2017
Northwest Territories
Forest Health Report

Prepared by

Jakub Olesinski (GNWT ENR)
Roger Brett (NRCan CFS)

Contents

1. Forest Health Program in the Northwest Territories

Background

Forest Management Division (FMD) of the Department of Environment and Natural Resources (ENR) is responsible for monitoring forest health conditions across the NWT to ensure the forest has the capacity for renewal after a wide range of disturbances, and for retention of its ecological resiliency while meeting current and future needs of NWT residents. The focus of the forest health program has been on monitoring insect and disease impacts in the NWT forests. However, since 2015, FMD has also been recording abiotic disturbances to address the uncertainty of forest ecosystem response to a changing climate. Examples of abiotic disturbances recorded during monitoring surveys include: drought symptoms (reddening of foliage, sun scalding scars, stunted and gnarled foliage), flooding, wind and snow damage, land slumps, and permafrost related disturbance ("drunken forest" phenomenon). General decline of some tree species is also tracked. In cases where biotic agent cannot be identified it is considered to be of abiotic origin.

Since 2009, the annual forest health surveys have been conducted by the FMD staff assisted by the Canadian Forest Service (CFS). In 2017, the aerial FHS were conducted by Jakub Olesinski (ENR) and Roger Brett (CFS). Brent Starling, a Forest Officer from the South Slave Region also participated in surveys conducted in the South Slave.

Monitoring scope

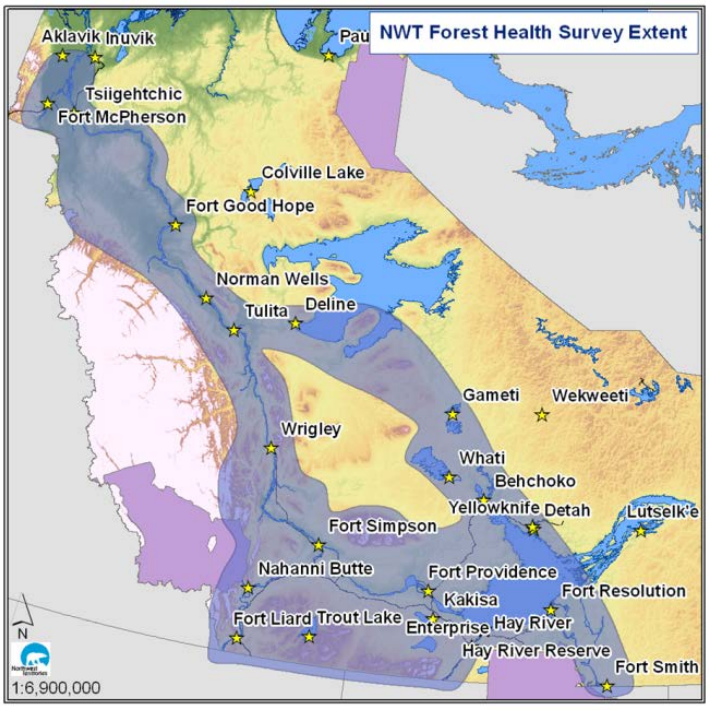


Figure 1. Forest Health monitoring extent in the NWT

Forested land in the NWT encompasses nearly 800,000 km^2 (larger than any European country except for Russia); therefore prioritization of areas surveyed annually is necessary. Traditionally, areas occupied by mature spruce forests have been a priority because of their significance as the preferred host for the most serious insect pest in the NWT – the Spruce Budworm (*Choristoneura fumiferana*) (SBW). 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. Since 2015, monitoring has been extended to include the Mackenzie Delta. This decision was triggered by the discovery of the SBW outbreak in this sensitive region.

Approximately 7500 km of flight paths were flown in 2017.

Methods

Aerial detection

The monitoring is mostly conducted through aerial detection mapping using fixed-wing aircraft. Helicopter is used when ground verification is required in areas of limited road or water access. Disturbed areas are digitally mapped using a tablet with ESRI Arc Pad 10 software. Insect and disease agents are usually identified on site. However, in some cases samples are collected and taxonomic identifications are made at the CFS Northern Forestry Centre lab in Edmonton.

Severity of defoliation and damage is also recorded during aerial surveys. Severity expresses the degree of foliage affected, or amount of mortality present in a stand, caused by the particular pest or damaging agent. In the case of defoliators or foliar damage, severity class is assessed visually as a percentage of current growth affected (Table 1), whereas with mortality agents such as bark beetles or abiotic factors, severity represents the percent of trees affected within a stand. Mortality can also result from moderate to severe defoliation reoccurring over several years, which is especially the case with spruce budworm. Other defoliators, like aspen serpentine leafminer or willow blotch leafminer, rarely are a single cause of tree mortality despite the severe damage they cause each year. The ramifications of severity of defoliation are described below when discussing each particular pest agent.

Table 1. Defoliation severity classes and mortality severity classes used by FMD.

Defoliation severity class	% of current growth defoliated (conifer)	% of current growth defoliated (broadleaf)
Light (L)	<30	<30
Moderate (M)	30-50	30-70
Severe (S)	>50	>70
Mortality severity class	**% of trees affected within a stand**	
Light (L)	<=10	
Moderate (M)	30-50	
Severe (S)	>50	

Ground surveys

Ground surveys along major NWT highways are also conducted annually. These surveys play an important role as they are often the only opportunity to confirm suspected pest agents on the ground. Ground surveys also provide opportunities for collecting samples and discovering new and emerging factors affecting forest health, often not discernable from the air.

In 2017, ground surveys were conducted by Roger Brett (CFS) in the following areas along accessible highways:

- NWT border to Hay River
- Hay River to Fort Smith
- Fort Providence to Yellowknife
- Along Ingraham Trail
- Fort Simpson to Blackstone (Liard Highway)
- Fort Simpson to Fort Providence
- Fort Providence to Enterprise

Pheromone trapping

Pheromone trapping is currently used to help detect presence/absence of the mountain pine beetle using dispersal baiting. Five baiting locations were established in the southern NWT. Three locations were established along the Highway 1 corridor (AB border – Enterprise), and two locations were established along the Highway 5 corridor (Hay River – Fort Smith), outside the Wood Buffalo National Park.

In addition, the spruce budworm pheromone trapping program was reactivated in the Inuvik Region in 2017. FMD collaborated with CFS and the regional forestry staff to deploy traps in historical trapping locations along the Arctic Red, Peel River, and the upper Delta. Four sites were established with three traps per site.

Figure 2. Spruce budworm pheromone trapping site locations in the Inuvik Region

Public reports

Public sightings and regional reports are an important addition to the existing body of knowledge. Renewable Resource Officers, Forest Officers, and the public are encouraged to report any forest health issues that draw their attention. Each year, FMD receives inquiries with photos of various insect and disease disturbances from communities across the NWT. Public reports are important because they not only help corroborate aerial survey observations, but often help direct ground surveys.

In 2017, public reports included:

- Northern tent caterpillar (*Malacosoma californicum*) infestation in Yellowknife
- Birch dieback in Yellowknife and Hay River
- Spruce needle rust (*Chrysomyxa ledicola*) in the Inuvik Region

Timing

Aerial surveys are flown in the second half of July when the spruce budworm defoliation is most evident. Any other disturbances visible from the air are also being recorded during this main pan-territorial survey. Additional surveys targeting specific pests are flown as required.

Dates of the 2017 surveys:

- June 19 – aspen defoliation aerial survey, targeting forest tent caterpillar (*Malacosoma disstria*), South Slave

- June 20 – aerial survey mapping the flooding mortality around Fort Providence
- July 14 – ground survey Fort Smith to Fort Simpson
- July 17-24 – the main aerial survey coinciding with peak SBW defoliation (territorial)
- July 25-28 – ground survey along major highways
- September 6 – aerial survey along the Alberta-NWT border targeting the mountain pine beetle (*Dendroctonus ponderosae*)
- September 7 – collection of MPB baits

Areas not surveyed in 2017

- Great Bear River
- Southern shore of the Great Bear Lake
- Gameti to Whati

2. Climate and wildfire conditions (source: 2017 Fire Weather Report)

- Environment and Climate Change Canada (ECCC) ranked the winter of 2016-2017 as the 5th warmest on record (out of the 70 past winters) and 22nd wettest.
- Winter temperatures were, on average, 5C higher than normal, while precipitation was 9.2% below average

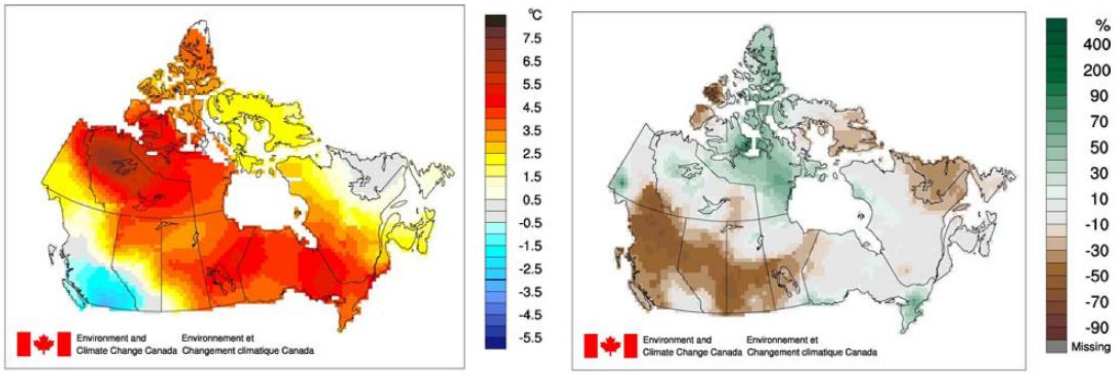
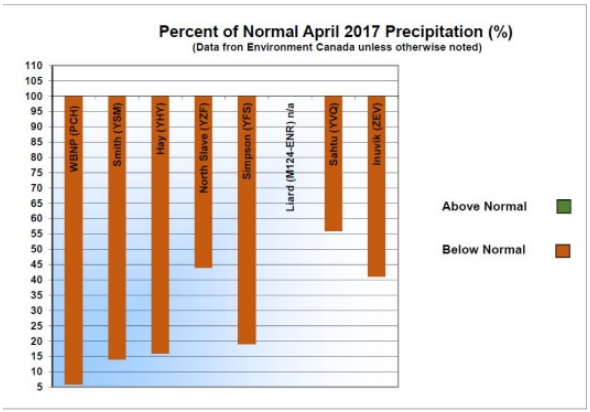
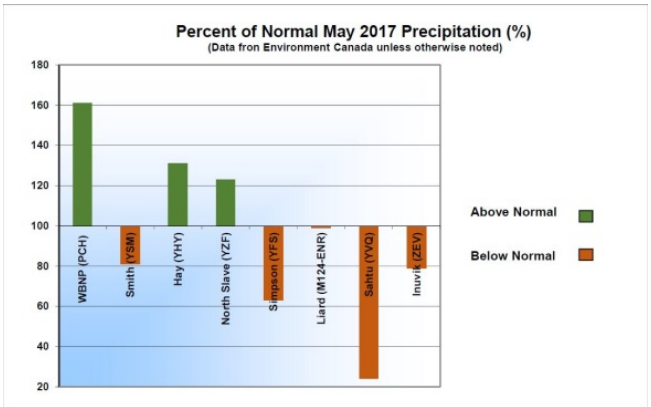


Figure 3. Winter 2017 temperature and precipitation departures from normals (1948-2017). Source: ECCC.

- Very dry conditions dominated throughout the NWT in April with precipitation less than 60% of normal.
- First major heat wave of the summer occurred in late May which was followed by a rapid increase in fire activity.
- Unseasonably cool and moist weather conditions dominated across the NWT in June except for the Inuvik and Sahtu regions which experienced dry conditions at the end of June.
- Early July experienced another heat wave resulting in increased fire activity in most regions
- August experienced unseasonably warm and dry conditions in southern portions of the territory.





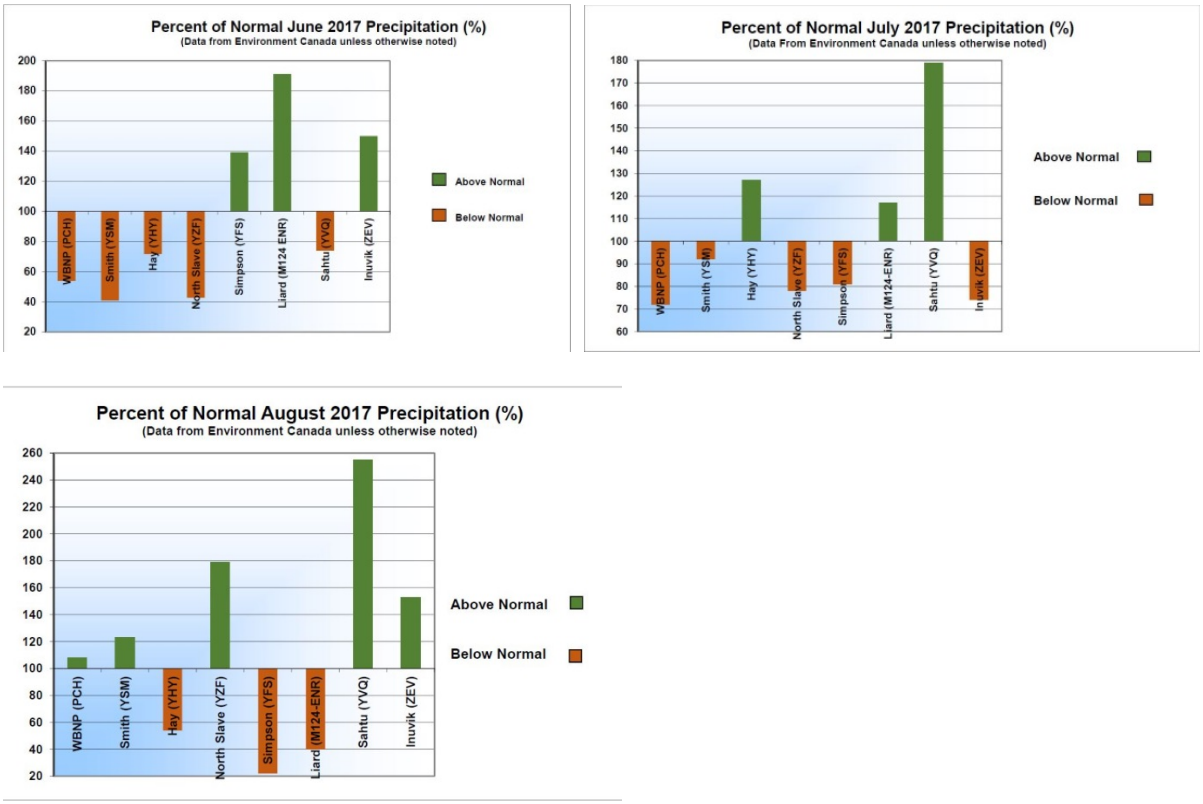


Figure 4. Monthly percentages of normal precipitation recorded at individual stations across the NWT in 2017.

Wildfire activity

There were 262 fires accounting for 1,030, 259 ha burned in 2017 which was close to the 5-year average but above the 25-year average. The most active region in 2017 was the South Slave (103 fires), while the least active was the Dehcho (22 fires). In terms of area burned, 2017 ranked as the 5th most active season of the past 30 years. Interestingly, 80% of the area burned in August (over 800,000 ha). Smoke from wildfires caused visibility issues during aerial surveys between the Carcajou River and Fort Good Hope in the Sahtu.

3. Overview of forest health conditions

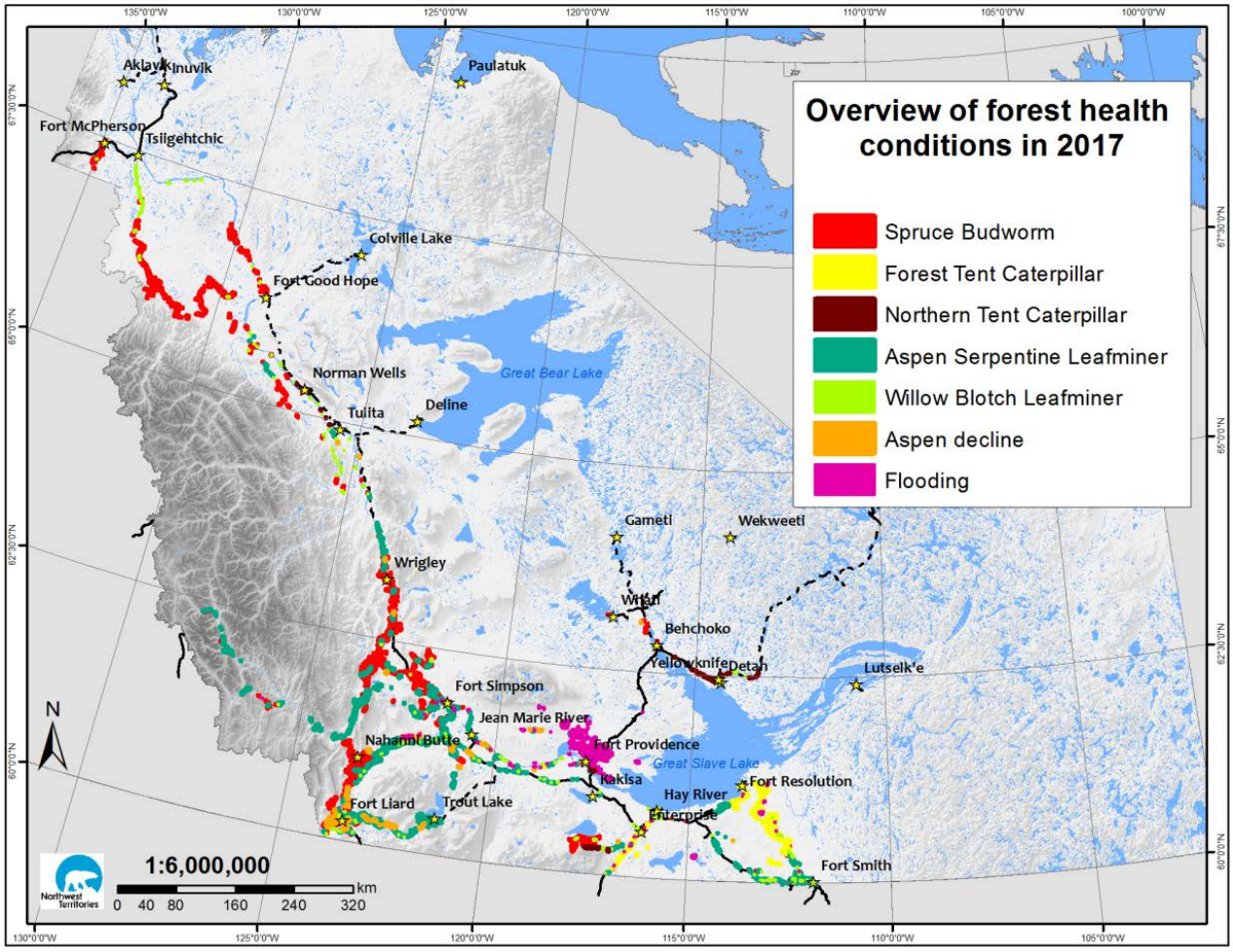


Figure 5. Overview of the NWT forest health conditions in 2017

Over 573,000 hectares were affected by insect and disease agents in 2017, an 8.5% increase compared to 2016. Most pests observed in 2016 continued to affect the NWT forests by expanding the infested areas with exception of the Forest Tent Caterpillar (FTC) which declined 58% compared to the 2016 extent. There was a significant expansion of the Spruce Budworm (SBW) outbreak which doubled in size mostly in the Dehcho and Sahtu regions. Outbreaks of other deciduous defoliators continued to expand throughout the NWT with notable increases of leafminers. The Willow Blotch Leafminer (WBL) expanded 50%, Aspen Serpentine Leafminer (ASL) outbreak expanded 8%, and the Amber-marked Birch Leafminer (BLM) outbreak expanded 20%.

Abiotic disturbances were also recorded during surveys and accounted for over 179,500 ha which is over three times more than what was recorded in 2016. This significant increase is mostly due to precise mapping of the flooded area north of Fort Providence which was mapped only preliminarily in 2016. In addition, significantly more areas with aspen decline were mapped in the Dehcho (5 fold increase).

Table 2. Summary of areas affected by the insect and disease agents across administrative regions of the NWT based on the area surveyed. Since 2015, abiotic disturbance has also been recorded during annual forest health surveys.

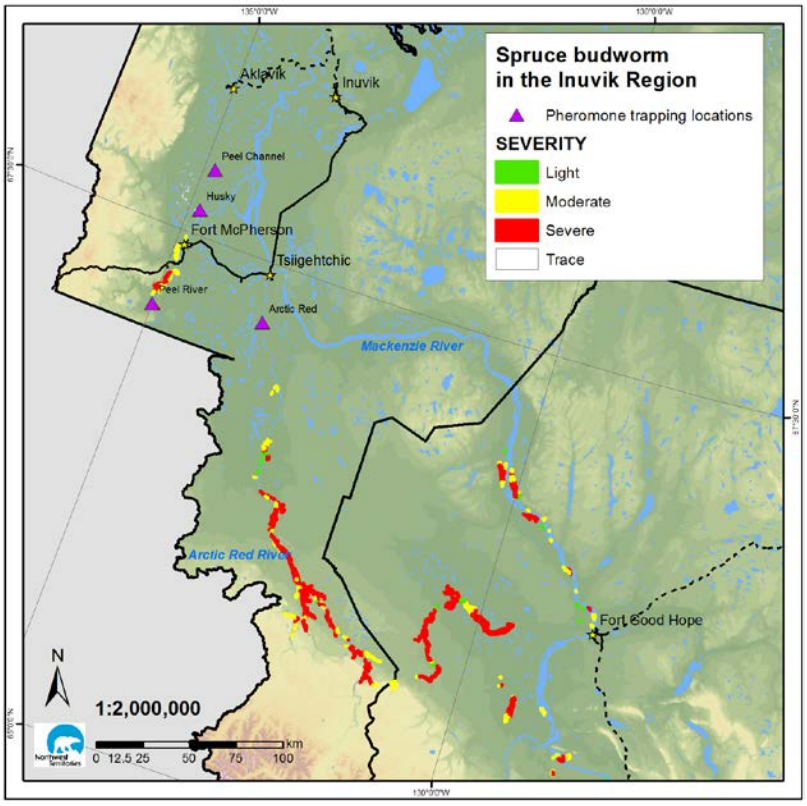
Area affected (ha)	Dehcho	Inuvik	North Slave	Sahtu	South Slave	Grand Total
Insect and disease	**359,923**	**31,089**	**10,936**	**43,318**	**128,002**	**573,270**
Aspen serpentine leafminer	185,552			1577	30,892	218,020
Birch leafminer			1149			1149
Eastern Larch Beetle			252		74	326
Forest tent caterpillar					54,938	54,938
Gray willow leaf beetle	2843				5231	8074
Northern tent caterpillar			3666	971	3971	8608
Spruce budworm	165,585	25,753	549	36,716	21,662	250,267
Spruce mortality (budworm)				554		554
Willow blotch leafminer	5141	5336	5318	3500	11,233	30,529
White-spotted sawyer beetle	695					695
Abiotic disturbance	**49,462**	**-**	**139**	**392**	**129,525**	**179,518**
Flooding	9,696		79		125,703	135,479
Pine drought					2,575	2,575
Red belt	4,136					4,136
Aspen decline	35,630		60	392	1246	37,328
Regional Total	**409,385**	**31,089**	**11,075**	**43,710**	**257,527**	**752,788**

4. Insect pest activity

Spruce budworm (*Choristoneura fumiferana*) – SBW

The general dynamics for SBW over the last couple of years has been a build-up phase, which was especially evident in the Dehcho Region. As expected, there was a substantial expansion of this pest in the Liard Valley and, to a lesser extent, in the Sahtu, Inuvik, and South Slave regions. Further expansion is expected in 2018 given normal winter conditions.

Inuvik Region



A total of 25,753 ha of SBW defoliation was recorded in the Inuvik Region, a 4,200 ha increase compared to 2016. Most of the new defoliation occurred along the Peel River from Fort McPherson to the Yukon border, and along the southern portion of the Arctic Red River.

A pheromone trapping program was reactivated in the Inuvik Region in 2017. Trap count results from the Peel River confirm substantial populations with counts as high as 2600 which accounted for moderate to severe defoliation in this area. The Arctic Red River traps also show active populations with counts as high as 289, which is likely causing only trace to light defoliation. The Husky and Peel Channel traps both had counts indicative of endemic populations.

COORDINATES	SITE	TREE	COUNT
67.213232 N	1 Arctic Red	1	289
133.630127 W	2 Arctic Red	2	218
	3 Arctic Red	3	144
67.115448 N	2 Peel River	1	2058
134.999134 W	3 Peel River	2	2200
	4 Peel River	3	2638
67.616253 N	3 Husky	1	16
134.856515 W	4 Husky	2	15
	5 Husky	3	53
67.823584 N	4 Peel Channel	1	10
134.856215 W	5 Peel Channel	2	12
	6 Peel Channel	3	29

Table 2. 2017 SBW Pheromone trapping results from the Inuvik Region.

Figure 7.Severe spruce budworm defoliation observed in 2017 along the Peel River, approx. 50 km south from Fort McPherson (left), and along the Arctic Red River, approx. 180 km south of Tsiigehtchic (right).

Sahtu

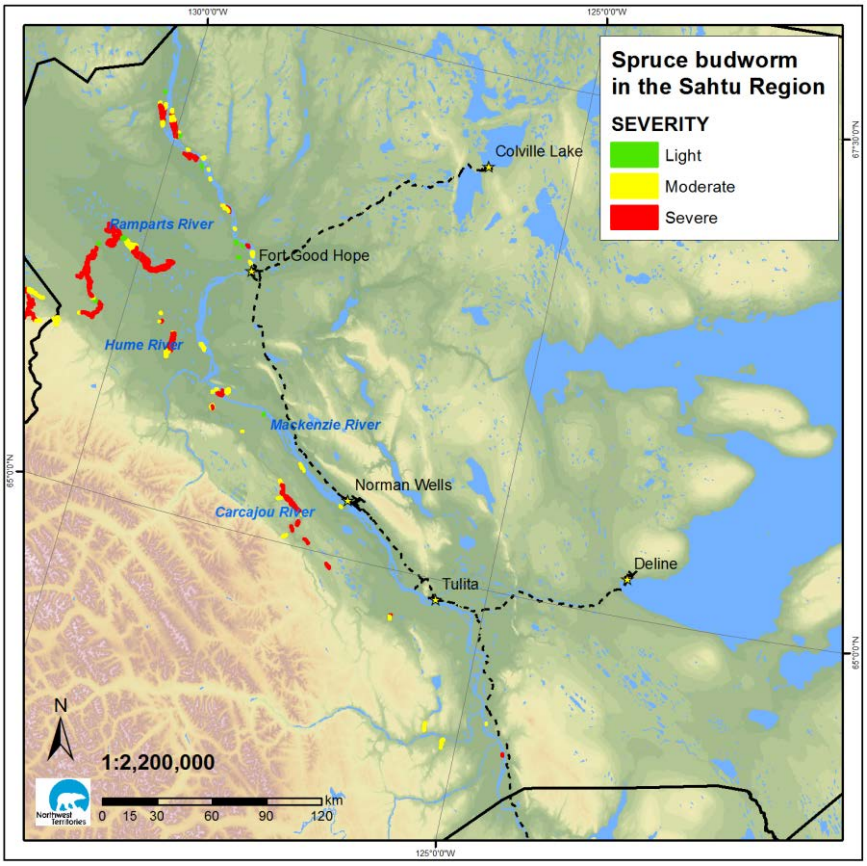


Figure 8. The 2017 spruce budworm defoliation extent in the Sahtu Region.

The total area with SBW defoliation recorded in the Sahtu in 2017 was 36,716 ha (approx. 5000 ha increase over 2016). This increase occurred mostly along the Ramparts and Carcajou Rivers, and along the Mackenzie River near its confluence with the Ontaratue River, roughly 95 km north of Fort Good Hope.

Smoke from wildfires caused visibility issues durning the aerial survey between the Carcajou River and Fort Good Hope. In addition, due to inclement weather in Inuvik delaying surveys, the Great Bear River was not surveyed in 2017.

Dehcho

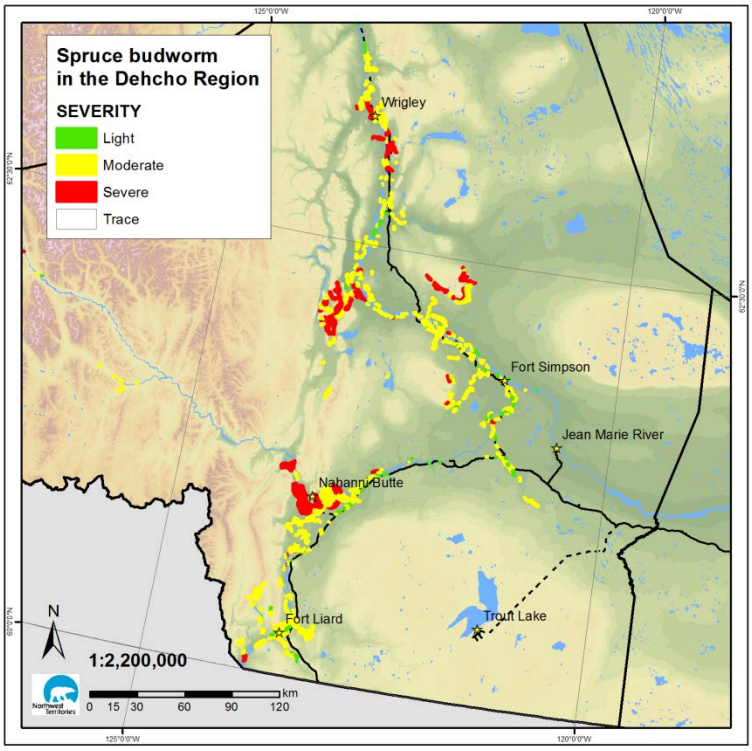


Figure 9. The 2017 spruce budworm defoliation extent in the Dehcho Region

The SBW population build-up in the southern Dehcho was very noticeable in 2016 with trace defoliation observed in many locations along the Liard Highway. In 2017, SBW populations in the Dehcho increased significantly. The largest areas of expansion occurred along the Liard River in the Fort Liard and Nahanni Butte areas, and along the Mackenzie River in the Camsell Bend / North Nahanni River and Wrigley areas. The Ebbutt Hills also experienced severe defoliation; however, areas mapped in 2017 more or less matched those mapped in 2016.

North and South Slave

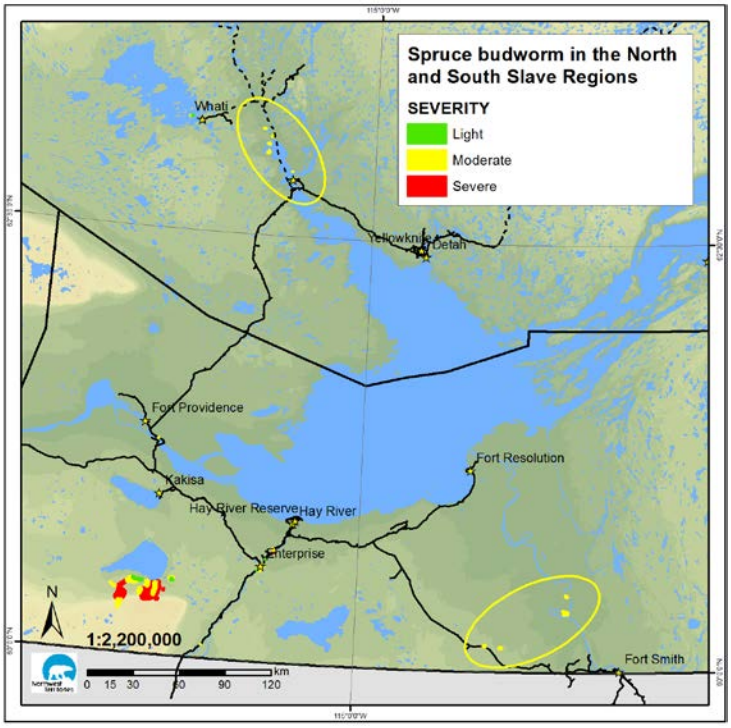


Figure 10. The 2017 spruce budworm defoliation extent in the North and South Slave Regions

Only 550 ha of mostly moderate SBW defoliation were recorded in the Frank Channel and Whati areas, in the North Slave. Though this area was not surveyed in 2016, SBW was present in this area both in 2014 and 2015, so it was likely present there in 2016 as well.

In the South Slave SBW also increased slightly, mostly due to the expansion of mostly moderate and severe defoliation in the Cameron Hills outbreak. Defoliation typically observed along the Slave River by the Grand Detour area, declined by nearly 200% with only 790 ha of moderate defoliation mapped in this location in 2017.

Aspen defoliators

Forest tent caterpillar (Malacosoma disstria) - FTC

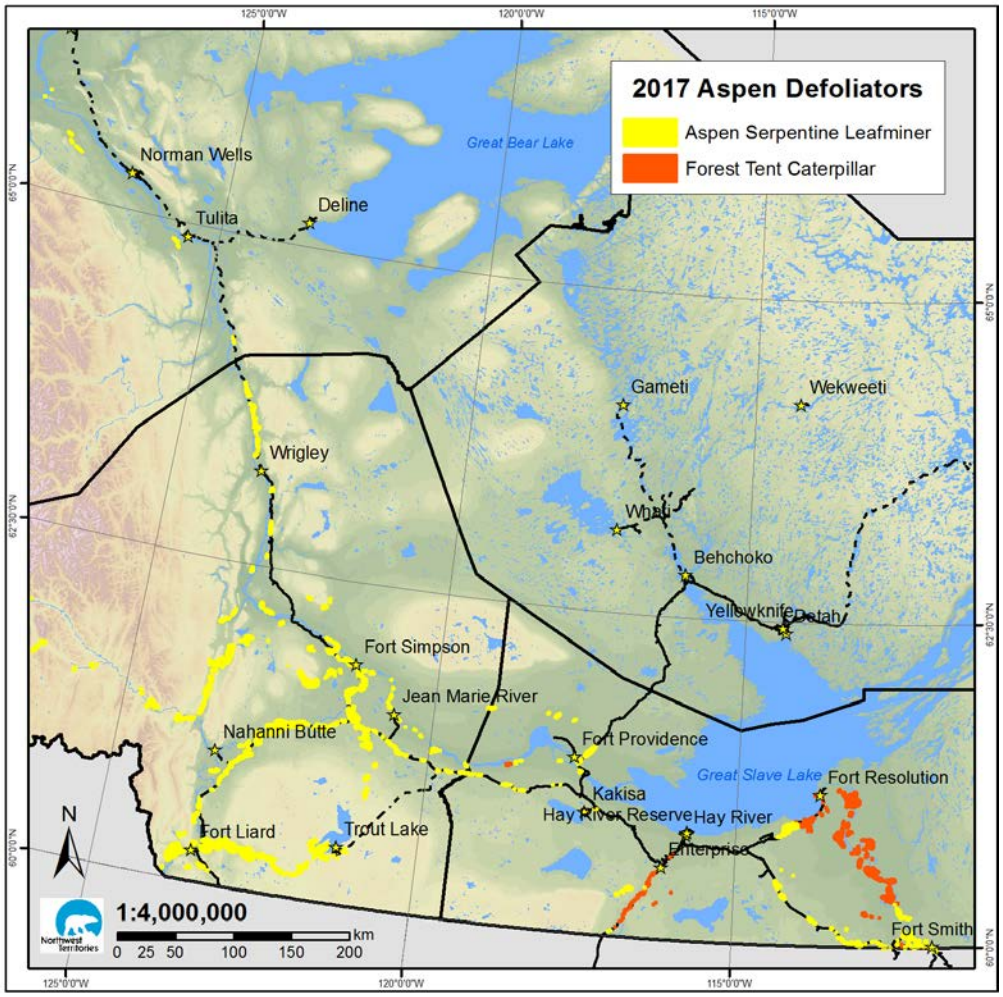


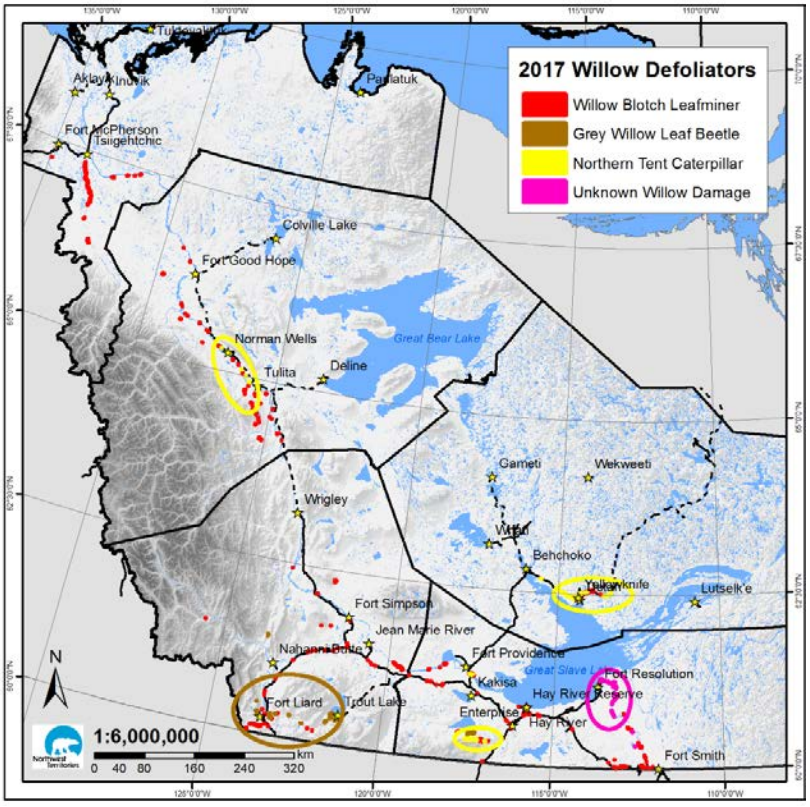
Figure 11. The extent of aspen defoliator damage in 2017

Forest tent caterpillar is the most serious aspen defoliator in the NWT. The only previously recorded outbreak occurred in the mid 90's in the Dehcho. The outbreak currently observed in the South Slave started in 2015 with over 100,000 hectares defoliated. A substantial expansion was observed along the Slave River and Fort Smith area in 2016 (24% increase compared to the previous year). Forest tent caterpillar defoliation declined by 58% in 2017, with a total affected area of 56,677 ha. All of the FTC damage was recorded in the South Slave Region, primarily along the Slave River north of Fort Smith, and along the Hay River south of Enterprise. The decline is consistent with the typical duration of FTC outbreaks, so further decline is expected in these areas next year.

Aspen serpentine leafminer (Phyllocnistis populiella) – ASL

Aspen serpentine leafminer continues to be one of the most prevalent insect pests in the NWT. The extent of ASL matches the current aspen range in the NWT making it one of the most "successful" pests in the North. Approximately 250,324 ha of aspen serpentine leafminer damage was recorded in 2017 which is more or less the same amount as was recorded in 2016. There is currently little information available on duration of ASL outbreaks; however, the NWT outbreak seems prolonged as it has been occurring for approximately 20 years. Normally this pest is considered secondary which causes very minor growth loss and no lasting long-term health effects; however, given the duration and severity of the outbreak, it is likely causing a more significant effect on health. Given its current spread, it is safe to assume most aspen stands in the NWT suffer some level of damage on an annual basis.

Willow defoliators



Willow blotch leafminer (Micrurapteryx salicifoliella) - WBLM

Willow blotch leafminer is another prevalent pest in the NWT which continues to damage willow foliage throughout the NWT. The total affected area mapped in 2017 was 31,309 ha, an increase of approximately 50% over 2016. However, due to the widespread extent of defoliation and only a fraction of willow range surveyed, the full affected area is likely being underestimated on an annual basis. In 2017, the WBLM damage was recorded further north than previously found. Severe damage was observed north along the Arctic Red River to just south of Tsiigehtchic. It is interesting to note that willow in the Mackenzie Delta were not affected.

Gray willow leaf Beetle (Tricholochmaea decora) - GWLB

A new outbreak of this secondary pest was first observed in 2015 near Fort Liard and on the northern slopes of Cameron Hills. GWLB is native to the NWT; however, it has never been recorded at outbreak levels before. In 2016, the infestation continued and the total affected area decreased by 50% compared to 2015.In 2017, approx. 8,267 ha of GWLB defoliation were mapped in the Trout Lake, Fort Liard, and Nahanni Butte areas.

Northern tent caterpillar (Malacosoma californicum) – NTC

Northern tent caterpillar outbreak has been occurring since 2015. NTC was active in the Yellowknife area attacking mostly willow and small shrubs. In 2017, the NTC outbreak expanded and was recorded in other areas in the NWT, including the Cameron Hills, and along the Mackenzie River in the vicinity of Tulita and Norman Wells. A total area recorded was 8,609 ha. NTC was confirmed during July ground surveys in the Hay River and Fort Providence areas.

Unknown willow damage

During aspen defoliation surveys in June, large areas of willow damage were observed along the Slave River between Fort Smith and Fort Resolution. The damage was consistent with how severe defoliation appears, but it is possible that it was not damage but rather a late leaf-out due to high water tables or slow ice melt. A confirmation on cause could not be determined at the time. An attempt of confirmation should be made if it is present in 2018.

Figure 12. Unknown willow damage observed along the Slave River in late June 2017

Secondary pests of notable occurrence

Forest stands in many areas of the NWT have been recovering from drought. One important symptom associated with this recovery has been an increased activity and change in behavior of insect pests considered secondary. Water stress reduces the capacity of trees to defend against insect and disease. Under normal conditions, secondary pests cause no significant damage to host plants but they can become a concern when conditions like drought enable them to thrive. Over the last two years, increased activity of several secondary pests has been noted:

- **White-spotted sawyer beetle (*Monochamus scutellatus*) (WSSB) complex** – previously described in the 2015 Forest Health Report. Water-stressed mature pine stands near Checkpoint (Dehcho) were attacked by a complex of insects with WSSB being the main pest. Another spruce leading stand near Jean-Marie River was suspected to be affected by WSSB complex as well. The affected area expanded from 767 ha in 2015 to over 2000 ha in 2016. In 2017, the area affected was 695 ha in the Dehcho.
- **Eastern larch beetle (*Dendroctonus simplex*) ELB** – ELB is native in the NWT; no previous outbreaks were ever recorded. However, tamarack mortality likely caused by this insect was observed in north-eastern British Columbia during the mountain pine beetle aerial survey in 2015. Twenty three hectares of tamarack mortality were mapped the following year along the Liard Highway. In 2017, ELB was found at several locations along Hwy's 1 and 3 with pockets of tree mortality (3 -13 trees per pocket), and current healthy broods were present. ELB damage is difficult to capture from aerial surveys due to sporadic distribution of tamarack.
- **Amber-marked birch leafminer (*Profenusa thomsonii*) BLM** – drought conditions likely contributed to increased population levels of this invasive alien species. BLM continues to spread throughout the Yellowknife / Ingraham Trail area.
- **Balsam Bark Beetle (*Dryocoetes confuses*)** 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 in the Dehcho. Total area recorded in 2017 was 106 ha.

Mountain pine beetle (*Dendroctonus ponderosae*) MPB update

Mountain pine beetle, the most damaging insect pest of pine trees in North America, had been monitored in the NWT since 2009. In 2012, the beetle was found in one pine stand just north of the NWT-Alberta border. The affected trees were cut and burned the following spring, and wildfire occurred in this area later in the season destroying the stand completely. Since then, there has been no recorded presence of MPB in the NWT.

In 2017, an aerial survey targeting MPB was flown on September 6th. The survey path followed the most susceptible pine stands in southern sections of the Dehcho and South Slave regions focusing on the 25 km wide corridor along the NWT-AB / NWT-BC border. In addition, north-eastern section of British Columbia was surveyed to gain a better understanding on the nature and extent of MPB at its northern range limit. A few scattered pockets of pine mortality with MPB symptoms were found near Fort Nelson, approximately 150 km south of the NWT border. In one patch of pine mixed with aspen and white spruce located 40 km east of Trout Lake symptoms of pine mortality resembling those of MPB-caused were noted. This location will be ground-checked for MPB activity in February 2018.

The MPB pheromone baiting program was also continued in the southern NWT. Three baiting locations were established along HWY 1 between NT-AB border and Enterprise, and two between Kakisa and Jean Marie River. Dispersal baiting procedures were used as described in the MPB Monitoring Plan for NWT Pine Forests (2015-2020). No evidence of MPB was recorded in any baiting location. The pheromone program will continue in 2018.

5. Disease agents

Improved moisture and humidity conditions across the NWT in 2016-17 following the relatively dry 2014-15 seasons may have caused an increased activity of various pathogens:

- Spruce needle rust (*Chrysomyxa spp.*) was observed in the Inuvik Region in the vicinity of the Inuvik airport and approximately 40 km south of town along the Dempster Highway. Previously recorded along the Mackenzie River south of Tsiigehtchic.
- Commandra blister rust (*Cronartium comandrae*) – disease of hard pines including jack pine, caused by a fungus growing in the inner bark. The rust attacks pine of all sizes and ages causing stem cankers leading to mortality of seedlings and branch mortality in older trees. Observed along the Yellowknife Highway and Ingraham Trail affecting mature trees in form of branch flagging (condition when tree branches scattered throughout the tree's crown turn brown).
- Yellow witches broom or spruce broom rust (*Chrysomyxa arctosphyli*) – another fungal disease that may be associated with an increased humidity following drought. Observed in spruce stands along the Mackenzie River in areas affected by suspected spruce needle rust.
- Western gall rust (*Endocronartium harknessii*) – increased branch mortality on mature trees was observed in the Fort Simpson and Checkpoint area in 2015. The mortality was likely triggered by drought. Further expansion was noted in 2017.
- Sweet fern blister rust (*Cronartium comptoniae*) – found on single pine trees around Yellowknife

- Willow leaf rust (*Melampsora spp.*) – found locally around Yellowknife and Hay River
- Marssonina leaf spot (*Marssonina populi*) – found in aspen across the South Slave region
- Saskatoon juniper leaf rust – along the Hwy 1, around Redknife River

Figure 13. Branch mortality caused by western gall rust observed along the Hwy 1 near Checkpoint

6. Abiotic disturbances

In the wake of climate change, monitoring for climate-related disturbances has become equally important as monitoring for pest and disease. Direct impacts of climate on forest condition may be subtle and require long-term consistent monitoring over large areas. There is currently little baseline information on abiotic disturbances in the NWT, yet understanding the natural range of variation in the northern boreal forest is essential in inferring climate change impacts. To address this issue, FMD started recording abiotic disturbances during annual aerial surveys. Information gathered each year will be evaluated for any changes in the extent, frequency or patterns to determine natural regimes and distinguish new trends.

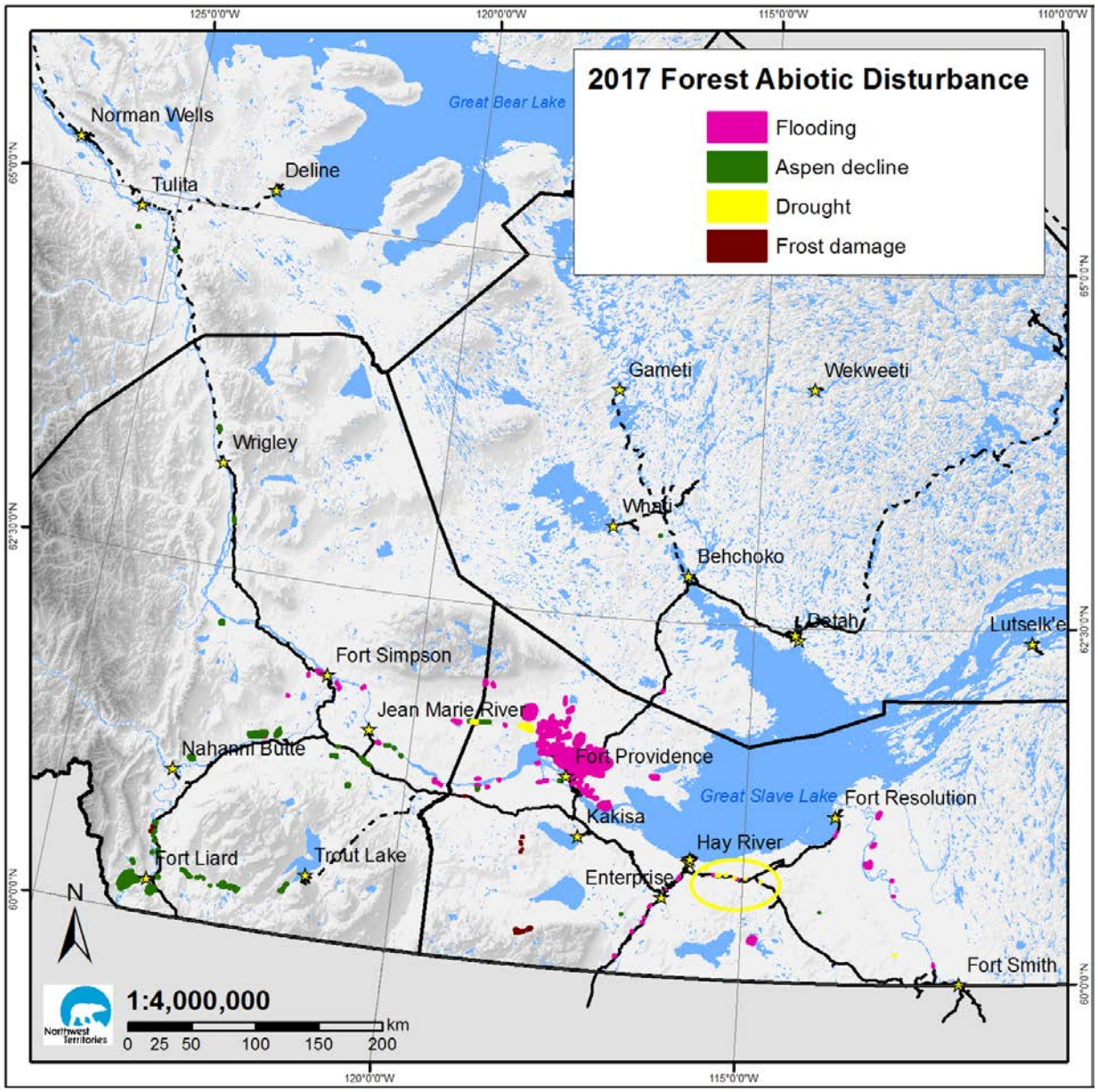
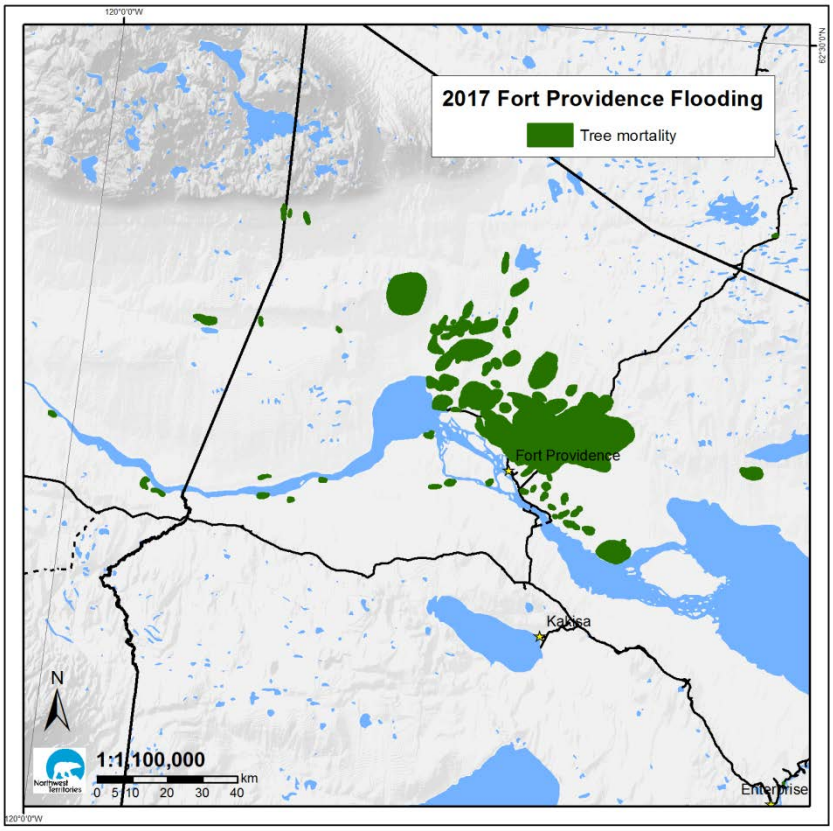


Figure 14. Abiotic issues recorded during 2017 aerial surveys

Flooding and high water table issues



Flooding is an example of water stress which can result in stand mortality. In the North, flooding can be associated with thawing permafrost, a phenomenon that can be triggered by the increased fire activity or climate warming. In areas where timber harvest is occurring, flooding could be caused by an erroneous silvicultural prescription applied to the flood prone area. Lastly, local flooding can be a result of increased beaver activity. While identifying the anthropogenic causes is relatively easy, diagnosing the natural or climate-related causes is much more challenging because it requires long-term monitoring and a good understanding of the fire regime.

In 2017, large-scale flooding mortality near Fort Providence was re-mapped to provide more precise extent of the affected area. Total area mapped is 117,400 thousand hectares. Several smaller patches were mapped in the Slave River delta in previous years.

Figure 15.Extensive flooding observed north of Fort Providence (left) and surface water reflecting through the forest canopy south of Horn Plateau (right).

High water tables appear to cause forest health issues in productive stands, especially in aspen as seen in the Liard Valley and along the Fort Simpson – Wrigley highway.

Figure 16. Declining aspen due to high water table near Fort Simpson (left) and flood-killed trees being utilized for firewood along the Fort Simpson - Wrigley highway (right)

Aspen decline

Aspen decline has been observed mostly in the Dehcho Region in recent years. It is not clear what the main cause of this decline is. According to some long-term studies carried out in the Prairies in over-mature aspen, the decline with similar symptoms has been associated with climate driven changes in site moisture regimes. The current monitoring effort is focused on more precise mapping of this phenomenon to capture the extent. Ground checking and sample collection is recommended as a potential next step.

Figure 17. Aspen decline observed in the Dehcho Region.

Other abiotic issues observed in 2017

- Trees collapsing into the Mackenzie Delta ("drunken forest"). This could occur due to losing stability from permafrost thaw along the banks or just due to high water table from snow melt / rainfall.
- Roadside aspen foliage damage likely due to road salt or drought
- Pine drought near the southern edge of the Horn Plateau
- Snow damage near Jean Marie River, Blackstone, Redknife River