Shearings

Spring 2015

Greg & Jan Davagian & Family with Commissioner Watson (2014) at Davagian Tree Farm for the Annual tree cutting ceremony

Massachusetts Christmas Tree Association
www.christmas-trees.org

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ORGANIZATION & INDUSTRY NEWS

Can you see above the snow pile yet? With any luck, sunshine and warmer weather will fade the memories of bitter cold temperatures and the "epic" snow-ma-gedeon" winter of 2015. The shovels are curled, worn to fibers, and everyone got lots of exercise and extra reading time. It's nice to set records, and thankfully Mother Nature held off the bigger flakes until well after Christmas. Can you image all that snow in December? With a few prayers, she'll forgo any spring surprises, and get us back to a "normal" spring. Be sure to check out Umass Extension's 1st Landscape Message on March 13, 2015, giving us the vivid details of "That's the way it was".

From early reports, Christmas season of 2014 started off with a bang, and continued into the first weeks of December. Our website was humming along, and it seems the economy picked up in our favor. We have yet to see the results of the National Survey of Consumers, but hope to have the *details* in the next few months.

Green Friday. Hosts Greg & Jan Davagian of Davagian Tree Farm of Sutton, MA get a special "Thank you" for kicking off the Christmas season with Dept. of Agriculture, Commissioner Watson (2014) in the traditional Cutting Ceremony on November 28, 2014. The Colorado Blue Spruce was cut and donated to the Sutton Town Common, from the Sutton Garden Club. Jan presented the Commissioner with one of her decorated wreaths and a jar of her homemade wild grape jelly. It was a beautiful day and lots of fun. All this was coordinated by Rick LeBlanc, of the Massachusetts Dept of Agriculture and great supporter of *Mass Grown & Fresher,* in getting the word out on cutting your own tree to consumers.

To date, there are three (3) twilight meetings scheduled for June. The dates, times and places will be send to you sometime in May, giving you enough time to plan an evening off, in your busy schedule. Our annual meeting is tentatively scheduled for mid-late August.

Calendar

March	30	NCTA Webinar 7:00 pm "Key's to Accounting"
April	8	MCTA Director's Meeting Chicopee, MA
May	28	Weed Walk About Arnold Arboretum, Boston Umass Education Event
June		Twilight Meetings - TBA
June	27	NH/VCTA Spring Meeting Purinton Farm Huntington, VT 8:30 – 3:00
July	9-11	Penn CTGA Summer Meeting Pioneer Evergreen Farms Orwigsburg, PA
July	17 - 18	CTFA NY 2015 Sumer Meeting Bob's Trees Galway, NY
July	23	NCTA 1-Day Seminar Richardson's Farm Spring Grove, Illinois

NATIONAL NEWS

The Check Off Program Update for 2015:

Announcement of official board selection is pending. Check-off program due to start this year.

Trees for Troops

This year, Trees for Troops® provided 18,032 free, real Christmas Trees to military families and troops, bringing our total since the inception of the program to more than 157,000 trees. This year's trees were delivered by FedEx to 63 military bases in the U.S. and overseas, covering every branch of the armed services.

Consumers supported Trees for Troops by donating funds or by visiting the 30 farms and retail locations across the country that hosted Trees for Troops Weekend on Dec. 5-7, 2014. A total of 6,406 trees were donated from consumers. and delivered to U.S. military bases by Fed Ex. For statistical information go to http://ww.christmasspiritfoundation.org/dnn/Donate/2014TreeDonors.aspx

Wreaths across America, celebrated its 150th Anniversary at Arlington National cemetery. Their goal was to place 230,000 wreaths across America on as many veteran's graves as possible. They had an overwhelming group of volunteers to help. They are waiting to get the final numbers of how many were place, but are sure it exceeded 2014.

Dying of Thirst

The Impact of Road Salt and Deicers on Conifers

The snow events for the winter of 2014-2015 in the Northeast will undoubtedly be one for the record books. With it brings a two-fold amount of road salt, salt spray and de-icing agents used to keep us safe, may be more detrimental to our trees, the vegetation surrounding it, the soil and water that supports its overall health. Salt's adverse effects conifers and deciduous trees have been known for a long time. In an average snowfall year, a single lane of well-traveled highway can receive 40-80 tons of rock salt per mile.

Incidents of vegetation injury were first reported in Minnesota during the 1950's, when trees along city boulevards started to show signs of salt-related decline *(French 1959).* At about the same time, the New Hampshire Highway Department reported the death and removal of nearly 14,000 trees along 3,700 miles of salt-treated highways. *(Sucoff 1975)* Salt-weakened trees are more susceptible than healthy trees to be attacked by insects and pathogens, and can also fall prey to environmental stresses, such as drought, wind and ice.

How Salt Damages Trees

All plants become injured when roots and foliage are exposed to salt-laden water. The general mechanisms of road salt damage to trees primarily enter through two pathways: a) increased salt concentration in soil and soil water, which can result in salt absorption though roots, and b) salt accumulation on foliage and branches due to splash and spray. Factors such as temperature, light, humidity, wind, soil texture and drainage, precipitation and water availability to each demographic location contribute to the degree of salt injury. Man made factors for consideration include vehicle exhaust emissions and alterations in drainage patterns of the roadway.

Infiltration of Salt into Soil & Water

The infiltration of salt into soil depends on site specific factors, such as slope of roadside, direction of drainage, type of highway drainage system, (if present) soil type, vegetative cover, presence of snow and ice, and precipitation.

The downward transport of salt through soil is often slow and dependent on the drainage, or infiltration, characteristics of the soil. Sand, gravel, and course pictured soil allows fast infiltration, whereas clay and fine textured soil slow infiltration *(Jones et al.1986).* Chloride moves through soil faster than sodium and is thought to be more harmful than sodium to vegetation. When absorbed through roots, chloride tends to accumulate in plant tissues over a long period of time, causing osmotic stress, which can lead to dehydration injury typical of drought. Chloride ions are negatively charged and are repelled by similarly charged clay and other soil particles. Sodium ions, which are positive, undergo ion exchange with other positive ions in soil particles, which results in retention of higher percentages of sodium in soil, especially if infiltration is slow *(MD Dept of Transportation study 1987).*

Studies of sodium and chloride levels in soil generally indicate that the greatest concentrations are found within 5 to 10 feet of pavement edge. However, depending on local conditions, impact areas can be more extensive. For instance Hofstra and Smith reported higher than background concentrations of sodium and chloride as far as 30 ft. from the roadway *(1968).* Chloride is generally considered less detrimental than sodium to soil. High concentrations of sodium and chloride are not usually found if it dips below 1 to 3 ft. In some cases all concentrations of sodium chloride are leached from soil by late spring or summer; in other cases leaching is slower and

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Dying of Thirst continued

sodium may accumulate for several years. *(Prior & Berthouex 1967-1968: Hutchinson & Olson 1967,Hanes et al. 1970).*

Sodium accumulation and impact on vegetation is less direct, although high concentrations can alter soil structure, diminish permeability, and increase the alkalinity of the soil. A complete loss of permeability is unlikely, as highway runoff and precipitation often facilitate sodium leaching. Sodium can increase the compactness of clay soils and cause the dispersion of suspended particles in the soil that are important for improving percolation and aeration (Jones et al. 1986). Sodium can increase soil alkalinity by reducing the exchange capacity of the soil, thereby reducing levels of calcium, magnesium, and other nutrients that are important for soil fertility and vegetation growth. In the root zone, water molecules are held very tightly by salt ions, making it difficult for roots to absorb sufficient quantities of water. In sensitive species, this increases the water stress, thereby causing "physiological drought" or "Dying of Thirst" resulting depresses growth and yield.

Salt In Water

In most part of the country, fresh water contains low salt concentrations. Average chloride concentrations in freshwater lakes, streams and rivers are 0 - 100mg/L, and most concentrations are lower than 20 mg/L. *(Goldman & Horne 1983).* However, salt and its components, sodium and chloride, can access freshwater through numerous sources as shown in Table 1.

Table 1: Type of Water	Chloride Concentration (mg/L)
Rainwater	0-2
Upland Surface Water	0-12
Unpolluted River Water	0-15
Spring Water	0-25
Deep Well Water	0-50
Sewage Water	70-500
Seawater	20,000

During the past 30 years, salt runoff from highways especially from salt storage facilities, has been identified as a source of salt in surface water. Alterations occurred in plant communities in wetland and roadside bogs that were adjacent to uncovered salt storage piles. In recent years, greater attention to salt storage practices has reduced the incidence of storage related contamination in surface water.

Salt tolerance in many prominent wetlands species, such as cattails, is high*. (Anderson 1977)* Currently, the State of Massachusetts applies an alternative to salt, in the form of calcium magnesium acetate, on highways adjacent to cranberry bogs. The policy stems from a state agency ruling that prohibits the use of chloride deicers on this section of highway. (*Massachusetts Dept of Public works)*

During and after storms and during spring melts, highway runoff may contain high concentrations of sodium and chloride. For instance, chloride concentrations higher than 10,000 mg/L have been reported in Ontario and Wisconsin during early spring thaws near large roadside snow banks. Ordinarily, however, even high concentrations of sulfur quickly diluted when they enter large lakes and waterways. Generally, smaller roadside streams and creeks are more likely to be affected. The magnitude of the impact depends on factors such as water flow, salting intensity, precipitation, type of highway drainage, topography, and natural drainage patterns.

A study of 28 streams in Sierra Nevada found noticeably higher chloride concentrations at stream locations that crossed salt treated highways then at upstream locations far from the highway. Studies of small creeks and drainage basins in Illinois and New York found maximum chloride concentrations that exceeded 500 mg/L during late winter and early spring thaws. In contrast, it was found that the effect of road salt on sodium and chloride levels in seven Maine streams and rivers was compensated for by the increased flow associated with spring snowmelt. *(Hutchinson 1970)*

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Dying of Thirst continued

Like most studies of salt impacts on the environment, investigations of lakes, streams, and rivers impacts have been site-specific, and findings have been largely circumstantial. Evidence, however consistently points towards the general conclusion that salt concentration diminish rapidly as water volume in distance from the roadway increase. Hence, small streams and creeks run adjacent to heavily traveled, salt treated highways are more likely to be affected by salt runoff than larger streams and rivers, which are likely to experience comparatively minor impacts.

There is some evidence from laboratory experience that chloride passing through soil contributes to mobilization, to groundwater, of some heavy metals, such as cadmium, sink, and led, but field evidence of this effect is limited. *(Hahne & Kroontje 1973: Amrehein & Strong 1990*). A recent field study in southern Ontario found that concentrations of heavy metals in groundwater beneath roadside soils were similar to those in non-highway locations *(Pilon & Howard 1987).*

Salt Accumulation on Needles, Foliage and Branches

When salt particles may be deposited on foliage in twigs due to splash and spray from traffic and wind, physical breakdown of plant the results because of the added weight of the salt deposit, but tissue damage due to local dehydration is more common. Damage increases with the amount of salt applied and with traffic volume and speed; decreases rapidly with distance from the roadway.

The slope of a roadside is added key factor in determining where salt reaches vegetation either from splash or spray or root absorption. In a 1990 study of the Lake Tahoe basin, the percentages of salt exposed trees were compared on steep, gentle, flat, uphill, and downhill slopes. The mean percentage of salt exposed trees on steepest downhill slopes was significantly greater than on all other slope types; 50 % of trees on steepest down slopes were affected by salt. The zone of salt exposure ranged from 17 ft. from the pavement

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edge for flat slopes to approximately 53 ft. for steep downhill slopes. Overall, the mean zone of exposure was 36 feet from pavement edge for downhill slopes and 22 feet from uphill slopes.

The correlation between salt exposure and roadside slope has been widely discussed. Exposure distances also vary according to other factors, such as drainage, traffic levels, wind and weather conditions and the intensity and frequency of salt treatments. The Connecticut Dept. of Transportation found that airborne salt traveled as far as 300 ft. from the roadway under heavy traffic conditions on Interstate and other primary highways. And, salt spray can be transported downwind for greater than 500 ft. under high wind conditions *(Chung 1981).*

Contributing Factors

Even when exposed to high salt concentrations, the degree of damage depends on many other factors.

- Temperature: the effects of salt are compounded by higher temperatures, which can increased dehydration through foliage, faster movement of salt to the plant, and increased salt absorption through groups.
- Light: Exposure to direct light increases the rate of dehydration.
- Humidity: High humidity lowers the rate of dehydration and, therefore, helps alleviate water stress.
- Wind: Exposure to wind may increase the rate of dehydration. In general, more damages found on the windward side of trees than elsewhere.
- Soil water: As salinity increases, the soil water available to plants decreases. High concentration of salt in soil can cause more injury when soil water is limited because of below normal precipitation.
- Soil texture and drainage: The ability of soil to retain salt is partially determined by soil texture and drainage characteristics.

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Dying of Thirst continued

For example, course textured soils are quickly leached of salt, and steep slopes may not absorb salt

- Precipitation: Rain and other precipitation are transport mechanisms for salt. Rainfall can flush salt deposits from foliage and dilute salt solutions in soil water. On the other hand, precipitation can transport salts, via surface runoff, to roadside soils.

The type and condition of roadside vegetation also affect degree of salt damage. Different tree and shrub species have varying tolerance for salt, and within species, plant maturity and size affect salt tolerance. The sensitivity of various groups and species is summarized in the following section.

Damage to Deciduous and Conifers

Generally, the trees that are most sensitive to salt are broadleaf species, such as Linden, black walnut, and sugar and red maples. In roadside maples, the levels of chloride greater than 0.5% dry weight of plant tissue have been highly correlated with moderate damage to leaves (e.g., discoloration) and levels of 1 to 2% have been associated with severe leaf burn, defoliation, and even plant death. Among conifers, chloride concentrations of 1% in the needles of red and white pine have been associated with extensive plant injury.

Conifers damaged by salt spray show the greatest damage in early spring. On branches facing the road starting from the tips, needles become yellow or broken and perhaps drop off. Soil salt causes the needles of conifers to take on a blue-green cast. Deciduous trees affected by salt spray can develop tuft-like "witches brooms". Bunches of lateral branches grow to compensate for a terminal bud that was killed by salt.

Salt spray damage can occur in trees that are up to fifty feet from a fast moving, salted road or highway. Salt spray will damage exposed branches more severely than branches covered by snow. Suspect soil damage in trees that near salted streets and sidewalks as well as commercial trees that have been injured by salt exhibits clear physiological symptoms, including leaf scorch, late summer coloration, early fall defoliation, reduced shoot growth, and dying twigs.

A study in Ontario found that trees within 35 m (about 100 ft.) of the pavement showed growth reduction trends, whereas trees more than 75 m (200 ft.) away did not. *(Hall et al 1972)* A study of the effect of sodium chloride on Ponderosa pine and Greenleaf Manzanita in the Sierra Nevada found few damage trees beyond 40 feet of the roadway. *(Gidley 1990).* Another study found the chloride concentrations in Maple tissue from New Hampshire roadsides or above normal only within 30 feet of the pavement edge *(Lacasse & Rich 1964).*

In response to concerns about increasing tree mortality in the Sierra Nevada, state highway agencies in California and Nevada studied a 64 mile corridor of highway in the Lake Tahoe basin.*(1990)* The corridor, which extended 100 ft. on both sides of the roadway, had approximately 150,000 trees (2,400 trees per mile), of which an estimated 10% to 15% or 20,000 trees were affected to some degree by salt. This estimate was based on 206 sample wood lots that contain 5,450 trees. Of the sample trees, 55% did not exhibit any signs of salt injury, drought, disease, insects, or mechanical damage. Of the 10% to 15% of trees affected by salt, about one third showed signs of other types of injury or diseases as well.

Trees that are tolerant of salt tend to retain less chloride as a percentage of tissue weight. (See Table 2) For salt sensitive trees, distance from the roadway helps explain salt damage. It was also concluded that densely wooded areas located downhill and within 40 to 60 feet of heavily traveled, salt treated highways are primarily candidates for salt related damage.

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Table 3: ***Provides tolerances for resistance to salt spray, soil-borne salt, and salt from other sources (including uncommon or rare sources such as naturally saline water and salts from home plumbing water systems, salt generated pool and filter discharge)***

Reported Salt Tolerance of Christmas trees and common conifers

Plant Name	Salt Spray	Soil-Borne Salt	Other Salt Source
Abies balsamea **Balsam Fir**	M	S	M,S
Abies Frasier **Fraser Fir**	M	M	-
Abies Concolor **Concolor Fir**	T	-	-
Pseudotsuga menziesii **Douglas Fir**	M,S	M,S	M,S
Abies Intermedii **Cannan Fir**	M	M	-
Abies Koreana **Korean Fir**	M	M	-
Abies Procera **Noble Fir**	T	T	T
Abies Grandis **Grand Fir**	M	M	M,M
Picea glauca **White Spruce**	S	M	M,S
Picea pungens (Glauca) **Blue Colorado Spruce**	T	-	T, M
Picea pungens **Colorado Spruce**	-	M,S	-
Picea Abies **Norway Spruce**	M,S	S	-
Pinus mugo **Mugo Pine**	T	T	-
Pinus nigra **Austrian Pine**	T	-	T,M
Pinus ponderosa **Ponderosa Pine**	-	M	T,M
Pinus resinosa **Norway Pine, Red Pine**	S	S	S
Pinus strobes **Eastern White Pine**	S	S	S
Pinus sylvestris **Scotch Pine**	M,S	-	T,M,S
Pinus thunbergii **Japanese Black Pine**	T	-	-

Key:
T = Tolerant M = Intermediate S = Sensitive -- No information Available

Dying of Thirst continued

Understanding Brine

It is a known fact that there are big differences between ice melters. A decier's speed of action depends on how fast it becomes brine as this depends on how quickly it takes up moisture. This depends on temperature, the freezing point of the brine, and the nature of the material used.

Sodium chloride, potassium chloride, and urea must come in direct contact with moisture before they can dissolve into a effective brine.

By contrast, calcium chloride and magnesium chloride readily attract moisture from the atmosphere to form brine very quickly. Calcium chloride attracts more moisture under a wider range of conditions than magnesium chloride, that is why it is used more readily. Calcium chloride and magnesium chloride generate heat as they go into solution. They create what is called a *exothermic reaction.* A pound of calcium chloride generates 290 BTU's as it dissolves – enough heat to raise the temperature of water by 35^{o}F.

Rock salt must draw 39 BTU's to go into solution. Potassium chloride requires up to 170 BTU's, and Urea requires 106 BTU's. These materials absorb enough heat to lower the temperature of the same gallon of water by 5^{o}F, 20^{o}F, and 13^{o} F. respectively. Under "practical conditions", when temperatures drop much below freezing, the rate of heat slows to a point that brine production is minimal.

Eutectic temperature is the lowest temperature at which de-icier brine can dissolve ice. It only applies

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Dying of Thirst continued

to a specific concentration of a de-icer in water. The longer it takes for the brine to be created and to linger on the target, the more concentrated the brine. Which inevitability, as a concentrate, translocates into plants and trees.

"Witches'-brooms" is a common condition along roads because of salt spray injury

Table 3 compares the action of common deicing materials and their relative effectiveness on ice and snow and the environment.

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Table 3:

De-icing Products	Eutectic Temperature	Lowest Practical Temperature	Characteristics
Calcium Chloride ($CaCl_2$)	-59°F	-25°F	• If used as recommended, will not harm vegetation • More expensive than sodium chloride
Calcium Magnesium Acetate (CMA)	-0°F	20°F	• Made from dolomitic limestone & acetic acid • Provides needed nutrients (Ca, Mg) for plants • Low toxicity and biodegradable, does not form a brine • Most expensive, best results at 20° F
Magnesium Chloride ($MgCl_2$)	-28°F	+5°F	• Will not harm vegetation, if used as recommended: however, $MgCl_2$ contains 17-56% more Chloride ion • Less irritating to skin • Less corrosion on metal surfaces; safe protects concrete from spralling. • Environmentally safe around animals, humans & vegetation • Magnesium brine is an effective road salt pre-wetting agent • More expensive than sodium chloride
Potassium Chloride (KCL)	+12°F	+25°F	• Will not harm vegetation but depletes nutrient balance • More expensive than sodium chloride
Sodium Chloride (NaCl)	-6°F	+16°F	• Can soften ice at lower temperatures • Inexpensive and effective. Damaging to plants, high toxicity • Least expensive de-icing product
Urea (fertilizer)	+11°F	+25°F	• Potential harm to vegetation & ground water with nitrates. Urea is 46% soluble nitrogen. • Could cause nitrogen pollution to ponds & waterways • More expensive than sodium chloride
Potassium Chloride & Urea	+11°F	+12 °-+15°F	• Common ice-melter that are often perceived as safe products to use around vegetation. Both need to be used. • Less corrosive and safer for use on concrete containing rebar and around steel structures. This is one of the preferred ice-melt for airports.

Second Year Shearing on Freeze Damaged Fraser Fir Revisited

Reprinted from Limbs and Needles-Summer 2003
Written y Jeffrey H. Owen
Christmas Tree Extension Specialist
NC State University

Two consecutive winters of harsh winter wind, single digit and sub-zero temperatures and deep sustaining snow cover will surely bring additional challenges to most farmers in the Northeast. We may see above-snow-line damage to whorls and budsets as well as girdling at and below the snow line from hungry deer and rodents. This second year rehabilitation effort will create additional time and labor for this year and years to come.

Higher elevations of North Carolina, are more likely to experience similar freeze damage to New England this year from the harsh winter.No matter what the cause of hard freeze damage to Christmas trees, especially Fraser Fir, the solutions to rehabilitating Frasers and other conifers will be the same.

In 2003, Dr. Jeffery Owen of North Carolina State University Extension did an interesting pruning study. A revisit of his experimentation and findings could help guide us in rehabilitating the winter damage to our budsets and top whorlsl. Here are his findings.

Fraser Fir Christmas trees damaged by freeze will need special care in pruning and shearing in the second year after the freeze, if they are to be rehabilitated. The kinds of corrective pruning that is necessary, such as the removal of multiple tops and horns, will be magnified as the entire tree responds to previous year's injury in this year's growth. As buds are even elongating, you'll see many more than usual are vertically orientated and are destined to produce a horn that will need to be removed. In addition, but set in many areas is so heavy that the resulting growth will produce a "witches broom" that will either need to be put back to a few shoots or be removed completely.

In most cases, growers will contend with too much growth as opposed to two little growth from the previous year.

Selecting the Top

Most freeze damaged trees appear to have but that will make a new top. However, those terminals that were severely damaged last year may be so weak that any shoots emerging from them will also be stunted. A basal shoot or central chute off of a lateral branch might produce a more reliable terminal under such conditions. Fall the vigor in the tree as much as possible. As in any tree, where there are choices among shoots; select a top that has good vertical orientation, height, and budset along its entire length. The best top is not necessarily the highest shoot. Take time for careful examination. By the end of June buds can be seen or at least felt if lightly grasped by the hand. Select a terminal bud at about the right height only if the shoot has straightened adequately. If the top still needs to straighten, leaving the natural bud on it until mid-to-late August will aid in that process.

The rule-of-thumb has always been that once you select the best top, all other terminal shoots should be removed. This usually hasn't taken long since most pruned Frasers only put up about three tops on average. This year could be different. Looking at bud angle and size, my fear is that many lateral branches on freeze-damaged trees will turn up as multiple paths or horns. If you lose too many laterals as horns that have to be cut out, it could leave the top to open. It would be better to pick a lower shoot on last year's terminal to avoid leaving a gap.

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Dying of Thirst continued from page 12

Reducing the Brine

There are many De-icing alternatives available for use in and around your farms *(as shown in Table 3).* However, alternatives are more expensive than salt. Unfortunately, salt remains the preferred method because it's lower cost, availability and efficiency in melting snow and ice.

Assuming that the use of salt to de-ice roadways will not change greatly, there still is some management techniques that could be used to minimize damage to trees from salt.

1. All trees are affected by salt to some degree. Plant trees that are relatively tolerant to salt, (and maybe more than one row) in locations where salt accumulation, melt-water runs off, and salt spray from vehicular traffic near roads occurs.
2. Avoid salting roads and pathways when trees are active, particularly in the fall and spring, even if there is snow. In late October and early March, many trees in upper New England and New York take up nutrients when the ground has thawed. Dormant trees are less likely to be harmed by salt.

3. Irrigate soils to leach sodium and chloride before spring growth. A saline soil condition is relatively easy to correct. Since most salts are water soluble, applications of water will effectively leach salts out of the symptoms. A general formula suggests that 6 inches of water should be applied to leach out about half soluble salts. Leach potassium and magnesium can be replaced through an application of fertilizer.

4. Apply gypsum (calcium sulfate) to soils that are high in sodium. The addition of calcium displaces the sodium and lessens the dispersion of soil particles and the loss of soil aggregates, improving soil aeration and drainage.

5. Avoid sites at high risk from salt injury by planting trees away from salt spray drift zones in areas where salt-laden brine and slush are likely to accumulate. Plant tolerant trees at least 60 feet away from roadside. Trees that are closer stand a higher chance of being affected.

6. Plants that are injured and exhibit dieback should be watered, proved and fertilized. Mulch should be applied to reduce water loss. Weakened or stressed trees are often attacked by insects and diseases, and may eventually die.

7. Design or engineer site to minimize salt spray that is deposited on trees. High density fabric snow fencing, drainage ditches and ridges to limit the amount of snow and salt that can reach trees. Plant high tolerant plant and shrub species, but remember severe salt can still damage or kill ever salt-tolerant plants – the dose makes the poison!

Resources:

"Road Salt Impacts on the Environment": SP610-12M-7/03; University of Tennessee Institute Agriculture, Cooperative Extension Service, Division of Forestry.

"Tree Susceptibility of Salt Damage." Wayne K. Clatterbuck. Associate Professor, Agricultural Extension Service, U. of Tennessee. 2006.

"Salt Damage to Landscape Plants": ID-412-W: Perdue University, 4/09 J. Beckman, Dept. of Botany and Plant Pathology; B. Rosier Lerner, Dept. of Horticulture and Landscape Architecture, Perdue University.

National Highway Research Program, "Strategies to Mitigate Impacts of Chloride Roadway Deicers on the Natural Environment" Synthesis 449, 2013.

"Impact of Road Salt on Adjacent Vegetation" March 20, 2013 Rutgers University, New Jersy Agricultural Experiment Station.

Yates County Master Gardeners "Dying of Thirst, How Salt Damages Tress" xynth.com/resource/icemelter-enviro/

"Plants & De-icers" Peters Chemical Company, Hawthorne, N.J.

Second Year Shearing continued from page 13

Top to Lateral Branch Ratio

In this study**,** many freeze damaged trees entered 2003 with a short, damaged top and heavy "shoulders" in the top whorl of lateral branches. The ideal 2:1 balance between top and laterals was shifted in these trees from terminals to the branches. Tops on such trees continue to lose their natural dominance. Horns proliferate around the base of the terminal and on lateral branches. The central leader weakens further and may die back. With freeze damage, a short top may be unavoidable, but you should trim the laterals accordingly. Try to approach the 2:1 top-to-branch ratio even on damaged trees.

However, remember that cutting the top and lateral branches sets the shearing cone for the entire tree. Short tops and short laterals are followed by hard shearing I can remove an excess amount of growth. Do not cut so deep into a tree that it becomes a salvage cut into old wood or leaves most foliage with few remaining buds. Hard cuts this year will often produce horns the following year. A little imagination regarding the ability of terminal shoot to catch up to normal length lateral branches can be important to preserving next year's potential for growth. Sound pruning and shearing is important part of rehabilitation of such trees, but working with the natural vigor of the tree is equally important.

Corrective Pruning:

A well shaped Fraser fir has a simple symmetry with branches radiating out horizontally from the trunk with only little shoots growing vertically from the dense branches. Many freeze-damaged trees have over-compensated for the loss of dominant shoots in the top of the tree and on the end of every branch. Shoots that should have grown horizontally have become vertical horns were strong diagonal cross-overs. Where three shoots should have existed more than a half-dozen develop. Ideally, all of this abnormal growth should be cut out. Realistically, dominant horns, crossovers, or witches brooms need to be removed. The most vigorous growth will occur in the top third of the tree requiring the greatest attention, but horns may show up all the way down to the bottom whorl in freeze-damaged trees. Cutting them out this year could prevent a whole developing in the normal foliage behind them next year.

Field conditions are seldom as simple as a recommendation on paper. While cutting out abnormal growth is appropriate, the assumption is that "normal" growth is present to fill the gap. This may not be true on the worst damaged trees. For instance, a horn might cover a bare side of a trunk that has no shoots or developing buds to fill it in. Rather than cutting the horn our completely, it could be cut back to a whorl of lateral branches that can be fill the bare spot. Similarly, if the only growth to come out on a branch is a witches broom, thinning would be more appropriate than complete removal.

Timings:

Last year, early pruning yield no great advantage because shoots took longer to commit to their new relative position on the tree (such as a lateral shoot turning up to replace the freeze-killed terminal) and early pruning was likely to be too severe. In a Mitchell County (NC) study, tree response was often other than what was expected such that much of the early pruning was bypassed by vigorous growth lower on the tree.

However, the second year after freeze damage can be characterized by an excess rather than a deficiency of growth. Barring a climatic event, early pruning could help some freeze damaged trees to grow better. Early pruning has the advantage of being done on tender growth that can be rolled out with fingers and thumb. Since the focus will be on removal of entire shoots where

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Second Year Shearing continued

density is too great, the work could begin shortly after budbreak is complete in late May or early June.

Where trees have witches brooms or excessively dense branching, these areas could be thinned out by hand. More nutrients and water would then be committed to remaining shoots to yield more normal and less stunted growth. Where trees have produced an excessive number of horns, their early removal will shift resources to horizontally-orientated growth on branches and to select leaders where they occur on the terminal.

Early work should be focused on these problems of vigor in the wrong place or direction and not on regular pruning and shearing.

When immature shoots are pruned, a depth of cut takes more potential growth than if the shoot were allowed to approach maturity in late June or early of Fraser fir, wait until new growth is at least 75-80% of the length of last years' foliage. Foliage should be still enough to exhibit a clean perpendicular cut from the knife. Thus, working freeze-damaged trees will likely require more than one trip to the field to maximize potential gain of each tree.

In Conclusion:

While many of us know a little more about rehabilitating freeze-damaged trees than in previous years, the second year is very different from the first year after a freeze.

Much of this study was based on observation of budset and bud angle on damaged trees over a year and into the following spring. There rehabilitating freeze-damaged in Fraser firs is an ongoing process and requires continuous study of budset growth in successive years.

Cultural and Pest Management Update for Christmas Tree Plantations October 2014

By Tom Rathier, Retired Soil Scientist
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Drought has received a lot of nationwide attention this year. It's no wonder. Huge regions of our Western and Southern states have been drastically short of rainfall and it hasn't been just this year. Some areas have been substantially short of rainfall for more than 10 consecutive years. Large portions of historic national force and landscapes have been lost to say nothing of the significant shortages of domestic water supplies. There is no shortage of causes presumed or expressed in both scientific and popular settings by all sorts of experts and non-expert's, far too confusing for me to even guess. The one thing I am sure of is that we here in the Northeast and north-central states that had a very little to complain about when it comes to moisture challenges.

Okay – so we have some complaints – even this year. We did have a drought this year. It was kind of mild and sort of sneaky, with you drastic symptoms but problems, nonetheless. The sneaky aspect is the fact that we had pretty good early spring which came on the tail of a reasonably voiced 2013 (all rainfall data in this update have been implied from the Valley Labs weather records). June was a little week with only 2.5 inches in five events but things bounce back in early July with over 3 inches in six events by July 15. Trees were in great shape with good new growth to go with at least two years of good growth behind that. What could go wrong? Not too much, really, but we did have a couple of scary. As the summer progressed.

In the 27 pretty warm days of July 15 to August 12, only 0.63 inches of rain fell in four events. We had 2.25 inches on August 13 which was helpful but then went another 47 mostly hot days until October 1 with 1.65 inches in five events. Adding up all the rainfall from mid July to October 1 is us a pretty decent total but those two big hot, dry stretches to at least a moderate toll on plenty of trees.

Most of the drought injuries we've seen this fall are an older growth, usually 2 to 4 years old. The generally accepted terms for this sort of injury is called interior needle loss. My favorite term is forgotten growth browning. With woody plants, there is nothing more important for their health than the new growth that emerges each spring. Included in the new growth is the young stem tissue that will become structural woody parts and foliar tissue that will become the leaves or needles that capture sunlight to produce the carbohydrates necessary for growth (photosynthesis). Water and nutrient supplies are sent from roots to the youngest tissues in greater proportions than to any other part of a tree to bolster establishment and support the most active photosynthesis.

Conifers, like all evergreen plants, favored their newest growth but also support all the foliage from previous years. When water supplies are strong (and roots are functioning properly), there is enough moisture to support foliar growth and activity throughout the tree. But when water is in shorter supply and there's not enough for everything, some older foliage may be abandoned. The oldest foliage on any conifer is further back on branches and further away from sunlight – the least productive when it comes to photosynthesis – forgotten growth. So, when it's dry, trees shut down their older growth and leave it to discolor and eventually fall off, leaving the healthiest foliage to continue the task – forgotten growth reminding us that it still has some importance.

Effects are usually most noticeable on larger trees because of the sharp contrast between browned needles and healthy needles, but the real concern should be about younger trees with one year's worth of needles. If you are needles in total, the lost of one year's production will likely represent a greater needle percentage loss. These trees will have a harder time because, in addition to fewer

needles, their root systems are still immature and likely unable to take up enough water to support recovery. They could not lose more than one year's growth in may even fail completely.

Any success in limiting needle loss is usually due to timely irrigation prior to and during the drought period(s). Attempts to irrigate when the Browning shows up will help the trees but probably not reverse the Browning. Trees (or blocks of trees) that are showing the symptoms could be tagged in the event that similar drought conditions return next year. A survey like this could reveal the areas where symptoms occur and provide clues about how different soil types for factors like sun exposure, slopes and cultural practices may play roles in the problem.

It's difficult to save needle loss will worsen as the season progresses but if it does, it will likely not be due to water shortages through the fall. I'm finishing this update on October 23 on a plane to Italy, flying through a Nor'easter rain event that is delivered significant quantities that should keep soils moist for quite a while and long-range forecasts are optimistic, setting the stage for a good beginning to next season. That doesn't mean that from here on, everything will be okay. Currently asymptomatic trees could still show needle color loss as the season progresses but, unless you have no signs of needle loss now, it will be difficult to tell if that happens.

A big concern with interior needle loss is the unthrifty appearance affected trees, both salable and younger, while still standing in the field at harvest time. Left unattended, browned or Browning needles may stay attached long beyond Christmas and result in unappealing appearance for choose and cut customers. It should be less of a problem for precut trees because they can be cared for after cutting but pre-sales time. The best two ways to remove old, dead needles are: blowing them out while they are still standing in the field with significantly strong wind producers like backpack leaf blowers; or shaking them loose from cut trees with one of several commercially available or hand made whole tree shakers. Predicting success for this strategy is difficult – it all depends on how healthy the browned needles are at the spots they attached to the stems.

Interior loss can be confused with injuries caused by arthropods, especially spider mites and scale insects. Injury caused by both pest groups often begins on interior needles and can progress outward. With both groups, whole needles often turn yellow quickly and stay so for quite a long time. It's important to examine the undersides of the needles to look for the pests or evidence that there have been life pests (usually frass or feeding damage).

Still no frost? As of October 23, I suspect we've only had one mild frost – and only in Connecticut's typically colder areas. The coldest it got at my house in Windsor was 34°F and that night fit in between a whole bunch of nights that it never got colder than 45°F. To say the least, we've been having a mild autumn – great for getting things done but possibly a problem for our conifers. During a typical autumn, cold temperature slowly but progressively get colder and colder resulting in a slow acclimatization to call conditions by trees. The slow acclimatization involves the transfer of carbohydrates and other compounds from green tissue to woody tissue – sort of an insulation process. Warm autumns can result in green tissue staying more active and at greater risk for freezing if/when freezing temperatures.

Freeze damage trees are frequently on the newest growth but may or may not show very much in the field during the harvest season. It would certainly show up over the winter and can result in some tweaking branch loss heading into the next spring. Here's hoping we make a slow progression towards rectally freezing temperatures and we don't see died backs next spring only time will tell.

For additional information on these topics are other aspects of conifer growth and care, contact me at trathier@sbcglobal.net .

Environmental Data for Massachusetts: Growing Degree Days and Precipitation Rate

Source: Umass Extension Landscape Message #1-2015

Region/Location	GROWING DEGREE DAYS		Precipitation	
	Year End accumulation For 2014	Current Accumulation For 2015	Since 1/1/2015	March 1 to 11th
Cape Cod	2708	2	9.20" rain Eq. (70" snow)	2.63" rain Eq (16.5" snow)
Southeast	2623	1	8.85" rain Eq. (103" snow)	1.10" rain Eq. (9.0" snow)
North Shore	2499	0	6.23" rain Eq. (86.3" snow)	.49" rain Eq. (3.6" snow)
East	2815	0	8.33" rain Eq. (104.25" snow)	.60" rain Eq. (2.5" snow)
Metro West	2286	0	8.37" rain Eq. (104" snow)	.50" rain Eq. (3.8" snow)
Central	2288	0	8.37" rain Eq. (79" snow)	.55" rain Eq. (61.8" snow)
Pioneer Valley	2744	0	4.91" rain Eq.	.24" rain Eq.
Berkshires	2139	0	6.11" rain Eq. (61.8"snow)	.51" rain Eq. (5.6" snow)
Average	2513	0	7.55" rain	.83" rain