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| **Spatial approaches to modelling fire in New Zealand** |
| **Introduction/Aim:**  It is widely accepted that the New Zealand wildfire regime is predicted to become more severe with future climate change and increasing populations. “Smart firefighting” encompasses the collection and integration of data from a wide range of databases, sensor networks (including sensors on firefighters and equipment), computational tools and communication systems. Smart Firefighting ensures the flow of critical information when and where it is needed, and encompasses all four components of emergency management, namely reduction, readiness, response, and recovery. In the Fire and Atmospheric Science Team at Scion we are developing a tool to model the risk of fire across New Zealand to aid smart firefighting.    **Methods and Results:**  The Wildfire Intelligence Simulation Engine (WISE) and its predecessor Prometheus are wildfire growth simulation models developed in Canada which we have adapted for use in New Zealand. These models incorporate fuel, topography, and weather to provide spatially explicit fire behaviour and spread data for use with Geographic Information Systems. These models were chosen as they utilise the Canadian Fire Weather System, the Fire Weather Index and the Fire Behaviour Prediction systems which were already adapted and adopted as core systems for fire management in New Zealand. We included New Zealand specific fire behaviour and fuel models and validated the adapted model simulations against data from historic wildfires in New Zealand.    These models have been valuable for modelling fire growth during wildfire incidents and have been incredibly valuable for fire response. Scion previously developed tools using WISE, including a Fire Registry tool which uses hotspot detections from satellite data to model potential smoke hazard and fire growth over New Zealand. During conversations and collaboration with decision makers, we identified the need for a decision support tool integrating fire risk which could help with readiness and reduction.  Using WISE we are developing a tool to increase our understanding of wildfire risk across New Zealand which can then be integrated into a decision support tool to prioritise management actions. We are combining human-driven ignition probability and extreme weather conditions through thousands of WISE runs to build up information on the likelihood and severity of wildfires across New Zealand. Spatial ignition probability has been mapped using machine learning to determine the importance of different ignition drivers, such as population and distance to roads, and estimate a probability of ignitions based on proximity to these drivers. Weather conditions have been taken from weather stations across New Zealand during periods of extreme fire weather, and applied for any fires which occur within the same climatic spatial zone as the station. The resulting fire risk grid will show areas predicted to have the greatest fire risk under the 95th percentile fire weather conditions. Once spatial outputs are available, decision makers such as forest managers and owners will be able to consider fire risk in their planning and land management. |

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