

Bugs and Diseases

Vol. 30 No. 2

August 2019

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**Forest Health
and Adaptation**

Will mountain pine beetle populations grow in 2019 after the cold winter?

Alberta Agriculture and Forestry (AAF) uses spring population forecast surveys to assess the potential productivity of overwintering infestations. While this data does not provide a direct measure of overwinter mortality, we use this information to assess the likelihood of population growth in the coming summer. These surveys are based on r-values, which are calculated by summing all live MPB life-stages for each plot and dividing that value by the sum of all attack starts from the previous year. The values are categorized into low, moderate, high and very high which indicate that populations are likely to decrease, remain stable or increase during the following summer.

Provincially, 2019 r-values predicted lower productivity than in those in 2018 (2.0 versus 1.3 respectively, Table 1). The majority of sites sampled this spring were categorized as low (70 per cent), 25 per cent as moderate and just 5 per cent as high. Compare this to 2018 when 47 per cent were low, 40 per cent were moderate and 14 per cent were high. The shift to lower productivity was primarily driven by lower r-values in the Edson Forest Area (FA). In 2018, 25 per cent of sites in the Hinton FA predicted low productivity but shifted to 83 per cent in 2019.

The majority of sites in the Grande Prairie FA were low (67 per cent) which is similar to 2018 (62 per cent). One site just had unusually high productivity with an r-value of 21.0, but six sites sampled had r-values of 0.0. This pattern was repeated in the Lac La Biche FA, where two sites were highly productive and five sites with values of 0.0. In the Slave Lake FA, more than half of the sites sampled were categorized as moderate – an increase from 36 per cent in 2018 – but fewer sites were high this year (21 and 11 per cent in 2018 and 2019 respectively). Three sites were sampled in the Calgary FA with one categorized as low and the other two categorized as high.

Alberta experienced significant cold events during February 2019 and some areas of the province reached lows between -36 to -42°C. Indeed, models used to predict MPB mortality suggest that February 2019 temperatures were cold enough to cause greater mortality than had occurred in the years since 2015². By using BioSIM to

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©2019 Government of Alberta | Published: April 2019 | ISSN No. 1499-5859 (print)
ISSN No. 1499-5867 (online)

Alberta

predict the winter temperatures at each r-value site, we know that temperatures did drop low enough to cause 90 per cent mortality which could at minimum, stabilize these populations³.

Cold-related mortality may not have been the only reason for low r-values. In many areas of the province, but in the Edson FA in particular, reduced reproduction rates and delayed phenology were observed during the summer of 2018^{4,5}. Temperatures above 24°C have a deleterious effect on MPB development⁶. July and August, 2018 were unusually hot months, which could have negatively impacted MPB brood development. Additionally, a second late flight occurred in mid-August 2018⁷. This late flight coincided with hot westerly winds that scattered

Cold-related mortality, delayed phenology, hot summer temperatures, and a late season flight are all possible contributors to reduced reproductive rates in 2018

beetles throughout the north central region. Anecdotal reports suggest that this second flight resulted in mass-attacked trees but very few offspring. Smoke from British Columbia wildfires blanketed many parts of Alberta during this time and may have affected MPB flight and reproduction. This is speculation since research has not documented the effect of wildfire smoke on MPB. Regardless of the cause, fewer offspring were produced last summer. Of those offspring produced many were immature (i.e. eggs and immature larvae) going into winter. These life stages are most vulnerable to cold^{1,8}.

So, what comes next? Once MPB flight concludes for the summer, ground surveys will be performed to assess actual population growth. These surveys are based on a ratio of green-attack (pines with green crowns, infested in the current year) to red-attack (pine with red crowns, infested the previous year) trees. Green- to red-attack data will help us fully understand the impact that the low reproduction and cold winter temperatures had on MPB populations in the province.

Table 1. Mountain pine beetle r-value survey results, 2018 and 2019.

Forest Area	Number of sites/trees		Average r-value		Range of r-values	
	2018	2019	2018	2019	2018	2019
Calgary	3/26	3/30	2.7	1.1	2.6 – 2.9	0.8 – 1.5
Edson	8/65	29/265	2.5	0.3	0.0 – 8.9	0.0 – 1.5
Grande Prairie	13/96	9/17	1.4	2.6	0.0 – 6.5	0.0 – 21.0
Lac la Biche	5/6	12/43	0.0	2.6	0.0	0.0 – 12.8
Peace River	5/41	0/0	3.9	—	0.0 – 10.6	—
Rocky Mountain House	1/4	0/0	2.7	—	2.7	—
Slave Lake	14/25	9/8	2.4	1.9	0.0 – 10.0	0.0 – 6.3
Whitecourt	9/42	2/13	1.5	0.1	0.0 – 6.0	0.0 – 0.1
Provincial	58/302	64/385	2.0	1.3	0.0 – 10.6	0 – 21.0

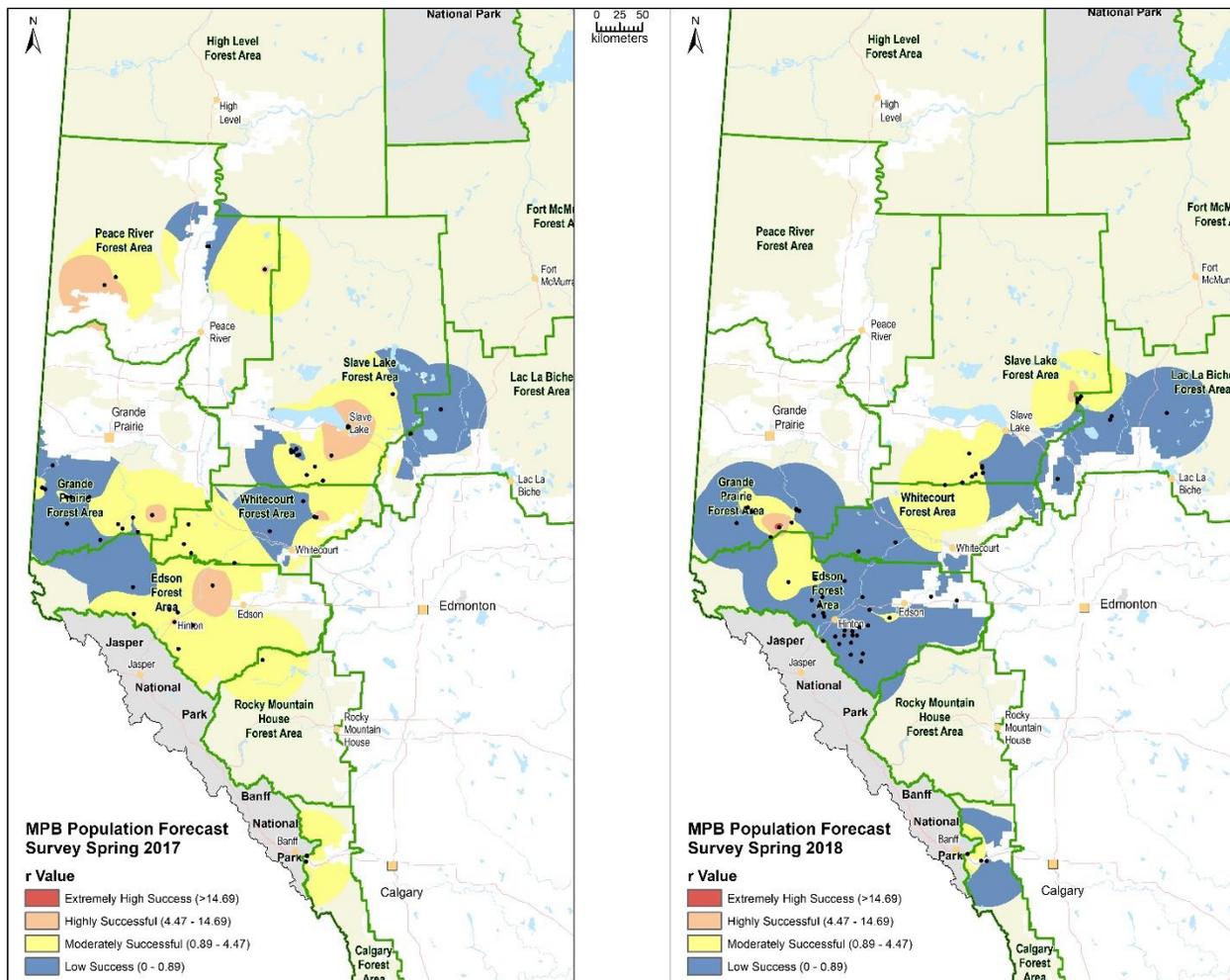


Figure 1. Mountain pine beetle population forecast survey results, 2018 and 2019.

References

¹Reviewed in Safranyik L. and Carroll A. L. 2006. *The biology and epidemiology of the mountain pine beetle in lodgepole pine forests*, pp. 3–66. In Safranyik L., Wilson B. (eds.), *The mountain pine beetle: a synthesis of its biology, management and impacts on lodgepole pine*. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC.

²MacQuarrie, C.J., Cooke, B., and St-Amant, R. 2019. *The predicted effect of the polar vortex of 2019 on winter survival of emerald ash borer and mountain pine beetle*. *Can. J. For. Res.* **8**(June): 1–8. doi:10.1139/cjfr-2019-0115.

³Régnière, J., St-Amant, R., Béchard, A., and Moutaoufik. 2017. *BioSIM 11 —User’s manual*. Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre, Inf. Rep. LAU-X-137E (updated). Available from ftp://ftp.cfl.scf.mcan.gc.ca/regniere/software/BioSIM/

⁴Roger Brett, Canadian Forest Service, personal communication

⁵Caroline Whitehouse, Alberta Agriculture and Forestry, unpublished data

⁶Safranyik, L., and Whitney, H.S. 1985. *Development and survival of axenically reared mountain pine beetles, Dendroctonus ponderosae (Coleoptera: Scolytidae), at constant temperatures*. *Can. Entomol.* **117**: 185–192.

⁷Dr. Nadir Erbilgin, University of Alberta, personal communication

⁸Bleiker, K.P., Smith, G.D., and Humble, L.M. 2017. *Cold tolerance of mountain pine beetle (coleoptera: Curculionidae) eggs from the historic and expanded ranges*. *Environ. Entomol.* **46**(5): 1165–1170. doi:10.1093/ee/nvx127.

Caroline Whitehouse - Edmonton

A New Forest Health Technician for Whitecourt Forest Area

It's time once again to get to know a new Forest Health staff Member. Eryn Snoddon officially signed on as Whitecourt's Forest Health Technician in April 2019, and I've recently sat down with her in order to introduce her all of our loyal Bugs and Diseases newsletter readers.

A: Allison Brown, Forest Health Officer; E: Eryn Snoddon, Forest Health Technician

A: Eryn, for the benefit of those who have not had the pleasure to meet you, could you tell me about your education and work history?

E: *I grew up in Lethbridge, Alberta so after finishing high school, I immediately started my post-secondary journey at Lethbridge College in the Renewable Resource Management program. After graduating in 2011, I transferred to the University of Alberta for one year before returning to Lethbridge. In 2014, I graduated from the University of Lethbridge with a Bachelor of Science in Environmental Science degree. After finishing my post-secondary career, I started working with the then Environment and Sustainable Resource Development as an Aquatic Invasive Species Inspector based out of the Crowsnest Pass. It was my supervisor during this seasonal position who helped me get a job in Whitecourt as a Forest Health Assistant in the fall of 2014. I fell in love with Forest Health that winter and knew I wanted a permanent career in this field one day. Since this position was only for the winter, I spent my summers working as a Wildfire Logistics Assistant in the Whitecourt area. Every fall I would return to Forest Health and I repeated this pattern continually from Fall 2014 until Spring 2019. I am very exciting about joining the Forest Health team and look forward to learning what the spring/summer forest health program entails!*

A: Is Forest Health where you thought you'd end up? When you were a kid, what did you want to be when you grew up?

E: *Feel free to laugh at me, but when I was a kid all I wanted to do was save the tigers. I wanted to be like Jane Goodall (she was my hero when I was little) but work with tigers instead of chimpanzees.*

A: An admirable cause! I guess you could say that now you're the Jane Goodall of the pine tree world, and helping protect the forest! When you're not at work, what type of things keep you busy on weekends?

E: *When I am not suffering from feline-paralysis (the condition where the cat has chosen you as the spot where she will sit so you are not allowed to move with risk of upsetting her) I can be found in the kitchen baking or spending time outside running or even hanging out with my friends. I also love to enjoy a good movie curled up on my couch with my husband and fur babies (1 dog; 1 cat).*

A: Sounds like you keep busy and active, when your cat allows it that is! Switching gears a bit, let's get to know some of your favorite things. What would be your favorite movie?

E: *I'd have to say Pretty Woman for my favorite movie.*

A: Great choice, that's a good one. Favorite band?

E: *Hillsong would be my favorite band.*

A: Awesome! And finally, what is your favorite animal?

E: *Cat – I'm guessing at this point no one is surprised by that?*

A: Haha, no surprise here! Can you first tell me which forest health damaging agent interests you most, and why?



Eryn enjoying sushi

Alberta's eye on forest health

E: *I can't choose just one forest health damaging agent, but I am more interested in those affecting coniferous trees. Whether its bark beetles, or needle diseases or animal damage, I am more interested in those. I don't know why coniferous trees are more appealing to me (sorry, deciduous!).*

A: There is definitely something to be said for coniferous trees and their ability to keep their needles year round, and being a bit hardier in our cold climate in the Whitecourt Forest Area. In your opinion what is the biggest challenge facing the health of Alberta's forests now and into the future?

E: *The biggest challenge I think facing the health of AB's forests is the unknown consequences of climate change. We don't know how our native trees will respond to changing climate and what new pathogens will thrive with the changing climate. Which pests will shift to an epidemic stage with changing host susceptibility? That is why it is so important for Forest Health to monitor for changes every year and I am very excited about joining this mission.*

A: We're glad to have you join the team. We certainly have our work cut out for us in the years to come, monitoring and ensuring the forest's health. What aspect of your job do you enjoy the most (aside from hanging out with me)?

E: *I love that my job is largely spent outdoors. Being in the forest surrounded by trees is where I feel the most like myself and all my stress disappears. I am a very active person and getting paid to be hike in the woods is like a dream come true!*

A: I'd have to agree with you, being able to get away from a computer screen and into the forest is something I value as well. And finally, one more question for you Eryn as we come up to lunch time; what would your dream meal consist of? If you could share it with anybody (dead or alive) who would it be?

E: *My dream meal would be a traditional German meal that I cook with my great-grandma. She is my personal hero and I would love to hear her tell stories about her life and learn how to cook a traditional German meal from her.*

A: That's a great answer. Thanks Eryn for the chat and welcome to the team.

Allison Brown – Whitecourt Forest Area

Another New Forest Health Technician for Lac la Biche Forest Area



Introducing Steve Simpson, who joined Forest Health Officer Fraser McKee in the Lac la Biche office last fall. Steve has this to say about his work and personal worlds:

"I moved to Alberta in 2017 and I live just outside of Lac La Biche with my girlfriend and our dog. Before joining Forest Health, much of my work focused on planning and conducting wildlife survey work as well as managing the resulting data. I'm very happy to be a part of the Forest Health program where I enjoy working outdoors and learning about Alberta's forests."

Welcome to the forest health team, Steve!

Fraser McKee – Lac la Biche Forest Area

Alberta's eye on forest health

Willow Leafminer is Not Done Yet

Yogi Berra, was one of baseball's all-time greats. His major league career spanned from 1946 to 1989 as a player, coach, and manager. He was selected as an all-star 18 times, won 13 World Series, and was inducted into the Baseball Hall of Fame in 1972. Aside from his illustrious baseball career, Yogi was famous for his often funny (yet somehow insightful) malapropisms – called “Yogi-isms.” Some of these include: “ninety percent of baseball is mental, the other half is physical”; “it ain’t over till it’s over”; and, “I never said most of the things I said.” At this point you may be asking “what does this have to do with forest health?” Well, nothing really, except that in our August 2018 Bugs and Diseases Newsletter I attempted to use a Yogi-ism and it somehow got garbled.

I was attempting to say “it was like deja-vu all over again,” with regard to questions I was hearing about what was responsible for killing all the willows. I have been hearing this question since 2008. In fact, in 2010 I wrote an article for The Bonneyville Nouvelle to help address the public concern about browning willows in northern Alberta. Subsequently, a large number of public enquiries prompted the province to produce a [brochure](#) about the insect causing widespread damage to willows – the willow leafminer (*Micruapteryx salcifoliella*) – aka the willow leaf blotch miner. In the years that have followed, this insect has continued to ravage willows throughout the Alberta, and beyond. St. Albert Today's Kevin Ma published an article in July of 2018 in which he quoted noted horticulturalist Jim Hole saying the outbreak of this insect that year was the worst he'd ever seen and that he'd fielded many questions about it from concerned citizens. In June of this year CBC news had several stories, on all of its media platforms, regarding public concern over the willow leafminer's outbreak in the Yukon. A common theme in the articles and brochure mentioned above is the assertion that damage caused by this insect is unlikely to kill willows, unless it occurs over a number of years.

Well, it has been a number of years. In fact, it has been over a decade since the willow leafminer outbreak has affected willows in Alberta. Willow die-back and/or mortality is now clearly evident over much of the province. During our aerial surveys this spring it appeared that the insect had possibly eaten itself out of house and home, and their populations had collapsed. However, current damage has become more noticeable as the summer wanes, suggesting that development may have been delayed this season. This observation was also made by aerial surveyors for the Canadian Forest Service for northern parts of the province as well as in the Northwest Territory.



Weather has no doubt contributed to the extent and severity of the willow leafminer's outbreak provincially, as well as this year's delayed development. To what extent climate change is a driver for the insect's behavior and impacts is not certain. Willows are important. They provide a number of ecological services (e.g. stream bank stability, forage for ungulates), and are aesthetically valuable. As well, willows are often used for reclamation on many industrial sites, and having large areas of dead willows could influence future fire behavior. Given their importance and that the public have expressed concern for some time, the GoA has been making more of an effort to delineate areas where willow damage is occurring, or has occurred. However, it is difficult to map during aerial surveys, at least with our current system. How bad will the damage to willows get? Is this another symptom of climate change? What will the future be like for willows? Willow damage/die-back probably does warrant more consideration, but how much given limited survey capacity? Certainly, there is a great deal of uncertainty and, for willows, to quote Yogi Berra, “the future ain't what it used to be.



Tom Hutchison – Edmonton

Alberta's eye on forest health

Spruce Broom Rust 101

This summer, a local wood lot owner contacted me to ask about his spruce trees and what I knew about spruce broom rust. Unfortunately, I knew very little about spruce broom rust (*Chrysomyxa arctostaphyli*) and had always assumed that the ‘witches-broom’ masses of thick branches in spruce were caused by dwarf mistletoe. I thought that as I did research on spruce broom rust lifecycle, impacts to the spruce tree and methods to mitigate the spread of spruce broom rust, that I should summarize my findings in a short article for the avid Bugs and Diseases readers.

Spruce broom rust, unlike dwarf mistletoe, is a fungal infection rather than a parasitic plant. The fungus (or rust) itself acts parasitically and requires two hosts to complete its lifecycle. The primary host is spruce; *Chrysomyxa arctostaphyli* has been known to infect Black spruce, White spruce, Red spruce, Norway spruce, Sitka spruce, Blue spruce, as well as Engelmann spruce. In the summer, the lifecycle starts as an orange rusty substance appears on the spruce needles. This orange substance is actually a pustule filled with spores, which will rupture and then release the spores into the wind so that they can settle on their secondary host: common bearberry, or kinnikinnick (*Arctostaphylos uva-ursi*).

The spores will settle and germinate onto the leaves of the kinnikinnick during the summer if there is moisture on the leaves for the spores to adhere to. The spores over-winter on the leaves of the kinnikinnick and in the spring the infection will appear as small purple brown spots. In the spring if you flip over the kinnikinnick leaf and see orange-brown spots on the underside, you’ll know the next type of spores have formed and are ready to disperse in the wind. The spores will land on new growth spruce needles and then the lifecycle starts again.

the most obvious symptom of broom rust is the ‘witches-broom’...a massed ball of branches up to 2 meters in diameter

Once a spruce tree is infected, it will start to develop signs and symptoms of the infection. Two of the signs were described above in the lifecycle description: the orange-rust substance on the spruce needles and the spots on the kinnikinnick leaves. A dead top on your spruce tree could be a symptom of spruce broom rust, but the most obvious symptom is the ‘witches-broom’: a mass of branches that can often appear as a ball in the tree, and can be up to 2 meters in diameter (see Figure 1). The witches-brooms take a year to develop after the tree has been infected, and develop either on the bole of the tree or a branch. The broom’s growth is caused by a change in hormones caused by the infection. The branches within the broom will drop their needles every year, so mid-summer the needles of the broom may appear orange, and then these branches will be bare by fall.



Figure 1. Spruce Broom Rust witches-broom on a Spruce tree near High Level. Photo: Tom Hutchison.

Like most fungus, spruce broom rust will thrive during a wet cool season as these conditions are favorable for fungus development. The climate is out of our control, but in order to decrease the incidence of spruce broom rust, it’s advised to avoid planting pure spruce stands as well as avoiding planting spruce if there’s kinnikinnick in the area. I did not find any reference to a successful chemical treatment for spruce broom rust, but it is noted that pruning off the witches-broom is a possible treatment. If the broom is on the bole of the tree, the trunk above the broom should be removed.

Diseased trees can also be removed in their entirety and it's said that this will not cause the infection to spread.

Spruce broom rust isn't always the first thing on everyone's mind when thinking of spruce health, but with local changes in temperature and precipitation, it may become a more prevalent disease in our forests. Witches-broom growth is a drain on the tree's resources and can decrease the tree's growth. Spruce stands should be monitored for this disease so preventative or mitigatory measures can be taken to reduce negative impacts to spruce.

References:

Management Guide for Spruce Broom Rust: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5187557.pdf

Natural Resources Canada Spruce Broom Rust: <https://tidcf.nrcan.gc.ca/en/diseases/factsheet/1000053>

Spruce Broom Rust Yukon Forest Health-Forest insect and disease: http://www.emr.gov.yk.ca/forestry/pdf/forest_health20.pdf

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ISSN No. 1499-5859 (print)
ISSN No. 1499-5867 (online)
Published Apr., Aug. & Dec.
Editor: marian.jones@gov.ab.ca

Bugs & Diseases informs forestry-related personnel about current forest health issues.

Articles are welcome.

A Distant Memory

What is Forest Health?
What is forest health?
What would you like it to be?
'cause health for you and health for me
Could differ quite a bit, you see

Maybe you want lumber
Maybe you love trees
To try to reconcile the two
Can sometimes cause unease

So how then to define it?
When values are subjective
You really need to ask yourself
What's the ultimate objective?

Tom Hutchison - Edmonton

