

Addendum Nov 18, 2017

Prepared for meeting on Nov 18, 2017 with Prof William Lahey (Project Leader for the Independent Review of Forestry in Nova Scotia)

The notes above were prepared initially for a meeting with Premier McNeil in his constituency office on April 11, 2016. Donna Crossland, who lives in his constituency, asked for the meeting and invited myself and Bob Bancroft to join her to talk about our concerns about the science underlying forestry practices on Crown lands in Nova Scotia. Premier McNeil expressed considerable interest in “the map” and the related story, and said he would be talking to government staff people about it and that he expected they would want to talk to me.

On May 7, 2016, the Chronicle Herald published an op-ed that I wrote under the heading “ Acid rain + clear cuts = permanent loss”. (It was their heading; I had suggested “Of Fish and Forests”, but I was quite OK with CH heading). It described the soil nutrient depletion/aquatic acidification issue as I had outlined to the Premier including the lack of communication from DNR about the Forest Nutrient Budget Model which had been under development since 2009 or earlier and initially had been expected to be ready mid-2010.

Related to the discussions with the Premier and to the op-ed, or not so related, NSDNR scheduled an information session on the Forest Nutrient Budget Model (FNBM) on June 29, 2016. Attendance was by invitation. A wide range of interest groups were invited. I had not been invited to attend, but NatureNS asked me to attend on their behalf.

It was an informative session, handled mostly by NSDNR soil scientist Kevin Keys and I asked many questions. Following the session, I wrote a report on the meeting for Nature Nova Scotia and copied it to NSDNR for comment.

These suggestions were included in that report:

Following are some steps that I suggest would help to establish more confidence in NSDNR’s handling of the “nutrient file”:

- **NSDNR recognizes concerns about limitations to the FNBM** [Forest Nutrient Budget Model] highlighted by questions and discussion at the meeting and in this document.
- **NSDNR considers nutrient issues in the context of whole watersheds** and interacts with aquatic scientists to help address the extreme low aquatic calcium values in many of our watersheds created by acid rain combined with the poor buffering capacity of our soils, and that are exacerbated by clearcutting.
- **The model is validated at the level of a whole watershed or subwatershed in which clearcutting is being conducted, as well as in a watershed not being harvested** and those results published in a recognized journal.
- **NSDNR issues written reports on the status of the model** and its use at annual or shorter intervals.
- **The public at large, and not just the larger private concerns, is given access to the model and to related information such as results of new soil surveys no later than any private partners are given access**, with updates as appropriate (the public availability of the NS Forest Growth and Yield Model with a disclaimer [10] is a precedent).
- **When the output from a FNBM is part of the PTA, the results should be published as part of the public notification process** related to harvests on crown land.

- **Open (public) access to results is agreed upon by any partners in the ongoing and further research in this area by NSDNR.**

NSDNR asked to meet with me on Oct 6, 2016 to discuss the FNBM. I asked Donna Crossland to accompany me. We met with Kevin Keys, their soil scientist, and Bruce Stewart, Manager of Research and Planning for forestry at NSDNR. One week before the meeting, Kevin e-mailed to tell me that a paper on the FNBM had just been published.

We had a frank discussion over an hour and 15 minutes. We were repeatedly told not to go off topic, e.g. at one point I asked whether the model has been applied in practice; Kevin commented No, that they need more site specific data... and “why would we apply a model whose data fundamentally are flawed?” I then commented, OK, but in the absence of the model why is a lot of intensive harvesting going ahead in situations where there must be massive nutrients losses?, Kevin commented that “that goes beyond what we are here to talk about. We here to talk about this model and how it is going to be used.”

Here are my comments on the paper on nsforestnotes.ca, last sentence highlighted here only:

[A Simple Geospatial Nutrient Budget Model for Assessing Forest Harvest Sustainability across Nova Scotia, Canada](#)

by Kevin Keys, Joshua D. Noseworthy, Jae Ogilvie, David L. Burton, Paul A. Arp. *Open Journal of Forestry*, 2016, Vol 6, pages 420-444.

This peer reviewed paper describing the Nutrient Budget Model for Nova Scotia (NBM-NS) was published in an open-access journal on Sep. 29, 2016. Of particular note are data showing large declines in %BS (% Base Saturation) compared to earlier soil surveys (for 25 sites, the declines ranged from -37% to -82%). Very low %BS values (5-10%) are seen over a large part of the landscape, notably over most of SW Nova Scotia where new harvesting operations are focussed. See Fig 3. They reference critical values for %BS cited in the literature: “Cronan and Grigal (1995) suggest 15% BS as a threshold below which “aluminum stress” occurs in forest soils, and Driscoll et al. (2001) suggest 20% BS as a general value for assessing soil recovery from already incurred acid deposition impacts.” So these are already highly stressed systems and the intensive harvesting now getting underway will simply increase the stress to forests and aquatic systems.

At least to this reader, other results are likewise not supportive of intensive (clearcut) harvesting, especially in SW Nova Scotia. For example, they tested the model with site specific data for 25 plantations and found that “Based on comparisons with NBM-NS output, approximately 1/4 to 1/2 of the assessed plantation sites have non-sustainable MMAI yield expectations...Plantations with non-sustainable MMAI values are mainly associated with low soil weathering classes (especially Class 1) and/or tree species with high nutrient demands (e.g., Norway spruce).” Class 1 Gibraltar soils cover much of SW Nova Scotia. Keys et al. identify calcium and nitrogen as the most common limiting nutrients and note that “Ca has long been considered a nutrient of concern in eastern North America...”, also concluding that “Nutrient assessments are even more important in areas that have been impacted by long-term acid deposition since harvest removals can exacerbate declines in base cation levels (especially Ca) in affected soils.” **I am certainly glad to see that last statement, perhaps the first formal acknowledgment from DNR that forest harvests can worsen the effects of acid rain.**

There is no doubt that this paper, published in a recognized, peer-reviewed scientific journal, is an excellent piece of work, as is all of Kevin Keys' work.

I do have one major concern about the Keys et al (2016) paper which is the absence of any mention of the extreme acidification of aquatic systems in much of NS and especially especially in SW Nova Scotia as documented by Tom Clair and others in highly cited scientific papers. It seems NSDNR generally does make the connection between the health of aquatic systems and the state of the forests or, if it does, avoids discussing it or highlighting it in the public realm. I think it is more the latter, as Keys has become involved in recent years in experimental liming of watersheds by fisheries and aquatic scientists to correct stream acidity. I see that as an admission of sorts that calcium depletion issues need to be addressed at the level of watersheds not individual forest stands.

Some further evidence that NSDNR is having difficulty coming to terms with the implications of Keys' nutrient research: there is no mention of it in the recent State of the Forest Report, nor, apparently, on the NSDNR website. There is no mention of acidification issues in the recently released Field Guide to Forest Biodiversity Stewardship.

Not to downplay Keys' important work in any way, but there are no surprises in the 2016 paper; NSDNR has known about this issue for a long time. The soil BS% map for Nova Scotia in Keys et al., 2016 (their [Fig 3](#)) is highly consistent with the [Map of Forest Sensitivity to Acid Deposition](#) coming out of work by aquatic scientists in the mid 2000s. There was very good scientific evidence 10 years before the Keys'et al. 2016 paper that forest soils over a large part of NS are highly base (nutrient) deficient and that this was impacting the health of aquatic systems. NSDNR also knew from the work of Noseworthy (2011) (which I assume involved Kevin Keys) that acidification problems are exacerbated by clearcutting.

So I see this all as a case of Good NSDNR Science Not Applied. The explanation is repeatedly that we need more data, better models etc. But it also calls for a highly precautionary approach; the implications of the work by aquatic scientists earlier and of Keys and Co are clear: there should be no clearcutting in watersheds still experiencing extreme acidification. That doesn't need site-specific soil tests and a finished FNBM, it just needs communication with aquatic scientists who have mapped aquatic acidification.

At the very least, NSDNR needs to do much more highlighting of the forest nutrient depletion/aquatic acidification issue, and to communicate much more actively about the issue with other departments (Inland Fisheries in particular), in academic forums and with industry, private woodlot owners and the public at large.