Bugs and Diseases

Vol. 33 No. 1 April 2022

Inside this issue

Forest Health and Adaptation

Introducing Spongy Moth

If you are a lover of all news buggy, you may already be familiar with the invasive species now known as spongy moth, *Lymantria dispar dispar*. For those of you who are not, let me introduce you to this moth which previously went by gypsy moth. You might ask "Why was it renamed? This is something that rarely happens in the insect world!" The Entomological Society of America recognized that time had come to rename this moth species with an inoffensive, biologically relevant name. The "spongy" in spongy moth refers to the egg masses that the female moths lay – the masses are fuzzy, brown, and a bit squishy (Fig. 1).

Figure 1. Fuzzy, brown egg masses laid by spongy moth females. Up to 1,000 eggs can be laid in each mass. Photo credit: The Morton Arboretum.

As I mentioned, this moth is an invasive species that was purposely brought to the United States by an artist with the intention of breeding it for silk. Unfortunately, some escaped the artist's home in Massachusetts and the insect has slowly spread eastward ever since. It's also rare to be able to pinpoint exactly where, when, and how an invasive species was introduced.

Alberta

There are several aspects of spongy moth's biology that make it a successful invader. The larvae, or caterpillars, feed on the leaves of over 300 species of trees and shrubs, so they can find something to eat in any forest, urban or otherwise. The egg masses are relatively cold-hardy, which allows it to survive cold winters, and they have few natural enemies and diseases that could suppress populations. The egg masses are easily transported as well – the females lay eggs on almost any surface, which can include vehicles, outdoor equipment and firewood. It is thought that approximately 85 percent of new infestations occur through the movement of outdoor household items.

Figure 2. Larvae can be found feeding on foliage from May to July. They are easily recognizable with their hairy appearance, with two rows of five blue spots, followed by six spots along their back. Photo credit: UW-Madison Extension.

In Canada, spongy moth is established in parts of Ontario, Quebec, New Brunswick, Prince Edward Island and Nova Scotia. Given how destructive this invasive species is, it is federally regulated by the Canadian Food Inspection Agency (CFIA) to prevent the spread to uninfested regions of Canada. This is achieved through regulating the movement of goods out of regions that are infested. Adhering to the regulations have a negative economic impact on forestry-related industries, such as nurseries and wood products.

Unfortunately, in the last couple of years, spongy moth has become a more frequent visitor to our province. Interceptions have been increasing in Calgary, in particular, but also in Edmonton and some national parks. We suspect that this is due to increased travel from southern Ontario where spongy moth is currently outbreaking. If this pest was to become established in Alberta, the environmental effects and economic impact could be sizeable in warmer regions of the province (i.e., historically the area south of Edmonton). Larch, birch, and trembling aspen are among the hosts preferred by spongy moths, and these three species represent ~85 percent of Alberta's hardwood inventory. In addition, impacts on Alberta's urban forests could be significant.

So you may be asking "what can I do to help stop the spread of spongy moth?" If you travel to any regions that are regulated, inspect your vehicle and any items left outside for egg masses and remove them if found. Be on the lookout for egg masses and larvae (Fig. 2) and if you find a suspicious insect, report it. Finally, don't move firewood that isn't certified as heat-treated - essentially, "buy it where you burn it". This will prevent the movement of not only spongy moths but also other invasive species. The CFIA website is a great source of information on spongy moths.

Caroline Whitehouse - Edmonton

AFRED MPB Survey and Control Program Update for 2021-22

Agriculture, Forestry, and Rural Economic Development's 2021-22 mountain pine beetle (MPB) control program is now complete. The number of infested trees in the Calgary forest area doubled this year compared to last year but infested trees throughout the rest of the province declined significantly. This year, 24,281 infested trees were cut and burned at 7,840 concentric survey sites.

The table below shows the number of infested trees controlled within each forest area over the last three years.

Forest Area	Trees controlled 2019/20	Trees controlled 2020/21	Trees controlled 2021/22
Edson	26,307	34,116	14,204
Rocky Mountain House	35,124	17,014	3,093
Whitecourt	31,903	6,522	1,137
Grande Prairie	5,056	2,676	952
Calgary	4,202	2,315	4,696
Slave Lake	1,950	2,298	195
Lac la Biche	282	111	4
Total	104,824	65,052	24,281

There has been a steep decline in the number of trees controlled. This reduction is not due to a lack of budget. Alberta reached a funding agreement with the Federal government to support Alberta's MPB control program. The agreement is active until March 31, 2023, and allows the Federal government to contribute up to $60 million dollars to provincial MPB management efforts. These additional funds have allowed for an increase in the area of interest for MPB Heli-GPS surveys; all the sites detected by air were ground surveyed and the infested trees at the sites were controlled. In previous years, higher beetle populations and lower budgets made it necessary to limit survey and control efforts to higher priority sites.

I am looking forward to another aggressive MPB control season in 2022/23 and I am optimistic that MPB populations will continue to decline.

Devon Belanger - Whitecourt

Projects Using Aerial Imagery for Identification of Mountain Pine Beetle Damage

Annually, the Forest Health Section is responsible for completing mountain pine beetle (MPB) and aerial overview surveys to record forest disturbances. Many within the section have dreamed of using aerial imagery to identify these disturbances and there are many reasons why this is a good idea:

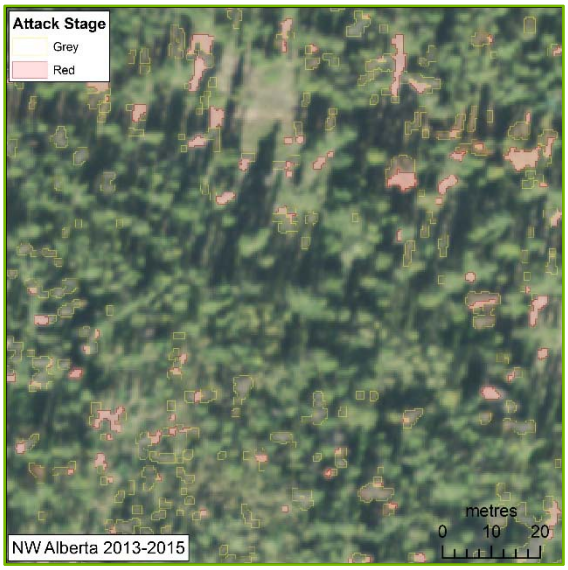
- Seek to reduce costs of forest survey
- Staff spend less time in aircraft (safety)
- Acquire detailed digital record of disturbance captured on imagery
- Expand the area of survey in Alberta. For example, performing MPB survey outside the "leading edge" MPB management zone.

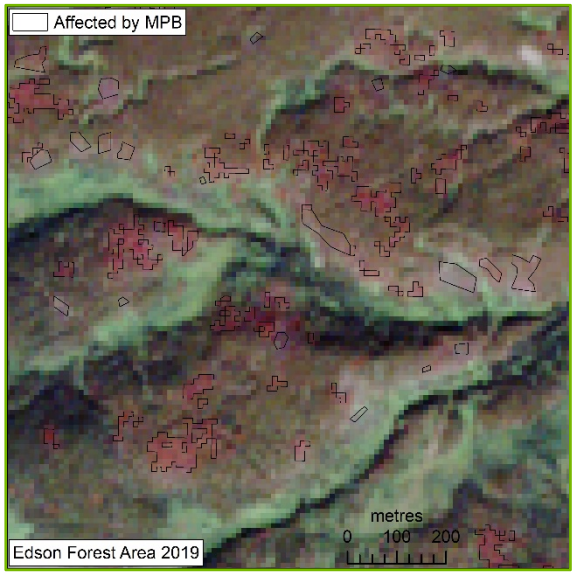
Forest Health has piloted some projects to explore the use of satellite and high-resolution imagery for the identification of MPB-killed trees.

	Image Analysis for MPB-Killed Trees			
Year of Imagery	**2013-2015**	**2019**	**2020**	**2021**
Resolution	30-40cm	10m	25cm	20-25cm
Project Area	NW Alberta	Edson FA	West Fraser FMA	Various sample areas
Gross project area	3,744,191 ha.	465,959 ha.	477,095 ha.	189,548 ha.
MPB Red Tree ID	Yes	Yes	Yes	Yes
MPB Grey Tree ID	Yes	No	Yes	No

Northwest Alberta 2013-2015

This project, which was by far the largest image analysis project undertaken, involved sampling many townships of the Peace River and High Level Forest Areas. The project was undertaken to identify the total impact of MPB on the area since surveys to assess and control the beetle were no longer being performed. Both "red" (recent MPB-killed) and "grey" (old MPB-killed) pine trees were identified from the imagery by "supervised classification." The data was extensively quality-checked by Brooks Horne. Additional analysis was performed to determine the total impact of MPB on pine crown area and pine volume.





Edson Forest Area 2019

This project's purpose was to fill in "gaps" in the 2019 MPB inventory, where large portions of the Edson Forest Area were not surveyed. A "mask" area was established with the gross project area: Only Alberta Vegetation Inventory stands where 10 per cent or more pine exists, and 10 meters or taller.

Unlike the other projects, this one used satellite imagery instead of fixed-wing aerial photos. Specifically, this project used 10 metre resolution Sentinel Satellite images. We struggled to get cloud-free imagery. Nineteen per cent of the imagery was from less than an ideal season for identification of MPB (May and June), and four per cent of the imagery was from 2018.

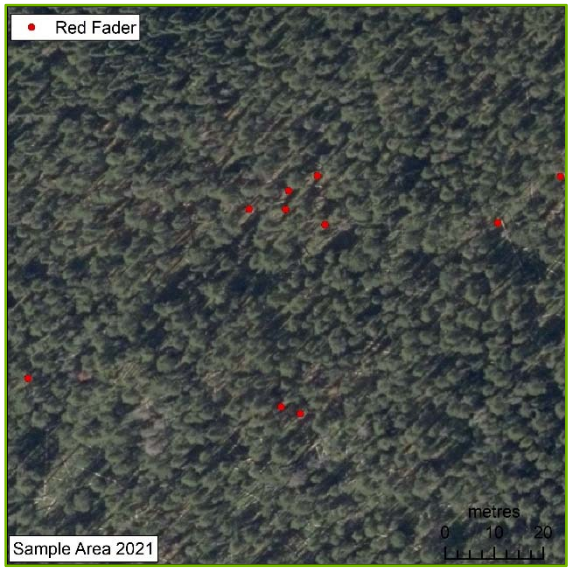
The final product identified polygon areas affected by MPB. The unique scale and resolution of this project in turn created a very unique product. It is recommended the output be used only to identify large areas impacted by MPB, and not effective for scattered MPB attacks.

West Fraser Forest Management Area 2020

This project intended to leverage existing digital imagery to expand the MPB inventory in the Edson Forest Area. The aerial imagery was captured and paid for jointly by West Fraser FMA and Yellowhead County. West Fraser, in turn, provided the imagery to Forest Health. Again, a "mask" area was established within the project to limit where MPB-killed trees could be identified using the same criteria as the 2019 project and targeted stands containing 10 per cent or more pine that were at least 10 meters tall. Within that scope, the contractor identified 2,118,906 red trees, and 1,665,161 grey trees by "supervised classification."

Quality checks (QC) were performed, where small sample areas were compared. The QC results indicated a very poor correlation between counts of digitally "classified" red trees compared to manually-identified red trees. It was concluded the supervised classification over-estimated the number of MPB-killed trees. Quality checks on the imagery suggest that this imagery type may not be appropriate for this type of classification. Long shadows from late fall acquisition, as well as excessively dark and washed out images were common and lead to the misidentification of red pines where they did not exist.

Various Areas 2021



This project was to test if high-resolution imagery, and analysis of that imagery, could approximate the work of heli-GPS surveys. In other words, identify *recent* MPB-killed trees, as a selection of sites for ground survey and control. Sample townships from Edson, Rocky Mountain House, Slave Lake, and Whitecourt Forest Areas were selected. The contractor was provided with sites identified during heli-GPS surveys, as well as high-resolution (colour/near-infrared) imagery captured during the same season.

The heli-GPS survey identified 216 sites and a total of 681 red trees. Within the same area, the image analysis identified 22,023 red trees or 32 times more. False positives were not the only issue: 125 (58 per cent) of the heli-GPS sites had no image-identified red trees within 50 meters. With these serious issues, the goal to "replace" heli-GPS survey with an analysis of high-resolution images has yet to be accomplished.

Future Projects

Forest Health is currently engaged in a project with Service Alberta to develop image products to assist in the survey process. The plan is to use satellite imagery over time, with change detection tools, to identify areas of the forest that have suffered damage. The areas will be provided to the surveyor as a layer of "background" data on digital maps. The surveyor will be able to review this data "live" as they are performing the surveys from aircraft, or field-checking on the ground. The areas will be mapped in detail by the surveyor, and assigned forest damage attributes

Alberta

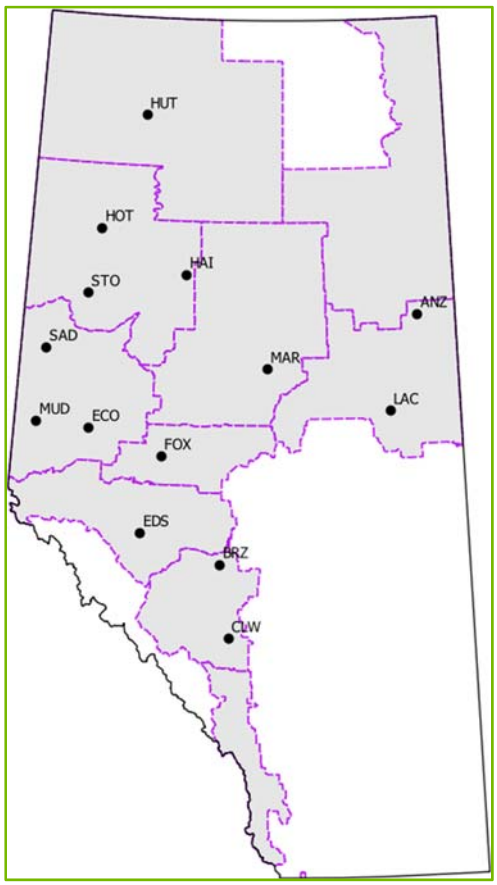
such as symptom, species, severity, and damage agent. The goal is to improve the efficiency of the survey and provide tools to help *train the eye* of the surveyor toward forest damage.

Technology does not yet exist to *replace* the work of forest health surveyors. Image acquisition technology is advancing with new product choices; image analysis technology is also advancing, for example, with the use of artificial intelligence (AI) models. The Forest Health Section will continue using digital aerial imagery to identify forest damage events on the landscape and invest in applying new technology to improve the inventory process.

David Tellier – Edmonton
Caroline Whitehouse - Edmonton

Climate Impact Monitoring Program Heats Up

Drought-induced, regional-scale dieback of forests has emerged as a global concern that is expected to escalate in coming decades, based on model projections of climate change. Such events have far-reaching impacts on forest ecosystem dynamics and local economies.



To address these concerns, Alberta Agriculture, Forestry & Rural Economic Development (AFRED) has partnered with the Canadian Forest Service (CFS) in a large-scale study entitled Climate Impacts on the Productivity and Health of Aspen (CIPHA) that includes annual tree-based monitoring of health and dieback in a network of long-term research plots (est. 2001) across the western Canadian interior.

Recognizing the importance of climate on the health of other prominent Alberta tree species, we have recently expanded the study to establish a climate impacts research network in Alberta's white spruce forests. White spruce, accounts for almost one-half of Alberta's merchantable volume of coniferous growing stock, and is not immune to the impacts of projected future climate scenarios.

The new network is called Climate Impacts on the Productivity and Health of Spruce (CIPHS). This spruce network will be similar in design to the CIPHA network and will help to determine the impacts of climate on both the health and productivity of spruce forests. Over the past three years we have successfully established a network of 14 sample nodes (see map). Each node contains two white spruce stands; generally one sample stand in each node contains spruce greater than 100 years old, and the other stand with trees in a slightly younger are class.

AFRED and the CFS recognize the need to utilize the results and findings of this research in the development of proactive and adaptive forest management strategies. These strategies will help ensure the economic, social and recreational sustainability of Alberta's forests in a changing environment.

Mike Undershultz - Edmonton

Alberta

Endangered Pine Recovery 2021 – No Fear Edition

Endangered trees, seriously?

Alberta has two endangered pine trees: whitebark and limber pine. In Alberta, they only grow in the Rocky Mountains and foothills, so working to sustain and restore them is a challenge, starting with hiking to the trees in remote areas, and climbing them.

I've seen plenty, what do you mean they're endangered?

If you're a keen hiker or mountaineer you'll know they aren't rare, but they were listed as endangered species because populations have been crashing since the fungus causing the fatal disease white pine blister rust was introduced, around 100 years ago. They are highly susceptible to mountain pine beetle. They grow so slowly that impacts take decades or even centuries to repair.

In some areas of southwestern Alberta, over 90 per cent of trees are infected with rust and 80 per cent have died.

Trees with blister rust infections show characteristic symptoms, including where rodents chew the cankers to get carbohydrates.

What's Alberta doing about it?

Lots! Like other places with endangered pines, Alberta has a recovery plan with targets and objectives. The comprehensive recovery program adapts best practices based on current science. Most restoration activities take many years.

Working with funders and partners across boundaries, we identify disease-resistant trees, protect them from pine beetles, collect their seeds, genetically test them, produce and plant disease-resistant seedlings for restoration, identify the most effective treatments for each habitat, treat stands to improve regeneration and growth, and do outreach to build support and share knowledge. Together, we are establishing rust-resistant seed orchards and clone banks of limber pine and whitebark pine in Alberta and B.C. Partners sharing knowledge and contributions by partners make all of this great work possible - none of us could do it alone.

Alberta

Each tree needs to be climbed twice: first to protect the cones from wildlife, then to collect the seeds. Without cages, no seeds are left to collect.

We are crazy for whitebark pine! Trust us, this is the only way to get seeds.

Jodie Krakowski - Whitebark Pine Ecosystem Foundation of Canada

Eastern Spruce Budworm

Eastern spruce budworm (*Choristoneura fumiferana*) occurs across Canada and the USA, from the Maritimes to northeastern British Columbia and into the Yukon, Northwest Territories, and Alaska. High populations of spruce budworm occur periodically in the Prairie Provinces and may last for several years. Unlike the name would suggest, spruce budworm can be found on balsam fir (*Abies balsamea*), as well as white spruce (*Picea glauca*) and black spruce (*Picea mariana*).

Canada Warbler [1]

If you are walking through an infestation, you may notice a variety of birds snacking on the spruce budworm such as warblers, chickadees, juncos, sparrows, nuthatches, thrushes, and finches. Canada warbler (*Cardellina canadensis*) and golden-crowned kinglet (*Regulus satrapa*) populations tend to increase with spruce budworm population outbreaks. A variety of parasitic and predatory wasps and ants also rely on the spruce budworm to support their populations.

Parasitoid wasp on a host [2]

The spruce budworm contributes to an ecosystem's nutrient cycling process by dropping needles and molts, through the decay of their bodies and from the excrement of other animals that come to consume them. They are also involved in the stand replacement and development process, where tree mortality allows for the generation of other individuals and species, resulting in increased diversity and maintained ecosystem functions.

Late instar spruce budworm larvae [3]

Young instar larvae are small and light yellow-green. As they develop into later instars, they become brown with two rows of white spots, a dark head, and a white band near their head. Larvae feed from April through June on current foliage and mine needles, buds and new cones. Larvae prefer new foliage, but if the bud flush has not occurred or all the new foliage has been consumed, larvae will feed on older foliage and shoots. Tree crowns and branch tips will turn a reddish-brown, with frass and silken webbing noticeable on the branch tips. The larvae spin silk around shoots and needles for protection during feeding and pupation, emerging as moths from late June to early July. The adult moth has a wingspan of 2 cm, with grey to copper-brown hindwings and a spotted or smeared grey and copper-brown pattern on the forewings. Females lay up to 300 lime green egg masses on the underside of needles over a two week period in July. The young hibernate for the winter in silk shelters under bark scales or flower stamen scars. They molt within the hibernaculum and emerge as young instars in the spring to feed, dispersing on silk threads.

The forests in Alberta have evolved with these insects and have developed a tolerance to multiple years of infestation. Three or more years of defoliation will reduce a tree's vigor and may lead to stem defects, reduced seed production, and height and volume loss. Tree mortality may occur after five to seven years of moderate to severe defoliation, with balsam fir or immature, weakened or suppressed trees at greatest risk. Outbreaks are intensified by successive years of unseasonably warm and dry weather, weakening the host trees and increasing the activity of the insects. The weakened trees produce fewer feeding deterrents and contain higher concentrations of nitrogen and sugars. These occurrences increase the spruce budworm's growth rate and their chances of survival.

Spruce budworm moth and larvae [4]

Do you remember the saying "Not all bugs need drugs" That saying goes for our forest insects too, as not all insects need to be managed to protect trees. Spruce budworm often does not require control or management, with the population naturally collapsing from predation, disease and unseasonable weather, such as late spring frost. However, many people cannot bear to watch their trees die and so, applications for tree protection or insect population control are available but need to be sprayed at specific times in the insects' development stage to either alter the outbreak progression or protect trees. For single-tree treatments, spraying the tree with high-pressure water can assist in knocking the larvae off the tree. This needs to be completed after the larvae have emerged from hibernation and before they pupate.

Landscape-level aerial spray operations are another tactic that has been used to varying degrees of success. Aerial spray operations often use a naturally occurring bacteria, *Bacillus thuringiensis var. kurstaki* (B.t.k.), which is present in outbreak stage spruce budworm populations. If the insect population was left alone, B.t.k. would control the population naturally due to the increased chance of sharing diseases with the higher density population. Aerial spray of B.t.k. only works if the insects consume lethal amounts, which can be done when the insect larvae reach the fourth and fifth instar levels. Some insects develop slower or faster than others and so, multiple sprays may be needed to catch all larvae at the correct instar stage. Having an even distribution of B.t.k. is also important for

ensuring the larvae consume lethal amounts. This can be tricky in dense white spruce stands which the insects prefer in this province, resulting in a need for multiple sprays. The last issue is transference to waterbodies, other insects, and other ecosystems. B.t.k. does not target spruce budworm, but any butterfly or moth that is in a larval feeding stage. This impacts the other animals which rely on any butterfly or moth for food. There are also general insecticide sprays that if entering a waterbody or other ecosystem, will kill any insect larvae that many birds and fish rely on. However, aerial sprays for both tree protection and insect population reduction have a history of being effective if done correctly and with the right objectives.

References:

Burleigh J, Ebata T, Kope H, Rusch D, White K, editors. 2014. Field guide to forest damage in British Columbia. Joint publication, ISSN 0843-4719; no. 17. 355 p.

Campbell RW, Torgersen TR, Srivastava N. 1983. A suggested role for predaceous birds and ants in the population dynamics of the western spruce budworm. Forest Science [Internet]. [cited 2021 Oct 20]; 29(4):779-790. Available from: https://doi.org/10.1093/forestscience/29.4.779

Crawford HS, Jennings DT. 1989. Predation by birds on spruce budworm Choristoneura fumiferana: functional, numerical, and total responses. Ecological Society of America [Internet]. [cited 2021 Oct 20]; 70(1):152-163. Available from: https://doi.org/10.2307/1938422

Hiratsuka Y, Langor DW, Crane PE. 1995. A field guide to forest insects and diseases of the Prairie Provinces. Edmonton (AB): Natural Resources Canada. 297 p.

Ives WGH, Wong HR. 1998. Tree and shrub insects of the Prairie Provinces. Edmonton (AB): Canadian Forest Service. 327 p.

Jennings DT, Houseweart MW. 1984. Predation by eumenid wasps (hymenoptera: eumenidae) on spruce budworm (lepidoptera: tortricidae) and other lepidopterous larvae in spruce-fir forests of Maine. Annals of the Entomological Society of America [Internet]. [cited 2021 Oct 20]; 77(1):39-45. Available from: https://doi.org/10.1093/aesa/77.1.39

Ono H. 1989. Aerial B.t. application program for spruce budworm control in the area north of Eaglesham in 1989 (unpublished report). Forest Protection Program, Alberta Forest Service. Available from the Forest Health Library, 9920-108 Street, Edmonton, Alberta. Call number: H 6029 1989.

Ranasinghe S, Ono H. 1991. Spruce budworm management – 1991 (unpublished report). Forest Protection Program, Alberta Forest Service. Available from the Forest Health Library, 9920-108 Street, Edmonton, Alberta. Call number: H 1402 1991 c.2

Volney WJA, Cerezke HF. 1992. The phenology of white spruce and the spruce budworm in northern Alberta. Canadian Journal of Forest Research. 22:198-205.

Photos:

[1] Canada Warbler - https://www.flickr.com/photos/enthalpy5/50265209607/in/dateposted-public/

[2] Parasitoid wasp on a host - Roger Ryan, USFS PNW Station, Bugwood.org https://www.forestryimages.org/browse/detail.cfm?imgnum=1564040

[3] Late instar spruce budworm larvae - https://tidcf.nrcan.gc.ca/en/insects/factsheet/12018

[4] Spruce budworm moth and larvae - https://www.nrcan.gc.ca/our-natural-resources/forests/wildland-fires-insects-disturbances/top-forest-insects-and-diseases-canada/spruce-budworm/13383

Laticia McDonald - Calgary

Biocontrol for Invasive Plants in Alberta

Invasive weeds are plant species that are non-native and have few or no natural predators; this gives them an advantage over native species. Weeds can be difficult to control and compete with native plants, which can cause harm to the environment, economy, and health. These weeds tend to be abundant in disturbed areas, rangeland, and along riverbanks and gullies. Biocontrol is being used in Alberta to help control species such as leafy spurge, houndstongue, dalmatian toadflax, oxeye daisy, and knapweed.

What is biological control?

Biological control (biocontrol) uses living organisms to suppress the population of invasive species. In Alberta, host-specific insects are being used to control invasive plants to help restore natural ecosystems. When specialist insects are introduced from countries where they originated, the invasive plant no longer has the competitive advantage it once had, and native vegetation can grow. Locations that are ideal for using biocontrol are areas with large patch sizes of weeds that are well established to ensure host specific population survival. Biocontrol is also beneficial in sensitive areas where environmental and or economic damage is occurring and traditional methods are ineffective or may be harmful to the environment.

Over 50 years of research has been done on screening and establishing biocontrol agents for invasive plants and research continues. Prior to biocontrol agents or insects being released, at least 10 years of research is completed. Insects are studied to ensure there is no risk to off target species. There is a robust process that needs to be followed before biocontrol can be used. Controlled release of specialist biocontrol agents is carried out to ensure the agents will achieve the desired goal while minimizing any negative impacts. The sites are monitored for effectiveness and population establishment, which may take years to accomplish. Well established, specialized biocontrol agents can be collected and redistributed to other areas of concern when populations are high. Below are examples of some invasive plants and biocontrol agents that have been introduced to help restore biodiversity.

Leafy Spurge (*Euphorbia esula*)

Leafy spurge is considered a noxious weed in Alberta and is commonly seen in ditches, canals, rivers, pastures and rangeland. It reproduces through seeds that can float on water, can be dispersed several meters, and are viable for at least six years. It can also reproduce with creeping roots. It produces a milky juice that can cause severe skin rashes in humans. It is poisonous to most livestock except for sheep.

Leafy spurge beetles (*Aphthona spp.)*

Adult leafy spurge beetles are a biocontrol agent for leafy spurge. They reduce the plant`s ability to photosynthesize by feeding on flowers and leaves. Stem growth is stunted and root function is diminished by larvae that hatch from eggs laid in the soil. In Alberta, the most effective species of the five *Aphthona* beetles that are used for biocontrol are the black dot leafy spurge beetle (*A. nigriscutis*) and the brown-legged leafy spurge beetle (*A. lacertosa*). Adult leafy spurge beetles can be collected by nets at the end of June under the right conditions and redistributed. Leafy spurge beetles do best in areas that have full sun exposure, large patch sizes of leafy spurge and on south facing slopes.

Photo Credits: Alberta Invasive Species Council

Dalmatian Toadflax (*Linaria dalmatica*)

Dalmatian toadflax is a noxious weed in Alberta and can be found in pastures, rangeland, and along roadsides. It prefers coarse-textured soils and often invades disturbed areas. This deep-rooted perennial reproduces through creeping roots and seeds, which remain viable for up to 10 years. Once established Dalmatian toadflax is difficult to eradicate.

Dalmatian Toadflax Stem Weevil (*Mecinus janthiniformis*)

This stem weevil is a biocontrol agent for Dalmatian toadflax. Distinct hole patterns are made in the upper leaves of the plant by the adult weevil stunting plant growth and suppressing flowering. Larvae that hatch from eggs laid by the female mine out the tissue inside the stem of the plant causing desiccation and die off. When plants are first sprouting in the spring, larvae that overwintered in the toadflax stem pupate and emerge as adults.


Photo Credits: Alberta Invasive Species Council

Why Biocontrol?

Biocontrol is an effective way to control invasive species where traditional methods are ineffective, difficult or unsafe to use. They can be much less damaging in environmentally sensitive areas, around waterbodies and steep slopes. When using biocontrol all options should be considered including weed patch size, climate, temperature, slope aspect, etc. Some other methods to control invasive plant species include herbicide or chemical sprays, pulling, grazing and mowing. Many times integrated pest management works best! Please note that biocontrol does not eradicate invasive species but reduces the number of invasive species so native vegetation is able to thrive once again creating a more balanced ecosystem and achieving biodiversity.

Anyone interested in using biocontrol agents can put in orders through the Alberta Invasive Species Council. They are accepting orders until April 30 at a cost of $900 plus GST for one release. Please visit the following website for more information:
https://abinvasives.ca/biocontrol-release-program/#:~:text=What%20is%20Biocontrol%3F,for%20invasive%20plants%20in%20Alberta

References:

Alberta Agriculture Food and Rural Development. 2000. Biological Control of Weeds on the Prairies. AAFD. Accessed 23 March 2022. [https://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex3445/$file/641-1.pdf?OpenElement]

Alberta Invasive Species Council. 2022. Biocontrol Release Program for Invasive Plants. AISC. Accessed 25 March 2022 [https://abinvasives.ca/biocontrol-release-program/#:~:text=What%20is%20Biocontrol%3F,for%20invasive%20plants%20in%20Alberta]

Oldman Watershed Council. 2019. Managing Weeds in SW Alberta. Oldman Watershed Council. Accessed 24 March 2022. [https://oldmanwatershed.ca/blog-posts/2019/7/23/managing-weeds-in-sw-alberta]

Forest Health Officers

Louis Price
Calgary
403.355-4073
LouisPrice@gov.ab.ca

Andrea Sharpe
Hinton
780.865.6969
Andrea.Sharpe@gov.ab.ca

Jennifer MacCormick
Slave Lake
780.849.7409
Jennifer.MacCormick@gov.ab.ca

Devin Letourneau
Grande Prairie
780.538.5609
Devin.Letourneau@gov.ab.ca

Pam Melnick
Rocky Mountain House
403.845.8277
Pam.Melnick@gov.ab.ca

Ryan Hermanutz
Peace River
780.624.6448
Ryan.Hermanutz@gov.ab.ca

Allison Brown
Whitecourt
780.778.7202
Allison.Brown@gov.ab.ca

Fraser McKee
Lac La Biche
780.623.5393
Fraser.Mckee@gov.ab.ca

ISSN No. 1499-5859 (print)
ISSN No. 1499-5867 (online)
Published Apr., Aug. & Dec.
Editor: crystal.ionson@gov.ab.ca
Bugs & Diseases informs forestry-related personnel about current forest health issues.
Articles are welcome.

Weird and Wild, Wonky Weather

From a heat dome in the summer
To a winter of freeze and thaw
Weird and wild, wonky weather
Certainly, is what we saw

Oppressive, deadly, scorching heat
Occurring June into July
Made things so hot, upon my head
An egg would take mere seconds to fry

In January
Came a wicked, cold, deep freeze
So cold, in fact, it made me sorry
For all the little brass monkeys

Then came February
Oh, what a ride
Snow, cold, rain, snow, rain, cold, snow
It's as if it just could not decide

Such weird and wild, wonky weather
Surely, must be hard on trees
I suppose post spring, It'll be apparent
If foresters should feel unease

Tom Hutchison - Edmonton

January 6, 2022

June 27, 2022

Photo credit: Tom Hutchison

Classification: Public