branch lines

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Biofuels and bioenergy – challenges and opportunities

Over the last year or two, there has been a huge surge of interest in biofuels and other forms of bioenergy. Although oil prices have fallen somewhat over the last month or so, they remain relatively high, influencing everything from personal to national budgets. It is certain that uncertainty will continue regarding the future of oil prices, due to the seemingly intractable conflicts in the Middle East oil-rich countries and the vulnerability of other critical oil producing regions to extreme weather events. Governments in Europe, North America and Asia have embraced biofuels and bioenergy to in part address social and economic concerns over global energy supplies. For example, Sweden has a national target of being 'fossil-fuels free' by 2020, with bioenergy (including the import of wood pellets from BC) playing a key role in attaining this target. Similarly, roadmaps developed in the US have assessed that country's potential for biomass growth and biofuel production, and found it may be possible to offset the one billion dollars a day the US currently spends on imported oil.

Over the past few years, UBC has been fortunate in obtaining federal and provincial support to establish a world class Clean Energy Centre based out of the Faculty of Applied Science, while our own Faculty has received about $2.5 million to establish a Process Development Unit (PDU) to assess the potential of wood-based biofuels and chemicals. As well as carrying out an active research program and training graduate students in this area, our group within the Faculty act as the Task Leaders for the International Energy Agency's (IEA) network, coordinating the technical and policy issues influencing the global commercialization of liquid biofuels from biomass. For information, please check the faculty website www.forestry.ubc.ca, or our IEA website at www.task39.org.

In August 2006, the Faculty hosted more than 130 experts from around the world to discuss bioenergy development. Senior folks from North America, Europe, Asia, and Africa each brought their own unique perspectives to the table and helped define the technical and political challenges and significant opportunities that the current and future biofuels and bioenergy sectors will face. One clear outcome of the meeting was that there are significant opportunities that new biofuel and bioenergy technologies can provide, in terms of social, economic, and environmental returns.

The ongoing Mountain pine beetle outbreak, projected to cumulatively impact almost 1 billion m3 of lodgepole pine in the province of British Columbia by 2013, served to provide a focus for the meeting. An outbreak of this size is unprecedented in recorded history. There is an accumulating surplus of standing deadwood in our forests, which increases the danger of catastrophic fires and reduces the merchantable volume of the working forest. While we will try to recover as much of the beetle-killed wood as possible in the short term for structural applications, we know that wood impacted by MPB loses its value as timber over time, and so wood that has been standing dead for extended periods cannot be processed into lumber, pulp or other advanced wood products. In the longer term, development of bioenergy applications may provide us with a cost-effective product that justifies harvesting and replanting activities. In this way, the development of bioenergy could greatly enhance the regeneration of our forests for future use.

As keynote speaker for the conference, Dr. Avrim Lazar of the Forest Products Association of Canada highlighted the interest that the forest industry has in bioenergy options, and convincingly showed how the forest industry is already one of Canada's greatest contributors to lowering our nation's production of greenhouse gases. For the global forest industry, moving away from fossil fuels is an economic necessity, as volatility associated with fossil fuels has resulted in high energy costs for the industry in recent years. There is a need to extract additional values from our forest resource, and a need to accept ecosystem realities in forest industry practices. Biofuels and bioenergy, which are inherently carbon-neutral and work within the carbon cycle, represent a new model of business which all types of industry could follow.

A wide range of options exist for bioenergy production from wood. Bioenergy is essentially the generation of heat from combustion, which can be captured in the form of steam or gas and used to power turbines for electricity production. Biofuels include alcohols such as ethanol as well as methyl esters such as biodiesel. Biofuels can be blended with gasoline or diesel fuels, and are compatible with existing internal combustion engines and fuel distribution systems, and as such offer an immediate alternative to fossil-based fuels. While foods such as starch may be used for biofuel production, lignocellulosics like wood, although challenging to process, represent an important opportunity. There are significant amounts of lignocellulosic biomass available around the world, and conversion of this material to biofuels could significantly reduce the amount of fossil-derived fuel required.

Our Faculty is carrying out research which addresses some of the key challenges associated with increased biofuels and bioenergy consumption. Some of these challenges are technical and require investment in research, development and demonstration (RD&D). Moreover, a number of different technological platforms for biofuel production exist, and each should be explored to compare their effectiveness and their ability to produce value-added coproducts. In all cases, the use of wood for biofuel production should be linked to bioenergy and bioproduct generation, creating a 'biorefinery' with multiple outputs. The biorefinery concept provides maximum economic and environmental returns by efficiently utilizing all components of the wood.

Some of the major challenges will be political, rather than technical. In the short term it will be necessary to increase the financial incentive for using electricity or fuels derived from biomass. In Canada, the cost of electrical power is low enough that bioenergy generation facilities have difficulty in competing. Policies might also be applied to encourage the development of bioenergy production in existing forestry and agricultural processing facilities, such as an accelerated capital-cost write-off schedule. One recent development is the emergence of mandates for biofuel use as seen in Europe, where 5.75% of fuels must be renewable by 2012, as well as in the United States (10% by 2012) and Canada (5% by 2010).

The size of the biofuel and bioenergy opportunity in Canada is huge, and biorefinery technologies can and will bring about major changes to the sustainable energy future for our nation. Biomass systems and technologies have potential applications not only in the energy sector, but also in buildings, transport, construction, etc. They have the potential to add long-term, sustainable jobs in rural, urban, and aboriginal communities. To implement these systems, we need trained individuals whose skills cross traditional boundaries and who can understand the technical, political, and ecological ramifications of these technologies. At the Faculty of Forestry, we are dedicated to training individuals who have the skillsets and knowledge necessary to contribute to this sector of the economy. The potential is there; what is needed now is continued collaboration to create technical platforms for effective and sustainable use of bioenergy, and a strong political rationale for putting these platforms to work.

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Measuring public forest preferences

Thomas Maness is leading a Sustainable Forest Management (SFM) Network funded initiative to determine how forest stakeholders' perceptions and preferences change when they learn more about the challenges involved in balancing tradeoffs. He is joined on this project by Drs. Sheppard, Kozak, and Harshaw as co-investigators, along with a large interdisciplinary team comprised of researchers from BC, Alberta and Ontario.

In making decisions about how forests are managed, the managers are forced to make tradeoffs. These tradeoffs are often made in by considering how stakeholders value different characteristics of the forest. But past research has shown that stakeholders' preferences and values about the forest can change as they learn more about the complexities of forest management. Interacting with the public and developing plans that satisfy their wants and needs is perhaps one of the biggest challenges facing forest managers today.

This project will create an interactive planning model that incorporates social, economic, and ecological values. The model will be used by the public to explore how decisions based on their preferences affect the outcomes of a forest plan. Researchers will then study how and why the public makes tradeoffs to create an acceptable plan. The results will be used to develop better planning methods involving the public.

The first step in the project is identifying suitable criteria and indicators for the planning model. To this end the researcher team is organizing a workshop at UBC in November to gather experts to discuss and select the criteria and indicators that will frame the model. Next, a user-friendly information kiosk will be developed to present some common forest management issues. This kiosk will be deployed at a number of public locations in Alberta and British Columbia and used to meet the team's three objectives:

- To examine people's trade-offs of forest values over time and space in the context of increased uncertainty;
- To examine the opportunity costs among ecological, social & economic values which people are typically willing to accept; and
- To identify how people's preferences change with improved information on SFM plans.

The research team will also be gauging the effectiveness of novel methods of information presentation designed to make the communication of complex spatial and temporal dynamics more useful and meaningful to managers, local stakeholders and community representatives. This will be accomplished using interactive visualization-based interfaces tied to the planning model.

The eventual outcome from this project will be tools and extension materials that resource managers and local stakeholders, public advisory groups and community representatives can use in the development of local forest resource management strategies. It is hoped that this approach will boost public confidence in forest planning models and the strategies derived from them.

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Possible forest futures:

Addressing the complexities of multi-value ecosystem management

A decade ago, Branchlines reported on 20 years of ecosystem management modeling in the Faculty of Forestry. Here we report on progress over the past decade on ecosystem management simulation models (EMSM) developed under the Canada Research Chair in forest ecosystem modeling.

In response to increasing societal pressures, forest managers have moved away from a resource extraction paradigm towards an ecosystem management paradigm designed to meet multiple resource objectives including the maintenance of ecosystem processes and sustaining economic production. Many new silviculture systems and landscape management strategies have been developed and put into practice in response to this paradigm shift. However, since we lack long-tem experience of the response of forest resources to such practices, and to the consequences of anthropogenically accelerated climate change, decisions in forestry today should be based on a combination of past forest management experience and an understanding of key ecosystem processes.

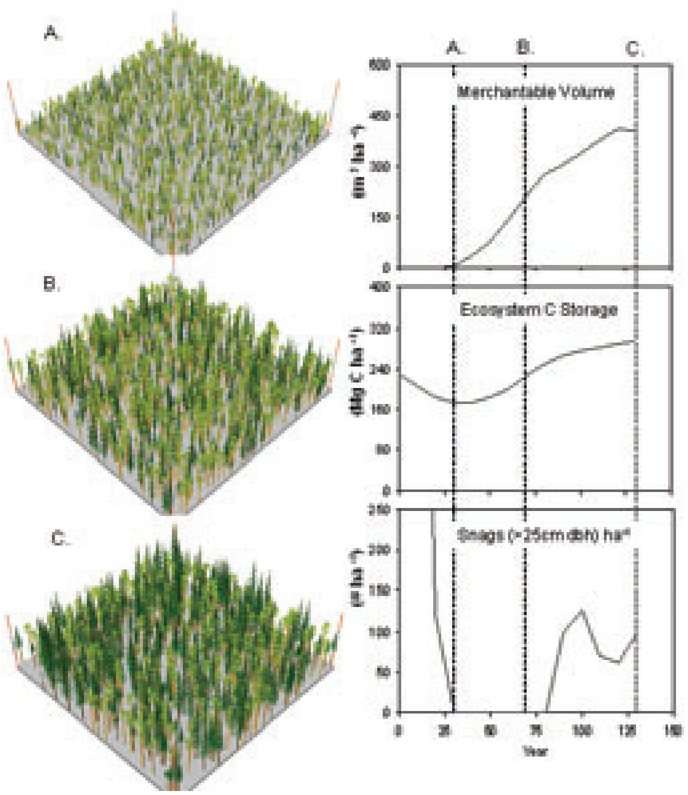

Fig. 1 Stand-level simulation results from FORECAST showing merchantable volume, ecosystem C storage, and large snags for a natural mixed aspen-spruce stand following a stand replacing fire. Images of the stand are shown for three time periods A) year 30, B) year 70, and C) year 130.

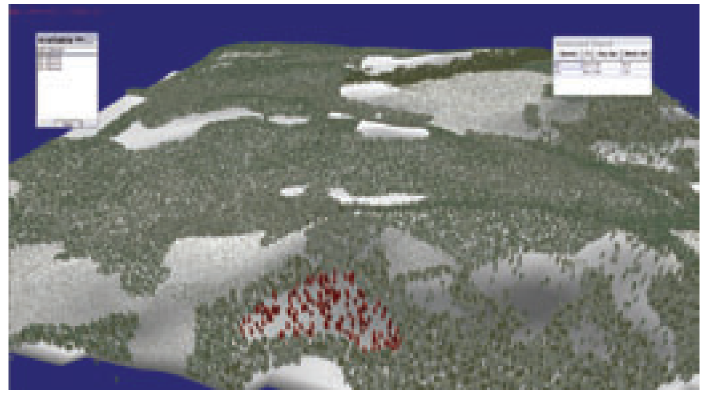

Fig. 2 An example of the ability of the visual forest management interface in LLEMS to comunicate a dispersed retention harvest with 80% removal.

Forest ecosystems are characterized by function, structure, complexity, and patterns of change. While traditional experience-based forecasting systems will always be useful in forestry for short-term tactical decision making, strategic planning and any planning for which we lack appropriate experience requires decision-support tools that explicitly address these four ecosystem attributes. A new generation of ecosystem management decision-support systems at multiple spatial scales is required in an environment of sustainability, certification and stewardship. These new tools should build on existing experience-based tools by adding our understanding of ecosystem processes. Decision-support systems for the management of ecosystems should function at the ecosystem level, not at the population or biotic community level.

1. Our non-spatial, stand-level, EMSM FORECAST has been improved to provide output for a wide range of variables and associated indices to address the needs of multi-objective forest management. These include: a) economic outputs related to wood value such as piece-size distributions, crown ratios, and merchantable volume; b) stand structure outputs and indices related to wildlife habitat quality and biodiversity such as snags, coarse woody debris, minor vegetation cover and large live trees; c) ecosystem outputs such as carbon storage and sequestration rates, and measures of long-term ecosystem productivity (Fig. 1). Other ongoing improvements include the representation of shifts in carbon allocation to above and below-ground biomass components under varying light conditions, representation of water balance and moisture competition, and climate change implications for ecosystem processes. The model has been validated in several forest types and has been used for a wide range of applications including: projections of temporal trends in stand attributes associated with multiple forest values (in support of certification), analyses of forest carbon management, analyses of effects of alternative mountain pine beetle salvage methods on long-term stand dynamics and development, and in developing forest ecosystem reclamation strategies for Alberta's oil sands region.

2. The growing popularity of complex cutblocks (e.g variable retention systems) and the need for multi-value tradeoff analysis of these systems, for which we lack rotation-length experience, led to the development of a new model: Local Landscape Ecosystem Management Simulator (LLEMS). The spatial resolution of LLEMS is 10x10m. Thanks to a clustering algorithm, LLEMS can address areas of 2000-4000 ha while retaining all of the stand-level capabilities of FORECAST. To facilitate the development of spatial management scenarios and to communicate output from LLEMS we developed an interactive, 3-dimensional visualization management interface with support from Dr. Stephen Sheppard and Duncan Cavens in UBC's Centre for Advanced Landscape Planning. With the interface, users can create different variable retention harvest scenarios, examine them from different perspectives, and then simulate the long-term growth of the forest after treatment (Fig. 2). The model also provides output describing the spatial and temporal distribution of ecosystem attributes (Fig. 3).

3. Interest in complex stand management (multi species, multi age stands; uniform, multi-entry, partial harvesting systems) led to a further extension of FORECAST into a spatial, individual tree, stand model: FORCEE. FORCEE includes a detailed representation of crown competition for light and root competition for belowground resources. While not yet complete, FORCEE appears to be a promising heuristic tool for exploring the spatial interactions among different tree species in complex stands including boreal mixedwoods, agroforestry systems, and uneven-aged silviculture systems. Data from long term boreal and sub-boreal mixedwood studies and from Canadian and international agroforestry research will provide data for testing model performance.

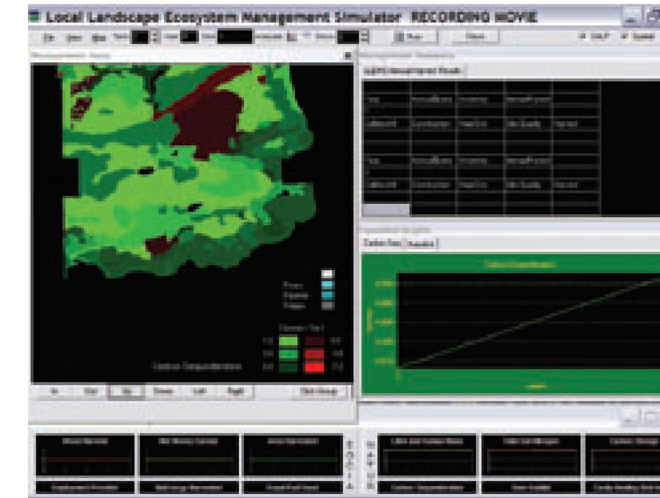

Fig. 3 Output display for the forest growth module in LLEMS showing the spatial pattern of carbon sequestration rates within the landscape unit. The graphical display on the lower right shows total carbon sequestration rates within the landscape unit for each of the two simulation years run in this example.

Planned future developments include continued testing of our models against long-term field data, continued development of software capabilities to address user's needs, and the application of the models in the exploration of policy, practice in forestry and agroforestry, and examination of ecological theory.

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Fig. 4 Demonstration of output from the spatially explicit, individual tree model FORCEE. Both light levels and litter distribution on the forest floor are shown.

Sustainability, biodiversity, and western governance

Environmental sustainability is not in our best interests. Not for those of us in the relatively wealthy western nations, that is. We are the world's most rapacious consumers of the world's natural resources on a per capita basis. We consume not only our own resources; we rely on others' resources as well. There is still a net flow of resources from the less developed nations to western nations and we are largely responsible directly or indirectly for the massive overharvesting of the oceanic fisheries, the world's commons. And by depleting renewable resources faster than ecosystems can replenish them, we are consuming future generations' resources too.

In short, we enjoy our wealthy, consumptive lifestyles at the expense of others. Is this a problem? Not for us, not in the short term at least. But it is for those in less developed countries, and it will be a problem for future generations if they are forced to contend with a planet that is less capable of providing natural resources.

This takes us to the heart of the issue: humans are fully dependent in the long term on the ability of the natural environment to produce a continuous, and continuously changing, supply of biological resources in particular. What is less apparent is that biodiversity is a necessary precondition for the long-term supply of biological resources.

Comprehending the full meaning and value of biodiversity has been elusive until recently. Even among conservation biologists, some still perceive biodiversity as, roughly, the sum of the bits and pieces in nature (e.g., genes, species, and ecosystems), and its value as the sum of the useful bits and pieces either now or in the future. But this conception refers to the value of biological resources and what are known as 'ecosystem services' (e.g., water storage, waste assimilation, carbon sequestration, local climate regulation). It does not refer to the value of biodiversity itself.

Among the world's 5 to 30 million species only a few hundred are currently useful to humans directly, and in the future perhaps a few thousand additional species might be useful someday. Many more are indirectly useful, especially for providing ecosystem services. Even if we were to go wild with our estimates and say that few hundred thousand species might be directly or indirectly useful at some time in the future, we cannot account for the utility of the vast majority of the world's species.

But thinking about biodiversity in an economic sense is misplaced from the start. Biodiversity is not simply the sum of nature's bits and pieces, nor can we value it in these terms. Instead, biodiversity is a concept at a higher logical plane. Biodiversity is an emergent property of the biosphere; it is an environmental condition (Wood Biodiversity and Democracy 2000). More importantly, it is an essential environmental condition for humanity because it is necessary for the maintenance of biological resources in the long term. Biodiversity provides the evolutionary conditions required to keep humans well stocked with biological resources ad infinitum. Put differently, this means that biodiversity is the source of biological resources upon which humans depend (Wood Environmental Values 1997).

The conservation of the world's biodiversity, therefore, is a measure of sustainability. International and national agreements attest to this assertion. Are we conserving it? Not by a long shot. Mostly by way of altering, fragmenting, or destroying species' habitats for short-term economic gain, humans are now precipitating the sixth major mass extinction event. At five times deep in the geological past, and for largely unknown reasons, most of the world's species suddenly went extinct. After each such event, it took evolution tens of millions of years to repopulate the Earth with species. Humans are now poised to exert an equivalent effect on the planet's biota.

Western nations are a large part of the problem for a host of reasons. Here are three. First, as mentioned, we are the world's largest per capita consumers, and mass consumption is one of the drivers of biodiversity loss, not just in other parts of the world, but here at home. As a case in point, the British Columbia provincial government has scientifically listed more than 1300 species at risk of extinction in the province, but is willing to legally protect only about 5% of them. The reason is straightforward: the opportunity costs – mostly in the form of reducing timber extraction in forest-dependent species' habitats – are considered too high (Wood and Flahr Canadian Public Policy 2004).

Second, western, liberal democratic governance, despite all its advantages for the freedom of individuals, has one large failing for sustainability: it caters to the short term preferences of the electorate. In a forthcoming article, we argue that citizens in liberal democracies authorize our governments to promote our best interests, but we almost never authorize our governments to act in the interests of those in other countries or in the interests of future generations (Wood and Waterman, in review). We prefer mass consumption, even at the expense of others. This is the antithesis of sustainability (Wood Environmental Ethics 2004).

Finally, by example and by other means, we encourage non-western nations to emulate us. They see the short-term advantages – opportunities for similarly consumptive lifestyles – but not the long-term disadvantages, including the depletion of one of the world's life-support systems: biodiversity. But of course, those of us in the western world rarely see those long-term disadvantages either.

The overall conclusion is clear: a failure to protect biodiversity is a failure to protect humanity in the long term, and this is precisely where Western governance is at odds with sustainability; it is not in our best interests to do so.

Seeking ways to circumvent this impasse is the subject of current research. Constitutional limits on the discretionary powers of governments, for the sake of future generations, are entirely consistent with central tenets of Western governance (Wood Biodiversity and Democracy 2000 and Wood Environmental Ethics 2004). Alternatively, empowering citizen groups to debate contentious policy issues in a consensus-building format, a process known as 'deliberative democracy', may prove more socially and politically feasible.

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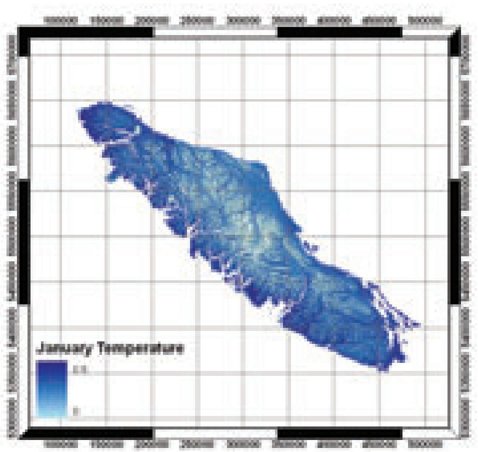
Forestry remote sensing: The view from above

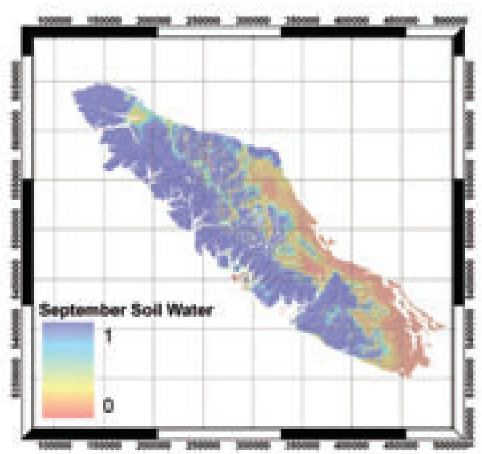
Growth potential using physiology coupled with satellite imagery

To manage forests sustainabily, under changing climate and disturbance regimes, we need improved spatial estimates of forest growth. Progress can be made by linking satellite imagery, improved soil maps and spatial climate surfaces within physiological forest growth models. Coastal Douglas-fir (*Pseudotsuga menziesii spp. menziesii* (Mirb.) Franco) occurs over a wide range of environmental conditions on Vancouver Island, BC. Although ecological zones have been drawn, no formal spatial analysis of environmental limitations on tree growth has been carried out. Such an exercise is desirable to identify areas that may warrant intensive management and to evaluate the impacts of predicted climate changes. Graduate student Sam Coggins, in the Integrated Remote Sensing Studio (IRSS) at UBC, in collaboration with the Canadian Forest Service (CFS) is applying a physiologically based forest growth model, 3-PG (Physiological Principles Predicting Growth) to interpret and map current limitations to Douglas-fir growth at 100 m cell resolution across Vancouver Island. We first calibrated the model to reproduce the regional productivity estimates reported in yield table growth curves. Our analyses indicated that slope exposure is important with southwest slopes of 30^0 receiving 40% more incident radiation than similarly inclined northeast slopes. When combined with other environmental differences associated with aspect, the 3-PG model predicted 60% more growth on southwest than on northeast exposures. Model simulations support our field observations that drought is rare in the wetter zones but common on the eastern side of the Island at lower elevations and on more exposed slopes.

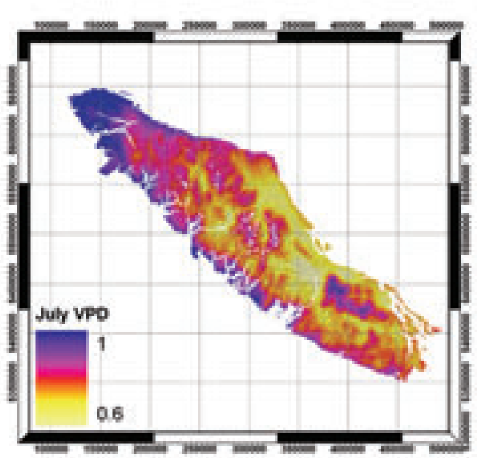
Spatial variation in the 3-PG temperature modifier for January for a 100 year old stand for Vancouver Island. Lighter shades of blue and white indicate more restriction to growth due to temperature.



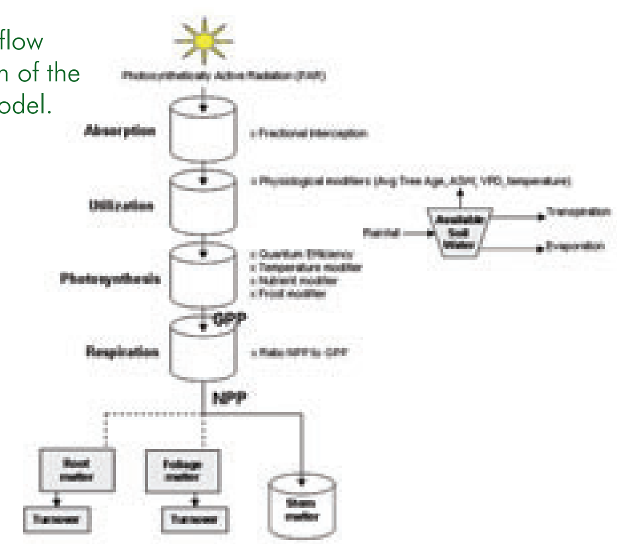
Spatial variation in the 3-PG soil water modifier for September for a 100 year old stand for Vancouver Island. Blue indicates areas with no summer drought, red indicates areas with significant summer drought.



Spatial variation in the 3-PG vapour pressure deficit modifier for July for a 100 year old stand for Vancouver Island. Yellow shades indicate more restriction to growth due to VPD.

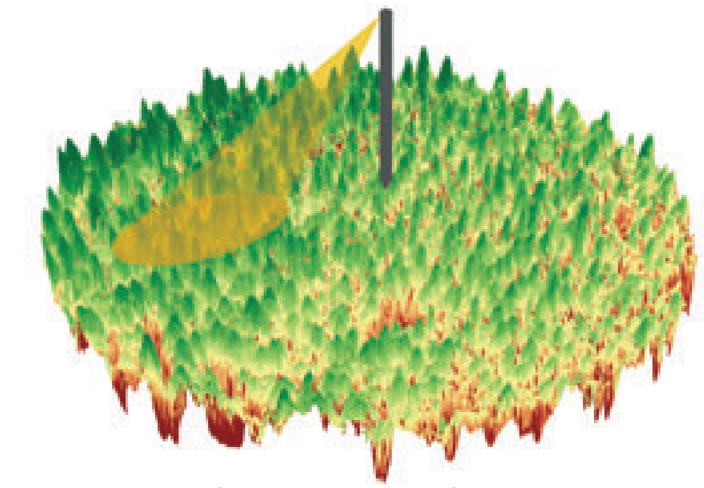


Simple flow diagram of the 3PG Model.



An automated tower spectroradiometer to measure diurnal and seasonal changes in canopy condition

The biochemical composition of foliage is strongly related to the rate of photosynthesis and depends on species and the environmental conditions impacting an individual plant. While some biochemical foliage properties change slowly, others can change quickly as a result of plant responses to rapidly changing environmental conditions. An example of a fast biochemical response is the photo-protection mechanism plants use to control their rates of photosynthesis and to protect themselves against excessive light energy. The advent of new sensors, more sensitive to narrow wavebands, offers new possibilities to isolate and identify single biochemical components using canopy reflectance measurements. However, the use of satellite or aerial data for detailed studies on biochemical processes is still restricted.



Schematic view of the Campbell River forest canopy as measured using airbourne LIDAR and the view of the spectro-radiometer.

One possibility for detailed observation of canopy reflectance over an entire vegetation growing season is to use automated near surface remote sensing to systematically scan the canopy surface. As part of an NSERC / FLUXNET-CANADA program, graduate student Thomas Hilker has mounted a spectro-radiometer instrument on a 50 m tower at Campbell River, BC. This instrument will measure canopy reflectance every 15 min over a one year period allowing us to measure the entire surroundings in a 360° view around the tower. The results will help us to understand the relationship between canopy spectral reflectance and forest productivity for the assessment of forest carbon budgets. Our ultimate aim is to have a detailed understanding of the relationship between changes in photosynthetic efficiency and spectral responses.

View from the top of the FLUXNET-Canada Campbell River tower with the automated spectro-radiometer measuring canopy reflectance every 15 minutes, 24 hours a day.

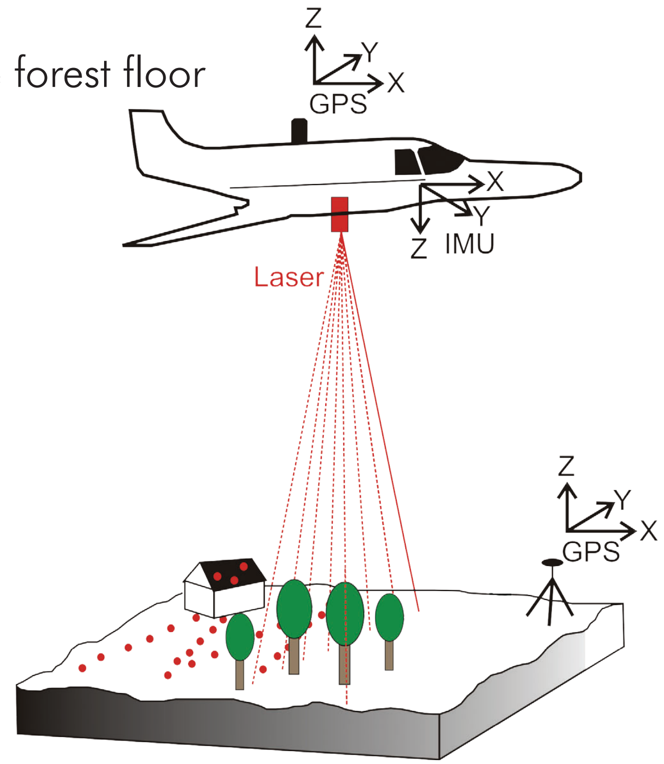
Application of LiDAR to accurately map the forest floor

Light detection and ranging (LiDAR) is an active remote sensing technology that uses an airborne laser to measure ground morphology and canopy structure simultaneously with sub-metre accuracy.

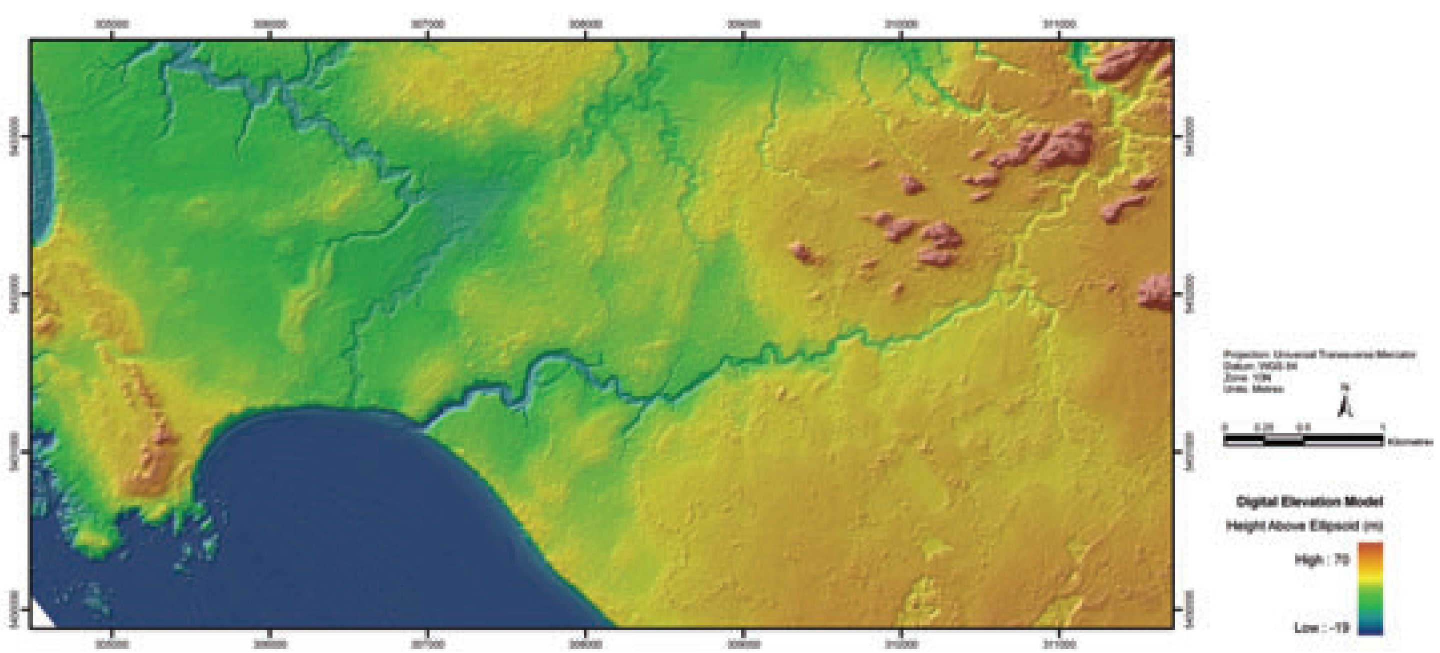
The instrument sends laser pulses to the ground and records the length to time taken for each pulse to return to the sensor. This dense coverage of laser pulses results in the forest being scanned at approximately 1 pulse every metre. By exampling the distribution of laser pulses we can establish which pulses intersect the forest canopy and which ones are returned from the forest floor. As a result, both canopy surface and ground surface models can be developed.

Information about the forest floor is critical for a range of applications including slope analysis for forest operations, landslide risk assessment and surficial mapping and hydrology. Information on forest structure includes very accurate estimates of tree height, canopy cover as well as growth stage and volume.

In collaboration with BC Ministry of Forests and Range, and the Forest Science Program (FSP) M.Sc. student Chris Bater, is investigating the capacity of LiDAR technology to accurately map terrain below dense forest canopies at Clayoquot Sound, British Columbia. Our work helps us to better understand the accuracy and ability of this technology to generate digital elevation models across a range of forest structural types.



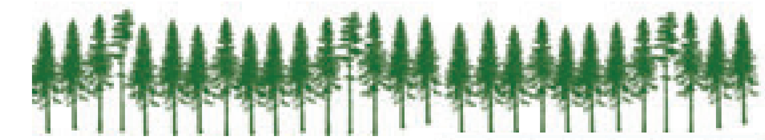
Schematic diagram showing how an airborne LiDAR system works. A laser pulse is sent from the aircraft to the ground and the beams are returned from either the ground surface or the forest canopy. Each LiDAR pulse is approximately 15 cm in diameter and is horizontally spaced at less than 1 m apart over the entire landscape.

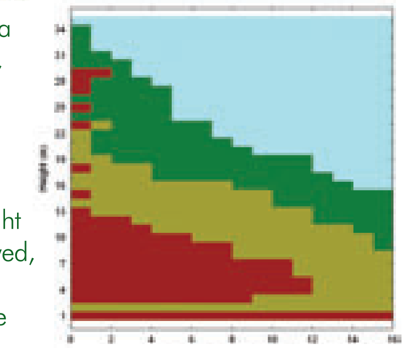


Bald Earth digital elevation model of Clayoquot Sound, derived from the LiDAR pulses which reached the ground, through the forest canopy.

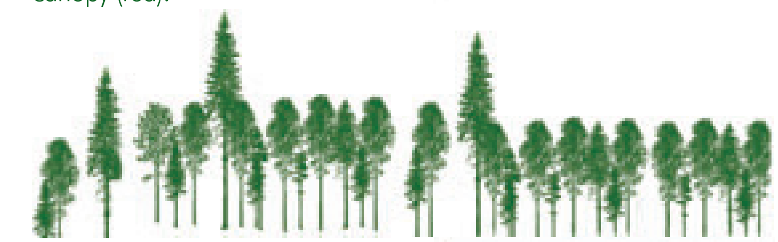
Laser mapping of forest canopy structure

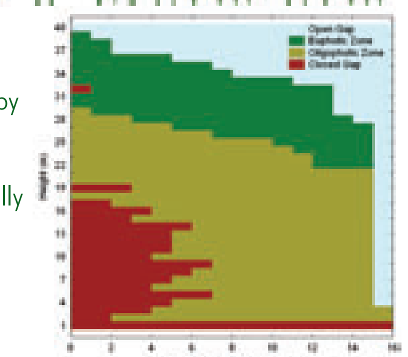
The labour intensiveness of field based methods can make variations in vertical and horizontal forest structure very difficult to quantify. However, light detection and ranging (LiDAR) technology, as described on the previous page, can be used with minimum effort to measure foliage height and to estimate several stand and canopy structure attributes. One such LiDAR project is focusing on Douglas-fir [*Pseudotsuga menziesii* spp. *menziesii* (Mirb.) Franco] and western hemlock [*Tsuga heterophylla* (Raf.) Sarg.] stands located on the east coast of Vancouver Island, British Columbia. These stands represent different structural stages of stand development. We are measuring tree height, crown dimensions, cover, and vertical foliage distributions in the field and relating these measurements to patterns of LiDAR responses. Our results indicate that measured stand attributes, such as mean stand height and basal area, are highly correlated with LiDAR estimates. Significant relationships were also found between the LiDAR data and the field estimated vertical foliage profiles. Our work demonstrates that LiDAR observations can provide quantitative information on stand and tree height, as well as information on foliage profiles. Furthermore, our results demonstrate that LiDAR results can be used to model detailed descriptions of canopy structure.



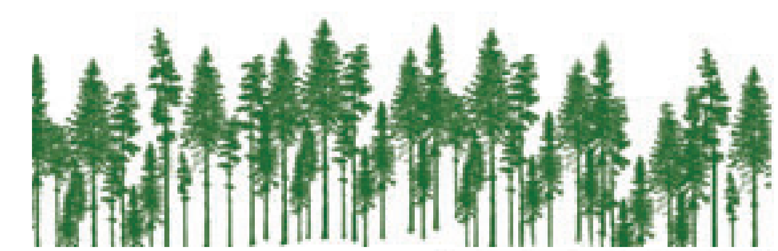


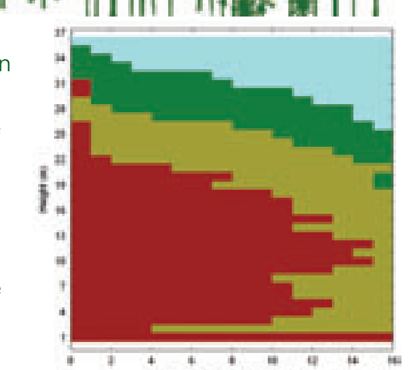
Distribution of LiDAR pulses over a highly stocked, even aged, stand, dominated by Douglas-fir. The distribution of LiDAR hits provides information on open gaps above the canopy (blue), foliage which intercepts the bulk of available light (dark green), lower, often shadowed, components of the stand (light green) and open gap beneath the canopy (red).





Distribution of LiDAR pulses in a mature Douglas-fir stand. In this case the stand is taller (as seen by the y-axes) with a dense canopy. There is general horizontal arrangement of canopy, especially at the upper level indicating optimum structure for light interception.





Distribution of LiDAR pulses in an over mature Douglas-fir stand. Again the stand is taller than the young forest, however at these later structural stages, a larger portion of the stand is gap (red) with filled volume approximately 40% of the total canopy and the closed volume or gap increases to a maximum.

Remote Sensing is taught at the undergraduate and graduate levels at UBC. For more information on courses, the Integrated Remote Sensing Studio (IRSS) and other remote sensing projects visit www.forestry.ubc.ca\irss or contact:

Dr. Nicholas Coops
Canada Research Chair in Remote Sensing
Department of Forest Resources Management
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BC Forum on Forest Economics & Policy

On **November 1, 2006**, the BC Forum on Forest Economics and Policy will host a one day symposium on **Land Tenure & Forest Management in British Columbia**. The symposium will inform decision makers and stakeholders of the opportunities and potential costs and benefits of alternative tenure arrangements in BC.

According to Thomas Maness, symposium chair, "the current tenure system has created an industry structure with a dependence on high harvest levels and a focus on being high volume, low cost producers in commodity products. However, forest sector conditions have changed substantially in the last 30 years. BC is no longer a global cost leader as timber quality and piece size decrease over time, environmental costs, once nonexistent, continue to rise, and labor rates cannot compete with those of developing countries. At the same time, the public has become more aware that our public forestlands are more than simply an economic asset. They represent vital ecosystems that should provide a flow of a variety of timber and non-timber goods and services well into the future."

Clearly the conditions that created the need for the tenure system have changed, and the system itself is no longer meeting its original stated objectives: "competitive advantages in world markets", "maximum continuity of employment in all phases of the industry" and "stable, settled and prosperous communities". The choices of how we manage this asset will have serious impacts on both current and future generations, and there is widespread public concern about the development of these management policies.

This symposium will convene forest sector leaders to look at a new sustainable development strategy that once again ties forests to our inherent values, to the communities where we live, and to a diverse and globally competitive forest sector. Several Faculty of Forestry members including Drs. Hamish Kimmins, Ron Trosper and David Haley will be presenting papers that identify the ecological, social and economic issues that must be considered when designing a new forest land management system.

The symposium will engage participants and our panel of experts in a healthy dialogue and obtain feedback and measure support from the public and stakeholders for ideas for changing the tenure system as well as determine the research questions and information required to facilitate policy changes that advance new opportunities.

For more information, or to register for the event, please visit www.bc-forum.org or call 604-822-5570.

North American Forest Ecology Workshop 2007

The Faculty of Forestry at UBC will be hosting the 6th North American Forest Ecology Workshop in June 2007.

The theme of the 2007 meeting is "From Science to Stewardship: knowing, understanding and applying". The objective will be to examine the three major components of our science: knowing (experience-based, descriptive, inductive), understanding (deductive, experimental, reductionist, hypothesis-testing), and prediction (based on synthesis of knowledge and understanding up to the temporal, spatial and complexity scales of contemporary issues and questions). What is the role of these three components in the ecological underpinnings of forestry, where are the gaps that need to be filled, and how well does this science serve the profession of forestry? What are the barriers to the practical application of forest ecology to help achieve an economically, socially and environmentally sustainable use and conservation of forests?

Dr. Hamish Kimmins, workshop chair, is looking forward to working with the Faculty in hosting an audience of forestry researchers and practitioners from Canada, the US and Mexico. For more information, visit the NAFEW website at www.nafew2007.org.

Newsletter Production

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