Arboriculture & Urban Forestry 2021. 47(6):234–251
https://doi.org/10.48044/jauf.2021.021

Professional Expertise and Its Role in Risk Assessment

By Ryan W. Klein, Andrew K. Koeser, Gail Hansen, Laura A. Warner, Adam G. Dale, and John Watt

Abstract. Professional judgment is derived from a person's intuition, training, and level of expertise. When exploring the influence that expertise has on the process of tree risk assessment, it is helpful to approach the topic in relation to its impact across various related fields and disciplines. This paper reviews the effects of arboricultural and tree risk assessment training on the assessor and overall tree risk assessment methodology through the lens of professional judgment and decision making. Additionally, the topic of risk perception is explored based on how it can affect decision making. Concepts and theories related to risk perception are applied to arboriculture and tree risk assessment to provide additional insight into how subjectivity and personal bias may affect recommendations, mitigation, and the overall management of our urban forests. The review finds that an individual's perception of a risk can be equally as influential as the reality of the risk on the decision-making process, recommendations, and subsequent outcomes of an assessment. Furthermore, experts, similar to novices, are susceptible to the influence of perceived risk. Much of the available research has suggested that the acquisition of professional expertise (i.e., previous experience, training, and accreditation) can result in decision making that is more closely tied to the reality of a risk. Ultimately, a great deal remains unknown regarding our understanding of professional expertise and its influence on the tree risk assessment process.

Keywords. Decision Making; Professional Judgment; Risk Perception; Tree Risk Assessment.

INTRODUCTION

The practice of identifying potential risks and managing them at an acceptable level is important to many disciplines, industries, and regulatory agencies. In arboriculture, individuals and groups who manage urban forests have seen evolutions in tree risk assessment methods over a relatively short period of time. Many see tree risk assessment as an inherently human endeavor that is impacted by assessor biases, tolerances, and errors. Tree risk assessment methods rely on professional judgment in determining the likelihood of tree failure. Therefore, it is recommended that determinations surrounding natural resources be based on sound professional judgment (Haas 2003). Haas (2002) defines sound professional judgment as "a reasonable decision that has given full and fair consideration to all the appropriate information, that is based upon principled and reasoned analysis and the best available science and expertise, and complies with applicable laws."

With anything that has the potential to cause harm, there is an actual, a perceived, and an assessed risk. Professionals try to free themselves from their own personal biases to assess and manage risk based on an appraisal of the actual risk. Some authors have argued that the guise of objectivity assumed by experts is a fallacy, and there is no way to eliminate human perception from risk assessment (Shrader-Frechette 1990; Adams 1995; Eduljee 2000). When experts act on their assessments as if they were accurate reflections of the actual risk, unknown personal biases or errors can influence the process and result in misguided mitigation measures (Slovic et al. 1981).

Given the inherent subjectivity of risk assessment, we believe that tree risk assessment would benefit from a deeper understanding of the impact personal biases, perceptions, risk tolerances, and expertise can have on the decision-making process. As such, this literature review provides a general and arboriculture-specific overview of past and current research on

these topics. Combining psychology, sociology, and arboriculture literature, the following summary provides insight into the individual judgments and perceptions that affect tree risk assessment outcomes. We conclude by identifying related future research recommendations.

This review seeks to address the following questions: How does a tree assessor's professional expertise and perceptions affect their judgments regarding tree health and public safety? What qualifies someone as a "professional" capable of making meaningful decisions regarding the risk of trees and appropriate management options? Are training and experience sufficient gauges of expertise, or are there other benchmarks related to skill and performance that must be met? The key terms explored throughout the review are detailed in Table 1.

MATERIALS AND METHODS

We searched several journals in their entirety to compile this literature review (all volumes that pre-date the composition of this manuscript in 2019), namely *Arboriculture & Urban Forestry*, *Journal of Arboriculture*, and *Urban Forestry & Urban Greening*. The search centered on the topics of professional expertise, tree risk, risk perception, professionalism, training, and credentials. We conducted the keyword searches using Google Scholar, JSTOR, Science Direct, Web of Science, and the University of Florida George A. Smathers Library collections database. The following search terms were used: expertise; decision making; urban forestry professionalism; arboriculture professionalism; tree care professionalism; qualified to assess trees; qualified to assess arboriculture; urban forest risk assessment; tree risk assessment; tree failure; risk perception; perception of trees; perception of natural spaces; risk perception psychology; public risk perception. There were no additional specified qualifiers (i.e., term A OR term B) to accompany the words and phrases searched as part of the review. The articles searched were not restricted by any specified time frame. The process of sorting through articles began with identifying titles that fit into the scope of the topic being reviewed. From there, the retained articles' abstracts were read for relevance, and we eliminated those that were unrelated to the review. Roughly 1,500 articles were examined for relevance, approximately 250 of which were relevant to the topic. We excluded articles that did not meet the established criteria (i.e., perceptions of natural space

Table 1. A list of key terms that have been outlined in the literature which are used throughout the review.

Term	Definition
Expert	An individual who is well versed in a particular subject matter and is recognized by others as having expertise in their field (Skjong and Wentworth 2001).
Expertise	Exceptional performance in a given field (Krosnick 1990).
Professional judgment	A reasonable decision that has given full and fair consideration to all the appropriate information, that is based upon principled and reasoned analysis and the best available science and expertise, and that complies with applicable laws (Haas 2002).
Professional	An individual that has previous education and training related to a specific profession which allows them to perform associated tasks at a relatively high level (Cambridge University Press 2020).
Professionalism	The actions, conduct, and mindset of an individual in a professional setting (Virginia Tech 2020).
Risk assessment	A systematic process for identifying hazards, determining if there is a target, evaluating the potential for risk, and then proposing some sort of mitigation if it is warranted by the situation (Ball and Ball-King 2014).
Tree risk assessment	Evaluating the level of risk (low to very high) associated with a tree and its likelihood to fail and impact a person or property (Pokorny 2003).
Risk perception	The subjective assessment of the probability of a specified type of accident happening, and how concerned we are with the consequences (Sjöberg et al. 2004).
Emotional intelligence	The skills associated with emotion-based information that takes into account the measurement of related abilities (Mayer et al. 2003).
Risk governance	A construct for the manner in which public risks are dealt with, specifically those that are complicated and clouded by uncertainty (Renn and Klinke 2013).

excluding any mention of trees or tree failure unrelated to risk assessment). The relevant articles were then read in their entirety for possible inclusion and overall relatedness to the topic.

RESULTS

Expertise

The results offer an understanding of expertise both from a developmental standpoint and across various professional levels. Furthermore, expertise is explored in the context of arboriculture and urban forestry professionalism to better explain expert judgment and decision making in tree risk assessment. Additionally, components of professionalism and risk perception are examined to determine their relationship to both expertise and the decision-making process.

Skjong and Wentworth (2001) suggested that when selecting an expert, candidates should be screened for key markers of experience: relevant experience, local reputation, objectivity, self-confidence, and adaptability. Skjong and Wentworth (2001) defined an expert as an individual who is well-versed in a particular subject matter and is recognized by others as having expertise in their field. The authors further added that it is important to be conscious of the limitations surrounding expert judgments. Specifically, experts (like non-experts) can be susceptible to outside influences and biases.

Glaser et al. (1988) reviewed expertise research and found that experts (i.e., someone with exceptional performance in a particular domain) generally outperform novices due to their ability to accomplish tasks more quickly with relatively few errors. Experts generally excel in their area of expertise and have a better understanding of more complex problems related to their specialization. Furthermore, they have superior long- and short-term memories (Rikers and Paas 2005). It seems logical, then, that experts and non-experts could view the same situation differently given differences in aptitude on a particular topic. Yet, this does not explain the variability in assessments that can be found from one expert to another and when comparing individual skill sets.

Beyond a well-developed understanding of a particular topic, industry credentials, and real-world experience, experts can also be held in high regard based on personality traits. Several authors have suggested that trustworthiness helps give experts credibility (Hovland et al. 1953; Schweitzer and Ginsberg 1966; Griffin 1967; McGinnies and Ward 1980; Goldman 2001; Haynes et al. 2012). McGinnies and Ward (1980) further added that trustworthiness relates to an individual's integrity and evident honesty, while expertise speaks to an individual's knowledge and competency of a given situation.

What Makes an Expert—The Development of Expertise

At its core, expertise development results from life experiences. Experiences can help to shape and build an individual's capacity to function at a high level in a particular area of understanding. In a review on expert performance, Ericsson and Charness (1994) suggested that the development of expertise stems from the acquisition of intricate skills and physiological adaptations. They further stated that the highest levels of expertise were typically obtained by individuals trained at a very young age through a process of intense daily practice sustained for a decade or more. Other studies have concluded that the main driver of expertise in any given field is practice, and that those individuals who reach a high level of expertise typically spend more time on deliberate practice (Ericsson et al. 1993; Ericsson 2006). There is a common belief within philosophy and psychology that an individual that has achieved the status of expert has dedicated roughly 10,000 hours to practicing their expertise (Collins 2014). Individuals with greater levels of expertise generally began practicing 2 to 5 years earlier in life compared to individuals with lesser skills (Ericsson et al. 1993). Franklin (2013) proposed that the development of expertise is the result of individuals frequently refining their skill set and modifying it to fit new and evolving situations.

Researchers have identified several stages as a person progresses from novice to expert (Alexander 1997; Alexander 2003). Specifically, Alexander (2003) pointed to the relationship between knowledge, interest, and strategic processing. In that context, as detailed in the Model for Domain Learning (MDL) (Alexander 1997), knowledge means the extent of understanding in a field and of a specific domain topic. Interest means investment in a specific domain and the attention piqued by an event or feature of the environment. Strategic processing means processes used to decipher text and the ability to judge credibility or develop mental interpretations. The model further explains that knowledge, interest, and processing

occur at three distinct stages of learning: acclimation, competence, and proficiency. During the initial stage, acclimation, the learner has limited knowledge of a complex domain (Alexander 2003). The learner is driven by their personal interest to stimulate their performance (Mitchell 1993). The second stage, competence, is denoted by the ability to demonstrate a foundational understanding of a domain. That understanding links knowledge and strategy to an increase in more sustained personal interest (Alexander 2003). The final stage, proficiency, is achieved expertise in a domain where the knowledge base is well-developed. Additionally, the expert's personal interest and engagement are elevated (Alexander 2003), and the individual's level of deep-processing strategy remains high (Alexander et al. 2004).

To better understand the potential stages that lead professionals to proficiency at tree risk assessment, we applied the MDL model (Alexander 2003) to expertise development in the field of arboriculture (Figure 1). In the proposed model, professional experience leads to the acclimation of the knowledge base needed to perform various industry-related tasks. Eventually, enough experience is gained and a level of competence attained that can be applied towards specialized industry training and accreditation. A level of expertise has been achieved when an individual has developed both a thorough understanding of their specific area of the industry and displays the necessary skills to perform the related tasks at a high level. We believe that this model can be applied to any of the specialized skill sets required for proficiency in various areas of arboriculture (e.g., training in aerial rescue, electrical hazard awareness, and tree risk assessment and accreditation). Specific to tree risk assessment, as a certified arborist gains professional experience, they begin to further develop an understanding of the various areas of arboriculture. Some common areas are tree defects, pests and diseases, species characteristics, site conditions, and infrastructure conflicts. This knowledge can be applied to their understanding of what leads a tree to fail and the potential associated risk. As recognition of their demonstrated level of proficiency regarding tree risk assessment, arborists can pursue their International Society of Arboriculture (ISA) Tree Risk

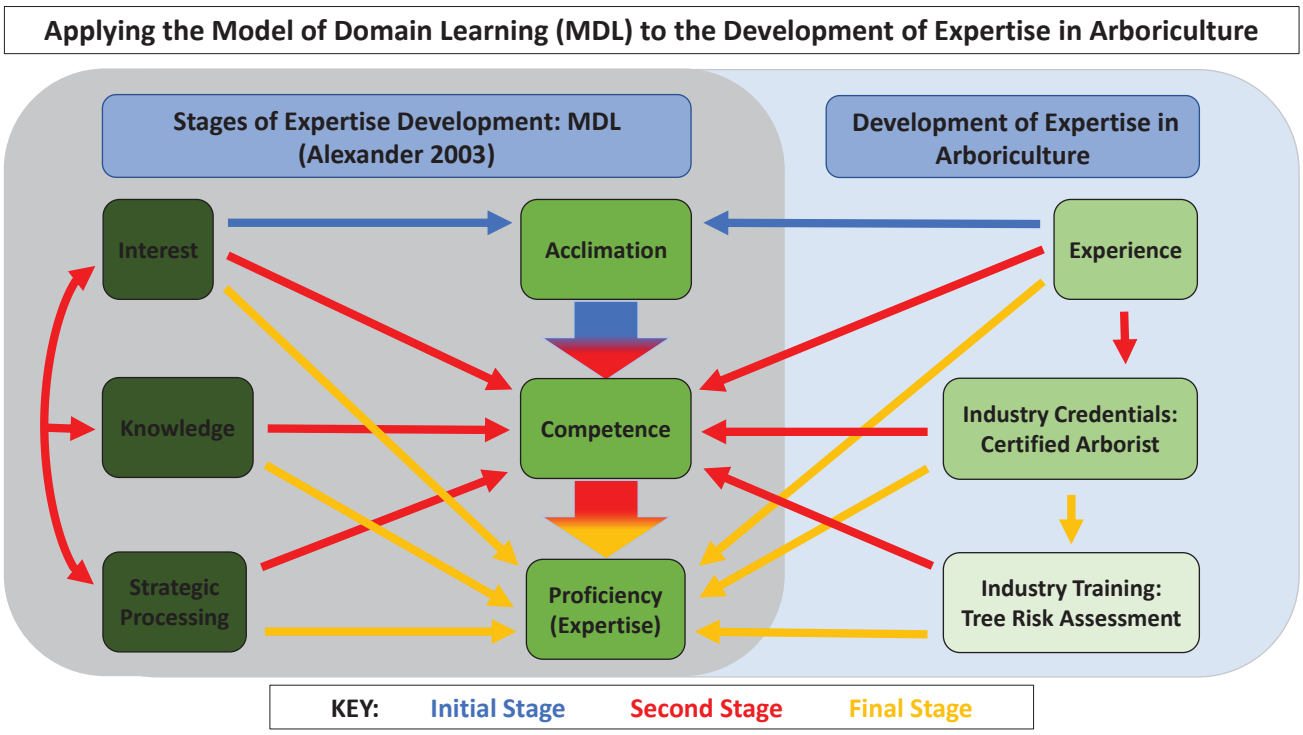

Figure 1. The figure depicts our proposed application of the Model of Domain Learning (MDL)(Alexander 2003) to the development of expertise in arboriculture, specifically related to tree risk assessment. The model follows the authors' three stages of learning (i.e., initial, second, final) as a person goes from a novice to an expert.

Assessment Qualification (TRAQ)(Dunster et al. 2017). Similar accreditation can be earned depending on the method commonly used and accepted in an area (i.e., Quantified Tree Risk Assessment [QTRA] [Ellison 2005] in the UK).

Kahneman and Klein (2009) attested that experts are cognizant of what they do not know, whereas non-experts are ignorant to what they do not know. Additionally, Kahneman and Klein (2009) proposed that an individual's subjective assurance on a matter should be viewed as an undependable sign of their decision making and instinctive judgments. It would seem logical, then, that some experts may make decisions based on beliefs (the subjective) stemming from their previous experiences and knowledge of a topic rather than reality (the objective). Also, many experts toe the line between subjectivity and objectivity with a combination of personal beliefs and scientific understanding. To better understand whether decisions based on intuition can be trusted involves a deeper understanding of the situation in which decisions are made. Additional insight is also needed regarding the opportunities available to identify any regularities related to that situation (Kahneman and Klein 2009).

Although experts can provide a deeper understanding of a topic, we need to be aware of any limitations to their abilities. Following a study on clinical judgment, Goldberg (1968) concluded that experts can lack reliability and validity. Further, additional information will increase confidence but may not actually improve experts' level of precision (Shanteau and Stewart 1992). Similarly, in a review on expert decision making, Shanteau and Stewart (1992) presented additional examples of how experts and non-experts act in similar ways. They argued that an expert's use of information can be equally as limited as novices' (Reilly and Doherty 1989). Also, experts may not be more accurate than non-experts (Camerer and Johnson 1997), and experts are equally as susceptible to the cognitive illusions that affect novices (Kahneman 1991). Although experts are imperfect, the public relies on them to provide technical support related to important decision making that is often based on varying degrees of available information (Klein et al. 2017). This prompts several questions related to the accuracy and improvement of expert judgments and why experts come to different conclusions on the same issue.

In a paper on the acquisition of expertise, Dreyfus and Dreyfus (2005) explicated that experts often base their decisions on intuition rather than reflection or calculation. The authors proposed a five-stage model for the acquisition of expertise. The model transitions from novice to advanced beginner, competence, proficiency, and finally an achieved level of expertise. Dreyfus and Dreyfus (2005) stressed that the embodiment of an expert's abilities cannot be likened to any set of guidelines or facts. Rather, expertise is the result of experiencing tens of thousands of real-life situations. Likewise, Salas et al. (2010) suggested that intuition and expertise have overlapping components based on the rapid production of decision options (e.g., extensive domain-specific knowledge, pattern recognition, and automaticity). They further stated that this expertise-based intuition can develop through experience in a domain, ultimately affecting decision making. Amassed experience in conjunction with a developed understanding of a topic separates experts from beginners. Although, experts are often times unaware of the extent of their own knowledge as it relates to expertise (Feigenbaum and McCorduck 1983).

Risk Assessment

Human beings are faced with many different scenarios and activities throughout our daily lives that present some level of risk. Simonet and Wilde (1997) explained that the ramifications of our daily activities cannot be foreseen without a shadow of a doubt. There is a degree of uncertainty that might present some sort of disadvantage or associated level of risk. Much of the time, we are aware of the associated risks that we encounter daily (e.g., driving a car, crossing the street). We choose to accept those risks. Other times, a risk might outweigh the benefit or have the potential to threaten public health and safety, thus warranting some degree of risk assessment.

Ball and Ball-King (2014) explained that risk assessment is a systematic process for identifying hazards, determining if there is a target, evaluating the potential for risk, and then proposing some sort of mitigation if the situation warrants it. Some risk assessments are more quantitative or formulative in nature, while others rely solely on qualitative inputs. The latter leaves the assessor with a greater influence on the outcome of the assessment. Quantitative risk assessments attempt to measure core aspects of risk

when possible, often expressing the final determination in a numerical form. Qualitative risk assessments, however, utilize terms such as low, medium, improbable, and imminent, among others, to categorize the level of risk. Skjong and Wentworth (2001) pointed out that it is commonplace for risk assessments to be scrutinized for being too dependent on expert judgments, although this is seen as a better alternative to having no analysis of risk to aid in the decision-making process.

Risk Assessment—Arboriculture

To be a professional, an arborist must develop the skills needed to address the most commonly performed services and tasks. One such skill is the ability to assess the risk that trees pose to public health and safety. As part of an extensive literature review on tree risk assessment, Klein et al. (2019) explained that the most commonly used tree risk assessment methods address: (1) the likelihood of tree failure; (2) the likelihood of a target being present/impacted; and (3) the consequences of failure (Matheny and Clark 1994; Mattheck and Breloer 1994; Pokorny 2003; Dunster et al. 2017; Smiley et al. 2017). In evaluating these three factors, assessors will consider a wide array of environmental features (precipitation, soil, pests, disease, etc.), species characteristics, and site conditions that might increase the likelihood of failure (Matheny and Clark 1994). In this context, no situation is entirely free of risk unless the site is devoid of all potential targets (Mortimer and Kane 2004; Ellison 2005; Dunster et al. 2017; Smiley et al. 2017) or trees. There needs to be a balance between maintaining an acceptable level of risk in return for the provided benefits (e.g., health, cultural, aesthetic).

Risk Management

Risk management is the process of establishing a course of action to mitigate a particular risk that has been identified within a risk assessment (Eduljee 2000). It is thought of as a decision-making process that considers the related social, political, engineering, and economic factors to evaluate and devise a suitable governing response (Eduljee 2000). Furthermore, the US National Research Council (1983) views risk assessment as an objective process that is rooted in the scientific method. Many assessments have some level of subjectivity, however. Throughout both the risk assessment process and the management of a given risk, those individuals involved in decision making ultimately influence the recommendations made and the resulting mitigation. Aven (2016) attested that how we view and define a risk ultimately dictates how that risk is evaluated and the resulting risk management.

Part of managing risk is to determine a set of objectives, then determine and assess any potential obstacles that would prevent the realization of these goals (Watt 2007). Specifically on managing the risk posed by trees, Watt (2007) pointed out that safety is only one possible aim with tree management. Ball and Ball-King (2014) explained that safety means different things to different people (including experts). Nothing is entirely safe without some level of risk, and the question of whether something is safe is complex and needs to consider both the risks and benefits of a given situation. Several other studies have also attested that when managing tree risk, consideration needs to be given to both the risks and the benefits associated with a given tree (National Tree Safety Group 2011; Roy et al. 2012; Ball and Watt 2013a).

Developing Expertise in Arboriculture

Education and Professionalism

Higher education is seen as one of the main pathways to positions that require higher levels of expertise in arboriculture and urban forestry. Vogt et al. (2016) conducted a survey to assess the presence of arboriculture and urban forestry courses found at the collegiate level. Of the 116 responding institutions, only 36% had a related course, and only 29% had an academic degree program. The lack of related courses and programs is interesting given that there has been a great deal of research in arboriculture (McPherson 1984; Penn-Del Chapter 2001; Elmendorf et al. 2005; Wiseman et al. 2011). These efforts indicate that industry employers place great value on higher education when hiring. Moreover, Elmendorf et al. (2005) found that courses highlighting skills such as pruning, planting, and diagnosis were most valued among industry managers. Despite this, Wiseman et al. (2011) found that only 94 out of 279 urban tree care-related college programs offered core arboriculture courses.

Once in the workforce, continuing education programs and trade literature are essential for industry professionals to further or reinforce their expertise on a particular topic. As part of a survey of 298 tree wardens in the northeastern United States, Ricard and

Bloniarz (2006) found that 69.3% of respondents advanced their knowledge of the industry through conference events. Furthermore, the authors reported that 64% of tree wardens stated that when they need an immediate answer to a question, they reach out to their peers in the private sector, while only 5.3% seek out information from their associated professional group, the International Society of Arboriculture. Ricard and Bloniarz (2006) pointed out that this lack of reliance on their primary professional society is likely tied to involvement in local professional organizations. Koeser (2009) noted that although many arboricultural professionals obtain a great deal of their continuing education through industry-sponsored events, there is generally very little control over the quality and validity of the content presented. Small, local training events may be beneficial for transferring localized knowledge, but they may also be more prone to stray from current, empirically derived management practices. Similarly, tree care professionals may also receive additional industry training and continuing education from their employers. Specialized skills training programs related to tree worker safety, aerial rescue, and electrical hazard awareness have been designed by industry groups like the Tree Care Industry Association (TCIA). Such programs are commonly taught in-house by some companies.

Standards and Credentials

When determining an individual's level of expertise, Collins and Evans (2007) explained that the standard measurement is generally seen as the credentials that a person has received. That said, no credentials for gauging proficiency exist for many forms of expertise that move beyond the specialist level. For example, having keen moral or political judgment, being fluent in your native language, and having the ability to differentiate between other experts and non-experts are skills that are not associated with any professional credential system. As such, Collins and Evans (2007) noted that credentials are an incomplete measure for determining overall expertise. Rather, the authors suggested that a person's experience and track record may serve as an alternative to credentials when gauging one's level of expertise. They also noted that these attributes are a better representation of an individual's ability or inability to make judgments. Collins (2014) acknowledged the difficulty associated with using experience and track record as judgment criteria, however, as it requires the person making the assessment to have an understanding of what is notable (meta or managerial expertise). Despite their noted limitations, credentials offer some assurance of expertise to those outside an area of practice. Given the varying perspectives surrounding qualifications, it seems likely that the total sum of a combination of criteria distinguishes an individual's level of expertise. Specifically, as a person gains experience, participates in specialized training, and acquires industry credentials, these events together can elevate a beginner and can lead one to develop specialist expertise. There remain other factors that likely influence the development of expertise that have yet to be explored.

To be successful in any line of work, one needs to provide a quality service and project a desired level of professionalism. Within the United States tree care industry, credentials have emerged as an accepted indication of expertise (Hauer and Peterson 2016). Hauer and Peterson (2016) stated that industry credentials and standards of practice have emerged to define and shape professionals and predict their level of success. This is not to say that an individual or business will be unsuccessful in their endeavors without such professional achievements. Rather, when a potential client chooses one arboricultural professional over a competitor based on standards and credentials, it is a testament to the hours spent working towards professional development and the perceived value of the industry standards and accreditations.

The tree care industry has come to the consensus that the ISA Certified Arborist® (Certified Arborist) is the standard care credential for most industry professionals. Many other industry-specific international credentials exist as well, including ISA Certified Arborist Utility Specialist®, ISA Certified Arborist Municipal Specialist®, ISA Certified Tree Worker Climber Specialist®, ISA Certified Tree Worker Aerial Lift Specialist®, ISA Board Certified Master Arborist® (BCMA™), and the ISA Tree Risk Assessment Qualification (TRAQ). Many states also promote their own arborist certification programs (e.g., Massachusetts, Connecticut, and Maine).

In the United States, the most commonly recognized tree care industry standards are American National Standards Institute (ANSI) A300 standards. These standards cover various aspects, including pruning, supplemental support systems, lightning protection systems, planting and transplanting, and more. Additionally, the ANSI Z133 safety standards

address general safety, electrical hazards, vehicles and mobile equipment, power tools, and more. Together, the ANSI A300 and Z133 have been accepted as the industry standards. As an example of their impact in practice, Kenney et al. (2011) attested that successfully expanding an urban forest is as equally dependent on the commitment to industry standards as it is to planting and caring for newly planted trees. Thus, professionalism is just as much a product of what is accomplished as how it is accomplished.

Several studies throughout the years have surveyed municipalities to see if they have a Certified Arborist on staff (Schroeder et al. 2003; Koeser et al. 2016). For example, in a recent survey of 655 municipalities, Hauer and Peterson (2016) found that 61% of respondents had at least one Certified Arborist currently employed. Furthermore, regarding industry standards, the authors mentioned that of 419 responding communities, 60% followed the A300 tree care standards and 51% the Z133 safety standards. When hiring contractors, Hauer and Peterson (2016) found that of the 419 responding communities, 68% preferred Certified Arborists, 68% adhered to the A300 tree care standards, and 57% followed the Z133 safety standards. Studies such as these speak to the value the industry places on both the standards and credentials available to arboricultural professionals.

The importance of industry standards and professional credentials should not be overlooked when it comes to tree risk assessments, mitigation recommendations, and outcomes. There is the assumption that industry credentials should serve as an indication that someone is more qualified than someone without them. Several studies have addressed the impact of professional credentialing on risk assessment ratings (Koeser et al. 2015; Klein et al. 2016; Koeser et al. 2017). Most recently, Koeser and Smiley (2017) had a group of 296 industry professionals with different levels of experience, education, and credentialing perform basic visual assessments on three different trees. They found that Certified Arborists were four times as likely to recommend retaining and monitoring trees (as opposed to more active management options such as removal). Moreover, arborists with an additional ISA Tree Risk Assessment Qualification were two times more likely to recommend inaction compared to Certified Arborists. Similar to earlier conclusions by Norris (2007), Koeser and Smiley (2017) suggested that the assessor performing the assessment likely has the greatest impact on the final risk determination. If these findings were found to be consistent in practice, then this could lead to conflicting assessments, public disapproval, and disagreements in a court of law (Stewart et al. 2013; Koeser and Smiley 2017). The high value placed on professional standards and credentials is especially apparent when legal issues related to tree failure arise. As Mortimer and Kane (2004) explained, it is considered commonplace for arboricultural professionals to act as expert witnesses in lawsuits, and for industry standards to be used as the standard of care for arborists involved as both plaintiffs and defendants.

Expert Judgment and Decision Making

In the field of arboriculture, professionals require a skill set that takes time and experience to develop. Specifically, those who perform tree risk assessments must gain a level of expertise that allows them to make pragmatic recommendations based on the health of a tree in relation to the risk that it might pose to the public. Based on Collins' (2014) explanation of the various levels of expertise, the level most closely related to and required for the management of trees is specialist expertise, more specifically, those who have acquired specialist tacit knowledge. Collins (2014) pointed out that this group can be further broken down into interactional expertise and contributory expertise. Interactional expertise means the ability to comprehend and evaluate others' work while lacking the skills needed to contribute. Contributory expertise means the proficiency required to participate fully to every aspect of a field. Of these two groups, the contributory expert seems to best describe how individuals who manage trees develop their skills. In an ideal world, management decisions would be based on expert assessments or even empirical findings. However, this is not always the reality. It is important to keep in mind that although common themes are shared amongst general risk management and tree risk management, there remain many unknowns regarding specific connections between topics. These unknowns affect arboricultural professionals' judgment and decision making.

In addition, with expertise comes a higher level of responsibility. Beyond an individual assessor's expert evaluation of a tree, many outside factors can influence both the assessor's recommendations and the decisions made regarding the ultimate mitigation of a

tree. For example, Jones et al. (2014) explored a controversial case in Newcastle, Australia, where city officials were pitted against community activists in a fight over public safety and the protection of some of the city's heritage fig trees. The authors attempted to shed light on the political, emotional, and other factors that affect how individuals and groups perceive tree-related risks. Following several risk assessments resulting in varying risk assessments of the trees, the city council ultimately decided to have the fig trees removed. To make sense of the situation, Jones et al. (2014) concluded that the risk posed by the trees—or rather, how the risk was perceived—was in part a manifestation of time and place and the understanding, beliefs, and relations of those involved. Similarly, Ball and Ball-King (2014) explained that it is becoming more common for experts across a variety of disciplines to be held accountable for their risk management decisions. Because of this, many have begun protecting themselves by consulting and relying on codes and standards, rather than performing a risk assessment of their own. The application of this approach in tree care would prove problematic, as tree risk is weighed against benefits. Trees are complex structures that exist in dynamic environments, like changing weather conditions and levels of occupancy. The establishment of uniform decision criteria would likely never be sufficient to capture the full range of scenarios experienced in practice. Kahneman (2011) pointed out that experts with well-developed intuition can identify familiar components in new situations and can apply their understanding duly. Similarly, Anderson et al. (2019) suggested that while intuition can lead to inaccuracies, it is also linked to expert decision making and the ability to make rapid and complex judgments. To this point, it seems logical that someone who has amassed experience assessing tree risk would have developed a similar level of intuition.

Risk Perception

The way in which a risk is perceived is equally as influential (if not more so) in the decision-making process as that of the reality of the risk. Risk perception is defined as "the subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences" (Sjöberg et al. 2004). Pidgeon et al. (1992) similarly stated that risk assessments are no longer thought of as being objective in nature. Rather, they contain a certain level of subjectivity. This can be problematic, especially for individuals who perform risk assessments or make decisions about managing risk. Bodemer and Gaissmaier (2014) pointed out that a great deal of research has been conducted on the different factors that contribute to how an individual perceives risk. Some factors include a person's age (Quadrel et al. 1993; Hermand et al. 1999; Millstein and Halpern-Felsher 2002; Galesic et al. 2009; Fischhoff et al. 2010), level of expertise (Sjöberg 1998; Slovic 1999), personal and cultural values (Douglas and Wildavsky 1982; Kahan et al. 2009), gender and race (Finucane et al. 2000; Kahan et al. 2007), and their ability to understand statistical information (Dillard et al. 2006; Peters et al. 2006; Reyna et al. 2009; Garcia-Retamero and Galesic 2010). Likewise, Skjong and Wentworth (2001) explained that an individual's experience with risk (accidents, close calls, etc.) can alter their perception of risks. Their experience can make them more aware of their surroundings, leading toward safer behaviors. Conversely, their exposure to risk can lower their ability to deal with similar situations, cause undue stress, and lead them down a path that perpetuates riskier behaviors.

When a serious tree-related accident occurs, risk aversion and the fear of similar situations occurring can influence those in charge of managing trees. This fear can lead some people to overreact to the situation and recommend the unwarranted removal of trees (Fay 2007). Regardless of whether perceptions of tree-related risks are grounded in reality, they ultimately play a role in how trees are managed. These perceptions can subsequently influence a variety of parties, including the courts, tree care professionals, insurance providers, and media outlets (Ball and Watt 2013b). Slovic et al. (1981) explained that people are more likely to conjure up regularly occurring events than those that rarely transpire. This can be influenced by a variety of factors outside that of the actual frequency of an event. The authors used the example of a current disaster or the events that take place in a movie. Those fictional depictions can alter a person's ability to make sound risk-related judgments, leading to unfounded perceptions of risk, poor decision making, and an overall warped view of potential hazards.

Perceptions of tree-related risk can be difficult for tree care professionals to overcome when working with a client. Both risk-averse and risk-tolerant

perspectives can be equally as problematic if a person is unwilling to change their mind based on information they receive. To complicate this issue further, an assessor may also have an irrational view of the situation at hand, thus conveying their unfounded perceptions to the decision maker. Slovic et al. (1981) pointed out that, similar to non-experts, experts are just as likely to fall prey to overconfidence. This is especially true when they are forced to find answers that extend beyond the most up-to-date information on a topic and depend on their judgment to make decisions. Previous experience, training, and accreditation can lead an individual to be overconfident in their ability to assess risk and may blind the assessor from fully understanding the reality of a risk. As it relates to tree risk assessment, the current and most commonly used methods are imperfect and can be influenced by personal bias and perception. In addition, many unknowns exist when it comes to the likelihood of a tree or tree part failing. As a result, an individual's previous experience, training, and accreditation will only take them so far when it comes to evaluating the associated risk. Ultimately, the individual performing the assessment will have the most influence on the final determination of risk, which may or may not be based solely on the components commonly assessed by most methods. There is therefore the potential for two different arborists to look at the same tree and come to different conclusions about the risk. Aside from the most up-to-date scientific information, industry standards and credentials, and personal work experience, the most common thread related to tree risk assessments that allows for variation in expert judgment and recommendations could be the subjective nature of assessments, personal bias, and unfounded perceptions of risk. Ultimately, how a person views a potential risk (real or perceived) can dictate the recommendations, decisions, and outcome of a situation.

Risk Perception—Arboriculture

Many studies have documented the cornucopia of perceptions that people have in relation to trees. Such perceptions include the costs and benefits (Hull 1992; Lohr et al. 2004; Jorgensen and Anthopoulou 2007; Kirkpatrick et al. 2011; Kirkpatrick et al. 2012), urban vegetation and landscape preferences (Schroeder 1982, 1983; Talbot and Kaplan 1984; Jorgensen et al. 2002; Roovers et al. 2006; Zheng et al. 2011), safety in and around urban green spaces (Schroeder and Anderson 1984; Shaffer and Anderson 1985; Jorgensen et al. 2002; Bjerke et al. 2006; Jansson et al. 2013), preferred species characteristics (Summit and Sommer 1999; Nelson et al. 2001; Lohr and PearsonMims 2006; Gerstenberg and Hofmann 2016), and the potential risks that they can pose (Wyman et al. 2012; Kirkpatrick et al. 2013; Koeser et al. 2015; Klein et al. 2019). The latter has been addressed the least. There are many things that we do not understand about how perceptions affect an individual's view of tree-related risks and the decisions that are made in response to both real and perceived risks. Gilbert and Brack (2007) pointed out that the bulk of the available research on public perceptions of urban trees deals with costs, benefits, and biology. Considerably less work has focused on how people view the potential risks associated with trees.

To better understand tree-related perceptions, Kirkpatrick et al. (2013) interviewed 52 arboricultural professionals and surveyed 736 residents from 6 Australian cities. The authors found that arboricultural professionals commonly believed that many residents have a general dislike of trees, overstate tree-related risks, have an illogical fear of trees, and need to be better educated about trees. Conversely, the authors explained that urban residents view arboricultural professionals as being responsible for planting trees where they shouldn't be planted, allowing trees to be disfigured and removed, preventing warranted tree removals, and failing to properly educate the public on tree-related issues. Kirkpatrick et al. (2013) concluded that arboricultural professionals generally had more of a positive and pragmatic attitude toward trees compared to the views of the surveyed urban residents. It seems plausible that increasing public education about trees might bring the two groups closer together in their views on trees and potentially alleviate some of the conflicts between them. However, Kirkpatrick and Davison (2017) suggested that overcoming unsubstantiated fears of trees might still be challenging, given that the media and other cultural depictions continue to perpetuate the negative stereotypes surrounding trees.

Risk Governance

The assessments that professionals make, whether based in reality or on perception, can be viewed within the overarching conceptual framework of risk governance. Renn and Klinke (2013) explained that

risk governance is a construct for how public risks are dealt with, specifically those that are complicated and clouded by uncertainty. Additionally, the authors pointed out that the related concepts are a product of interdisciplinary research, including sociology, psychology, policy, etc., and mirror how various stakeholders, both public and private, approach risks. The conceptual framework for risk governance was developed by the International Risk Governance Council (IRGC 2005) as a means of providing various stakeholders an inclusive and adaptable means of dealing with risks (IRGC 2019). The proposed framework consists of four interrelated components: pre-assessment, appraisal, characterization and evaluation, and management (IRGC 2019). Additionally, the framework incorporates three additional features that work with the above-mentioned components to further address and deal with risks: communication, stakeholder engagement, and addressing social context (IRGC 2019).

The overarching framework of risk governance provides a prospective platform to evaluate the data collected during the risk assessment process beyond the insight offered by the assessor (whether expert or non-expert). Additionally, the framework fosters supplementary information pertaining to the overall management of a risk that can go well beyond just the associated likelihood and consequences. Management decisions might also be directed towards objectives that have less to do with public health and safety. Such decisions may have more to do with other predetermined goals established by individuals or groups who will determine the fate of a tree. Ellison (2019) suggested that both the costs and benefits of risk need to be considered when making management decisions. Ellison (2019) also stated that there are numerous benefits (e.g., wildlife habitat, conservation utility, aesthetics, and health) that can lose monetary value when a risk is mitigated. When considering "how safe is safe enough," Watt (2007) suggested that groups and individuals can both have varying perspectives on safety. Different personal, professional, and cultural objectives and values affect decision makers as they weigh the potential for damage and the cost of mitigation. Ball and Ball-King (2014) posed the question, what kind of professionals are best equipped to make such determinations? Given the wide array of available experts with various levels of expertise and abilities, it can be challenging for non-experts to choose the best candidate that best fits the situation at hand. Aven (2016) proposed that future research needs to address the question, "How can we state how good expert judgements are, and how can we improve them?"

At times it seems that expertise is not always valued. In some cases, expertise is relied upon only if it aligns with the perceptions or goals of the individual or group making the final decision. With privately owned trees, tree care professionals make recommendations and leave the final decision regarding action to the landowner. Conversely, public trees are predominately managed by local municipalities that are frequently subjected to budgetary constraints and regulatory inefficiencies. Furthermore, municipalities are occasionally misguided by elected officials' motivations beyond health and safety. Renn and Schweizer (2009) attested that simply aspiring to be inclusive to all stakeholders throughout the decision-making process is inadequate. Methods that support the assimilation of not only professional expertise but also governmental constraints and the interests of the public are needed. The authors also pointed out that it is unreasonable to supersede professional expertise with ambiguous public opinions, just as it would be unwarranted to have experts incorporate personal beliefs into a process that should be democratic.

Cost–Benefit Analysis

Despite local differences across urban forest management, the obstacles faced by most communities are budgetary and staffing constraints, a lack of public involvement, inadequate planting spaces, and the threat of invasive species (Kenney et al. 2011). Also, urban forest managers need to recognize when they have achieved the goals and targets they laid out. They should also outline and regularly assess any additional measures that need to be addressed and implemented as they work towards their established objective. Nowak and Dwyer (2007) suggested that urban forest management plans need to address specific issues that are unique to a given area by improving the suite of benefits that are the most desired for that location. Ultimately, management plans that are site-specific, goal-oriented, and set out to balance costs and benefits are more likely to be successful than plans solely based on money or risk aversion.

Performing a cost–benefit analysis for risk management entails more than just addressing the potential costs and benefits of a situation. Ball and Ball-King

(2014) pointed out that decision makers need to consider the availability of resources in risk management decisions. They also said it is important to acknowledge any established policy, legal constraints, and responsible agencies, and any potential societal, economic, and ethical issues. A balancing act is needed between public safety with regards to risk severity and the associated mitigation cost. If the risk is relatively small and located in a place where the likelihood of injury to the public or damage to property is low, then management might decide to allocate their resources elsewhere. On the other hand, if a risk poses a significantly high level of threat to the public or property, then management might decide to mitigate the risk. Cost–benefit analyses can help create a sort of equilibrium between the important and desired things versus those that threaten real damage and need mitigation. Sometimes, mitigating a particular risk or addressing a specific cost might prove to be costlier than not addressing the issue. Attempting to deal with those situations might result in additional costs or risks.

When we look at specific costs in relation to urban forest management, minimizing the risks that trees pose is generally towards the top of the list of concerns. Ball and Ball-King (2014) proposed that in place of traditional risk assessment methods used to make decisions in the public sphere, risk benefit or cost–benefit analyses should be used in their place. The authors attested that such analyses compare both the associated risks of a location and activity by balancing associated decisions with the myriad of benefits that are provided to the public. Furthermore, the authors expound that risk benefit or cost–benefit analyses are well equipped to deal with complex issues such as threat of harm to the public, as balanced against the benefits of sustainability, aesthetics, social values, preserving natural spaces, and public use. Lastly, Ball and Ball-King (2014) pointed out that a cost–benefit analysis should be viewed as a jumping off point to assist with risk-related judgments and is by no means a substitute for making them. They likened this to the dynamic between risk assessment and risk management. From identifying a potential issue to balancing the associated costs and benefits, to the decision-making process and resulting mitigation, making determinations on risk and other management concerns is a process with many inputs along the way.

CONCLUSION

Decisions made pertaining to tree management should be based on a working knowledge of trees that only expert practitioners can provide. Systematic approaches and advanced equipment can reduce errors and provide greater insights into the multitude of factors that go into assessing tree risk. However, these are merely tools to aid in decision making and are not sufficient judgments on the relative safety of a tree. The findings in the literature show evidence that varying levels of professional expertise can lead to tree-related judgments that are more in line with the reality of a given risk. If this pattern continues to be found in future studies, it could be seen as a benefit to public health and safety in urban areas.

Currently, expertise is judged across a variety of criteria, including experience, credentials, trustworthiness, local knowledge, and the use of professional standards. Yet even an individual with all the above-mentioned qualities can make mistakes. One of the main issues that surfaces when exploring the topic of expertise is how to determine the expert's level of expertise. Additionally, one should consider to what extent an expert's understanding of a topic is biased by outside factors. Given the wide range of criteria for which expertise is judged, it would be difficult to suggest which measurements of expertise are the most important and to what extent a particular criterion would qualify one tree professional over another. Ultimately, it is up to the individual or group seeking out a tree risk assessment professional to determine whether the assessor is qualified for the job.

Expertise and professionalism in tree risk assessment, risk perception, and tree management influence the decision-making process to varying degrees. This influence ultimately affects the retention of tree-related benefits and the exposure to the risks that trees can pose. Further examining the individuals who make tree-related judgments and how they reach their decisions will better our understanding of the relationship between expertise and tree risk management. Many unknowns remain regarding the influence of professional experience, education, professional accreditation, industry standards, and risk perception on the accuracy and consistency of tree risk assessments. We are unaware of which aspects of professionalism most influence an arborist's ability to perform the various facets of their job at a high level. Much also

Table 2. Areas of future research that have been identified as having the potential to add to our current understanding of tree risk assessment.

Future research need	Utility to tree risk assessment
Additional studies that evaluate the influence of previous experience, training, and industry accreditation.	Help guide future training programs and industry certifications to better fit the skills needed to perform tree risk assessments more accurately and consistently.
A better understanding as to what qualifies someone as a professional and what criteria should be evaluated to determine their ability to perform tree risk assessments.	This information can be used to help homeowners and other decision makers make more informed choices regarding the individuals that they hire to assess and manage tree risk.
Further examining how tree-related judgments are made and the individuals who make the decisions.	Such insight has the potential to better our understanding of the relationship between expertise and tree risk management.
Explore the effect that risk perception, personal bias, and other subjective inputs have on the risk assessment process and the subsequent mitigation.	Provide a better understanding of how and why tree-related decisions are made and determine potential approaches to counter such subjective inputs through education and training.

remains unknown on the influence that previous experience and industry training and accreditation have on the outcomes of tree risk assessments and the recommended mitigation. It is likely that a combination of the criteria listed in this review come together to provide arboricultural professionals with skill sets and higher performance levels compared to those without. It seems intuitive then to suggest that the more experience, training, and education an arborist has, the more likely they will be able to perform at a high level. However, this assumption needs to be explored in greater detail.

Past work in the field of psychology illustrates how much is still not understood regarding risk perception and how it can affect an individual's objectivity while conducting risk assessments. Eliminating some of the subjective inputs, personal bias, and unwarranted perceptions that can influence risk assessment outcomes can make the process more objective and closer in line with the reality of a risk. Such a shift still does not account for our lack of understanding as to why some trees fail unexpectedly or how risk assessments can be refined for better accuracy and consistency. Given the importance of risk perception and the assessor's impact on the final determination of risk, future research (Table 2) has the potential to bring more insight that will improve our understanding of the topic.

LITERATURE CITED

Adams J. 1995. *Risk*. London (UK): University College London Press. 228 p.

Alexander PA. 1997. Mapping the multidimensional nature of domain learning: The interplay of cognitive, motivational, and strategic forces. *Advances in Motivation and Achievement*. 10:213-250.

Alexander PA. 2003. The development of expertise: The journey from acclimation to proficiency. *Educational Researcher*. 32(8):10-14. https://doi.org/10.3102/0013189X032008010

Alexander PA, Sperl CT, Buehl MM, Fives H, Chiu S. 2004. Modeling domain learning: Profiles from the field of special education. *Journal of Educational Psychology*. 96(3):545-557. https://doi.org/10.1037/0022-0663.96.3.545

Anderson NE, Slark J, Gott M. 2019. Unlocking intuition and expertise: Using interpretative phenomenological analysis to explore clinical decision making. *Journal of Research in Nursing*. 24(1-2):88-101. https://doi.org/10.1177/1744987118809528

Aven T. 2016. Risk assessment and risk management: Review of recent advances on their foundation. *European Journal of Operational Research*. 253(1):1-13. https://doi.org/10.1016/j.ejor.2015.12.023

Ball DJ, Ball-King L. 2014. *Public safety and risk assessment: Improving decision making*. Abingdon-on-Thames (UK): Routledge. 224 p.

Ball DJ, Watt J. 2013a. Further thoughts on the utility of risk matrices. *Risk Analysis*. 33(11):2068-2078. https://doi.org/10.1111/risa.12057

Ball DJ, Watt J. 2013b. The risk to the public of tree fall. *Journal of Risk Research*. 16(2):261-269. https://doi.org/10.1080/13669877.2012.737827

Bjerke T, Ostdahl T, Thrane C, Strumse E. 2006. Vegetation density of urban parks and perceived appropriateness for recreation. *Urban Forestry & Urban Greening*. 5(1):35-44. https://doi.org/10.1016/j.ufug.2006.01.006

Bodemer N, Gaissmaier W. 2014. Risk perception. In: Cho H, Reimer TO, McComas KA, editors. *The SAGE handbook of risk communication*. Thousand Oaks (CA, USA): SAGE Publications. p. 10-23.

Cambridge University Press. 2020. Professional. In: Cambridge Dictionary. Cambridge (UK): Cambridge University Press. [Accessed 2020 September 29]. https://dictionary.cambridge.org/us/dictionary/english/professional

Camerer CF, Johnson EJ. 1997. The process-performance paradox in expert judgment: How can experts know so much and predict so badly? In: Goldstein WM, Hogarth RM, editors. *Research on judgment and decision making: Currents, connections, and controversies.* Cambridge (UK): Cambridge University Press. p. 342-364.

Collins H. 2014. *Are we all scientific experts now?* Hoboken (NJ, USA): John Wiley & Sons. 140 p.

Collins H, Evans R. 2007. *Rethinking expertise*. Chicago (IL, USA): University of Chicago Press. 176 p.

Dillard AJ, McCaul KD, Kelso PD, Klein WM. 2006. Resisting good news: Reactions to breast cancer risk communication. *Health Communication*. 19(2):115-123. https://doi.org/10.1207/s15327027hc1902_3

Douglas M, Wildavsky A. 1982. *Risk and culture: An essay on the selection of technological and environmental dangers*. Oakland (CA, USA): University of California Press. 224 p. https://www.jstor.org/stable/10.1525/j.ctt7zw3mr

Dreyfus HL, Dreyfus SE. 2005. Peripheral vision: Expertise in real world contexts. *Organization Studies*. 26(5):779-792. https://doi.org/10.1177/0170840605053102

Dunster JA, Smiley ET, Matheny N, Lilly S. 2017. *Tree risk assessment manual*. 2nd Ed. Champaign (IL, USA): International Society of Arboriculture. 194 p.

Eduljee GH. 2000. Trends in risk assessment and risk management. *Science of the Total Environment*. 249(1-3):13-23. https://doi.org/10.1016/S0048-9697(99)00507-0

Ellison MJ. 2005. Quantified tree risk assessment used in the management of amenity trees. *Journal of Arboriculture*. 31(2):57-65.

Ellison MJ. 2019. Quantified Tree Risk Assessment User Manual: Version 5, 3.3. Macclesfield (UK): Quantified Tree Risk Assessment Ltd.

Elmendorf W, Watson T, Lilly S. 2005. Arboriculture and urban forestry education in the United States: Results of an educators survey. *Journal of Arboriculture*. 31(3):138-149.

Ericsson KA. 2006. The influence of experience and deliberate practice on the development of superior expert performance. In: Ericsson KA, Charness N, Feltovich PJ, Hoffman RR, editors. *Cambridge handbook of expertise and expert performance*. New York (NY, USA): Cambridge University Press. p. 683-704.

Ericsson KA, Charness N. 1994. Expert performance: Its structure and acquisition. *American Psychologist*. 49(8):725-747. https://doi.org/10.1037/0003-066X.49.8.725

Ericsson KA, Krampe RT, Tesch-Romer C. 1993. The role of deliberate practice in the acquisition of expert performance. *Psychological Review*. 100(3):363-406. https://doi.org/10.1037/0033-295X.100.3.363

Fay N. 2007. Towards reasonable tree risk decision-making? *Arboricultural Journal*. 30(2):143-161. https://doi.org/10.1080/ 03071375.2007.9747489

Feigenbaum EA, McCorduck P. 1983. *The fifth generation: Artificial intelligence and Japan's computer challenge to the world*. Reading (MA, USA): Addison-Wesley. 275 p.

Finucane ML, Slovic P, Mertz CK, Flynn J, Satterfield TA. 2000. Gender, race, and perceived risk: The 'white male' effect. *Health, Risk & Society*. 2(2):159-172. https://doi.org/10.1080/713670162

Fischhoff B, de Bruin WB, Parker AM, Millstein SG, Halpern-Felsher BL. 2010. Adolescents' perceived risk of dying. *Journal of Adolescent Health*. 46(3):265-269. https://doi.org/10.1016/j.jadohealth.2009.06.026

Franklin CL II. 2013. Developing expertise in management decision-making. *Academy of Strategic Management Journal*. 12(1):21-38.

Galesic M, Garcia-Retamero R, Gigerenzer G. 2009. Using icon arrays to communicate medical risks: Overcoming low numeracy. *Health Psychology*. 28(2):210-216. https://doi.org/10.1037/a0014474

Garcia-Retamero R, Galesic M. 2010. How to reduce the effect of framing on messages about health. *Journal of General Internal Medicine*. 25(12):1323-1329. https://doi.org/10.1007/s11606-010-1484-9

Gerstenberg T, Hofmann M. 2016. Perception and preference of trees: A psychological contribution to tree species selection in urban areas. *Urban Forestry & Urban Greening*. 15:103-111. https://doi.org/10.1016/j.ufug.2015.12.004

Gilbert M, Brack CL. 2007. Changes in public requests to remove significant urban trees after severe bushfires in Canberra, Australia. *Urban Forestry & Urban Greening*. 6(1):41-48. https://doi.org/10.1016/j.ufug.2006.10.001

Glaser R, Chi MT, Farr MJ. 1988. *The nature of expertise*. East Sussex (UK): Psychology Press. 470 p. https://doi.org/10.4324/9781315799681

Goldberg LR. 1968. Simple models or simple processes? Some research on clinical judgments. *American Psychologist*. 23(7):483-496. https://doi.org/10.1037/h0026206

Goldman AI. 2001. Experts: Which ones should you trust? *Philosophy and Phenomenological Research*. 63(1):85-110. https://doi.org/10.1111/j.1933-1592.2001.tb00093.x

Griffin K. 1967. The contribution of studies of source credibility to a theory of interpersonal trust in the communication process. *Psychological Bulletin*. 68(2):104-120. https://doi.org/10.1037/h0024833

Haas GE. 2002. Visitor capacity on public lands and waters: Making better decisions. A report of the Federal Interagency Task Force on Visitor Capacity on Public Lands for the Assistant Secretary for Fish and Wildlife and Parks, US Department of the Interior. Ashburn (VA, USA): National Recreation and Park Association.

Haas GE. 2003. Restoring dignity to sound professional judgment. *Journal of Forestry*. 101(6):38-43. https://doi.org/10.1093/jof/101.6.38

Hauer RJ, Peterson W. 2016. Building and growing professionals for trees: Arboricultural standards and credentials. *Arborist News*. 25(1):42-46.

Haynes AS, Derrick GE, Redman S, Hall WD, Gillespie JA, Chapman S, Sturk H. 2012. Identifying trustworthy experts: How do policymakers find and assess public health researchers worth consulting or collaborating with? *PLoS One*. 7(3):e32665. https://doi.org/10.1371/journal.pone.0032665

Hermand D, Mullet E, Rompteaux L. 1999. Societal risk perception among children, adolescents, adults, and elderly people. *Journal of Adult Development*. 6(2):137-143. https://doi.org/10.1023/A:1021676909857

Hovland CI, Janis IL, Kelley HH. 1953. *Communication and persuasion: Psychological studies of opinion change*. New Haven (CT, USA): Yale University Press. 315 p.

Hull RB IV. 1992. How the public values urban forests. *Journal of Arboriculture*. 18(2):98-101.

IRGC (International Risk Governance Council). 2005. Risk governance: Towards an integrative approach. Geneva (Switzerland): IRGC. White Paper No. 1. 157 p.

IRGC (International Risk Governance Council). 2019. IRGC Risk Governance Framework. Geneva (Switzerland): IRGC. [Accessed 2020 July 14]. https://irgc.org/risk-governance/irgc-risk-governance-framework

Jansson M, Fors H, Lindgren T, Wistrom B. 2013. Perceived personal safety in relation to urban woodland vegetation—A review. *Urban Forestry & Urban Greening*. 12(2):127-133. https://doi.org/10.1016/j.ufug.2013.01.005

Jones RM, Instone L, Mee KJ. 2014. Making risk real: Urban trees and the ontological politics of risk. *Geoforum*. 56:211-225. https://doi.org/10.1016/j.geoforum.2014.07.009

Jorgensen A, Anthopoulou A. 2007. Enjoyment and fear in urban woodlands—Does age make a difference? *Urban Forestry & Urban Greening*. 6(4):267-278. https://doi.org/10.1016/j.ufug.2007.05.004

Jorgensen A, Hitchmough J, Calvert T. 2002. Woodland spaces and edges: Their impact on perception of safety and preference. *Landscape & Urban Planning*. 60(3):135-150. https://doi.org/10.1016/S0169-2046(02)00052-X

Kahan DM, Braman D, Gastil J, Slovic P, Mertz CK. 2007. Culture and identity-protective cognition: Explaining the white-male effect in risk perception. *Journal of Empirical Legal Studies*. 4(3):465-505. https://doi.org/10.1111/j.1740-1461.2007.00097.x

Kahan DM, Braman D, Slovic P, Gastil J, Cohen G. 2009. Cultural cognition of the risks and benefits of nanotechnology. *Nature Nanotechnology*. 4(2):87-90. https://doi.org/10.1038/nnano.2008.341

Kahneman D. 1991. Article commentary: Judgment and decision making: A personal view. *Psychological Science*. 2(3):142-145. https://doi.org/10.1111/j.1467-9280.1991.tb00121.x

Kahneman D. 2011. *Thinking, fast and slow*. New York (NY, USA): Farrar, Straus and Giroux. 499 p.

Kahneman D, Klein G. 2009. Conditions for intuitive expertise: A failure to disagree. *American Psychologist*. 64(6):515-526. https://doi.org/10.1037/a0016755

Kenney WA, van Wassenaer PJ, Satel AL. 2011. Criteria and indicators for strategic urban forest planning and management. *Arboriculture & Urban Forestry*. 37(3):108-117.

Kirkpatrick JB, Daniels GD, Davison A. 2011. Temporal and spatial variation in garden and street trees in six eastern Australian cities. *Landscape & Urban Planning*. 101(3):244-252. https://doi.org/10.1016/j.landurbplan.2011.02.029

Kirkpatrick JB, Davison A. 2017. Arborists and arguments in the urban forest: A synthesis. In: TREENET Proceedings of the 18th National Street Tree Symposium; 2017 September 7–8; Adelaide, South Australia. Myrtle Bank (South Australia): TREENET. p. 34-40.

Kirkpatrick JB, Davison A, Daniels GD. 2012. Resident attitudes towards trees influence the planting and removal of different types of trees in eastern Australian cities. *Landscape & Urban Planning*. 107(2):147-158. https://doi.org/10.1016/j.landurbplan.2012.05.015

Kirkpatrick JB, Davison A, Harwood A. 2013. How tree professionals perceive trees and conflicts about trees in Australia's urban forest. *Landscape & Urban Planning*. 119:124-130. https://doi.org/10.1016/j.landurbplan.2013.07.009

Klein G, Shneiderman B, Hoffman RR, Ford KM. 2017. Why expertise matters: A response to the challenges. *IEEE Intelligent Systems*. 32(6):67-73. https://doi.org/10.1109/MIS.2017.4531230

Klein RW, Koeser AK, Hauer RJ, Hansen G, Escobedo FJ. 2016. Relationship between perceived and actual occupancy rates in urban settings. *Urban Forestry & Urban Greening*. 19:194-201. https://doi.org/10.1016/j.ufug.2016.06.030

Klein RW, Koeser AK, Hauer RJ, Hansen G, Escobedo FJ. 2019. Risk assessment and risk perception of trees: A review of literature relating to arboriculture and urban forestry. *Arboriculture & Urban Forestry*. 45(1):23-33. https://doi.org/10.48044/jauf.2019.003

Koeser AK. 2009. Trees and risk researcher summit white paper. Champaign (IL, USA): International Society of Arboriculture. https://www.isa-arbor.com/Portals/0/Assets/PDF/research/educ_Portal_Risk_Whitepaper.pdf

Koeser AK, Hauer RJ, Klein RW, Miesbauer JW. 2017. Assessment of likelihood of failure using limited visual, basic, and advanced assessment techniques. *Urban Forestry & Urban Greening*. 24:71-79. https://doi.org/10.1016/j.ufug.2017.03.024

Koeser AK, Hauer RJ, Miesbauer JW, Peterson W. 2016. Municipal tree risk assessment in the United States: Findings from a comprehensive survey of urban forest management. *Arboricultural Journal*. 38(4):218-229. https://doi.org/10.1080/03071375.2016.1221178

Koeser AK, Klein RW, Hasing G, Northrop RJ. 2015. Factors driving professional and public urban tree risk perception. *Urban Forestry & Urban Greening*. 14(4):968-974. https://doi.org/10.1016/j.ufug.2015.09.004

Koeser AK, Smiley ET. 2017. Impact of assessor on tree risk assessment ratings and prescribed mitigation measures. *Urban Forestry & Urban Greening*. 24:109-115. https://doi.org/10.1016/j.ufug.2017.03.027

Krosnick JA. 1990. Expertise and political psychology. *Social Cognition*. 8(1):1-8. https://doi.org/10.1521/soco.1990.8.1.1

Lohr VI, Pearson-Mims CH. 2006. Responses to scenes with spreading, rounded, and conical tree forms. *Environment and Behavior*. 38(5):667-688. https://doi.org/10.1177/0013916506287355

Lohr VI, Pearson-Mims CH, Tarnai J, Dillman DA. 2004. How urban residents rate tree benefits and problems. *Journal of Arboriculture*. 30(1):28-35.

Matheny NP, Clark JR. 1994. *A photographic guide to the evaluation of hazard trees in urban areas*. Champaign (IL, USA): International Society of Arboriculture. 85 p.

Mattheck C, Breloer H. 1994. Field guide for visual tree assessment (VTA). *Arboricultural Journal*. 18(1):1-23. https://doi.org/10.1080/03071375.1994.9746995

Mayer JD, Salovey P, Caruso DR, Sitarenios G. 2003. Measuring emotional intelligence with the MSCEIT V2.0. *Emotion*. 3(1):97-105. https://doi.org/10.1037/1528-3542.3.1.97

McGinnies E, Ward CD. 1980. Better liked than right: Trustworthiness and expertise as factors in credibility. *Personality and Social Psychology Bulletin*. 6(3):467-472. https://doi.org/10.1177/014616728063023

McPherson EG. 1984. Employer perspectives on arboriculture education. *Journal of Arboriculture*. 10(5):137-142.

Millstein SG, Halpern-Felsher BL. 2002. Judgments about risk and perceived invulnerability in adolescents and young adults. *Journal of Research on Adolescence*. 12(4):399-422. https://doi.org/10.1111/1532-7795.00039

Mitchell M. 1993. Situational interest: Its multifaceted structure in the secondary school mathematics classroom. *Journal of Educational Psychology*. 85(3):424-436. https://doi.org/10.1037/0022-0663.85.3.424

Mortimer MJ, Kane B. 2004. Hazard tree liability in the United States: Uncertain risks for owners and professionals. *Urban Forestry & Urban Greening*. 2(3):159-165. https://doi.org/10.1078/1618-8667-00032

National Research Council. 1983. *Risk assessment in the federal government: Managing the process*. Washington (DC, USA): National Academies Press. 205 p. https://doi.org/10.17226/366

National Tree Safety Group (NTSG). 2011. *Common sense risk management of trees: Guidance on trees and public safety in the UK for owners, managers and advisers*. Edinburgh (Scotland): Forestry Commission. 104 p.

Nelson T, Johnson T, Strong M, Rudakewich G. 2001. Perception of tree canopy. *Journal of Environmental Psychology*. 21(3):315-324. https://doi.org/10.1006/jevp.2001.0223

Norris M. 2007. Tree risk assessments—What works—What does not—Can we tell? A review of a range of existing tree risk assessment methods. ISAAC Conference Perth 2007; 2007 May 1; Perth (Australia). p. 1-31.

Nowak DJ, Dwyer JF. 2007. Understanding the benefits and costs of urban forest ecosystems. In: Kuser JE, editor. *Urban and community forestry in the northeast*. Dordrecht (Netherlands): Springer. p. 25-46.

Penn-Del Chapter. 2001. Arboriculture: The state of the industry. Bedminster (PA, USA): The Pennsylvania Delaware Chapter of the International Society of Arboriculture. 10 p.

Peters E, Västfjäll D, Slovic P, Mertz CK, Mazzocco K, Dickert S. 2006. Numeracy and decision making. *Psychological Science*. 17(5):407-413. https://doi.org/10.1111/j.1467-9280.2006.01720.x

Pidgeon N, Hood C, Jones D, Turner B, Gibson R. 1992. Risk perception. In: *Risk: Analysis, perception and management*. London (UK): Royal Society. p. 89-134.

Pokorny JD. 2003. Urban tree risk management: A community guide to program design and implementation. St. Paul (MN, USA): USDA Forest Service Northeastern Area State and Private Forestry. NA-TP-03-03. 194 p.

Quadrel MJ, Fischhoff B, Davis W. 1993. Adolescent (in)vulnerability. *American Psychologist*. 48(2):102-116. https://doi.org/10.1037/0003-066X.48.2.102

Reilly BA, Doherty ME. 1989. A note on the assessment of self-insight in judgment research. *Organizational Behavior and Human Decision Processes*. 44(1):123-131. https://doi.org/10.1016/0749-5978(89)90038-1

Renn O, Klinke A. 2013. A framework of adaptive risk governance for urban planning. *Sustainability*. 5(5):2036-2059. https://doi.org/10.3390/su5052036

Renn O, Schweizer PJ. 2009. Inclusive risk governance: Concepts and application to environmental policy making. *Environmental Policy and Governance*. 19(3):174-185. https://doi.org/10.1002/eet.507

Reyna VF, Nelson WL, Han PK, Dieckmann NF. 2009. How numeracy influences risk comprehension and medical decision making. *Psychological Bulletin*. 135(6):943-973. https://doi.org/10.1037/a0017327

Ricard RM, Bloniarz DV. 2006. Learning preferences, job satisfaction, community interactions, and urban forestry practices of New England (USA) tree wardens. *Urban Forestry & Urban Greening*. 5(1):1-15. https://doi.org/10.1016/j.ufug.2006.03.004

Rikers RM, Paas F. 2005. Recent advances in expertise research. *Applied Cognitive Psychology*. 19(2):145-149. https://doi.org/10.1002/acp.1108

Roovers R, Dumont B, Gulinck H, Hermy M. 2006. Recreationists' perceived obstruction of field and shrub layer vegetation. *Urban Forestry & Urban Greening*. 4(2):47-53. https://doi.org/10.1016/j.ufug.2005.09.001

Roy S, Byrne J, Pickering C. 2012. A systematic quantitative review of urban tree benefits, costs, and assessment methods across cities in different climatic zones. *Urban Forestry & Urban Greening*. 11(4):351-363. https://doi.org/10.1016/j.ufug.2012.06.006

Salas E, Rosen MA, Diaz Granados D. 2010. Expertise-based intuition and decision making in organizations. *Journal of Management*. 36(4):941-973. https://doi.org/10.1177/0149206309350084

Schroeder H. 1982. Preferred features of urban parks and forests. *Journal of Arboriculture*. 8(12):317-322.

Schroeder H. 1983. Variations in the perception of urban forest recreation sites. *Leisure Science*. 5(3):221-230. https://doi.org/10.1080/01490408309513004

Schroeder H, Anderson LM. 1984. Perception of personal safety in urban recreation sites. *Journal of Leisure Research*. 16(2):178-194.

Schroeder HW, Green TL, Howe TJ. 2003. Community tree programs in Illinois, U.S.: A statewide survey and assessment. *Journal of Arboriculture*. 29(4):218-225.

Schweitzer D, Ginsberg GP. 1966. Factors of communicator credibility. In: Backman CW, Secord PF, editors. *Problems in social psychology*. New York (NY, USA): McGraw-Hill Book Co. p. 94-102.

Shaffer G, Anderson LM. 1985. Perceptions of the security and attractiveness of urban parking lots. *Journal of Environmental Psychology*. 5(4):311-323. https://doi.org/10.1016/S0272-4944(85)80001-3

Shanteau J, Stewart TR. 1992. Why study expert decision making? Some historical perspectives and comments. *Organizational*

Behavior and Human Decision Processes. 53(2):95-106. https://doi.org/10.1016/0749-5978(92)90057-E
Shrader-Frechette KS. 1990. Perceived risks versus actual risks: Managing hazards through negotiation. *Risk*. 1:341.
Simonet S, Wilde GJ. 1997. Risk: Perception, acceptance and homeostasis. *Applied Psychology*. 46(3):235-252. https://doi.org/10.1111/j.1464-0597.1997.tb01228.x
Sjöberg L. 1998. Risk perception: Experts and the public. *European Psychologist*. 3(1):1-12. https://doi.org/10.1027/1016-9040.3.1.1
Sjöberg L, Moen BE, Rundmo T. 2004. Explaining risk perception. An evaluation of the psychometric paradigm in risk perception research. *Rotunde publikasjoner Rotunde*. 84:55-76.
Skjong R, Wentworth BH. 2001. Expert judgment and risk perception. In: *Proceedings of the Eleventh (2001) International Offshore and Polar Engineering Conference*; 2001 June 17–22; Stavanger, Norway. Cupertino (CA, USA): International Society of Offshore and Polar Engineers. p. 537-544.
Slovic P. 1999. Trust, emotion, sex, politics, and science: Surveying the risk-assessment battlefield. *Risk Analysis*. 19(4):689-701. https://doi.org/10.1023/A:1007041821623
Slovic P, Fischhoff B, Lichtenstein S. 1981. Perceived risk: Psychological factors and social implications. *Proceedings of the Royal Society of London A*. 376(1764):17-34. https://doi.org/10.1098/rspa.1981.0073
Smiley ET, Matheny N, Lilly S. 2017. *Best management practices: Tree risk assessment*. 2nd Ed. Champaign (IL, USA): International Society of Arboriculture. 86 p.
Stewart MG, O'Callaghan D, Hartley M. 2013. Review of QTRA and risk-based cost-benefit assessment of tree management. *Arboriculture & Urban Forestry*. 39(4):165-172.
Summit J, Sommer R. 1999. Further studies of preferred tree shapes. *Environment and Behavior*. 31(4):550-576. https://doi.org/10.1177/00139169921972236
Talbot JF, Kaplan R. 1984. Needs and fears: The response to trees and nature in the inner city. *Journal of Arboriculture*. 10(8):222-228.
Virginia Tech. 2020. Career and Professional Development. [Accessed 2020 September 29]. https://career.vt.edu/develop/professionalism.html
Vogt J, Fischer BC, Hauer RJ. 2016. Urban forestry and arboriculture as interdisciplinary environmental science: Importance and incorporation of other disciplines. *Journal of Environmental Studies and Sciences*. 6(2):371-386. https://doi.org/10.1007/s13412-015-0309-x
Watt J. 2007. The management of risk with respect to cultural heritage—A case study. *Arboricultural Journal*. 30(2):175-185. https://doi.org/10.1080/03071375.2007.9747491
Wiseman PE, Hoffman JW, Day SD, Clements TL. 2011. A syllabus-based review of collegiate arboriculture course content in the United States. *Arboriculture & Urban Forestry*. 37(2):51-59.
Wyman M, Escobedo F, Stein T, Orfanedes M, Northrop R. 2012. Community leader perceptions and attitudes toward coastal urban forests and hurricanes in Florida. *Southern Journal of Applied Forestry*. 36(3):152-158. https://doi.org/10.5849/sjaf.10-022
Zheng B, Zhang Y, Chen J. 2011. Preference to home landscape: Wildness or neatness? *Landscape and Urban Planning*. 99(1):1-8. https://doi.org/10.1016/j.landurbplan.2010.08.006

ACKNOWLEDGMENTS

This study was funded by the University of Florida Institute of Food and Agricultural Sciences (IFAS) 2018 Early Career Scientist Seed Fund.

Ryan W. Klein (corresponding author)
University of Florida
Department of Environmental Horticulture, CLUE, IFAS
Fifield Hall, PO Box 110670
Gainesville, FL, USA
352-273-4519
ryanwklein@ufl.edu

Andrew K. Koeser
University of Florida
Department of Environmental Horticulture, CLUE, IFAS
Gulf Coast Research and Education Center
14625 County Road 672
Wimauma, FL, USA

Gail Hansen
University of Florida
Department of Environmental Horticulture, CLUE, IFAS
Fifield Hall, PO Box 110670
Gainesville, FL, USA

Laura A. Warner
University of Florida
Department of Agricultural Education and Communication, CLUE, IFAS
407 Rolfs Hall, PO Box 110540
Gainesville, FL, USA

Adam G. Dale
University of Florida
Department of Entomology & Nematology, IFAS
Steinmetz Hall
1881 Natural Area Dr, PO Box 110620
Gainesville, FL, USA

John Watt
Middlesex University
Centre for Decision Analysis and Risk Management
Natural Sciences Department
London, UK

Conflicts of Interest:
The authors reported no conflicts of interest.

Résumé. Le jugement professionnel découle de l'intuition, de la formation et du niveau d'expertise d'une personne. Lorsqu'on étudie l'influence de l'expertise sur le processus d'évaluation des risques associés aux arbres, il est utile d'aborder ce sujet par rapport à son impact dans divers domaines et disciplines connexes. Cet article passe en revue les effets de la formation en arboriculture et en évaluation des risques associés aux arbres sur l'évaluateur et sur la méthodologie globale d'évaluation des risques liés aux arbres, sous l'angle du jugement professionnel et de la prise

de décision. En outre, le sujet de la perception du risque est examiné sur la manière dont il peut influencer le processus décisionnel. Les concepts et théories en lien avec la perception du risque sont appliqués à l'arboriculture et à l'évaluation des risques pour les arbres afin de mieux comprendre comment la subjectivité et les préjugés personnels peuvent affecter les recommandations, l'atténuation et la gestion globale de nos forêts urbaines. Cet examen révèle que la perception d'un risque par une personne peut avoir autant d'influence que la réalité du risque sur le processus décisionnel, les recommandations et les conséquences ultérieures d'une évaluation. D'autant plus que les experts, au même titre que les novices, sont sensibles à l'influence du risque perçu. Une grande partie de la recherche disponible laisse à penser que l'acquisition d'une expertise professionnelle (c'est-à-dire, une expérience antérieure, une formation et une habilitation) peut aboutir à une prise de décision plus étroitement liée à la réalité d'un risque. En définitive, plusieurs inconnues subsistent quant à notre compréhension de l'expertise professionnelle et de son influence sur le processus d'évaluation des risques associés aux arbres.

Zusammenfassung. Professionelles Urteilsvermögen ergibt sich aus der Intuition, der Ausbildung und dem Fachwissen einer Person. Bei der Untersuchung, inwiefern sich Fachwissen auf den Prozess der Baumrisikobewertung auswirkt, ist es hilfreich, das Thema in Bezug auf seine Auswirkungen in verschiedenen verwandten Bereichen und Disziplinen zu betrachten. In diesem Beitrag werden die Auswirkungen der Schulungen für Baumpflege und Baumrisikobewertung auf die Sachverständigen untersucht und die gesamte Methodik der Baumrisikobewertung unter dem Aspekt des professionellen Urteilsvermögens und der Entscheidungsfindung betrachtet. Darüber hinaus wird untersucht, wie sich die Risikowahrnehmung auf die Entscheidungsfindung auswirken kann. Konzepte und Theorien im Zusammenhang mit der Risikowahrnehmung werden auf die Baumpflege und die Baumrisikobewertung angewandt, um zusätzliche Erkenntnisse darüber zu gewinnen, wie Empfehlungen, Schadensbegrenzung und die allgemeine Bewirtschaftung unserer städtischen Wälder durch Subjektivität und persönliche Befangenheit beeinflusst werden können. Die Untersuchung zeigt, dass die Risikowahrnehmung einer Person den Entscheidungsprozess, die Empfehlungen und die Ergebnisse einer Bewertung ebenso stark beeinflussen kann wie die Realität des Risikos. Außerdem sind Experten, ähnlich wie Anfänger, anfällig für den Einfluss des wahrgenommenen Risikos. Ein Großteil der verfügbaren Forschungsergebnisse deutet darauf hin, dass der Erwerb von Fachwissen (d. h. frühere Erfahrung, Ausbildung und Akkreditierung) zu einer Entscheidungsfindung führen kann, die enger mit der Realität eines Risikos verbunden ist. Letztendlich bleibt vieles unbekannt, was unser Verständnis von Fachwissen und dessen Einfluss auf den Prozess der Risikobewertung von Bäumen betrifft.

Resumen. El juicio profesional se deriva de la intuición, la capacitación y el nivel de experiencia de una persona. Al explorar la influencia que la experiencia tiene en el proceso de evaluación del riesgo de los árboles, es útil abordar el tema en relación con su impacto en varios campos y disciplinas relacionados. Este documento revisa los efectos de la capacitación en evaluación de riesgos arbóreos y en arboricultura y la metodología general de evaluación de riesgos de árboles a través de la lente del juicio profesional y la toma de decisiones. Además, se explora el tema de la percepción del riesgo en función de cómo puede afectar la toma de decisiones. Los conceptos y teorías relacionados con la percepción del riesgo se aplican a la arboricultura y la evaluación del riesgo de los árboles para proporcionar información adicional sobre cómo la subjetividad y el sesgo personal pueden afectar las recomendaciones, la mitigación y la gestión general de nuestros bosques urbanos. La revisión encuentra que la percepción de un individuo acerca de un riesgo puede ser tan influyente como la realidad del riesgo en el proceso de toma de decisiones, las recomendaciones y los resultados posteriores de una evaluación. Además, los expertos, al igual que los novatos, son susceptibles a la influencia del riesgo percibido. Gran parte de la investigación disponible ha sugerido que la adquisición de conocimientos profesionales (es decir, experiencia previa, capacitación y acreditación) puede resultar en la toma de decisiones que está más estrechamente vinculada a la realidad de un riesgo. En última instancia, queda mucho por hacer con respecto a nuestra comprensión de la experiencia profesional y su influencia en el proceso de evaluación del riesgo de los árboles.