SAFEWOODS

Woodlot Licence & Community Forest Agreement Safety Committee

Rainfall Events – Operational Management and Safety Considerations

Climate change and seemingly more frequent extreme weather events are affecting the safety and performance of forest infrastructure and operations in diverse and unexpected ways. In some cases, the results include increased safety risks for road users, structure failure rates and maintenance costs. Tenure holders need to understand how climate change, and rainfall events in particular, can affect the safety of their forest operations, and what they can do to prepare for, and respond to those events.

For purposes of this guide, rainfall events are defined as:

- an extremely high rainfall in a 24-hour period,
- sustained rainfall in a 3-day period,
- antecedent rainfall followed by a heavy rain event,
- rain on snow, and,
- rapid snowmelt

Climate change may bring increased stream peak flows and flashiness. Heavy rains can carry debris which plugs and/or damages stream crossing structures (bridges and culverts). Ditches may be overwhelmed during rain events resulting in backed up culverts, compromised ditch-blocks, and water pooling on roads. Road washouts can occur quickly and may surprise drivers. Soil next to bridges and culverts may be eroded by heavy rains and high stream flows. Be cautious and assess crossings from a safe distance before driving over them. Travelling in the dark during heavy rain events is not recommended. Limited visibility can result in not being able to spot washouts in time to stop safely.

Tenure holders need to anticipate current and forecasted changes in temperature and precipitation and the implications these changes may have on resource road infrastructure and management. This information is necessary to identify and adapt methods to plan, build, maintain and deactivate resource roads so they are resilient to climate change. Will climate in your area be getting hotter, drier, wetter? How will you need to adjust your management activities?

A key step is to create an accurate, up-to-date inventory and performance assessment of existing resource road infrastructure held under your tenure. Then, risk-rate those roads and develop a road inspection schedule based on risk (i.e., inspect high risk sections annually and after rain events). Document road and infrastructure condition and use this information to prioritize the form, timing, and location of maintenance activities to anticipate future maintenance needs. Consider engaging with a **Professional Geotechnical Engineer** to help identify high hazard areas and prescribe mitigative measures.

Tenure holders should review and record the number, location, and diameter of existing structures and re-evaluate the ability of current culverts and bridges to adequately pass or accommodate flood conditions and increased water flow, bedload, and debris. Ensure that water crossings on winter roads can accommodate flows from early thaws or from rain-on-snow events. Review current guidelines on cross-drain culvert placement (Section 3.6.4 Ministry of Forests Engineering Manual), spacing and sizing. Given predicted frequency of peak events, it may be necessary to increase the number and size of cross-drain culverts to accommodate higher flows and more debris and, thereby, reduce the likelihood of washouts.

Remove water crossing structures if a road is expected to be inactive for an extended period. If ongoing maintenance of the water crossing and drainage structures won't or can't be regularly done, consider removing all or some of the structures to reduce maintenance issues and prevent road washouts.

Rainfall events are often accompanied by strong winds that increase windthrow risks and the hazards of danger tree failure. Soils are weaker when they are saturated and combined with strong winds, leave trees within cutblocks, or along road right of ways are more susceptible to blowdown. Operations in areas with leave trees should be curtailed during extreme rain and wind events.

Legacy roads are those roads on the land that are not permitted and generally not maintained. They may have been constructed several decades ago and have never been deactivated. They may have drainage structures that are no longer functional, especially during peak rainfall events. Consequently, these roads may be at a higher risk of failing in extreme rain events. As the holder of an area-based licence, it's in your best interest to be aware of any legacy roads when developing a nearby area and determining whether any intervention is required to prevent a potential failure. Again, using the services of a **Professional Geotechnical Engineer** may be necessary.

Discourage the use of **plastic culverts** in wildfire prone areas. If plastic pipes are used, install non-flammable segments on the ends of the pipe.

Optimize the number and spacing of roads (often measured as **road density)** to ensure that the least amount of road is constructed and maintained to support the required economic, recreational, and community/wildfire access activities in the area. Minimize your liabilities - if you no longer need a road, stabilize/deactivate it so you minimize the likelihood that it will be a problem during peak events.

Budget for summer and winter **road maintenance** activities to better manage risk.

- Seed erodible ditches and side slopes. Ensure that erosion resistant materials and slope stabilization methods are implemented in and around cross drain culverts.
- In landslide prone areas, implement enhanced erosion and stabilization techniques, such as armoring and vegetating slopes, and, especially, the toes of slopes.
- Reduce the erosive capacity of roadside ditch water through the effective use of diversion ditches to move the water away from the road. Ensure the use of adequately sized ditch blocks in ditches to direct ditch water into cross drains and prevent its concentration.
- Inspect deactivated roads from time-to-time to ensure they are functioning as expected.
- Be familiar with hauling regulations, allowable truck weights and truck haul configurations. Regulations such as spring haul restriction periods and winter weight premiums can be important factors when planning heavy vehicle hauls and management of the resource road infrastructure during certain periods of the year.

Tenure holders need to consider the implications of climate change and extreme weather events on safety within their forestry operations, from initial planning and design to implementation and maintenance. Extreme events are more likely in the years ahead. This article by no means covers every scenario but is intended to encourage tenure holders consider how climate change will impact their operations and the safety of all road users.

Links:

Climate Vulnerability Forest Management Tool (arcgis.com)

Research Report (gov.bc.ca)

Microsoft Word - 19-214 MFNRORD Southern Engineering Gp Wet Weather Shutdown Criteria - FINAL.docx (gov.bc.ca)

Climate change adaptation for resource roads - Province of British Columbia (gov.bc.ca)

FOR Engineering Manual - Province of British Columbia (gov.bc.ca)

List of Automated Snow Weather Stations - Province of British Columbia (gov.bc.ca)

Data - AQUARIUS WebPortal (gov.bc.ca)