

Management of Hail-Damaged Landscape and Nursery Plants[©]

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INTRODUCTION

The weather can be fickle with effects of some widespread while at other times quite localized. Hailstorms seem to travel in bands whereby a swath is cut through an area while nearby areas are untouched.

A recent spring hail event in our area resulted in a distinct Christmas-like smell that was combined with a dying plant smell (Fig. 1). While the damage can seem to be overwhelming it's important to move quickly to clean up the site to reduce the impact of secondary infectors and infestations.

Prioritize the treatment of damaged plants. Decide which plants are beyond saving due to severe damage, those that have moderate damage but can be saved, and those that have minimal damage and will survive with limited care. The first plants to be treated should be those in the moderate damage category since immediate attention is needed and those that follow should be the minimally damaged plants. An exception might occur when a specimen plant experiences a high level of damage and “needs” to be saved.

DAMAGE

It's important to recognize that while hail injury is mechanical damage, it is also a stress-related injury. The impact on plants may continue long after the storm has ended. The following are types of damage and notes on what to consider when reviewing damage.

Damage to herbaceous plants can include damage that extends from holes in the leaves, to shredded leaves, to near total defoliation. This damage can result in significantly reduced photosynthetic activity and create opportunities for disease infection.



Fig. 1. A: Accumulated hail the morning after the storm. B: Evergreen (*Pinus*) buds, catkins, and cones on pavement.

While herbaceous plants are aggressive growers, recovery will depend on the stage of growth when damage occurs. Some plants will come through well while others may not survive. If plants are located in largely defoliated wooded areas, increased sunlight may also modify the plant's environment further limiting recovery.

Foliar damage to woody plants can include symptoms similar to those experienced by herbaceous plants. Young twigs and stems can also be stripped or broken from heavier stems. If enough of the foliage is lost, trees will usually generate new leaves and buds. When partial defoliation occurs, trees will generally not initiate new leaf growth.

Damage to thin-barked trees can vary from tearing to what appears to be pinpoint damage. Tearing will lead to a scarring while pinpoint damage tends to result in a callus tissue bump on the stem. Each type of wound exposes the vascular cambium and will lead to necrotic or dead areas on the stem. Callus will normally form along the margins of the wounds (Fig. 2). Extensive wounding will negatively impact nutrient movement. Early in the year, when the vascular cambium is active, these wounds tend to be more severe and are more susceptible to infection. Later in the year, when wood is tougher and conditions are cooler and drier, infection is less likely. Bruising is another type of damage that is similar to pinpoint damage but without a break in the bark. It is not easily detected and may lead to delayed symptoms that can include dieback.

Bud damage on evergreens can have more impact than bud damage on deciduous plants. Hail damage that occurs in the spring, when there is new growth with many new buds and cones, can result in open wounds that can lead to disease infection and insect pest infestation. Because evergreens have leaves (needles) that are meant to last for several years, stress-related secondary impacts can occur over an extended period and will continue until the water and nutrient supply is balanced against plant growth needs.

TREATMENT

Treatment options are related to the type of plant impacted and the extent of damage but the first step is to clean up the area of plant material that has fallen to the ground (Fig. 3).



Fig. 2. A: Torn bark on *Betula*. B: Callused wounds on *Betula*.



Fig. 3. A: Mostly evergreen tissue dropped the day following a hailstorm. B: Cleanup is important: the same area a week later after cleaning.

Flowers and fruit are desirable for their beauty but if damaged, plan to dispose of them as soon as possible. Flowers and fruit are succulent and/or sugary and can easily be infected with diseases. Rain and wind can then spread the infection to other susceptible plants.

When annuals experience moderate to large amounts of damage they will likely need to be replanted. Consideration must be given to one's goals. Flowering periods are generally limited so replanting may be the best option even under limited damage scenarios. Recovery takes time. If there is no regrowth within 1 to 2 weeks following the hail event, plan to replace plants.

While herbaceous perennials will generally survive and initiate new growth, they are at risk because of damage to succulent growth. Plan to remove damaged tissue to reduce the possibility of secondary infection. The crown of many herbaceous perennials is a critical area. When crown damage occurs, they will either decline or have a prolonged period needed to restart growth. Regrowth of vegetative plant parts can be slow or quick depending on the time of year and the type of plant. When damage occurs during flowering or an active stage of growth, new flowers and buds can start appearing within a week.

Mature deciduous trees can generally survive hail damage. Leaves may be stripped but buds will normally survive, ensuring tree refoliation. Younger deciduous trees are most at risk due to the possibility of the aforementioned bark damage.

It may take a couple years to repopulate evergreens with the same number of needles that were there before the storm. During that repopulation period, plants will continue to be under increased stress. For younger trees, plan to manage water needs during dry periods.



Fig. 4. Cleaning up can be a big job. This was load #3 and there was plenty left to do.

While the thought of cleanup can be bewildering, it's imperative to get started as quickly as possible. Remove fallen leaf tissue and larger plant parts to help reduce secondary infection. Woody plants that have been damaged will often have a secondary drop of leaf tissue and small stems that have been damaged but most of those will have dried down so cleaning up those is less critical.

There is continuing discussion on the value of pesticide applications following hail damage. The application of fungicides following removal of damaged tissue can help prevent secondary infections. Depending on pest pressure an insecticide bark spray may be useful to help prevent damage from borers and bark beetles. Since there doesn't seem to be a consensus to use or not to use chemical controls, monitoring for problems is important.

OPTIMIZING GROWING CONDITIONS

It's important to optimize future growing conditions. Plan to prune to eliminate problem areas and to enhance plant structure. In locations where hail damage has reduced the amount of foliage and it has resulted in increased light and temperature, mulch damaged plants to help maintain soil moisture and reduce the soil temperature.

For herbaceous plants, remove tattered leaf tissue while maintaining as much good tissue as possible. Closely examine the crown areas to be sure there is not damage. It's difficult to recommend fertilization practices for herbaceous perennials. Some species respond well to increased fertility while others respond better to lower levels of fertility.

Weather conditions following a damaging hail event can have a major impact on recovery. Research has been conducted to determine the relationship between leaf tissue loss and re-growth from animal feeding damage and environmental factors. Results indicated that when environmental conditions limit plant growth, loss of plant tissue will most likely be detrimental to plant performance but when conditions are favorable, limited defoliation may enhance plant growth (Hicks, 1997).

For woody plants, prune using techniques recommended by Dr. Alex Shigo (Shigo, 1982). Remove dead and injured twigs and tissue first. Prune back to a bud; don't leave stubs that will lead to decay. Prune to develop a desirable plant structure. Don't paint wounds in an effort to protect them.

Irrigation may not be needed soon after hail events. Since the root systems have not been affected, there may be more capacity than plants require. Clean up the ground of plant tissue prior to initiating irrigation activities to reduce the possibility of spreading disease. Trickle irrigation is preferred over sprinkler irrigation to avoid wetting damaged leaves. Under high heat conditions, plan to irrigate regularly as soils become dry. Aim for a total of about an inch per week. Irrigate more frequently with less water on lighter soils and less frequently with more water on heavier soils.

The need for fertilization is dependent on the time of the year and the type of plant. Hail damage in the spring can occur after plants have used most stored carbohydrate reserves so hail damage may have high impact. If plants survive the event, they may require initial low levels of nutrition that gradually increase.

Depending on the time of a summer hail event, plants may have adequate carbohydrates stored that will help with re-growth. Look for nutrient deficiency symptoms as new growth generates and fertilize accordingly.

Late-summer and early autumn events can result in an early dormant period or a time of re-growth. If re-growth is initiated, plants need to have time to have that growth mature so additional carbohydrates can be stored before heading into the winter. Young growth that is exposed to freezing conditions can be killed and any additional plant injury can compromise overwintering success. Fall fertilization is usually not beneficial since it can stimulate growth that might continue later into the autumn and risk winter damage.

If a late autumn event occurs, plants should have stored carbohydrates that would not be called upon for new growth until spring. Plant should enter a fairly normal dormancy. Late autumn fertilization is not required.

Nurseries, especially those with container production, have a way to minimize the potential for hail damage and to optimize growing temperatures. If cooler temperature conditions or lower light intensity helps optimize growth, plan to install shade cloth. This is especially useful as related to nursery container plant production. Polyethylene or polypropylene shade cloth can also reduce damage resulting from future hail events.

Literature Cited

Hicks, S.L. 1997. Compensatory growth of three herbaceous perennial species: The effects of clipping and nutrient availability. MS Thesis, The University of British Columbia.

Shigo, A.L. 1982. A pictorial primer for proper pruning. Forest Notes. Spring 1982.