Managing the Hydrology of Vermont's Forests in a Rapidly Changing Climate

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Clean, clear, cold water has been called *the premier product* of a healthy forest. When forest management standards such as the "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont" (VT FP&R, 1987) are complied with fully, even actively managed forests can continue to produce high quality water supplies while moderating peak flows during storm events (Barten and others, 2008). Unfortunately full AMP compliance on logging jobs in Vermont has historically been very rare (Newton and others, 1990). In 2011 Tropical Storm Irene demonstrated the ecological and economic impacts that a violent storm can have when natural hydrology has been degraded.

There is a general consensus that the earth's climate will continue to change rapidly. In the Lake Champlain Basin mean annual air temperatures warmed by 2.1°F in the twenty years between 1976 and 2005 (Stager and Thill, 2010). In addition, Stager and Thill reported that total annual precipitation was over 7% higher than it had been in the previous 80 years and that freeze-up of Lake Champlain was delayed by a full two weeks when compared to the early 1800s. Using 16 atmosphere-ocean global climate change models they predicted that, under the current path scenario, there will be an additional 6-11°F change by the end of this century. The ecological consequences to forest streams will include more flooding, higher water temperatures, reduced habitat for cold-water species, increased nutrient inputs, and more erosion and siltation.

A report by Barnosky and others that appeared in the June 2012 edition of the journal *Nature* is even more alarming. Whereas Stager and Thill's work assumed a rapid warming within the current state, Barnosky and others suggested that we are "approaching a planetary-scale critical transition as a result of human influence" to a completely altered ecological state within a few human generations. This altered state will require a dramatic reduction in world population growth and per-capita resource use, a dramatic increase in energy efficiency, and an urgent need for focused conservation of ecosystem services.

Clearly we have much work to do. What should the focus of Vermont's forest community be? In a word: **WATER!** As we head back to the forest for fuel and other products we will need a major re-commitment to water as the premier forest product. What would this look like?

First, we should expand the definition of a forest product beyond the traditional wood products of boards and biomass to include forest ecosystem services as well as the full range of non-wood forest products.

Second, Vermont's AMPs were adopted in 1987 and the Vermont Department of Forests, Parks, and Recreation is currently reviewing them. At a minimum any revisions should enhance effectiveness of the practices to meet the challenges of the new climate. We also need a credible, citizen-friendly system for assessing compliance and we should regularly assess compliance. Full compliance should always be the goal but particularly when a source forest involves publicly-funded projects such as forest biomass facilities, tax programs, or public lands.

Third, a Timber Harvesting Impact Study is currently under way and we should look to that to inform the changes needed to restore and to conserve forest hydrology in the face of a rapidly changing climate. We should be sure the study is credible.

Fourth, we need to do a better job of encouraging forest landowners to either leave sensitive areas such as riparian zones, steep slopes, and shallow soils alone or to manage them very carefully.

Fifth, using the Vermont Center for Geographic Information's (VCGI) readily-accessible mapping resources, we need to create a data layer where *Optional Conservation Practices* such as 'leave alone' are available by default to all Vermont forestland owners.

Finally, in the age of a rapidly changing, unpredictable climate, the default in forest conservation must always be to put forest health first.

The climate is changing rapidly. It will continue to do so. Our forests are resilient but their limits are already being tested. Our forest conservation strategies must reflect the realities of climate change. Just as the condition of the blood in our veins reflects the health of our bodies, the condition of the water in our streams and rivers reflects the health of the land. Flowing water is a publicly-held asset and we do not have to apologize for protecting it. As the *state shift* in the Earth's biosphere nears, we need a *state shift* in our forest conservation efforts. To prepare for the gully-washing storms, flood events, fires, and/or droughts that the changing climate will undoubtedly throw at us, let's focus much more of our publicly supported forest conservation efforts, investments, cost-shares, and tax breaks on conserving water quality in the commons and much less of our efforts on producing wood products for the marketplace.

May the forest be with us!

References

Barnosky, A.D. *et al.* Approaching a state shift in the Earth's biosphere. Nature 486, 52-58 (2012).

Barten, P.K. *et al.* Hydrologic Effects of a Changing Forest Landscape. Natural Research Council of the National Academies, Washington, D.C. (2008).

Newton, C.M. *et al.* Impact Assessment of Timber Harvesting Activity in Vermont. University of Vermont, Burlington, VT (1990).

Stager, J. C., and Thill, M. Climate Change in the Champlain Basin: What natural resource managers can expect and do. The Nature Conservancy, Montpelier, VT (2010).

Vermont Department of Forests, Parks and Recreation. Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont. Waterbury, VT (1987).