What to Do About Flood-Damaged Trees

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How are trees affected by flooding?

Tree health is adversely affected when the surrounding soil is temporarily flooded by the overflow of streams and rivers or the soil becomes saturated by persistent rains. The primary effect of flooding is the reduction in soil oxygen. The upper six inches of a typical soil has an abundance of oxygen. This is where the roots responsible for the absorption of water and nutrients reside.

Flooded soil has less oxygen to support root respiration so tree roots begin to decline. As the roots die, the tree's capacity to absorb water decreases and the foliage begins to wilt. Paradoxically the tree dies from the lack of water because it is standing in water, a phenomenon referred to as physiological drought.

What are the symptoms of flood injury?

The most common symptoms associated with flooding are the following

- Leaf discoloration, usually yellowing
- Leaf scorching and wilting
- Premature fall color, bright reds and yellows
- Premature defoliation
- Sprouting along the trunk
- Twig and branch dieback
- And with severe or persistent flooding - death

These symptoms may occur during or after the flooding. It may take a year or more for a tree to decline after a major flood event.

What determines the degree of injury?

A tree's response to flooding depends upon a number of tree and flooding characteristics:

- The tree species, age and health
- The season of flooding
- The depth and duration of the flooding

The tree

Tree species do not respond the same to flooding. Some tree species, typically those found growing naturally along rivers and streams, can tolerant and adapt to flooded conditions. Species that are tolerant to flooding may be able to withstand more than a month of flooding, depending on other conditions. Species that are intolerant of flooding may begin to decline with as little as two week's exposure to flooding. An individual tree's tolerance to flooding is also dependent upon its age and health. Mature trees generally cannot withstand as long a period of flooding as younger trees. The tree's most likely to survive are usually 2- to 6-inches in diameter (measured at 4.5 feet above the ground). Trees that are in good health are more likely to survive the stress of flooding, regardless of age.

The commonly planted species with the highest tolerance to flooding. These trees may be able to withstand a month or more of flooding.

- *Acer rubrum* – red maples
- *Fraxinus pennsylvanica* – green ash
- *Fraxinus nigra* – black ash
- *Populus deltoides* – cottonwood
- *Salix nigra* – black willow

The commonly planted tree species with an intermediate tolerance to flooding. These trees may be about to withstand a few weeks of flooding.

- *Acer x freeman* – Freeman maples (common cultivars include “Autumn Blaze”)
- *Acer negundo* – boxelder
- *Acer saccharinum* – silver maple
- *Betula nigra* – river birch
- *Fraxinus americana* – white ash
- *Gleditsia triacanthos* – honeylocust
- *Gymnocladus dioicus* – Kentucky coffeetree
- *Platanus occidentalis* – sycamore
- *Populus* – poplars
- *Quercus macrocarpa* – bur oak
- *Ulmus americana* – American elm

The commonly planted species with the lowest tolerance to flooding. These trees may decline after only a week or two of flooding during the growing season.

- *Acer platanoides* – Norway maple
- *Acer saccharum* – sugar maple
- *Aesculus glabra* – Ohio buckeye
- *Betula papyrifera* – paper birch
- *Crataegus* – hawthorns
- *Elaeaganus angustifolia* – Russian-olive
- *Juglans nigra* – black walnut
- *Malus* – crabapples and apples
- *Prunus* – all cherries and stone fruits such as peaches and plums
- *Pinus* – pines
- *Picea* – spruce
- *Quercus rubra* – northern red oak
- *Sorbus* – mountainash
- *Tilia* – lindens
- *Ulmus* – many of the hybrid elms including ‘Discovery’ and ‘Accolade’
- *Ulmus pumila* – Siberian elm

Figure 1. Spruce and pines are very susceptible to decline if standing in stagnant water

The Flood Conditions

Season of flooding

Late spring and early summer flooding is the most harmful to trees as this is the time when roots are actively growing. Standing in water or even saturated soils is harmful to all trees at this time of year. Flooding in late winter while the tree is dormant is the least harmful.

Duration, depth and water temperature and movement

These are all key factors in determining the impact of flooding on trees. The longer the water remains during the growing season, the greater the impact. If the flood water recedes within a week, most trees will recover. If the waters remain for a month or two, most trees regardless of tolerance will begin to decline and may die. The depth is also an important factor. Water on the trunks is considerable more harmful than water just covering the roots so a good rule of thumb is the higher the water the greater the injury. And finally the water temperature and movement have an influence on the amount of oxygen carried in the water. The warmer the water and the less movement, the lower the oxygen level and the more potential for injury.

If the flood waters become stagnant and remain for several weeks covering the lower two or three feet of the tree’s trunks, most trees will decline and sensitive trees may die though this process may take a year or more to occur.

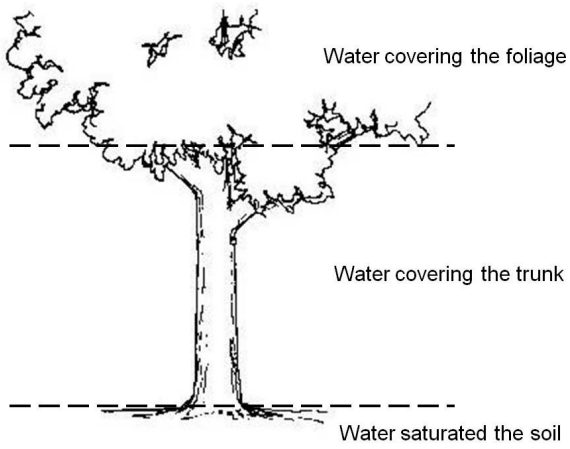

Figure 2. Flooding diagram of soil depth

How can I help my tree after the flood?

Moving water has more oxygen than stagnant water. After the flood waters have receded, removing any ponding around trees by channeling or pumping. Trees that stand in warm, stagnant water are most susceptible to injury.

Once the flood waters have receded, inspect the tree to determine whether the root collar – the base of the tree where the roots flare out and enter the soil – has been covered by sediment. If the flood has deposited sediment around the tree, carefully remove this material and restore the original grade as far out from the trunk as possible. Ideally all the deposited soils should be removed but at least an area within four or five feet of the trunk should be restored to the grade before the flooding, even an additional three-inches of soil deposited around the base of the tree can have detrimental affects.

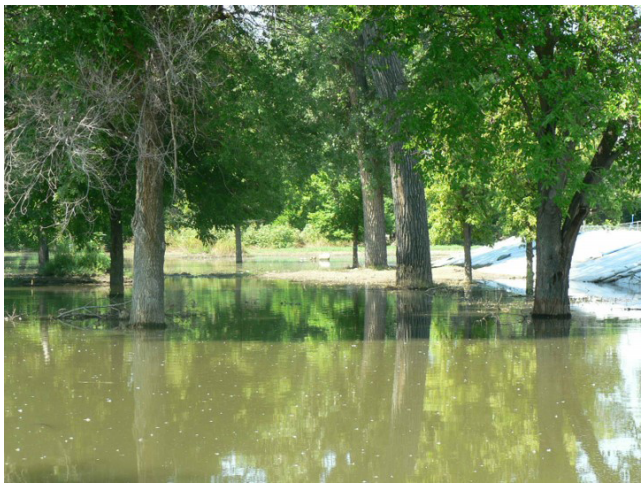

Figure 3. Do not allow trees to remain in ponds created by flood waters

Also inspect the lower trunks for any torn bark. Use a sharp knife to cut away any torn bark but do not attempt to carve the wound into an elliptical pattern or apply any wound dressing or paint. Any broken branches should be pruned off the tree.

It may take several years for a mature tree to recover from a single summer of flooding. During this recovery time the tree is very vulnerable to attack by a number of insects and pathogens. Inspect your trees several times during the growing season and identify and manage any pest outbreak.

Do not fertilize your trees. Generally they will not benefit from any additional nutrients applied as a fertilizer, however, once the soils have dried you may need to water the tree as the root system may have declined enough it cannot absorb sufficient water to maintain the canopy. Also expect some dieback in the canopy and remove these branches as they die. Do not prune any living branches unless they are broken.

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