White Pines at Risk

Paul Hetzler, ISA Certified Arborist

Our eastern white pine (*Pinus strobus*), monumental in a number of important ways, is now imperiled throughout much of its range south of the border. Unfortunately, we can expect that to become the case in Canada in the near future.

The tallest trees east of the Rockies, white pines in excess of 70 metres were recorded by early loggers. The species provided settlers with abundant clear lumber for structural members, sheathing, and flooring. Within its range, it's fair to say that European settlement was built on white pine.

It also has a towering cultural significance in southeastern Canada. Over a millennium ago, the white pine with its five needles joined at the base helped inspire five competing First Nations peoples to lay down arms and form a unified democratic government. Today the Haudenosaunee, or Iroquois as we often call them, still regard the white pine as the Tree of Peace, and a symbol of their enduring confederacy.

In addition, women's rights as we know them began in the figurative shade of the white pine. Matilda Joslyn Gage, a key architect of the US women's rights movement, expressly credited Haudenosaunee women, who've always voted to elect their chiefs, as her inspiration for pursuing equal rights.

With so many reasons to love white pines, I was distraught when around 2009, foresters and arborists in the northeastern US began to document a new flavour of needle disease across large swaths of white pine forests. The severity and scope of the disorder increased markedly in 2016 and 2017, and by 2018, widespread mortality was being reported.

Although the syndrome, known as white pine needle damage (WPND), is being studied intensively, it is not yet fully understood. Needles begin to turn yellow in May, and by August only the current year's growth remains. Infections are perennial – once a tree is affected, it never recovers. Following the initial infection, the new growth is increasingly stunted in subsequent years. Trees on poor soils and along highway corridors were impacted early on, and symptoms were also noted in landscape settings, where trees are by definition stressed. But soon even pines on rich sites were sickly.

A fact sheet from UMass Extension clarifies why early defoliation caused by WPND is so significant:

"When needles are prematurely shed early in the growing season due to WPND, white pines not only have a reduced ability to photosynthesize, they also lose foliar nitrogen that would have been retained by natural senescence. When foliage is naturally senescing, trees pull nitrogen out of the declining foliage, a process known as resorption. Research has shown that needles shed early in the growing season can have twice the amount of nitrogen present compared to needles naturally shed in autumn."

All arborists know about the "disease triangle," whose three legs are pathogen, susceptible host, and an environment conducive to infection. In the case of WPND, at least four fungal pathogens are involved. However, typically only two or three are present on any given site, which makes it hard to point a finger at any one microbe.

According to a March 24, 2020 article in *NH Forest Health*, brown spot needle blight (*Lecanosticta acicola*) is present on the majority of WPND sites. The second most prevalent pathogen is *Septorioides strobus.* It is the more virulent of the group, and a possible invasive species (all others are native and endemic). Two other organisms, *Lophophacidium dooksii* and *Bifusella linearis* also appear in affected needles on some locations. Several additional fungi have been recovered from needles at a minority of WPND sites.

To muddy the waters even more, *Caliciopsis* canker, as a rule considered a weak native pathogen, has become more prevalent (found on about 85% of sites sampled), and is causing greater damage as well. Infestations of the eastern white pine bast scale, a native insect, is on the rise too, and may predispose white pines to *Caliciopsis* canker.

Given that the insect pest and all but one of the identified pathogens have been around forever, it's reasonable to look at another leg of the disease triangle: conditions which favour infection. In a June 2019 article in the *Conservationist* magazine, Jessica Cancelliere, a Research Scientist with the New York State Department of Environmental Conservation writes:

"Increases in annual temperatures and precipitation have provided ideal conditions for WPND fungi, allowing them to proliferate to consistent outbreak levels. Since 1950, the northeastern U.S. has experienced an increase in average temperature (about 1° C) and cumulative precipitation (about 165 mm) during the April–September growing season, with 2011 ranked as the wettest year on record."

From what we know about WPND, a changing climate has allowed otherwise weak pathogens to become lethal. It would be nice to know how best to respond. Fortunately, management options do exist to enhance tree health and vigour.

In terms of forest stands, the best response is to thin them. To again cite the UMass Extension bulletin, "Research has shown that thinning to create lower density stands of white pine promotes crown vigor, radial growth and reduces the severity of WPND. Heavier thinning operations had a more significant effect on the reduction of WPND."

We understand that affected pines lose half their annual nitrogen complement as a result of early-season needle drop. It makes sense, then, that supplemental nitrogen applications show promising results, both in forest and landscape settings.

The Bartlett Tree Research Lab recommends mulching around landscape white pines, and watering deeply during hot spells. Ideally, soil pH should be kept between 5.2 and 5.6. Soil testing to identify and correct any nutrient deficiencies is a good idea. Soil compaction can be mitigated through air or hydraulic fracturing. Ideally, plant something other than white pines on clay soils, or those with a pH above 7.0. Planting them farther apart than historical norms is another important practice to adopt.

More information can be found at https://ag.umass.edu/landscape/fact-sheets/dieback-of-eastern-white-pine and https://www.sciencedirect.com/journal/forest-ecology-and-management/vol/423/suppl/C and https://storymaps.arcgis.com/stories/8a4ac2f813dc4b34ac08d8081eecb50d

*An ISA-Certified Arborist since 1996, **Paul Hetzler** lives in Val-des-Monts, Québec.*