

Salt Injuries on Trees

Effects, Prevention, Management

The common practice of using salt for road de-icing and dust control in Alberta has an impact on nearby water and vegetation. Public safety on Alberta roads is paramount, and using salt based products for winter maintenance and de-icing is one way to make sure that roads are safe. According to Environment Canada, well over five million tonnes of salt are used every year on Canadian highways. A City of Edmonton study showed that they use an average of 20 to 30,000 tonnes of salt annually.

Sodium chloride (NaCl) is one of the most used salts of road de-icing followed by calcium, magnesium and potassium chlorides. Each of these salt de-icing products have variable melting temperatures, costs, and impacts on tree and local vegetation. Sodium chloride is one of the most damaging on vegetation as some studies show.

Origin

Plants accumulate salt in two ways during the growing season:

1. Moving vehicles or air currents cause drifts of salt particles to spray, splash or dust trees. You can see effects of the salt in a very short period as the “burnt” areas are on the parts of the trees exposed to the road while areas not exposed to salt spraying are very green. Damage occurs only on those parts of the tree actually sprayed.
2. Roots absorb salt through water. Soils may be naturally salty or may have had salt levels increased artificially. In this case, it takes more time for salt to accumulate but you can see whole trees gradually start to decline and eventually die.

Salt Toxicity Symptoms

Symptoms of salt toxicity include leaf burn and yellowing of the needle points that later turn reddish-brown or reddish-purple, wilting even when moisture is adequate, no flowering, and early fall defoliation.

Measuring Salt Levels

Any soil-testing laboratory can measure salt levels in soil. Salinity in soil is measured as Electrical Conductivity of extract (ECe) in deciSiemens per meter (dS/m). Most trees will grow in soils with an ECe of up to four, but beyond that level their growth is restricted. Only saline tolerant species may grow in soil with an ECe of 8 -16 dS/m and their growth may be only satisfactory. Chloride concentration for drinking water is less than 250 mg/L.

Effects

Salt can damage trees and vegetation up to 200 meters from divided highways, or 35 meters from a single lane highway or a secondary road.



Salt-water spray from roads will cause the needles to brown from the tips inward. Sprayed needles

shed and the branches become barren and die.



Damage is more severe on the side closest to the road and to those branches above snow level. Browning in evergreens becomes evident in late winter and intensifies with time, while hardwood species will

show signs for burning early in the spring. Damage increases with higher volumes of traffic.

Hardwood vs Coniferous

Salt affects hardwood and coniferous trees in different ways. As coniferous trees keep their needles all year round, soil particles end up staying longer on spruce, pines, and other coniferous trees. On hardwood species during winter, soil particles can affect the buds, twigs, and trunk, but because they shed their leaves in this season, the leaf areas

are not affected. In the summer when salt is used for dust control, it could damage hardwood tree species more because they generally have a larger leaf area than coniferous trees. In both cases, if the salt does not directly end up on the



trees, it ends up in the soil where both coniferous and hardwood species accumulate it through the root system.

Prevention

No plants are immune to salt injuries but the speed and extent of the injuries varies. Many factors affect the rate of salt damage to vegetation, including but not limited to:

- Temperature and light – Higher daily temperatures draw more moisture from the trees (evapotranspiration) which increases the salt intake through plants' roots. More exposure to the sun will increase dehydration and cause more "burnt" symptoms.
- Wind will increase the rate of water loss as well as the amount of air borne salt particles on trees
- Humidity and Precipitation – Moisture will decrease dehydration and rain will wash out salt particles from trees
- Soil types and texture – Sandy soil allows more intake of salt water through ground water while clay will keep salt water in the upper portion of the soil
- Water movement – Areas below slopes allow more water movement than flat or depressed areas, which accumulate more salt water.



- Location – Salt injuries are prevalent on the road-facing side as well as the down-wind side.

Salt Injuries on Trees - Prevention

Where soil salt levels are uniform, the entire tree is affected, both in older, well-established trees and in younger ones. Evergreens and shrubs suffer from salt induced browning in saline areas along sidewalks where salt is used to melt snow.



Over-application of fertilizer around trees can also cause salt damage. Salt injury can predispose trees to drought or cold temperature injury.

Salt-Tolerant Species

All species of plants and trees are affected by salt; some are able to tolerate greater salt levels than others.

High salt tolerance: Sea buckthorn and Silver buffalo berry, Austrian pine, Russian olive, Rocky Mountain juniper

Medium salt tolerance: Caragana, Villosa lilac, Snowberry, Spreading juniper, Green ash, Manitoba maple, Ponderosa pine, Hawthorn, Chokecherry, American and Siberian elms, Laurel leaf willow, some apples, and Mountain ash

Low salt tolerance: Colorado blue spruce, Rose, Douglas fir, balsam fir, Cottonwood, Aspen, Birch, Raspberry, Dogwood, Little-leaved linden winged euonymus, Spirea, Larch

Snow often prevents harm as snow-covered branches show less damage from salt injuries.



Management

Management options for the reduction of salt injuries are following:

- It is crucial to plant more salt tolerant species. Less winter hardy plants are more susceptible to salt injuries.
- Plant trees and shrubs further away from roads to reduce the level of salt injuries.
- Understand the biology, habitat, and requirements of each species before planting. Some species can be very invasive and rather than being a beneficial salt intake, could cause more damage to the environment.
- Wash salt off trees in early spring to reduce the extent of injury to sprayed branches.
- Snow fences may help reduce snow drifts rather than pushing the snow into the tree areas
- Give notice to local authorities that you may not need to use spraying for dust control.
- Prune and water plants that exhibit die back. Test your water for sodium prior to watering any tree. Weaker trees will also attract more insects and diseases than healthy trees.