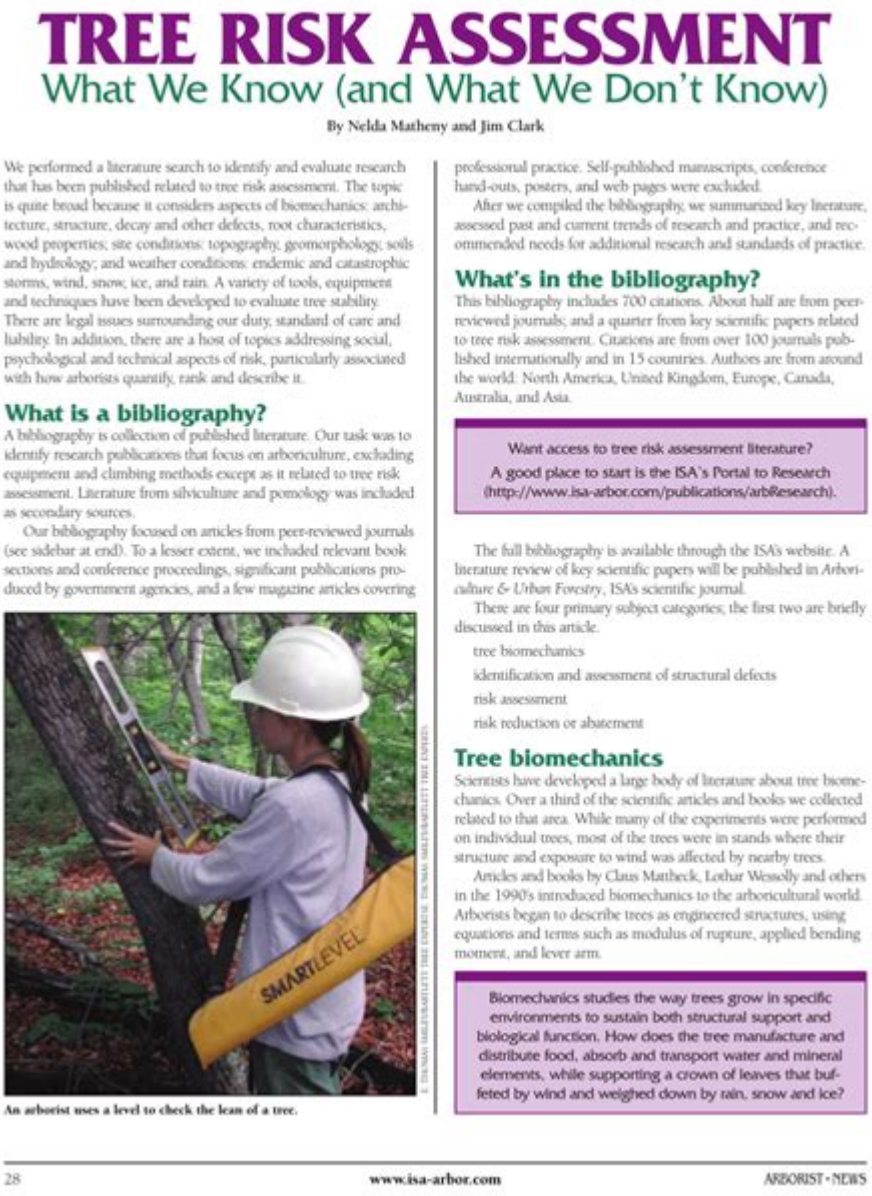
Tree Risk Assessment Report



TREE RISK ASSESSMENT

What We Know (and What We Don't Know)

By Nelda Matheny and Jim Clark

We performed a literature search to identify and evaluate research that has been published related to tree risk assessment. The topic is quite broad because it considers aspects of biomechanics: architecture, structure, decay and other defects, root characteristics, wood properties; site conditions: topography, geomorphology, soils and hydrology; and weather conditions: endemic and catastrophic storms, wind, snow, ice, and rain. A variety of tools, equipment and techniques have been developed to evaluate tree stability. There are legal issues surrounding our duty, standard of care and liability. In addition, there are a host of topics addressing social, psychological and technical aspects of risk, particularly associated with how arborists quantify, rank and describe it.

What is a bibliography?

A bibliography is collection of published literature. Our task was to identify research publications that focus on arboriculture, excluding equipment and climbing methods except as it related to tree risk assessment. Literature from silviculture and pomology was included as secondary sources.

Our bibliography focused on articles from peer-reviewed journals (see sidebar at end). To a lesser extent, we included relevant book sections and conference proceedings, significant publications produced by government agencies, and a few magazine articles covering professional practice. Self-published manuscripts, conference hand-outs, posters, and web pages were excluded.

After we compiled the bibliography, we summarized key literature, assessed past and current trends of research and practice, and recommended needs for additional research and standards of practice.

What's in the bibliography?

This bibliography includes 700 citations. About half are from peer-reviewed journals; and a quarter from key scientific papers related to tree risk assessment. Citations are from over 100 journals published internationally and in 15 countries. Authors are from around the world: North America, United Kingdom, Europe, Canada, Australia, and Asia.

Want access to tree risk assessment literature?

A good place to start is the ISA's Portal to Research (http://www.isa-arbor.com/publications/arbResearch).

The full bibliography is available through the ISA's website. A literature review of key scientific papers will be published in *Arboriculture & Urban Forestry*, ISA's scientific journal.

There are four primary subject categories; the first two are briefly discussed in this article.

- tree biomechanics
- identification and assessment of structural defects
- risk assessment
- risk reduction or abatement

Tree biomechanics

Scientists have developed a large body of literature about tree biomechanics. Over a third of the scientific articles and books we collected related to that area. While many of the experiments were performed on individual trees, most of the trees were in stands where their structure and exposure to wind was affected by nearby trees.

Articles and books by Claus Mattheck, Lothar Wessolly and others in the 1990's introduced biomechanics to the arboricultural world. Arborists began to describe trees as engineered structures, using equations and terms such as modulus of rupture, applied bending moment, and lever arm.

Biomechanics studies the way trees grow in specific environments to sustain both structural support and biological function. How does the tree manufacture and distribute food, absorb and transport water and mineral elements, while supporting a crown of leaves that buffeted by wind and weighed down by rain, snow and ice?

An arborist uses a level to check the lean of a tree.

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Tree Risk Assessment Report is a crucial document that provides an analysis of the potential risks associated with trees, particularly in urban and suburban environments. As trees provide numerous benefits, such as improving air quality, enhancing aesthetics, and offering shade, the necessity for a systematic assessment of their health and stability cannot be overstated. This article delves into the importance of tree risk assessment, the methodologies used, and the factors that influence tree health and safety.

Understanding Tree Risk Assessment

Tree risk assessment is a systematic process that evaluates the likelihood of harm to people, property, or

infrastructure from a tree or tree part. It incorporates various factors, including the tree's health, structural integrity, environmental conditions, and the presence of targets (e.g., homes, roads, and pedestrians).

The Importance of Tree Risk Assessment

1. Safety: The primary objective of tree risk assessment is to ensure the safety of individuals and property. Trees that are dead, dying, or structurally compromised can pose significant hazards, especially during storms or high winds.

2. Property Protection: Trees can cause damage to homes, vehicles, and other structures if they fall or shed limbs. Regular assessments help identify potential risks before they manifest as costly damages.

3. Environmental Benefits: Healthy trees contribute positively to the environment. By assessing and managing tree health, communities can maintain their ecological balance and aesthetic value.

4. Legal Liability: Property owners may face legal consequences if their trees cause injury or damage. Conducting regular risk assessments can mitigate liability and demonstrate due diligence.

Components of a Tree Risk Assessment Report

A comprehensive tree risk assessment report typically includes several key components:

1. Site Assessment

A thorough site assessment is essential to understand the environment surrounding the tree. This includes:

- Location: The geographical location of the tree and its proximity to targets.
- Soil Conditions: Type of soil and its drainage capabilities, which influence root health.
- Surrounding Vegetation: Other plants and trees that may affect or be affected by the tree in question.

2. Tree Identification

Identification of the tree species is crucial because different species have varying growth habits, lifespans, and susceptibility to diseases and pests. Key details should include:

- Species Name: Common and scientific names.

- Age: Estimated age of the tree.
- Height and Diameter: Measurements that help assess the tree's size and potential risk.

3. Health Assessment

A health assessment evaluates the overall vitality of the tree. Important factors to assess include:

- Foliage: Color, size, and density of leaves can indicate health.
- Bark Condition: Look for wounds, cracks, or signs of pests.
- Root System: Inspect for exposed roots or soil erosion around the base.

4. Structural Assessment

Determining the structural stability of a tree is vital. This includes examining:

- Trunk Integrity: Signs of decay, cavities, or structural weakness.
- Branch Structure: Assessing the weight and distribution of branches.
- Lean: A noticeable lean could indicate instability.

5. Risk Evaluation

The risk evaluation involves analyzing the likelihood and potential consequences of tree failure. This can be categorized into:

- Likelihood of Failure: Determining how likely it is that the tree will fall or shed limbs.
- Consequences of Failure: Evaluating the potential impact of a failure, which could vary from minor property damage to severe injury or loss of life.

6. Recommendations

Based on the findings, the report should provide clear recommendations. These could include:

- Pruning: Removal of dead or damaged branches to reduce risk.
- Removal: When a tree poses an unacceptable risk, removal may be necessary.
- Monitoring: For trees that are not in immediate danger but show signs of decline, regular monitoring should be recommended.

Methodologies for Tree Risk Assessment

Various methodologies can be employed during tree risk assessments, each with its advantages and limitations. Here are some widely recognized techniques:

1. Visual Inspection

The most common and straightforward method involves a thorough visual inspection of the tree and its surroundings. Trained arborists can identify noticeable signs of distress or decay. This method is generally quick and cost-effective.

2. Diagnostic Tools

Modern technology has introduced various diagnostic tools that can supplement visual inspections, including:

- Resistographs: Used to measure wood density and detect decay.
- Ultrasound: Provides images of internal structures, allowing for a more detailed assessment of wood strength.

3. Quantitative Risk Assessment (QRA)

For high-risk trees, a more detailed quantitative assessment may be necessary. This method employs mathematical models to evaluate the probability of failure and its consequences, offering a more precise risk profile.

Factors Influencing Tree Health and Stability

Several factors can affect the overall health and stability of trees. Understanding these can enhance the effectiveness of risk assessments.

1. Environmental Conditions

- Soil Quality: Nutrient-rich, well-drained soil contributes to healthier trees.

- Water Availability: Both drought and excessive moisture can adversely affect tree health.

2. Pests and Diseases

Trees can fall victim to various pests and diseases that can compromise their integrity. Regular monitoring for signs of infestation or infection is crucial.

3. Weather Events

Extreme weather events, such as storms, hurricanes, and heavy snowfall, can cause damage to trees. Assessing the resilience of a tree to such events is an essential part of risk assessment.

Conclusion

A Tree Risk Assessment Report is an invaluable tool for property owners, municipalities, and arborists. By systematically evaluating the risks associated with trees, stakeholders can make informed decisions that prioritize safety and environmental health. Regular assessments not only help mitigate risks but also ensure that trees continue to provide their myriad benefits to communities. As our understanding of tree health and risk assessment evolves, so too does the ability to manage and maintain these vital natural resources effectively.

Frequently Asked Questions

What is a tree risk assessment report?

A tree risk assessment report is a document that evaluates the condition and stability of trees, identifying potential hazards they may pose to people, property, and infrastructure.

Why is a tree risk assessment important?

A tree risk assessment is important to ensure public safety, prevent property damage, and maintain the health of urban and natural ecosystems by identifying trees that may need management or removal.

Who should conduct a tree risk assessment?

A tree risk assessment should be conducted by a qualified arborist or tree care professional who has the necessary training and certification in tree risk management.

What factors are considered in a tree risk assessment?

Factors considered include the tree's species, size, health, structural integrity, location, and the potential targets nearby, such as people or buildings.

How often should tree risk assessments be performed?

Tree risk assessments should be performed regularly, typically every 1 to 3 years, or after significant weather events, to monitor changes in tree condition and risk levels.

What are common recommendations in a tree risk assessment report?

Common recommendations may include pruning, cabling, removal of dead branches, soil management, or complete removal of the tree if it poses a significant risk.

How can technology assist in tree risk assessments?

Technology can assist in tree risk assessments through the use of tools like drones, 3D scanning, and software that analyzes data on tree health and structural integrity.

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TREE（4）比TREE（3）大多少？ - 知乎
Feb 15, 2024 · “tree(4)”与“tree(3)”之间的大小差异无法用传统数值或增长比例来衡量，因为它们代表的是递归构造的复杂度级别，而非具体的数值大小。实际上，TREE函数的增长速度远超任 …

能通俗地解释一下*TREE（3）吗？* - 知乎
tree（3），如山压卵，将宇宙碾为齑粉。但是有趣的是，它是有限的。如果tree（3）是无限的，那么无限延伸的角色关系必定包含了此前已被画出的角色关系。这违背了我们漫画的分镜规 …

请问我的**fdtd**的界面变成这样，怎么恢复到原来的界面**？ -** 知乎
知乎，中文互联网高质量的问答社区和创作者聚集的原创内容平台，于 2011 年 1 月正式上线，以「让人们更好的分享知识、经验和见解，找到自己的解答」为品牌使命。知乎凭借认真、专业 …

葛立恒数、**Tree(3)**、不可达基数、大基数、阿列夫零、阿列夫**1**分 **…**
十、TREE(3) TREE(3)源于TREE函数，定义如下：在所有由“顶点k染色的树”组成的，而且满足下面的两个条件的序列中，序列的最大长度就记作TREE(k)。1. 任意正整数i，序列的第i项只有 …

从数学原理上说一说，葛立恒数、**tree(3)** 等数为什么那么大？ **-** 知乎
tree(k)或者TREE(k)总是“满足某条件的最长序列的长度”，因此，如果找到一个满足该条件的序列，那么它的长度可以作为tree(k)或者TREE(k)的一个下界。因此，tree(k)或TREE(k)经常会被 …

*TREE（3）*到底有多大？ - 知乎
比如tree(3)和tree(tree(3)) 其实都是一个数量级的。同一数量级内的数值比大小在科学研究过上没有什么帮助。比如最简单的tree(3)你用前面所有的无论什么方 …

如何评价字节新出的*AI*编程*IDE——Trae*（念*chui*）？ - 知乎
官网: Ship Faster with Trae支持MacOS和Windows，内置基于Claude-3.5-Sonnet和GPT-4o的AI助手。是另一个…

tree（3）究竟意义是什么，有数比他更大吗？ **-** 知乎
已知tree(1)=2, tree(2)=5, tree(3)也并不大，可能等于1688849860263934，也可能还稍微大一点，但应该不会超过第一句话说的范围。非常巨大的那个数 …

知乎 - 有问题，就会有答案
知乎，中文互联网高质量的问答社区和创作者聚集的原创内容平台，于 2011 年 1 月正式上线，以「让人们更好的分享知识、经验和见解，找到自己的解答」为品 …

借你*5*块钱，*G(0)*天之后你需要还*TREE(2)*元，你愿意吗？ - 知乎
TREE（2）=3. 就是说借你五块钱，四天之后要还三块钱，你愿意吗？但凡知道这些东西的人肯定会同意．如果没有限制借的次数，请 …