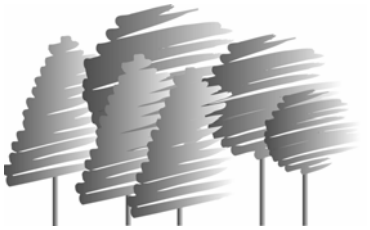
PLANT INFORMATION BULLETIN - HIGH MORTALITY IN URBAN TREES

June 2010. Ver.2



Urban tree and shrub mortality rates in Alberta have spiked this year due to a combination of weather events that occurred between September 2009 and May 2010.

What happened to cause such an increased loss of plants? The answer is not an easy one to explain as there are many factors to take into consideration. Plants are complex organisms and a basic understanding of their physiology is needed before an explanation as to why so many "prairie hardy" plants did not survive the 2010 spring season.

The life of trees occurs in cycles. In early spring, as days begin to get longer and the weather is warmer, the tree is pulling all of its energy together for growth. As the weather continues to warm the tree begins to grow rapidly, taking advantage of the long days and optimum sunlight. For most trees, growth ceases by August. From this point until fall, the objective of the tree is to prepare for winter. During fall, a tree stores up food and energy reserves - everything that is needed for next spring's growth. Between fall and spring is the period known as **dormancy**.

What is dormancy? It is a period when the tree's physical life cycle is temporarily stopped to help the tree minimize metabolic activity. Plants prepare themselves for dormancy by going through a process termed "**hardening off**," which is triggered in plants by the gradual decrease in day-time temperatures and the length of daylight (photoperiod). Within the plant, chlorophyll production slowly decreases, antifreeze proteins develop and leaves prepare to drop (abscission). This is known as **predictive dormancy** and occurs when an organism enters a dormant phase *before* the onset of adverse conditions. As you will read later, changing the environmental conditions around the tree may alter the time of year when it goes into dormancy.

When spring approaches, dormancy begins to come to an end and the physiological process is reversed. Metabolic activity begins again triggered by lengthening daylight and a gradual increase in temperature.

It is the period between fall and the following spring that is of interest in the examination of tree mortality, especially the period just before the onset of dormancy and the period when dormancy is broken in spring.

As mentioned above there are many factors that influence when a tree enters the dormancy period, one of which is temperature. (Other factors may include stress and too much water/fertilizer applied prior to leaf drop.) In an average season the reduction in temperature during fall (September/October) is gradual. If, however, temperatures are above or below 'average' this may have an impact as to when and how well a tree enters its dormant period.

Temperatures across Alberta in September 2009 were well-above average and this would have had an influence on some plants not fully "**hardening off**" before the cold weather arrived. In other words, the onset of dormancy would have been retarded.

For this bulletin, temperatures were reviewed in Grande Prairie, Edmonton, Red Deer, Calgary and Lethbridge. The highest temperatures recorded for September 2009 were: Grande Prairie 28C, Edmonton 33C, Red Deer 33C, Calgary 32C and Lethbridge 33C. The mean maximum temperature in these five locations was 6.6C above the combined average of 13.6C.*

The above average warm weather continued into the first week of October 2009 and then in all locations plunged to well below 0C. The sub-zero temperatures lasted for a week and were accompanied by strong winds – combined this is called an **advective freeze.** The lowest temperatures recorded during this period were: Grande Prairie -9C, Edmonton -10C, Red Deer -14C, Calgary -16C and Lethbridge -17C. The mean minimum temperature in these five locations was -7.2C below the combined average of +5C.*

The late onset of dormancy, caused by late fall warm weather and the sudden and extreme drop in temperatures will have had an impact on the physiology of some plants and may have caused extensive tissue damage. This is called **Consequential dormancy** and occurs when organisms enter a dormant phase *after* adverse conditions have arisen. This is what, in our opinion, we believe happened in October 2009 – as indicated by leaves frozen in-situ on some plants. The result of the tissue damage was not seen until this past spring, when many plants failed to break dormancy as they normally would.

A compounding factor in some tree & shrub mortality are adverse weather conditions during late winter and early spring periods when plants are coming out of dormancy. Plant growth in spring is stimulated by lengthening daylight hours and slowly increasing temperatures. If temperatures rise too quickly and too early in the dormancy cycle, some plants may begin cell growth too soon. If temperatures drop below freezing after cell development begins, tissue damage is therefore possible.

Weather records indicate that this did happen in most locations this past spring, although it is difficult to know whether this is when the cell damage occurred or whether it was during the fall conditions noted above. Regardless, when combined with all these environmental conditions, many plants were unable to survive and leaf-out this spring.

Another contributing cause of tree mortality is drought. Although 2010 has so far been wet, successive dry years since 2001 have taken a significant toll on a number of tree species throughout the province. Many drought-stressed trees (ash in particular) have also been attacked by an insect called the cottony psyllid (*Psyllopsis discrepans*) and this has further contributed to some tree mortality.

Why do some plants on the same street, even within the same species, have no problem surviving extreme weather conditions while others don't? As a living organism each one will react differently to environmental conditions – it could be genetics, location, injury, stress or even how it was maintained that contributes to how well it survives. Even plant scientists who conduct research into plant hardiness find the answer to this question challenging.

Please contact your local garden centre, contractor or plant supplier for more information.

* Weather data provided by Weather Underground

Information provided by:

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