

Vermont Forest Health

How Does Late Summer Flooding Affect Trees?



Department of Forests, Parks, & Recreation
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Most trees survive temporary flooding.

When thousands of acres of normally dry land were inundated following Tropical Storm Irene, so were the trees growing there. Some trees were swept away for good. In better news: most trees left standing will survive temporary flooding.

Flooding can harm trees in several ways:

- Undermining root systems by washing away the soil.
- Depriving roots of oxygen by soil saturation.
- Depriving roots of oxygen by depositing sediment.
- Carrying toxic contaminants.
- Causing stem wounds from fast-moving debris.



Where fast-moving debris scraped off bark, the trunk may decay over time.

The Impact of Flooding Depends on:

Velocity: Speed of the current is important, and was the greatest cause of tree damage in this storm. Many trees left standing are at risk of falling in future storms because the soil around them has been washed away.

Fast moving debris causes injuries, which can lead to tree decay and breakage. Some injuries are obvious; the bark was scraped off, exposing wood underneath. Others won't be visible for several years. They are still covered by bark, but the impact has killed living cells underneath it. These injuries will become visible when the bark loosens and falls off.

Fast moving water exposes fine roots, which desiccate as the site dries out. Although roots normally remain active until the ground freezes, the damage to fine roots in late summer isn't as critical to tree health as it would have been earlier in the year.

Some branches that were submerged in rushing water are packed with mud. New growth may emerge from these branches in the spring. Seriously mud-caked or buried branches will be unproductive and die.

Where water slowed down, it deposited soil it had been carrying. This sedimentation buried roots, and will deprive them of oxygen even after the soil has dried out. When roots suffocate, trees become starved for water and nutrients.

Duration: As the duration of flooding increases, saturated soils become anaerobic, and roots start to suffocate. The short duration of the flooding from this storm will be an advantage for tree survival. Many trees can tolerate a month of water on the soil surface, and most can survive a week or two. Trees on soils with fine silt or clay particles will suffer more because these will remain saturated longer than sandy soils.



Sediment deposits can suffocate roots.

Time of Year: Flooding in late summer is less harmful than in the spring. Trees are approaching dormancy, their growth is slowing down, and oxygen demands on the roots are not as great.

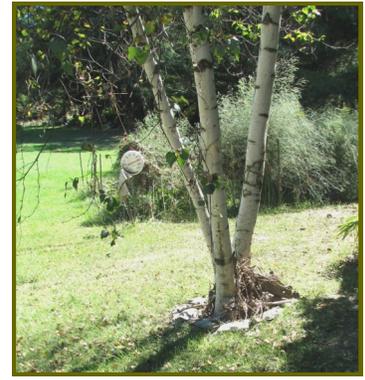
Water Depth: Once the soil is saturated, it really doesn't matter how deep the water is, as long as the foliage isn't covered. If leaves are submerged, however, they can't exchange gases with the atmosphere and photosynthesis stops. Conifer branches injured by flooding are unlikely to grow back.

Species: Bottomland species, like silver maple, elm, honeylocust and green ash, are adapted to occasional flooding and can be expected to survive wet conditions. Upland species, like sugar maple, beech, and birch, are less tolerant.

Tree age: Young trees, especially those that were planted recently, are more susceptible. Their bark is thinner and more vulnerable to injuries. Young trees have limited root systems, and may not tolerate additional root loss from sedimentation, flooding, or exposure.

Contamination: Trees downriver from sources of toxic compounds are at increased risk of decline.

Loss of Litter and Duff: Soil temperatures will fluctuate more where the mineral soil is exposed, increasing root susceptibility to freezing and drought. This should be temporary. The insulating layer will begin to be restored as leaves drop in the fall.



Upland species, like paper birch, are less tolerant of flooding.



Soil temperature fluctuations will increase where mineral soil is exposed.

Trees with severely undermined roots should be removed if their location puts people or property at risk.



What Should You Do?

Determine whether trees have become hazardous. Trees with seriously undermined roots are at risk of blowing over in future storms. If their location puts people or property at risk, they should be removed. Trees with significant trunk or root collar injuries should also be evaluated for hazard, since the point of injury will become a weak spot as the wood underneath decays.

Restore original soil conditions. Gently remove excess soil deposits over the roots, which extend about as far from the trunk as the branches. Cover newly exposed roots, but don't overdo it. A thin covering of soil and/or 2-4" of mulch is enough.

Remove dirt from leaves and branches Releasing mud-caked branches gives them a better chance of recovery. Although a thin coating of dirt is unlikely to affect deciduous trees, whose leaves will soon be shed, conifers may benefit if dirt is hosed off.

Prune broken branches. Prune off branches broken by water or wind to minimize bark tearing and future decay.

Small uprooted trees can be reset if their roots have not dried out. Keep trees watered through the fall, as if they were newly planted trees.

Wait. Don't rush to conclusions unless trees are hazardous to people or property. Some trees will decline over several years. Many will recover.



Root collar injuries create a weak spot in the trunk.



For more information, contact the Forest Biology Laboratory at 802-879-5687 or:

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