

# Winter Stem Damage To Street Trees in Minnesota

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## Introduction

It is common knowledge among city foresters and other tree care professionals that trees growing in boulevards (tree lawns), sidewalk cut-outs and planters suffer from stresses not common to landscape trees. Among the many stresses that trees must tolerate to survive, Minnesota winter may be as stressful on tree health as it is on humans.

Winter damage is often as unpredictable as the winters, but damage to trees can be categorized as follows:

- 1) Root death due to abnormally low soil temperatures;
- 2) Cambial death in the stem and/or branches;
- 3) Dieback;
- 4) Bud death;
- 5) Foliage death (on evergreens);
- 6) Bark cracking;
- 7) Frost cracking.

Damage to the stem of trees, which is usually characterized as cambial death, bark cracking or frost cracking is of particular interest to managers of "public" trees due to the potential long-term effects on tree health and safety. Stem damage, no matter what the cause was, can leave the tree more vulnerable to secondary pathogen invasions such as the target canker fungi. Stem damage can also lead to extensive columns of discoloration and decay in weakened trees, especially those that are poor compartmentalizers. As trees age and increase in size, stems that are structurally weakened by cankers and/or decay are more likely to fail during windstorms and are therefore labeled as hazard trees.

The Minnesota Extension Service, Department of Forest Resources began surveying communities throughout the state following the winter of 1993-94. For three consecutive winters, public managers of the urban forests in over 800 communities were asked to rank the frequency of winter stem damage that their street trees suffered. Community representatives were instructed to rank the top three species (in order) for frequency damage, and the sizes most commonly damaged. Other information requested included a list of all tree species damaged, the (compass direction) exposure of the damage, presence of prior cracks/

wounds and any treatments.

## Results From Three Winters Of Survey Information

### Representation

The number of surveys completed and returned each year has been disappointing (from 10-17% of all communities surveyed), but those returned could honestly be considered as randomly sampled communities. Only one survey and letter of request was mailed to each community each year. Over half of the counties in the state had communities that responded to the surveys (range of 51-76% of the counties).

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# Winter Stem Damage—

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## Species

The most strikingly consistent survey result for each year was the ranking of the most frequently damaged tree species. In order, maples, ashes and lindens topped the lists. Even more notable, maples and ashes were *much* more frequently rated as the most commonly damaged trees, as compared to third-place lindens. The frequency of damage to other tree species ranged from barely "significant" to not worth mentioning.

Maples are by far the species most frequently ranked as the number one victims of winter stem damage. Each year, almost twice as many communities ranked maples as the most frequently damaged species, as compared to runner-up ashes.

**Table 1.** Species of trees reported as most frequently damaged by communities. Frequency is recorded as the number of communities ranking that species as one of the three most frequently damaged species. Percentage value is the percentage of all reporting communities that ranked that species as most frequently damaged.

Tree Species	1995-1996	1994-1995	1993-1994
Maple	51 (44.35%)	25 (30%)	40 (29.41%)
Ash	32 (27.83%)	11 (13%)	18 (13.24%)
Linden	14 (12.2%)	7 (9%)	13 (9.6%)
Other	10 (8.7%) Mt. Ash	4 (4.9%) Crabapple	5 (3.7%) Crabapple 5 (3.7%) Hon. Locust

## Sizes

Smaller trees were most commonly damaged. However, for the three species most frequently damaged (maple, ash, linden), the sizes that experienced the most frequent damage included d.b.h.'s of up to 10 inches. These were trees of a size that were beginning to make an impact on the urban forest. These were trees of a size that were no longer receiving very much (if any) new tree care in many cases.

**Table 2.** The sizes of the three most frequently damaged trees. Ranking number is a mean score for all reports in that year. A 1-4 scale was used for ranking, with 1=most frequently damaged, 4=least.

\*1993-1994 reported sizes were 0-4"; 4-12"; 12-24" +.

\*\*Sizes most frequently damaged for all communities reporting on that species.

## Exposure

Each year, the south sides of the trees received the most stem damage. However, examine the frequencies closely for 1995-96. Although the south side was most frequently

Table 2

Tree Species	Sizes	Rank/ Frequency 1995-1996	Rank/ Frequency 1994-1995	Rank/ Frequency 1993-1994
Maple	0-3"	1.73/37	1.57/26**	1.35/31**
	3-10"	1.44/50**	1.66/23	1.46/35**
Ash	0-3"	1.75/37"	1.80/5**"	1.88/9**
	3-10"	1.40/20**	2.00/7	1.90/10**
Linden	0-3"	1.64/14**	1.50/6	1.80/7
	3-10"	1.58/12**	1.44/9**	1.10/9**

damaged, the frequencies for damage on other sides were not that much lower. This is quite possibly due to the extremely (record-breaking) cold temperatures that Minnesota experienced during that winter.

**Table 3.** Sides (exposure) of trees showing new damage. Frequency was rated on a 1-4 scale; 1=most frequent, 4=least. Ranking scores were calculated mean values.

\*\*Most frequently damaged exposure.

Table 3

Exposure	Rank/Frequency 1995-1996	Rank/Frequency 1994-1995	Rank/Frequency 1993-1994
North	2.72/43	3.08/13	10
South	1.44/57**	1.50/22**	34**
East	2.75/40	2.40/15	4
West	2.24/42	2.25/16	13

## Other

The frequency of older cracks and wounds "occasionally" present on damage stems increased in 1995-1996. However, the frequency of older cracks and wounds being commonly present still remained low throughout the three years of surveys.

Most city foresters do little to nothing for winter stem damage.

**Table 4.** Evidence of old cracks on the trees that experienced trunk/bark damage.

Response	Frequency 1995-1996	Frequency 1994-1995	Frequency 1993-1994
Not at all	5	2	10
Occasionally	42	23	35
Very Often	8	5	4
No answer	2	1	n/a

## Discussion/Implications

Regardless of the percentage of communities and counties that returned surveys, the severity of the winter or the

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“qualifications” of respondents, there are two obvious trends: maples are the most frequently damaged street trees by far each year, and younger trees of all species suffered the most. Depending on the presence and extent of internal stem damage to these trees, we may only be seeing the beginning of other long-term and possibly more severe damage (e.g., decay, hazard tree situations).

Consider these options:

1. Most maples are forest trees . . . boulevards rarely offer the protection of forests and are poor sites for maples. Use more of the species that normally don't suffer from stem damage as frequently (elms, oaks, walnuts, cottonwood, hackberries and just about anything other than maples, ashes and lindens).

2. Prepare the planting sites better for all trees, and especially maples. There is much evidence that supports the notion that healthy trees suffer winter damage less frequently.

3. Monitor and regularly care for street trees after the one year nursery guarantee. Mulch, irrigate, fertilize, correctly prune and control pests on trees during those stressful, formative years (up to 10" d.b.h.)

Data analyzed and summarized by Kathi Kyro, Minnesota Tree Care Advisor.



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Cary Femrite and Daryl Scheerhorn relax after golf.

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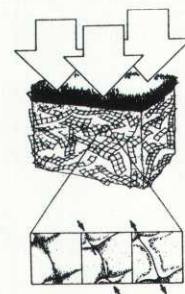
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