# RESEARCH LABORATORY TECHNICAL REPORT

BARTLETT TREE EXPERTS
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## Managing Trees in Severe Drought

### Advanced Mitigation Options

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The best way to maintain tree health during drought periods is also the simplest: provide additional water when the soil dries and add mulch appropriately to conserve soil moisture. Of course, simply adding more water is not always feasible when environmental stewardship and water use restrictions come into consideration. Fortunately, most mature trees in arid or Mediterranean climates are adapted to long periods without rain, making supplemental irrigation unnecessary under moderate drought conditions. However, even drought-tolerant species will suffer under prolonged water shortage.

The following mitigation options may be considered during these extended periods of severe drought. They are meant to supplement but not replace the basic steps of smart irrigation and mulch. None of the following options should be looked at as a 'silver bullet', but each will help to reduce the stress related to prolonged drought:

### Plant Growth Regulation

Type-2 plant growth regulation is based on the inhibition of gibberellin, a plant hormone responsible for cell elongation. Treated plants produce the same number of cells as untreated, but these cells have reduced elongation. This results in slightly smaller leaves and less leaf area, thicker leaves, thicker waxy cuticle, and often increased pubescence (hair) on the bottom of leaves (Figure 1). All of these factors will help to reduce transpiration and thus will reduce water usage. It is important to remember that the treatment applied in the current growing season will only take effect the following spring as new growth emerges, and will reduce growth for 2-3 years or more, depending on species.

**Figure 1: Oak branches from growth regulator treated (left) and untreated (right) trees. (Photo courtesy of C. Haugen, Rainbow Treecare Scientific Advancements)**


### Potassium Phosphite Soil Treatments

Potassium phosphite fertilization has been proven in past research to increase plant tolerance to some disease organisms and environmental stresses, including drought. Fertilization with this material does not provide phosphorous in usable form, but does supply potassium, which is important in drought resistance. It also causes an additional systemic induction of stress-related plant physiological functions. Fertilizers with high levels of quick release nitrogen are not recommended because they may encourage excessive foliar growth which will increase plant water usage.

## Soil Wetting Agents

Soil that has become extremely dry can often be difficult to re-moisten (hydrophobic) leading to wasted irrigation water through run-off or surface evaporation. Thoroughly wetting the root zone of trees with a wetting agent helps to reduce water surface tension, allowing water to absorb more quickly into the root zone and create a plant-available moisture film around soil particles. This effect will last for some time allowing post-treatment irrigation or rain water additions to more quickly and completely moisten the root zone with reduced water loss.

## Mycorrhiza Inoculation

It is well known that symbiotic fungi (mycorrhiza) help plant roots explore and mine the soil for various resources, including water and nutrients. If a plant is lacking these symbiotic associates, addition of mycorrhiza inoculum might help to re-establish this relationship and result in better water uptake capabilities for the plant. It should be kept in mind that a lack of existing mycorrhiza is likely due to unfavorable soil conditions. Any artificial inoculation should be made in conjunction with improvement of soil cultural conditions.

## Ineffective Practices

The following common techniques are ***not*** recommended by Bartlett Tree Research Laboratories:

**Anti-desiccants:** A wide variety of silicon, polyethylene, or poly-terpene based products are sold as anti-desiccants, but extensive research projects conducted by Bartlett scientists have not shown any measureable benefit. Most products physically block leaf pores (stomata) which may reduce water use, but also will increase leaf temperatures and reduce photosynthesis.

**Humates, humectants, fish oils, seaweed extracts, etc.:** As with anti-desiccants, multiple experiments have been conducted by Bartlett scientists on various products marketed to improve drought tolerance through increased root growth or other factors. None have shown any measurable benefit.

## Summary

While there is no substitute for water in improving plant growth, appearance, and vigor, several options exist that can help to reduce the physiological stress associated with extreme drought. The options listed in this report are based on peer-reviewed, data-based scientific studies, conducted by Bartlett Research Laboratories and/or other academic and government entities.

Proper irrigation and addition of 2-4 inches of organic mulch are the most important factors in maintaining plant health during drought. Under extreme drought or water restricted conditions, the additional options detailed in this report may provide some level of relief and help maintain plant health and beauty under challenging environmental conditions.

**Founded in 1926, The Bartlett Tree Research Laboratories is the research wing of Bartlett Tree Experts. 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.**