RESEARCH LABORATORY TECHNICAL REPORT

BARTLETT TREE EXPERTS
SCIENTIFIC TREE CARE SINCE 1907

Bartlett Flood Recovery Program

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Flooding can have many long-term detrimental effects on landscape plants. Flooding impedes the function of tree roots, where the majority of a tree's energy reserves are stored, with potentially serious physical damage. It also causes detrimental changes in soil nutrient availability and microbial communities present. Long-term flooding eventually leads to root and branch dieback and tree decline. Flooding stress can also increase the susceptibility of plants to serious plant pathogens. Since the year 2000, there has been a marked increase in the number of instances of widespread flooding, raising concern from many in the professional tree care industry. For these reasons the **Bartlett Flood Recovery Program** has been developed to help offset the effects of long term flooding damage to trees.

Outline

The program consists of:

- Decompaction
- Drainage
- Soil and Nutrient Management
- Mulching
- Pest and Disease Management

Prolonged flooding is now an almost annual issue for trees in certain landscapes.

Decompaction

Decompaction, using an 'air spade' compressed air lance, re-opens the soil structure to a greater degree than before flooding, promoting recovery as more air reaches the roots and the re-establishes a healthy aerobic microbial community. Air-spading will also help to reduce instances of honey fungus and other soil borne pathogens. A root collar excavation should also be carried out, if the root collar is buried, to improve plant health and decrease pathogen susceptibility.

Drainage

After decompaction using the air spade, sand, perlite or biochar can be added to the soil to increase and maintain porosity. Biochar can also aid in nutrient/fertilizer retention, increase plant health and help beneficial soil microbes to proliferate. It should be applied at 5% by volume (1:19, Biochar:Soil). Biochar may also decrease plant uptake of toxic by-products produced during flooding by anaerobic bacteria.

These structural soil improvements keep the structure of soils open increasing aeration and allowing quick drainage in future instances of flooding. They can also be applied using the VOGT system of soil amendment, which creates and fills a void through the soil. In comparison to the air spade, it can be used to modify soils through turf or other surface vegetation with minimal visual disturbance. It can also reach deeper into the soil, breaking through lower layers of compaction e.g. plough pans on previously agricultural land.

Soil and Nutrient Management

Flooding dilutes and leaches nutrients from the root zone. Flooding is also associated with an altered soil pH due to anaerobic respiration by soil microbes; this can reduce the availability of nitrogen to the tree. Nitrogen fertilization can help to mitigate this stress, even when applied during flooding. Soils flooded long term can also have a build-up of phytotoxic elements produced by anaerobic soil microbes. Soil nutrient analysis and tailored soil amendment and fertilization can correct deficiencies and aid the recovery of previously flooded trees to health.

Mulching

Organic mulches can provide nutrition for both the tree and healthy soil microbes that can help defend against root pathogens. They can also encourage worms and other soil fauna which improve nutrition and soil structure, maintaining aeration and drainage. Applied after flooding has subsided, they stabilize soil moisture levels further improving the rooting environment. Trees can root into the mulch layer which is particularly well drained and defended by healthy microbes, providing extra defence against disease and further flooding damage.

Mulch conserves soil moisture, suppresses weeds, insulates soil to reduce winter injury and improves the physical condition of soil. Apply mulches to a depth of 5-10cm (2-4 inches) around trees and shrubs, avoiding contact with the stem.

Pest and Disease Management

Prolonged flooding can be highly detrimental to overall tree health, weakening defences against pests and diseases. A significant risk are *Phytophora* and *Pythium* species; these soil borne pathogens which are made more mobile by flooding and can enter water damaged root systems. Fungi including honey fungus, *Armillaria*, also pose a threat. A mixture of targeted cultural controls and amendments (drainage, phosphites, mulches) can ensure the tree stands the best chance of a full recovery from flooding stress.

Bartlett's Pest and Disease Management Programme ensures early detection and treatment of pest problems before significant injury to the plant occurs. A trained Plant Health Care Technician periodically inspects plants for pests and other factors that adversely affect plant health. Treatments are applied as necessary to keep pests below damaging levels and to maintain plant health. Regular professional inspection is the key to early detection and treatment of pests.

Established in 1994, The Bartlett Tree Research Laboratories at the University of Reading is the research wing of Bartlett Tree Experts in the UK. Scientists here develop guidelines for all of the Company's services. The Lab also houses a state-of-the-art plant diagnostic clinic and provides vital technical support to Bartlett arborists and field staff for the benefit of our clients.