



Borrowed Credentials and Surrogate Professional Societies: A Critical Analysis of the Urban Forestry Profession

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Abstract. Background: Urban forestry is an emerging profession, yet its professional identity is not clearly defined, nor does it have the full complement of support mechanisms commonly expected or needed by professionals. As a result, urban forest professionals rely on closely allied professions (e.g., arboriculture, forestry) resulting in frustration amongst urban forest professionals and confusion and lack of awareness amongst the general public. Methods: We developed a series of practical but ideal benchmarks for a successful “modern profession” based on features extracted from a review of the literature and precedents from 11 other professions. We then examined a broad array of evidence to identify gaps between the benchmarks and the current reality of urban forestry. Strength of evidence was assessed, and each benchmark was classified as being supported by established, emerging, or little to no evidence. Results: Gap analysis indicates that while the profession provides an essential service to society, there is a need for improvement in credentialing, public awareness, recruitment into the profession, and support for career advancement. Many gaps result from a lack of coordinated efforts or organized community dedicated to the full scope of urban forest professionals. We identified a misalignment between urban forest professionals and existing professional organizations that are dedicated to closely allied professions. Conclusion: To meet benchmarks for a successful “modern profession,” urban forestry needs professional support explicitly dedicated to urban forestry. The profession cannot meet the future needs of society supported only by borrowed credentials and surrogate professional organizations.

Keywords. Green Industry; Professional Credentials; Professional Organizations; Professionalization; Public Image.

INTRODUCTION

Towns and cities have long recognized the importance of stewardship of their trees (Miller et al. 2015). It is only in the past 50 years, however, that urban forestry has emerged as a distinct profession (Jorgensen 1968, 1970, 1993; Kenney 2010). Like many emerging professions, urban forestry has suffered from a confusing professional identity where it is simultaneously viewed as a specialization within existing professions (e.g., forestry) and as a novel interdisciplinary field arising at the intersection of several disciplines (e.g., arboriculture, forestry, planning, and others) (O'Herrin et al. 2020). Professional identity of urban forestry is receiving heightened attention, particularly in the United States and Canada, as tree-based solutions to socio-ecological problems are increasingly deployed

against a backdrop of workforce demographic shifts and public perceptions of green space management (Silvera Seamans 2013; Ordóñez et al. 2019; Sax et al. 2020).

Lack of clarity in urban forestry's professional identity has a long list of consequences. Competing professional organizations, disparate educational paths, and inconsistent job descriptions create challenges for those seeking careers and for development of a common body of knowledge for the profession (O'Herrin et al. 2018a; O'Herrin et al. 2018b). Standardization of qualifications and validation of expertise are not clear-cut, likely negatively impacting public perception and growth of the profession (Kirkpatrick et al. 2020a, 2020b). Recruitment and training of new professionals and continuing education of

current practitioners may be inefficient or disjointed, potentially contributing to poor workforce diversity and retention (Phillips and Malone 2014; Kung et al. 2020; Clayborne et al. 2021). Practicing professionals may feel that their expertise is questioned or poorly understood by colleagues (O'Herrin et al. 2014, 2015; O'Herrin et al. 2016). Even collecting data about urban forest professionals and the impacts of their work is challenging. Parajuli et al. (2022), for example, noted that there are extremely limited analyses of the economic contributions of urban forestry because it is poorly differentiated from the green industry, which includes horticulture, landscaping, and nurseries. Defining the identity of urban forestry is needed for the profession to progress and fulfill its service to society.

Professions with strong identities and clarity of purpose engage in periodic self-reflection that seeks improvement by scrutinizing the past, present, and future (Kirkpatrick et al. 2020b). Professions are dynamic in space and time, but likewise are enmeshed in a dynamic society that is the end user of the services provided by those professions. Reflecting on one's own profession to identify strengths and weaknesses is commonly seen in the literature of more well-established professions, often in the form of a periodic assessment by a professional society (O'Herrin 2016). However, professional self-reflection is nearly absent from the urban forestry literature.

Urban forestry is changing rapidly both in scope and complexion. For the purposes of this paper, we define urban forestry as the art, science, and technology of managing trees and forests in and around urban ecosystems for their social, ecological, and economic benefits (Konijnendijk et al. 2006; Miller et al. 2015). It has evolved from vegetation management largely focused on beautification to ecosystem management revolving around sustainability. Likewise, the workforce is as diverse as ever in terms of race, gender, culture, and professional pedigree. To forge a strong professional identity that will serve current and future professionals, as well as the public whom they serve, urban forestry must undergo self-reflection and define goals for improvement, which will drive educational opportunities and career pathways.

We assume *a priori* that urban forestry is a profession because it has the principal characteristics of a profession, in that it provides an essential service and requires a high level of specialization that sets a field

apart from other occupations and disciplines (Freidson 1999; Bayles 2003). Furthermore, many urban forest professionals now indicate that they view urban forestry as a profession distinct from closely allied fields such as forestry and arboriculture (Day et al. 2022). Many of the characteristics typically associated with professions—such as having a dedicated professional society—may not exist for urban forest professionals. Identifying these gaps and thus the areas in which urban forestry needs to advance as a profession, however, is precisely the aim of the analysis presented here.

This paper performs a comprehensive analysis of the urban forestry profession by examining the professional support landscape experienced by urban forest professionals. We employ a practical ideal type (PIT) methodology (Shields and Rangarajan 2013) suited to analyzing a complex system, such as an entire profession, for which a framework of benchmarks does not exist. In a PIT analysis, first a literature-based framework of benchmarks is constructed for a “practical but ideal” version of the system in question—in this case, an ideal modern profession. Then this ideal framework is compared against the case being studied (the urban forestry profession). Identifying gaps between the ideal framework and the case being studied then reveals discrete areas for improvement to the case being studied.

To complete this analysis, we rely on both existing literature and results of a recent survey of urban forest professionals about their experiences with existing credentials and whether they believe urban forest professionals need their own credential or professional society (Day et al. 2022). Importantly, that survey cast a wide net around urban forest professionals in the broadest sense, not just those who self-identified as urban foresters, which can be construed as more narrowly focused on management of the tree resource (Day et al. 2022). This wide net is an important factor in the analysis of an emerging profession. Because educational programs in urban forestry are relatively few (Vogt et al. 2016) and urban forest professionals belong to a wide array of professional organizations, many self-identify primarily as allied professionals (O'Herrin et al. 2020). By taking a broad view of urban forest professional practice in this analysis, we can better elucidate not just where elements of the profession are strong, but for whom. While urban forestry has followed a similar trajectory elsewhere in the world (Konijnendijk 2003; Barona et al. 2020),

we confine our analysis to the United States and Canada for 2 reasons: (1) a gap analysis of a profession requires a clearly defined scope; and (2) the United States and Canada are well represented in the survey from which we draw evidence to support our PIT analysis for urban forestry.

Our objectives are to: (1) create a PIT for a modern profession that is suitable for urban forest professionals; and (2) identify gaps between this PIT and the existing professional support mechanisms for and reported experiences of urban forest professionals in the United States and Canada.

LITERATURE REVIEW: PRACTICAL IDEAL TYPE FOR A MODERN PROFESSION

Numerous authors have examined professions in pursuit of a coherent definition for a profession. Bayles (2003) synthesized many schools of thought on the topic, concluding that a profession requires extensive training of a significantly intellectual nature and provides an essential service to society. Evashwick et al. (2013) concluded that public health clearly meets the definition of a profession after meeting 4 criteria: (1) a distinct body of knowledge; (2) an educational credential offered by schools and programs accredited by a specialized accrediting body; (3) career paths that include autonomous practice; and (4) a separate credential, signaling the ability to self-regulate. Similarly, Willetts and Clarke (2014) found that nursing has evolved into a profession because it has a body of knowledge, professional recognition, societal recognition, a code of ethics, and a community of professionals monitoring the conduct of members. Kirkpatrick et al. (2020c) noted that the definition of a profession is not static, but typically includes providing a service, drawing from an academic body of knowledge, forming an advocacy group, enforcing a code of ethics, and practicing self-regulation. Freidson (1994), having spent decades studying professionalism and professions, highlighted that professions provide an essential service based on a body of knowledge conveyed via higher education. However, he also believed every researcher must define “profession” for themselves, because there is no single perfect definition.

Our definition of a modern profession is presented here as a framework of practical ideals assembled by broadly examining the literature on professions and also analyzing 11 well-established professions selected

for their relevance to this analysis (see methods): doctor, nurse, public health worker, pharmacist, lawyer, civil engineer, landscape architect, urban planner, social worker, arborist, and forester. No profession is perfect or singularly exemplifies a practical ideal type; all have strengths and weaknesses. Below we delineate 8 practical ideals of a modern profession gleaned from the literature. For each ideal, we first explain the ideal and then present examples from other professions striving toward improvement in that ideal. The ideals and their supporting literature are summarized in Table 1.

Essential Service to Society

The foundational justification for any profession is to provide an essential service to society that only a specific group of experts possessing specialized knowledge can perform (Freidson 1994; Bayles 2003). Professions gain autonomy and prestige from societal recognition and, in exchange, perform essential services to society through their professional actions (Gardner and Shulman 2005; Fitzgerald 2020). Medical doctors are the most common example, because providing care for human health is essential to improving quality of life, while the specialized knowledge is increasingly complex and held only by that specific group of experts (Bayles 1986; Holden et al. 2015).

Case Study

Nelson et al. (2021) identify 5 distinct roles pharmacists have taken on over the last 100 years as technology and society have changed. Today, pharmacists provide an essential service to society by playing a critical role in health care as the specialists who prevent, identify, and manage medication therapy problems and their root causes. Although the pharmacist’s position in society makes sense to us today, it is just as easy to imagine “druggists” having lost relevancy around WWII, when their primary function of hand-mixing medication formulas was mostly made obsolete by mass-produced medications, and the balance of their duties could have been absorbed by doctors. Instead, that is just one example of a period in history where pharmacists embraced technology and successfully pivoted.

Pharmacists are currently engaged in yet another period of adjustment and are undergoing extensive self-reflection of their profession and role in society (Gregory and Austin 2019; Edwards 2020; Kellar et al. 2020; Nelson et al. 2021; Santarossa et al. 2021).

They struggle with the public perception that they simply dispense medication and do not provide direct patient care and lament a lack of awareness of their importance as health care professionals (Santarossa et al. 2021). They also strive to be seen as important as medical doctors and express frustration over being labeled as only “mid-level” providers by the US Drug Enforcement Administration (Moore et al. 2022). Nelson et al. (2021) lament failure of pharmacists to embrace a unified professional identity and highlight a need to regain unity, identifying pharmacology’s primary service to society and area of specialized knowledge as the core of an effort to refocus the profession.

Body of Knowledge

Whereas essential service to society is the philosophical core of a profession, the Body of Knowledge (BoK) is the tangible core. The BoK is a compendium of the most recent and best understanding of the minimum knowledge required to be a professional in a given discipline (Brauer 2011, 2015; Kirkpatrick et al. 2020a). This knowledge is specialized and is continually reviewed and updated to reflect new advances in research and practice. The BoK may take many forms, but it is the foundation of accredited degree programs, credentialing, and continuing education (Daley 2001), acting as the bridge between the three. This ensures that students are prepared for the workforce, and that the needs of society and employers are met (Brauer 2011). BoK stewardship is one primary function of professional organizations (Kirkpatrick et al. 2020a). Over time, the BoK of a given profession is likely to become more complex as knowledge expands.

Case Study

The American Society of Civil Engineers (ASCE) published a controversial policy statement in 1998 supporting the concept of a master’s degree as the new minimum standard for the practice of civil engineering, expressing that a bachelor’s degree was no longer adequate (Ressler 2005). This proposal was reinforced by an updated and significantly expanded BoK (Ressler 2005). Today, the ASCE BoK is on its third revision and is still working to achieve alignment with accreditation criteria for higher education (Ressler and Lenox 2020; Ressler et al. 2021). This highlights the importance of the links between the BoK and accreditation and other elements of a profession.

Maintaining these alignments as a profession evolves with society is an ongoing challenge.

Higher Education

The specialized knowledge of a profession typically requires some form of higher education. Accreditation of higher education degree programs based on the BoK ensures quality of education and alignment with the reality of society’s needs (Planning Accreditation Board 2006; Patil and Codner 2007). Accreditation is a powerful communication tool, informing students that universities have passed minimum quality standards set by the profession (Bollag 2005; Clarke and Prichard 2013; Gaston 2014). Employers seeking to fill entry-level positions may utilize degree accreditation as a minimum requirement because a student who has graduated from an accredited program meets some minimum level of competency (Kavanagh and Drennan 2008; Vlasses et al. 2013). This is commonly seen in traditional forestry positions at all levels in the United States (Redelsheimer et al. 2015) and Canada, which frequently require a forestry degree accredited by the Society of American Foresters (SAF) or Canadian Forestry Accreditation Board (CFAB), respectively. Some professions are large enough that the accreditation body is separate from the membership society of practitioners (e.g., medicine, engineering, planning).

Case Study

Sample et al. (2015) performed a national survey of forestry employers to assess the preparedness of recent forestry degree graduates. Bullard (2015) used those results to inform a realignment of the curricula of one traditional forestry degree program. The purpose was to match what employers reported with what society currently needs and desires from foresters, all within the confines of the SAF accreditation standards. This process revealed foresters have a deficiency in “people skills,” which had been identified as a problem in similar surveys since at least 1953, yet the problem persisted nationally. This was exemplified by a reported problem with awareness and public image of the term “forestry”; the public and potential students unfortunately perceived foresters as “timber beasts” rather than “sustainability-oriented problem solvers.” Bullard (2015) offered specific, large-scale recommendations to permanently resolve the problem, including major revisions to accreditation standards representing a paradigm shift toward embracing

human dimensions of natural resources and fostering a mindset of lifelong learning in undergraduates.

Credentialing to Provide Self-Regulation

Credentialing is a process used by professions to establish key competencies and then grant a designation, such as a certification or qualification, to individuals who demonstrate those competencies (Kirkpatrick et al. 2020b). Credentialing serves 4 critical functions. First, it is a tool used to determine which practitioners are qualified to practice, providing regulation (i.e., a barrier to entry). Industries may be unregulated because they are not viewed as posing significant risk to society (e.g., society likely does not need to be protected against incompetent interior designers or florists). Or they may be perceived as either too disorganized, requiring no particular skill, untrustworthy, or too irrelevant to bother.

Self-regulation is a professional point of pride (Bayles 1986, 2003) and is administered by an organization composed of practitioners, very commonly a professional society or an affiliate (Gorman 2014; Monteiro 2015). Professional self-regulation is a defining characteristic of professionalism, maintaining professional autonomy, and instilling public confidence (Bayles 1986). The alternatives are regulation by government, which is undesirable, as it shows the profession cannot be trusted, or going without regulation, which communicates unprofessionalism (or irrelevancy). Self-regulation communicates that a group of professionals care enough about their work and are organized enough to manage themselves in a manner that is consistently ethical and with regard for society.

Credentialing serves a second critical function as a tool of ethical accountability (e.g., unethical actions result in a doctor losing their medical license). Maintenance of a credential thereby communicates trust to public, peers, and employers that a given practitioner works with regard for society in addition to meeting basic qualifications. The third critical function of credentialing is maintaining practitioner competency. Credentialing is often the incentive for continuing education by requiring practitioners to obtain new knowledge or in some cases periodically reassess competency through examinations or evaluations. This ensures that practitioners maintain their connection to the BoK and utilize it in their service to society. Professionals without this connection may experience a decline in knowledge and skills, professional

dissatisfaction, low morale, disillusion, lack of commitment, and reduced interest in their work. Formal higher education occasionally functions as credentialing, but fails to provide for continuing education or ethical accountability (Kirkpatrick et al. 2020a).

The fourth and final critical function of credentialing is to provide some level of occupational closure by requiring minimum qualifications for practitioner competency. In addition to functioning as a barrier to entry to protect the public from unqualified practitioners, highlighting the qualified practitioners and excluding unqualified practitioners provides value to those who achieve the credential. This creates a shared purpose, which builds community and professional identity, especially when the credential is explicitly named (e.g., Certified Public Accountant). In our examination of 11 well-established professions, we found no examples of professions using mislabeled credentials or borrowing those from other professions, which is common among urban forest professionals seeking to codify their expertise.

Case Study

Medical doctors are one of the oldest professions in our society, and the Hippocratic Oath from the medical field is the earliest known example (AD 275) of professional ethics. Doctors are expected to operate with near absolute autonomy and strict adherence to this ethical standard; as a result, they are held in high regard by the US general public (Funk et al. 2019) and are rewarded with respect, prestige, and high pay. However, Harris and Buchbinder (2021) discuss how they believe physicians are betraying the Hippocratic Oath through overdiagnosis and overtreatment, poor science literacy, the belief in personal experience over scientific evidence, eagerness to intervene, and overestimation of medical effectiveness. This perspective challenges a status quo and may signal a realignment is necessary (Craig et al. 2018; Gao 2021). Indeed, Kirk (2007) found that medical schools are now explicitly teaching professionalism, including selflessness, accountability, and ethical principles. This shows that instead of becoming complacent, the profession is in a constant state of self-reflection to improve delivery of essential services to society.

Likewise, a requisite attribute for physicians providing quality health care is not just mastering medical knowledge, but the need for a lifelong-learning approach because the practice of medicine is constantly and quickly evolving (Accreditation Council

for Graduate Medical Education 2020). So just as the BoK itself is constantly updated, professionals are expected to continuously improve through continuing education (Daley 2001). This need for continual improvement at both the individual level and the profession itself is primarily driven by the concept of self-regulation through credentialing.

Public Trust

Public trust is critical to maintaining the autonomy granted to professions by society. Organizations work to elevate the public image of a profession through coordination of advocacy and representation (Kirkpatrick et al. 2020a). Erosion of trust can result in a loss of autonomy and prestige. For example, the profession of law is in poor standing with the US public owing to a perceived lack of ethical accountability and failure to meet the needs of society (i.e., the broken US justice system) (Hadfield and Rhode 2015; Rhode 2015).

Cultivating public trust requires proactive assessment and strategic, intentional actions. Establishing and raising standards to secure greater public trust and awareness is a common stage of professionalization (Kirkpatrick et al. 2020a). Organizations help establish the legitimacy, credibility, and consistency of professions through education and knowledge creation and dissemination via certification, accreditation, and regulation (Kirkpatrick et al. 2020c). Through market influence or through credentials, organizations must broaden public understanding of the value that qualified practitioners bring to the workforce to support the reputation of the profession (Kirkpatrick et al. 2020b).

Case Study

Pearson (2004) found that \$400 million per year was spent on boosting the public's understanding of engineering. "Despite this investment, most engineering groups believe the public neither understands nor appreciates sufficiently the role of engineering in society" (Pearson 2004). Lachapelle et al. (2012) surveyed over 1,000 elementary students and found their perception and awareness of engineering careers to be disappointing and "naive," or even detrimental. Adults' conceptions were similarly limited. Engineers were often not recognized as professionals and were instead conflated with car mechanics, laborers, technicians, and heavy equipment operators. Engineers struggle with an image often defined as builders,

designers, or planners as opposed to engineers—they strongly desire the term "engineer" to be instantly recognizable, instead of being defined by other terms.

Recruitment

Professions must be proactive and intentional with their recruitment strategy to be competitive, especially with efforts to recruit youth and diversity into the profession. Universities often engage in recruitment, as may local/regional chapters of professional societies, but the primary professional organization often plays a large role through coordination of efforts and by creating materials and literature (Banken 2013; Lent 2015; Roach 2015; Skiera 2016; Zhou 2020).

Professions establish pipelines from K-12 to higher education to workforce. In the best examples, these are collaborative efforts between practitioners and their professional organizations, employers, and higher education. Professional organizations frequently target students with marketing initiatives even after they have chosen a university degree program (O'Herrin 2016). For example, many landscape architecture programs have "professional practice courses" that educate students on topics such as professional licensure (mandatory credentialing), professional membership and service, starting a private practice, and other topics about working in the profession (Lent 2015). The intent is to cultivate a relationship early between students and the professional society. Building a shared sense of professional identity aids both student and workforce retention.

Case Study

The American Society of Landscape Architects (ASLA) sees lack of awareness of landscape architecture as a career option to be a major challenge to the profession, affecting recruitment amongst other problems. Lent (2015) reported that ASLA "absolutely manages the public image of the profession" and it is "probably the top priority." Klein et al. (2010) examined recruitment into landscape architecture and identified foundational problems, including a need to market toward high school students on both the existence of degree programs as well as awareness of the profession in general. Shaffer (2010) surveyed university students already enrolled in landscape architecture to understand determining factors in their career choice, which resulted in improvements to marketing efforts.

Banken (2013) sought to understand student perceptions of landscape architecture as a career to increase

enrollment in a degree program. They found that 34% of students had discovered landscape architecture as a career through their own independent research, owing to landscape architecture's robust internet presence. The ASLA operates a part of its website devoted to "career discovery," hoping to capture the interest of pre-college students. Additionally, 34% of students discovered the profession through family and friends (word-of-mouth recommendations), indicating a profession's public trust and awareness directly affects recruitment into the profession.

Retention and Advancement

As opposed to recruitment of new practitioners, retention and advancement refers to retaining and supporting current practitioners through professional development. This requires monitoring of employment trends to inform development of the career ladder and other opportunities for advancement within the profession (Luker and Lyons 1997; Mills and Treagust 2003; Pugsley et al. 2017). Professional societies frequently define or support the most useful professional development programs (Kirkpatrick et al. 2020b).

Case Study

Nursing has seen widespread adoption of formal career path programs since the 1970s called "clinical ladders": a structured system to provide staff nurses with career advancement while remaining in the clinical setting and providing direct patient care (Esfahani et al. 2020). It is used to encourage and recognize professional development and differentiates levels of nursing expertise. Wall (2007) performed a survey in nursing and found reduction of turnover to be the most common benefit, in addition to increasing staff productivity and versatility and improving employee morale and satisfaction. Drenkard and Swartwout (2005) analyzed a 5-hospital clinical ladder program in relation to costs and financial impact, finding the benefits justified the salary increments for that program.

Monitoring of employment trends is as equally important to meeting the needs of the profession as it is to meeting the needs of individual practitioners. Buerhaus and Auerbach (2011) examined the effect of the Great Recession on nursing trends and argued that while the economic downturn drove many nurses back to work, many of these same nurses were likely to leave the workforce just as quickly. This served as a valuable early warning for hospital administrators tasked with nursing recruitment and retention.

Professional Organization

Successful modern professions all have an organized community of practitioners working to advance the profession by coordinating and providing the services represented by the prior 7 ideals listed here. In mature professions, this is often 2 or 3 separate professional organizations (e.g., a membership society, an accrediting body, and a credentialing organization). Kirkpatrick et al. (2020c) state that these organizations play an important role in creating and reinforcing a common identity among professional groups. This activity is central for practitioners to identify themselves as being professionals. When organizations do not represent the identity of a group, Kirkpatrick et al. (2020a) describe the splintering of organizations as normal as groups of practitioners emerge as an offshoot of or specialty within an established profession.

Additionally, organizations must provide conferences, journals, and other forums for networking and dialogue to fuel innovation and growth. These forums also support community building, allegiance, and networks to achieve shared goals such as collaboration with partner industries, self-advocacy that requires state/provincial- or national-level lobbying, brand building, and similar large-scale campaigns.

Case Study

Urban and regional planning (planning) formed as a modern profession around 1900 to provide healthy living conditions in dense urban environments through modern sanitation (Scott 1969). As society has changed, planning has not only grown but expanded widely to cover a myriad of essential services, from social programs and community organization to traffic infrastructure. Planning may be spread too thin, as this very broad focus area directly reflects a weak professional identity amongst planners (Davoudi and Pendlebury 2010; Miller 2019).

As opposed to closed professions with strong professional identities, planning has minimal occupational closure and is porous to entry, with many professionals holding degrees aside from planning. Less than half of planners achieve the voluntary American Institute of Certified Planners (AICP) certification (American Planning Association 2022; US Bureau of Labor Statistics 2022). This means many practitioners hold neither accredited degrees nor credentials in the planning field, contributing to a lack of a common identity (Dawkins 2016).

Accreditation of degrees is managed by either the Planning Accreditation Board (a separate organization from the American Planning Association membership society) or the quasi-affiliated credentialing organization AICP (Planning Accreditation Board 2006; Roach 2015). Confusion and disagreement over the core professional identity (Davoudi and Pendlebury 2010; Edwards and Bates 2011) contribute to numerous problems in the profession, including a growing divide between applied practice and the increasingly theoretical academic discipline (Goodman et al. 2022), encroachment into planning by other professions (Myers and Banerjee 2005), and the lack of a consistently applied BoK (Dawkins 2016; Miller 2019; Guyadeen and Henstra 2021), which all taken together leave the future of the planning profession unclear.

METHODS

Our approach to identifying the needs of urban forestry to advance as a profession in the United States and Canada comprised 3 stages: (1) define a PIT for a modern profession; (2) operationalize the PIT to evaluate the urban forestry profession in its current form; and (3) articulate the gaps between the PIT and the urban forestry profession in a table and conceptual framework. Each stage is described in greater detail below.

PIT Construction: Define a Practical Ideal Type for a Modern Profession

Shields and Rangarajan (2013) developed the PIT method to facilitate evaluation of complex systems where no set model for comparison exists. Evaluation with the PIT method entails a gap analysis between the structure of an existing complex system and a framework of benchmarks created to answer the question, “what should be?” The “practical” aspect of the methodology sets a goal not to achieve the “ideal,” but to “direct our course to realization of potentialities” (Dewey 1938; Shields and Rangarajan 2013). Importantly, the ideal is not thought to represent perfection but an attainable version that can be improved upon through time. Overall, the criteria in a PIT are “developed for their usefulness”—the exercise of self-reflection is just as important as the outcome of the gap analysis (Shields and Rangarajan 2013).

To construct a PIT following the methods in Shields and Rangarajan (2013), we reviewed academic literature and distilled ideal type elements that were

common across existing professions. We reviewed literature on (1) the theory and history of professions in the United States and Canada and (2) the evolution of 11 professions in “classic fields” (e.g., medicine and law), professions allied with urban forestry (e.g., planning, landscape architecture, engineering), and professions that have recently navigated similar professional identity issues (e.g., social work and public health). The product of this review was a set of ideals broken into categories and subcategories that typify a modern profession.

PIT Operationalization: Compare the Urban Forestry Profession to the Practical Ideal Type for a Modern Profession

We then operationalized the PIT we constructed to compare urban forestry as it currently exists in the United States and Canada against each practical ideal in the PIT (Table 2). Appropriate methods and associated evidence were chosen to evaluate each PIT category and subcategory. In this way, even with the knowledge that further research on each ideal is possible, the method with which conclusions are arrived at is clear and transparent (Shields and Rangarajan 2013).

The methods utilized in the PIT operationalization for urban forestry were literature review, document analysis, survey analysis, and personal observations. Literature review consisted of a question-based search and review of peer-reviewed academic articles that had studied each PIT category and subcategory in the context of urban forestry, based on past reviews and knowledge of the literature by the authors. Document analysis was a review of reports, white papers, plans, educational materials, websites, and other relevant materials produced by leading urban forestry organizations. Survey analysis specifically referred to a survey of urban forest professionals on professional credentials and organizational membership conducted in 2020 (hereafter referred to as 2020 Urban Forest Profession [UFP] Survey). The survey’s protocol and findings on credentialing were published in Day et al. (2022). Personal observations of the authors come from decades of combined experience in higher education, professional organization leadership, and research in urban forestry and related fields.

The strength of the evidence supporting whether the urban forestry profession currently possesses each ideal in the PIT was evaluated using a 3-tiered scale of “little to no evidence,” “emerging evidence,” and “established evidence.” “Little to no evidence”

indicated that evidence was scant for an ideal or that there was evidence that the gap had previously been identified. “Emerging evidence” described evidence that suggested an ideal was only partially, or recently, present in urban forestry. “Established evidence” meant that an ideal was firmly rooted in the current state of urban forestry. To ensure consistency in evaluation, each ideal in the PIT was thoroughly evaluated by one of the authors then reviewed by a second author. All final ratings were then agreed upon by the entire author team.

Gap Analysis: Assess Evidence to Identify Needs for Advancement of the Urban Forestry Profession

The results of the PIT operationalization were synthesized and articulated into a summary of the gaps between the profession of urban forestry and the practical ideal type for a modern profession. These gaps are what urban forestry needs to advance as a profession. They are visualized into our proposed conceptual framework for the profession with gaps highlighted as priority action areas.

RESULTS

PIT Construction

Based on the literature review, features of successful modern professions were distilled and delineated by 8 ideals, making up our resulting PIT (Table 1, Figure 1). Each ideal is articulated through subcategories of illustrative statements about conditions that exist within a profession. It is understood that in the creation of a PIT, there could be further detail added to the model, but that the goal of practicality necessitates a degree of generalization and acknowledges that improvements can be made (Shields and Rangarajan 2013).

PIT Operationalization

The PIT of a modern profession, which we constructed based on our literature review, was operationalized for urban forestry by selecting an appropriate method to evaluate each ideal type subcategory based on existing conditions in the urban forestry profession (Table 2). A total of 26 subcategories describing 8 ideal conditions of a successful modern profession were evaluated (Figure 2). Established evidence for urban forestry achieving the practical ideals was discovered in only one instance: urban forestry performs essential service to society. Emerging

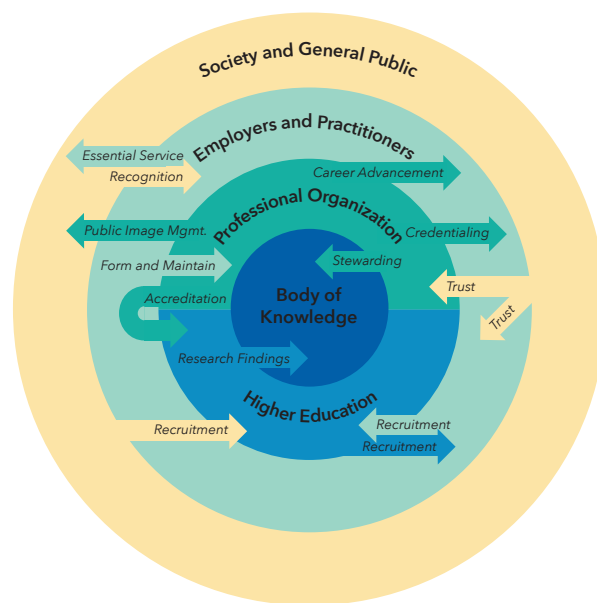


Figure 1. Conceptual framework of the practical ideal type (PIT) for a modern profession. Shown are interrelationships amongst key actors and the roles and processes that support a strong profession. Figure credit: Daniella Jia Lu Zhang and Heather Bylsma.

evidence was the prevailing trend for every practical ideal except in credentialing and in retention and advancement, which both trended toward little or no evidence for urban forestry achieving those ideals. Retention and advancement had little to no evidence of urban forestry achieving the ideal for all 3 of its subcategories. Emerging evidence was strongest in the ideals of public trust, higher education, and professional organization. Evidence was mixed upon evaluating the ideals of BoK and recruitment for urban forestry.

Gap Analysis

The gaps were synthesized and articulated from a review of the PIT operationalization exercise. These are not recommendations but rather a summary of what elements were found to be lacking in the urban forestry profession through PIT operationalization (Table 3).

DISCUSSION

Based on our construction of the PIT for a modern profession and operationalization of the PIT for urban forestry, we offer the following observations about the current status of urban forestry for each practical ideal type category.

Table 1. Practical ideal type (PIT) of a successful modern profession and its foundations in the literature. Each ideal type category and the relationships between them are graphically represented in Figure 1.

Ideal type category	Literature
1. Essential Service to Society <ol style="list-style-type: none"> 1. Performs essential service to society 2. Society recognizes that profession performs essential service 	Bayles 1986; Freidson 1994; Bayles 2003; Gardner and Shulman 2005; Holden et al. 2015; Gregory and Austin 2019; Edwards 2020; Fitzgerald 2020; Kellar et al. 2020; Nelson et al. 2021; Santarossa et al. 2021; Moore et al. 2022.
2. Body of Knowledge (BoK) <ol style="list-style-type: none"> 1. BoK is organized and accessible to practitioners 2. BoK is updated regularly 3. Practitioners steward BoK via their organization 4. Practitioners and higher education expand BoK via research findings 5. BoK aligns degree accreditation, credentialing, and continuing education 	Freidson 1994; Daley 2001; Gardner and Shulman 2005; Ressler 2005; Brauer 2011, 2015; Accreditation Council for Graduate Medical Education 2020; Fitzgerald 2020; Kirkpatrick et al. 2020a; Ressler and Lenox 2020; Ressler et al. 2021.
3. Higher Education <ol style="list-style-type: none"> 1. Accreditation applies BoK to degree programs 2. Accreditation sets minimum quality of formal higher education 3. Accreditation aligns higher education curricula with societal and employer needs 	Bollag 2005; Planning Accreditation Board 2006; Patil and Codner 2007; Kavanagh and Drennan 2008; Clarke and Prichard 2013; Vlases et al. 2013; Gaston 2014; Bullard 2015; Redelsheimer et al. 2015; Sample et al. 2015.
4. Credentialing <ol style="list-style-type: none"> 1. Practitioners provide their own credentialing via their organizations 2. Credentials set a minimum level of competency 3. Credentialing enforces ethical accountability 4. Profession self-regulates 	Bayles 1986, 2003; Kirk 2007; Brauer 2011; Gorman 2014; Monteiro 2015; Craig et al. 2018; Funk et al. 2019; Kirkpatrick et al. 2020a, 2020b; Gao 2021; Harris and Buchbinder 2021.
5. Public Trust <ol style="list-style-type: none"> 1. Professional reputation and standing in society are monitored 2. Public understanding and awareness of profession are promoted 3. Member-serving organization, employers, practitioners, and higher education coordinate to manage public image 	Pearson 2004; Lachapelle et al. 2012; Hadfield and Rhode 2015; Rhode 2015; Kirkpatrick et al. 2020a, 2020b, 2020c.
6. Recruitment <ol style="list-style-type: none"> 1. Youth and diverse identities proactively recruited into profession 2. Member-serving organization, employers, practitioners, and higher education collaborate on recruitment 	Klein et al. 2010; Shaffer 2010; Fantz et al. 2011; Banken 2013; Holden et al. 2015; Lent 2015; Roach 2015; O'Herrin 2016; Skiera 2016; O'Herrin et al. 2018a; Zhou 2020; American Society of Civil Engineers 2022.
7. Retention and Advancement <ol style="list-style-type: none"> 1. Employment trends are monitored 2. Career ladder and advancement opportunities are defined 3. Professional development programs are informed by employment trends 	Luker and Lyons 1997; Mills and Treagust 2003; Drenkard and Swartwout 2005; Wall 2007; Buerhaus and Auerbach 2011; Pugsley et al. 2017; O'Herrin et al. 2018b; Esfahani et al. 2020; Kirkpatrick et al. 2020b, 2020c.
8. Professional Organization <ol style="list-style-type: none"> 1. Practitioners form and maintain a member-serving organization 2. Member-serving organization is dedicated to advancing the profession 3. Organization mediates the other 7 ideals listed here 4. Organization provides conferences, journals, and other forums for networking and dialogue 	Scott 1969; Myers and Banerjee 2005; Planning Accreditation Board 2006; Davoudi and Pendlebury 2010; Edwards and Bates 2011; Roach 2015; Dawkins 2016; Pugsley et al. 2017; Miller 2019; Kirkpatrick et al. 2020a, 2020c; Guyadeen and Henstra 2021; American Planning Association 2022; Goodman et al. 2022; US Bureau of Labor Statistics 2022.

Table 2. Practical ideal type operationalization table. Research methods are literature review, document analysis, and survey analysis. Survey analysis refers to the UFP Survey from Day et al. 2022.

Ideal type category	Research method	Source(s)	Results
1. Essential Service to Society			
1. Performs essential service to society	Literature review; document analysis; survey analysis	Nesbitt et al. 2017; O'Herrin et al. 2018b; 2020 UFP Survey; Day et al. 2022	Established evidence: The essential services provided by urban forests, and by extension those who manage them, are well documented in the literature. Urban forest professionals who responded to the 2020 UFP Survey consider that they have specialized expertise. Cities seek urban forestry expertise and many maintain urban forestry staff to provide essential services.
2. Society recognizes that profession performs essential service	Literature review; document analysis	O'Herrin 2016; American Forests 2022a; Tree Canada 2022	Emerging evidence: The proliferation of urban forestry non-governmental organizations (NGOs) indicates that society recognizes the value of urban forests, but may not recognize that urban forest professionals provide an essential service. Some, but not all, cities and towns employ professional urban foresters. The public is relatively unfamiliar with the urban forestry profession.
2. Body of Knowledge (BoK)			
1. BoK is organized and accessible to practitioners	Document analysis; literature review	Personal observation; Miller et al. 2015; Arbor Day Foundation 2022b; Sustainable Forestry Initiative 2022; Web of Science Data accessed 2022	Emerging evidence: The USDA Forest Service, many universities, and even some private foundations and companies maintain research units that produce and disseminate research findings. Attendance at annual conferences sponsored by NGOs in the field is increasing, and audiences are becoming more diverse. Urban forestry-related papers are published in multiple peer-reviewed journals, and urban forestry textbooks are available. However, there is no universally accepted BoK organized in one place.
2. BoK is updated regularly	Document analysis; literature review	Bentsen et al. 2010; Krajter Ostoić and Konijnendijk van den Bosch 2015	Emerging evidence: Two peer-reviewed research journals regularly publish research studies that advance the BoK and whose readership is focused largely on urban forestry. The number of papers published has multiplied significantly in recent decades. The transfer of this knowledge to an organized BoK is not as evident.
3. Practitioners steward BoK via their organization	Document analysis; literature review	Konijnendijk et al. 2006; Sustainable Forestry Initiative 2022	Little to no evidence: Because there is no professional organization dedicated to urban forestry professionals, stewardship of the BoK is diffused across multiple organizations. Individual organizations advance the BoK based on their own perspectives and needs and the “niche” they occupy under the broader urban forestry discipline.
4. Practitioners and higher education expand BoK via research findings	Document analysis; literature review	Ugolini et al. 2015; Vogt et al. 2016	Emerging evidence: The nature and scope of the urban forestry BoK is often debated and analyzed. Researchers have explored the interdisciplinary nature of the field and the boundaries of emerging terminology.
5. BoK aligns degree accreditation, credentialing, and continuing education	Document analysis; survey analysis	Program Learning Outcomes for University of British Columbia Bachelor of Urban Forestry 2019; 2020 UFP Survey	Little to no evidence: Because there is no dedicated urban forestry credential available, urban forest professionals have cobbled together an assortment of different credentials in order to meet their needs and advance their careers. The Society of American Foresters (SAF) and the Canadian Forestry Accreditation Board (CFAB) have begun to accredit university urban forestry programs, but not on the scale of traditional forestry ones. Individual programs in higher education develop program learning outcomes based upon their own niche or interpretation.

Table 2 continued on next page

Table 2. (continued)

Ideal type category	Research method	Source(s)	Results
3. Higher Education			
1. Accreditation applies BoK to degree programs	Document analysis; literature review; personal observation	Wiseman and Day 2010; SAF 2021; CFAB 2022; SAF 2022a; Personal observations	Emerging evidence: Both the SAF and the CFAB accredit degree programs in urban forestry, but these standards may not include the full array of urban forest professional knowledge and its niches. Relatively few programs are accredited. Many programs accredited under the forestry standard by SAF have urban forestry as a subcategory, but not as a fully developed program that can meet the specialized urban forestry standard.
2. Accreditation sets minimum quality of formal higher education	Document analysis; personal observation	Wiseman and Day 2010; SAF 2021; CFAB 2022; Personal observations	Emerging evidence: Both CFAB and SAF accreditation processes have stringent quality standards; however, the standards may not fully capture the full array of urban forest professional knowledge.
3. Accreditation aligns university curricula with societal and employer needs	Literature review; document analysis	O'Herrin et al. 2018b; O'Herrin et al. 2020; Association of British Columbia Professional Foresters 2021; Ontario Professional Foresters Association 2022	Little or no evidence: Jobs analyses show no employers require or even mention accredited degrees or credentials that result from this in the US. In Canada, Registered Professional Forester (RPF) credentials do not distinguish between urban forestry and traditional forestry. There is little evidence of significant communication between employers of urban forest professionals and professional organizations about the link between university curricula and employer needs.
4. Credentialing			
1. Practitioners provide their own credentialing via their organizations	Document analysis; literature review; survey analysis	O'Herrin et al. 2020; 2020 UFP Survey; see Figures S1 and S2	Little to no evidence: No dedicated urban forestry credential with broad acceptance and usage is provided by an organization of urban foresters. Some credentials exist with limited uptake, such as credentials at state/provincial levels or with a more specialized scope. Professionals also voice support for the creation of a credential and professional organization for urban forestry.
2. Credentials set a minimum level of competency	Survey analysis	2020 UFP Survey	Little to no evidence: Without specific credentials for urban forestry, there can be no minimum level of competency set specific to urban forestry.
3. Credentialing enforces ethical accountability	Document analysis	ISA 2022a; SMA 2022	Little to no evidence: See 4.1; without specific credentials for urban forestry, there can be no enforcement of ethical accountability specific to urban forestry.
4. Profession self-regulates credentials	Survey analysis	2020 UFP Survey; see Tables S1 and S3	Emerging evidence: A majority of surveyed urban forest professionals hold credentials of allied professions which are regulated by allied professionals. However, there is strong participation and contribution to these credentialing organizations by urban forest professionals.
5. Public Trust			
1. Professional reputation and standing in society are monitored	Document analysis; literature review	Janse and Konijnendijk 2007; Baur et al. 2016	Emerging evidence: Periodic studies have attempted to gauge public understanding and support for urban forestry, but these have typically been geographically limited.
2. Public understanding and awareness of profession are promoted	Document analysis; literature review	Trees Are Good 2022; Vibrant Cities Lab 2022	Emerging evidence: NGOs such as American Forests, the Arbor Day Foundation, and the International Society of Arboriculture (ISA) have established public outreach programs that advance understanding of urban trees and their benefits, but do not explicitly focus on urban forest professionals.

Table 2. (continued)

Ideal type category	Research method	Source(s)	Results
3. Member-serving organization, employers, practitioners, and higher education coordinate to manage public image	Personal observation; document analysis	Personal observation; Trees Are Good 2022; Vibrant Cities Lab 2022	Little to no evidence: There is no membership organization centrally aligned with urban forestry. Therefore, while there are efforts to advance the public image of some aspects of urban forestry, these efforts are aligned with the needs of the particular organization sponsoring the initiative and not necessarily with urban forest professionals.
6. Recruitment			
1. Youth and diverse identities proactively recruited into profession	Document analysis; literature review	O'Herrin 2016; O'Herrin et al. 2018a; O'Herrin et al. 2020; ADF 2022a; ISA 2022b	Little to no evidence: There is no evidence of coordinated efforts to raise awareness of urban forestry as a career; instead, the profession leans on forestry and arboriculture. Students lack awareness of urban forestry and nature as career options.
2. Member-serving organization, employers, practitioners, and higher education collaborate on recruitment	Document analysis; literature review; personal observation	O'Herrin et al. 2018b; American Forests 2022b; Project Learning Tree Canada 2022; Vibrant Cities Lab 2022	Emerging evidence: There is limited evidence of leadership from national organizations in the area of recruitment into urban forestry and limited recruitment pipelines to serve as models. Success seems limited to localized and isolated cases.
7. Retention and Advancement			
1. Employment trends are monitored	Document analysis; literature review; personal observation	O'Herrin et al. 2018b; O'Herrin et al. 2020	Little to no evidence: There is very little prior literature on monitoring of employment trends. Urban forestry is persistently conflated with arboriculture, and the terms are used interchangeably and overlapping—"urban forestry" remains undefined and underutilized.
2. Career ladder and advancement opportunities are defined	Document analysis; literature review; personal observation	O'Herrin et al. 2018b	Little to no evidence: Urban forestry lacks entry-level jobs; commercial arboriculture largely serves that role, which likely filters out desirable potential recruits.
3. Professional development programs are informed by employment trends	Document analysis; literature review; personal observation	O'Herrin et al. 2018b; Green Communities Leadership Institute 2022; Municipal Forestry Institute 2022	Little to no evidence: Urban forestry has limited professional development programs (Municipal Forestry Institute; Green Communities Leadership Institute) and these do not maintain formalized connections to trends in professional practice.
8. Professional Organization			
1. Practitioners form and maintain a member-serving organization	Survey analysis	2020 UFP Survey; see Tables S1, S2, and S3	Emerging evidence: No professional membership organization has been formed and maintained specifically by and for urban foresters in the US and Canada. Urban foresters primarily belong to several allied professional organizations who serve them as a subset of their members, and/or to informal, local urban forestry networking groups.
2. Member-serving organization is dedicated to advancing the profession	Document analysis	CIF 2022; ISA 2022c; SAF 2022b; see Table S1	Little to no evidence: There is no specific organization in the US and/or Canada dedicated to advancing the profession of urban forestry. Certain allied professional organizations include urban forestry within their programs, though they are primarily composed of allied professionals who prioritize their own profession.

Table 2 continued on next page

Table 2. (continued)

Ideal type category	Research method	Source(s)	Results
3. Organization mediates the other 7 ideals listed here	See analysis of ideals 1–7; document analysis	See analysis of ideals 1–7; see Table S2	Emerging evidence: There are organizations dedicated to urban forestry who mediate other ideals for the profession of urban forestry (e.g., see 2.1 and 2.2); however, none is a member-serving organization explicitly dedicated to advancing urban forestry as a profession, since they are focused on each of their flagship credentials and programs.
4. Organization provides conferences, journals, and other forums for networking and dialogue	Document analysis; literature review; personal observation	O'Herrin et al. 2020; ADF 2022b; CUFC 2022; Green Communities Leadership Institute 2022; Municipal Forestry Institute 2022; see Table S2	Emerging evidence: Many urban forestry conferences, journals, and other forums for networking exist and have been initiated. They are provided by educational and research institutions, research and extension arms of government agencies, NGOs, and allied professional organizations.

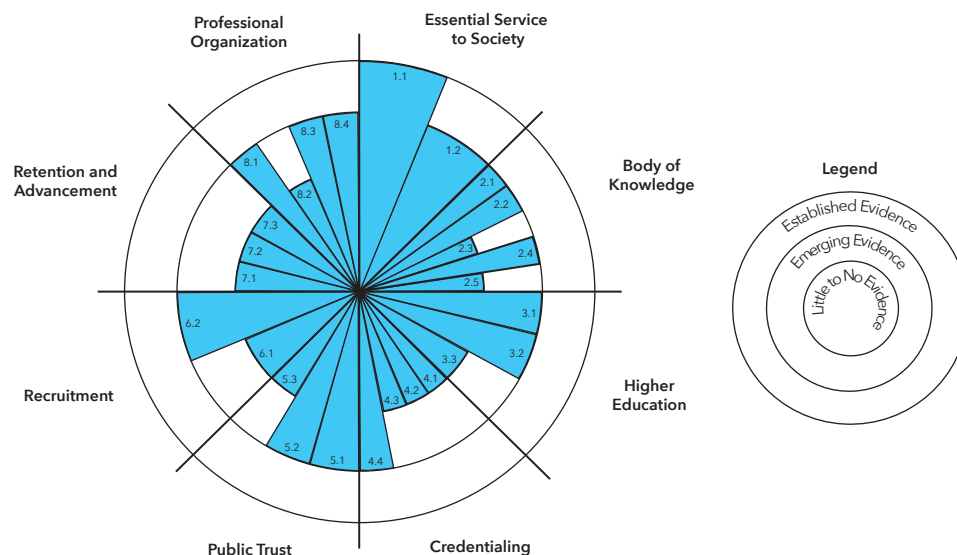


Figure 2. Evidence ratings of the state of the urban forestry profession in comparison to the practical ideal type of a modern profession. For all except one subcategory, there is only emerging or little to no evidence that urban forestry meets these benchmarks. Figure credit: Heather Bylsma.

Ideal 1. Essential Service to Society

Urban forests are increasingly critical as essential infrastructure to support human health and well-being (Nesbitt et al. 2017). Consequently, the urban forest professionals who manage this infrastructure are providing an essential service. It is less clear whether society recognizes this essential service. Proliferation of non-governmental organizations (NGOs) at both the national (e.g., American Forests and Tree Canada) and local levels (e.g., Keep Indianapolis Beautiful and LEAF Toronto) indicates society recognizes the value

of urban forests, but simultaneously suggests that society does not fully recognize the expertise provided by urban forest professionals. Considerable urban forest management is delegated to volunteers and even more simply just goes undone. Hauer and Peterson (2016) found that 40% of the US urban population lives in a city without even a single ISA Certified Arborist® on staff.

Nonetheless, open-ended responses to the 2020 UFP Survey indicate that urban forest professionals perceive that they have specialized expertise, and many cities and towns do hire professional urban forestry

Table 3. Summary of gap analysis generated from applying the practical ideal type to the profession of urban forestry.

Ideal type category	Summary of gap analysis
1. Essential Service to Society	Urban forestry lacks societal recognition that urban forest professionals provide an essential service.
2. Body of Knowledge (BoK)	Urban forestry lacks a codified BoK that is stewarded by practitioners and serves as the foundation of the profession moving forward, including an alignment of degree accreditation, credentialing, and continuing education.
3. Higher Education	Urban forestry lacks alignment of university curricula with the needs of the profession and society. There is also a lack of formal relationships among professional organizations, practitioners, employers, and higher education.
4. Credentialing	Urban forestry lacks a dedicated credential for urban foresters that can establish a minimum level of competency, enforce ethical standards, or foster professional unity.
5. Public Trust	Urban forestry lacks a coordinated nationwide effort to increase awareness of the profession as well as an urban forestry credential to build public awareness and trust.
6. Recruitment	Urban forestry lacks formal recruitment pipelines into degree programs and into the profession.
7. Retention and Advancement	Urban forestry lacks consistent job titles and standardized qualifications needed to monitor employment trends and identify opportunities for professional development and advancement.
8. Professional Organization	Urban forestry lacks a member-created professional organization dedicated to serving and promoting the profession.

staff. Overall, while society increasingly recognizes the importance of “nature-based solutions” and “green infrastructure,” recognition of urban foresters as the experts responsible for delivering those services is lacking.

Urban forestry is steadily becoming more important in urban settings. Defining roles, responsibilities, and achievements will help move the practice forward, increase its cultural value, and elevate the profession. (2020 UFP Survey respondent)

Society does not fully recognize that urban forest professionals provide an essential service because urban forest professionals do not adequately manage their public image to generate public trust and awareness.

Ideal 2. Body of Knowledge

The BoK for urban forestry is not actively stewarded by practitioners, organizations, and higher education, nor is it consistently utilized to align degree accreditation, credentialing, and continuing education. The SAF developed a BoK for urban forestry in 2014 through a rigorous, standardized process as part of absorbing the California Certified Urban Forester program (O’Herrin 2016). However, after more than

8 years, the program has still not been expanded as intended (Society of American Foresters 2014).

The Sustainable Forestry Initiative (SFI) is currently developing an Urban and Community Forest Sustainability Standard (SFI 2022) which articulates desired outcomes in pursuit of sustainable urban forests and service to society. Developing this standard is an acknowledgment that (1) there has been no practical consensus-building on urban forest management to date, and (2) there is now enough momentum and recognition for the importance of urban forest sustainability to drive that consensus-building. However, this does not speak to the competencies or qualifications necessary to deliver those desired outcomes and cannot fill the role of an urban forestry BoK.

Urban Forestry is a mix of many other professions. It’s not the same as just being an arborist. Urban Forestry is similar to Green Infrastructure in that it takes into account multiple jobs including arboriculture. We have a stronger science part compared to a landscape architect, we understand about landscapes, not just trees, we know many other plants, and based on that can understand the health of the land. We have skills in stormwater mngt. [sic], construction,

water systems, mapping, etc. It's hard to explain this to a layperson but once people have a good urban forester on any team, you have someone who can look at everything comprehensively and not narrowly. (2020 UFP Survey respondent)

Urban forestry lacks a codified BoK that is stewarded by practitioners and serves as the foundation of the profession moving forward, including to align degree accreditation, credentialing, and continuing education.

Ideal 3. Higher Education

While both the SAF and the CFAB accredit degree programs in urban forestry, there is still quite limited participation by higher education. SAF's college guide lists 5 degree programs with the specialized urban forestry accreditation and another 6 programs with an urban forestry option as a subset of the standard forestry accreditation (Society of American Foresters 2022a). Forestry accreditation in Canada is mediated through the provinces and a national accreditation board, and there is to our knowledge only one degree program under consideration for accreditation at this time.

Both sets of accreditation standards recognize the interdisciplinary nature of urban forestry. As a result, the accreditation standards tend to be quite broad relative to traditional forest management, but likely not broad enough to include the full array of urban forest professional knowledge and all of its niches. They are not fully aligned with the practice of urban forest professionals and tend to have more depth in traditional forest management, which should come as no surprise, as these standards are administered by organizations dedicated to serving their membership of traditional foresters. Additionally, the majority of urban forest professionals are not members of these organizations (Day et al. 2022).

This misalignment may explain why jobs analyses indicate that market demand for graduates of accredited programs is still limited. In the United States, few employers require or even mention graduation from accredited degrees (O'Herrin et al. 2018b). In Canada, Registered Professional Forester (RPF) credentials, which require graduation from an accredited program, do not distinguish between urban forestry and traditional forestry, so it is difficult to determine if employer interest in RPFs are focused on urban forestry. This misalignment may also explain a lack of

formal relationships between higher education and other interested parties, as urban forestry is scattered across diverse academic units. See Ideal 6. Recruitment for further details.

There are many intangible skills and characteristics that contribute to the practice of urban forestry. It is multidisciplinary in nature and difficult to design programs for training. It requires collaboration with many related fields and there are also different areas of practice. This has always been the challenge in training urban foresters. Just stating the obvious I guess. It is time we step up, lean in, whatever you want to call it, and own our profession. Perhaps a unique credential will facilitate that. (2020 UFP Survey respondent)

Urban forestry lacks alignment of university curricula with industry needs. There is also a lack of formal recruitment pipelines, which could also serve as a forum for dialogue through collaboration between professional organizations, practitioners, and higher education.

Ideal 4. Credentialing

Urban forest professionals currently use a variety of credentials from other professions to articulate their professional identity (Day et al. 2022), none of which use the words "urban forest." A Certified Urban Forester credential program created by the California Urban Forest Council and later adopted by SAF has had little uptake and is not currently being offered (O'Herrin et al. 2020). Only 6 of 708 respondents in the 2020 UFP Survey reported having the credential, and all expressed varying degrees of dissatisfaction with the credential in its current state while indicating support for a credential for the urban forestry profession. Another example is the International Society of Arboriculture (ISA) Certified Arborist Municipal Specialist®; however, this is decidedly an advanced arborist credential, as only ISA Certified Arborists are eligible to take the exam. There are also examples of localized self-regulation of urban forestry, such as the Massachusetts Qualified Tree Warden credential by the Massachusetts Tree Wardens and Foresters Association (2022); however, these are local by design and are not open to the whole profession.

To establish competency and communicate a minimum level of knowledge, urban forest professionals maintain many credentials from allied professions:

45% of respondents to the 2020 UFP Survey held 3 or more unique credentials (Day et al. 2022). Additionally, urban forestry jobs often require credentials from allied professions, most commonly the ISA Certified Arborist or an academic degree from a wide range of fields (O'Herrin et al. 2018b). However, they are not based in the BoK of urban forestry and are controlled by other professionals whose primary objective is to advance their own profession. Thus, fostering professional unity amongst urban foresters or enforcing ethical standards in urban forestry is currently impossible.

I've experienced the frustration of trying to obtain adequate support for professional urban forestry from traditional (fibre extraction) forestry professionals. I've also experienced the frustration of seeing urban forestry poorly practiced by non-professionals in urban forestry, specifically some landscape architects, ISA Certified Arborists, and environmental planners; the majority without a science-based education and training. Is this the time to go in this new direction of a new UF credential? Or, is it rather the time to hold these traditional forestry professionals and governments at the Provincial & State levels accountable for their inadequate support & regulations governing the practice of professional urban forestry to ensure that the public good is served? (2020 UFP Survey respondent)

Urban forestry lacks a member-created and member-serving professional organization providing a credential for urban foresters that can establish a minimum level of competency, enforce ethics, or foster professional unity (Figures S1–S4). Thus, urban forestry is currently unregulated and can be practiced by anyone with any number of credentials and types of work experience.

Ideal 5. Public Trust

Urban forestry's lack of a coherent definition, which is a professional hallmark usually grounded by an explicitly named credential based on a BoK, translates to confusion concerning the scope and aim of urban forestry. The name "urban forestry" is an oxymoron that contributes to a detrimental lack of awareness amongst the general public. A survey of university students found lack of awareness to be the largest

obstacle to increasing and diversifying recruitment (O'Herrin et al. 2018a).

Urban forestry needs leadership in this area. Related efforts by national organizations promote arboriculture, tree planting, or other urban tree issues, rather than the image of the urban forest professionals who steward urban forests (Table S1). The term "urban forestry" is frequently omitted and is poorly understood in any case. Likewise, there is no organization devoted to promoting public trust of urban forest professionals (Table S2). The USDA Forest Service is aware of this problem and has issued a request for proposals to develop a nationwide awareness campaign (NUCFAC 2022; USDA Forest Service 2022).

The greatest challenge I've had over the last 25 years of UF practice is getting recognized as a professional. (2020 UFP Survey respondent)

Job skills and responsibilities of urban foresters are often poorly understood by allied professionals, and the urban forestry profession is not well respected (O'Herrin 2016). This results in encroachment by allied professionals into responsibilities and skills that might be considered the realm of urban forestry, to which there is no resistance because urban forestry has no occupational closure or barrier to entry. Urban forestry lacks a coordinated nationwide awareness campaign to increase awareness and an urban forestry credential to build trust.

Ideal 6. Recruitment

We found very limited evidence of coordinated efforts to raise awareness of urban forestry as a career. Instead, the profession leans on recruitment from forestry and arboriculture with limited programming dedicated to urban forestry, which O'Herrin (2016) found to be a recurring theme across the entire profession. O'Herrin (2016) detailed how urban forestry degree programs are limited to recruiting students primarily through traditional forestry and natural resources pipelines in the K-12 system. This has resulted in poor diversity: O'Herrin et al. (2020) surveyed current urban forest professionals and found them to be 92% white and 80% male, while only 4% were age 18 to 34. O'Herrin et al. (2018a) surveyed university students and found race, gender, and socio-economic status were all not inherent barriers to recruitment, but rather that students lacked awareness of urban forestry and of nature as a career.

We found very limited evidence of leadership from national organizations in the area of recruitment into urban forestry as is seen in more-developed professions. Examples include the Arbor Day Foundation's Tree Campus K-12 program (Arbor Day Foundation 2022a), which represents an opportunity to leverage national name recognition to get professionals into classrooms to provide youth with experiential learning and exposure to nature as a career, or Project Learning Tree Canada's inclusion of urban forestry within a broader green jobs program. But we found no solid recruitment pipelines built around these or other such programs.

A new pipeline model has recently formed organically nationwide in arboriculture, with guidance and leadership from American Forests and the USDA Forest Service (Vibrant Cities Lab 2022). These are arboriculture career pathways programs, which range from formal arboriculture apprenticeships (some with state recognition) to "another chance" recidivism reduction programs to youth guidance programs. These are largely focused on environmental justice and tree equity and so are rising to meet the demand to recruit both youth and diversity while also achieving local impact in historically disadvantaged communities with a need for tree canopy. It remains to be seen if or how this will translate into improved youth and diversity recruitment into urban forestry.

The lack of racial and gender diversity in our industry is a huge barrier to advancing the profession as a whole. (2020 UFP Survey respondent)

Urban forestry lacks recruitment pipelines and struggles with implementing widespread and effective diversity initiatives.

Ideal 7. Retention and Advancement

We found limited leadership in the area of professional development for urban foresters beyond the Municipal Forestry Institute (MFI) or the Green Communities Leadership Institute. O'Herrin et al. (2018b) examined the career ladder in urban forestry and found a dearth of entry-level positions and a high degree of misalignment between desired qualifications and actual job functions. The career ladder is underdeveloped and poorly outlined relative to those seen in other professions. Employment trends in urban forestry are difficult to monitor or define, partially due to inconsistent usage of the term "urban forestry"

in job postings (O'Herrin et al. 2020) and partially due to a lack of standardized qualifications or credentialing. Gender-based discrimination and barriers to achieving credentials have also been found to impede the retention and advancement of women in urban forestry (Bardekjian et al. 2019).

Urban forestry needs to become more widely recognised as a profession of its own. This will also help with developing specific employment opportunities, career paths, and educations. (2020 UFP Survey respondent)

Because the profession is not consistently defined, there is no evidence of coordinated retention and advancement of urban forest professionals. Urban forestry lacks consistent job titles and standardized qualifications in order to monitor trends and outline opportunities for development and advancement.

Ideal 8. Professional Organization

There is no organization devoted solely to the profession of urban forestry. While there are many organizations that urban forest professionals are active in, these organizations, understandably, are dedicated to advancing their own profession and prioritize serving their core members (e.g., arboriculture, forestry).

The Society of Municipal Arborists (SMA), while dedicated partly to urban forestry, specifically serves professionals who work for municipalities and is in many ways focused more on serving a specific audience of arborists through its partnership with the ISA to deliver the ISA Certified Arborist Municipal Specialist credential. In the 2020 UFP Survey, 48% of professionals indicated working at "local (city/county/district) government agencies" and 31% were SMA members ($n = 708$). However, though founded in 1964, there are signs that SMA may be attempting to widen the type of urban forest professionals they serve through providing the MFI (see Ideal 7) and their e-magazine *City Trees*.

There are also strong signs that urban forest professionals actively seek and serve professional organizations. Urban forest professionals in the 2020 UFP Survey belonged to an average of 2.83 professional organizations, with 54% belonging to 3 or more. About 24% reported membership in local and regional urban forestry networking groups, though participation in these groups may be higher as they frequently do not have formal membership structures (Table S3).

While the majority of surveyed professionals believed the profession needs an organization, professionals were split on its desired format (Figure S5).

Urban forestry conferences, journals, and other forums for networking are provided by educational and research institutions, research and extension arms of government agencies, NGOs, and allied professional organizations. NGOs provide conferences that are strong and vital networking and meeting points for urban foresters, such as the Arbor Day Foundation's Partners in Community Forestry Conference (Arbor Day Foundation 2022b), Tree Canada's Canadian Urban Forest Conference (Canadian Urban Forest Conference 2022), and other state/provincial urban forest professional meetings. These attract distinct groups of professionals who do not identify with the central missions of allied organizations such as ISA and SAF and also likely do not maintain arborist or forester credentials.

The title urban forester is a vague term as are the explicitness of qualifications. Instead people are foresters, landscape architects, horticulturalists or arborists. This means that these other organizations are doing the work of regulating, administering, defining scope of practice, and communicating with persons who hold credentials to perform specific tasks related to urban forestry. Unless urban forestry defines itself, it will always be at the behest of other organization's goals and objectives (which may not be urban forestry's). (2020 UFP Survey respondent)

Urban forestry has developed tremendously in recent decades. Its developing identity and role, in response to needs from society, is coming from a growing group of professionals who need more professional supports than have been and are currently offered by existing allied professional organizations. An organization dedicated to the profession of urban forestry would be ideal to facilitate needed dialogue and self-reflection.

CONCLUSIONS

We used a novel and innovative form of strategic self-reflection to assess the state of the urban forestry profession in the United States and Canada. Such self-reflection is, at present, largely absent from the literature on this field. Our analysis uncovered weaknesses that, while recognized anecdotally by many

urban forest professionals, have never been rigorously examined. We hope this analysis will inspire discussion and action amongst urban forest professionals by articulating what is possible and needed to advance our profession.

Society's need for the expertise of urban forest professionals is growing quickly as urban population growth accelerates and the climate emergency intensifies. Our analysis demonstrates that the profession is currently not sufficiently organized or strategically structured to meet that demand. To achieve this, the profession would have to both grow and change *with intention* to position itself to meet the needs of society into the future. The PIT analysis creates a clear and specific catalog of the organizational and structural gaps within the urban forestry profession. Identified gaps (Table 3) reveal serious misalignments between the professional supports currently available to urban forest professionals and what is needed to advance the profession. Because of urban forestry's interdisciplinary nature, urban forest professionals often find their interests served via a niche within another profession. Conversely, none of these professions represent the full breadth of urban forestry. This fundamental misalignment of organizational mission and professional needs perpetuates many of the serious gaps illuminated by our analysis. Urban forest professionals have so much more to offer than to serve as a niche of another profession. Nature as a career in urban or suburban settings has a huge appeal in its own right, especially to the next generation of professionals entering from increasingly diverse pathways. All 11 professions analyzed in our literature review boasted a professional society dedicated to advancing that profession, a distinct credential, and other tailored support structures. Urban forest professionals now clearly have specific, recognizable expertise focused on the planning and management of the complex socio-ecological systems that are our city forests and green spaces. Urban forestry can no longer meet the needs of society supported only by borrowed credentials, surrogate professional organizations, and demographics that do not reflect those served.

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Corinne Bassett reports that Dr. Cecil Konijnendijk, Editor-in-Chief of *Arboriculture & Urban Forestry*, is a co-supervisor of her PhD at the University of British Columbia. This manuscript is not related to her PhD research. Susan D. Day, PhD, reports being co-PI and co-supervisor of Corinne Bassett, unrelated to this manuscript, and reports being on the ISA Board of Directors.

Résumé. Contexte: La foresterie urbaine est une profession émergente, mais son identité professionnelle n'est pas définie clairement, pas plus qu'elle ne dispose de l'ensemble des mécanismes de soutien généralement attendus ou nécessaires aux professionnels. Par conséquent, les professionnels de la forêt urbaine s'appuient sur des domaines étroitement associés (par exemple, l'arboriculture, la foresterie), ce qui entraîne une frustration chez

les professionnels de la forêt urbaine ainsi que de la confusion et un manque de reconnaissance par le public en général. Méthodes: Nous avons développé une série de références pratiques mais idéales pour une “profession moderne” reconnue, sur la base de caractéristiques extraites d’une revue de littérature et des modèles de 11 autres professions. Nous avons ensuite examiné un large éventail d’évidences afin d’identifier les écarts entre les critères de référence et la réalité actuelle de la profession. La solidité des évidences a été évaluée, et chaque référence a été classée comme étant soutenue par des preuves soit établies, soit émergentes ou soit avec peu sinon aucune évidence. Résultats: L’analyse des écarts indique que, bien que la profession fournisse un service essentiel à la société, il est nécessaire d’améliorer la crédibilité des titres de compétences, la reconnaissance du public, le recrutement menant à la profession et le soutien à l’avancement de la carrière. Plusieurs écarts résultent du manque de coordination des efforts ou de l’absence d’une prise en charge organisée dédiée à l’ensemble des professionnels de la forêt urbaine. Nous avons identifié un décalage entre les professionnels de la forêt urbaine et les organisations professionnelles existantes qui se consacrent à des professions étroitement apparentées. Conclusion: Pour répondre aux critères de référence d’une “profession moderne” reconnue, la foresterie urbaine requiert un soutien professionnel explicitement dédié à la foresterie urbaine. La profession ne pourra répondre aux besoins futurs de la société en s’appuyant uniquement sur des titres de compétences empruntés et des organisations professionnelles associées.

Zusammenfassung. Hintergrund: Die städtische Forstwirtschaft ist ein aufstrebender Berufszweig, dessen berufliche Identität jedoch nicht klar definiert ist und der auch nicht über alle Unterstützungsmechanismen verfügt, die von Fachleuten üblicherweise erwartet oder benötigt werden. Infolgedessen sind die Fachleute der städtischen Forstwirtschaft auf eng verwandte Berufe (z. B. Baumpflege, Forstwirtschaft) angewiesen. Dies führt zu Frustration, Verwirrung und mangelndem Bewusstsein bei den Fachleuten der städtischen Forstwirtschaft und in der Öffentlichkeit. Methoden: Wir entwickelten eine Reihe praktischer, aber idealer Maßstäbe für einen erfolgreichen “modernen Beruf” auf der Grundlage von Merkmalen, die wir aus einer Überprüfung der Literatur und Präzedenzfällen aus 11 anderen Berufen entnommen haben. Anschließend untersuchten wir eine breite Palette von Belegen, um Lücken zwischen den Benchmarks und der aktuellen Realität des Berufs zu ermitteln. Die Stärke der Evidenz wurde bewertet, und jede Benchmark wurde klassifiziert. Sie wurde als durch etablierte, neu entstehende oder wenig bis gar keine Evidenz unterstützt eingestuft. Ergebnisse: Die Analyse der Defizite zeigt, dass der Beruf zwar eine wichtige Dienstleistung für die Gesellschaft erbringt, dass es aber

Verbesserungsbedarf bei der Qualifikation, der Sensibilisierung der Öffentlichkeit, der Rekrutierung für den Beruf und der Unterstützung für die berufliche Weiterentwicklung gibt. Viele Lücken resultieren aus einem Mangel an koordinierten Bemühungen oder einer organisierten Gemeinschaft, die sich dem gesamten Spektrum der städtischen Forstfachleute widmet. Wir haben festgestellt, dass es eine Diskrepanz zwischen den Fachleuten des städtischen Waldes und den bestehenden Berufsorganisationen gibt, die sich eng verwandten Berufen widmen. Schlussfolgerung: Um die Anforderungen an einen erfolgreichen “modernen Beruf” zu erfüllen, braucht die städtische Forstwirtschaft professionelle Unterstützung, die sich explizit der städtischen Forstwirtschaft widmet. Der Berufsstand kann den zukünftigen Bedürfnissen der Gesellschaft nicht gerecht werden, wenn er nur durch übertragene Qualifikationen und Ersatzberufsorganisationen unterstützt wird.

Resumen. Fundamento: La silvicultura urbana es una profesión emergente, pero su identidad profesional no está claramente definida, ni tiene el complemento de mecanismos de apoyo comúnmente esperados o necesitados por los profesionales. Como resultado, los profesionales de los bosques urbanos dependen de disciplinas estrechamente relacionadas (por ejemplo, arboricultura, silvicultura) lo que genera frustración entre los profesionales de los bosques urbanos, confusión y falta de conciencia entre el público en general. Métodos: Desarrollamos una serie de puntos de referencia prácticos pero ideales para una “profesión moderna” exitosa basados en características extraídas de una revisión de la literatura y precedentes de otras 11 profesiones. Luego examinamos una amplia gama de evidencia para identificar vacíos entre los puntos de referencia y la realidad actual de la profesión. Se evaluó la solidez de la evidencia y cada punto de referencia se clasificó como respaldado por evidencia establecida, emergente, poca o nula. Resultados: El análisis indica que, si bien la profesión proporciona un servicio esencial a la sociedad, existe la necesidad de mejorar la acreditación, la conciencia pública, el reclutamiento en la profesión y el apoyo para el avance profesional. Muchas situaciones son el resultado de la falta de esfuerzos coordinados o de una comunidad organizada dedicada al alcance de los profesionales de los bosques urbanos. Identificamos una desalineación entre los profesionales de los bosques urbanos y las organizaciones profesionales existentes que se dedican a profesiones estrechamente relacionadas. Conclusión: Para cumplir con los puntos de referencia para una “profesión moderna” exitosa, la silvicultura urbana necesita del apoyo profesional dedicado explícitamente a la silvicultura urbana. La profesión no puede satisfacer las necesidades futuras de la sociedad apoyada solo por credenciales prestadas y organizaciones profesionales sustitutas.

Appendix on next page

Appendix.

Table S1. Mission statements of professional membership organizations associated with or adjacent to urban forestry.

Organization	Mission statement
International Society of Arboriculture (ISA)	<p>"Through research, technology, and education, the International Society of Arboriculture (ISA) promotes the professional practice of arboriculture and fosters a greater worldwide awareness of the benefits of trees."</p> <p>https://www.isa-arbor.com/Who-We-Are/Our-Organization</p>
Society of Municipal Arborists (SMA)	<p>"The Society of Municipal Arborists builds the confidence, competence and camaraderie of professionals who manage trees and forests to create and sustain more livable communities."</p> <p>https://www.urban-forestry.com/about-sma</p>
Society of American Foresters (SAF)	<p>"The mission of the Society of American Foresters is to advance sustainable management of forest resources through science, education, and technology, promoting professional excellence while ensuring the continued health, integrity, and use of forests to benefit society in perpetuity."</p> <p>https://www.eforester.org/Main/About/History/Main/About/History.aspx</p>
Canadian Institute of Forestry (CIF)	<p>"Provide national leadership in forestry and forest stewardship, promote competency among forest practitioners, and foster public awareness and education of forest and forestry issues."</p> <p>https://www.cif-ifc.org/who-we-are/about-us</p>

Table S2. Mission statements of urban forestry-aligned organizations. These organizations do not represent a membership organization for urban forest professionals, as they are either not membership-based or their members are not individual urban forest professionals. Note: These urban forestry organizations fulfill parts of the PIT, especially related to performing an essential service to society, maintaining body of knowledge for urban forestry, and holding professional conferences and networking (1.1, 1.2, 2.1, and 8.4). However, they differ significantly in mission and goals from professional organizations.

Organization	Mission statement
The Arbor Day Foundation (ADF)	<p>"We inspire people to plant, nurture, and celebrate trees."</p> <p>https://www.arborday.org/about/annualreport</p>
Tree Canada/Arbres Canada (TC/AC)	<p>"To inspire, educate and enable Canadians to plant and nurture trees in order to improve lives and address climate change."</p> <p>https://treecanada.ca/about-us</p>
American Forests	<p>"American Forests creates healthy and resilient forests, from cities to large natural landscapes, that deliver essential benefits for climate, people, water and wildlife. We advance our mission through forestry innovation, place-based partnerships to plant and restore forests, and movement building."</p> <p>https://www.americanforests.org/about-us</p>
Sustainable Forestry Institute (SFI)	<p>"To advance sustainability through forest-focused collaboration."</p> <p>https://forests.org/who-we-are</p>
Sustainable Urban Forests Coalition (SUFC)	<p>"To convene and mobilize this diverse network of national organizations to foster thriving communities through healthy urban and community forests."</p> <p>https://sufc.org/who-is-sufc</p>
Tree Care Industry Association (TCIA)	<p>"Our mission is to advance tree care businesses."</p> <p>https://www.tcia.org/TCIA/ABOUT/About_Home/TCIA/About/About.aspx</p>

Table S3. Distribution of memberships in professional organizations in 2020 UFP Survey. “% of Canada” and “% of US” each represent the percent of respondents employed in that country who are members of the indicated organization. “Mean # of memberships per member” represents the mean memberships held by members of the indicated organization (e.g., ISA members held on average 3.0 memberships in professional organizations). Overall, US and Canadian respondents hold a mean of 2.8 memberships (median is 3.0). Organizations that were not explicitly professional organizations (e.g., the Arbor Day Foundation) or do not offer memberships for individuals (e.g., Tree Care Industry Association) were excluded.

	Country of employment						
	Canada respondents (n = 106)		United States respondents (n = 602)		Total respondents (n = 708)		Mean # of memberships per member
Organization	Count of Canada	% of Canada	Count of US	% of US	Count of total	% of total	
International Society of Arboriculture (ISA)	87	82.1	536	89.0	623	88.0	3.0
One or more ISA Chapters	55	51.9	450	74.8	505	71.3	3.3
Society of Municipal Arborists (SMA)	28	26.4	194	32.2	222	31.4	3.9
A local or regional urban forest networking group*	20	18.9	153	25.4	173	24.4	3.9
A state urban forest council*	2	1.9	150	24.9	152	21.5	4.1
Society of American Foresters (SAF)	2	1.9	68	11.3	70	9.9	4.1
American Society of Consulting Arborists (ASCA)	5	4.7	37	6.1	42	5.9	4.6
Utility Arborists Association (UAA)	2	1.9	33	5.5	35	4.9	4.6
Arboriculture Research and Education Academy (AREA)	4	3.8	29	4.8	33	4.7	6.0
American Public Works Association (APWA)	0	0.0	29	4.8	29	4.1	4.2
Provincial/state professional forestry organization**	17	16.0	2	0.3	19	2.7	2.8
American Society of Landscape Architects (ASLA)	0	0.0	18	3.0	18	2.5	3.9
Canadian Institute of Forestry (CIF)	17	16.0	0	0.0	17	2.4	3.2
American Planning Association (APA)	0	0.0	12	2.0	12	1.7	4.4

*These organization types tend to be variable in terms of formality of membership structures.

**Variable grouped from write-in responses of provincial and state forestry professional organizations. This was the only organization type from write-in responses where $n > 10$.

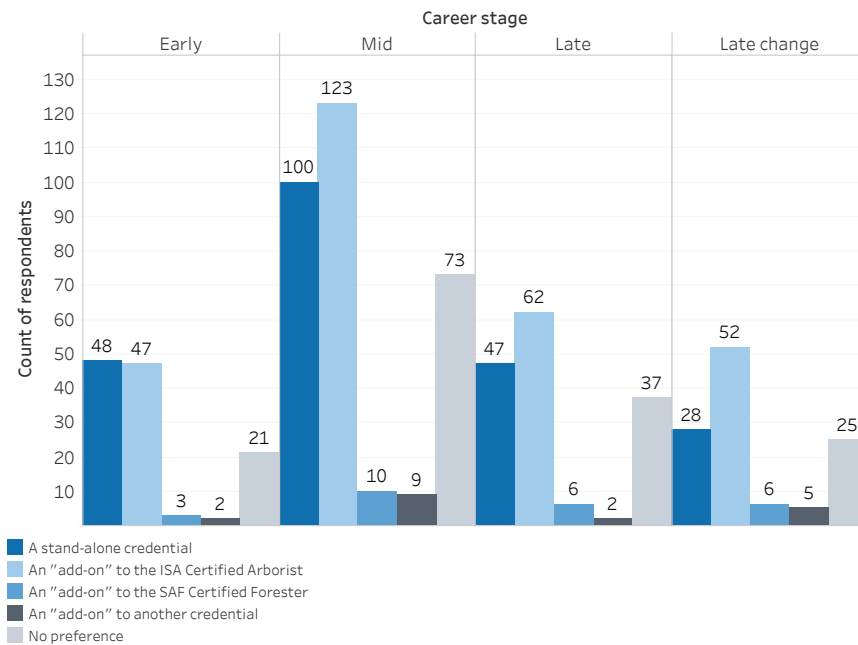


Figure S1. Preference of urban forest professionals in the US and Canada on the format of a hypothetical urban forester credential. Respondents answered the multiple-choice question, "If an Urban Forester Credential was created in the next 5 years, would you prefer it be..." and are grouped by career stage, a variable combining age and years since entering the urban forestry profession (Day et al. 2022).

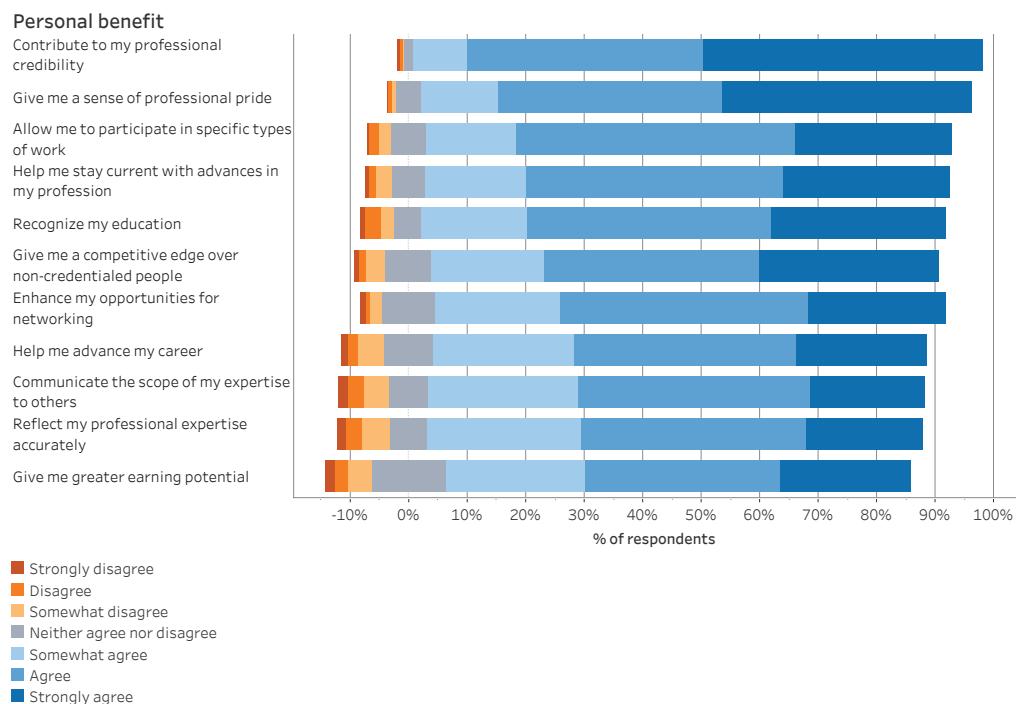


Figure S2. Personal benefits that urban forest professionals in the US and Canada receive from their own credentials. Respondents rated a series of benefits on a Likert-scale in response to the question, "Please evaluate the personal benefits that you currently receive or expect to receive from your current credentials identified in the previous question. 'In the context of my urban forestry work, the credentials that I currently hold..." Benefits are ranked in order of average Likert score so that the benefit with the most positive overall responses appears on top. As the average score decreases, the proportion of participants who "strongly agree" decreases.

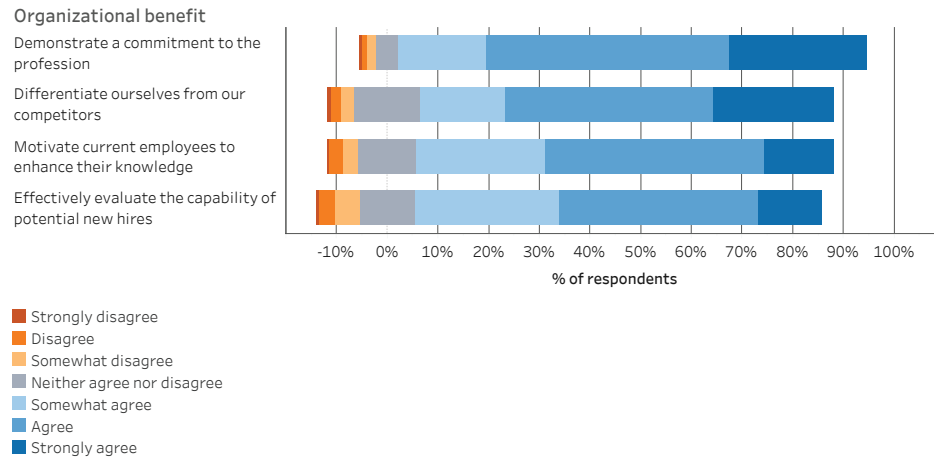


Figure S3. Organizational benefits from credentials currently available to urban forestry professionals. Respondents rated a series of benefits on a Likert-scale in response to the question, “Please evaluate what the current credentials available to urban foresters (whether you hold these credentials or not) allow your agency, organization, or company to do. ‘The credentials currently available in the field allow my organization to...’” Benefits are ranked in order of average Likert score so that the benefit with the most positive overall responses appears on top. There was most overall agreement that credentials demonstrated a commitment to the profession, and least agreement and most disagreement that credentials give them ability to evaluate the capability of new hires.

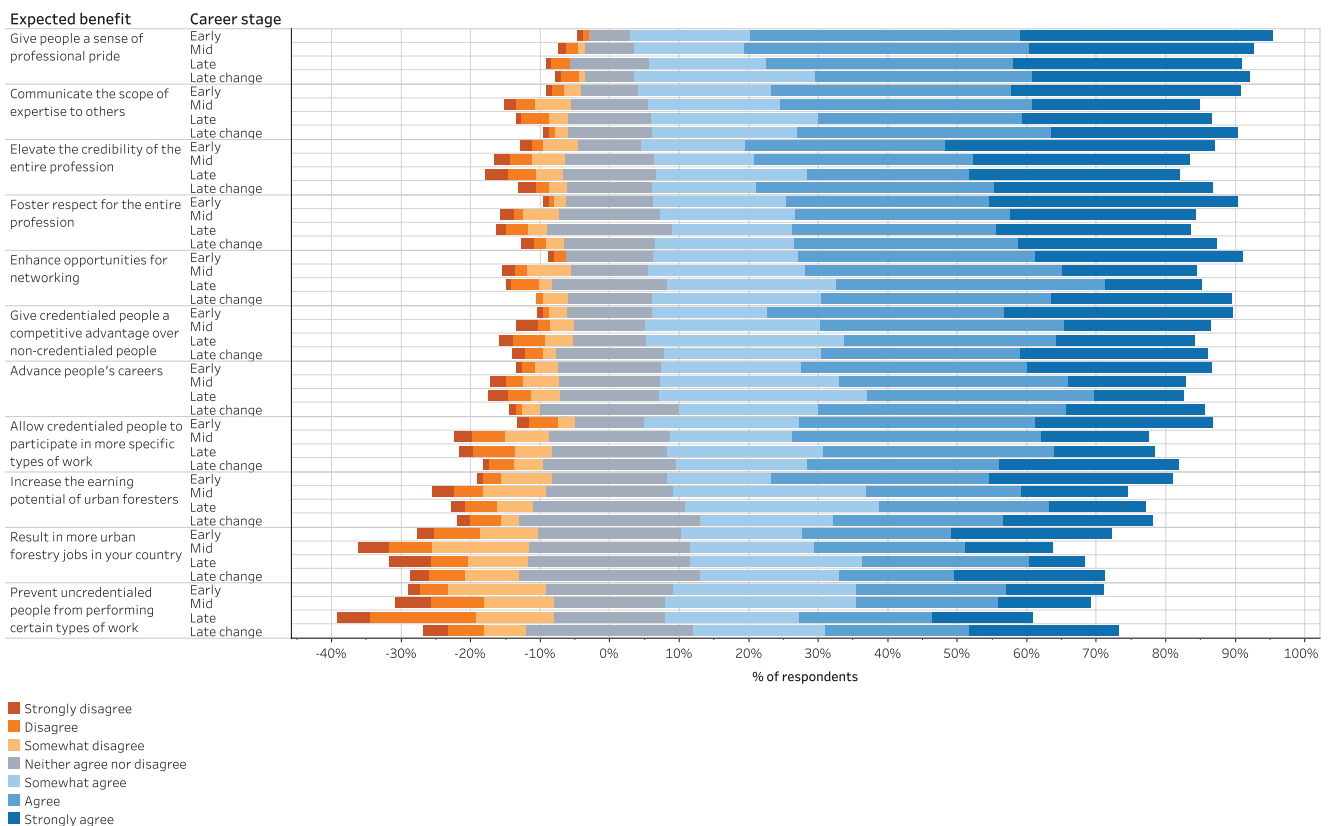


Figure S4. Expected benefits of a hypothetical urban forester credential by urban forest professionals in the US and Canada. Respondents were asked to rate their level of agreement with a series of statements in response to the question, “If a specific Urban Forester credential were to become available on a wide geographic scale within the next 5 years, please evaluate what you think a new Urban Forester credential would allow the profession to do.” Benefits are ranked in order of average Likert score so that the benefit with the most positive overall responses appears on top. Each benefit is sliced by career stage, a variable combining age and years since entering the urban forestry profession (Day et al. 2022). There is a clear pattern of early career and late-career-change respondents responding more positively about each expected benefit than mid- and late-career respondents.

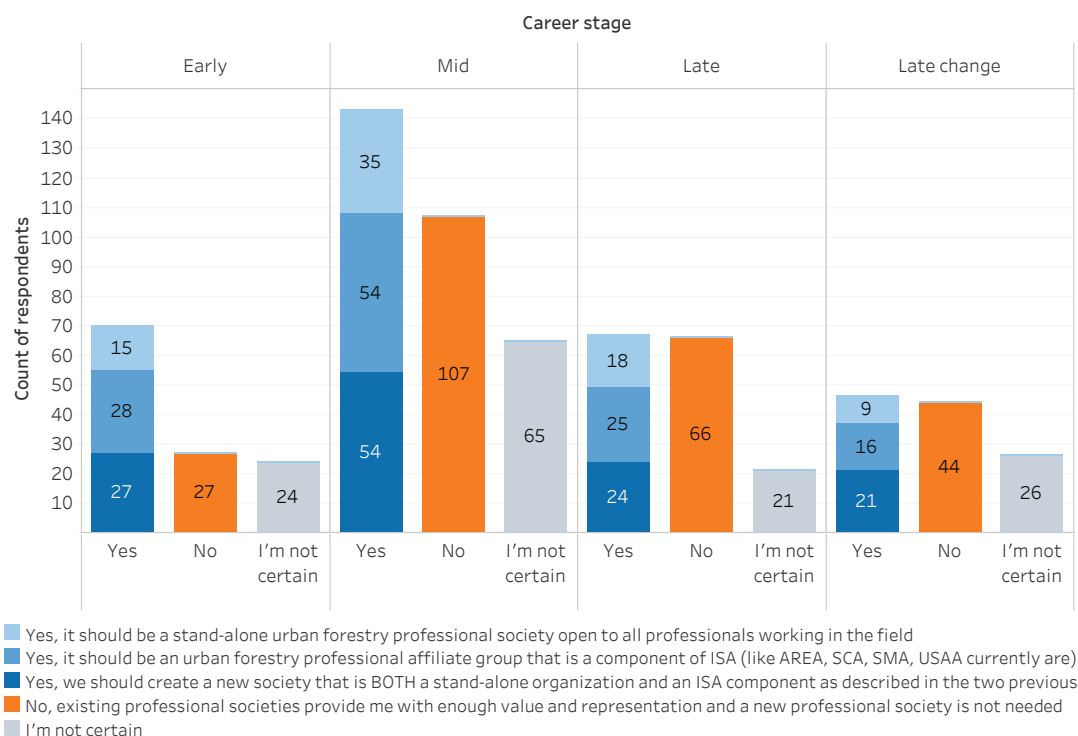


Figure S5. Preference of urban forest professionals in the US and Canada on the creation of a professional society for urban forestry. Respondents answered the multiple-choice question, “Do you think the urban forestry profession needs its own professional society?” and are grouped by career stage, a variable combining age and years since entering the urban forestry profession (Day et al. 2022). A majority of respondents, across career stages, thought that the profession needs its own society, though they differ on preferred format.