

Presenter	<i>Session 1: The Challenge and the Science</i>
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Dan Turner	Young stands in B.C.: Silviculture records
Babita Bains & David Rusch	"Pest incidence and impact" current knowledge on the health of young stands: biotic and abiotic. What are the major threats to young stands in British Columbia?
	<i>Session 2: A Scattergram of Data</i>
Tim Ebata	Forest health data – What do we have and what can we do with it?
Rene De Jong & Scott McKinnon	Estimating future impacts of stem rusts with young stand monitoring
	<i>Session 3: The Science and the Future: Uncertainty and Climate Change</i>
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Vanessa Foord	Climate change and drought risk
Suzanne Simard & Jodi Axelson	Surprise is inevitable: Adaptive management for reforestation in times of uncertainty.
	<i>Session 4: Policy and Tools- Improving the Health of Young Stands</i>
Ken Day	Re-imagining the role of silviculture: Protection and reduction of losses
Rick Monchak	The health of young stands – An operational coastal perspective
Nick Ukrainetz	A genetics approach to forest health issues
Will MacKenzie	Reforestation decisions under climate change uncertainty : Modern Portfolio Theory guided species diversification as a strategy for minimizing forest health risks
	<i>Session 5: Modelling the Uncertainty</i>
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Derek Sattler	Impacts of stem rusts: GRIM & CRIME TASS II Modules
Dave Waddell	Impacts of stem rusts: Application in TSR
Stefan Zeglen	Creating operational adjustment factors: Root disease on the B.C. south coast
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Surprise is Inevitable: Adaptive Management for Reforestation in Times of Uncertainty



Jodi Axelson, Silviculture Lead, Office of the Chief Forester | Resource Practices Branch, FLNRORD, Victoria, B.C.

Abstract: Climate change is modifying many disturbance regimes in western North American

forests, such as wildfires, droughts and insect outbreaks, which are increasing in frequency, extent and severity. With these changes, there is increasing uncertainty about the resilience of forest communities, challenging our understanding of how disturbances impact forests in the near- and long-term. Understanding the impacts of climate change and associated changes in disturbance regimes however is critical to effectively manage a multitude of ecosystem services, including timber, carbon sequestration, habitat and biodiversity. Exacerbating these uncertainties is the challenge of regenerating forests across large disturbed landscapes that will be resilient to future conditions. The uncertainties we face necessitates a critical assessment of whether standard reforestation practices that have historically emphasized establishing dense conifer crops in gridded plantings (e.g., pines in lines) followed by intensive management will create resilient and robust forests of the future? C.S. (Buzz) Holling understood that our knowledge of natural systems is always incomplete, and that surprise is inevitable. However, once we accept this “the essential point is that evolving systems require policies and actions that not only satisfy social objectives but at the same time provide flexibility for adaptation”. Thus, providing the flexibility for adaptation and what this looks like in different

areas of B.C. is our central challenge in creating resilient and productive forests of the future.

Dr. Jodi Axelson is an interdisciplinary scientist in applied forest ecology and disturbance dynamics. Her research program is focused on collaboration and innovation to identify what qualities resilient forests exhibit and how these can be maintained or enhanced through forest management. Jodi’s research has included quantifying the long-term dynamics of western spruce budworm and bark beetle outbreaks impacts on forest dynamics and regeneration. More recently Jodi has examined how disturbances change ecosystem function and impact trajectories of forest recovery. As climate change accelerates and forests continue to be exposed to new and compounding stressors, Dr. Axelson believes that there is an urgent need for research collaboration, integration and innovation to maintain forest resilience and enhance adaptation.



“Pest Incidence and Impact” Current Knowledge on the Health of Young Stands: Biotic and Abiotic. What are the Major Threats to Young Stands in

British Columbia?

Babita Bains, Provincial Forest Entomologist, Resource Practices Branch, FLNRORD, New Westminster, B.C.

Abstract: Stand and forest regeneration has become increasingly challenging due to changing climate conditions that are driving stand level and landscape level disturbances. With changing climate conditions, many abiotic and biotic forest health factors will continue to increase in both severity and frequency. This two-part talk briefly outlines the primary abiotic and biotic forest health factors affecting young stands in British Columbia, highlights the need for long-term monitoring data that is required to mitigate current and emerging forest health factors, and discusses the potential negative consequences of not amending current government policies that drive forest management.

Babita joined the Ministry as the Provincial Forest Entomologist in the spring of 2017. Prior to joining the forest health group, Babita worked as the Seed Planning Officer with B.C. Timber Sales for 1.5 years, and worked as a forestry consultant with B.A. Blackwell & Associates from 2010 – 2016 where she completed and contributed to numerous projects relating to forest health, environmental impact assessment, community wildfire protection planning and urban forestry. Prior to starting her professional career, Babita spent eight summers working as a tree planter and manager throughout B.C. Babita’s academic background includes a B.Sc. from the University of Victoria, M.Sc. in forest entomology from UBC and she has been a Registered Professional Forester with the ABCFP since 2015.

Re-imagining the Role of Silviculture: Protection and Reduction of Losses

Ken Day, M.F., RPF, Forestry Consultant, KDay Forestry Ltd., Williams Lake, B.C.



Abstract: Our current silviculture policy is heavily weighted to the regeneration phase and pays very little attention to the development and protection of stands beyond the first decade or two of their growth. In addition, we manage to stocking standards that are

focused on delivering volume without considering value of the final crop, and stocking rates are often low. With climate change, we face unforeseen forest health issues in increasingly novel ecological conditions. Biotic and abiotic disturbance is increasing at a rapid pace. This presentation starts the process to re-imagine our approach to silviculture by focusing on forest and stand protection. Citing examples of insect and disease management issues from experience, the presenter will discuss silvicultural techniques to develop a resistant and resilient growing stock that will achieve our objectives.

Ken Day is a consulting forester in Williams Lake, B.C. In 2018, he retired from his position of Manager of the Alex Fraser Research Forest after 31 years. Prior to his time at UBC, Ken worked for various consultants and sawmills in the Okanagan Valley. Ken has been a Registered Professional Forester since 1982 and in 1998, he received his Masters of Forestry from UBC, focusing on the management of uneven-aged Douglas-fir in the IDF. Ken is married, and has a daughter, a son and two grandchildren.

Estimating Future Impacts of Stem Rusts with Young Stand Monitoring



René De Jong, Growth and Yield Data Analyst, Forest Analysis and Inventory Branch, FLNRORD, Victoria, B.C.

Abstract: Since 2012, FAIB has been establishing a young

stand monitoring (YSM) program throughout B.C., comprising a grid network of ground sample plots where trees are permanently tagged, stem mapped, and periodically re-measured to track changes in growth and mortality of young stands using design-based sampling techniques.

Tracking forest health is a key component of the YSM program, where the incidence and severity of up to five forest health damage agents are recorded per tree at each measurement. In addition, height and encirclement data are collected from stem rusts (including comandra blister rust, stalactiform blister rust, & western gall rust) that will enable forest health modules specifically developed for these rusts (CRIME & GRIM) to be run within TASS (tree and stand simulator) growth model projections.

FAIB's expanding collection of YSM data across different management units has provided an opportunity to quantify the estimated volume impacts at rotation age that may be anticipated from measured incidences of these particular stem rusts. Results comparing incidence to estimated impacts for a subset of management units are presented.

René received a Bachelor of Science in Forestry from UBC in 1985. His current activities with the Forest Analysis and Inventory Branch include compiling and analyzing growth and yield project data. Previous experience includes consulting as a project manager with J.S. Thrower & Associates, major tenures forester at the Queen Charlotte Forest District, and growth and yield and fire research officer at Pacific Forestry Centre.

Forest Health Data – What Do We Have and What Can We Do with It?



Tim Ebata, M.Sc., RPF, Provincial Forest Health Officer, Resource Practices Branch, FLNRORD, Victoria, B.C.

Abstract: Understanding the importance of the

damage occurring in young stands requires data. Since the inception of the forest health program in the late 1970's, damage to young stands has always been perceived as significant, but the actual impacts to timber supply and other values have been hard to quantify. Young stand data collection efforts have been somewhat inconsistent with a few exceptions. This presentation will document the history of these efforts, what the sampling efforts have provided to date, and recommended improvements to ensure our sampling efforts accurately assess the impacts of the many damaging agents affecting regenerating forests.

Tim Ebata joined the Resource Practices Branch (formerly Forest Practices Branch) in 1995, starting as the Forest Health Project Specialist and then being promoted to the Forest Health Officer position in 2010. Prior to that, he was the Regional Entomologist in the former Prince Rupert Forest Region (now Skeena Region) from January 1986 to June 1995. 1986 was a very busy year. After starting his job in Smithers, he received his M.Sc. in Forest Entomology from UBC Faculty of Forestry, obtained his RPF, and got married! Tim has been involved in a wide range of forest health initiatives, including establishing the provincial aerial overview survey program in 1998, administering the provincial forest health budget, and implementing (and surviving) the gypsy moth eradication program for 22 years. He has been involved in young stand forest health damage surveys and assessments, participating in the establishment of the first set of free-growing damage criteria in 1986.

Climate Change and Drought Risk



Vanessa Foord,
Research
Climatologist,
FLNRORD, Prince
George, B.C.

Abstract: Links
between climate
change and

temperature increase in B.C. are quite clear, but understanding precipitation trends are tricky. Models project increases in precipitation for many places in B.C., but are minor compared to projected increases in temperature, indicating potential risk of ecosystem moisture losses, not gain. Temperature driven changes to snow seasons may also alter soil moisture content and potentially, water available to trees during spring/summer dry periods. Field based research is occurring in B.C.'s interior to understand climate-soil moisture changes and links to forest health. In addition, a stand-level drought risk assessment tool has been developed to project the risk of tree mortality using future climate change scenarios and information of soil moisture regimes. While these and other drought-related projects are still in the works, forest managers may want to consider the role potential future ecological droughts may play in forest health issues and promote management options that consider soil moisture retention.

Vanessa Foord is a Research Climatologist for the North Area of the Ministry of Forests, Lands, Natural Resource Operations and Rural Development. She has a M.Sc. in Earth Sciences from Simon Fraser University and a B.Sc. in Environmental Sciences from the University of Northern B.C. She loves to crunch weather data into climate stats and apply her knowledge of climate change to understanding different forest health and natural disturbance events. She is a Professional Agrologist, as well as a member of the American Meteorological Society, Canadian Meteorological and Oceanographic Society, American Geophysical Union, and the Canadian Institute of Forestry.

The Challenge and the Science: Background and Introduction



Neil Hughes: RPF, Forest
Establishment Leader,
Resource Practices Branch,
FLNRORD, Victoria, B.C.

Abstract: For over 100 years
BC has been known around
the world for supplying high
quality timber, but to
continue doing this for
another 100 years will be a

very big challenge. As we move from an industry based upon harvesting, whether old growth or naturally regenerated second growth on the coast, the forests that we are growing and managing through our silviculture practices must provide a seamless transition. But will they?

Climate change has already delivered huge blows to our forests, with likely more to follow; we seem to have a social and political environment that does not regard forestry and silviculture favourably; and possibly worse yet, some of our silviculture practices and legislative requirements over the last 30 years may not have been doing more than maintaining a green cover on the landbase, rather than creating high quality timber stands. Silviculture foresters are seeing more issues in young plantations than ever before, whether it is Swiss needle cast on the coast or one of many rusts in the interior.

As a profession, silviculture foresters and forest health professionals will have to rise to the challenge, utilizing the most effective tools and practices available, and designing and developing new methods relevant to the current forest conditions. Game on!

Neil has a wide and varied background in silviculture, block development and harvesting gained over 33 years as a professional forester. He knows the coast like the back of his hand and is very quickly gaining an understanding of the complexities of the interior forest industry. He came to B.C. in 1994 after working as a professional forester in Scotland for 7 years. Since then, he has worked in many spheres, including private industry, not for profit organizations and finally for FLNRORD, where for the past five years he has been the Forest Establishment Leader with the Province, dealing with everything related to early stand development and looking after the Forests For Tomorrow program.

Reforestation Decisions under Climate Change Uncertainty : Modern Portfolio Theory Guided Species Diversification as a Strategy for Minimizing Forest Health Risks



William H MacKenzie,
Provincial Research
Ecologist, Skeena-
Stikine Region,
FLNRORD, Smithers,
B.C.

Abstract: Climate change will adjust tree species suitability to current site conditions

and impose increased uncertainty in future environmental conditions and the ecological relationships between tree species and forest health agents. A Climate Change Informed Species Selection (CCISS) analysis, which projects the trajectory tree species suitability under 30 modelled climate futures from a stand to regional level has been created. However, disparity in future species suitability between models must be accounted for in application. Ecological theory highlights species diversity as a critical component of ecosystem resilience. Similarly, in contemporary economic theory, asset diversity in investments is a widely accepted approach to managing for market uncertainty. In this presentation, we intersect the Modern Portfolio Theory (MPT) of economics with the CCISS analysis as an approach to address risk from environmental and forest health factors by selecting optimal mixes of species for long-term reforestation investment under a changing climate.

Will is a Registered Professional Biologist working in the provincial Biogeoclimatic Ecosystem Classification (BEC) and Ecology program of the Forest Service since 1992 with a primary role in building and coordinating the province's ecosystem classification and standards. Since 2014, applications of BEC to climate change have become a primary research focus.

A Retrospective Look at Pests in Young Stands: The 1990's vs. 2020. What has Changed and What are the Implications?

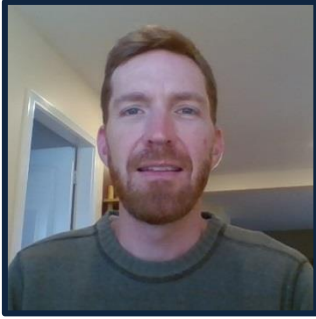
Lorraine MacLauchlan,
Ph.D., RPF, Forest
Entomologist,
Thompson Okanagan
Region, FLNRORD,
Kamloops, B.C.



Abstract: The previous two mountain pine beetle outbreaks of the 1970's and 2000's have dramatically accelerated lodgepole pine harvesting and reforestation efforts in B.C. In 2019, young pine stands (age 15-20 years) were surveyed for incidence of damaging agents and mortality in the Southern Interior Region and compared to data collected in similar aged stands and locales in the late 1990's. The percent stems affected by specific pests was higher in recent surveys, and density and structure of new stands has also changed. Many damaging agents have minimal long-term impacts to regeneration but others, such as lodgepole terminal weevil and western gall rust, can have serious implications in terms of stem form and tree survival. Drought events are more common and severe and have impacted regeneration, with over 100,000 hectares affected by the 2017 drought. I will highlight the changes in pest occurrence over the past two decades and the long-term damage caused by the most prevalent and important pests found in young pine stands.

Lorraine has held the position of Regional Entomologist based in Kamloops, since 1987. She also taught forest entomology at Thompson Rivers University from 1995 through 2016. In 1980, Lorraine received her B.Sc. from the University of Victoria followed by a Masters of Pest Management in 1985 and Ph.D. in 1992 from Simon Fraser University, where she specialized in forest pest management and pests of young stands. Her operational and research endeavors are varied and broad and include work on the effects of changing climate on the dynamics, impacts and management of forest insect pests such as western spruce budworm, numerous bark beetle species and pests affecting regeneration.

Estimating Future Impacts of Stem Rusts with Young Stand Monitoring



Scott MacKinnon, RPF, Vegetation Resources Inventory Specialist, Forest Analysis and Inventory Branch, FLNRORD, Victoria, B.C.

Abstract: Since 2012,

FAIB has been establishing a young stand monitoring (YSM) program throughout B.C., comprising a grid network of ground sample plots where trees are permanently tagged, stem mapped, and periodically re-measured to track changes in growth and mortality of young stands using design-based sampling techniques.

Tracking forest health is a key component of the YSM program, where the incidence and severity of up to five forest health damage agents are recorded per tree at each measurement. In addition, height and encirclement data are collected from stem rusts (including comandra blister rust, stalactiform blister rust, & western gall rust) that will enable forest health modules specifically developed for these rusts (CRIME & GRIM) to be run within TASS (tree and stand simulator) growth model projections.

FAIB's expanding collection of YSM data across different management units has provided an opportunity to quantify the estimated volume impacts at rotation age that may be anticipated from measured incidences of these particular stem rusts. Results comparing incidence to estimated impacts for a subset of management units are presented.

Scott received a Bachelor of Natural Resource Science from the University College of the Cariboo (now TRU) in Kamloops in 2001 and has been an RPF in B.C. since 2007. He started his forestry career with J.S. Thrower & Associates Ltd. in 1999, and worked there sampling inventory ground plots and conducting data analysis until 2011. Since that time, Scott has been with the B.C. Government, primarily in the Forest Inventory group, managing inventory ground sampling contracts and working with the data, sampling protocols, and database design, specializing in the B.C. Vegetation Resources Inventory standard.

The Health of Young Stands – an Operational Coastal Perspective



Rick Monchak, RPF, Campbell River, B.C.

Abstract: To date, the coast has been spared the large-scale forest health issues that have dominated the interior for the past two decades. As a result, forest health dominates few conversations on the coast. This needs to change.

There is ample evidence on the coast that we are struggling to deal with some of our traditional forest health issues. In addition, thanks to climate change, we are already seeing the front end of a new suite of forest health issues. This presentation will explore some of these concerns and attempt to identify trends and policies that need to change to help forest professionals be more successful in managing forest health.

Rick has a B.Sc. in Forestry from UBC and has been involved with operational forestry on the B.C. coast for 40 years. He still remembers the carefree days of no paperwork and government paid programs. Rick has recently retired from his position at TimberWest as their public lands Operations Forester where he spent much of his time working with government, First Nations, NGOs and stakeholders. The job description included higher-level plans, management plans, forest stewardship plans and (still his favourite) silviculture. Retirement lasted four months. Rick is currently a part time Board Member of the Forest Practices Board and a Director of a local First Nations forestry company.

Incorporating Operational Adjustment Factors (OAFs) for Armillaria Root Disease in the Arrow Timber Supply Review



Michael P. Murray, Regional Forest Pathologist (Kootenay-Boundary), FLNRORD, Nelson, B.C.

Abstract: Armillaria root disease is the leading impact on loss of young timber volume in the Kootenay-Boundary region. A customized, Armillaria root disease operational adjustment factor (OAF) was developed to better account for losses of timber in the Arrow Area Timber Supply Review (2017). This quantitative adjustment provides a more accurate prediction of timber yields. Each conifer species is differentially impacted by Armillaria. Furthermore, these growth & yield reduction values vary by site-specific infection severity (low, med, high) and tree plantation age. The G&Y reduction values were input into the Tree & Stand Simulator (TASS). This model uses the G&Y values (aka OAFs) to project tree volume by decade in post-harvest regeneration. By incorporating our G&Y reduction estimates across the entire timber supply area, volume projections were calculated. This resulted in an estimate that growing stock would be 17% lower than that in the 'base case' (OAFs 1 & 2) alone. Similarly, the long-term harvest level would be 12% lower. Thus, by age 100, we expect G&Y losses to approximate 17% among all conifers due to Armillaria root disease.

Michael works in the Forest Sciences Section (FLNRORD), in Nelson, B.C. Degrees include a M.S. in Natural Resources at Humboldt State University and Ph.D. in Fire Ecology at the University of Idaho. Interests include climate impacts, whitebark pine, and tree declines. He is on the Board of Directors of the Whitebark Pine Ecosystem Foundation, hosts a weekly radio show, <https://www.kootenaycoopradio.com/flashback-70s/> and is learning to play pedal steel guitar.

Assisted Migration and Future Health of Regeneration



Greg O'Neill, Climate Change Adaptation Scientist, Forest Improvement and Research Management Branch, Kalamalka Forestry Centre, FLNRORD, Vernon, B.C.

Abstract: A well-designed seed source selection system is

central to the maintenance of healthy and productive forest plantations, particularly in an era of rapidly changing climates. Opportunities for improving the effectiveness of seed source selection in British Columbia are provided by new technologies, analysis techniques, and genetic data. In 2018, B.C. implemented a Climate-Based Seed Transfer (CBST) system that is expected to better match climates to which seed sources are best adapted and plantation climates. Sources of uncertainty in CBST will be examined, and a logic model for genetic diversification of plantations to help buffer climate uncertainty will be presented.

The focus of **Greg O'Neill's** research is on understanding the nature and distribution of adaptive variation of B.C.'s tree species, and applying this understanding to reforestation practices to help ensure B.C.'s forest plantations remain healthy and productive in new climates. Greg is a professional forester with degrees in biology, forest ecology and forest genetics. He has worked in environmental consulting, international development, seedling production, and for the last 20 years in the Forest Genetics section of the Forest Improvement and Research Management Branch of FLNRORD.

“Pest Incidence and Impact” Current Knowledge on the Health of Young Stands: Biotic and Abiotic. What are the Major Threats to Young Stands in British Columbia?



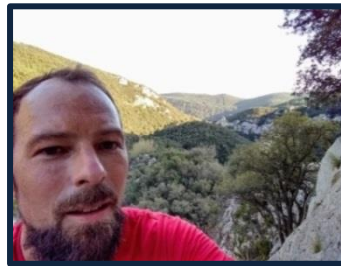
David Rusch,
Regional Forest
Pathologist,
Cariboo Region,
FLNRORD, Williams
Lake, B.C.

Abstract: Stand and forest regeneration has become

increasingly challenging due to changing climate conditions that are driving stand level and landscape level disturbances. With changing climate conditions, many abiotic and biotic forest health factors will continue to increase in both severity and frequency. This two-part talk briefly outlines the primary abiotic and biotic forest health factors affecting young stands in British Columbia, highlights the need for long-term monitoring data that is required to mitigate current and emerging forest health factors, and discusses the potential negative consequences of not amending current government policies that drive forest management.

David Rusch lives in Williams Lake with his wife and has two daughters. He is a Registered Professional Forester with an M.Sc. in forest science from UBC. Through the early part of his career he ran a small forest health consulting firm “Rot Rooters”, where he specialized in root disease surveys and danger tree assessments. In 2007, David joined the forest service in Alexis Creek as a forest health technician. After a brief stint as a forest entomologist in 2012, he became a regional pathologist. His current research interests are focused on root disease management, effects of dwarf mistletoe sanitation, and identifying impacts and natural resistance to elythroderma needle cast. David is passionate about trying to improve the state of forest health in B.C. through education, research, and policy.

Impacts of Stem Rusts: GRIM & CRIME TASS II Modules

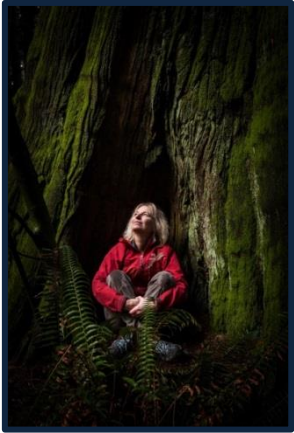


Dr. Derek F. Sattler,
Forest Project
Leader, Canadian
Wood Fibre Centre,
Canadian Forest
Service, Pacific
Forestry Centre,
Victoria, B.C.

Abstract: Western gall rust (*Cronartium harknessii*) and Comandra blister rust (*Cronartium comandrae*) have the potential to affect productivity within managed stands of lodgepole pine. Despite this, the impact from these rusts on final product yields has been largely unquantified. It is possible to simulate the impacts from these rusts following the development of two rust modules: GRIM (gall rust impact module), and CRIME (comandra rust impact module and evaluator). The modules were developed from data collected at experimental plots located in the interior region of B.C. Equations within the modules predict: i) the infection of individual trees over time, ii) the probability of mortality following infection, and iii) the location of large stem galls requiring removal during lumber manufacturing. An additional set of equations is used to provide the input value required the initialize the modules for any managed opening loaded in RESULTS, which allows the modules to be used in TSR. The modules are programmed to work with the TASS II growth model, with simulated impacts on final product yields possible through the SAWSIM add-on. This presentation will trace the development of the modules, present some examples of how they may be used, and discuss the potential for improvement.

Dr. Sattler is a Forest Research Project Leader with the Canadian Wood Fibre Centre, and is located at the Pacific Forestry Centre, in Victoria, B.C. For the past ten years, Derek has specialized in growth and yield modelling. Derek completed his Master’s at UBC and Ph.D. at the University of Alberta, after which he joined FLNRORD’s Forest Analysis and Inventory Branch, before moving on to his current position as researcher and regional liaison at the Wood Fibre Centre. Derek’s current projects include the development of climate-sensitive growth and mortality functions, improving the rust modules, and examining ways to include genetic gain within growth and yield models.

Surprise is Inevitable: Adaptive Management for Reforestation in Times of Uncertainty



Suzanne Simard,
Professor, University of
British Columbia,
Vancouver, B.C.

Abstract: Climate change is modifying many disturbance regimes in western North American forests, such as wildfires, droughts and insect outbreaks, which are

increasing in frequency, extent and severity. With these changes there is increasing uncertainty about the resilience of forest communities, challenging our understanding how disturbances impact forests in the near- and long-term. Understanding the impacts of climate change and associated changes in disturbance regimes however is critical to effectively manage a multitude of ecosystem services, including timber, carbon sequestration, habitat and biodiversity. Exacerbating these uncertainties is the challenge of regenerating forests across large disturbed landscapes that will be resilient to future conditions. The uncertainties we face necessitates a critical assessment of whether standard reforestation practices that have historically emphasized establishing dense conifer crops in gridded plantings (e.g., pines in lines) followed by intensive management will create resilient and robust forests of the future? C.S. (Buzz) Holling understood that our knowledge of natural systems is always incomplete, and that surprise is inevitable. However, once we accept this “the essential point is that evolving systems require policies and actions that not only satisfy social objectives but at the same time provide flexibility for adaptation”. Thus, providing the flexibility for adaptation and what this looks like in different areas of B.C. is our central challenge in creating resilient and productive forests of the future.

Suzanne Simard is a Professor at UBC, where she studies the synergies and complexities of forests and the development of sustainable forest stewardship practices. Her research centers on understanding the vital relationships between trees, biota and soils that underlie the adaptability and resilience of ecosystems. She is known for her

work on belowground fungal networks that connect trees and facilitate interplant communication. Website:

<http://profiles.forestry.ubc.ca/person/suzanne-simard/>

Modelling For Decisions



Jeff Stone, Ph.D., RPF,
RPBio, Stand Development
Modelling Research
Scientist, Forest Analysis
and Inventory Branch,
FLNRORD, Kamloops, B.C.

Abstract: The role of models and modelling within a decision process is

often misunderstood and can lead to questioning or discrediting of a decision. Reality is detailed, complex and messy. A model is a simplification of reality useful for understanding. Modelling for a decision must recognize this simple concept of a model in order to meet the informational needs of a decision maker. In this presentation, the role of modelling is discussed in the context of the allowable annual cut determination in British Columbia and the challenges around forest health considerations.

Jeff's interest in the quantitative side of natural resource management led to pursuing a M.Sc. in Forest Biometrics and Ph.D. in Wildlife Conservation. Joining the Research Branch of the Ministry of Forest in 1992, Jeff worked as a research scientist/modeller with the “growth and yield” modelling team. His primary research area was around the modelling of dead trees and other non-timber values. In 1998, an unexpected lateral transfer had Jeff bring his modelling skill set to the timber supply review (TSR) for the chief forester’s allowable annual cut determination. After a 2-decade detour on modelling at the forest level for the AAC determination and other decision processes, Jeff recently returned to his initial position in stand development modelling research with grandiose hopes of what he might accomplish prior to retirement.

Young Stands in B.C.: Silviculture Records



Dan Turner, RPF, Forest Management Analyst, Resource Practices Branch, Office of the Chief Forester, FLNRORD, Kamloops, B.C.

Abstract: Crown lands in British Columbia have had over:

- 6.8 million hectares harvested,
- 9 billion seedlings planted,
- 5.2 million hectares of post-harvest stands declared free growing,
- 1.2 million hectares with DSG identified,
- 560 thousand hectares with DSC identified,
- 440 thousand hectares fertilized, and
- 93 thousand hectares with one or more foliar diseases identified.

Do you want know where? Best review some silviculture records!

Silviculture records provide us stand level treatment history and treatment outcomes for an ever-increasing amount of crown land in B.C. There is a massive amount of survey data available that may be of value to support forest management decisions other than the measure of success against a silviculture obligation.

Dan Turner, RPF, is a forest management analyst in the B.C. FLNRORD Office of the Chief Forester division. He has more than 22 years of forestry experience; the last 5 years in his current position. Earlier in his career, he spent much of his time in forestry consulting, either collecting data in the field, completing GIS analyses or managing project teams to deliver on a wide range of natural resource related projects. More recently, his time is mostly spent analyzing and summarizing silviculture data to support resource management decisions. To contact him via e-mail:

Dan.Turner@gov.bc.ca

A Genetics Approach to Forest Health Issues

Nicholas Ukrainetz,
Research Scientist Tree
Breeder, Forest
Improvement and
Research Management
Branch, Surrey, B.C.



Abstract: Tree breeders managing the breeding programs associated with each commercial tree species in British Columbia have incorporated at least one forest health issue into their testing, selection and breeding objectives. In this talk I will review some of the strategies used by tree breeders to find resistant trees which can be used in seed orchards for reforestation. I will also talk about the research and information needed to allow us to contribute to the resilience and productivity of young stands. Most breeding programs have now advanced through two cycles of testing that span several decades and accumulated a significant amount of data on the trees in the breeding program. Therefore, the most effective way to incorporate forest health objectives into existing breeding programs is to gather forest health information about the trees already in the breeding program. Surveying existing field trials is a very quick and efficient way to gather this information; however, in some situations controlled screening programs are more appropriate. Furthermore, genomic projects can develop tools that one day may become useful for breeding programs but must utilize trees from the breeding program to be most effective. Finally, directing deployment of orchard seedlots with high resistance to high priority locations is essential and requires collaboration with our forest health partners and silviculturalists.

Nicholas has worked for FLNRORD since 2006 with the provincial Forest Genetics group and has been the lodgepole pine breeder since 2010. He also manages the western white pine breeding program for blister rust resistance and genecology research for interior broadleaves. Nicholas is particularly interested in breeding for resistance to forest pathogens while maintaining gain in volume achieved through the breeding program. He also participates in the climate based seed transfer scientific working group. He has been a member of the ABCFP since 2009 and has a Ph.D. from the University of British Columbia.



Impacts of Stem Rusts: Application in TSR

Dave Waddell, M.F., RPF, Modelling Forester, Forest Analysis and Inventory Branch, FLNRORD, Victoria, B.C.

Abstract: Forest Health data in RESULTS surveys

can indicate the incidence of stem rust. In the perfect world, this data would easily incorporate into TSR to assess its impacts. It is important to note that the data was never intended for this purpose. Further analysis is required to make the data operational since it can be incomplete in its coverage of potentially affected stands. Derek Sattler has proposed using an age correction and a Hurdle Model approach. Taking this approach, incidence data can be used as input to the TASS modules GRIM and CRIME. Rust and non-rust merchantable volumes can be compared, and an age associated adjustment factor can be derived. These factors can then be used to adjust volume curves in a Timber Supply model and thus impacts to timber supply can be assessed. The Mackenzie TSA will use this approach to assess rust impacts.

Dave has a B.S.F. and a M.F. from UBC. He has worked for Forest Analysis and Inventory Branch since 1986. He has been responsible for technical developments in timber supply models, database implementations and other technical solutions as well as being a timber supply analyst. Lately, he has been the technical architect of a system to directly integrate RESULTS data into TSR to derive Managed Stand Yield Tables.

Creating Operational Adjustment Factors:

Root Disease on the B.C. South Coast

Stefan Zeglen, RPF, Forest Pathologist, FLNRORD, Nanaimo, B.C.

Abstract: Using models to predict tree growth under perfect conditions begs the question: well, what if



things aren't perfect? Operational adjustment factors (OAFs) are an attempt to temper model output to better reflect the real-world conditions in which trees must grow. OAFs, in this case, are specific for use with the TASS/TIPSY model used in B.C. and other adjustment factors serve the same purpose (hopefully) for other growth and yield models. TASS/TIPSY uses OAFs to both model gaps in stands (OAF1) and losses due to decay, waste and breakage (OAF2). The latter is used to bend the growth curve down over a 100-year period by the amount of the OAF and realizes its full effect only at the end of the period. Therefore, it is considered suitable for use to mimic the action of pests whose impact grows over time, like root disease in a new plantation. This presentation discusses how an OAF2 was created for the B.C. south coast to account for losses in the commercial timber species Douglas-fir (*Pseudotsuga menziesii*) from *Armillaria* (*A. ostoyae*) and *Phellinus* (*Coniferiporia sulphurascens*) root diseases.

Stefan has been the forest pathologist for the B.C. Coast Area for the past 26 years. His main areas of research include testing operational treatments for root diseases, managing white pine blister rust on western white pine and attempting to predict the impact of various foliar diseases on coastal trees.