A new strategic level forest planning tool:

Modelling Timber Harvesting Effects on Fish Stream Habitat

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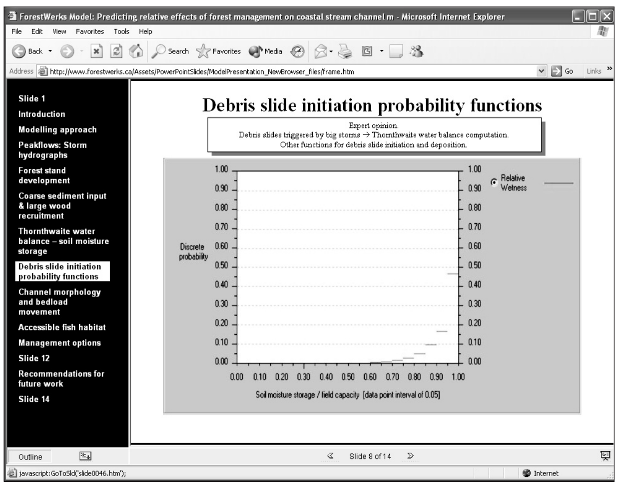
How effective are current regulations and rules in preventing negative impacts on aquatic-stream systems? How do alternative forest management strategies affect fish habitat in the long term? What are the potential trade-offs between forest management strategies and acceptable aquatic habitat conditions?



This slide is one from a Powerpoint presentation that describes the simuluation model and what it can do. The model is described in more detail in a slide presentation on www.ForestWerks.ca

To address these questions, I have developed a simulation model that tracks cumulative watershed effects. This model and research provide a strategic level forest planning tool that can predict relative impacts of forest management on fish habitat in small and intermediate streams in coastal British Columbia. In addition to many biotic processes, the production of salmonids and other aquatic organisms depends on the structural complexity of aquatic habitat within stream systems. The approximation of timber harvest-induced changes in pattern of runoff generation, coarse sediment input, and large wood recruitment, and their likely impact on the channel network and hence aquatic habitat, are essential for qualitatively evaluating forest management options.

The simulation model assumes that major precipitation events and the ensuing storm runoff "drive" the system. These major events initiate debris slides, mobilize sediments, entrain large wood in stream channels, and change stream habitat characteristics. The model uses operationally available ecological information about forest stand dynamics and it simulates storm peakflow events. Debris slides as the input mechanism of coarse sediment into the channel network and bedload transport in channels are modelled. The recruitment of large wood into channels from hillslopes, riparian zones, and upstream channels, and the dynamics of log jams as critical elements for channel morphology and aquatic habitat are simulated. Changes in channel morphology are tracked and the habitat capability of the channel network is rated, using for this analysis the example of coho salmon. Habitat ratings of other aquatic species could be integrated in future work. Forest harvesting is simulated to produce diverse cutting patterns across the landscape.

I applied the model to a 3,200 ha watershed in the Tsitika River basin on northeastern Vancouver Island. Elevation, site series, and terrain information are from this watershed while all other data are from the literature and expert opinion. I am interested in trends in frequency distributions and relative answers.

The model produces expected trends in log jam numbers, bedload yield, and fish habitat capability rating. Without riparian buffers, log jam numbers decrease with increasing harvest volume. Bedload yield increases with increasing debris slide rates and decreasing log jam numbers. Coho salmon habitat capability rating tends to decrease with decreasing log jam numbers. A key finding is that large wood input limits coho salmon habitat quality. Thus, forest managers may need to consider large wood input and log jam dynamics in addition to sediment input when attempting to create a forest with sustainable aquatic stream habitat.

As more watersheds on the central coast of British Columbia are being slated for harvesting, I hope to inform the decision making process by using and improving this forest planning tool. A simplified version of the model will be freely available at ***http://www.ForestWerks.ca*** by fall 2003.

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