Forest Health NEWS

2018

Government of
Northwest Territories

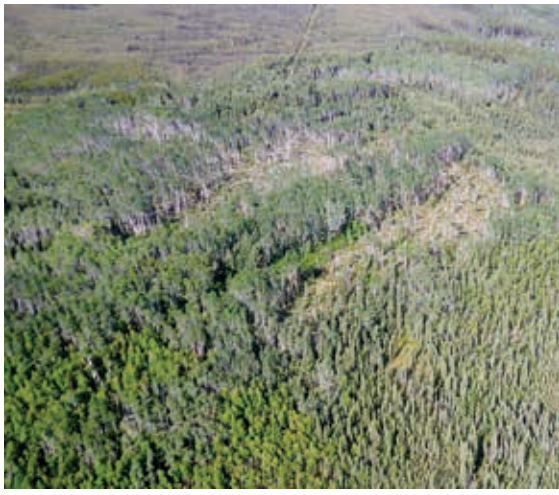
What's bugging our trees? It's not only bugs

Forested land in the NWT encompasses nearly 800,000 km^2 – more than any European country except for Russia. Monitoring forest health over such a large area is challenging and requires certain areas to be prioritized. The Department of Environment and Natural Resources (ENR) conducts annual aerial surveys in areas occupied by mature spruce forests as a priority, mostly because of their significance as a preferred host for the most serious insect pest in the NWT – the spruce budworm (*Choristoneura fumiferana*). These areas extend along major rivers and waterways, including the Mackenzie, Liard and Slave Rivers, and their main tributaries, as well as foothills of the Mackenzie Mountains and slopes of the Cameron Hills, Marten Hills and Ebbutt Hills.

The 2018 fire season was one of the slowest on record, with only slightly more than 13,000 hectares (ha) burned. This low fire activity was likely caused by heavy precipitation across the southern NWT in June, along with cool and damp conditions in the north later in the summer. This overall wet environment created favourable conditions for many pests and pathogen fungi to thrive. Approximately 875,000 ha (1.1% of entire forested land) was found to be affected by insect and disease agents in 2018 – a 52% increase compared to 2017. The most significant increases were noted for willow blotch leafminer, which increased over 200%, and spruce budworm outbreaks, which doubled in size, mostly in the Dehcho and Sahtu regions (a 66% increase compared to 2017). Other deciduous defoliators also continued to expand throughout the NWT, with the exception of the forest tent caterpillar. The outbreak of this pest has been occurring in the South Slave region since 2015, but it collapsed in 2018, with only slightly over 3,000 ha defoliated. However, a related species – the orange-tinged northern tent caterpillar – continued to thrive around Yellowknife. It was also seen as far north as Fort McPherson and Inuvik.

Wet summers generally favour the development of fungal diseases. This seemed to be the case in some areas of the NWT in 2018. Increased activity of needle and gall rusts was noted throughout the territory, most notably the spruce needle rust outbreak in the Inuvik region (see the "Mystery of the Peel River goo" article on page 3).

Abiotic disturbances were also recorded during annual surveys as part of baseline data collection. The most notable abiotic issues mapped in 2018 included aspen decline (99,000 ha – Liard Plains), flooding (13,000 ha – Dehcho and South Slave), red belt (1,000 ha – Dehcho), and blowdown (980 ha – Dehcho and North Slave).



Blowdown event observed near Muskeg River.

NWT FOREST HEALTH IN NUMBERS

80 million hectares of forest in the NWT

10,800 km of monitoring surveys were flown in 2018

1.1% of forested area affected by forest health issues

85% of forest health disturbances occurred in the Dehcho and South Slave regions

MAJOR PEST POPULATION TRENDS*

SPRUCE BUDWORM	FOREST TENT CATERPILLAR	ASPEN SERPENTINE LEAFMINER	WILLOW BLOTCH LEAFMINER	NORTHERN TENT CATERPILLAR
66%	94%	35%	200%	33%
increase	**decrease** (outbreak collapsed)	**increase**	**increase**	**increase**

*Compared to 2017 population levels

Spruce budworm populations continue to rise

Eastern spruce budworm moth and larva. Caterpillars are the damaging agent, but moths can be caught in pheromone traps to help determine population status. Photo credit: NRCan

The general dynamics of spruce budworm populations over the last couple of years represent a build-up phase, especially evident in the Dehcho region where significant expansion was noted in 2018 compared to the previous year. The greatest increases were observed in the Fort Liard area, along the Liard and Muskeg Rivers, in the Fort Simpson area along the Mackenzie River northward to Wrigley, and along the Ebbutt Hills.

Another area with significant increase in budworm activity was the Inuvik region, with almost 50,000 ha mapped mostly along the Peel and Arctic Red Rivers. In addition to aerial surveys, a pheromone trapping program was continued in the Inuvik region. Trap results from the Peel River confirm substantial populations accounting for moderate to severe defoliation in this area.

In the Sahtu region, the most notable increase in defoliation occurred mostly along the Mackenzie River between the confluences of the Mountain and Carcajou Rivers, and north of Fort Good Hope to the regional border.

SPRUCE BUDWORM FACTSHEET

DISTRIBUTION

Eastern spruce budworm (*Choristoneura fumiferana Clemens*) is a native species, considered the most serious pest in the NWT, found throughout the range of white spruce.

ECOLOGY

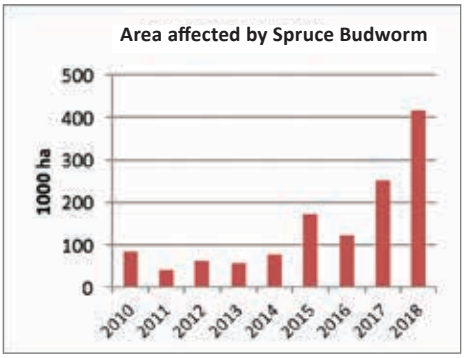
During outbreaks, spruce budworm larva cause damage in mature and over-mature white spruce stands. Population cycles are characterized by endemic (low, causing no significant damage) and epidemic (high, causing significant damage) phases. Outbreaks are usually triggered by suitable climatic conditions, such as warm dry springs and the availability of host trees.

DAMAGE

Larvae start feeding when they are very small by mining unopened spruce buds. As they become bigger, they begin free feeding on the branches, eating needles on the current shoot growth. All defoliation is caused by larvae; it begins at the top of the tree and progresses downwards. The red appearance of the defoliation is a result of half-chewed needles falling and getting caught in the webbing spun by the larvae as they roam and rappel from branches. The caught needles dry out and turn red.

IMPACT

A single year of defoliation weakens the tree, making it more susceptible to attacks by other insects. Repeated defoliation over a few consecutive years causes tree growth loss. Uninterrupted, severe defoliation over several years can kill many trees within a stand, while others will continue to decline for years, even after the end of the outbreak. Spruce trees in the NWT tend to die after 5-7 years of severe defoliation.



Area affected by spruce budworm defoliation has been consistently growing over the last decade.

Spruce budworm defoliation (brownish-red tree tops) observed along the Arctic Red River in 2018. Photo credit: Roger Brett, NRCan

Interesting observations

Several interesting observations of insect pests were made last summer. Perhaps one of the most surprising finds reported by residents was an outbreak of the **Rusty Tussock Moth** (*Orgyia antiqua*) in the Inuvik area. It is a common species in the NWT, but rarely occurs in outbreaks, especially so far north. The Rusty Tussock Moth is not choosy when it comes to food. Its larvae have been recorded feeding on up to 50 different host species, both coniferous and hardwood. In the NWT, it feeds mostly on willow and small shrubs. Over 1,300 ha of defoliation damage by this insect was recorded in two distinct patches in the vicinity of the Inuvik airport in 2018. It is quite possible that the insect hitched a ride on a plane from a southern location and got established in Inuvik. Alternatively, populations were already endemic and took advantage of a warming climate, leading to an outbreak.

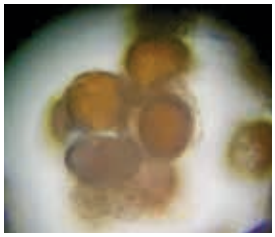
Mystery of the Peel River 'goo'

Orange "goo" was observed floating on the surface of the Peel River in late July. Photo courtesy of Sarah Lord, GRRB

Last summer, residents of Fort McPherson and Tsiigehtchic observed a mysterious orange film floating on the surface of the Peel and Arctic Red Rivers as well as some local lakes. The phenomenon was reported as large collections of a reddish-brown powdery substance floating on the water surface. Naturally, there was a fair amount of community concern about the nature and origin of the substance, and whether it was safe to use the affected water. The issue was brought to the attention of the Gwich'in Renewable Resources Board (GRRB) and ENR. Water Management and Monitoring staff with ENR collected water samples containing the substance for chemical analysis. The results indicated very high levels of aluminum and iron, which together with some historical evidence found in waters near Aklavik, suggested the culprit might be iron bacteria. However, when the orange substance was photographed under the microscope, it looked more like fungal spores.

Dr. Tod Ramsfield, a forest pathologist from the Canadian Forest Service's Northern Forestry Centre, was consulted to help identify the species. Given the evidence and circumstantial knowledge about the orange powdery substance observed on the needles and bark of spruce trees in the area, Dr. Ramsfield was confident the photographed floating spores belonged to *Chrysomyxa ledicola* – Spruce-Labrador Tea Needle Rust – a parasite of both spruce trees and Labrador Tea, a flowering woody shrub common in the boreal forest. The reason it is called rust is because it makes plants look rusty by discharging orange, powdery spores on leaves and stems during at least one of its many life stages. During an outbreak, the tips of branches become light orange because the rust only affects current year growth. The infestation can be widespread if conditions are favourable (warm and humid summer) and host plants are available in close vicinity to one another (spruce and Labrador tea). The mass of spores can be picked up by wind and dispersed widely within a large area, sometimes concentrating into a visible mass on lakes and rivers, as was observed around Fort McPherson and Tsiigehtchic last summer. This recent observation has not been the only one made in the north. A very similar situation was observed in 2012 in a coastal Alaskan village when orange goo collected on the surface of water at the local harbour. In that case, spruce needle rust was also identified as the culprit.

It is worth noting that spruce trees are rarely killed by spruce needle rust. The damage is mainly cosmetic, even though infection levels can be very high (nearly 100% of new needles), especially on trees growing close to boggy areas with infected Labrador Tea. Because fungus attacks the most important class of needles, it is possible that tree growth may be impaired as a result of infection. However, serious growth loss or mortality could occur only if severe infestation was repeated over several consecutive years. This rarely happens, as the fungus is usually epidemic only for a couple of years.



Labrador tea – spruce needle rust fungal spores observed under the microscope. Photo credit: Sarah Lord, GRRB

Onset of severe spruce needle rust observed on twigs around Fort McPherson. Photo credit: Roger Brett, NRCan

Another new observation was a notable defoliation of aspen, rose, Saskatoon and willow caused by the **Scarab Leaf Beetles** (*Dichelonyx spp.*) along the highway to Fort Resolution as well as **American Leaf Beetle** (*Chrysomela crotchi*) along the highway south of Hay River. Both species were abundant, often seen in clusters on single branches.

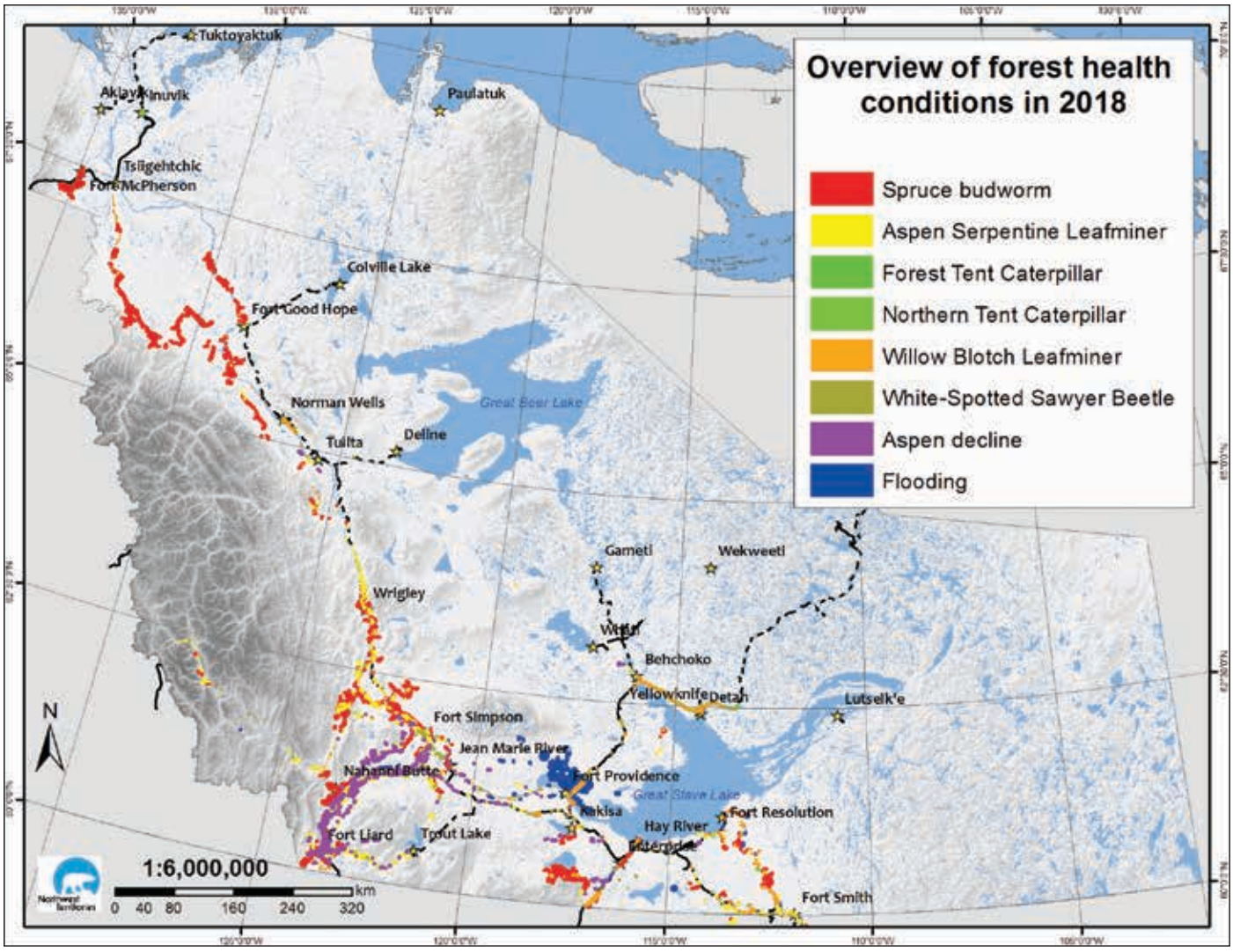
Western Balsam Bark Beetle (*Dryocetes confusus*) is the most destructive insect of subalpine fir in British Columbia. Scattered mortality caused by this pest was noted in the southern ranges of the Mackenzie Mountains. The total affected area recorded in 2017 was only 106 ha, but that expanded to 923 ha in 2018.

Spruce Gall Adelgid (*Adelges cooleyi),* a species that produces galls in spruce trees, was noted in several areas, including Hay River, Fort Smith, Little Buffalo, Angus Tower and the Ingraham Trail.

The Rusty Tussock Moth caused notable damage on willow around Inuvik in 2018. Photo credit: Roger Brett, NRCan

Higher than usual activity of Scarab beetles was noted in the South Slave last summer. Photo credit: Roger Brett, NRCan

Twig deformation caused by the Spruce Gall Adelgid was observed along the Ingraham Trail. Photo credit: Roger Brett, NRCan



Aspen decline mapping

Aspen decline is a dieback phenomenon affecting trees of all ages. The decline has been occurring throughout the range of aspen in the NWT, but appears more severe in the Dehcho region. Symptoms of decline may develop quickly or may not be noticeable for years. They include premature fall colouration, decreased twig and stem growth, noticeably smaller foliage, thinner overall appearance and defoliation. Declining trees are also more vulnerable to insect pests and pathogens. Most of the damage is linked to drought and prolonged defoliator events, such as the Aspen Serpentine Leafminer; however, some of the decline is also suspected to result from high water table issues. Drought-driven decline appears to affect upland areas, while high water table issues seem to affect lowland areas. Much of the decline occurs in the mature and over-mature aspen forests, but dieback can be also seen in younger aspen. Dedicated aspen decline surveys were conducted in the Liard Plains in the summer of 2018, with a total of 99,000 ha mapped. Surveys will continue in the South Slave region in 2019.

Aspen decline observed along in the Liard Plains Ecoregion.

For more information on the forest health program in the NWT, please contact:

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