Bugs & Diseases

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Alberta's eye on forest health

Issue highlights:

Alberta Government

A New Manager for ATISC at Smoky Lake

Long-time manager of the Alberta Tree Improvement and Seed Centre, Leonard Barnhardt, retired in January of this year. The search for a new manager began shortly afterwards and I am happy to say, our search has ended successfully. Lee Charleson, SBF, MBA, joined the Forest Health and Adaptation Section in mid-June and is in full swing. Lee is a great fit for ATISC and FMB with over 25 years of work experience in tree improvement and reforestation in Alberta and BC.

Prior to arriving at ATISC Lee served as the BC provincial expert in tree seed policy in the BC's Tree Improvement Branch. She focused on genetic resource management strategies, policies and standards, and development of operational practices by applying science knowledge and risk management principles. I am very pleased to have Lee with us in FH&A and Forest Management Branch. She has already proven to be a great addition to our team and her knowledge and experience will be an asset to us as we move forward in tree improvement programming in Alberta.

"*I am pleased to return to Alberta to manage the Alberta Tree Improvement and Seed Centre. Based at Smoky Lake, I manage the provincial program in forest genetics, tree improvement and reforestation seed. I maintain financial management for the program and work with a staff of 23. Overall, I have responsibility for multiple tree breeding programs, including tree breeding research and testing, tree gene conservation work, tree and shrub seed sciences and seed production. I also oversee for the tree and shrub seed registration for reforestation and reclamation, and the regulation of seed and seed use activities under the Alberta Forest Genetics Resource Management and Conservation Standards.* "

Welcome Lee!!

Erica Samis— Edmonton

Canadian Forest Genetics Association Conference in New Brunswick

Lindsay Robb (Provincial Seed Specialist) and Andy Benowicz (Forest Genetics Specialist), both with the Alberta Tree Improvement and Seed Centre (ATISC), attended the biennial Canadian Forest Genetics Association (CFGA) meeting held this year in Fredericton, New Brunswick. In addition to the main conference, there were two satellite meetings: the CFGA Tree Seed Working Group workshop and the Conservation of Forest Genetic Resources across Canada (CONFORGEN) meeting. The conference was a mix of field tours and scientific presentations mainly from Canada, but also from USA, Sweden, South Korea and Iran. Lindsay presented a very well received talk entitled “Using water activity in tree seed banking and its implementation in Alberta” and an overview of ATISC while Andy delivered a short eulogy in honour of Narinder Dhir (who started tree improvement in Alberta and ran it for over 30 years, and was a long-term CFGA member).

Forestry is a major industry in New Brunswick and forest tree improvement is advanced in the province. Approximately 45-50 million seedlings are planted annually, roughly split half and half between the crown and private land. The main species are white spruce, black spruce, Norway spruce, red spruce, and jack pine. Tree improvement is delivered by the government for planting on crown land and by the industry for the private land. Both government and industry-run facilities were included in the conference field tours. We visited the government-owned Kingsclear Forest Tree Nursery that produces 20-25 million seedlings for reforestation and has commercial seed orchard production. Second generation orchards have been established for white, black and red spruce and a third generation orchard has been established for jack pine. The estimated gain in volume at rotation age is 10% per generation. However, with rotation ages that can be as low as 35 - 40 years and only one breeding zone in the province, tree improvement in NB is in some ways easier than that in many other provinces, including Alberta.

Spruce clonal miniplug seedlings produced by tissue culture (somatic embryogenesis)

As part of the conference, J.D. Irving hosted a full day tour of its facilities including the nursery, seed orchards, breeding orchards, field testing, the somatic embryogenesis lab and the endophytes enhancement program. Similarly to the government-run programs, advanced generation seed orchards have been established for all major species. However, in addition to the traditional tree improvement, a tissue culture based cloning method (somatic embryogenesis) has been developed for commercial production. Currently 300,000 somatic seedlings are produced with the scale-up target of up to 5 million. These seedlings can deliver growth gain of 15% over the first generation gain and have improved resistance to attacks by terminal weevils. J.D. Irving has also invested in the commercial development of endophyte enhancement of conifer seedlings to improve tolerance to bugs and diseases. Endophytes are beneficial fungi living in conifer

Spruce clonal seedlings in the final containers. Note differences among the clones.

needles. Encouraging results have been found for using endophytes to fight spruce budworm in white spruce and white pine blister rust in white pine.

In the CFGA business meeting Leonard Barnhardt, a long-time ATISC manager, was accepted as a new honorary member of the CFGA and Lindsay Robb was accepted as a new active CFGA member (that's in addition to Deogratias Rweyongeza, Jodie Krakowski and Andy Benowicz who already are active members of the CFGA). We need a strong Alberta representation in this organization as the next CFGA meeting in 2017 will be in Alberta.

Andy Benowicz —ATISC

The Shifting Tides of FH&A Personnel

Caroline Whitehouse I've headed south from Peace River to Edmonton to start my new role as a Forest Health Specialist. This position will see me becoming more involved with scientific and resource specialists throughout the province and nationally. I'll have a chance to take a lead role in forest health research development by identifying and prioritizing research and technology needs.

I'm looking forward to working with various researchers to evaluate and develop their research proposals. My time in Peace River as the Forest Health Officer has given me a good operational background to evaluate the research needs of the forest health program and also the feasibility of research activities. I also get to nerd out occasionally with data analysis and insect identification so if you find an interesting insect and don't know what it is, send it my way! Just warn me first….

Exiting Peace River Forest Health Officer

Megan Evans Hired last June as the Invasive Plant Specialist in the South Saskatchewan Region, Megan has now taken on the role of acting Forest Health Officer in the region to fill the vacancy while Brad Jones is on secondment until March 2017 (B&D December 2014).

Megan had this to say: "*I am thrilled to be acting as the SSR Forest Health Officer for the next two years. I have a lot to offer the program with my background in terrestrial ecology and entomology and I am eager to learn more about forest ecosystems. It is an exciting time for the program and I am excited to be playing a larger role.* "

Acting Forest Health Officer—South Saskatchewan Region

Whitebark Pine Ecosystem Foundation Workshop in the Robson Valley, BC.

On July 29-30, 2015 the Whitebark Pine Ecosystem Foundation of Canada hosted one day of talks focusing on restoration and recovery at the northern limit of the range of 5 needle pines, and one field trip day on McBride Peak. Earlier WPEF-Canada workshops have been held, jointly with the WPEF-US, in Nelson (2009) and Kimberley (2012). The WPEF-US hosts a science and management workshop every year.

Almost 40 people registered from Alberta and British Columbia, hosted by the welcoming community of Dunster, BC. Attendees included staff from the provincial government, Parks Canada, consultants, students, and program administrators from various agencies. A good diversity of expertise was on hand including forestry professionals, ecological restoration experts, applied biologists, policy specialists, and many others. This set the stage for some animated discussions and great questions.

Presenters described current projects including ongoing blister rust screening in BC of 40 trees per year, policy achievements, and data on the current status and trends of the species. The afternoon highlighted a report produced for the BC Government identifying policy and operational barriers to whitebark pine recovery in BC and options to overcome them – many factors were very relevant to Alberta. Whitebark pine is blue-listed (or vulnerable) in BC, but lacks legal protection. Unlike the minister-approved recovery plans facilitating 5 needle pine recovery through inter-agency cooperation in Alberta, there is no coordinated recovery plan in BC for whitebark pine…yet.

The field trip featured Sybille Haeussler of UNBC and the Bulkley Valley Research Centre discussing a restoration trial. Don Pigott of Yellow Point Propagation in BC and Jodie Krakowski of FH&A showed participants how to identify white pine blister rust in the field, when and how to cage cones, and select trees. Jodie described the health transect monitoring program and how the results can be used to aid in and prioritize recovery and management activities.

The WPEF-US science and management meeting is September 17-20 in Ashland, Oregon, featuring the latest on all things 5 needle pine, emphasizing coastal recovery. There are field trips to Crater Lake and Dorena Genetic Resource Center where the coastal rust screening program has been operating for decades. Registration and information is here: http://whitebarkfound.org/?p=1519

Promoting whitebark pine recovery in B.C. http://www.whitebarkpine.ca/uploads/4/4/1/8/4418310/promoting_whitebark_pine_recovery_in_bc.pdf
Alberta whitebark pine recovery plan 2013-2018 http://esrd.alberta.ca/fish-wildlife/species-at-risk/species-at-risk-publications-web-resources/plants/documents/SAR-WhitebarkPineRecoveryPlan-Jan-2014.pdf
Alberta limber pine recovery plan 2014-2019 http://esrd.alberta.ca/fish-wildlife/species-at-risk/species-at-risk-publications-web-resources/plants/documents/SAR-LimberPine-RecoveryPlan-Sep2014.pdf

Jodie Krakowski - ATISC Smoky Lake

The 2015 Golden Beetle Award

Each year the Golden Beetle is awarded to a member of the FH&A group and the recipient is chosen by the previous year's honouree. 2014's recipient Aaron McGill, our GIS guru in Edmonton, chose Pam Melnick, Forest Health Officer for the Red Deer—North Saskatchewan region.

"*Pam is always challenging the way we do things, looking for innovative ways of doing things. ..improving our processes … Looking for new forest health threats. She is always helping others and is willing to go anywhere in the province to help out fellow forest health officers,*" said Aaron.

Congratulations Pam!!

What the heck *IS* that?

This is a Cuckoo wasp and they are a very large group of wasps in the Chrysididae family. Tom Hutchison found this in a funnel trap in the Lower Athabasca Region. They are nest parasites of predatory wasps and sawflies, and walking stick (Phasmatodea) egg parasites.

Cuckoo wasps attempt to enter host species nests undetected to lay their eggs. If discovered, the concave underside of their abdomen enables them to curl into a ball, completely protected. So rather than host species killing the cuckoo wasp, they're only able to haul them out of the nest. Another unique physical feature is the female stinger is highly modified into an egg laying tube and the poison gland is greatly reduced so that these insects can be safely handled. Cuckoo wasp larvae will either consume host larvae and their food, or wait until the host larvae is plump and mature and then consume them.

If you're dying to know more about these colorful wasps, check out this book—http://bugguide.net/node/view/161144

White Spruce Cone Harvest at the Alberta Tree Improvement & Seed Centre

This year, three white spruce tree seed orchards were chosen for harvest, based on cone crop, existing seed in storage and demand. Starting in mid-July, the white spruce cones were checked regularly, using cone cutting tests, in order to assess cone and seed maturity. Cone cut tests have several specific criteria to indicate maturity, including cone axis moisture, flexibility, embryo size, and seed coat & wing colour. These cone cuts are especially important on white spruce crops because there is such large variability in cone maturity between families that it is important to wait as long as possible. If the crop is harvested too early, a large proportion of the final bulk seed lot would be immature resulting in a drastically shortened lifespan of the seeds in cold storage, e.g. from 50 years for mature seeds to 15 years for immature seed.

The final cone cut tests on August 10th indicated a mature crop for our first white spruce seed orchard on site, Region H. Although we ended up losing a small amount of seed from early maturing clones, this late start date ensured that our bulk seed would have the greatest longevity possible in storage, which is important when we don't know how quickly these seeds will be used. However, we started picking in one of the hottest weeks of the summer! The week of August 10th saw temperatures above 30°C and not only was it difficult working conditions for staff, the cones started drying out and opening even faster than anticipated! So the push was on to get them in as quickly as we could. We definitely would have struggled this year to recover all the cones in time if it hadn't been for the fantastic fire crews that kept showing up to help us pick cones! They also unloaded and spread our co-op Region G2 orchard crop from North Star in a few hours, a task that would have taken our all-female base staff days to complete (not to mention days to recover!). We are always very grateful in the years when the fire crews arrive to help us out.

The final tally from the 3 orchards selected for harvest this year was: Breeding Region H – 21.45hL, Breeding Region E1 – 52.32hL & Breeding Region G2 – 45.86hL. This makes a total of 119.63hL for these 3 orchards for 2015. The seeds present per cone are fairly high, due to the cone and seed insect population crash that happened last year (a year of few cones following the mast year). We expect a good amount of healthy seed. Right now the cones are spread thinly indoors on stacked pallets & screens with good aeration (fans, air conditioning) to promote drying and scale flexing (see photos). Room temperature and humidity are monitored to keep both low and every day the cones are mixed using a rake to speed up drying. This usually takes 4-6 weeks to dry the cones sufficiently to a 'safe' level so that they can then be shipped to a seed extraction facility. After extraction, cleaning and testing the seed will come back to ATISC for registration and cold storage and, following that, be made available for reforestation.

Lindsay Robb—ATISC Smoky Lake

The Continuing Adventures of the Whitebark (and Limber pine) Warriors

Our previous episode left the intrepid 5-needle pine crew galloping across remote ridges on the quest for those rare, precious trees that may be resistant to the insidious, lethal white pine blister rust. It must have been tough holding your breath for months to wait and see what happened next! Just in time to avert a first aid incident, we have breaking news.

Field crews focused on southwestern Alberta, by far the worst hit area with white pine blister rust. No signs of current or very recent mountain pine beetle attacks were observed. Trees and stands were targeted using the long term health monitoring transects that so many of the fabulous and good-looking FH&A folks have helped to establish and measure, together with staff from Alberta Parks, Parks Canada, and contractors.

2014 transect data were used to find trees that could be resistant to rust, called 'candidate trees'. Stands with very heavy rust (85-100%, and then 70-85%) were prioritized for sampling since trees that appear healthy are more likely to truly be rust resistant in a stand with heavy rust. However, we don't know for sure if candidate trees are really disease resistant, or if they just happened to escape infection until they are tested. Testing, or blister rust screening, is done by growing seedlings from candidate trees, inoculating them with rust, and monitoring them for several years. Trees could be completely disease resistant, partially resistant, or tolerant to the disease, which means they are infected but can still grow and function.

Keen field crews selected 85 limber pine trees that appeared to be lonely bastions of health in a miasmic, festering sea of fungally facilitated debilitation, death and destruction. Each tree was carefully and thoroughly examined for signs of disease and compared to the health of the surrounding stand. Trees that had enough cones to meet the needs of conservation, testing, and trials were protected using mesh cages. The mesh had to be fine enough so seeds didn't fall through when limber pine cones matured and opened, yet tough enough to deter even the most determined Clark's nutcrackers and other mammalian and avian varmints.

Crews started mid-June and finished the selections mid-August. Because of the hot, dry summer some cones were already starting to open – weeks earlier than usual. Each tree has a metal tag with unique ID number and photos so we can return to collect ripe seeds this fall.

Our crews examined thousands and thousands of limber pine trees in dozens of stands. Only about one of every 300 to 500 trees met our strict criteria to join the elite ranks of the candidate trees – this means that the natural likeli-

hood of rust resistance in the wild is very low in this area. Trees that looked great but had no cones this year were noted for future collections. There were few to no whitebark pine cones this season in southwest Alberta.

In late September, staff will return to the beautiful mountains and foothills of southwestern Alberta to collect the cones. Seeds will be processed at the provincial facility in Smoky Lake, and ultimately used for gene conservation, rust resistance screening, and provenance testing. Surplus seeds may be available for restoration projects in priority areas.

Jodie Krakowski— ATISC Smoky Lake

Iceland – Treeless Wasteland or Forest Health Opportunity

From my discussions with people about my recent trip to Iceland, I gather the impression most people have is that Iceland is completely treeless. For the most part, this assumption is correct. However, this was not always the case. According to various papers and articles I have read, at the time human inhabitants arrived on the island (about 900 AD) up to 40% of it was covered with forests. Over the centuries around 95% of these forests have disappeared. Harvesting by humans, climate change (Little Ice Age), and volcanic activity have all contributed to this decline to some degree. Extensive sheep grazing has been largely responsible for the inability of forests to regenerate. Over time a perception developed that trees of any size could not be grown in Iceland. More recently, however, this assumption has been challenged and afforestation programs have been attempted in many areas. Between 1950 and 2009 afforestation through planting trees increased. The global financial crisis of 2008 curtailed public money for forestry and planting efforts have drastically decreased since then.

Conifer plantation near Kerith, Iceland.

From the limited amount of Iceland that I saw, it appeared that wherever trees were planted they have grown pretty well. Many of the towns and cities have a significant number of large trees. In fact, the first thing that struck me about Reykjavik was the amount of urban forest there. Many rural farms have quite a few trees around the buildings, and occasionally we came across fairly large conifer and deciduous plantations. The vast majority of the trees planted are not native to Iceland. So, it was interesting, at least to me, to see that many trees were affected by needle casts, rusts and leaf blights similar to ones we would encounter in Alberta. I was even noticing some die-back and mortality apparently caused by these pathogens. I mentioned this to one of the employees at Reykjavik's botanical gardens and he told me there was a real lack of knowledge about these types of things in Iceland. I wonder if there's an opportunity there – a Forest Health sabbatical in Iceland perhaps? Maybe if their forestry programs pick up again in the future such an opportunity may present itself. Icelandic Forest Health Officer…ah well, I can dare to dream.

Trees in Reykjavik.

Tom Hutchison— Edmonton

Get To Know a New FHO

Fraser McKee is the new Forest Health Officer for the Lower Athabasca Region And works out of the Lac La Biche office. I sat down with him recently to ask him a few questions.

Mike: For the benefit of those who have not met you, could you tell me about your education and work history?

Fraser: I started things off with a B.Sc. in Wildlife Biology from the University of Guelph. After a year or so I enrolled at the University of Northern British Columbia for a M.Sc. in Natural Resources & Environmental Studies (Biology). I then moved to Minnesota for a Ph.D. in Entomology from the University of Minnesota which I completed in July of this year. Over the past 7 or 8 years, I have been involved with forest health issues through my programs of study. My own focus on forest health has been on bark beetle ecology and impacts to forest health. However, in working with collaborators, colleagues, and attending forest health meetings I have been fortunate to learn about a wide variety of other important issues facing North American forests. Along the way, and aside from forest health, I have held jobs in an auto garage, machine shops, residential construction, farming, and some horseshoeing experience thrown in as well.

Mike: Can you tell me a bit about your doctoral thesis and how the defense went?

Fraser: The defense went well, thanks. My advisor, Dr. Brian Aukema and my committee members did an excellent job of mentoring me throughout the project and preparing me for the defense so that there were not any surprises in the process before, during, or after the defense. It was a relief to get the defense done with though! In brief, I studied the eastern larch beetle, a relative of the mountain pine beetle. Eastern larch beetles typically do not undergo widespread outbreaks. However, since 2000, this insect has been in outbreak mode in the Great Lakes region, and now, in several other areas of Canada as well. In Minnesota, about 30% of the tamarack forest type has been killed by eastern larch beetles to date. My project had three main focus points. The first was to get a detailed description of the biology of the beetle in Midwestern North America including the timing of adult beetle spring emergence and flight, periods of attack on host trees, larval development, and the number of broods and generations produced per year. The second focus was to use that biological data to try and figure out what factors may be responsible for the ongoing outbreak. Third, I examined the interactions between the beetle and its host and looked at host tree quality and its effect on beetle host selection, colonization dynamics, reproductive success, and offspring fitness. This information will hopefully help researchers figure out the feedback mechanisms that govern the population dynamics of eastern larch beetles and hopefully other bark beetles as well.

Mike: When you were a kid, what did you want to be when you grew up?

Fraser: I grew up on a farm and that was something I have always wanted for myself. While farming full-time was not in the cards for me, I do plan on getting back into it as a second job or career. Apart from farming, I always knew I wanted a job that enabled me to spend as much time outdoors as I could. While not specifically planned, one thing led to another and forest health is the career that ended up unfolding before me and I've really enjoyed the work.

Mike: What things keep you busy on weekends?
Fraser: At the moment some time on weekends is used to help get me up to speed on this job. The rest of the time is spent in some outdoor activity whether it be hiking, camping, hunting, snowshoeing, cross country skiing or any number of other sports, or just general odds and ends that need doing such as cutting grass.

Mike: Any nicknames?
Fraser: This is one that I thought about glossing over, but since were all friends here….the only nickname that ever really stuck, and I am not even sure how it came to be, was when I worked in a tire shop back in Ontario I somehow got the name "Sweet Swifty Slick" or just "Swift". So there it is, ha ha.

Mike: What's on the record player at the moment?
Fraser: Quite a range of music generally, however country takes up a lot of space. At this very moment though is Bob Seger's Greatest Hits. FYI, there's a notable (amazing) guitar bit in "Little Victories" that's worth checking out (starts around 2:39 if I remember right).

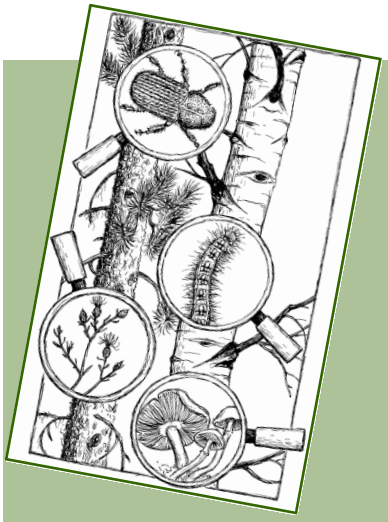
Mike: Any interesting hobbies?
Fraser: I have had a big interest in blacksmithing for a number of years now, and plan on getting a forge setup now that I am done school and have some time to really delve into it.

Mike: Can you tell me what your favourite forest pest is and why?
Fraser: I don't have a favourite outright. But, I did develop a fondness for the eastern larch beetle because so little is known about it that almost anything you choose to study is brand new and interesting information. Also, the tamarack bogs in the fall when the needles have changed to that luminescent yellow are extremely nice to be working in.

Mike: In your opinion, what is the biggest challenge facing the health of AB's forests now and into the future?
Fraser: I think that species that have historically not been forest health issues are going to be worth watching out for in the future as climate change occurs and potentially alters the traditional biological patterns of these organisms. For example, historic climate patterns that kept the population of a given species in check may change and allow that species to become problematic. Something else to consider with these types of species is that often very little (or nothing) is known about them since they have not been important to forest health in the past. However, if a species does emerge as a new pest, and the biological information on that species is not known, then forest health managers have to play "catch-up" to first figure out the species biology and then have to try and figure out a way to manage it. I think it is worthwhile re-examining and updating what is known about the species that are on the fringe of being important to forest health, as they could become more important in the next 20 years, for example as the climate continues to change.

Mike: Thanks Fraser!

Mike Undershultz & Fraser McKee—Edmonton & Lower Athabasca Region



Oooh Icky Kleptoparasite

Try as I may
Envision as I might
I simply can't imagine a more horrific plight
Than to be the hapless victim
Of a kleptoparasite

Satellite fly
You devious wee beast
Sneaking in is your success, you do the very least
Didn't even catch the prey
On which your larvae feast

Miltogrammine species
Your competitors are bested
When you've placed your eggs where the solitary wasp has nested
Still, pity to your victims
Cerambycid or Buprestid

Tom Hutchison—Edmonton

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