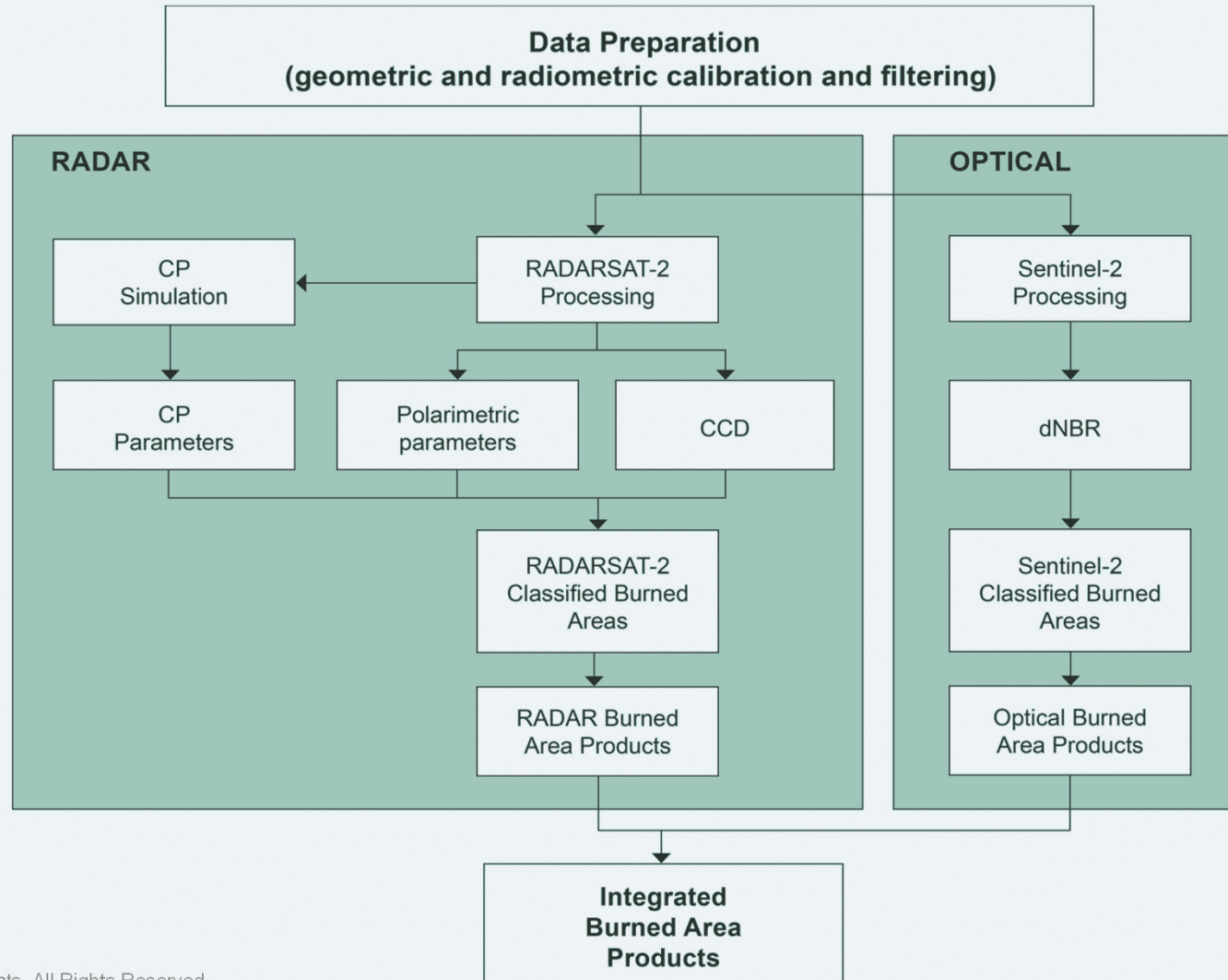
Sensor	Beam Mode	Polarization	Date Range	Total No. of Frames
RADARSAT-2	Fine Quad-pol, Single, Dual	HH-VV-HV	May. 14, 2010 to May. 30, 2016	20
Sentinel-1	Extra Wide, Interferometric Wide	VV-VH	Apr. 02, 2015 to Jul. 13 2016	7

OPTICAL over Case Study #1

Sensor	Date Range	Total No. of Frames
Sentinel-2	Apr. 29, 2016 to July 12 2016	10
Landsat-7	May 03, 2015 to Jul. 15 2016	8
Landsat-8	May 10 2015 to Jul. 15 2016	9

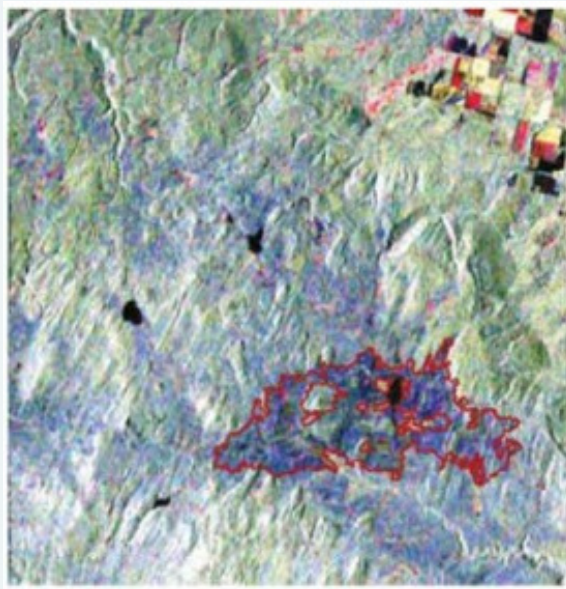
The project also proposes 24 new acquisitions of RADARSAT-2 Fine Quad-Pol data. This data will be acquired over the 150 Miles House fire in BC and other locations based on the occurrence of wildfires over western Canada and the US in the 2017 and 2018 fire season.

Analytical Methods

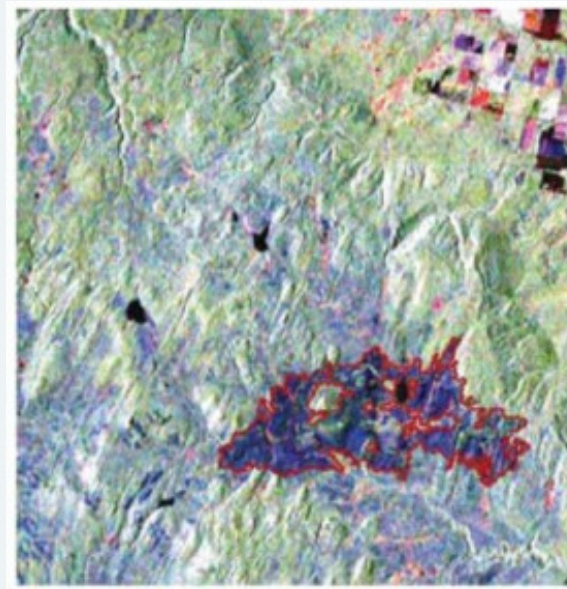


Radar Burned Area Products

- Goodenough et al. (2011) demonstrated that RADARSAT-2 fine quad-pol polarimetric phase information can be used to accurately map fire scars in Canada.



FQ10, 2 July 2010

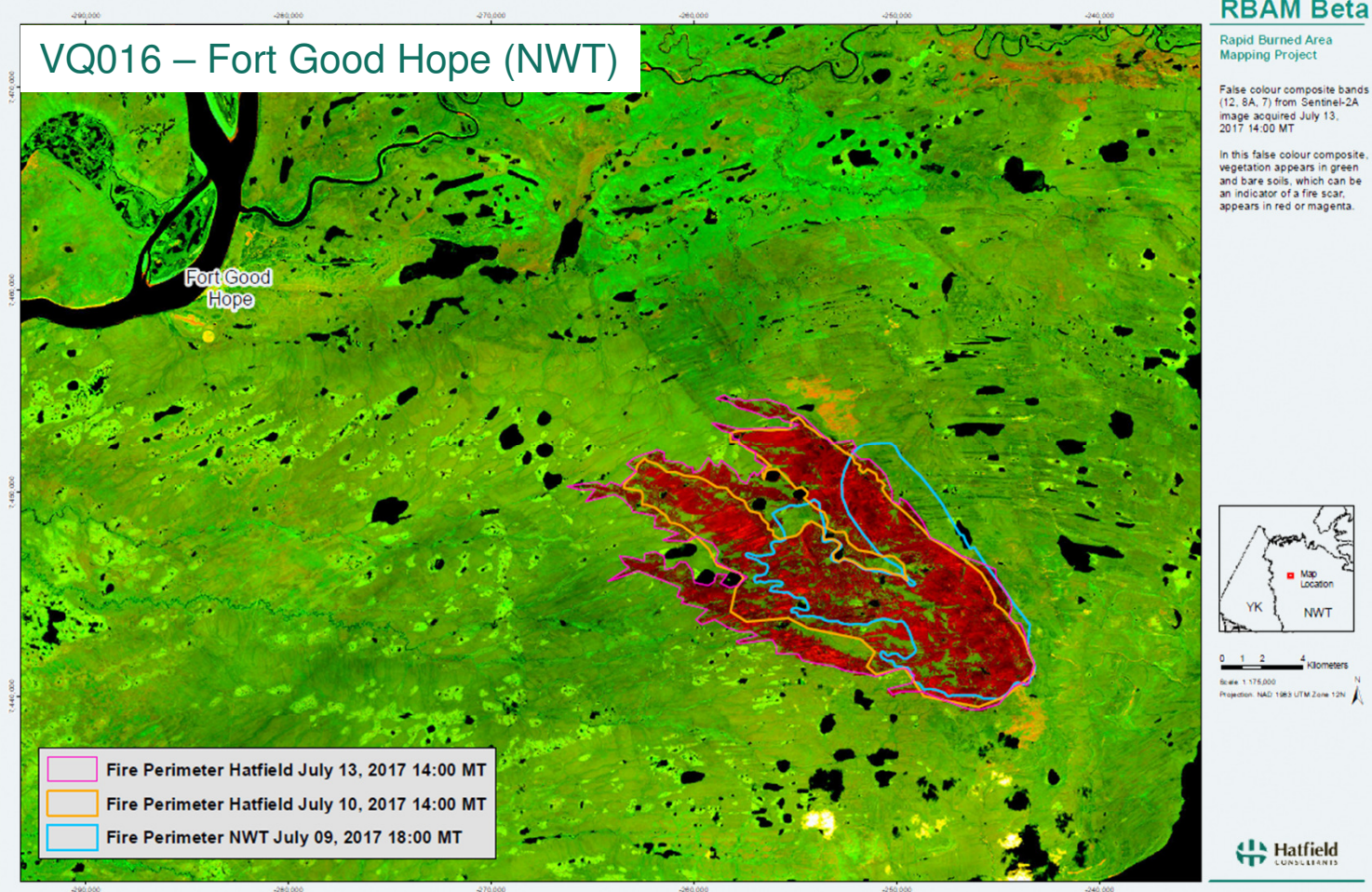


FQ10, 26 July 2010

Source: Goodenough et al. (2011)

Optical Burned Area Products

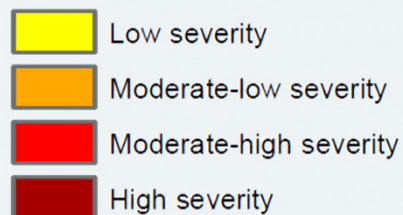
- Fire perimeter and false colour composite



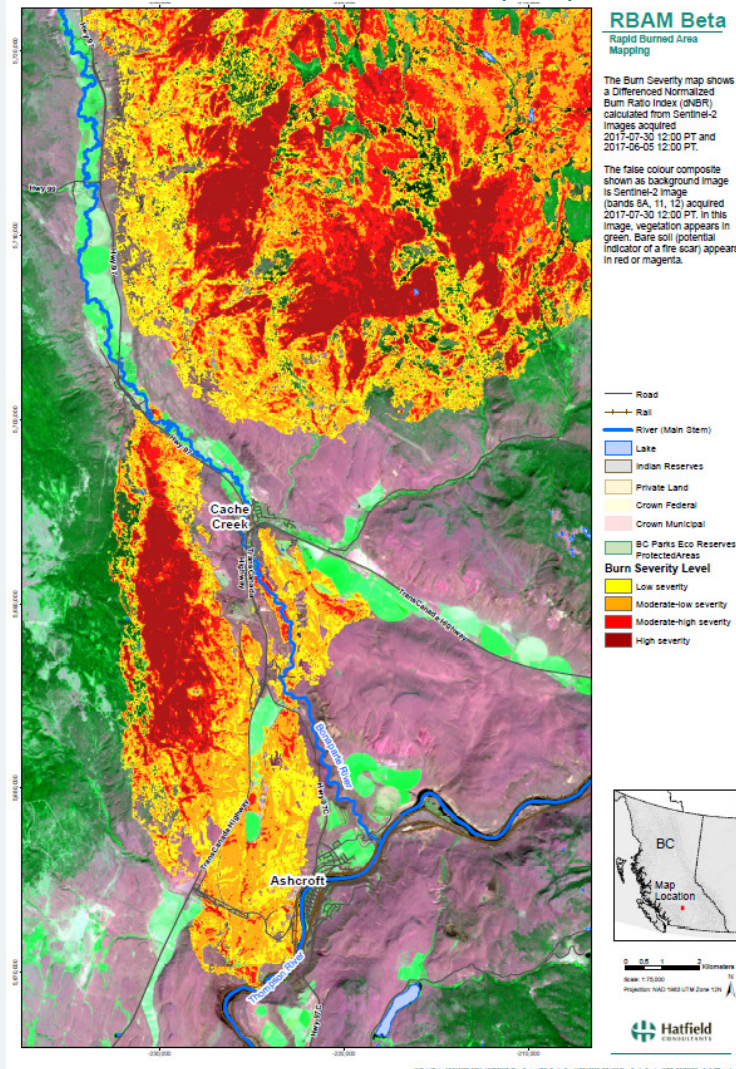
Optical Burned Area Products

- › Burn Severity Map derived from differenced Normalized Burn Ratio Index (dNBR)

Burn Severity Level



B8A1112 - Cache Creek (BC)



Thank you!



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