

Hydrology

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Forest Management in Watersheds With Fans: Reducing the Risks

The highly-regarded and innovative work on alluvial fans conducted by the Smithers-based research team expanded in new directions during 08/09. Previously, research and extension led by Dave Wilford demonstrated and brought awareness to how the shifting of stream channels and the run-out of landslides on alluvial fans in BC has caused significant losses to water systems, fish habitat, buildings, and human lives. This year, he expanded the scope of inquiry by moving from examining site-level influences on fans to watershed-level management. This new direction recognizes that forest management at both scales, site and watershed, can influence the stability of fans.

08/09 Activities

This project has brought together, synthesized, and publicized for the first time information on the risks posed by activities in BC's fan-watershed systems. The information reveals how forestry activities in watersheds can aggravate natural processes, increasing the hazards of debris flows and floods.

Clients

A major component of this project involved sharing the watershed-level information with forestry practitioners throughout BC via field workshops, conferences and office presentations. To extend the work even further, the project produced a MOFR Land Management Handbook on watershed-level forest management to address the risks of destabilizing alluvial fans.

Relevance & Impact

Foresters require a watershed perspective on alluvial fan hydrology and geomorphology to achieve the objectives of the Forest Planning and Practices Regulations given in Section 54 on fan destabilization, Section 35 regarding soil disturbance, and Section 57 on protection of fish and fish habitat. This project newly assembled and extended the knowledge on watershed-level fan management needed to properly address these aspects of the Regulations. In practical terms, the insights gained and information disseminated by this project will contribute to reducing impacts of forest management on alluvial fans in BC. The savings to habitat, water, property, and lives are significant.

Partners & Collaborators

The Research Team also includes: Matt Sakals, Tom Millard, Tim Giles, and Robin Pike from the MOFR, Todd Redding from FORREX, and Bill Grainger from Grainger and Associates. Partners in the project include: BCTS, MOFR, COFI, CFP, and APEGBC.

Applicable Divisional Priorities

Forest Stewardship Division

- *B.1.1* Continue to work with our partners to ensure we have a smooth transition to the new results based regime

Operations Division

- *A.2.d.* Provide leading edge, first class training programs
- *B.1.* Support delivery of the Ministry's Service Plan
- *B.5.c.* Promote a culture of safety and safe practices in the forest industry
- *B.6.a.* Promote professional reliance, professional accountability, and compliance and enforcement under the *Forest and Range Practices Act*

Major Issues Addressed

- FRPA implementation
- Sustainable forest management

Recent Publications

- Wilford, D.J., M.E. Sakals, W.W. Grainger, T.H. Millard, and T.R. Giles. 2009. Managing forested watersheds for hydrogeomorphic risks on fans. B.C. Min. For. Range, Res. Br., Victoria, B.C. Land Manage. Handb. 61. <http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh61.htm>
- Millard, T., D.L. Hogan, D.J. Wilford, and B. Roberts. 2009. A method to assess fluvial fan channel networks, with a preliminary application to fans in coastal British Columbia. *Geomorphology*. In press.
- Pike, R.G., Redding, T.E., Wilford, D., Moore, R.D., Ice, G., Reiter, M., and Toews, D.A.A. 2007. Detecting and predicting changes in watersheds (Ch. 14). In: Moore, R.D. Pike, R.G. and Winkler, R.D. (ed). *Compendium of Forest Hydrology and Geomorphology in British Columbia*. FORREX, Kamloops, BC.
- Millard, T.H., Wilford, D.J., and M. Oden. 2006. Coastal fan destabilization and forest management. B.C. Min. For. Range, Coast Forest Region, Nanaimo, B.C. Technical Report 034.
- Wilford, D.J., S.R. Morford, and R.G. Pike. 2006. Forest management on alluvial and colluvial fans: extension plan and evaluation survey of workshops, publications, and presentations. B.C. Min. For. and Range, Res. Br., Victoria, B.C. Tech. Rep. 031.
- Wilford, D.J., Sakals, M.E., and Innes, J.L. 2005. Forest management on fans: hydrogeomorphic hazards and general prescriptions. B.C. Min. For., Res. Br., Victoria, B.C. Land Manage. Handb. No. 57.
- Wilford, D.J., Cherubini, P., and Sakals, M.E. 2005. Dendroecology: a guide for using trees to date geomorphic and hydrologic events. B.C. Min. For., Res. Br., Victoria, B.C. Land Manage. Handb. No. 58.
- Wilford, D.J., Sakals, M.E., Innes, J.L., and Sidle, R.C. 2005. Fans with forests: contemporary hydrogeomorphic processes on fans with forests in west central British Columbia, Canada. In: Harvey, A.M., A.E. Mather, and M. Stokes (eds.). *Alluvial Fans: Geomorphology, Sedimentology, Dynamics*. Geological Society, London. Special Publications 251: 24-40.
- Wilford, D.J., Sakals, M.E., Innes, J.L., Sidle, R.C., and Bergerud, W.A. 2004 Recognition of debris flow, debris flood and flood hazard through watershed morphometrics. *Landslides* 1(1): 61-66.
- Grainger, B and Wilford, D.J. 2004. The effects of fire on geomorphic processes. *Streamline Watershed Management Bulletin*. 7(4): 16.

- Wilford, D.J., Sakals, M.E., Innes, J.L., and D. Ripmeester. 2004. Kitsequecla fan case study: specific risk analysis. In: Wise, M. P., G.D. Moore, and D.F. VanDine (eds.). Landslide risk case studies in forest planning and operations. B.C. Min. For., Res. Br., Victoria, B.C. Land Manage Handb. 56: 83-89.
- Wilford, D.J. and R. Lalonde. 2004. A Framework for Effective Watershed Monitoring. Streamline Watershed Management Bulletin 8(1): 5-10.
- Wilford, D.J., Sakals, M.E., and Innes, J.L. 2003. Forestry on fans: a problem analysis. Forestry Chronicle. 79(2).