

Forest Health NEWS

Government of Northwest Territories



Have NWT forests changed in the last 25 years?

A CONVERSATION WITH ROGER BRETT, THE FOREST HEALTH SUPERVISING TECHNICIAN OF THE NATURAL RESOURCES CANADA – CANADIAN FOREST SERVICE, NORTHERN FORESTRY CENTRE



Roger Brett
Forest Health Supervising Technician

How long have you been involved in monitoring forest health conditions in the NWT?

I have been monitoring and advising on forest health issues in the NWT and northern national parks for the last 25 years.

Can you give us some background on how the collaboration has evolved over these years?

A long running program called the Forest Insect and Disease Survey operated by the Canadian Forest Service concluded in 1996, so I provided survey training to Environment and Natural Resources (ENR) staff from 1997 to 1999, who then continued the aerial surveys for 10 years. During this time I continued ground surveys and advising ENR while monitoring the northern national parks (Wood Buffalo and Nahanni). Due to ENR staff turnover in 2008, I was asked to renew the training program. Having not flown in some of these areas for years, the change from the 1990s was very noticeable. As we continued training for a few years, more climate-related issues were becoming evident. Due to the scale and complexity of the climate-related issues affecting forest health in the NWT, and to ensure strong consistent monitoring of these new changes, the training program quickly turned into collaboration.

Forest health is constantly changing depending on many factors. What is the most striking change that you have observed over the years in northern forests?

It would be a toss-up between the substantial areas of aspen decline mostly observed in the Dehcho and Sahtu, and the water table issues throughout the NWT.



Aspen decline observed in the Liard River valley

NWT FOREST HEALTH IN NUMBERS

80
million

hectares of boreal forest in the NWT

6,800
km

of monitoring surveys were flown in summer of 2017

0.8
million

hectares affected by pests and diseases in 2017

85%

of pests mapped in 2017 occurred in the Dehcho and South Slave regions

2017 PEST POPULATION TRENDS*

SPRUCE BUDWORM

108%
increase

FOREST TENT CATERPILLAR

58%
decrease

ASPEN SERPENTINE LEAFMINER

8%
increase

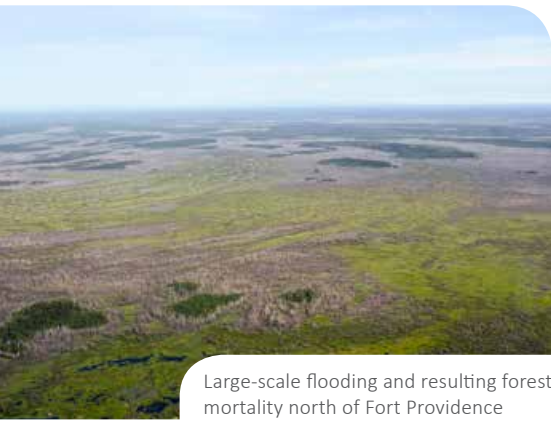
WILLOW BLOTCH LEAFMINER

50%
increase

BIRCH LEAFMINER

20%
increase

*Compared to 2016 population levels



Large-scale flooding and resulting forest mortality north of Fort Providence

Have NWT forests changed substantially in your eyes, or are these changes subtle?

Many changes are subtle and go unnoticed if you are not looking for them, and even if you are, many years could pass before the issue is recognized as an issue. I find the above two issues particularly substantial, especially given how these forests used to look in the 1990s.

So, for an untrained eye, these issues would be easy to miss?

The general public who travel the highways may not recognize these issues as readily as someone who annually relies on the forests for trapping, hunting and recreation. In fact, many of these changes do not look like much from the ground—after all, trees get old and die. Sometimes forests get flooded and drown, presumably due to beaver dams or rivers overflowing. However, it's the scale and rate at which these issues occur, and the underlying factors causing them, which make them substantial. A good example the public can see is the roadside forest mortality due to increasing high water tables roughly 10 km north of Fort Providence.

To what extent, in your view, could these changes be driven by a warming climate?

Many forest health issues are weather and climate driven, either directly or indirectly. A warming climate not only affects the severity, frequency, duration and range of pest outbreaks, but causes droughts, permafrost melt, soil instability, sun-scalding, wildfire

frequency and severity, etc. We have several examples in the north where this has, and is, occurring.

The warming trend affecting all of Canada is the highest in the NWT and Yukon. The issues observed over the last two decades correlate well with the northern warming and moisture trends. We have seen an approximate warming trend of +2°C since the 1950s in the Fort Simpson and Fort Liard areas, and +4°C in the Mackenzie Delta area since the 1970s. The change may not seem like much but it has a profound effect on the growing season and pest outbreaks. When you couple this with an increase in droughts it has a huge effect on forest health, not to mention wildfire frequency and severity. There is no doubt climate is affecting forest health in the North. Annual observations are common and, although we focus on forest health, many other agencies and organizations are involved studying the warming phenomena, such as NASA, federal departments and academics.

Is it easy to tell climate-related impacts on forest health from natural disturbances?

This depends greatly on the climate-related issue in question, but most often, no, it is not easy. From the air, many climate-related issues can closely resemble natural pest disturbances and can be easy to misdiagnose. Compounding this is the fact that forests weakened by climate-related issues will also attract pests seeking to take advantage of the forest's reduced vigor and defensive capabilities. So to the untrained eye, this issue can just look like pests.

The climate-related issues occurring in the NWT are very complex and hard to diagnose from aerial surveys alone. Often further ground investigation is required afterwards and circumstantial evidence, such as temperature and moisture records, or nearby disturbances such as permafrost issues or wildfire history, need to be considered. In general, the longer you monitor forest health in an area the easier it becomes to recognize the underlying issues and differentiate between what is "normal" and what is not.

Do you think consistent monitoring is enough to capture such changes?

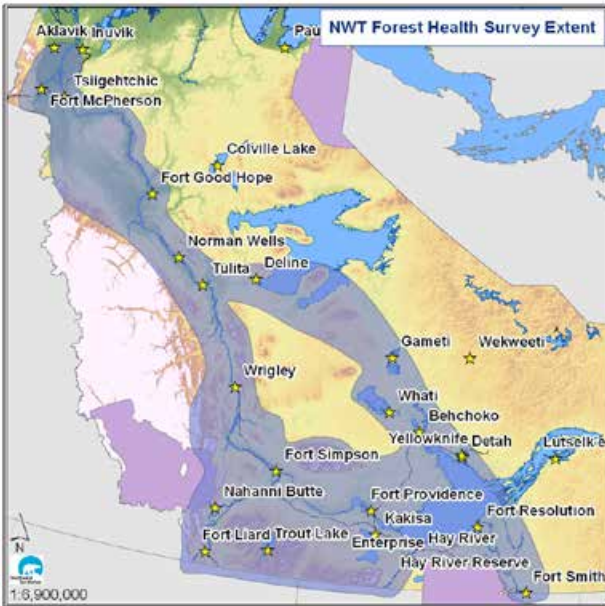
Consistent monitoring is enough to capture the awareness and general extent of the observations, and in some cases we can track general changes over time. The problem is the extent of these issues observed are so huge, more time and effort would be required to capture the detail required to track all of the changes properly over time. That said we do our best. Tracking changes is just the beginning. Most forest managers, researchers and policy makers need to know concrete underlying causes and rates of spread to better determine adaptation and mitigation strategies. This also takes substantial commitment to accomplish.

Given the enormous extent of the forested land up here, does the NWT have a good monitoring program, in your view?

When compared with other provincial forest health monitoring programs that have staff and substantial resources at their disposal, it has a very good program. The NWT program has limited resources and a much larger land base, compared to other jurisdictions. NWT monitoring has been consistent in expertise, intensity and extent for decades and has a very high success rate discovering annual emerging issues. The NWT program has even increased its effectiveness over the last 10 years by incorporating programs such as spruce budworm (SBW) pheromone trapping, mountain pine beetle (MPB) risk management assessments, bait trapping and adjusting the annual aerial surveys to more effectively capture the peak damage of various primary pests such as SBW, MPB and Aspen defoliators.

How does the forest health monitoring in the NWT differ from other jurisdictions?

Some of the biggest differences are the size of the land base, limited staff and resources, and more climate-related issues. Most jurisdictions have the staff and resources to monitor at a much higher level of detail covering a very high percentage of their land base. Much



Shaded areas are surveyed annually by ENR in collaboration with Canadian Forest Service

of the NWT monitoring is strictly done from the air, while other jurisdictions have more road access to verify issues after flights. The NWT does not and is further hindered by having a much larger and more remote land base to manage. Instead of targeting a high percentage of that NWT land base, ENR prioritizes aerial surveys based on forest inventory, known historic pest activity and risk. Aerial surveys, which include every forested region, are augmented by ground surveys where accessible and additional programs such as the SBW pheromone trapping and MPB baiting. The overall resulting program is impressive given that it is managed by one ENR staff member.

How about using remote sensing in forest health monitoring—would that work in the North?

Using remote sensing or satellite imagery on its own—no. But in addition to existing aerial surveys, possibly. Technology is always improving, however I do not think it is there yet. It is possible remote sensing/satellite imagery could help fill in the gaps to complete much greater coverage, but only once forest health issues are known through annual aerial surveys of priority areas. Knowing what is occurring in the priority areas allows for more accurate interpretation of issues observed through remote

sensing results. Even so, there would always be some error introduced when interpreting. Cost and feasibility are often deterrents of using remote sensing. Satellite imagery can be very expensive and difficult to acquire, especially at the level of detail, timing and coverage required. Aside from that, a skilled analyst familiar with forest health identification would be required to interpret the large amounts of data. Although some jurisdictions may have tried augmenting surveys with remote sensing, all provinces currently still rely on low cost aerial surveys

with experienced observers to monitor forest health annually.

A massive outbreak of the mountain pine beetle that erupted in early 2000s in BC keeps spreading in Alberta. It also appeared (albeit briefly) in NWT pine forests in 2012. Tent caterpillars have been defoliating large areas of southern NWT in recent years. Do you think infestations like these are likely to occur in the North if the climate keeps warming?

Yes. Under a warming scenario, outbreaks of certain pests may become more frequent, severe, widespread and prolonged because conditions have become more suitable for their success. I believe we are already seeing some examples of this in the NWT, such as SBW and tent caterpillars spreading northward, severe and willow leafminer outbreaks, and new records of pest outbreaks like the false hemlock looper (Fort Smith, 2013). This scenario could also include the risk of severe pests, like the MPB, potentially coming northward from southern latitudes.

Is there anything that can be done to prevent large scale outbreaks?

It all depends on management expectations and the outcomes wanted.

The key is to have a strong monitoring program in place to give as much early warning as possible and an aggressive pest control plan that can be employed swiftly. In the case of MPB, I feel this is one of the biggest lessons learned in the south—swift and immediate action is required. Any delay could cost millions of dollars. To date, the most affective form of control for bark beetles is cutting and burning affected trees, which is very manual and requires a great deal of resources.

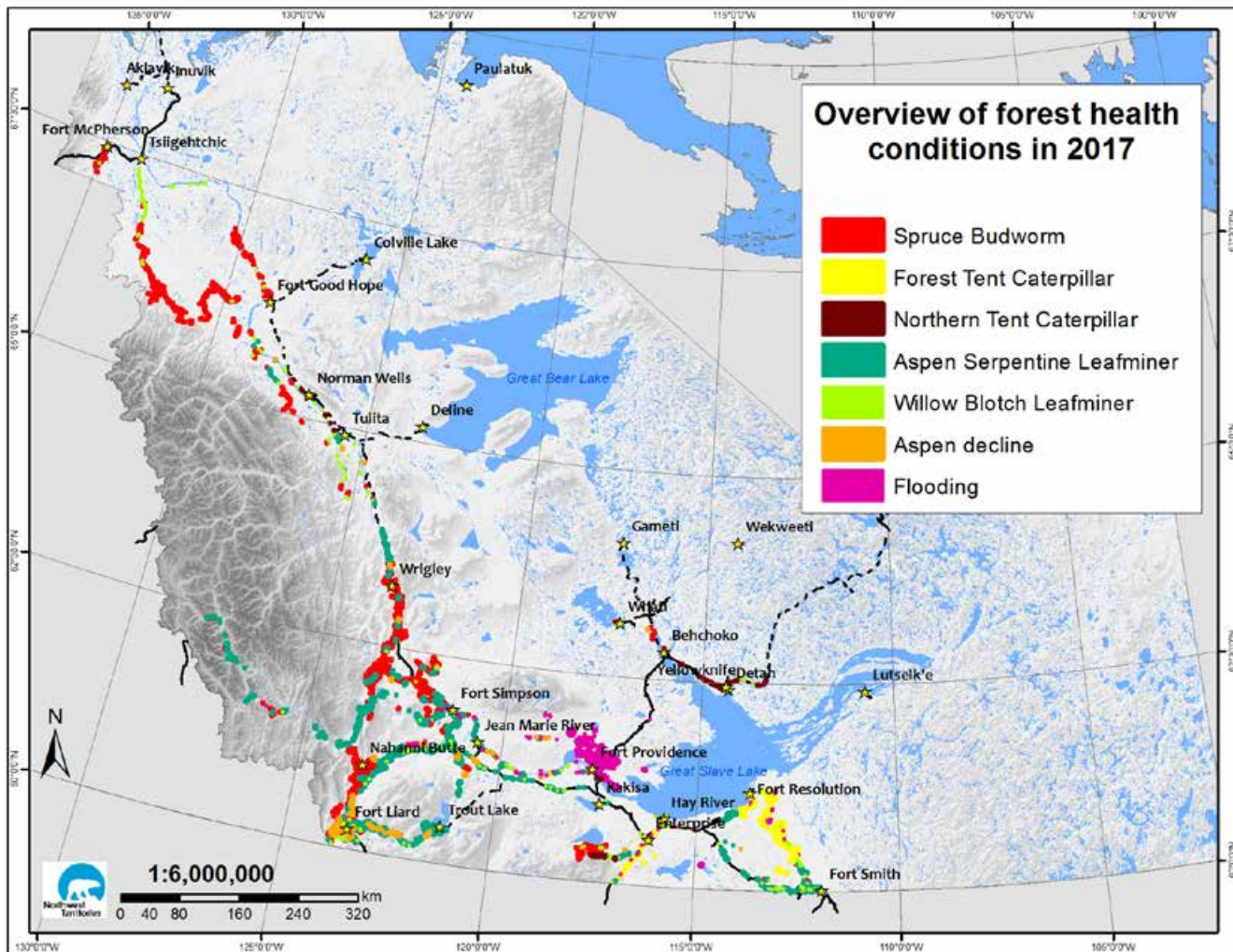
What is the most surprising observation you have made in the NWT over the years? There are many, but I think two of the more interesting surprises for me were discovering the large SBW outbreak in the Mackenzie Delta in 2015, and the False Hemlock Looper outbreak in the Fort Smith area in 2013. The delta outbreak was severe but short-lived because it is still a very harsh winter environment, so the population could likely not handle the winter or late spring. For the false hemlock looper, it was unique and surprising because it had never before been recorded east of the Rocky Mountains, nor at that latitude. It may have hitched a ride on a holiday trailer, but regardless, it became established because conditions were suitable. It was a perfect example of what can occur under a warming climate.



Spruce budworm outbreak observed in the Mackenzie Delta in 2015

You have had a chance to survey the most remote and wild forested areas in the NWT. Is there any area you particularly enjoy re-visiting?

It's very hard to nail down one particular area as I find all of the NWT very beautiful. Whether it is Nahanni, the Mackenzie Delta, the Great Bear, Keele or Taltston Rivers, I could go on and on.



2017 Forest Health Highlights

Pest dynamics

- Substantial expansion of SBW throughout the Dehcho was observed including a new outbreak in the Liard Valley.
- Expansion of SBW outbreaks was noted in the Sahtu along the Ramparts and Carcajou Rivers.
- The SBW pheromone trapping program was reactivated in the Inuvik Region at four trap sites matching historic trapping locations.
- Further growth of SBW populations is expected in 2018.
- Forest tent caterpillar defoliation declined around 58% compared to 2016. Further decline is expected in 2018.
- Aspen throughout the NWT is affected by Aspen serpentine leafminer.
- A widespread willow blotch leafminer outbreak continues throughout the NWT, and was recorded significantly further north in 2017 (Arctic Red River).
- The northern tent caterpillar outbreak in Yellowknife expanded and was recorded in other areas including Cameron Hills, Hay River and Fort Providence, but also as far north as Norman Wells and Tulita.
- Amber-marked birch leafminer continues to spread in the Yellowknife area and along the Ingraham Trail.

Abiotic/Environmental issues

- Flooding causing forest mortality in the Fort Providence area was re-mapped to increase precision. Total area is over 117,000 ha.
- More areas with aspen decline were mapped in the Dehcho compared to 2016. Total area is over 35,000 ha.

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

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This newsletter is published by the Forest Management Division – Forest Resources, Environment and Natural Resources, Government of the Northwest Territories. The division is responsible for monitoring forest health across the territory.