

Propelling Arboriculture into the Future

By E. Gregory McPherson

Research is the engine that propels arboriculture and urban forestry into the future. New knowledge, technologies, and tools provide arborists with improved tree care practices that result in healthier urban forests. The ISA Science and Research Committee (SRC) is composed of 13 professionals and researchers who are dedicated to elevating the importance of research within ISA. Our mission is to foster exchange among the research community and professionals, and identify important new opportunities for science and research that add value to arboriculture and urban forestry. This article describes accomplishments since our inception in 2006, as well products that you can expect to receive during the next five years.

As the body of arboriculture knowledge expands in breadth and depth it becomes harder for arborists to find the research results they need to solve specific problems. ISA has invested in a series of literature reviews that compile research on key topics. The literature reviews describe key research questions and theories, strength of effects, gaps in our knowledge, and promising new methods and tools. Completed thus far are literature reviews on pruning, tree risk assessment, growth and development of tree root systems, management of tree root systems, and urban forestry health benefits. A review on tree biomechanics is in progress, and future topics include costs of not maintaining trees, tree growth, economics of pest management, trees and water management, and tree mortality and longevity. SRC works with ISA's Educational Goods & Services Department to ensure that information from each literature review is accessible to all arborists. Summary articles are published in *Arborist News* and technical papers appear in *Arboriculture & Urban Forestry*, a scientific journal. These products and a searchable database containing all references on each topic are available for download at the ISA Portal to Research website (www.isa-arbor.com/education/portalToResearch/litReviewSeries.aspx).

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The ISA Annual Conference and ISA Chapter conferences are important opportunities for arborists to keep abreast of new research findings. SRC, AREA, and Conference and Events committees are collaborating to strengthen the science content at these events. Our vision is to make the Annual Conference the “go to” event for researchers. With a critical mass of scientists leading stimulating exchange among colleagues, arborists will gain new knowledge and influence future research. The symposium on Water Scarcity and Urban Forest Management at this year's Annual Conference in Sydney, Australia, is an excellent example. The industry panel will bring together roughly a dozen foremost experts to share lessons learned and best practices. Another SRC and AREA objective is to recruit future scientists by increasing student participation and interaction with researchers at these conferences.

By supporting and coordinating events like Biomechanics Week and the upcoming Tree Growth Symposium, SRC is fostering exchange between researchers, industry professionals, and funding entities. Attracting researchers from around the world to these types of events is opening eyes to new perspectives on tree care. As social networking makes the world smaller, sharing discoveries is easier. SRC will continue working to support your professionalism by enhancing the role of research in arboriculture and urban forestry.

Research Priorities

Pruning

- How much and what type of pruning is needed to reduce branch/stem/root failure (volume and/or length)?
- What is an optimum pruning dose (season, species, vigor, site, age, evergreen/broadleaf, decurrent/excurrent)?
- Scaling tree pruning response from small trees to large trees.
- How do we restore damaged trees?
- What are the effects of root pruning (dose, root diameter, distance from trunk) on tree stability and health?

Tree Strength

- What is the effect of defects (decay, cracks, cavities, etc.) on tree strength?
- What is the effect of pruning on tree strength?
- What is the effect of species on tree strength? Does it vary with defect or defect severity?
- What is the effect of growth (normal, post-pruning) on tree strength?

External Forces and Factors

- Wind, snow, and ice (weather predictions, interpreting weather damage, microscale models – from generic to specific, climate firmness and adaptation, wind speed and tree loading).
- Role of site factors: slopes aspect and slope position, water saturated soil.
- Transmission and dissipation of loads and forces in the tree.
- Failure in the absence of wind (summer limb drop).
- Develop factors for wind loads that account for: design wind speeds, risk zones, exposure, and/or tree species.
- Rapid changes in the loading and load dissemination due to: sudden exposure after clearcut; pruning; climate change; and/or cabling.

Consequences—Damages, Liability, and Loss of Benefits

- Quantify historic damage due to tree failures—identify associated tree and environmental conditions.
- Identify and evaluate the significance and impact of the possible outcomes of tree failure.
- Survey public opinion of the risk of tree failure and loss of benefits (perception of risk).



Research factors to consider regarding external forces: weather damage from wind, snow, and ice; site factors, such as saturated soils and slope; and rapid changes in dynamic loading.

- Where are consequences of tree failure most significant and where should we focus our efforts in assessment (ranking targets)?
- Identify and quantify the benefits that are lost when a tree fails or is removed.
- Develop a tree risk:benefit analysis and methods to perform it.
- Survey historic legal cases involving tree failure to summarize duty of care and liability.

Risk Assessment Methods

- What training is required to increase consistency in tree risk assessments among different arborists?
- What methods are used in other fields and which are applicable (or not) to arboriculture?
- What methods are used in other fields to quantify and/or make explicit expert judgment?
- What role does subjectivity play in these risk assessments?
- Is there a correlation between risk predictions from existing assessment methods and actual future tree performance?
- What is the validity, reliability, and consistency of risk assessment methods currently in use in arboriculture?

Tree Root Systems

- Can we characterize the inherent root growth and development patterns for different species?
- What are effective remediation methods for deeply planted, established trees?
- How do we correct or prevent root defects in containers?
- What are the characteristics of mulch that give it its beneficial properties?
- Can we develop an effective root detection system?
- What tools are needed for tree stability diagnostics? What guidelines for assessment are needed? Is a qualitative or a quantitative approach best?
- What rooting conditions are present in structural soil installations and how long do these conditions last?
- How do soil–water relationships influence tree growth and survival?
- Where do we position the root system at the time of planting?
- How does soil biology influence tree growth and survival?

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Research factors to consider regarding tree root systems: characterizing root growth patterns for different species, guidelines for assessment of tree stability, and understanding how soil biology influence tree growth and survival.