ONTARIO BATTLE: Risk Analysis of Bushfire in Queensland, Australia

INTRODUCTION

Australia has long been battling with bushfire during the summer season in the southern hemisphere, December to February, when the climate in Australia is dry and hot. This year, the condition of bushfire is extremely severe and unprecedented in many ways. According to 2019-2020 Australian Bushfire (2020), the situation worsened from the beginning of November, while the firefighters were not able to contain all the fires in some areas in Australia until mid-February. During this year’s bushfire, more than 11 million hectares of bush, forest, and parks across Australia has burned. Many species, unique and endangered, are facing extinction and the experts concerned that the ecosystem would be difficult to recover. Also, the smoke pollution produced by the bushfire worsens the air quality not only in Australia but also in many other countries due to the monsoon. Queensland, situated in the north-east of the country, would experience bushfire more likely in spring and mid-summer (“Bushfire weather”, 2020). Usually, the moister condition and tropical cyclone determine the end of the fire season. This year, the condition was described as ‘highly unusual’ because of the strong winds, a drier than average condition and a heatwave (“Unusual’ bushfires sweep Australia’s north”, 2020).

Due to the fact that fire is one of the most important forces at work in the Australian environment, it is hard to prevent the fire completely. There are many factors contributing to the ignition, such as climate, fuel, terrain and historical ignition (Aitkinson Chladil, Janssen & Lucieer, 2010). To be specific, information on fuel conditions and variability is important to this analysis (Miller et. al., 2015). Thus, it is necessary to do a risk analysis, aiming to identify the areas that are subjected to bushfire the most and shift focus to where need to implement actions and facilities to reduce the impact of bushfire.

METHOD

The final bushfire risk analysis included a weighted risk analysis for counties. I used symbology and natural breaks to produce average yearly rainfall (Figure 2). For current drought declaration (Figure 3), I added a field in attribute table and used field calculation. Then I changed symbol for defined forest area (Figure 4) and forest fire danger index (Figure 6). Additionally, I used buffer on figure 3 to identify the risk areas outside the forests. Vegetation hazard classes (Figure 5) was produced by reclassify 20 categories of land uses into three main categories based on their ability to produce bushfire according to handbook. They will be weighted in the raster calculator: 50% FFDI + 30% forest area + 15% drought declaration + 5% vegetation hazard class. The whole procedure is done by ArcMap 10.7.1.

RESULTS

I found that south-western part of Queensland is more likely to be affected by bushfire during fire season, especially after a dry winter and spring (Figure 1). The same results can be seen in average yearly rainfall (Figure 2), current drought declaration (Figure 3), and Forest Fire Danger Index (Figure 6), which all illustrate that south-western part is the bushfire prone area. In other words, this part experiences less than average rainfall, long-time drought and the most suitable weather for ignition of bushfire. However, the state-owned forest (Figure 4) and vegetation hazard classes (Figure 5) show an opposite pattern, with the lowest risk in the south-western part of Queensland.

CONCLUSION

Overall, people living in south-western part of Queensland should have a survival plan to protect themselves from bushfire during the fire season there. This map (Figure 1) also provides the information for the government to implement efficient fire-suppressing plan ahead of the fire season, trying to make the most of ignition under control.

However, this analysis is not quite consistent with government documentation, because this risk analysis did not take land slope into consideration, which may contribute to the potential fire-line. Also, this risk assessment only look at the ability for an area to develop bushfire, but exclude the fact that fires happening in south-western Queensland is also easy to suppress.

Considering data sources, Australia is featured in Eucalyptus, the food of Koalas, but I cannot find the exact distribution for each type of trees in Australia. Also, the data I use are quite old-fashioned, which is not quite predictable for current situation.

For future analysis, it is better to consider the land slope and vegetation hazard classes. Also, the size change of eucalyptus forest is also worth noticing. Additionally, taking suppressing into consideration, which may contribute to the potential fire-line. Also, this risk assessment only look at the ability for an area to develop bushfire, but exclude the fact that fires happening in south-western Queensland is also easy to suppress.

REFERENCES


DATA SOURCES

Figure 1 Average yearly rainfall in Queensland, December 2001, Department of Natural Resources, Water and Energy.

Figure 2 Current Drought Declaration. The original data were produced by the Department of Natural Resources (2002) from direct measurements compiled from multiple sources, including individual measurements.

Figure 3 Forest Fire Danger Index (FFDI).

The original data were produced by the Queensland Fire and Emergency Services (2015), calculating FFDI by measurement of rainfall, evaporation, wind speed, temperature and humidity. The higher the number is, the more extreme the weather would be.

Figure 4 Current Drought Declaration. The original data were produced by the Department of Natural Resources (2002) from direct measurements compiled from multiple sources, including individual measurements.

Figure 5 Vegetation Hazard Clas.

Figure 6 Forest Fire Danger Index (FFDI).

The original data were produced by the Queensland Fire and Emergency Services (2015), calculating FFDI by measurement of rainfall, evaporation, wind speed, temperature and humidity. The higher the number is, the more extreme the weather would be.

Figure 7 Bushfire prone area ( Queensland series, March 2015, Queensland Fire and Emergency Services).

Figure 8 Forest Fire Danger Index (FFDI).

The original data were produced by the Queensland Fire and Emergency Services (2015), calculating FFDI by measurement of rainfall, evaporation, wind speed, temperature and humidity. The higher the number is, the more extreme the weather would be.