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Feb. 12, 2014

To: The Honourable Stephen McNeil,
Premier of Nova Scotia;
The Honourable Zach Churchill,
Minister of Natural Resources;
The Honourable Randy Delorey,
Minister of Environment.

Subject: **Need for transparent and objective assessment of our forests' potential to meet demands for forest fibre and biomass sustainably**

Dear Mr. Premier McNeil, Minister Churchill and Minister Delorey:

I am writing these comments as a member of the board of the Woodens River Watershed Environmental Organization and in response to a request from our Co-Chair, Richmond Campbell, to comment on the possible implications of the government giving Northern Pulp access to the St. Margaret's Bay Bowater Lands. I am a retired Professor of Biology (Dalhousie University) with research experience in ecosystem processes.

WRWEO's primary mandate is protection of the Woodens River system of 19 lakes, streams, and riverscape that empty into St. Margaret's Bay. To that end we were involved in efforts to protect the Five Bridge Lakes Wilderness Area, which encloses one of the headwater lakes for the Woodens River, and wholly or partially encloses 5 other lakes. Amongst the stressors on the river system and its trout population are acid rain and clearcutting, which are probably the major stressors on Nova Scotia forests at large. We were consulted and had some input in relation to the purchase and plans for the St. Margaret's Bay Bowater Lands, our interest being the common larger watershed, ecological connectivity of the Chebucto peninsula lands with the larger mainland and the prospects the area offers for genuine greening of the local economy.

In this context, we are concerned about the government "honouring a commitment by the previous government that gives Northern Pulp access to an additional 125,000 green metric tones", and the discussions around a significant part of that coming from the St. Margaret's Bay Bowater Lands.

Two matters are of particular concern that, in addition to Northern Pulp's request, apply more broadly to forest fibre and biomass harvesting in Nova Scotia at large.

(i) Definition of Clearcutting

I understand that the government is committed to the target of reducing clearcutting to 50% of all harvesting, a goal set in 2010 that received all party support and wide public support in Nova Scotia. That support reflects a broader understanding and appreciation of Nova Scotians of the role of older growth forests and multi-aged stand management for biodiversity conservation, protection of water resources and carbon sequestration.

On Aug 15, 2012, the Dexter government released an operational definition of clearcutting:

> In Nova Scotia, a clearcut is now defined as a forest harvest where less than 60% of the area is sufficiently occupied with trees taller than 1.3 meters

with links to [Clearcut Definition] [Clearcut FAQs] providing more details.

The website where this is posted[1] boasts: " Nova Scotia is setting a precedent with its clearcutting target and definition."

However this definition is simply not consistent with the broadly accepted objectives of reducing clearcutting/promoting multiage management, and lacks both professional and public credibility. The rationalization cites "the potential of saplings" noting that "immature trees exceeding 1.3 metres tall are considered saplings … They have distinct visual and ecological impacts on harvest areas beyond what is produced by seedlings." This is very different from multiage management and the benefits it offers for biodiversity conservation, watershed protection and long term productivity. The best that can be offered in support of the definition is that "protection of sapling sized trees during harvesting has a significant potential to reduce future forest rotation lengths" – hardly a factor that increases sustainability in an ecological context!

Forester Jamie Simpson views it this way[2]:

> What's wrong with the definition? First, let's look at the context. The government promised to reduce clearcutting to 50% of all harvesting. So, half of all cutting can still level the forest to the ground, clearcut and whole-tree harvested, leaving nothing but ruts, exposed soil and the occasional "wildlife clump" of trees. According to the new definition, this devastation can take place in any forest type, including those forests least able to recover from such barbarous cutting.
>
> The other half of all cutting can reduce the forest to a scattering of trees that need only be a little more than 4 feet tall. Within a "non clearcut", 40% of the ground can be devoid of any trees, and in the remaining 60%, as long as some scraggly 4-foot-and-3-inches-high balsam fir or tamarack remain (standing or not), then presto, it's not a clearcut. And when determining if the embarrassingly low threshold has been met, feel free to include trees up to 25 metres into the surrounding forest, outside of the cut.
>
> So, what have we got? Half of all cutting can leave a moonscape; the other half can leave a scattering of low-quality trees, none necessarily higher than 4.25 feet. The government has reached their contrived, twisted goal, but have we really made any progress towards sensible forest management? No: our entire forest can be reduced to young, even-aged, low-value forest, and the Government can happily say they've fulfilled their promise to Nova Scotians.

What was widely anticipated before the definition came out was "a policy and definition promotes more partial harvesting and uneven-aged management – basically harvesting that leaves behind an intact forest overstory. The current definition fails because it can be met by leaving behind only seedlings and saplings, and still allows for the complete removal of the overstory."[3]

Clearly, this definition needs to be revised through a transparent and scientifically credible process. As it stands, it renders the commitment to a 50% reduction in clearcutting meaningless. Conditions that the government might attach to harvesting permits open the door to claims that a company has met restrictions on clearcutting when in reality they have not.

(ii) Sustainability of forest fibre and biomass supply

The definition of clearcutting is problematical because it ignores almost entirely the ecological and social values of forests and the potential for production of products other than fibre and forest biomass. But even as plantation type production systems, there are serious challenges to their sustainability related to the supply of calcium, in turn related to our geology, acid rain and our past history of forest management.

The broad outlines of this story have been known since the 1980s when declines in salmon on the Atlantic coast were related to acidification of surface waters, that in turn attributed to acid rain and the poor buffering capacity of the forest ecosystems, especially those developed on slates, granites and felsic bedrock.

Water acidity increases when there is not enough calcium and other basic cations (mainly potassium, magnesium) coming off the uplands through natural processes to buffer the leaching effects of acid rain. Emission controls introduced in response to acid rain problems have reversed the trend of increasing acidity in lakes and streams in most of eastern North America, but not so over much of Nova Scotia – including the lands of our Woodens River Watershed and the St. Margaret's Bay Bowater Lands - because of the poor buffering capacity of the soils[4,5] and the more recently discovered effects associated with aluminum toxicity[6].

> This is the only part of the world where acidity is not improving with major cuts in acid rain emissions. (Tom Clair, CBC interview, 2012.)

The methodology developed to look at effects of acid rain on surface waters was subsequently applied to look at effects of acid rain on forests without consideration of harvesting effects. In a study published in 2006[7], it was predicted that in the absence of harvesting, nutrient reserves under much of the Nova Scotia's forests will decline:

> Approximately half of the mapped area in Eastern Canada are exceeded. Given the increasing evidence that high exceedances lead directly or indirectly to forest damage (Akselsson *et al*., 2004; Duchesne *et al*., 2002; Moayeri, 2001; Ouimet *et al*., 2001; Thomsen and Nellemann, 2003), the possibility of decreasing forest growth and health appears strong in the exceeded regions. We conclude that further reductions in national and international S and Nemission rates should be undertaken in order to protect forest soils in Eastern Canada from excessive soil acidification in the long term.

"Exceedances" occur when the removal of basic cations by acid rain exceed the additions though atmospheric deposition and weathering of rocks. Quillet et al.[7] estimated that 39.9% of Nova Scotia mapped in exceedance based on the average 1994–1998 atmospheric total S+N depositions.

More recently, this methodology has been extended to look at effects of biomass harvesting on soil nutrient pools and the extent to which it might exacerbate effects of acid rain. Methodology has been developed specifically for Nova Scotia as described in a 2011 MSc thesis by Joshua Noseworthy in the Faculty of Forestry and Environmental Management at UNB[8]. The work was conducted under the supervision of Dr. Paul Arp, well known for his pioneering work in this area, and was sponsored by the Nova Scotia Department of Natural Resources.

One very significant result from the Noseworthy research, which incorporated more detailed local information than the Ouillet et al. study[7], is an upward revision of the estimate of the area of Nova Scotia mapped in exceedance from 39.9% to 73%. This is simply not good news for Nova Scotia: even with no harvesting, soil fertility under 73% of our forests will continue to decline because of acid rain.

Like acid rain, forest harvesting removes basic cations from forest soils and could be expected to exacerbate acid rain effects &/or lead to declines in nutrient reserves even in the absence of acid rain on some sites. For stem only-clearcuts, Noseworthy's results indicate an average 52% increase in Base Cation Depletion over the background acid rain effect averaged for all of Nova Scotia. The results also indicate that "there are stands within the province which would be subject to harvest-induced nutrient losses, without the added strain of soil acidification," but further details are not given. (Few detailed results are given in the thesis "due to confidentiality concerns with Nova Scotia forest inventory data".)

Also, these estimates do not include accelerated losses of nutrients after clearcutting[9], and so in that sense can be considered conservative.

Overall, these results would seem to make a strong case for the elimination of all clearcutting in N.S forests – not just whole tree harvesting (as proposed in 2013)[10] - an implication not discussed in the thesis, but a fairly obvious and logical inference. Noseworthy presents results for calculations of sustainable harvest rates across

Kejimkujik National Park for harvesting with and without base-cation depletions (his Fig. 9.19).* Although not specifically discussed in this context, the results can be interpreted as indicating that limited selective harvest schemes, but not clearcuts, would be sustainable for most of that area. Such a conclusion would likely apply also to the Bowater St. Margaret's Bay Lands which have similar geology, and indeed probably to most of Nova Scotia forests.

*There is no assumption that there would be commercial harvesting in Keji - details for Keji but not other areas are apparently given because there are no commercial interests in it as it is a protected area; also exisiting data on outflow of nutrients in streams allowed some validation of the methodology.

Clearly the results of the Noseworthy research, including those that have remained confidential, deserve to brought into public discussions on the future of Nova Scotian forests as sobering as they might be for the wood fibre and forest biomass industries. While the stated focus of the study was to examine the sustainability of forest biomass harvesting for energy production, the results are clearly applicable to clearcutting more generally and provide a framework and methodology (if not the specific results, which we don't know) for comparing clearcutting to selective harvesting under multi-aged harvesting schemes for their impacts on soil nutrient pools.

The growth-limiting nutrient and the one most subject to elevated depletion rates identified in the Noseworthy and earlier research is calcium, as is common for forests eastern North America. In addition to the well known effects of calcium loss and aquatic acidification on salmonids, many studies are emerging showing that declines in calcium under forests are having diverse adverse effects either through calcium deficiency directly or indirectly through reduced pH, aluminum mobilization and enhanced mercury toxicity e.g., on cold tolerance of red spruce[11], sugar maple decline[10], forest salamanders and snails[12], loon reproduction[13], zooplankton[14], forest herbs[15], invertebrates and song birds[16].

Obviously nutrient depletion issues should come into decision-making processes around forestry whether on public or private lands, but there is very little description or discussion of such issues in literature from or on the website of the Dept of Natural Resources. Certainly the department has the expertise and tools to address this issue and has invested in it – why then are we not seeing it highlighted in the public domain? Can we assume that DNR personnel are discussing these issues with Northern Pulp?

In Nova Scotia, we have to face the fact that our soils have some of the lowest weathering rates (and hence lowest capacity to replace calcium and other basic cations) amongst soils of Europe and eastern North America[4], to which we have to add the stress of acid rain. That doesn't mean we cannot have biodiverse, productive forests - witness the few old growth stands that we still have, successful cases of mult-aged management for hardwood timber, and growing markets for non-timber resources from our forests. But it does mean that we cannot clearcut them again and again without penalty. We are already paying

penalties. Granting more licenses to clearcut whether for fibre or biomass is equivalent to adding to our financial debt and passing the burden on to future generations. The science is in. Surely it is time for straight talk, open discussion and complete transparency on these issues.

Thank you for considering these comments.

David G. Patriquin
cc:

Honourable Labi Kousoulis, Minister of the Public Service Commission & MLA for Halifax-Citadel-Sable Island

Honourable Denise Peterson-Rafuse, MLA for Chester-St. Margaret's

Joachim Stroink , MLA for Halifax Chebucto

Iain Rankin, MLA for Timberlea-Prospect

Tom Musial, Chair, Five Bridge Lakes Wilderness Area Stewardship Committee

Geoff LeBoutlier, St. Margarets Bay Stewardship Association

Matt Miller, Wilderness Coordinator, Ecology Action Centre

Members of WRWEO

Notes

1. DNR's operational clearcut definition at http://novascotia.ca/natr/strategy/clear-cut-definition.asp

2. NDP definition far from clearcut. Op-ed by Jamie Simpson in the Chronicle Herald, August 25, 2012.

3. Matt Miller, Wilderness Coordinator, Ecology Action Centre, personal communication.

4. C.J. Whitfield et al., 2006. Comparison of weathering rates for acid-sensitive catchments in Nova Scotia, Canada and their impact on critical load calculations Geoderma 136; 899–911.

5. F. Dennis et al., 2007. Freshwater acidification research in Atlantic Canada: a review of results and predictions for the future. Environmental Reviews 15: 153-167.

6. F. Dennis & T.A. Thomas A. Clair. 2012. The distribution of dissolved aluminum in Atlantic salmon (Salmo salar) rivers of Atlantic Canada and its potential effect on aquatic populations. Canadian Journal of Fisheries and Aquatic Sciences 69:1174-1183.

7. Ouimet, Ret al. 2006. Determination and mapping of critical loads of acidity and exceedances for upland forest soils in Eastern Canada. Water, Air and Soil Pollution 172: 57-66.

8. J. Noseworthy. 2011. Mass balance, biogeochemical framework for assessing forest biomass harvest sustainability. A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Masters of Science in Forestry in the Faculty of Forestry and Environmental Management, University of New Brunswick.

9. F. H. Bormann et al., 1968. Nutrient Loss Accelerated by Clear-Cutting of a Forest Ecosystem

Science 159: 882-884.

10. Whole tree harvests at http://novascotia.ca/natr/strategy/forests/whole-tree-discussion.asp

11. M. E. Fenn et al. 2006. Status of soil acidification in North America Journal Of Forest Science, 52 (Special Issue): 3–13.

12. C.M. Beir et al. 2012. Changes in faunal and vegetation communities along a soil calcium gradient in northern hardwood forests. Canadian Journal of Forestry Research 42: 1141–1152.

13. Bird Studies Canada. 2013. The Canadian Lakes Loon Survey 1981-2012. Accessed Feb 9, 2013 at www.birdscanada.org/volunteer/clls/resources/CLLSsummary.pdf

14. A. Jeziorski, et al. 2008. The widespread threat of calcium decline in fresh waters. Science 322, 1374

15. N. M. Hill & D.J. Garbary 2011 Habitat may limit herb migration at the northern edge of the Appalachian deciduous forest Botany 89: 635-645.

16. S.E. Pabian & M.C. Brittingham. 2012. Soil calcium and forest birds: indirect links between nutrient availability and community composition . Ecosystems 15: 748–760.