2015

NORTHWEST TERRITORIES FOREST HEALTH REPORT

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Northwest Territories Environment and Natural Resources

1. Northwest Territories Forest Health Program

Forest Management Division of the Department of Environment and Natural Resources (ENR) is responsible for monitoring of forest health conditions across the NWT to ensure the forest has 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 on the NWT forests. The monitoring is mostly conducted through aerial detection mapping aided by roadside observations, pheromone trapping, and public reports.

The 2015 aerial surveys were conducted between July 16th and July 29th and on September 2nd by Roger Brett (NRCan-CFS) and Jakub Olesinski (ENR, GNWT). Over 6000 km of flight paths were flown along the major rivers and waterways including Mackenzie, Liard, and Slave rivers and their major tributaries, along the shores of Great Bear and Great Slave Lakes, and also along the foothills of the Mackenzie Mountains, Cameron Hills, and Ebbutt Hills. Generally, the same areas are monitored each year as they are the major areas featuring mature forest stands being the primary hosts for several insect pests across the NWT. A new area, the Mackenzie River delta was surveyed in 2015 after being last monitored in 2009.

2. Overview of the 2015 forest health conditions in the NWT

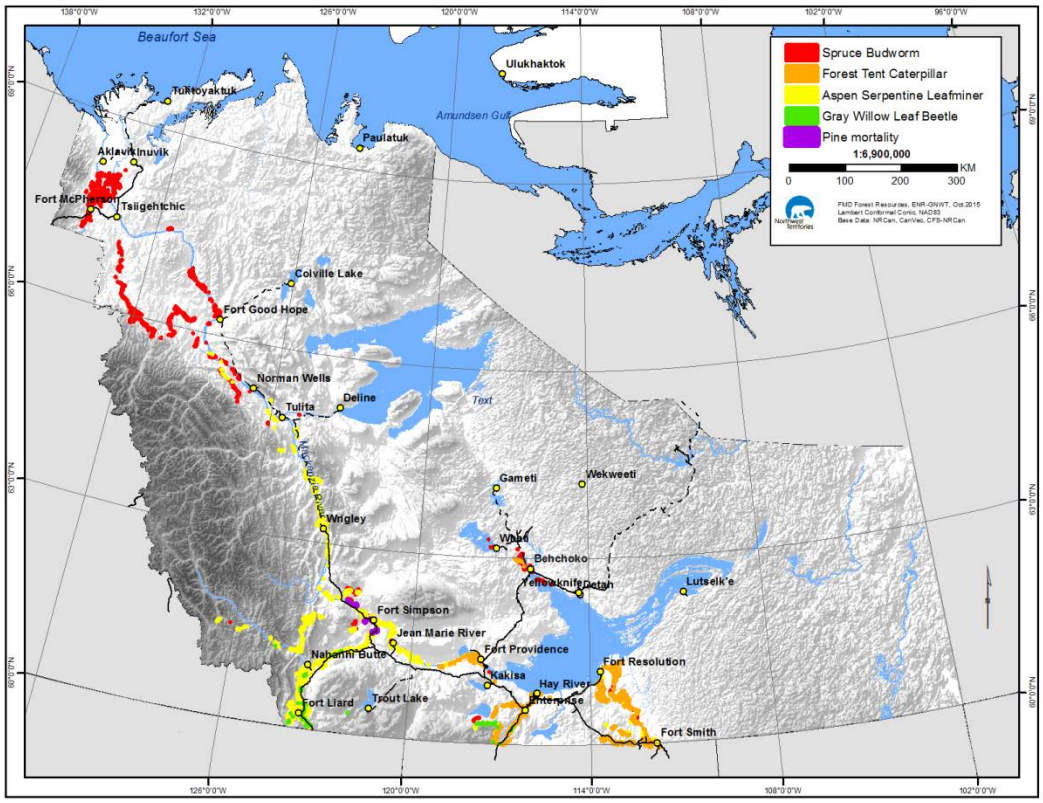

Figure 1 Overview map of the pest conditions observed in the NWT in 2015

Table 1. Major pest damage across the administrative regions of the NWT by severity of defoliation (hectares).

Severity of defoliation	Light	Moderate	Severe	Total (ha)
Aspen Serpentine Leafminer	**3208.94**	**136947.04**	**80359.50**	**220,515.49**
Dehcho	423.14	92,345.93	45,116.93	**137,886.01**
North Slave			1857.13	**1857.13**
Sahtu		99.08	4411.66	**4510.74**
South Slave	2785.80	44,502.03	28,973.78	**76,261.62**
Forest Tent Caterpillar	**2941.86**	**54031.31**	**45928.64**	**102901.81**
North Slave			1878.64	**1878.64**
South Slave	2941.86	54,031.31	44,049.99	**101,023.17**
Spruce Budworm	**3224.18**	**78,166.14**	**92,872.78**	**174,263.10**
Dehcho	543.37	6067.96	62.64	**6673.97**
Inuvik	2373.40	51,485.75	63,653.20	**117,512.36**
North Slave	78.70	4016.90	2728.41	**6824.01**
Sahtu	72.54	14,426.12	23,080.76	**37,579.43**
South Slave	156.16	2169.41	3347.77	**5673.34**
Gray Willow Leaf Beetle		**2603.79**	**6487.98**	**9091.77**
Dehcho		1096.67	4913.70	**6010.36**
South Slave		1507.12	1574.29	**3081.41**
Willow Blotch Leaf Miner		**2687.34**	**4379.02**	**7066.36**
Dehcho		318.83	1000.97	**1319.80**
North Slave			375.07	**375.07**
Sahtu		69.18	314.57	**383.75**
South Slave		2299.33	2688.41	**4987.74**

Severity of defoliation expresses the degree of foliage damage caused by the particular pest agent. Severity class is estimated visually as a percentage of the current growth of foliage defoliated. The ENR uses the following defoliation severity classes:

For agents defoliating coniferous trees (i.e. spruce budworm):

Light <30% Moderate 30-50% Severe >50%

For agents defoliating deciduous (broadleaf) trees (i.e. aspen serpentine leafminer, forest tent caterpillar, willow blotch leafminer, gray willow leaf beetle):

Light <30% Moderate 30-70% Severe >70%

It should be noted that the severity of defoliation does not imply the mortality of affected stands. Depending on the agent and an overall stand condition, mortality resulting from the insect damage usually occurs only after several consecutive years of severe defoliation. In the NWT, insect induced mortality occurs mostly in case of Spruce Budworm. Other defoliators, like Aspen Serpentine Leafminer or Willow Leaf Blotch Miner, 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.

3. Insect pest activity

Eastern spruce budworm (*Choristoneura fumiferana*) – (SBW)

Figure 2 Adult and larvae of eastern spruce budworm (nrcan.gc.ca)

Spruce budworm (Fig 2) remains the most serious forest pest in the NWT. Since 2005, the SBW populations have stayed at fairly low and stable levels in the southern parts of the territory; however, a new outbreak was observed in 2015 in the Mackenzie Delta for the first time on record (Fig. 2-3). This recently observed infestation extends south down the Peel River almost reaching the Yukon border. It is unknown if this is a new range expansion due to a warmer climate making conditions suitable, or it has been there in the past but gone unnoticed. The Inuvik ENR Regional staff has monitored the SBW population levels in these areas by pheromone trapping annually and continuously up until 2012. That year was also the last time when the previous aerial survey took place. Only endemic population levels were noted at the Arctic Red River trapping stations at that time. In 2015, the total area affected in the Delta was 94,189 ha with approx. 50% mapped as a severe defoliation, and only 2% as a light damage (Fig 2). The Mackenzie Delta SBW infestation appears to be the most northern SBW record in North America. Field sampling is recommended in summer of 2016 to better explain the nature of this outbreak. Another area that has been continuously affected in the Inuvik Region since 2009 was along Arctic Red River. Mostly severe defoliation was observed in 2015 with substantial stand mortality evident in some areas. In addition, a significant spread northward was observed this year along Arctic Red River compared to previous years.

Figure 3. Spruce budworm defoliation in the Mackenzie Delta (J. Olesinski)

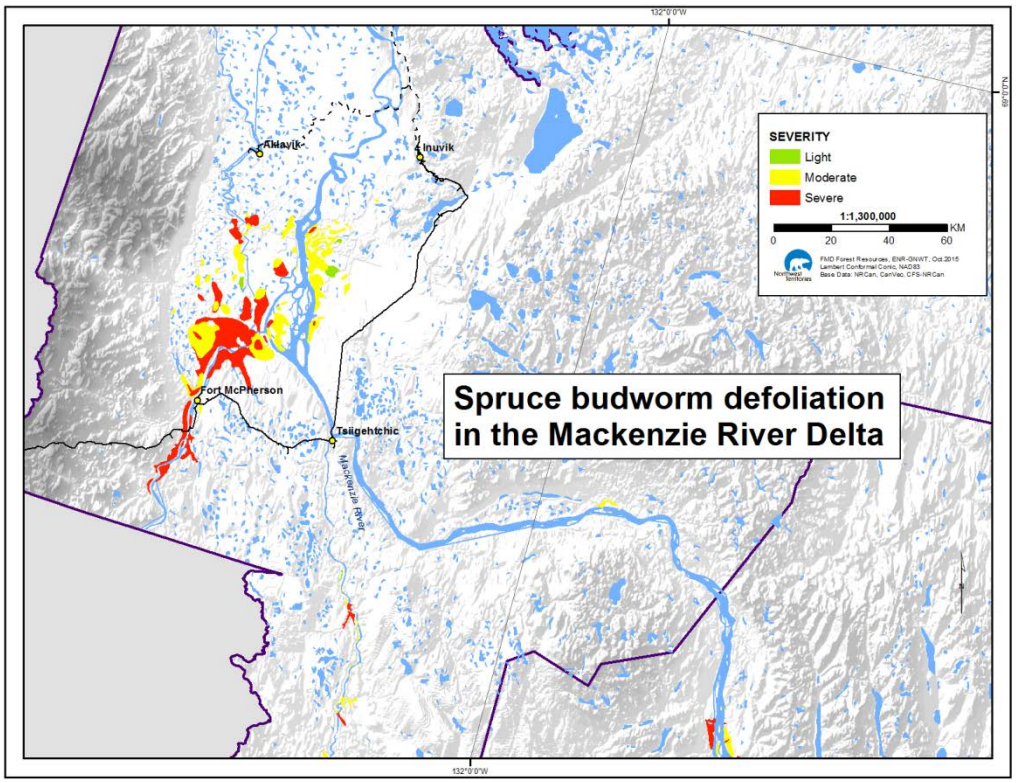

Figure 4. Spruce budworm defoliation mapped for the first time in the Mackenzie Delta in 2015

The SBW has been very active also in the Sahtu Region for several years. In 2015, areas along Ramparts and Hume rivers were mapped as severely defoliated with early signs of stand mortality evident in some areas. Pockets of mature spruce stands along the Mackenzie River have been attacked for several consecutive years and this trend continued in 2015 (Fig 4).

Figure 5. Severe spruce budworm defoliation along Ramparts River in the Sahtu Region (J. Olesinski)

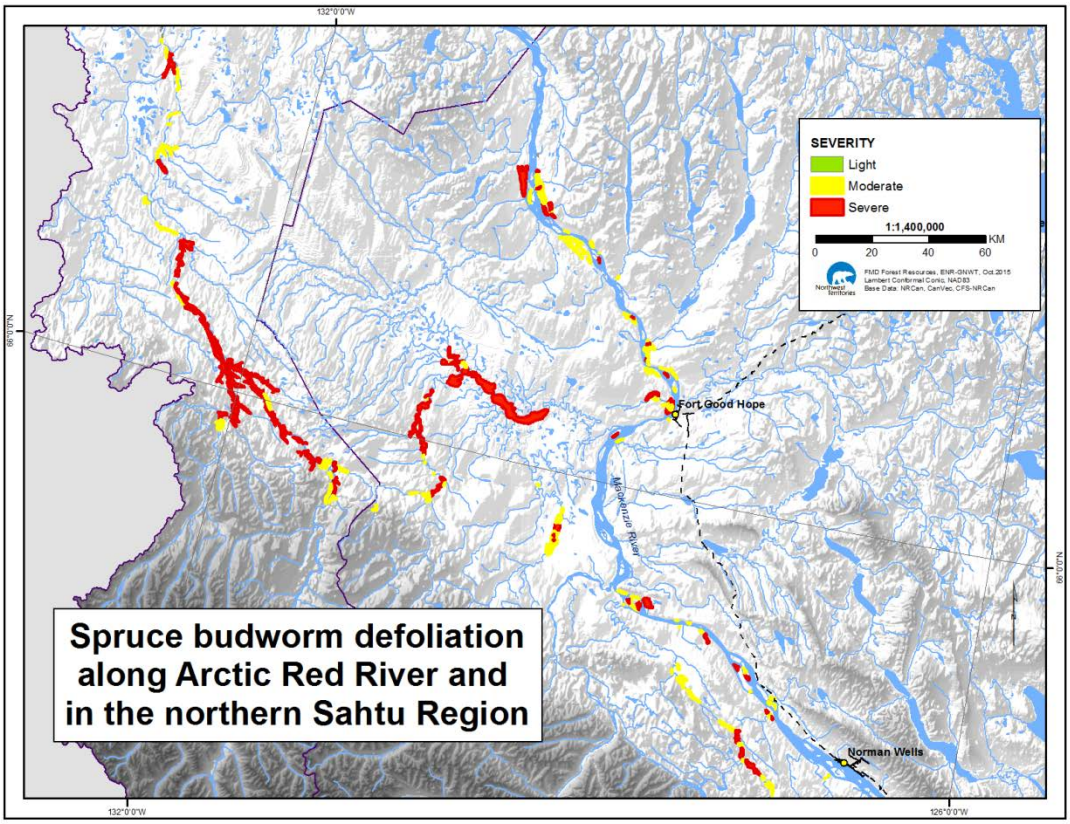

Figure 6 Spruce budworm defoliation continues to be severe in the northern Sahtu Region and extends northward along Arctic Red and Rampart rivers

There was a general decline in the spruce budworm activity in southern part of the NWT including the North Slave Region. Moderate to severe defoliation was mapped near the North Arm of the Great Slave Lake (Fig 7) while a few pockets of moderate to severe defoliation persisted along the Slave River in the South Slave Region. General decrease in the SBW activity in the South Slave Region can likely be attributed to an early spring with warm temperatures in May and June combined with occasional late frost events that occurred in the region at the same time.

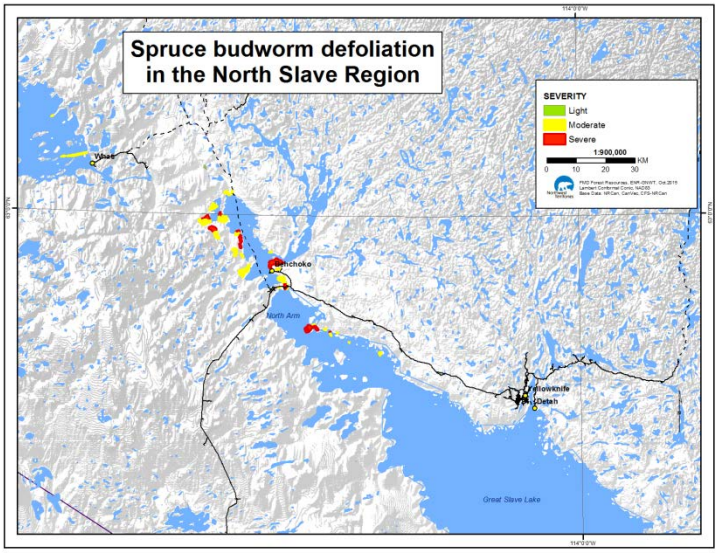

Figure 7. Spruce budworm defoliation in the North Slave Region

Forest Tent Caterpillar (*Malacosoma disstria*) – FTC

Figure 8. Forest tent caterpillar feeding on aspen leaves in Fort Smith (B. Starling)

An unprecedented forest tent caterpillar outbreak occurred across the South Slave Region from Fort Smith to the DehCho Region boundary, totaling 101,023 ha (Fig 10). An additional 1880 ha of similar defoliation was observed near Marian Lake, north of Frank Channel in the North Slave Region; however, this damage is currently unconfirmed as the FTC origin. Ground verification can be attempted in 2016 near Behchoko. Western tent caterpillar (*Malacosoma californica*) was also observed at higher than endemic population levels in Yellowknife and surrounding areas. This pest is often found active in conjunction with the forest tent caterpillar so the observed defoliation near Behchoko is likely an FTC activity. Interestingly, no FTC damage was observed in the DehCho Region where the only historical FTC outbreak in the NWT occurred in 1995-96. Light defoliation has little effect on trees, while repeated moderate-to-severe defoliations can disrupt tree growth. The risk of direct mortality caused by this pest is reduced as aspen is able to refoliate later in the same season, and still has time to produce and store nutrient reserves for the following growing season. Significant regrowth of foliage was observed during aerial surveys in late July across the affected areas (Fig 9). An early spring with warm temperatures in May 2015 was one of the triggers for increased activity of Forest Tent Caterpillar in the NWT after almost 20 years since the last recorded outbreak.

Figure 9. Forest tent caterpillar defoliation in the South Slave Region with visible signs of foliage re-growth (bright green patches within an overall gray - silver area).

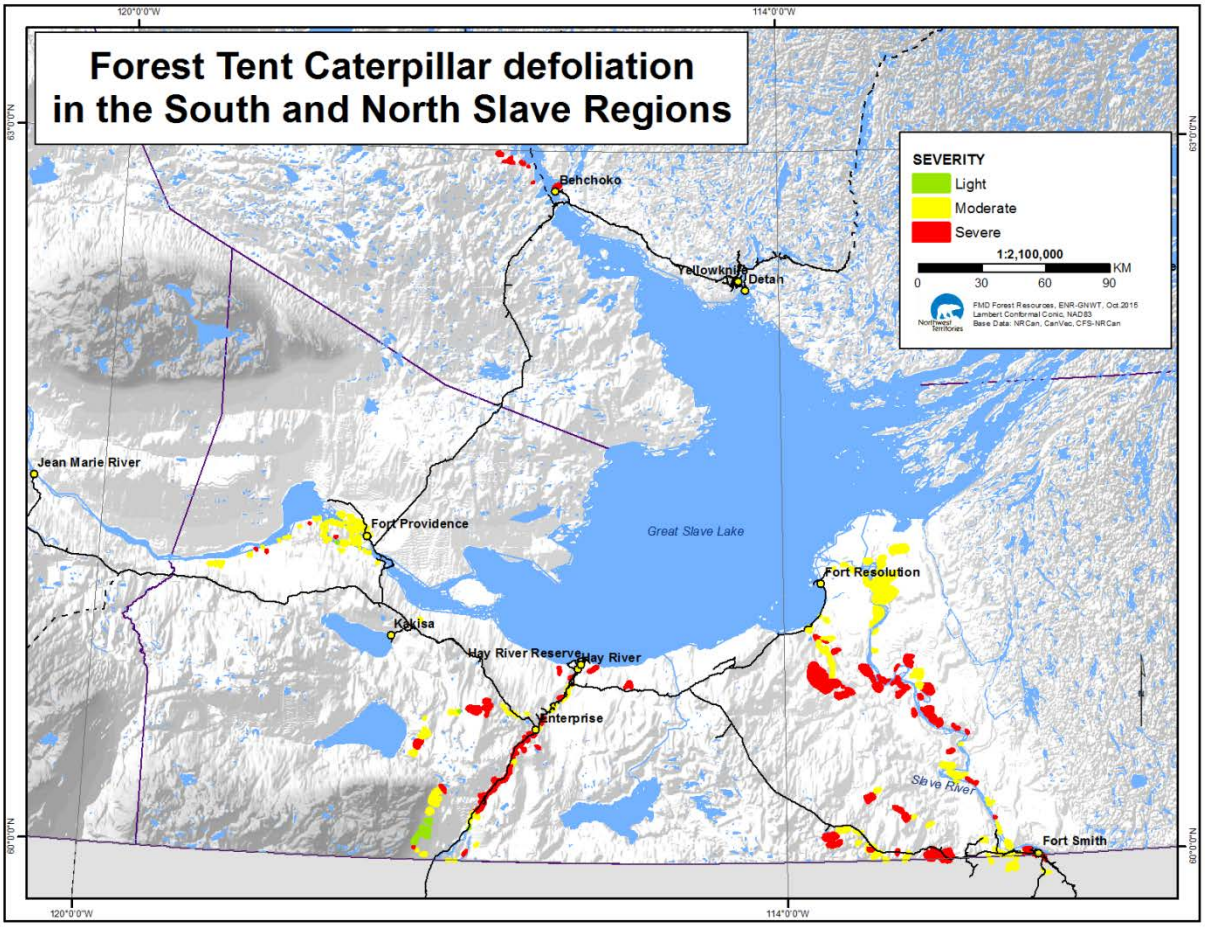

Figure 10. Forest tent caterpillar defoliation observed in the South Slave Region. Severe defoliation near Behchoko is currently unconfirmed as the FTC damage

Aspen Serpentine Leafminer (*Phyllocnistis populiella*) – ASL

Figure 11. The larvae of Aspen serpentine leafminer is the damaging agent (USDA Forest Service)

Aspen serpentine leafminer remains very active and the damage caused by this pest is virtually as abundant as trembling aspen across its range in the NWT. Over 220,500 ha were mapped throughout all regions except Inuvik, where the range of aspen is very limited. It is worth noting that almost all stands affected by FTC appeared to show some level of ASL activity. As in the previous years, the DehCho Region featured over 60% of all the ASL damage mapped in the NWT because of the greatest

concentration of aspen in this area (Fig 13). Despite vigorous activity of this pest for several years in the NWT, the tree damage is negligent. ASL is only slowing the growth of trees by inhibiting photosynthesis but does not cause tree mortality. Occasionally, the leafdrop can occur, but aspen can re-foliate effectively during the same growing season.

Figure 12. Serpentine damage caused by Aspen Serpentine Leafminer (M. Gravel)

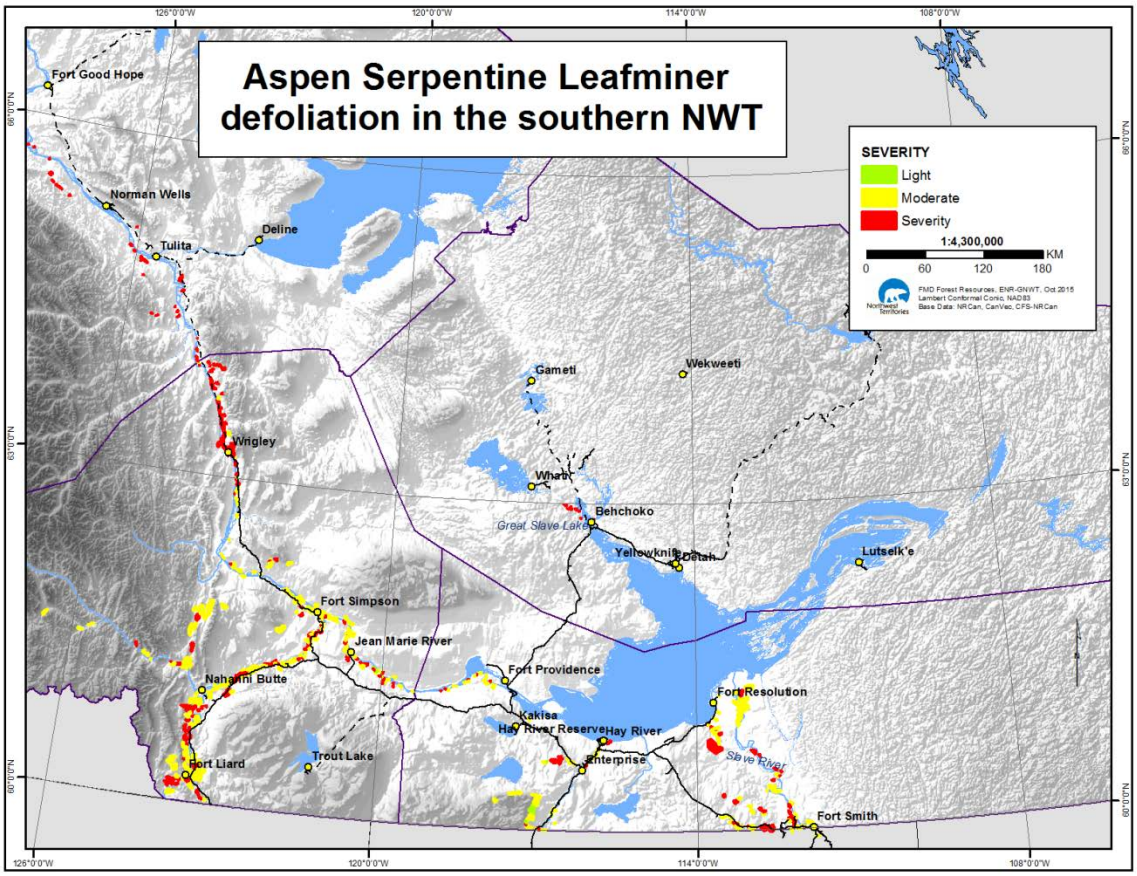

Figure 13. Aspen serpentine leafminer defoliation in the South Slave Region partially overlaps with areas affected by the FTC. The DehCho remains the most affected region by ASL in the NWT.

Gray Willow Leaf Beetle (*Tricholomea decora decora*) – GWB

Figure 14. Gray willow leaf beetle (agr.gc.ca)

A new outbreak of the gray willow leaf beetle was observed attacking willow south of Hay River and in the Fort Liard area. An approximate total of 9,100 ha were mapped including 6,010 ha in DehCho and 3,080 in the South Slave (Fig 16). Most damage in the South Slave was observed along the north slope of Cameron Hills, while the more severe damage was observed in the Dehcho from Muskeg River area down to the BC border. Gray Willow Leaf Beetle is a species native to the NWT, however, it is the first time it was observed at epidemic levels in the territory. The majority of damage is caused by the migrating adults who skeletonize leaves giving them a scorched appearance when observed from the distance (Fig 15).Substantial areas of willow defoliation caused by this outbreak were first noted in the delta flats by Lake Claire within the Wood Buffalo National Park in 2013. Gray willow leaf beetle does not appear to cause mortality, even during severe infestations. Outbreaks usually subside before any partial or whole tree mortality occurs.

Figure 15. Damage caused by the gray willow leaf beetle in the DehCho region. Photos: J. Olesinski, R. Brett

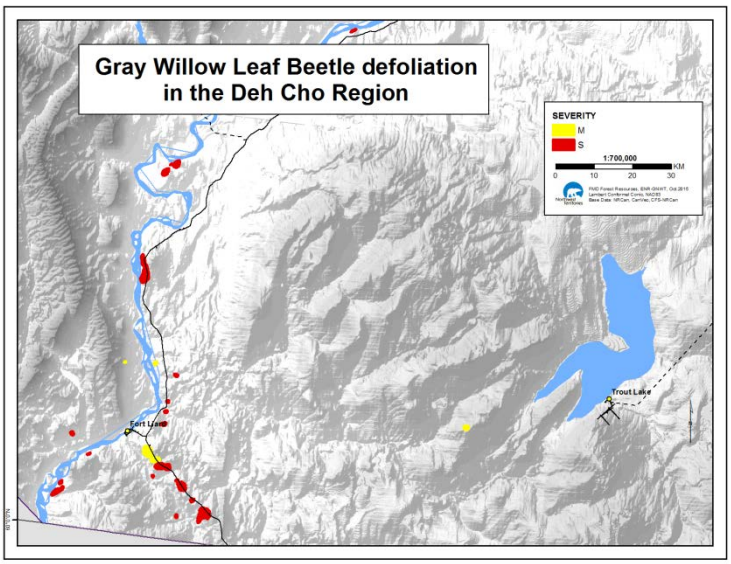

Figure 16. Over 6000 hectares of a new gray willow leaf beetle outbreak were mapped in the DehCho region.

Willow Blotch Leafminer (*Micrurapteryx salicifoliella*) – WBLM

Figure 17. Willow blotch leafminer adult (cityofgp.com)

This pest continues to be active in many locations throughout the NWT. Scattered locations were mapped in all regions except Inuvik. The total area of over 7000 ha was mapped in 2015 (Fig 18); however, since the outbreak is so widespread, many areas were likely missed. Similarly to GWB, the damage caused by this pest is usually not leading to mortality. Willows have capacity to refoliate effectively during the same growing season and produce enough resources to survive.

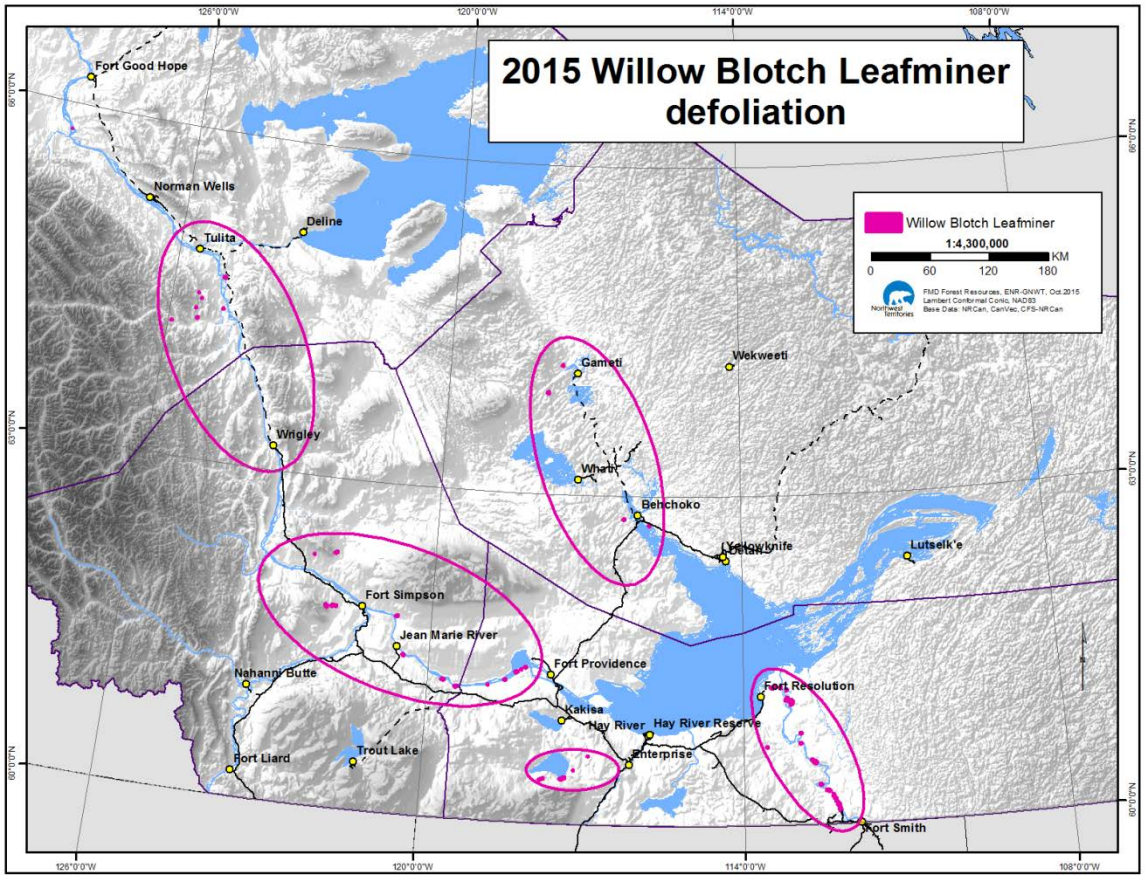

Figure 18. Willow blotch leafminer damage was scattered throughout most of the southern NWT in 2015.

White-spotted sawyer beetle (*Monochamus scutellatus*) complex

Prevailing drought conditions that have been occurring throughout the NWT in recent years contributed to significant weakening of mature trees which likely resulted in increased risk of mortality. Several pine stands (and one spruce stand near Jean Marie River) totaling 767 ha were mapped in the DehCho region as affected by a complex of pests combined with the drought stress. Majority of these stands were observed near Fort Simpson, along the Liard and Mackenzie rivers, and between Checkpoint and the

ferry crossing. Ground verification of these stands containing pine mortality determined many agents at work. Signs of drought stress were evident in many green trees such as red fading to yellow foliage on shoots. Agents collected and observed in these stands included white-spotted sawyer beetle larvae, the pine engraver beetle (*Ips pini*), the lodgepole pine beetle (*Dendroctonus murrayanae*), and western gall rust (*Endocronartium harknessii*). The vast majority of green trees being affected had sawyer beetle larvae active within, although pine engraver was present in many. Although it is very rare for sawyer beetle to kill healthy green trees, it is believed the weakening caused by drought stress and other secondary damaging agents is sufficient enough to cause trees to succumb. The primary factors killing these trees are the chronic drought and sawyer beetle.

Figure 19. Pine mortality in stands affected by various agents including drought stress, white-spotted sawyer beetle, pine engraver beetle, and lodgepole pine beetle (photos R. Brett).

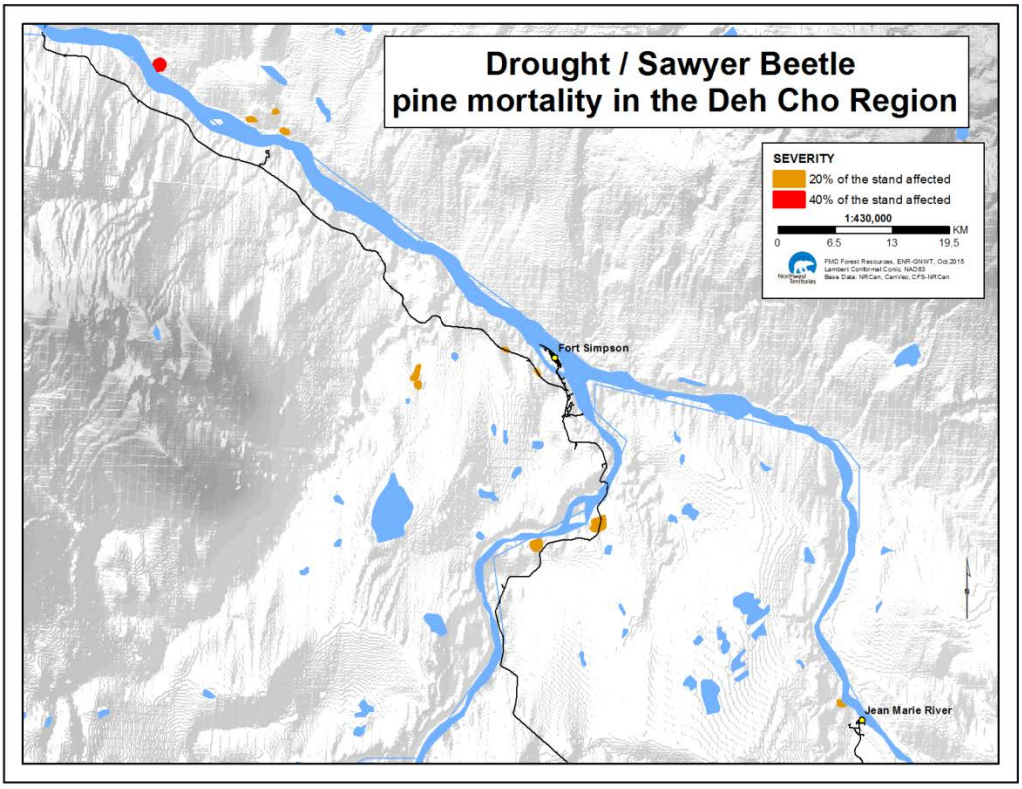

Figure 20. Extent of the mortality caused by drought combined with other agents, including white-spotted sawyer beetle observed in the DehCho Region.

Mountain Pine Beetle (*Dendroctonus ponderosae*) status update – MPB

The most damaging insect pest of pine trees in western North America, the mountain pine beetle, has been monitored for in the NWT since 2009. The beetle presence was confirmed in the NWT in 2012 in a jack pine stand located at the Alberta – NWT border. The attacked trees were controlled in March 2013 and the entire stand was burned in a wildfire a few months later. Since then, mountain pine beetle has not been confirmed again in the NWT.

In 2015, the Five-year Mountain Pine Beetle Monitoring Plan for the NWT Pine Forests was developed to identify MPB management zones and outline tactics recommended for MPB management in the NWT. An integral part of the plan is the decision tree allowing for dynamic changes in monitoring activities depending on results from the preceding year. An aerial survey focusing on pine stands along the AB – NWT / BC – NWT border was flown on September 2nd 2015, as recommended in the monitoring plan. No MPB activity was observed in these areas considered the most susceptible for potential MPB infestations. In addition, three dispersal baiting sites were established on June 30 – July 3, 2015 in easily accessible areas along Hwy 1 at the AB-NWT border, and along Hwy 5 near Fort Smith. No MPB activity was observed at any baiting location.

4. Abiotic factors

Drought

Drought has been prevalent throughout the NWT for several years with extreme conditions observed in 2014 and early 2015. As a result, many stands are showing drought-caused symptoms and mortality appearing increasingly across various species each year. In some areas these symptoms are more evident than in others; nevertheless, increased activity of many insect pests (i.e. FTC, GWB) suggests that even the mature stands are weakened and thus more prone to attacks than in normal conditions. Several juvenile stands were affected by drought as evidenced along Hwy 5 from Hay River to Fort Smith. Much of the damage was from the lack of water (yellowing-to-red foliage tips) but often physical damage from sun scalding on foliage and bark was observed. In the more extreme cases, dieback and mortality are occurring. Symptoms observed included areas of red desiccated jack pine regeneration, yellowing water-stressed tamarack, bark scalding on aspen and poplar, foliage desiccation (coniferous and deciduous), and dieback and mortality. One of the important factors contributing to exacerbating the situation is the fact that many of the drought affected areas feature very porous gravel type of soils that are not conductive for retaining moisture. Drought damage has been occurring in the NWT for a number of years now and will continue to manifest for several years, even after annual moisture conditions improve.

Figure 21. Drought symptoms observed on several species throughout the NWT in 2015.