The Plant Doctor's LANDSCAPE TIPS

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DEICING SALT IMPACTS ON LANDSCAPE TREES & SHRUBS

INTRODUCTION

As if we didn't think the problems with Winter weather brings with it the doldrums of the Seasonal Affected Disorder, otherwise known as SAD. Except for cold weather diseases such as snow mold on lawn turf, most diseases and pests are dormant. Hence, most of us can take the winter off and head south where the sun shines bright and we don't become SAD, right? Not so for many of us with year-round jobs!

As we prepare for the coming winter, our communities stock up on deicers, which are necessary to maintain safe driving and pedestrian conditions. While Sodium Chloride (NaCl, a.k.a. rock salt) is by far the most common deicer used, primarily because it is the least expensive, there are other alternatives (Table 1). Because NaCl is the most commonly used deicer, it is also the primary culprit for many plant problems (Photo 1).

SYMPTOMS AND IMPACT OF DEICERS ON PLANTS

Salt generally comes into contact with plants in two different manners: 1) airborne salt spray from vehicular activity on roads, and 2) dissolved salt in water runoff. Once in contact with a plant, salt impacts them by damaging stems, buds, foliage (especially evergreens in the winter) and roots. The "mode of action" by salt is that salt essentially absorbs water, resulting is desiccation of plant parts. This phenomenon is also known, perhaps scientifically, as creating an osmotic imbalance in plant tissues. Most of us have experienced this osmotic imbalance when we've lingered too long in a bath or hot tub. A more acute experience is when we've swam in a salty body of water such as an ocean. Recall the wrinkled skin? The desiccation impacts on plants may range from mild to extreme, sometimes causing severe stunting or even death of buds and foliage or entire plants. While symptoms from deicers may be conspicuous on conifer/evergreen plants during the winter months, the impact on deciduous plants may not be observed until the following spring or summer. Symptoms are usually the most dramatic on the side of the source of the salt.

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Table #1: Deicing Products and Methods

Sodium Chloride (NaCl)	Least Expensive Effective to 16 F Most Phytotoxic of Options
Calcium Chloride (CaCl2)	Effective to -59F Melts Ice to -25F Generally Not Harmful to Plants More Expensive than NaCl
Calcium Magnesium Acetate (CMA)	Effective below 0F Provides Nutrients to Plants Low Phytotoxicity More Expensive
Magnesium Chloride (MgCl2)	Not effective below 5-10F Generally not Phytotoxic Contains a higher % Cl than others More Expensive
Potassium Chloride (KCl)	Lowest Temp Efficacy 12F Generally not Phytotoxic More Expesnsive
Urea	Lowest Efficacy 12F May be Phytotoxic Pollution to Waterways More Expensive
Electric/Water Heaters	Costly

Photo 1: These arborvitae become brown every winter from salt spray from a road (opposite side in this photo). It's surprising these trees have survived and done so well health-wise for so long.

Photo 2: Needle tip desiccation from salt and wind is not uncommon on conifers during the winter months. This needle desiccation may be mistaken for Dothistroma needle blight.

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Photo 3: Leaf Scorch on oak.

Photo 4: Leaf Scorch on maple. In this particular instance, it is believed the leaf discoloration and margin necrosis are due to high soluble salts in the ground water . . . near an automotive proving ground where automobiles were tested for corrosion resistance for decades.

Photo 5: Bud and branch death are not uncommon from salt spray . . . or high soil salts.

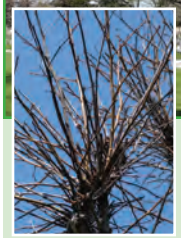

Photo 6: "Witches broom", a proliferation of buds and shoots impacted by salt spray, is not uncommon along heavily traveled roadways. See close-up Inset.

Photo 7: Dieback and decline are not uncommon in many trees as a result of salt exposure. Affected trees such as this white oak may be more susceptible to diseases and pests such as the Two-Lined Chestnut Borer.

Photo 8: Lawns and other plants that are irrigated with high levels of salts in the water from retention ponds and lakes, are more prone to wilt during stressful conditions.

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SYMPTOMS OF DEICER IMPACTS ON PLANTS MAY INCLUDE THE FOLLOWING

Foliar Desiccation (Photos 1 & 2)

Scorch, Needle Tip Burn, Leaf Margin Burn (Photos 2, 3 & 4)

Foliage/Bud/Branch Death (Photo 5)

Witches Broom (Photo 6 & Inset)

Stunted and/or Distorted Growth Fewer and/or Smaller Leaves Dieback & Decline (Photo 7)

Fewer and Smaller Flowers and Fruit Delayed Bud Break Wilting During Hot Weather (Photo 8)

Low Plant Vigor (Photos 9 & 10)

Induced Nutrient Deficiencies (Photos 11 & 12)

Discoloration (Chlorosis, browning, etc.) (Photos 1, 2, 8, 11 & 12)

Root Death (Photo 13)

Early Leaf Drop and/or Fall Color (Photo 14)

Plant Death (Photo 15)

Photo 9: Herbaceous annuals and perennials that are irrigated with high levels of NaCl in the water are likely to exhibit low vigor and unthrifty growth.

Photo 10: These holly shrubs at an upscale outdoor mall receive abundant exposure to salt, which is causing them to be low in vigor . . . some are approaching death.

Photo 11: Deicing salts may not only have a direct effect on plants, but they may also change the pH of the soil and induce nutritional deficiencies as these pachysandra plants can attest.

Photo 12: This Michigan inland lake, surrounded by roads, always exhibits elevated NaCl levels in the spring. Irrigation water pulled from the lake causes severe harm to landscape plants including the large white oaks (Inset).

Photo 13: Root damage and death can result from salt-laden water runoff.

Photo 14: Trees under stress often drop leaves earlier than normal or develop early fall color, such as this maple along a salted roadway.

Photo 15: Plant death may occur from deicing salt. The edge of this lawn has been killed by salt applied to the driveway during the winter months.

Photo 16: Two tools that may come in handy for preliminary tests for deicing salts are the pH meter and solubridge (conductivity meter). The solubridge (top) is especially useful for quickly testing for soluble salts in soil and water.

Photo 17: Although we don't often think about the big picture when diagnosing issues in the summer, a pile of salt-infiltrated snow during the winter can have negative impacts on trees in the summer.

MITIGATING DEICING SALT DAMAGE ON PLANTS

Diagnosis: While it may be common to blame salt on plant problems, an accurate diagnosis should be performed so that any mitigating efforts are fruitful. Part of that diagnosis may involve performing tests to determine if salt is the causal factor. The use of a solubridge and pH meter (Photo 16) in the early spring, before spring rains and irrigation leach away the evidence, is particularly useful. Plant tissues can also be analyzed for the presence of Sodium (Na) or Chloride (Cl), both of which are toxic at elevated levels. Another aspect of diagnosis is knowing where salt is used or piled (Photo 17).

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Photo 18: Various species of plants exhibit differential tolerance/susceptibility to salt damage. Note this differential sensitivity among the white pine and Austrian pine interspersed along this roadway. Despite the severe browning of the white pine needles the trees often exhibit new growth in the spring (Inset).

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Plant Selection: Species of plants vary "treemendously" in their sensitivity to deicing salts (Photo 18 & Inset). Install salt tolerant species where salt deposits are most prevalent. See Tables #2, #3 and #4 for relative tolerance/sensitivity of various plants to deicing salts. Please note that depending on the source, the ratings may vary somewhat.

Alternative Deicers: Even though more expensive, use deicers that are less damaging (Table 1).

Sand Dilution: Use more sand and less NaCl. Diluting pure rock salt with sand will provide good traction while lessening the use of salt and its impacts on plants.

Protection: Install temporary artificial barriers such as burlap.

Water Dilution: Leach problem prone areas in the spring with abundant water.

Salt Remediation: Consider applying a product that has the potential to tie up sodium and/or chloride ions to make them less available for plant absorption. Products such as Bio Char, Sodium Knockout and others make such claims.

Please feel free to contact me with any suspected, interesting cases of herbicide damage to trees, shrubs and landscapes at robertsd@msu.edu.

The author, MSU and MGIA do not endorse any particular products. If using pesticides, be sure to read and follow label directions.

Table #2: Some Plants Tolerant to Deicing Salts
Abies concolor White Fir
Acer pseudoplatanus Sycamore Maple
Aesculus hippocastanum Horse-Chestnut
Caragana arborescens Siberian Pea-shrub
Gymnocladus dioicus Kentucky Coffee Tree
Halimodendron halodendron Salt Tree
Larix decidua European Larch
Larix species Larch
Lycium species Matrimony Vine
Parthenocissus quinquefolia Virginia Creeper
Pinus banksiana Jack Pine
Pinus mugo Mugho Pine
Pinus nigra Austrian Pine, Black Pine
Pinus thunbergiana Japanese Black Pine
Populus canescens Gray Poplar
Populus deltoides Eastern Cottonwood
Rhus typhina Staghorn Sumac
Ribes alpinum Alpine Currant
Ribes nigrum Black Currant
Robinia pseudoacacia Black Locust
Salix fragilis Crack Willow
Tamarix species Tamarisk
Tilia platyphyllos Largeleaved Linden
Ulmus glabra Scotch Elm

Table #3: Some Plants with Moderate Tolerance to Deicing Salts
Abies balsamea Balsam Fir
Acer campestre Hedge Maple
Acer ginnala Amur Maple
Acer rubrum Red Maple
Acer saccharinum Silver Maple
Alnus incana & rugosa Speckled Alder
Berberis species Barberry
Betula sp. Paper, Eurpean White & Gray
Carya ovata Shagbark Hickory
Cladrastis lutea American Yellowwood
Forsythia Forsythia
Ginkgo biloba Maidenhair Tree
Juglans sp. Black & English
Juniperus species Juniper
Ligustrum Privet
Picea abies Norway Spruce
Pinus sylvestris Scotch Pine
Populus grandidentata Bigtooth Aspen
Populus tremuloides Quaking Aspen
Prunus padus European Bird Cherry
Pyrus sp. Pear
Quercus macrocarpa Bur Oak
Salix sp. Black & Laurel Willow
Shepherdia argentea Buffalo Berry
Symphoricarpos albus Snowberry
Syringa sp. Common & Japanese Tree Lilac
Tilia americana American Linden, Basswood
Ulmus americana American Elm

Table #4: Some Plants Sensitive to Deicing Salts
Acer palmatum Japanese Maple
Acer tataricum Tatarian Maple
Amelanchier sp. Serviceberry
Carpinus caroliniana American Hornbeam
Carya glabra Pignut Hickory
Celtis occidentalis Hackberry
Cercis canadensis Eastern Redbud
Chamaecyparis pisifera Sawara False-cypress
Cornus sp. Dogwood (most)
Corylus avellana European Filbert
Crataegus sp. Hawthorn (most)
Euonymus europaea European Spindletree
Fagus sp. American & European Beech
Gleditsia triacanthos Honey-Locust (also tolerant?)
Kolkwitzia amabilis Beauty Bush
Liriodendron tulipifera Tulip Tree, Yellow-poplar
Lonicera sp. Honeysuckle
Malus sp. & cultivars of Apple, Crabapple
Metasequioa glyptostroboides Dawn Redwood
Pinus cembra Swiss Stone Pine
Pinus resinosa Norway Pine
Pinus strobus Eastern White Pine
Platanus sp. London Plane & American Sycamore
Prunus sp. Peach & most Cherry
Pyracantha coccinea Scarlet Firethorn
Quercus sp. Swamp, White, Scarlet, Chinkapin, Pin & English
Rosa sp. Rose (most except rugosa?)
Salix alba 'Tristis' Golden Weeping Willow
Sambucus sp. Elderberry
Sophora japonica Japanese Pagoda-tree
Spiraea x bumalda Bumalda Spirea
Symphoricarpos orbiculatus Coralberry
Taxus baccata English Yew
Tilia cordata Littleleaf Linden (also tolerant?)
Tsuga canadensis Canada or Eastern Hemlock
Viburnum sp. Viburnum