

Bugs & Diseases

Vol. 26 No. 1

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And the New Name for the Newsletter is....

Results are in for Name the Newsletter and the new name is....**Bugs and Diseases.**

Several good potential names were submitted and a lot of votes were cast. However, after 26 years of publishing Bugs and Diseases, it seems that many identify this name with the ESRD forest health newsletter. I had not anticipated the level of loyalty and identification of the newsletter name. Perhaps I should have anticipated this as I myself am a very loyal forest health-er and I have been around for about 17 of the 26 years.

Of the votes that were cast for the new name, there was a clear winner – *What's THE BUZZ about Forest Health*. This suggestion was submitted by Forest Health & Adaptation's own Tom Hutchison, Senior Forest Health Officer in Edmonton. Instead of using this suggestion as a new name, we have decided to use it to develop a new section in the newsletter. In this new section, readers can submit a question about forest health, pests, tree improvement, seed science, adaptation, invasive plants or other topics that fall into the Forest Health and Adaptation scope and it will be answered. To submit a question you would like answered, send one of the FHOs or any FH&A staff member an email with your question. Then look for the answer in the next issue.

Thanks for participating in the contest, and a very big thanks for the loyalty.



**Forest Health
and Adaptation**

Erica Samis— Edmonton

Alberta's eye on forest health

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The Plague Fighters

Once upon a time, in a mountain kingdom not very far away, the forests were rapidly changing. Since 1910, all the 5-needle pine trees in North America had been dwindling away after suffering from a plague that was accidentally introduced from Eurasia. This plague is a virulent disease caused by a fungus. In Alberta, the 5-needle pines that were being decimated were whitebark pine and limber pine. They were now endangered because they were being killed far faster than they could regenerate.

“Whatever shall we do?” asked the inhabitants. These trees were very important in their mountain kingdom. They grew along mountain ridges, they protected hillsides from erosion, they provided food for a hundred wildlife species, and they were important for headwater streams. These trees were the main food source of the crow-like Clark’s nutcracker – pecking the cones open and caching the seeds in the ground was the only way these trees could regenerate. Seeds that weren’t dug up for bird food in winter and spring became seedlings that grew into the new forest. Without these forests, these ecosystems would change forever, the birds would stop visiting since their food would be gone, and these forests would be lost.

Charging across the mountain ridge came a squadron of green-clad field staff. “Never fear,” they cried, “we are from ESRD FH&A! We are here to help you save the limber and whitebark pine forests by following the provincial recovery plans.”

The citizens of the kingdom were a little suspicious of the invaders in green. “Where did you come from? Who are you? Why are you talking in acronyms?”



The visitors responded, “we mean we are from Environment and Sustainable Resource Development Forest Health and Adaptation. It is our mission to save these forests by understanding what is causing this plague and how to stop it. Scientists have found that some of these trees have natural resistance to this disease and by collecting their cones, we can grow seedlings and test them. By using disease resistant seedlings for restoration, we improve the immunity of the community. Resilience, you know – it’s the new thing.”

The citizens of the kingdom started to see these people weren’t just strange intruders. They were really on a mission to help. The community started to jump up and ask how they could help find disease resistant trees and plant seedlings.

The Forest Health and Adaptation staff explained that the best way to find these trees was to find an area that the plague had already attacked. Where most of the trees fell victim, finding a few healthy survivors may be a sign that these trees were resistant. These valuable trees should be protected to provide seeds for the future forest.

Flying from mountaintop to mountaintop, the fearless staff continued on their quest to save limber pine, whitebark pine, and the ecosystems of the mountain kingdom. They could hear the squawking of the Clark's nutcracker encouraging them on.

They knew they had decades of hard work and dedication ahead of them to find enough resistant trees, collect their seeds, grow the seedlings, test them for resistance and help restore them back on the mountaintops but they would not stop in their quest. Working together with keen volunteers, scientists, the Whitebark Pine Ecosystem Foundation, and agencies in other mountaintop kingdoms they would fight this plague and restore resilient forests.

Katherine Spencer & Jodie Krakowski —ATISC

Forest Health Training Opportunity

If you are looking to expand your knowledge of forest pests and their management, look no further. It is time to register for the **Forest Health 100** course being held in Hinton this summer. The purpose of the course is not to create forest health specialists, but rather show participants how to recognize and understand forest health issues as well as the best practices available to deal with them.

This 3-day course (June 23-25) consists of a combination of classroom lectures, presentations, and field tours, and is intended as an introductory session to familiarize those with an interest in Forest Health and its integration into natural resource management practices .

The course is designed for forest industry professionals responsible for managing forests through the development, review, and implementation of forest management and land management plans. It is also applicable to municipal government staff, natural resource professionals, or other individuals interested in the identification of forest health damage agents and their management.

CAPF/CAPFT continuing competency credits will be available.

For more information contact Tom Hutchison, Course Chair, at tom.hutchison@gov.ab.ca.



Protecting Alberta Elms

American elms (*Ulmus americana*) are planted extensively in Alberta (AB) and have throughout the years become the tree of choice for the Prairies with good reason. These giants with their height and broad vase shaped canopies have given them tremendous esthetic value. They are tough—enduring extreme heat, cold and drought, yet retaining incredible beauty.

Alberta does not have native elms, however, an estimated 750,000 elm trees are planted in cities, towns and rural landscapes and shelterbelts. A total of 250,000 elms valued at \$700 million dollars grow in the urban settings. The remaining 500,000 elms grow in provincial parks, farm shelterbelts and rural homesteads.

However, all elm species that grow in AB have an Achilles heel. They are prone to Dutch elm disease (DED) a deadly fungus. This fungus *Ophiostoma ulmi*, and a closely related variant, *Ophiostoma nova ulmi*, clogs the elm tree's water conducting system and causes the leaves to wilt and the tree to die. The fungus is primarily spread from one elm tree to another by three species of elm bark beetles: the smaller European, the native, and the banded.

The beetles are attracted to weak and dying trees, which serve as breeding sites. Once the beetles have pupated and become adults, they leave the brood gallery, fly to healthy elms to feed, and thus transport the fungus on their bodies from one tree to the next. Beetles are also attracted to recently pruned elms.

The Dutch elm disease (DED) pathogens and the vectors, the smaller European elm bark beetle, and the native elm bark beetle are named pests under the Alberta Agricultural Pests Act (APA). The APA delegates authority to local governments to implement prevention and control programs. It provides a means for enforcement. Under this act it is illegal to prune elm trees from April 1st to September 30th or store elm wood.

The Plant Protection Act of Canada regulates the movement of the DED pathogen. Elms from a DED infected province cannot be shipped to a disease free province. Alberta and British Columbia are classified as DED free.

So far, Alberta has been free of DED, thanks to the vigilance of The Society to Prevent Dutch Elm Disease (STOPDED). This non-profit organization's mandate is to preserve and protect Alberta's elm trees from DED. They take an active leadership role in the development and delivery of the Provincial Dutch Elm Disease Prevention Program.

STOPDED monitors for the vectors, surveys elm trees for DED, has suspicious elm trees sampled and tested at an accredited lab, trains the trainers such as the Agriculture Fieldman and custom officials on the disease and its prevention, maintains the provincial elm inventory,



Dead elm at Morden Research Station, MB.
Photo: Ieuan Evans

organizes the elm firewood confiscation at the AB/Montana ports of entry and Travel Information Centres, updates the response plan, operates the DED hotline, and does constant public awareness.

In 2014 a total of 1713 traps and lures were set province wide by STOPDED and the larger cities. The banded and smaller elm bark beetles have been found in 17 municipalities throughout the province including Edmonton, Calgary and Medicine Hat. A total of 26 DED suspect samples were cultured. All tested negative for DED.

The Society to Prevent Dutch Elm Disease (STOPDED) Board and its membership, would like to thank Alberta Agriculture and Rural Development and Environment and Sustainable Resource Development for their annual financial support. Without this financial support from government and all of STOPDED's volunteers throughout the province, the level of vigilance maintained would be impossible.

The experience in Provinces such as Manitoba and Saskatchewan fighting DED has proven that a prevention management program is essential. Alberta cannot afford to lose a valuable resource that provides economic, environmental and aesthetic benefits. Until there is a cure for DED, prevention remains our most effective form of control.

For more information go to www.stopped.org or 1-877-837-ELMS

Janet Feddes-Calpas - STOPDED Executive Director

What the heck *IS* that?



This hairy fellow is an American Dagger moth (*Acrionicta americana*) larvae and they feed on many tree species such as alder, birch, poplar, and willow. Their setae (hairs) turn pale yellow or nearly white as they near pupation and can cause a skin rash. The caterpillars grow to 5 cm long. The adult moth is the typical gray to gray-brown mottled with a wingspan of 5 to 6.5 cm. The dagger moth is native to North America, east of the Rockies. Both caterpillars and moths can be observed throughout the summer and early fall.

This photo was submitted by Nicolas Bilodeau of Highland Helicopters and was taken in the Simonette area, east of Grande Prairie.

MPB Rehabilitation Program

Restoring the productivity and function of pine forests impacted by the mountain pine beetle outbreak is a key objective of the Mountain Pine Beetle Rehabilitation Program.

The current mountain pine beetle outbreak is unprecedented and has impacted approximately 1.5 million hectares of pine forest in Alberta. This area represents about 25 per cent of the province's six million hectares of pine forests at risk of beetle infestation. Many of the impacted pine stands are in the Grande Prairie, Peace River, Edson, Grande Cache and Slave Lake areas and suffer from significant (up to 80%) pine mortality. The scale of the outbreak poses risks to ecosystem services such as water yield and water quality, wildlife and wildlife habitat, biodiversity, forestry, recreation, and public safety. In addition, there is increased risk of wildfire.

Some MPB-killed pine stands have been salvaged to recover economic value from the pine trees before they degrade and this will continue. Reforestation is the law in Alberta, thus timber disposition holders who harvest stands for salvage are required to reforest them with ecologically suitable tree species, in a timely manner, and to a level to ensure reforestation success, as defined by the reforestation standards.

However, in some areas MPB-killed pine stands are inaccessible or the quality of the wood has degraded beyond commercial use. Although the pine tree mortality is high, these forests still contain viable plant communities, provide important wildlife habitat, and influence water quality.

These forests will likely regenerate naturally in 20 to 30 years; yet restoring these forests in the short-term using silviculture will help reduce or mitigate impacts to ecosystem services and facilitate the return of environmental and socio-economic benefits more quickly. In June 2012, the Government of Alberta committed \$10 million to initiate the program and additional funds were allocated in 2013 and 2014 to implement operational programs, conduct research and obtain baseline data.

Funding for the MPB Rehabilitation Program is provided by ESRD and FRIAA administers the program. Funding is provided for eligible activities such as mapping, surveying, dead tree disposal, seed collections, seeding, seedling production, site preparation, planting, monitoring, and research. Initially the focus was on program development, seed collection, and developing criteria for identifying candidate stands. Recently there has been a shift to more operational rehabilitation programs such as the ongoing Weyerhaeuser and Canfor projects north of Grande Prairie which aim to bring heavily impacted stands back into fibre production while also answering research questions regarding efficacy of silvicultural treatments and wildfire risk. ESRD directly funded operational rehabilitation work in 2013 with aerial seeding of 140 Ha of pine and spruce in the 2012 Hotchkiss burn.

To make informed, science-based decisions ensuring the right stands are rehabilitated at the right time to maintain ecosystem services, three priority projects have been identified and Initiated. To prioritize stands for rehabilitation, knowing the extent of MPB caused mortality of pine in the province is critical. Shifts in MPB management priorities have led to a gap in pine

mortality inventory since many areas have not been continually aerial surveyed since 2005/6. This was remedied in June 2014 by obtaining spatial mortality data from 2013 high resolution imagery. Seventy-seven townships of imagery were identified for classification. Contracts were tendered to acquire 329 additional townships of 30cm resolution imagery to acquire all necessary images. Approx. 10% of the 2014 townships need to be flown in 2015 due to cloud, snow, etc.



Classification of pine mortality within pine leading polygons covered by the imagery was contracted. The work was initiated in November, 2014 and is ongoing with late spring completion. To date the work is of high quality and will be highly useful in many Department applications and by stakeholders. The submissions are in polygon form and are down to single tree in many instances. The next step is to quantify impacts to inventory polygons based on the killed pine portion. Left is an example of grey attack interpreted by contractor.

The 2nd priority project is to establish the fate of stands killed by MPB without any intervention. This question is critical in prioritization exercises to ensure money is spent where it is actually needed and the correct assumptions are used in timber supply analyses for MPB killed stands. There are FRI and ESRD funded projects ongoing aimed at answering this question based on temporary sample plots. Additional work will project what may happen in affected pine ecosites in Alberta based on GOA, and non-GOA ecological and silvicultural expertise. To obtain more Alberta-based data driven answers, a longer term sample plot network is likely necessary. To establish the rate of regeneration recruitment, fall down rates, basal area recovery and ultimately growth curves for stands killed at variable rates, a network of plots is desired across the range of natural sub-regions. The current GOA and industry sample plot network is insufficient in killed stands. Prospective sites have been investigated and funding sources are being explored to initiate the ground work.

The 3rd priority project is a spatial Stand Selection Decision Support Tool. This tool would consolidate all known data layers surrounding ecological function values at risk as well as the inventory, mortality, ecosite, projected stand dynamics, etc. stand level data. This GIS based system would identify candidate stands for rehabilitation based on ecological function impacts and likelihood of recovery without intervention. The data layers have been assembled and just waiting for the mortality data. New or improved data will be incorporated into the tool facilitating continual improvement of our rehabilitative efforts.

The rehabilitation program is evolving and new opportunities for research and data gathering will make the program more responsive, provide value for stakeholders, and maintain ecological function where possible in stands heavily affected by MPB.

Eastern spruce budworm monitoring and damage assessment in the Lower Athabasca

The last eastern spruce budworm (SBW), *Choristoneura fumiferana*, outbreak in Alberta began in 1987 and had collapsed in 2005 in most areas. Remnants of this outbreak persisted in the Lower Athabasca Region beyond 2005 and in response, Sunil Ranasinghe, Tom Hutchison, and Martin Robillard initiated a project to monitor SBW defoliation, tree vigor, and mortality along the Athabasca and Clearwater Rivers near Fort McMurray.



Spruce budworm webbing Hangingstone area.

Twelve plots were established in stands that were defoliated by SBW in the years prior to 2006. The rectangular plots were located in stands dominated by white spruce and/or balsam fir and were 50 m by 2 m in size (0.01-ha). Conifers ≥ 1.3 m were tagged and measured for height and DBH. Plots were revisited annually from 2008 – 2010 and again in 2014 to assess percent defoliation and tree vigor. Percent defoliation was assessed by visually dividing the tree crown into three sections (top, middle and bottom), and the percent of total foliage missing for each section was estimated.

As happens with most projects of this nature, adaptations to the methods had to be made by the various surveyors to accommodate natural and anthropogenic factors: One plot burnt down, whereas another was logged; helicopter landing pads had to be maintained due to falling trees and volunteer regrowth; surveys were done in

brutally cold weather, in a meter of snow, or, one year, in fully wet clothes after falling through semi-frozen sloppy muskeg. But it wasn't just the physical factors; there were mental factors at play as well. As one forester from Fort McMurray assisting with the project put it, after spending a few hours in a semi-dead stand with screeching trees howling in the wind: "This forest is haunted! I need a ghost buster issued to me!"

But the science must go on, and it did! Results for all sample years have now been processed.

This SBW outbreak caused severe defoliation and tree mortality in all of the sample plots. Throughout the duration of the study, defoliation activity became increasingly severe and a corresponding increase in tree mortality was observed. At the start of the study mean defoliation of all trees was 42% but doubled to 80% in 2007 and remained at high levels in 2008 and 2009 (Figure 1). Defoliation activity peaked at 95% in 2010. The outbreak collapsed by 2014 and percent defoliation was very low at just 3%. As far as tree vigor, in 2006, 35% of the trees in the plots were healthy, 50% were in decline, and 13% were dead. By 2014, only 14% of trees were healthy while 74% were dead.

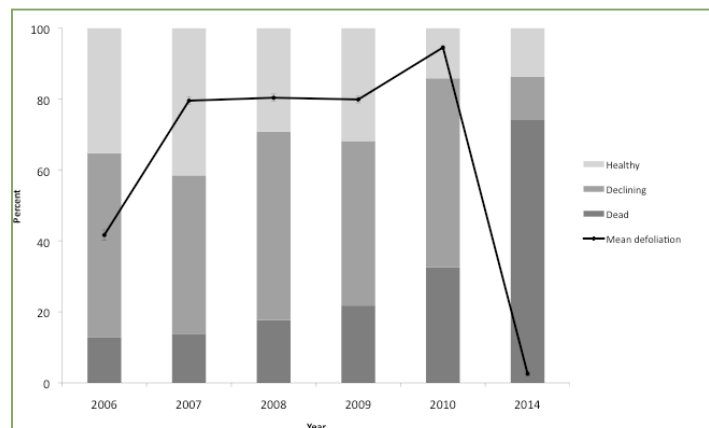


Figure 1. Percent mean defoliation and tree vigor by year. Overall, annual mean defoliation varied significantly (ANOVA and Tukey multiple comparisons = $P < 0.01$) but was similar in 2007 - 2009 ($P > 0.05$).

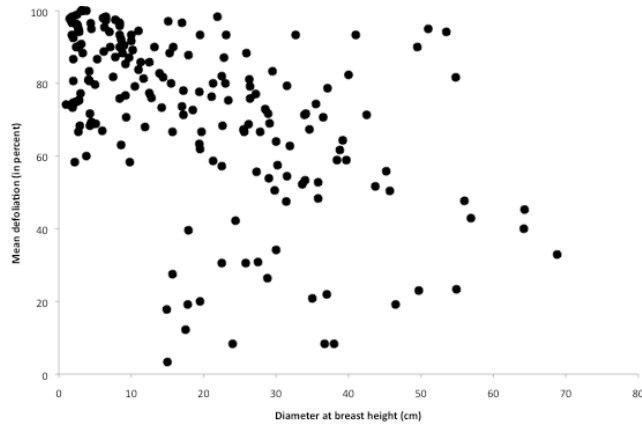


Figure 2. The relationship between mean percent defoliation and tree size. Trees with a smaller DBH were more defoliated than larger trees (linear regression: $P < 0.01$).

Defoliation activity varied by tree size and trees with a smaller DBH were more intensely defoliated (Figure 2). Defoliation activity was also variable between white spruce and balsam fir. Balsam fir were, on average, 85.5% ($SE^1 \pm 1.9$) defoliated while white spruce defoliation was much lower, 65.7% ($SE \pm 2.0$). Mortality varied significantly with tree size and trees with a smaller DBH were more likely to be dead by 2014 than trees with a larger DBH². Mortality did not vary between species and balsam fir and white spruce had comparable levels of mortality². It was noted during the study that greater numbers of small

trees were dying compared to their larger counterparts. In 2014, the mean DBH of dead trees was 16.4 cm ($SE \pm 1.2$), while live trees measured 26.2 cm ($SE \pm 2.48$). Trees that died sustained higher levels of defoliation than trees that were alive in 2014. Trees that were dead in 2014 were defoliated, on average, 76.6% ($SE \pm 1.89$) compared to 52.0% ($SE \pm 2.56$) of live trees.



Spruce budworm defoliation.

Factors such as drought, which affect tree mortality cannot be ruled out; however, it is clear that the spruce budworm outbreak heavily impacted these sample plots. Smaller trees tend to be less resilient to defoliation and SBW become concentrated in the understory during heavy infestations as they descend through the canopy to find food. This results in altered tree stand size composition. Although these plots were “thinned”, which can be beneficial, the loss of smaller, younger trees reduces future growth in these stands. Although defoliation activity was greater in balsam fir, mortality was comparable in white spruce. This result

suggests that white spruce in these plots were less resilient to defoliation than balsam fir. The ongoing temporal effects of SBW defoliation observed in this study highlight the importance of sustained monitoring in Alberta’s diverse forest ecosystems. And of course, how else are we to gather data on the need for ghost busters in forest health?

¹ SE refers to standard error, a measure that represents the accuracy of an estimate.

² Logistic regression: DBH, $P_{169} < 0.01$ and tree species, $P_{168} < 0.12$

Caroline Whitehouse— Lower Peace Region, Tom Hutchison & Marty Robillard—Lower Athabasca Region



Region A Expansion Project

A cooperative lodgepole pine tree improvement project between Environment and Sustainable Resource Development (ESRD), Hinton Wood Products, Sundre Forest Products and Weyerhaeuser (Pembina) was commenced in 2014. The short-term goal of this Region A expansion project over the next two years is to select approximately 100 intensive parent trees and 300 geographic trees.

This year, each agency was responsible to select, document and collect genetic material from 10 intensive selections with the remaining selections to be completed next winter. The Alberta Tree Improvement & Seed Centre (ATISC) field crew completed 20 intensive superior pine trees in the Drayton Valley and Rocky Mountain House area from January-March 2015.

In early March, 44 trees were felled and the following was collected from each tree: 50+ cones, 1 wood sample and 30 scions. Scions were shipped to ATISC and Skimikin Forest Nursery in Tappen, British Columbia for grafting. Wood and cones were delivered to ATISC.

Grafts will be used to establish two Region A clonal seed orchards located at the Presslee Seed Orchard site by Hinton and at the Tree Improvement Center near Drayton Valley. These two orchards will eventually produce improved seed for operational reforestation use in the Region A deployment zone. For gene conservation, another four grafts from each parent will be established in ATISC clone bank.



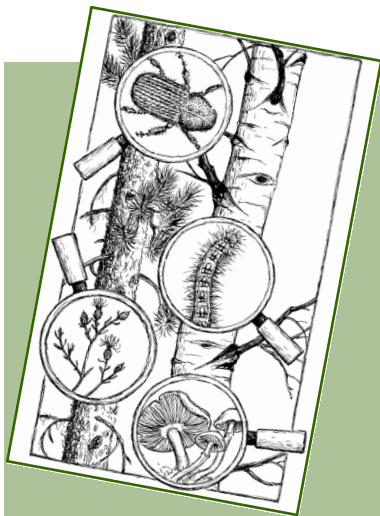
Superior trees, as selected by the crew.



Superior Crew (l to r) - Peter Franchuk, Shane Turko and Clarissa Mazur

Seed extracted from the cones will be stored at ATISC and will be used to establish progeny tests in the future to determine the breeding value of each of the parent trees. Wood samples are measured for specific gravity to establish benchmarks to ensure wood quality is not compromised as a result of tree improvement activities.

John Quinn—ATISC



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-related personnel about current
forest health issues. Articles are
welcome.

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Sustainable Resource
Development

Rufipennis once againis (A Spruce Beetle Call to Arms)

What is it with our cousins getting all the juicy Press?

I know, I know, it's quite a show

They really can impress

But we have game, we're quit legit, we have a pedigree

We've killed off stands in many lands

Kenai, Yukon, Bowron lakes - to name but only three

So why then can't we get our due?

We need some cred, when spruce turn red,

"Tree Killer" is our name too

Maybe we should make a scene, create an awful fuss

And we will show, for all to know

We are Dendroctonus!

Tom Hutchison—Lower Athabasca Region

