

The Need For Long-Term Research Installations and Datasets Profiled at the Fifth North American Forest Ecology Workshop

Philip J. Burton

Pacific Forestry Centre, Canadian Forest Service, Prince George, British Columbia, Canada

The importance of long-term research to understanding forest ecology and managing sustainable forests was showcased at the recent North American Forest Ecology Workshop, held June 12-16, 2005, in Aylmer, Quebec, Canada¹. The overall theme of the Workshop (which had more than 250 registrants) was “Ecosystem management—Can we conserve the pieces while managing the matrix?” A full-day symposium of invited and contributed papers, plus a variety of related posters, collectively illustrated ongoing needs for long-term data. The very nature of long-lived dominant organisms such as trees necessitates inter-generational collaboration among forest researchers.

Despite this need—and many examples of personal dedication and institutional commitment—a pervasive theme was the uphill battle to convince funding agencies and administrators of the value to be gained from long-term forest research.

Keynote speakers represented two different models of long-term research networks. Hague Vaughan (Canada Centre for Inland Waters, Burlington, Ontario) is the Director of the Ecological Monitoring and Assessment Network (EMAN²), which he described as providing a framework, protocols, and outreach capacity for a wide variety of professional and amateur monitoring activities across Canada. Not empowered to fund projects or start its own installations, it nevertheless represents a “network of networks” covering 93 research and monitoring sites across the country, each of which depends on institutional partnerships and external funding. Jim Vose (Coweeta Hydrologic Laboratory, U.S. Forest Service, Otto, North Carolina) described the Long Term Ecological Research (LTER³) Network in the United States. Like EMAN, LTER is national in scope, but it has had its own dedicated funding from the nation’s primary research funding agency, the National Science Foundation, since 1980. Directed primarily to questions of basic science by academic researchers, many LTER installations have built on other long-term infrastructure first established by the U.S. Forest Service or individual universities. The 26 LTER sites in the United States have become nodes of “place-based” research and expertise. They have collaborated on regular cross-site comparisons on topics such as patterns of primary productivity and disturbance.

Other speakers elaborated further on alternative models for organizing, maintaining, and presenting long-term ecological data. For example, Donald McLennan (Parks Canada Agency, Ecological Integrity Branch, Hull, Quebec) described a new legislatively mandated program within Canada’s national parks to ensure the maintenance of ecological integrity in Canada’s 41 national parks, and to report on “the state of our parks” every

two years. Building on EMAN and standards established for Canada's National Forest Inventory (NFI⁵), each park or regional cluster of parks selects a set of issue-relevant indicators for which it collects data. These data and derived trends and indices are then assembled in a pyramid of progressive detail, from simple color-coded trends of "OK," "caution," "danger" and "immediate crisis" for administrators, through to detailed empirical measurements that can be made available to scientific researchers.

Rob Fleming (Great Lakes Forestry Centre, Canadian Forest Service, Sault Ste. Marie, Ontario) described the North American Long-Term Soil Productivity Network⁶. This network, initiated in 1989, consists of 62 core sites and 42 affiliated sites that have implemented a common set of treatments addressing the effects of management-induced changes in soil porosity and organic matter on site productivity. Louise de Montigny (British Columbia Ministry of Forests and Range, Victoria, British Columbia), and colleagues Al Mitchell (Pacific Forestry Centre, Canadian Forest Service, Victoria, British Columbia) and Alan Vyse (British Columbia Forest Service, Kamloops, British Columbia) described a set of 24 large-scale, long-term forest management experiments started in British Columbia in the early 1990's⁷. Designed originally to test silvicultural alternatives to clear-cut harvesting, most installations incorporate a range of mature canopy retention treatments in a robust design that has lent itself to testing many biological and silvicultural responses. These trials were also included in the list of research installations located up and down the Pacific Coast of North America, described by Klaus Puettmann (Oregon State University, Corvallis, Oregon) and colleagues in a poster. They suggest that this set of long-term silvicultural research trials represents a de facto but under-utilized network for evaluating the interactive effects of climate and management on western forests.

A number of researchers discussed particular applications of long-term data, not only for the sustainable production of fibre-based forest products but for wildlife and habitat management as well. John Brissette and Laura Kenefic, with their colleague Paul Sendak (all with the Northeastern Research Station, U.S. Forest Service), described trends following alternative silvicultural regimes on the Penobscot Experimental Forest⁸ in Maine. Their presentations highlighted differences in individual species responses and stand level productivity observed 20 years and 40 years after treatment. Claude Delisle (Laurentian Forestry Centre, Canadian Forest Service, Sainte-Foy, Quebec) and colleagues described an analogous examination of the effects of diameter-limit cutting in balsam fir-yellow birch forests of eastern Quebec. Their analysis was based on the remeasurement of 18 sample plots established in 1950 and remeasured in 1960, 1970 and 2003. Guy Larocque and colleagues (all at the Laurentian Forestry Centre) used similar plot data from 1936, 1947, 1957, 1965 and 2003 to validate a forest succession model newly calibrated for the region. Michel Crête and Marzell Lothar (Ministère des Ressources Naturelle, de la Faune et des Parcs, Québec, Quebec) similarly revisited more than 7,000 permanent plots established in the 1970s to evaluate them for current habitat values. Wendy Wright (Monash University, Churchill, Victoria, Australia) and colleagues described a project in which bird-count sites used from 1980 to 1983 were relocated (after considerable land use change) and remonitored from 2002 to 2004. They reported that species turnovers observed among the 83 bird species were especially pronounced in smaller forest fragments.

Several other sessions of the Workshop drew upon or called for long-term ecological data. These sessions covered topics such as "Forest Plantations and Their Ecological Impacts," "Deadwood Ecology," "Characterizing Natural Disturbance," "Forest Modelling at Multiple Scales," "The Role of Forest Management in Carbon Sequestration," "Nutrient Cycling," and "Forest Dynamics." Because of the long time periods associated with forest rotations and cycles of natural disturbance and succession, many researchers apologized for using chronosequence (space-for-time substitution) data in the absence of more robust long-term data. This problem has been recognized for decades, and despite the fact that trees remain

rooted in place and readily lend themselves to remeasurement, only a minority of forest researchers have been able to take advantage of long-term research installations and datasets. There are thousands of “permanent sample plots” for forest growth and yield scattered across North America, but many are guarded as proprietary by timber companies, or their locations are confidential (so as to not bias their management) by government agencies, or they did not measure various attributes of wildlife habitat or biodiversity of interest to researchers today.

In a panel discussion at the end of the session, it was agreed that long-term findings often contradicted short-term research results. Unforeseen and serendipitous observations (often associated with ecosystem response to severe disturbance) frequently proved more interesting than data gathered to address an installation’s original objectives. Several researchers were able to “rescue” old research plots or archived data sets, but bemoaned the lack of data from intervening years. There was consensus that consistent support for the development, maintenance and monitoring of long-term research is only forthcoming when relevant results are generated each and every year. That is, installations and experiments have to be designed in such a way that they “earn their keep” by generating currently relevant information on an annual basis, even if recommendations are changed when more data become available. It is not good enough to say that important results will be generated in a few decades, that we should gather measurements just because we have done so in the past, or because we have faith that they will show meaningful trends “some day.”

All successful long-term research programs have had personnel dedicated to the regular summarization and communication of interim results, not just long-term results. Data cleaning, management, and archiving must be the explicit responsibility of specific individuals dedicated to the task, who must also ensure that this valuable information is stored in more than one place, that its existence is widely known, that it is in forms suited to use by others, and that its care is handed off to another specific individual upon departure or retirement. There is a general reluctance to start any new long-term research installations until we can adequately maintain and report on existing research investments. These factors, coupled with clear staff succession planning within research nodes over time, and networking of research nodes over space for comparative studies, seem to be the ingredients for the successful care and feeding of long-term forest research.

1 See <http://www.unites.uqam.ca/gref/nafew2005/> for a complete program and abstracts of presented papers and posters.

2 <http://www.eman-rese.ca/eman/>

3 <http://www.lternet.edu/>

4 See http://www.pc.gc.ca/docs/pn-np/ie-ei/prior/mesures-actions/mesures-actions2b_e.asp for details on this policy initiative

5 http://pfc.forestry.ca/monitoring/inventory/index_e.html

6 See <http://www.treesearch.fs.fed.us/pubs/7226> for a summary of the first decade of results.

7 Several of which are described at <http://www.for.gov.bc.ca/hre/standman/trtsilvsys.htm>

8 <http://www.fs.fed.us/ne/durham/4155/penobsco.htm> and

http://www.umaine.edu/universityforests/Penobscot_Experimental_Forest.htm