Figure 5. Late spring frost damage on aspen

Figure 6. Hail-damaged aspen stad

Figure 7. Discolouration along the margins of the aspen leaf affected by drought

Figure 8. Drought-affected aspen in Alberta.

Other Disorders Causing Damage Similar to Aspen Dieback

Late Spring Frost Damage

When frost occurs after new foliage has developed in late spring, most of the young, succulent new foliage dies leaving clumps of the hardened old foliage (Figure 5). This may appear like early stages of aspen dieback but the affected trees will recover.

Hail Damage

Hail damage causes mechanical injury to aspen trees resulting in branch kill. Hail damage injuries to stems are unidirectional depending on the direction of the hail storm. With aspen dieback, no mechanical injuries to tree stems are found.

Drought

Drought-affected aspen trees have leaves with discolouration along the margins (Figure 7). Drought-affected trees recover unless drought is severe or prevails for many consecutive years. Under these conditions drought can lead to aspen dieback.

Impact of Aspen Dieback

- **Biodiversity:** Aspen tree kill due to dieback affects biodiversity by impacting wildlife communities supported by aspen stands.
- **Aesthetics and Tourism:** In the fall, aspen foliage changes colour providing colourful yellow landscapes that attract tourists. Aspen dieback makes those areas unattractive to tourists.
- **Wildlife and livestock:** Aspen dieback denies a source of food and habitat for wildlife. Livestock that feed on aspen foliage are also affected by aspen dieback.
- **Water conservation:** Aspen stands help to conserve water by providing shade to the landscape. Dieback will remove this cover exposing soil to erosion and direct sun that accelerates evaporation of moisture from soil.
- **Wood fibre:** Large-scale tree kill and dieback will affect wood fibre supply unless the dead trees are salvage-harvested before quality of wood fibre deteriorates.

Management of Aspen Dieback

Management of aspen dieback is feasible with backyard trees. Ensure that trees are watered deep along the drip lines during drought periods and in the fall before the ground freezes. For watering, use a hose pipe with a nozzle attachment that penetrates deep into the soil. Applying fertilizer to keep the tree healthy will help it cope with drought as well as pests. Avoid causing mechanical damage that predisposes trees to pest attack.

There is no known cure for aspen dieback in natural stands although regenerated stands seem to cope with stressors better than old stands. Thus, logging and control burns encourage re-sprouting of aspen resulting in young more resilient stands.

Aspen Dieback

Aspen Dieback

Alberta Government

Figure 1.
Aspen dieback

Figure 2. Insect-caused defoliation on an aspen stand.

Introduction

Trembling aspen is the most widespread and abundant tree species in North America. It is also the main native tree in the aspen parkland.

Trembling aspen is important ecologically and commercially. Ecologically, it provides a source of food and habitat for species of wildlife, helps to maintain biodiversity and conserves water. Commercially, it provides wood fibre, improved aesthetics for tourism and recreation, and forage for livestock.

Aspen grows over a wide geographic and climatic range compared to other tree species in Alberta and it is commonly found in the prairies. However, aspen is a water-limited species and it is considered a drought sensitive species. Thus, prolonged, severe droughts can lead to aspen dieback (Figure 1).

What is Aspen Dieback?

Dieback is an often rapid, above ground death of aspen clonal trees that typically leads to stand break-up. Dieback has been observed in aspen throughout North America. Recently, aspen dieback has drawn more attention with its increased occurrence in western Canada and in north-eastern Ontario. With anticipated climate change aspen dieback is likely to increase.

Recently, aspen dieback has been occurring at a landscape level rather than at a stand level. Dieback is also occurring at a faster rate, killing stands in years rather than in decades.

What Causes Aspen Dieback?

The exact mechanism causing aspen dieback is not completely understood. Several factors are known to incite dieback or pre-dispose trees to dieback.

Drought is one of the key factors that causes dieback. Drought affects vascular tissues that transport water and nutrients in trees. It also can affect a tree's ability to produce and store food, eventually leading to dieback. Pests and damaging agents that also cause dieback include: insect defoliators that reduce carbon uptake and food synthesis (forest tent caterpillar, large aspen tortrix, Bruce spanworm), wildlife that damage tree stems (elk, moose, bear, porcupine) and weather events that lead to thaw freeze events (Chinook winds, spring frost) also incite aspen dieback.

Factors that pre-dispose aspen trees to dieback include genetics (clones), regional climate, topography (aspect, dry sites), forest structure, and stand age. Insects and fungal pathogens are attracted to trees stressed by inciting factors such as drought. Insects, fungal pathogens, cankers, and wind-throw become factors that contribute to aspen dieback.

Distribution of Aspen Dieback

Aspen dieback is widespread in western USA and in western Canada where it occurs from stand level to a landscape level. This disorder is common across large areas of west-central Alberta. Since mid-1990s there have been reports of aspen dieback mainly in the southern fringe of aspen parkland of Alberta. Following a severe drought in 2001, an estimated 35 per cent of the aspen in this region have died. Pockets of mature aspen trees showed signs of decline and eventually either parts of trees or whole trees died. Usually, in a given area dieback is more extensive in low lying, south facing slopes, which tend to be the hottest and driest areas as well.

Figure 3. Branch dieback at the early stages of aspen dieback

How to Recognize Aspen Dieback?

Branch dieback, leading to death of aspen trees, is the main characteristics of aspen dieback (Figure 3). This may occur within a relatively short time period (few years) or it may take a long time (decade or more) depending on the site factors, genetics and other pest damage that can contribute to aspen dieback. Within the forest stand, dieback first appears patchy with pockets of mature trees showing signs of decline and eventual tree death. As dieback continues, entire stands will appear either dead or dying. A few years following branch dieback and tree kill, the forest stand will have many snapped tree stems as decay and wind bring the dead trees down (Figure 4).

Figure 4. Aspen tree kill and stand breakup at the late stages of aspen dieback

Additional Information

For further informatioin contact your local ESRD office or call toll free at 310-0000 or visit our website at www.esrd.alberta.ca.

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