Quality Always Takes Time

David Shipway, October 2011

As a woodworker on the drier southern BC coast with a very small woodlot, and some working familiarity with the timber journey - from seed to old tree and from sawn lumber to sailboat, it seems obvious to me that there's still a tug of war between two polarized goals in forestry. One strives for Quantity, the other strives for Quality. It's a simplification I know, but then we could also call it Ishmael's battle between Takers and Leavers, and ask who is winning. Nearly always in our modern addiction to economic growth, gross volume wins over real value. But the short-term quest for higher quantity has already severely compromised long term timber quality in many coastal watersheds. Does this have to be the eternal dilemma in our transient relationship with wild forests, trees and wood? Or is this really a false dichotomy built on ignorant assumptions? Is there a better middle path, a more gracious future in a truly sustainable forestry?

The size and quality of native old growth trees were once legendary, but in my short working life I've watched and have had to adapt to a steady decline in the overall quality of native woods. This trend is just one consequence of Overcut or Overshoot. You might think this trend would motivate foresters to start seriously planning forests of large mature trees full of really nice valuable wood. Unfortunately, few foresters are also woodworkers, such trees by necessity will outlive our short human life spans, and both industry and government are driven by short-term goals. So the main policy response to the exhaustion of mature complex forests on this coast has been to manage planted forests on much shorter "rotations", in order to maintain revenue and fibre flowing through the industrial system. Unfortunately, this means that wood quality will continue to plummet - to the point that most "value-added" community-based activities in BC forestry are now drifting dangerously toward the global trash heap of biofuels, pulpwood and chipboard instead of celebrating fine guitars, wooden boats, timberframes and inheritable furniture. That's pretty sad. Beetles aside, this is mostly a tragedy of our own making, with our machines and corporate engines that just get faster and hungrier. It's the bottom line, and Quantity doesn't take much time running things into ruin.

As more of a fan of Quality, I'd like to present here some basic interwoven reasons why a commitment to growing bigger trees and older forests is so vitally important for both quality **and** quantity of future wood supply, for the survival of a human culture involved with it's forests, and for addressing the looming black swan of climate change. There are obviously many other ecological benefits to this forestry goal, but from just the perspective of sustaining wood quality, let's start by understanding and comparing sapwood with heartwood, using native coastal conifers such as Douglas Fir as an example:

Basic biology of wood - Cells are created on an annual cycle by the living protoplasm of the cambium layer surrounding a tree, which divides to form both bark and wood. Sapwood consists of active woody cells that are still forming their cellulosic walls, and conducting sugars, nutrients and water for the whole tree. Heartwood is formed when the the prosenchyma (fluid conducting) cells cease conducting sap, and the parenchyma (food storage) cells die. The residual resins and terpenes become crystalized, and the wood, usually darker in colour, serves primarily as stable core structure for the tree to continue growing bigger.

Wood Properties – In terms of wood quality, sapwood is weak and unstable, has high moisture and sugar content, and thus shrinks, stains and decays quickly; while heartwood is drier and compressed (more stable), stronger (mature lignin fibre), and more durable (resinous). Sapwood products are not very diverse: One can make useable toilet paper and temporary artifacts out of it if you're quick, but any solid sapwood product will need added chemical wood preservatives. Heartwood on the other hand is good lasting material for houses, boats, furniture, musical instruments and all the many traditional woodcrafts that have been passed down to us through the ages and are still relevant and essential today.

Proportions of heartwood and sapwood, and thus the quantity of good durable wood in a tree, change with the tree's age. This can be shown in an approximate cross-sectional comparison among trees in my woodlot of three different ages:

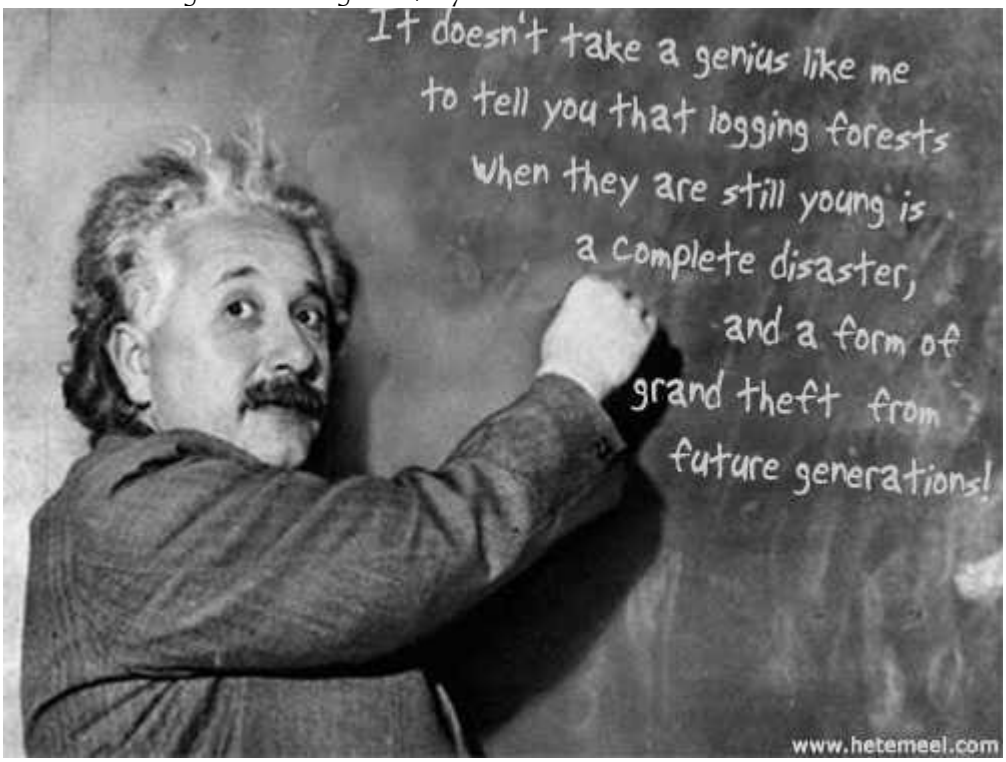
As a tree grows older, the ratio of sapwood decreases and that of heartwood increases: In a very young tree, most of the stem is sapwood, whereas in a mature tree, most of the trunk is heartwood. In trees that are now being cut on so-called "economic" rotation silviculture regimes, it's at best about 50/50. In other words, half the "wood" harvested isn't even real wood yet, it's compost. What sort of "economics" does such pre-culminate liquidation really create? Where's the genuine carbon sequestration in our downstream wood products?

A local sawyer who is better at lumber math than I am, calculated the following recovery volumes from some 12-foot Fir logs of different ages and diameters:

30 yr. old 12″ dia. log = 78 bd. ft.,
80 yr. old 24″ dia. log = 364 bd. ft.,
150 yr. old 48″ dia. log = 1720 bd. ft.

These surprising numbers gain even more spread when the sapwood/heartwood ratios are factored in. The large older log might produce 1600bf of heartwood, while the adolescent 80yr log produces only 250bf. of the same. But that skinny juvenile log will only render 30bf of wide-ring heartwood with lots of knots and a problematic centre pith. Hmmm..... it looks like five times the age produces fifty times the good wood. Is that a good enough argument for patience with forestry?

Two other important quality factors in wood are [1] how the sapwood volume/ratio increases as we work our way up the tree into the live branches, and [2] the total useable "sawlog-height" of each tree. The 180-year-old tree is perhaps three times as tall in logs worth a sawyer's trouble compared to the 40-year-old sapling; and its second and third logs contain both more heartwood and more good wood than the first log of the 80-year-old. These additional factors may help in answering questions about what kind of forests and what kind of wood we should be growing for long term economic benefit, as well as honouring our ecological duty to the future.



There is similarity between how the wood of a tree increases with age in both quality and quantity (accumulation of annual increment), and the principles of compound interest, though the numerical rate of growth in trees would not impress a stock broker. Merve Wilkinson, during his 60 years of managing Wildwood, determined that these coastal forests grow at about **2 ½ %** per annum. This may

help explain why clearcuts are at first very slow to take up carbon, and why true ecoforestry is so utterly rare. Most strategic investors in timberland portfolios are gambling on at least twice that rate of return. Thus, to bridge that gap, global TIMO's operating on private forest lands around the Salish Sea have chopped the third rotation already, and are now more interested in lucrative real estate development than in making a legal commitment to non-declining long term forest stewardship.

Looking at this quandry from a different angle, one can see that the capitalist growth economics that are running the Taker culture will produce further ecological overshoot. It's dangerously out of synch with the natural growth patterns of life on planet Earth, a biosphere that has very real limits and is now suffering from frequent and cumulative human disasters. Yet we witness almost daily the trained professionals dutily carry on with an incongruous agenda of "modernized" short-rotation forestry, as if ancient biological processes will suddenly reform and obey new feudal laws written by economists that we can now see live in a world of clever fiction.

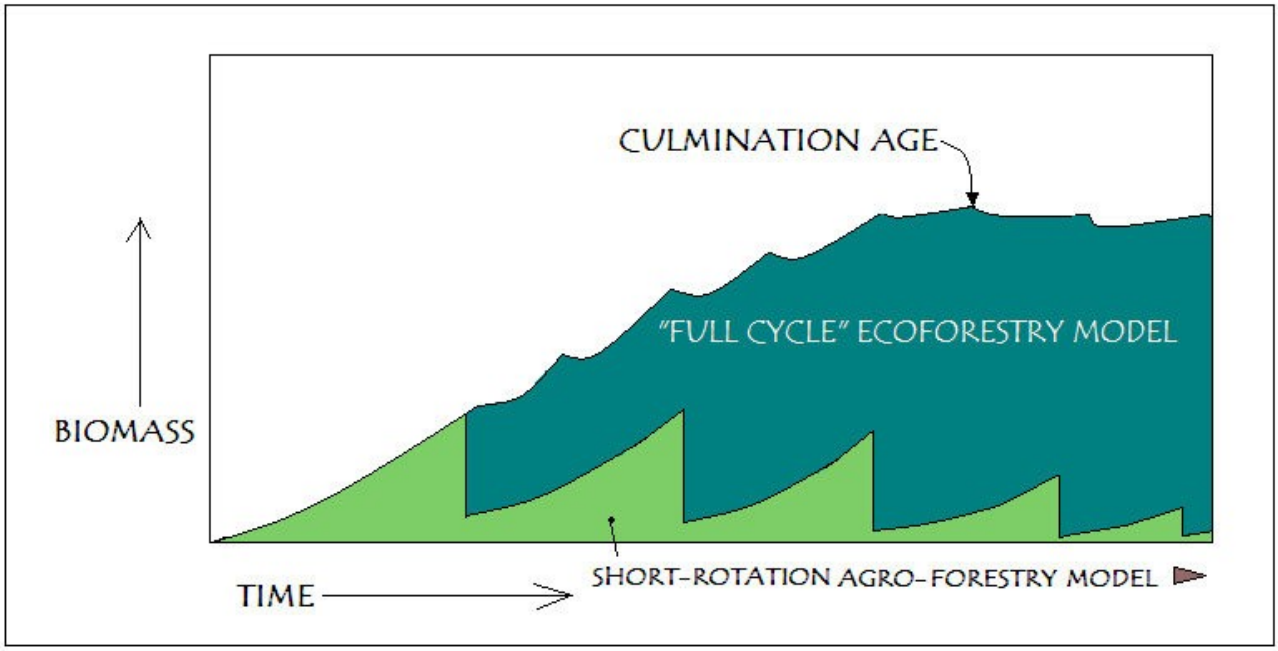
Forestry can certainly become more productive with careful loving management, but only within the range of resilience within an ecological community, only on Gaia's reciprocal terms. Two changes in forestry might improve our future prospects: one is stand management to lengthen the period of increasing annual growth; the other is to focus on intelligent decisions in conserving wood quality - to aim for and capture the highest market value of quarter-sawn clear beams, boards and cants that only come from large mature trees.

Mean Annual Increment (MAI) is a common forestry term that describes average growth rates in managed stands. Every year a tree puts on another layer of wood that is more voluminous than the year before, until it **culminates** (CMAI), and then very gradually slows down, the primary focus then being on lateral growth, seed generation, and perhaps that Gaian wisdom of just "being there" for all the other forest inhabitants. Forests are co-operative ventures. In typical coastal Douglas Fir stands managed by "crop rotation" (a euphemism for resetting growth rates to zero), culmination may occur at about 80-100 years of age, depending on stems/hectare density and site/nutrient conditions. If trees are cut too early, before CMAI is reached, there is an enormous loss of wood productivity per hectare over time, since the most productive volume years around and after culmination never occur. They have simply been stolen by false accounting practices.

In forest stands that are patiently managed by partial cutting and thinning to reduce competition, it is quite possible to shift the incremental growth curve of co-dominant trees so that culmination occurs at up to 200 years of age, meaning these trees are still putting on more incremental volume at this age than they were last year. Unfortunately, there are not many good documented examples of this kind of "old growth forestry" in BC, because our overall colonial history has been that of

methodically turning the Taker's spoils of verdant old forests into smoke and dust faster than they can regrow. But on a planet now experiencing the aggregate effects of human overshoot, there's little doubt we will have to change our collective ways or perish.

For many years now there has been a healthy debate about the differences between simplified industrial crop rotation and the practices of true ecoforestry (and heroes like Chris Maser and Herb Hammond have spent much of their lives trying to educate us all about those crucial differences). The former model follows industrial agriculture, which oversimplifies the ecosystem and is heavily reliant on fossil inputs, but eventually exhausts the living land. The latter is more like perennial polyculture, where a whole variety of human benefits are seen as just a subset to maintaining the full biodiversity, resilience and wild vitality of the native ecosystem. Yes, ecoforestry is unashamedly an "Earth First" sort of regime, but everyone benefits, including the humans. There have been some significant efforts to find this middle ground that works in forestry, that can get us to the more peaceful place where scientific truth and full cost accounting form the basis for a truly sustainable, transgenerational forest economy.



This simple graph isn't based on years of rigorous data collection, that's not my task. It's just an approximate visual comparison of biotic outcomes from two radically different philosophies about forest management. It also maps the consequential difference between Taker and Leaver cultures. In short rotation silviculture, the inevitable decline in productivity and biomass reflects more catastrophic soil disturbances and waste of nutrients, each of them incrementally destructive to both the forest carbon sink and forestry economics. Attempting to dodge this decline with genetically-altered tree stock and imported artificial fertilizers is hardly a holistic solution to greed.

It's ironic in terms of that other quest – for Efficiency - that the wood products industries now spend billions on the technological wizardry of chopping and shredding smaller trees and pressing the fibres back together with synthetic binders to create timber substitutes, a process that inevitably creates

products and by-products that are more hazardous to our health and the environment. The industrial processes that produce "manufactured wood" and alternative synthetic substitutes for real wood are themselves very energy intensive and use up limited resources while relying on various hidden forms of public subsidy. The jobs they provide are not that pleasant or gratifying, and you better have a good health plan. Meanwhile, back in that quiet old forest, the natural alternative of good quality mature wood simply grows for free, using sunlight and water, and most importantly these days: excess carbon dioxide.

Perhaps it's the global climate crisis we must now face and solve without any further stupid delays that is the strongest motive of all to manage our forests as mature complex ecosystems, with greater resilience to fire and pests, and with minimal disturbance to soils and biodiversity. As major terrestrial carbon sinks, our moist coastal temperate forests can moderate the dangerous accumulation of CO2 in the atmosphere, but only if whole landscapes are maintained on average **at culmination**, in combination with other important energy and consumption reductions. In recent times, we have in effect been burning up millions of years of sequestered ancient forest biomass every single year, and the consequences just in sea level rise may be worse than we can imagine. Better forestry alone cannot reverse climate change, but we must at the very least make a firm commitment to ensuring the carbon sink is deep, and the wood we can produce by selective harvesting of mature trees lasts for at least as long as it would have, if left inside a living tree.

That means that the science and stewardship of forest carbon must become primary. We must culturally incorporate and celebrate the "slow wood" patience of growing more durable mature heartwood. If we are lucky our great grandchildren will still be able to make inheritable high-quality wooden artifacts. This is a tall order in an age still caught up in ponzi economics, but it's becoming increasingly apparent that ignoring it may make our whole civilization obsolete in much less time than it takes for a Douglas Fir tree to grow to middle age.

Some useful references on these issues:

"Forests that Work" - An Analysis Dealing With the Problem of Investor-Driven Forestry :
http://www.coastrange.org/ftw_frame.htm

On Timber: **Understanding Wood** by R. Bruce Hoadley, The Taunton Press 1980
On Quality : **Zen and the Art of Motorcycle Maintenance** by Robert Persig 1974

A Cortes Forest Plan -a community-based effort at grappling with landscape ecology and social limits:
http://www.silvafor.org/cortes

Carbon and Forests (but no mention of the sapwood/heartwood reality): http://crfr.ca/samples/carbon/index.html

"Fixing Failed Forestry" by Tom Bender can be found through this portal:
http://www.tombender.org/indexpages/economicsofwholeness.html

Managing BC's Forests for a Cooler Climate by Ben Parfitt, Canadian Centre for Policy Alternatives, Jan.2010:
http://www.policyalternatives.ca/coolforests