branch lines

UBC Forestry
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Mountain pine beetle research at UBC

IN BRITISH COLUMBIA, we are witnesses to one of the worst insect outbreaks in modern times, as the mountain pine beetle continues to ravage the lodgepole pine forests of the province's interior. The beetle kills trees by mining the phloem area beneath the bark, cutting off the flow of nutrients and water within the tree. The beetles also carry a fungus that causes dehydration and inhibits a tree's natural defences against beetle attacks. The sapstain fungi leaves the wood a blue colour. This disturbance has been underway since 1994, and has already claimed more than 170 million m^3 of timber cumulatively. As of this year, about 5 million ha are being impacted – an area about the size of Denmark. By 2008, 10 million ha will be impacted, affecting 70 million m^3 of wood. The province of BC anticipates that a huge proportion of this material – perhaps up to 40% – will remain as standing deadwood, unharvested, decaying, and posing a huge potential fire hazard.

Using the wood from beetle-killed trees is a challenge. It is a highly variable supply of wood that is moving with the outbreak through the forests of BC. The wood quality of a tree in the 'green' phase of the outbreak – living trees with beetle infestation – is approximately the same as an unaffected tree. However, as the infestation continues into the 'red' 'and 'grey' phases, the tree begins to die and the wood quality begins to be reduced. Because of this, using beetle-killed wood for traditional applications is limited. The amount of residue that is generated from processing this wood is therefore increased. There are costs associated with harvesting this material – environmental, economic, and social – which must be assessed.

Aerial view of extensive MPB attack

At the Faculty of Forestry, we have devoted a large proportion of our research time to addressing the mountain pine beetle problem. Our researchers are examining the policy implications of this outbreak, and the impact that it will have on our resource-dependent communities. We have projects underway looking at the environmental cost of the outbreak and the long-term effects that it will have on our forest ecosystems. We are using advanced biotechnology to develop environmentally-safe controls that may mitigate future outbreaks. Our labs are busy developing new, advanced forest products that will be able to utilize beetle-killed wood more efficiently. Finally, we are considering the future and examining ways in which we can help the forest recover from this devastating blow.

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Governance and policy issues

THE MOUNTAIN PINE BEETLE (MPB) epidemic poses significant challenges to the governance and policy framework for forest management. Managing the complexities of the outbreak will require both vertical and horizontal coordination across different government levels, ministries and jurisdictions. Both the provincial and federal governments have launched major government initiatives to address the mountain pine beetle epidemic: British Columbia's Mountain Pine Beetle Action Plan 2005–2010, and the Government of Canada's Mountain Pine Beetle Initiative.

The provincial government, because of its jurisdiction over BC Crown forest lands, has taken on the dominant role. While the epidemic poses problems for many areas under provincial governance, the current plan is for the provincial action plan to be implemented under the authority of the Ministry of Forests and Range. Within the ministry, a new office, the provincial Bark Beetle Coordinator, will oversee the implementation of the action plan and the new bark beetle regulatory regime. Due to the scale and severity of the epidemic, the action plan will require inter-ministry coordination and intensive stakeholder involvement. The BC government created the Minister's Community Advisory Group to consult the government on the content and progress of the provincial action plan. Members include representatives from communities, First Nations, forest industry, scientific community, logging contractors, and the federal government.

The federal initiative, administered by the Canadian Forest Service, has three components:

- funding for research and development,
- assistance and funding to First Nations and federal forest land, and
- assistance and compensation to private forest land owners.

The federal government is also providing funding to the provincial government and has allocated $100 million for the 05/06 fiscal year, and the province, claiming that the mountain pine beetle epidemic is a national natural disaster deserving a national response, is hoping for significant increases in future budgets.

First Nations issues will be prominent in the development and implementation of beetle management strategies. The sudden availability of new fibre has created economic opportunities for First Nations in the forest industry. The province is under significant political and legal pressure to increase the involvement of First Nations in the governance of forest resources, and the need to create new policies to address the epidemic will provide a number of opportunities for these issues to be addressed.

In addition to the jurisdictional complications, the mountain pine beetle infestation presents a number of challenges to the policy framework for forest management in BC.

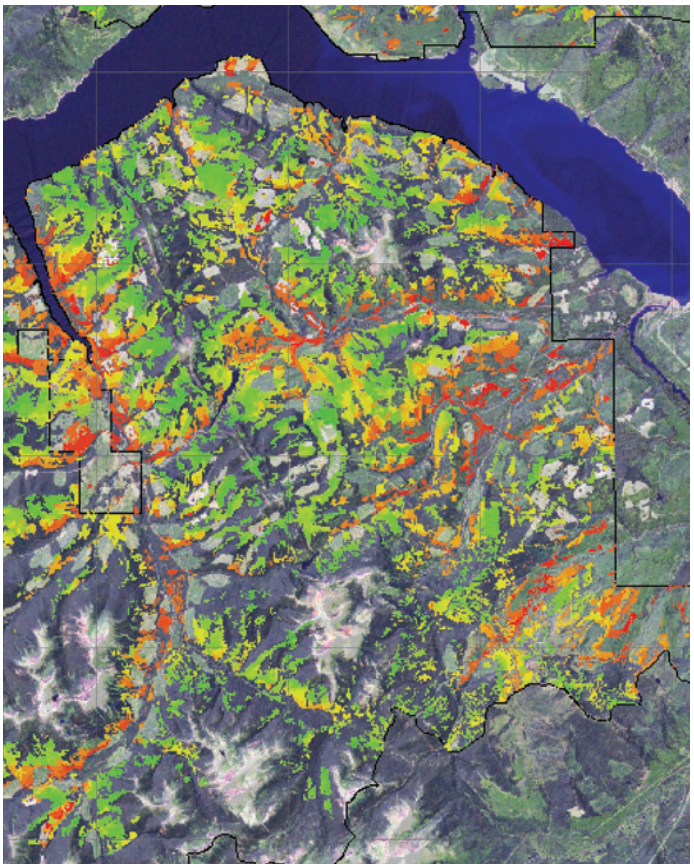
- While the BC government has acknowledged the need to amend environmental regulations in beetle salvage areas, it has yet to do so.
- The vast majority of salvage timber being harvested is being charged the minimum stumpage rate of 25 cents per cubic metre, which does not reflect either its market value or a fair return to the Crown, and creates considerable challenges to creating a market-based stumpage regime in the interior.
- Established Land and Resource Management Plans may need to be revisited because the infestation has significantly altered the resource values protected by the plans.
- The overwhelming majority of BC forests are under volume-based tenures with no established framework for strategic forest management planning – establishing an appropriate future forest will require a more effective strategic planning framework.
- The dramatic increase in available timber supply may aggravate the already adversarial relationship with the United States over our softwood lumber exports.

For further information contact Dr. George Hoberg (Head, Department of Forest Resources Management) at 604-822-3728 or george.hoberg@ubc.ca.

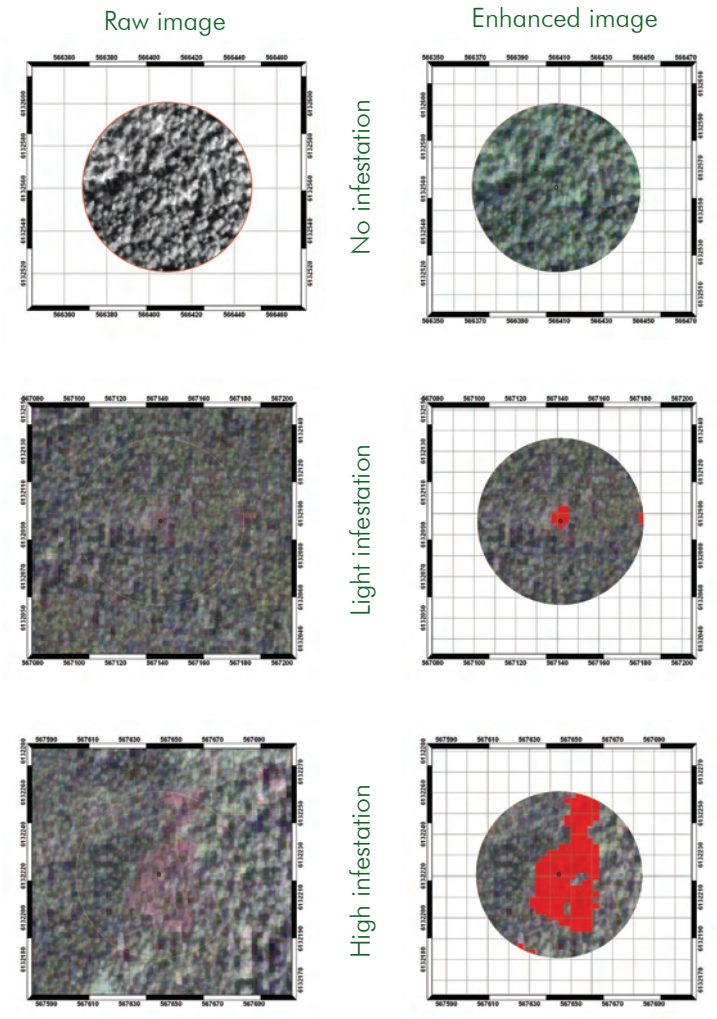
A comprehensive issue brief on the mountain pine beetle has been posted at **www.policy.forestry.ubc.ca.** The brief was designed to provide comprehensive coverage of all major facets of the problem while also being concise and accessible to non-experts. The site also acts as a portal to other internet resources on the subject. Your comments on either the substance of the site or suggestions for additional links are encouraged.

Detection and monitoring using satellites

THE FAST MOVING nature and vast spatial extent of the current mountain pine beetle (MPB) epidemic makes remote sensing, either by aircraft or satellites, the ideal technology for both detection and monitoring. We have had a long history of research on this topic within the Faculty of Forestry. Initially, Peter Murtha (now Prof. Emeritus) utilised a range of aerial photographic techniques to detect MPB infestations. Currently, researchers from UBC's Faculty of Forestry are working on detection and monitoring of the MPB infestation using both broad scale satellite remote sensing imagery (such as Landsat Thematic Mapper) and high spatial resolution satellite images, capable of detecting individual affected tree crowns. Dr. Nicholas Coops (Department of Forest Resources Management), is using a time series of satellite imagery, from both before and after the infestation at the edge of the outbreak near Chetwynd, BC, to monitor the movement of the beetles through forest stands. This work is being done in cooperation with the Canadian Forest Service. Using predictions of spread from the imagery, forest inventory data on age, species, canopy conditions and growth, is being used to establish which stands are preferentially selected for attack by the beetle. Results indicate that site index and slope are the principal discriminators of the current mountian pine beetle attack in this particular region,



Enhanced areas indicate high potential for infestation



followed by stand basal area, and to a lesser extent, crown closure and stem density. These types of conditions confirm what is predicted using standard non-remote sensing models of MPB spread.

Nicholas Coops and his research team are also investigating the application of QUICKBIRD imagery high spatial resolution satellite imagery to map red attack. The 1 – 2.5 m pixel size allows individual tree crowns to be seen clearly on the imagery, making individual counting of red attack trees possible. By mapping individual red attack crowns from space, in a consistent and repeatable manner, this information can be used as input to models of outbreak and spread as well as in delivering spatially precise maps of red attacked trees (or small groups of trees) for use in directing crews as part of ongoing control measures.

For further information contact Dr. Nicholas Coops (Canada Research Chair in Remote Sensing, Department of Forest Resources Management) at 604-822-6452 or nicholas.coops@ubc.ca.

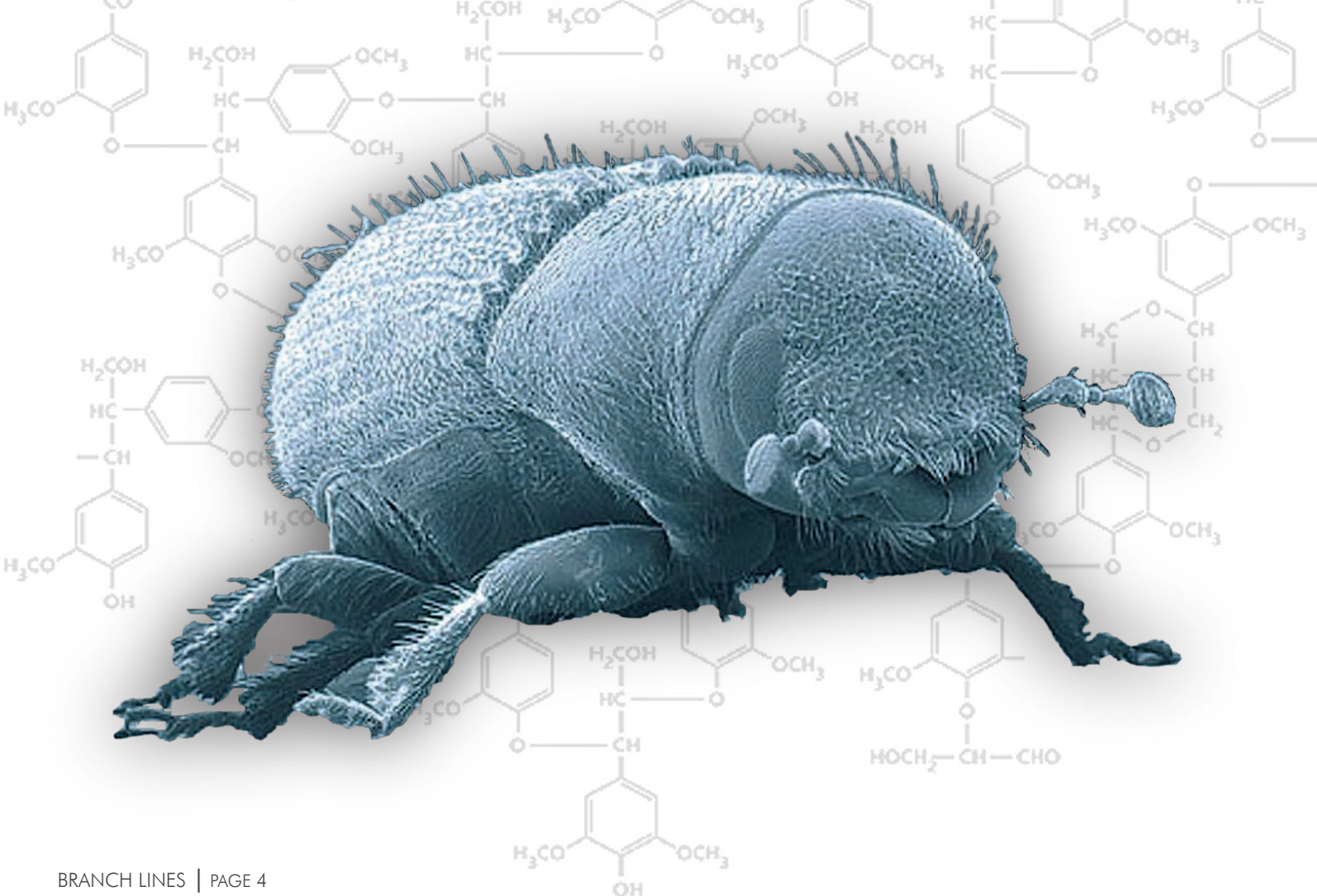
Chemical and physical properties of infested timber

TO SUCCESSFULLY REDUCE the impact of mountain pine beetle (MPB) on our forest products sector, we need to understand the relationship between the time-since-infestation and resulting changes in timber quality. A new research project, involving Drs. John Kadla and Frank Lam (Department of Wood Science) and Canadian Forest Products Ltd., is examining the chemical and mechanical properties of MPB-infested wood at various stages of attack including time spent as standing deadwood.

Preliminary studies on the thermo-mechanical properties of MPB-infested wood indicate that the lignin in infested wood is significantly softer when compared to non-infested wood. In the long term, MPB could have an impact on the durability of wood products in service. Durability is an important measure of the performance of existing wood products and it must also be considered in the development of new wood products from MPB-infested wood, particularly as it is influenced by time-since-infestation.

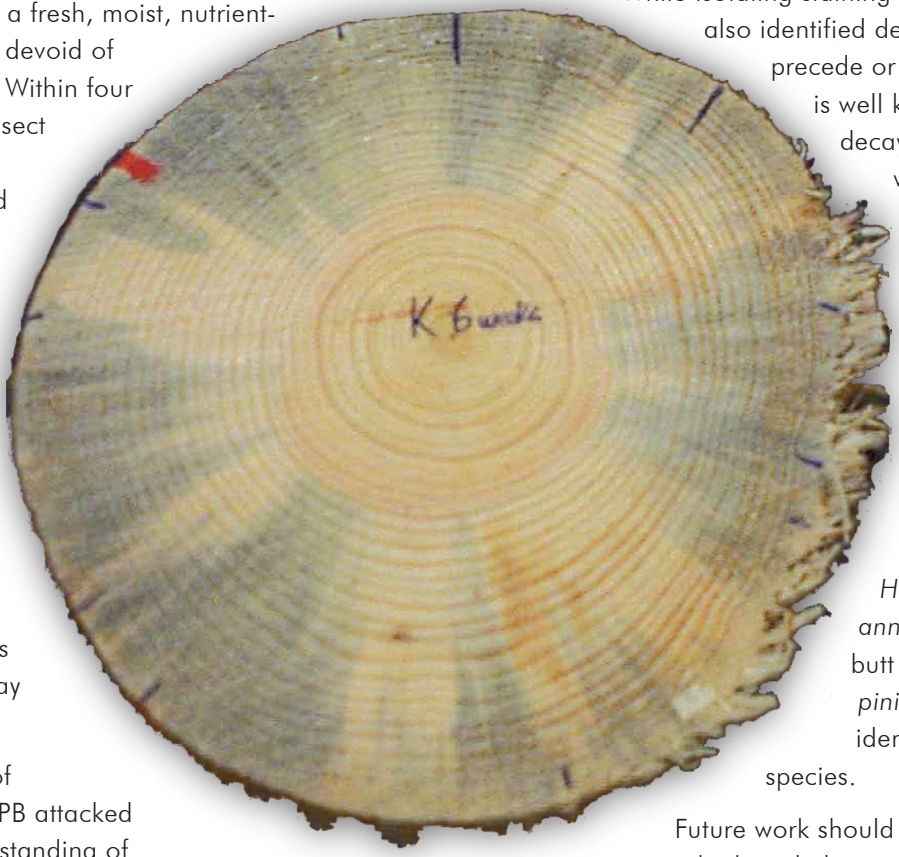
One issue that this research will address is the observation, made by others, that dry bending strength in MPB-infested wood increases or does not change in the initial stage of infestation. This group believes that MPB acts by degrading the hemicellulose component of wood, essentially breaking down the chemical chains that make up this molecule. If this is happening, very little mass loss would be observed, but the length of the structural components of the tree would be reduced. The degraded short chain hemicellulose would be 'sticky' or high in potential bond sites, and could increase adhesion within the cell wall – acting a little like starch on the back of wallpaper. Furthermore, the small hemicellulose fragments may interact with lignin and dramatically affect the adhesive properties of the lignin within the wood. However, if the tree is left unharvested in the forest, dies, and ages as standing deadwood, ongoing activities by the beetle and associated fungus will reduce the content of hemicellulose, ultimately reducing the long-term durability of the wood.

For further information contact Dr. John Kadla (Canada Research Chair in Advanced Biomaterials Chemistry, Department of Wood Science) at 604-822-5254 or john.kadla@ubc.ca.



Diversity and pathogenicity of fungal associates

MOUNTAIN PINE BEETLES (MPB) and their fungal associates are natural components of North American forest ecosystems. The beetles carry staining, pathogenic, and decay fungi into their host trees. The relationship between the beetles and the fungi is symbiotic. The fungal associates help the MPB overcome tree defenses and modify the moisture content and provide a source of food, which ensures the successful development of MBP progeny. The vectored staining fungi benefit because the beetles carry them through the tree bark, making available a fresh, moist, nutrient-rich wood environment devoid of competing microflora. Within four to six weeks after the insect attack, the fungi have discolored the sapwood and disrupted the transport of water to the crown. Tree death results from the synergistic action of the beetles and their fungal associates. Following tree death, secondary beetles can invade introducing different species of staining fungi as well as various molds and decay fungi.



Staining fungi in wood six weeks after mass MPB attack

Marketing and export of products made from MPB attacked trees requires an understanding of pathogenicity of the beetles' fungal associates and other secondary beetles involved in green attack. Dr. Colette Breuil and her research team in the Department of Wood Science are working towards identifying individual strains of MPB fungi and their mechanisms of action in the wood.

Colette and her team have been able to confirm that the development of sapstaining fungi and stained sapwood occurs within one month after a mass MPB attack. After the initial attack, they found that the fungal diversity of the sapstaining species was low, but the frequency of species isolated was high. The main sapstaining fungi present in BC have also been confirmed in the US, a major purchaser of BC softwood products. They have also determined which staining fungi colonize standing trees in each of the red and gray phases (two to three years after the initial MPB attack).

While isolating staining fungi, the Breuil team also identified decay fungi. Decay can precede or follow staining, and it is well known that some fungal decay species degrade wood faster than other species. The researchers found that the total isolates of decay fungi were approximately three times higher in red phases and two times higher in grey phases than in the initial attack. *Heterobasidium annosum*, a root and butt rot, and *Fomitopsis pinicola*, a brown rot, were identified among the decay species.

Future work should focus on contributing to the knowledge needed for the effective management of killed trees left in stands. In particular, there is a need to identity the decay fungi and to establish the rates at which different decay species degrade wood.

For further information contact Dr. Colette Breuil (Department of Wood Science) at 604-822-9738 or email colette.breuil@ubc.ca.

Using decision-support systems to help determine management alternatives

MUCH OF THE effort for the mountain pine beetle epidemic has been focused on mitigating economic impacts and developing silviculture and landscape management methods for reducing the spread and the risk of future outbreaks. While these are important and necessary activities, it is also important to consider the corresponding ecological implications, such as the loss of mature pine habitat, shifts in seral-stage patch size distributions and changes in stand dynamics. The massive scale of the current outbreak requires decision-support systems which allow us to examine the potential short and long-term consequences of mountain pine beetle management alternatives on both economic and ecological indicators of sustainable forest management.

In a project coordinated by Dr. John Nelson (Department of Forest Resources Management) and involving members of the Department of Forest Sciences, computer-based simulations are being run on a range of outbreak severity levels for TFL 48 in northeastern BC. These simulations will enable forest managers to assess the potential ecological and economic impacts on a landscape previously untouched by the mountain pine beetle. This project will also help to determine what pre- and post-attack management options are available for maintaining a profitable harvest profile while sustaining the ecological indicators. This includes questions related to the location and intensity of salvage operations under a range of attack assumptions, such as: "Is there an ecological 'fall down' following large scale disturbance and salvaging and can it be mitigated through management?"; "How can we balance economic and ecological risks in the context of the current and future MPB outbreaks?"; "To what degree can even-flow harvesting be maintained in landscapes prone to large-scale natural disturbance?"; and "Is zonation an effective strategy for mitigating ecological impacts in salvage-driven harvesting?".

The methods that Dr. Neslon's team will use to help address these objectives include: 1) generating stand-level structure and volume projections for post-attack stands; 2) building models that relate ecological indicators to stand and landscape structure projections; 3) developing beetle outbreak scenarios, and; 4) applying a strategic harvest scheduling tool that incorporates these ecological indicators as well as traditional economic indicators.

For further information contact Dr. John Nelson (Department of Forest Resources Management) at 604-822-3902 or john.nelson@ubc.ca.

Forest bioenergy and beetle-killed wood

BIOMASS FROM OUR forests can be converted efficiently into heat, electricity, and fuel in order to reduce our dependence upon fossil reserves, improve our environmental performance, lessen the risk of permanent climate change, increase employment in rural regions, and diversify the economy. As the mountain pine beetle epidemic increases our inventory of standing deadwood, we need to consider a strategy to take advantage of this wood as a potential source of bioenergy.

Advanced bioenergy platforms, including pyrolysis or gasification (thermochemical) or bioconversion (microbial), may be used to create chemicals and fuels from wood. A major research project at the Faculty of Forestry focuses on the microbial platform, which combines non-traditional pulping techniques with a biological treatment in order to break wood down into its component polymers. These polymers can be further processed into energy or heat through combustion, or into liquid biofuels such as ethanol, by fermentation of sugars. The creation of liquid biofuels is particularly important, as future transportation fuels are essential to support the Canadian economy.

A research team from the Department of Wood Science is examining the benefits and trade-offs associated with expanding bioenergy production in British Columbia. The team, led by Dr. Jack Saddler, will be evaluating the potential of different technological platforms to provide increased or new economic development in the rural regions of the province and across Canada, and better employment in resource-based communities in these areas. They will also explore the potential of bioenergy options to provide a hedge against eventual depletion of and escalating costs in fossil fuels. In the future, we expect forest bioenergy to be a major forest product in the industry's portfolio.

For further information contact Dr. Warren Mabee at 604-822-2434 or warren.mabee@ubc.ca.

Integrating silvicultural control with wildlife and sustainable forest management objectives

HOW CAN THE silvicultural control of mountain pine beetle be integrated with wildlife and sustainable forest management objectives? This is a question that is being addressed by researchers (Drs. Fred Bunnell, Ann Chan McLeod and graduate students) from UBC's Department of Forest Sciences. This issue is of critical importance because the catastrophic nature of the mountain pine beetle epidemic, and the silvicultural prescriptions that must be implemented to contain its damage, have immense implications for wildlife and non-timber resources. Beetle control measures must be effectively integrated with wildlife and sustainable management goals if potentially negative impacts on wildlife populations are to be avoided.

This study addresses the issue from three perspectives. At the most fundamental level, the study documents the effects of various control measures on wildlife populations and sustainable management indicators. For every management option exercised, there will be winners and losers among wildlife populations, and these tradeoffs must be understood and incorporated into integrated management prescriptions for silvicultural mosaics across the landscape.

This study also seeks to identify methods for integrating wildlife objectives and beetle management from the outset. Preliminary research results suggest that the location and distribution of trees left in the cutblock, and even slight differences in how many trees are left, can yield significantly different impacts on wildlife populations.

Finally, this study factors in long-term considerations in integrating beetle control and wildlife management objectives. This is achieved by quantifying the forest stand dynamics (such as windthrow, tree mortality, tree vigor, snag creation) of forest stands that have undergone beetle control measures, in order to project long-term implications for timber supply, habitat value, and sustainable management indicators.

For further information contact Dr. Ann Chan-McLeod (Department of Forest Sciences) at 604-822-8287 or ann.chan-mcleod@ubc.ca.

Photo: Julian Gonzales

Partial mortality

Forest fires and forest structure relationships

A RESEARCH TEAM led by UBC's Dr. Michael Feller (Department of Forest Sciences) has been looking at the impacts of mountain pine beetle (MPB) on forest stand structure in Montane Spruce – Interior Douglas-fir forests to test the hypothesis that fires on the west side of the southern Canadian Rocky Mountains have generally been more severe, and have resulted in a greater quantity of lower elevation even-aged dense lodgepole pine forests, than fires on the east side, helping to explain the greater incidence of MPB attacks in west side forests. The study compared season of burning of historic fires, relative severity of fires, and the structure and composition, of west- vs. east-side forests.

Seasonal distributions of fires appeared to be very similar in east- and west-side forests, with approximately 50% of fires in the dormant and early spring seasons, 30% in late spring, and 20% in summer. Fire severity distributions were also similar in both east- and west-side forests. MPB infestation was found to influence stand structure by reducing small diameter snag densities, living tree densities, size class distributions, and abundance of lodgepole pine, but these effects tended to decrease with time after an infestation. Other stand characteristics, such as regeneration density, tree height class diversity, and amount of coarse woody debris, were not consistently affected. A stand successional pathway model suggested that there might have been a greater proportion of forest containing such trees in west- rather than in east-side forests during the 20th century when previous MPB infestations occurred, and there is some support for this from historical photographs. However, the model also suggested a relatively greater proportion of high severity fire and a relatively lower proportion of low severity fire in east side forests around 1900. This would have led to a relatively greater proportion of forest susceptible to MPB in east side areas during the last 50 years when past MPB infestations were recorded. Consequently, the output from the model is unclear with respect to the degree of susceptibility to MPB of east- vs. west-side forests during the last 50 years. As the model is a preliminary one likely to have inaccuracies, more weight was given to the field measurements and the balance of the evidence collected suggested that the hypothesis is not valid.

Thus, it would appear that the fire regimes of east- and west-side forests have been similar historically, although fire suppression activities during the 20th century have been more effective in reducing the area burned in east side forests. Less frequent high severity fires in east- compared to west-side forests during the past 50 years, as a result of this suppression, may have lead to beliefs about differing fire regimes on the east- and west-side of the Rockies.

For further information contact Dr. Michael Feller (Department of Forest Sciences) at 604-822-3729 or michael.feller@ubc.ca.

The ecological legacy of unsalvaged post-beetle stands

THE CATASTROPHIC NATURE of the mountain pine beetle epidemic has resulted in an unprecedented rush to salvage log beetle-killed stands before wood quality deteriorates to unacceptable conditions, and before the excessive build-up in fuel results in calamitous wildfires. But although the economic reasons for salvage logging are clear, the ecological reasons are not. In fact, the rush to salvage log beetle-damaged wood has largely occurred without the benefit of ecological considerations, in part because there is very little information on the ecological legacies of the unsalvaged post-beetle stand. Yet these ecological relationships are critical. To the extent that the epidemic is wreaking great havoc on the forest industry and on the small communities that rely on this industry, so too will the epidemic have huge impacts on biodiversity values. If the ecological legacy of beetle-damaged stands is low, then salvage logging should not be hindered by suspected but unproven ecological benefits. On the other hand, if beetle-infested stands retain high ecological values, then indiscriminate salvage logging would magnify the already damaging effects of the epidemic to biological diversity.

For these reasons, Dr. Fred Bunnell (Department of Forest Sciences) and his team are conducting research that will help forest managers determine what ecological legacies should be sought in post-beetle forests, by documenting the ecological value of unsalvaged beetle-infested stands, and by providing understanding of the factors that will likely dictate the ecological legacy of any particular stand. One such factor is time since death. When the mountain pine beetle first attacks a pine stand, woodpeckers benefit from the increased food source, and negative effects are relatively minor because the stand structure that makes up wildlife habitat is mostly intact. Over time, however, the deterioration of the stand dramatically alters wildlife habitat, and in some cases, may be very detrimental. Another likely factor is the amount of live trees that are left in the stand after the beetle has passed through. Dead and dying trees are a critical component of wildlife habitat in a living forest. The juxtaposition of beetle-killed trees with residual live trees (deciduous and non-pine conifers trees that coexisted in the original mixed forest, or pine trees that escaped the beetle attack) may provide higher ecological value than a stand containing either all dead or all live trees.

By understanding these factors, forest managers will be able to better determine the manner and extent to which salvage logging should proceed in order to balance economic and ecological considerations. They will also be able to better prioritize locations, extent, and management units where salvage logging should proceed. Results from this research should benefit the timber industry by allowing foresters to salvage log with confidence where ecological values are insignificant, while reducing fuel loading and fire hazards to surrounding forests. The results will benefit conservation initiatives by providing justification for restricting salvage logging where it is ecologically inexpedient, and by possibly discouraging spurious accommodations of wildlife objectives through retention of beetle-killed stands that have little biodiversity value.

For further information contact Dr. Ann Chan-McLeod (Department of Forest Sciences) at 604-822-8287 or ann.chan-mcleod@ubc.ca.

BC Forum and the beetle epidemic

THE MOUNTAIN PINE beetle epidemic has shown how the forests of BC are interconnected with our communities, our citizens and our future. The short term response to the epidemic revolves around salvage and reforestation, but the long term response will involve nothing short of reinventing the forest sector in BC.

The BC Forum on Forest Economics and Policy was created to encourage self study and dialogue on issues surrounding the long term viability, competitiveness and sustainability of forestry in BC. This year the Forum, (directed by Dr. Tom Maness, Department of Forest Resources Management), launches a series of introspective synthesis papers, workshops and public events on research themes concerning the beetle epidemic. These themes include strengthening forest dependent communities, developing a value focused approach to forestry, designing the future forest to meet the ever widening variety of needs of the future, and positioning the forest products industry to compete in a changing global market place.

The Forum's multidisciplinary teams guiding this work include many members of the Faculty of Forestry. This year's program of work will help define the appropriate research questions to help us move into the future. For more information about our program and upcoming events, please visit www.bc-forum.org or call Nicole Robinson at 604-822-5570.

Balancing biological and social risks

DESPITE THE FACT that its severity and extent may reflect past fire control and contemporary human-enhanced climate change, the current mountain pine beetle (MPB) epidemic is part of the natural disturbance ecology of BC's interior forests. The epidemic is more of a social issue than an environmental issue, although widespread salvaging of beetle-killed timber would raise the environmental profile of the epidemic. The complexity of questions involved in MPB policy development renders this issue a classical "wicked" problem, with all that this entails. Unless the complexity is explicitly addressed, policy with respect to the epidemic may raise as many problems as it solves. Policy should be developed in the context of a comprehensive conceptual model of the many facets of the issue and their inter-relationships. It should also reflect an understanding of the uncertainties concerning the future development of beetle-killed forest stands, because patterns of stand development will influence the temporal flow of values and environmental services from these stands. Comprehensive decision-support systems that explicitly address both social and environmental dimensions of the MPB issue are essential for coping with the complexity and uncertainty associated with policy development.

The Faculty of Forestry's Forest Ecosystem Management Simulation Group (Drs. Hamish Kimmins, Brad Seely and Clive Welham), is involved in two projects concerning the mountain pine beetle epidemic. The first, conceived in conjunction with faculty members John Nelson and Fred Bunnell, examines two questions: (1) Is there an ecological 'fall down' following large scale disturbance and salvaging and can it be mitigated through better planning and management? (2) How can we balance economic and ecological risks in the context of the current and future MPB outbreaks? The ecosystem simulation model FORECAST is being applied to examine potential trajectories of stand attributes related to both ecological and economic indicators that may develop following different methods of stand-level salvage for a range of stand types and attack severities. Output from FORECAST will subsequently be linked with landscape-scale harvest scheduling and habitat models to facilitate scenario analyses.

The second project (part of a larger project led by Lorraine MacLauchlan of the BCMoF) is focused on improving our understanding of the early phase of MPB outbreak. This phase is critical to understanding MPB population dynamics and effective management strategies to mitigate beetle impacts. In the first phase, a retrospective spatial analysis was conducted to describe the stand and landscape-level conditions where MPB red attack was first observed in TFL 49. These empirical results provide a post-hoc analysis of the factors that are potentially important to the MPB during the endemic phase. In the second phase, FORECAST will be applied to simulate how stand susceptibility changes in relation to species composition and age, and how susceptibility can be mitigated through alternative management practices.

For further information contact Dr. Hamish Kimmins (Canada Research Chair in Forest Ecosystem Modelling, Department of Forest Sciences) at 604-822-3549 or hamish.kimmins@ubc.ca.

Public perceptions of management alternatives

COMPUTER-BASED FOREST visualization techniques can provide forest managers with visual representations of forest management scenarios that are otherwise only represented by abstract statistics or maps. Dr. Mike Meitner (Department of Forest Resources Management) and his team are involved in research to extend visualization techniques for looking at management alternatives in the current mountain pine beetle epidemic.

During the summer months, Dr. Meitner and his team collected a detailed photographic inventory of the various stages of beetle infestation and damage as well as the long term recovery of specific sites in TFL 49. These images, which include photographs of green, red & gray attack, snags, stumps, downed wood and fire effects, will add significantly to our capabilities to visualize the full range of possible outcomes for beetle attack in this area. Currently, efforts are focused on the post processing of the images to derive tree textures, critical to the overall visualization effort. Once this is complete, perceptual experiments will be conducted to help increase our understanding of the social dimensions affecting the acceptability of the different management actions.

The first of these perceptual experiments will assess the public acceptability of management alternatives by simply

presenting these visualization sequences to subjects for a variety of evaluations. The second study is targeted at deriving values for each time step within a scenario on the dimensions of scenic beauty, naturalness, and fire hazard. Additionally, a more traditional survey will be administered to identify public beliefs of the origins of this event and how those beliefs might frame perceptions of appropriate management goals post event. Lastly, a choice experiment will be conducted to assess the trade offs between aesthetic, recreational and economic values associated with alternative management possibilities.

Although the final determination of specific management scenarios has yet to be confirmed, the scenarios are intended to be both representative of issues facing forest managers and sufficiently diverse to be relevant in eliciting public assessments of acceptability. Three time periods will be visualized; current conditions, 20 years and 80 years in the future.

This program of research is an essential first step in understanding public perception of the current MPB epidemic and associated management strategies for dealing with this situation. Right or wrong public opinion is a major driver of public policy and an increased understanding of how the public sees these issues will certainly help to guide management efforts aimed at maximizing overall social benefits to be derived from proposed alternatives. The results of this research will help resource managers understand public perceptions regarding the manner and extent to which salvage logging should proceed in order to balance social, economic and ecological considerations.

For further information contact Dr. Mike Meitner (Department of Forest Resources Management) at 604-822-0029 or mike.meitner@ubc.ca.

Phtoto: Julian Gonzales

MPB damage in TFL 49

Mountain pine beetle reasearch at UBC, continued from page 1

This special edition of Branch Lines introduces the extent and diversity of the mountain pine beetle research currently underway in the Faculty of Forestry (much of it funded by the federal Mountain Pine Beetle Initiative). For further information on any of these projects, contact the individual researcher listed at the foot of each article. You may also want to find out more about the mountain pine beetle workshops being held in Vancouver (UBC) and Prince George (UNBC) in early November (see article below).

Your feedback is always welcomed.

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Research Synthesis and Strategy Workshops

The mountain pine beetle epidemic and the future of communities and ecosystems

Co–hosted by University of British Columbia & University of Northern British Columbia

UBC: Robson Square, Downtown Vancouver
Research Synthesis and Strategy Session: November 7th (Day)
Public Lecture: November 7th (Evening)
UNBC: Canfor Theatre, Prince George
Research Synthesis and Strategy Session: November 9th (Evening) – 10th (Day)

The University of British Columbia (UBC) and the University of Northern British Columbia (UNBC) are co-hosting two workshops and a public lecture series with video conferencing links that will bring together science providers and people affected directly or indirectly by the mountain pine beetle epidemic, including representatives from communities, First Nations, industry, academia, governments, and non-government organisations.

The UBC events will consist of an evening public lecture and a daytime technical session. The evening event for the general public will increase the public's awareness of the economic and community impacts of the current mountain pine beetle infestation in the province of British Columbia.

The research synthesis and strategy sessions at UBC on November 7th and UNBC (evening of the 9th and day of the 10th) will be useful to researchers, community leaders, industry, First Nations, and federal and provincial government representatives involved in mountain pine beetle action planning. These sessions will begin the dialogue on defining what we currently know and what we still need to know about the impacts of the infestation on our environment, our economy and our communities. Leaders in the innovation community will be identified to draft a research agenda discussion paper.

There is no cost to attend the workshop series. However, space is limited and registration is required. Registration forms are available from the FORREX website at www.forrex.org/events/mountainpinebeetleforum/

For further information contact the UBC/Vancouver coordinator, Dr. George Hoberg at 604-822-3482 (george.hoberg@ubc.ca) or the UNBC/Prince George coordinator Dr. Dan Lousier at 250-746-9522 (wiskeyjackscience@telus.net) or Debbie Krebs at 250-960-5650 (krebsd@unbc.ca).

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