

Managing Post Wildfire Erosion Risks

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The BC Forest Service (BCFS) maintains an internal and geographically dispersed Forest Science Program. The purpose of this program is to provide policy advice and consultation as well as to conduct research on priority issues. A challenge in the generation of new knowledge is the time lag between when an issue arises and when new information can be made available. This lag exists because of the amount of time it takes to conduct research and identify the best practices that can translate into action on the ground. BCFS faced this very challenge when it was confronted with post-wildfire flooding and erosion risks after the wildfires that struck BC's Interior in 2003.

The frequency and severity of wildfires, and subsequent erosion events, may be increasing as a result of climate change, insects and disease outbreaks and/or changes in stand dynamics due to forest management activities and fire suppression in the past century. Future ecosystem restoration and fuel management programs in urban interface areas should consider both the risk of high-severity fires and the associated, and potentially hazardous, post-fire erosion and flooding events.

The severe 2003 fire season in BC resulted in major erosion and mass-movement incidents in several of the areas affected by the fires. This was a phenomenon that occurred for several years following the fires that had not been extensively documented in BC before. The combination of intense fire, severely burned soil and severe soil drought alters the soil's hydrologic behaviour. The loss of forest floor and formation of water repellent soil create a hazard of overland flow and down-slope sedimentation that can result in severe flooding and erosion events. These hazards are greatest during high-intensity summer rainstorms and can persist for three to five years after a fire.

The 2003 post-fire erosion events, which occurred in 2004 and 2005, led BCFS researchers into collaborative projects with UBC Okanagan and the USDA Forest Service to develop a better understanding for the underlying mechanisms of these events and begin to predict and prevent them from happening in the future. BCFS researchers also helped to develop policy and procedures for addressing this newly recognized risk. This new risk analysis program was applied during the severe 2007 wildfire season in the Kootenay area of Southeastern BC on both the Springer and Sitkum Creek fires in the West Kootenay. During the risk analyses about 150 hectares, where high soil burn severity had occurred above gully systems that had residential properties and highways situated down slope, were identified as requiring treatment to reduce hazards.

Straw mulching was the main mitigative treatment used to treat these areas because it can reduce flooding and erosion hazards by protecting the soil surface from raindrop erosion, promoting water infiltration, slowing overland flow, helping to retain soil moisture, contributing to the breaking down of water repellency and promoting re-vegetation. Broadcast straw mulching from helicopters (heli-mulching) was used so that we could treat areas that would otherwise be inaccessible. Heli-mulching involves controlled dropping of large bales, which break up in the air and on impact to provide relatively uniform soil cover. When the districts involved sourced materials to use for mulch, they were careful to choose materials that would not perpetuate the spread of weeds such as wheat, canola and tall fescue. Researchers will monitor the treatment

areas for several years, to assess weed spread and the performance of different mulch materials.

In the US, where the initial heli-mulching research was conducted, post-fire mitigation does not normally include heli-mulching on slopes greater than 60%. However, since steep terrain is common in the Kootenay region, we decided to install several test plots on steep slopes. Silt fence monitoring plots were constructed to test the effectiveness of these and several of the operational treatments. Preliminary results indicate that surface erosion was significantly reduced with the application of the straw mulch. These findings are consistent with published results in the US and from our collaborative research to date.

Several challenges arose during mulching, including learning the best techniques for efficient application, adapting these techniques to our more humid mountainous environment, minimizing the introduction of weeds and sourcing the right mulch materials. We also encountered a problem with moist bales that did not disperse well when they were dropped. This problem was solved by fire crews who cut the bales in half with chainsaws before they were dropped. Mulching onto snow was another potential challenge, but in the end, it didn't turn out to be an issue because the snow was shallow or hard enough for the bales to disperse. Our collective success in accomplishing the treatments was due to the dedicated and talented protection and district staff who carried out the implementation phase with our input.

Currently, we have a Forest Investment Account (FIA) funded research project to study the soil and hydrologic processes causing post-fire erosion, including the impact of water repellency, burn severity, rainfall intensity and duration, and the persistence of erosion risks. Rainfall simulation and erosion study plots were installed on three of the 2007 sites in the west Kootenay, which will be used to test some of these factors over the next couple years.

Our approach to managing post-fire risk has evolved through an adaptive management strategy that has been, and continues to be, guided by detailed research findings, effectiveness monitoring and practical experience during our risk assessment and mitigation programs. This ongoing research and monitoring will be used to further refine the policy and procedures for the next time they are needed.

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Ashley Covert, MSc, is an auxiliary scientist hired to work on the wildfire erosion project.

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