Wildfire satellite mapping supports ongoing improvements to fire intelligence

November 8, 2022

Ashlin Richardson presents at the November conference

At last week's Wildland Fire Canada Conference 2022 in Edmonton, Alta., Senior Data Scientist Ashlin Richardson presented a new wildfire detection and monitoring capacity using free and open satellite imaging systems.

An innovative fire mapping product created by the BC Wildfire Service (BCWS), using high quality satellite data provided by the European Space Agency, was used in an operational trial by BCWS in the 2022 fire season.

"The priority was developing more situational awareness for operations. This product was enabled by close collaboration between BCWS' predictive services unit, BCWS' geospatial services team, regional and incident plans officers and other colleagues. The result was significantly enhancing B.C.'s fire intelligence in 2022," Ashlin said.

The fire mapping product supports response by increasing the frequency and fidelity of available fire extent and perimeter updates. Since this information also supports recording burned areas it assists planning and research activities depending on fire management records.

At the conference Ashlin presented an approach for expanding satellite mapping capacity to include detailed fuel-type maps to be updated frequently on a provincial scale, supported by local ground studies led by experienced fire protection personnel.

BCWS also collaborates directly with Canadian, Italian, and Japanese space agencies and other key partners like Natural Resources Canada (NRCAN), Canadian Forest Service and BC Forest Inventory to develop applications of emerging technology for increasing situational awareness especially in smoky or cloudy conditions.

A highlight of the conference, Ashlin said, was meeting in person with the WildfireSat mission's Principal Investigator and the knowledge exchange component team of the WildfireSat mission, which aims to monitor all active wildfires in Canada from space daily. Ashlin and Neal Mcloughlin, BCWS' Superintendent of Predictive Services, represent BC at that table, along with representatives from other provinces and territories engaged as part of an innovative "whole of community" approach.

During the conference Ashlin spoke to federal government members in Ottawa, including the director of NRCAN's Emergency Geomatics Services (EGS) team, who confirmed they would support data engineering work required to scale up the fire mapping technique to help more people, as well as decreasing the delays of fire mapping updates. Projects supported by Ashlin will play a part in providing key information for a new, modernized Canadian Fire Growth Model being worked on by a national development team.

Neal is leading the development team, which has been working for years to improve software used for fire growth modelling.

Support will soon end for the fire growth model called Prometheus. This 20-year-old model has been completely reprogrammed into a modernized software application known as Wildfire Intelligence Simulation Engine or WISE.

Prometheus requires a trained operator to prepare and enter numerous model inputs before running a fire growth simulation. "We want to move that technology towards automation," Neal said.

Due to the amount of time lost to repetitive steps for preparing and entering model inputs, the Advanced Planning Unit is often time constrained to modelling only the most significant fires. Automation will allow modelling to be available for any fire in the province.

"In reprogramming this fire growth model we've used modern programming languages and allowed the software to run on any operating system or environment," Neal said.

As part of the recently released BCWS Research and Innovation Road Map a large-scale validation of the models will take place.

"What's neat about this innovation is as we enable automated modelling we can start do things that weren't previously possible. Like running a previous fire season, let's say we have over 1,300 fires we can run all of the fires

through the model and get an idea of where it performs well and where it is deficient and could use further refinement. That was never possible at that kind of scale."

Looking ahead, the technology will allow those in predictive services to spend less time on administrative and repetitive tasks tasks and get ahead of fire.

"Before a fire centre is even requesting a model run, we are already seeing outputs. It allows predictive services to issue advanced warnings about potentially problematic fires or portions of the province if they are starting to show up in more of a holistic output.

> "On any given day in a busy part of the season we can typically look at three to five of all the fires burning. As opposed to envisioning a system when we have an idea of what all the fires are potentially doing."
>
> *Neal Mcloughlin*

More accurate mapping, as is being supported by Ashlin, will improve the quality of information input into this modelling software, therefore making the models more accurate.

Several presentations at the conference featured WISE. "Although this technology is very new, during its development we invited agencies that were comfortable to prototype the technology. That allowed us to verify that what we're creating was going to work and to get feedback and working examples."

The Government of Alberta presented on how they are using WISE to run automated fire growth modelling and Heartland Software Solutions presented a fee for service product called Firecast that leverages the WISE engine, and the Canadian Forest Service presented their project called Firehawk which uses the engine for strategic planning and scenarios.

"They've integrated their own modelling systems that compute damage to structures and urban environments so you can simulate a potential fire event based on historic or forecasted fire conditions."

The open-source software will be made available to anyone at the end of 2022.

"The intent of open source is to foster collaboration and sharing. People can take that code, work on it and contribute new code back to the project that might add a feature or functionality…historically these projects have been closed source and proprietary and code is not shared. This is a very different model, it's a big win.

"It's more than just the innovation of the software and technology, it's also innovation in how we foster collaboration going forward."

On November 18, Neal will co-present a Canada Wildfire webinar on the project. Register here to attend and learn more.

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