# Asset protection problem with uncertain time of wind change

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**Abstract**

Wildfires are natural disasters capable of damaging community assets and claiming human lives. In the case of extreme wildfires incident managers plan protection tasks at key assets, according to their special requirements. Decision makers working under severe time constraints need to take into account uncertainties involved in wildfires. A situation that frequently arises is that it is known a significant change in wind direction will occur in a few hours but the precise time is uncertain. During bushfires, all assets are often cannot be serviced due to the time constraint and limited resources, which is similar to the vehicle routing problem with profit. Thus, the asset protection protection problem can be counted as a variant of the vehicle routing problem with profit that aims to maximise the total profit collected. In our study, we develop a two-stage stochastic approach for the asset protection problem. The model handles existing complexities and the timing uncertainty along with other attributes of the problem. This stochastic program considers different wildfire scenarios and assign fire trucks to protective tasks in the first stage to achieve the maximum total expected value of assets being protected at all stages. In this paper, a case study is presented and solved using CPLEX. To validate our approach, we perform extensive experiments. Results are compared to the dynamic rerouting approach. The computational testing reveals that our approach can achieve better solutions and realistic sized problems can be solved using CPLEX in times suitable for operational purposes.

**Keywords:** Asset protection, Wildfire, Stochastic programming, Disaster management

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