LOGGING TO SUPPLY TIMBER VS. LOGGING TO SUPPLY WATER: *Is there a Difference?*

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In all of the long-drawn-out, at times acrimonious disputes over logging in Alberta's southern Eastern Slopes, one question has continued to baffle observers. Why has the Alberta government, despite all of the mounting opposition, been so determined to push ahead with logging these precious watersheds when the economic benefits are so minimal and the environmental costs so high?

One possible answer to that question has been hinted at in recent comments from government spokespeople in the media. What if the government is indeed logging full speed to maximize resource extraction from the forest, but the primary focus is not on the production of timber, but on the production of water? If you have a tunnel-vision focus on managing forests to supply one thing – be it timber or water – then other things, including wildlife and recreation are likely to suffer. This seems to be the case in Alberta.

The theory is relatively straightforward. When snow falls on a closed canopy forest, much of the snow in the canopy either evaporates or "sublimates" straight into the atmosphere. But if areas of forest are removed, through logging, fire or insect kill, this "lost" snow makes it to the ground. Here evaporation and sublimation are much slower, and so the yield of water is likely to be much higher, either in the form of runoff into rivers or percolation into the groundwater. So the temptation to log forests to potentially capture more valuable water is clear, whatever the negative effects may be.

Water is, of course, a precious resource. We know that demand for southern Alberta's limited water resources by far exceeds supply and that water in the South Saskatchewan basin is over-allocated. The attraction of managing forests to supply more of this valuable commodity is clear with water storage capacity in the Oldman, Bow and Red Deer River reservoirs and a market for selling or lending valuable water diversion rights.

In a case of "careful what you wish for" AWA has long argued that, with respect to forest management, it would make more sense to prioritize maintaining a supply of clean and abundant drinking water over supplying timber. While the Alberta government may have been listening to this half of the equation, unfortunately it seems to have missed the necessary accompanying step. This calls for the government to manage forests holistically for all of the myriad services they provide. Wildlife habitat and low-impact recreation opportunities have to be considered as well. The province also seems to have ignored the harmful, long-lasting effects to stream health resulting from the roads demanded by a timber-centric approach to the Eastern slopes.

Sublimation

Sublimation is defined by the *Chambers Dictionary* as "the change from solid to vapour without passing through the liquid state." Traditionally we think of snow "melting," turning into water, but in fact a high proportion of our winter snow does not melt; effectively it turns directly into a gas and evaporates away. The rate at which this snow sublimates depends on a number of factors, including temperature, slope, aspect and vegetation cover.

Marmot Basin Study

An extra risk of this blinkered approach of managing forests to supply water is the increased danger of flooding which comes from managing forests to supply maximum water volumes. As anybody who lived through the 1995 and 2005 floods in southern Alberta will remember all too vividly, the issue is not just how much snowmelt enters the rivers, but how much of that water is concentrated at peak flow times. A 2011 University of Saskatchewan study of the 9.4 km^2 Marmot Creek basin in Kananaskis Country found that "*Peak* daily streamflow discharges responded more strongly to forest cover decrease than did *seasonal* streamflow with increases of over 20% in *peak streamflow* with removal of forest cover" (emphasis added).

The Pomeroy, Fang, Ellis, and Guan study, *Sensitivity of Snowmelt Hydrology on Mountain Slopes to Forest Cover Disturbance*, throws valuable light on the implications of forest disturbance for water production within a drainage basin. The authors modeled a range of different disturbance scenarios and estimated their implications for:

- Seasonal Flow
- Peak Flow
- Snowmelt
- Streamflow
- Groundwater recharge

Seasonal Flow

- "Peak streamflow occurred in May and June and showed little difference in timing with forest cover change."

Peak Flow

- "even a 5% clearing of the basin forests resulted in a 7% to 8% increase in peak streamflow and further increases in forest disturbance to 60% of the basin resulted in up to a 23% increase in peak streamflow.

Snowmelt

- Pine beetles were found to have only a minor effect on snow melt "due to only 15% of the basin area being covered with lodgepole pine and this pine being at lower elevations which received much lower snowfall and rainfall than did higher elevations…"
- Complete pine mortality due to beetle kill would only result in a 5 percent increase in snowmelt. With salvage logging the increase in snowmelt due to pine beetle would double to 10 percent.
- A 5 percent removal of canopy (through logging or fire with salvage logging) could result in a 10 percent increase in snowmelt.
- A 60 percent removal of canopy (through logging or fire with salvage logging) could result in a 45 percent increase in snow accumulation.

Streamflow

- Complete pine mortality due to beetle kill would cover up to 15 percent of the basin area but only increase streamflow by less than 2 percent. With salvage logging this increases slightly to just over 2 percent.
- By contrast, forest disturbances from fire, salvage logging, and clearing ranging from 5 to 35 percent of basin area increase streamflow by from 3 to 5 percent.
- The most dramatic effect on streamflow came from fire; a complete burning of the basin with retention of burned trunks) resulted in an 8 percent increase in streamflow.

Groundwater recharge

- Groundwater recharge quantities ranged from 1,020,000 to 1,500,000 m3 each year, compared to annual streamflow of 3,500,000 to 5,600,000 m3.
- A 50 percent removal of the basin's forest would lead to up to a 7 percent increase in groundwater recharge.
- As forest removal exceeded 50 percent further increases in groundwater recharge did not occur.

The Pomeroy et al study acknowledges: "Water supplies in the rivers draining the RMES (Rocky Mountain Eastern Slopes) have been and are predicted to decline whilst demand increases due to rising population and increasing consumption from downstream agriculture and industry…" Later they note: "Water supply in this region is now exceeded by demand and ecosystem requirements."

Though this study makes it clear that we can indeed manipulate water volumes in rivers by the way we manage forests, whether or not we have the ability to do this *safely* is by no means clear. If, as this research seems to suggest, future flooding can be shown to be a "man-made" disaster rather than a natural occurrence, then the Alberta government may well be susceptible to legal action from anybody suffering from flood damage to property or from insurance companies. The Alberta public, of course, has never been given the opportunity to comment upon the advisability of managing forests to supply water to the exclusion of other forest resources.

Lost Creek Study

This research on snowmelt hydrology seems to leave out one critical piece of the puzzle; the additional impacts of logging roads on water quality. This extra strain on water health has been amply demonstrated in the Crowsnest Pass as seen in the research of the Southern Rockies Watershed Project, led by Uldis Silins of the University of Alberta's Department of Renewable Resources. This long-term study has monitored the effects of the huge 2003 Lost Creek fire on water quality. It compares water quality in unburned watersheds with watersheds that had been burned and also with forests which had been burned and then salvage logged.

The Lost Creek fire undoubtedly harmed the watershed's water quality, including "dramatically increased loading of sediments, nutrients, and other contaminants into the fire affected streams." And significantly, "(s)alvage logging produced incremental effects, over and above those of wildfire alone." The mechanism for these additional impacts is the roads infrastructure that comes with logging: "In salvage logged watersheds, sediment redistribution appeared to be further exacerbated by linear features, such as skid-trails and the larger network of trails and roads, which served as conduits for overland flow and sediment transport."

Star Creek Logging

David McIntyre, the University of Washington trained forest scientist who calls the Crowsnest Pass home, suspects logging for water is behind plans to log 180 hectares in the Star Creek Valley as part of the Southern Rockies Watershed Project. This valley's habitats are vital to cutthroat trout and grizzly bears. McIntyre made this connection when he told the *Calgary Herald*: "We know the South Saskatchewan River is over allocated, we know that industry wants water, we know that agriculture wants water. I am convinced this is all about logging one watershed to prove what we already know, that we can log it in a way that will increase water."

AWA believes that, properly managed, our forests should be managed "holistically." We must avoid managing forests with one single purpose in mind (such as providing timber or providing water). Instead, we must strive to balance all of the many and varied services which healthy forests provide us with. If the Alberta government continues to lurch from clearcutting forests to supply timber to clearcutting forests to supply water, then the casualties – from cutthroat trout to grizzly bears to flood victims – will continue to rise. In October 2011, a number of environmental groups, landowner organizations, watershed groups, and businesses produced the report, *Sustainable Forests, Sustainable Communities: The Future of Alberta's Southwestern Forests*. Its prescription will hopefully turn out to be highly prophetic:

> "There is an urgent need to create an alternative model of forest management in Alberta. We envision a new model, based on ecosystem management, guided by independent scientific expertise and augmented by local community participation and benefit. We are not opposed to all logging. Instead we support the development of a forest management model that maintains healthy forest ecosystems as its primary function, and offers sustainable benefits to communities from the wise use of these forests."