ABSTRACT

HOY, MORGAN AMES. Business Outlook of Private Urban Forestry in Northeastern and Midwest States (Under the direction of Dr. Rajan Parajuli).

The green industry is commonly comprised of the businesses and activities involved in the creation, distribution, and services corelated with landscape and design, garden supplies and equipment, and ornamental plants. Urban forestry is a crucial green industry sector, which serves as a valuable component of the urban and semi-urban environments and continues to grow as a popular solution to both ecological and social issues, supporting private businesses to meet the demand for the planning, establishment, and maintenance of the urban landscape. The increase in establishment of urban forests and subsequent green industry businesses necessitates understanding the outlook of urban forestry activities of these private businesses to anticipate any future needs and possible solutions to problems before they become larger issues.

The main goal of this study is to explore the outlook of the private green industry businesses have on their urban forestry activities in 21 Northeastern and Midwest states. An electronic survey was sent to private green industry private businesses in those states to document their perception on the outlook of urban forestry activities in their business and evaluate both business metrics and perception of certain issues to understand their outlook. Survey responses were analyzed using ordered logistic regression to handle the ordinal scale data. The results suggest that the nursery and florist’s supplies merchant wholesalers businesses are less likely to have a positive outlook on the urban forestry activities of their business. Although our survey instrument did not incorporate the COVID-19 Pandemic specifically, we received many comments accounting for the influence of the lingering Pandemic. Many respondents referenced how the Pandemic is an overall economic deterrent to economic growth,
implying that the state of their business is dependent on how the economy recovers from the national lockdowns.

We conclude that those who reported a higher percentage of urban forestry employees in their businesses had a higher likelihood of a positive outlook, implying those who invest in the urban forestry revenue streams have an increased likelihood of having a profitable future. The findings of this study can be used to identify gaps in green industry research while identifying needs of the business community. We recommend further research be conducted to better understand why those merchant wholesalers have a negative outlook on their future success.

**Keywords:** Green Industry; Urban Forestry; Outlook; Ordered Logistic Regression; Northeastern; Midwest; United States
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Business Outlook of Private Urban Forestry in Northeastern and Midwest States

by
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DEDICATION

To my mother and father,

for showing me anything is possible

with unrelenting work ethic

and an indomitable will.
Morgan Hoy was born in Norfolk, Virginia, and raised in the country landscape of Suffolk VA. She graduated from Nansemond-Suffolk Academy and attended Bridgewater College in the foothills of Virginia prior to transferring to the University of North Carolina Wilmington. She studied Environmental Science throughout her undergraduate career and traveled the state of North Carolina while interacting with local communities to understand their environmental concerns and needs. In the Spring of 2017 she traveled to Havana Cuba to study the organic aquaponics of local farmers. Shortly after returning from Cuba she flew to Washington DC on a scholarship with the nonprofit Population Connection to lobby Senate and Congressional leaders for increased access to international family planning. Hoy graduated in the Spring of 2017 with a B.S. in Environmental Science. After working for two years she wanted to continue her higher education and was accepted at North Carolina State University in the Department of Forestry and Environmental Resources to pursue a M.S. in Natural Resources; all for the dream of saving even a small piece of the world.
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I. Introduction

Green industry represents various industry types related to green structure and landscape in urban and semi-urban settings. Hall et al. (2005) illustrated green industry as “comprised of a variety of businesses involved in production, distribution and services associated with ornamental plants, landscape, and garden supplies and equipment” (Hall et al., 2005). Green industry is now commonly defined to emphasize horticulture and include retail garden centers, soil management, floriculture, and arboriculture (Alessandroni, 2021).

Although academic literature defines green industry to revolve around the production of urban greening products, many governments and private organizations interpret and focus on green industry as it pertains to environmentally sustainable economic growth. Both the United Nations Industrial Development Organization and the World Green Economy Council define green industry as “economies striving for a more sustainable pathway of growth, by undertaking green public investments and implementing public policy initiatives that encourage environmentally responsible private investments” (UNIDO, 2021; World Green Economy Council, 2021). Both entities argue that public investment in ‘green’ encourages private investment to promote greenery and natural urban forest ecosystems in human-urban landscapes.

Green industry services and products have an increasing impact on the lives of consumers and private businesses. Green industry sectors are substantial contributors to national and regional economies, providing employment opportunities wages which are then spent and recirculated throughout the economy (Hall et al., 2005; Hodges & Haydu, 2000; Palma & Hall, 2015). Not only is the green industry a substantial economic contributor but green industry products influence private property value through strategic landscaping (des Rosiers et al., 2002; Hardy et al., 2000). Green industry products, such as shade trees and ornamental plants, also
enhance the aesthetic appeal of retail environments, encouraging consumers to choose those businesses who have vegetation and shade trees over those who do not (Wolf, 2004a).

Urban forestry is an important contributing sector of the green industry (Mcpherson et al., 2005). Urban forestry has been defined “as the art, science, and technology of managing trees and forest resources in and around urban community ecosystems for the physiological, sociological, economic, and aesthetic benefits trees provide society” (Konijnendijk et al., 2006a). Urban forestry usually incorporates the establishment, conservation, protection and maintenance of trees in cities, suburbs and other developed areas. The term urban forestry has been seen in literature in the United States as early as 1894 but evolved throughout the 1960s as an interdisciplinary approach to the challenges related to growing trees in urban environments (Konijnendijk et al., 2006b). Recognition of the challenges with growing urban trees led to an expansion of research which focused on urban forestry and quantifying the social-ecological and economic impacts on urban landscapes and regional economies (Templeton & Goldman, 1996).

There have been numerous studies and programs created across the United States to aid in the successful development and expansion of urban forests (University of Virginia Institute for Environmental Negotiation, 2015; US Forest Service, 2015). Municipalities foster the creation of urban forests to encourage citizen involvement and create a healthier landscape for both businesses and citizens (Austin, 2002; Norwak et al., 2007; O’Neill, 2009; O’Niel-Dunne, 2019). Success of urban forestry programs has been positively influenced by national programs (US Forest Service, 2015) and could experience further success if research focused on the social and ecological benefits of urban forests (Escobedo et al., 2019).

The primary areas of focus on the green industry have been the economic contributions to the economy and the ecological contributions to the urban landscape. Although economic
contribution studies reiterate the fiscal responsibility behind the green industry activity in the urban landscape, little research has been dedicated to understanding how businesses view the future of urban forestry activities in their business. Our study attempts to fill this knowledge gap, seeking to understand the private businesses outlook of urban forestry in the green industry, and any perceived problems which may impact this outlook and warrant future investigation.

Understanding green industry private business perception of urban forestry is crucial as the economy continues to recover from the COVID-19 Pandemic to create new ways of providing products and services to urban forest practitioners.

The goal of this study was to evaluate the outlook of private businesses on their urban forestry activities within 21 Northeastern and Midwest states by surveying those businesses involved in the green industry. The main objectives of this study are to:

A) Determine the severity of impact certain issues have on private business outlook of urban forestry success.

B) Identify perceived private business outlook on the future of urban forestry activity success.

C) Identify the business metrics impacting the outlook of urban forestry activities of the private green industry in the study region.

We aimed to understand how businesses viewed the future success of urban forestry activities in their specific green industry sector, and the perception of potential problems impacting their outlook. While our survey administration procedure started prior to the COVID-19 Pandemic, several respondents referenced the global health crisis while reporting their outlook on urban forestry activities. Responses indicated the Pandemic positively impacted the economic success
of some businesses, while others still recognize the health crisis as an issue and felt it will have long term negative impacts to their prosperity.

Those green industry business sectors included in this study were defined by their corresponding North American Industrial Classification System (NAICS) codes sourced from the United States Census Bureau. The following business industries collectively represent most green industry activities:

- Landscape or tree care services (NAICS 561730)
- Nursery and florist’s supplies merchant wholesalers (NAICS 424930)
- Nursery, greenhouse, and tree production (NAICS 11142)
- Nursery and garden supply stores (NAICS 44422)
- Landscape architectural and design services (NAICS 541320)

Results imply private businesses within green industry sectors have different outlooks on the future of urban forestry activities in their business. Economic studies show a continued increase in both impact and contribution of urban forestry as a green industry sector throughout the years, yet businesses in certain sectors feel their urban forestry activities will not be successful into the future. The findings of this study provide the beginning steps towards bridging the gap between economic analyses reported throughout literature and the private business perception behind the scenes. The reported outlooks provide necessary context for policymakers to create informed decisions which could impact the future success of urban forestry creation and maintenance services provided by those businesses in the green industry.

This report begins with a literature review as evidence of the variety and depth of academic research into green industry sectors and their economic impact, while showing the lack of consideration for their business prospects in the future. Section III explains the methods used
to produce and disseminate the survey instrument and data analysis approached. Section IV presents results from the survey and the subsequent statistical model used for analysis. Section V discusses how the results can fill the knowledge gap in literature and assesses how the COVID-19 Pandemic has impacted the outlook of the future of urban forestry. Section VI presents conclusions drawn from the study and analysis. This report completes with Section VII, recommending how best the information presented can be best utilized to encourage future growth of green industry sectors and urban forestry in the Northeastern and Midwest states.
II. Literature Review

2.1 Green Industry and Hedonic Value

The increased property value of those homes near urban green space encourages private citizens to become involved in urban greening projects, thus positively impacting the green industry due to an increase in demand of products and services. Individual private citizens have a vested interest in the contributions of the green industry to their private property investments. One of the most common interactions people have with urban forestry is the landscaping present around their homes and vicinities. Behe et al. (2005) used a conjoint analysis with the results of roughly 1,300 volunteer photograph reactions to 16 photographs in seven different states depicting the front of a landscaped residence. The photographs focused on the landscape construction based on design sophistication, plant size, and plant material type. Results from the model indicated participant’s perception of home value increased from 5% to 11% when the homes had good landscaping (Behe et al., 2005).

Hardey et al. (2000) conducted a similar study in Detroit Michigan, in which volunteers in attendance of a flower show were asked: “how much value do consumers place on a good landscape?” Based on a conjoint analysis to quantify respondent answers, results indicated when all other variables are equal, increasing plant size from the smallest to largest increased perceived home value by 5%. In addition to the presence of landscaping and choice of vegetation, design sophistication was also as important as size with an emphasis on multiple beds and “curved bed lines” increasing perceived home value by 4.5%. The 158 surveys quantified in the conjoint analysis predicted perceived home value increased by 12.7% due to type and sophistication of landscaping (Hardy et al., 2000). The increase in perception of home value
when sophisticated landscaping is present is another indicator of the importance of green industry in the personal financial decisions of private citizens as well as the wider economy.

Understanding the purchase habits of private citizens allows green industry businesses to adapt their business strategy to ensure a profitable future. The decision to incorporate landscaping around a home leads to the choice of where to purchase the vegetation, impacting which green industry sectors will be positively influenced. Barton et al. (1998) focused on where consumers prefer to purchase their nursery and landscaping products when they conducted an in-depth review of previous preference research to draw conclusions on which demographic characteristics are associated with the purchase of products in certain retail environments. The review indicated consumer profile varies depending on the region and the product of focus. Although there was a variation, overarching results indicated that consumers choose retail centers based on plant quality and selection (Barton et al., 1998).

Private citizens can positively impact the property value of their homes if they leverage access to green space and green industry products effectively. As urban sprawl intensifies, more people are seeking access to green spaces and urban vegetation. Tyrvinen (1997) used hedonic pricing to analyze the costs and benefits of urban forests to 1,006 apartments. Results of the model indicated that increased access to forested areas and proximity to watercourses had a positive influence on the apartment price, and urban forests were appreciated by the apartment inhabitants and included in the sale price of the property (Tyrvinen, 1997).

Crompton (2004) used the proximate principle to evaluate the widely accepted notion that property values change depending on the relative proximity to natural, or perceived to be natural, areas. Compton (2004) used a mix of actual residential property values and their property tax base with scenarios proposing creation or renovation of open park spaces to quantify how urban
green space impacted the property value. Results emphasized how proximity to parks was
preferable if they were well maintained and easily accessible, but proximity could have negative
impacts to the property value depending on the crime rate, light pollution, and potential litter
problems (Crompton, 2004).

If close proximity to green space is not feasible, property owners increase spending on
landscaping to increase home value. Rosiers et al. (2002) investigated the influence of
landscaping on the value of homes using hedonic pricing based on a survey of 760 homes sold
between 1993 and 2000. The surveys included 31 various landscaping variables of the immediate
housing lawn and the surrounding area. Results suggested that tree cover and additional
landscaping features such as water features, flower beds, and rock formations contributed to
higher property value of homes and were preferred by those in the surrounding area of the
property (des Rosiers et al., 2002).

Landscaping on private property not only increased perceived property value but also
impacts energy consumption and utility bills. Donovan (2017) focused on the benefits consumers
derive from proximity to urban forests or a landscaped environment, focusing on energy
consumption in private homes and retail environments. Donovan (2017) used a regression
analysis to quantify electricity consumption of 460 homes in Sacramento California to estimate
the impact of shade trees on electricity use in the summer. Results indicated that the presence of
shade trees on the west and south side of homes reduced the electricity use by 5.2% while the
presence of shade trees on the north side of homes only reduced the use by 1.5% (Donovan,
2017).

Private citizens are willing to spend money in the green industry to improve their quality
of life, which then improves their property value and further bolsters the importance of the green
industry. Brethour et al. (2007) analyzed think tank studies on the influence of ornamental horticulture products on human socio-ecological health. The presence of green industry products were found to reduce energy cost, improve property value, enhance aesthetic appeal, and assist municipalities in multi-use functions of the urban landscape (Brethour et al., 2007).

A variety of issues can impact the daily operations and success of a business. Finding, training, and retaining employees is a common issue in the green industry. New York City has created a program to train young adults with low income in a green industry profession in an effort to create pathways out of poverty while simultaneously meeting the City’s need for an increase in green industry services (Falxa-Raymond et al., 2013). Flaxa-Raymond et al. (2013) reported those who completed the training program felt a greater sense of accomplishment in their work and more positive feelings towards the environment (Falxa-Raymond et al., 2013). The feelings of accomplishment and increased positivity towards the environment are indicators that there may be an increase in overall job satisfaction of those in green industry jobs.

Bitsch and Hogberg (2005) conducted a qualitative study of job satisfaction of green industry employees and found that job satisfaction impacted the longevity of employment and level of productivity, directly impacting business profitability (Bitsch & Hogberg, 2005). Bitsch and Hogberg (2004) also found that of those surveyed, employees were more likely to talk positively about job satisfaction over dissatisfaction, improving retention rates (Bitsch & Hogberg, 2004). If job satisfaction can be increased, it would be logical to concur that overall productivity would also heighten leading to a boost in profitability and thus improving business success and outlook.
2.2 Impacts of the COVID-19 Pandemic on the Green Industry

The COVID-19 Pandemic has deeply impacted every industry of the global economy. Sectors within the green industry are no exception, and studies have begun to examine the lasting ramifications of the pandemic. The Tree Care Industry Association (TCIA) (2021) reported that many of its members expected the economy to improve within the next 12 months, 54% considered adding new revenue streams, while 63% considered finding qualified employees to be their largest issue (Tree Care Industry Association, 2021).

The outlook for future success is varied as countries across the globe began lockdown in the early months of 2020 with differences in longevity and recurrence. Ugolini et al. (2020) studied the effects of isolation on individuals and their newfound desire to explore green spaces, and results showed that respondents specifically mentioned missing being outdoors in their urban forests in addition to an increase in willingness to drive short distances to utilize green space (Ugolini et al., 2020). Perez-Urrestarazu et al. (2020) focused on those who chose to bring the urban forestry environment inside via indoor houseplants and similar vegetation. A questionnaire asked respondents to evaluate “the impact of indoor and outdoor plants on their emotional welfare considering behavioural, social, and demographic variables.” Results indicated that having indoor plants directly correlated with more positive emotions while confined at home throughout COVID-19 lockdown (Pérez-Urrestarazu et al., 2020). The COVID-19 pandemic has influenced the outlook of those in the green industry as well as altering the purchasing habits of consumers, habits which will impact future economic trends beyond pandemic confinement.

Economic variability impacts every sector throughout the economy and the COVID-19 Pandemic is another fluctuation the green industry has survived in recent decades. Following the previous substantial economic fluctuation, the Great Recession of 2007 – 2008, Hall & Dickson
(2011) critically reviewed the literature to analyze which factors encouraged consumers to purchase nursery and horticulture items, and how the industry could adapt to encourage and meet this need. Results indicated that after the recession consumers were willing to purchase landscaping and home renovation items because they felt it would enhance their quality of life and well-being (Hall & Dickson, 2011). Previous consumer willingness to purchase green industry products and services for improved quality of life will again help the green industry survive the COVID-19 economic fluctuation.

2.3 Urban Forestry Development

Urban forestry is an integral part of the green industry. In North America urban forestry is widely accepted to involve the shade management of park and street trees (Konijnendijk et al., 2006b). The management of these trees is often included in municipality management plans which revolve around “tree maintenance, tree establishment, and tree protection” (Gibbons & Ryan, 2015). The production of the trees for the tree establishment in the management plans are sourced from nurseries and nursery wholesalers, both defined as sectors in the green industry (Economic Impact of Urban Forestry in New Jersey, 2012; Enterprise Innovation Institute Georgia Institute of Technology, 2018; Hodges & Court, 2019; Hodges & Haydu, 2000; Nana & Stottlemyer, 2019; Palma & Hall, 2015). The planted trees as part of these management plans are often planted with understory vegetation consisting of products from the horticulture and floriculture sectors of the green industry (Hauer & Peterson, 2016). Although the horticulture and floriculture sectors are defined as separate industries by their individual NAICS codes they are linked in their application to urban forestry.

Urban forestry management plans constantly evolve to meet private citizen needs and accommodate municipality budgets. Elmendorf et al. (2003) compared studies within the state of
Pennsylvania that have found issues with the creation of urban forestry programs versus programs which have been implemented successfully. Surveys were mailed to those involved in the cities’ tree boards in addition to volunteers who participated on projects arranged and managed by the boards. Results indicated that over 85% of respondents felt the urban forestry projects were important and roughly 43% had participated on a project. Although these results were encouraging, they did not match the rate of program creation and execution promised by the tree boards within the cities (Elmendorf et al., 2003).

City tree boards are not the only way to involve private citizen volunteers in urban forestry activities. Recreational parks in cities have been cited as viable opportunities to promote urban forestry while providing a source of revenue for municipalities due to businesses within park grounds or utilizing the urban green space as an event venue (Crompton, 2005). The multifaceted use of parks allows them to become an attraction in and of themselves, serving as city beautification while providing ecosystem benefits (Crompton, 2005).

Analyzing where urban forests exist allows a baseline of knowledge for governments to better understand where urban forests are desired and plan future establishment accordingly to allow increased access for more citizens. Du and Zhang (2020) used New York City as a case study to argue in favor of smaller dispersed parks throughout the City rather than a few large parks only accessible to a percentage of the population. After analyzing over 76,000 housing units, they found that the development and maintenance of green spaces were not in areas of economic need or areas which could create the most social benefit (Du & Zhang, 2020). Increased access to urban forests can only be argued if there is an established baseline of urban forest prevalence and documented need.
Pregitzer et al. (2021) utilized nationally available datasets with corresponding personalized questionnaires to urban forestry practitioners in cities of 50,000 or more residents to determine the general state of urban forestry in their cities and any common issues they face. Results suggested that urban forest land decreased 4% from 2014 – 2019, with common issues being a lack of data and low awareness of urban forestry value (Pregitzer et al., 2021). This lack of value recognition could be an opportunity for local organizations or governments to educate citizens on the value of urban forestry and lead to an increase in private citizen participation in urban forestry establishment and subsequent maintenance.

2.4 Urban Forestry and Community Involvement

Urban forests have been integrated as a part of residential communities for decades, but not many private citizens participate in the management of established vegetation. Austin (2002) conducted a study in Detroit Michigan to better understand how community involvement in the creation of urban forests could be encouraged and expanded beyond original participation in the day of tree planting. Austin (2002) found that participants enjoyed working with nature and therefore had a positive perception of urban greening projects, as well as being socially motivated to care for their neighborhoods to increase beautification (Austin, 2002). The positive perception of urban green space could be leveraged into justification of further marketing of urban forestry establishment and continual maintenance to encourage active citizen involvement.

Kuo (2003) conducted a similar study in Detroit which included human observation, interviews, and public records to understand the influence of urban forests on the social structure of a given area. Results indicated neighbors with urban forests had stronger ties with each other and communities experienced an increased sense of safety for themselves and their children, in addition to fewer crimes and more use of common outdoor spaces (Kuo, 2003). Publicizing the
positive ramifications of urban forests will only increase the likelihood of further establishment and encourage the active participation of community citizens.

Understanding who becomes involved in urban forestry planning and subsequent activities gives municipalities context to better adapt their plans to accommodate a more diverse range of individuals from communities. Westphal (2003) analyzed how community urban forestry events in Chicago sparked empowerment among individuals in the community. Data was collected from interviews and photoelicitation, a practice where interviewees were tasked with photographing what had changed in their community over the years, and respondents were asked to explain their response to each photo. Results indicated that urban green projects were considered “success sites”, further inspiring respondents to care for the project due to the vested interest in seeing it remain a success within the community (Westphal, 2003).

Assessing who is involved in neighborhood beautification events can expand the participation base and encourage frequency in events. Conway et al. (2011) conducted telephone interviews to determine what kinds of urban forestry activities communities were involved in, and then compared involvement across various neighborhoods of differing socioeconomic backgrounds. Conway et al. (2011) found that over half of those involved in community activities were planning community involvement events which focused on neighborhood beautification with an emphasis on urban vegetation (Conway et al., 2011).

Greenleaf and Ries (2020) focused on what kind of community members choose to participate on city tree boards. Surveys were sent to Arbor Day Foundation Tree Boards and results suggested that the sociodemographic range of those who served was limited and did not accurately represent those people who would be impacted by the recommendations of the board. Greenleaf and Ries (2020) suggested that volunteer motivations can be used to influence member
recruitment and thus form an accurate body of Board members who reflect the socio
demographic composition of the communities in question (Greenleaf & Ries, 2020).

Raising awareness of the benefits of urban forestry and encouraging stakeholder
involvement increases the likelihood of urban forest investment and success. Hauer et al. (2018)
conducted a nationwide survey to analyze the relationship between volunteers and community
group partnerships within municipalities to establish an understanding of what encourages
private citizens and businesses to become involved in the urban forestry planning process.
Results indicated that community and volunteer involvement primarily relied upon budget, per
capita spending, active tree boards, outreach, a strategic plan, and total employment (Hauer et al.,
2018).

The city of Philadelphia in Pennsylvania actively encouraged private citizen and business
involvement in urban forestry planning when the city hosted an Urban Forest Strategic Plan
Stakeholder Engagement Event in December of 2019 to involve community stakeholders in the
planning process of their 10 year urban forestry plan (Philadelphia Parks & Recreation, 2019).
This plan was the first of its kind for Philadelphia, stemming from a tree canopy assessment in
2018 which utilized geospatial analytics to prove canopy cover was declining and contributing to
a host of other environmental issues (O’Niel-Dunne, 2019).

Municipality urban forestry programs encourage the growth of the green industry. Hauer
and Peterson (2016) conducted a nation-wide census of urban and community tree activities in
2014 via a long and short questionnaire sent to contacts within municipal governments.
Respondents reported the municipal urban forestry plans were evolving and becoming a more
integrated part of community planning and infrastructure (Hauer & Peterson, 2016). The results
of Hauer and Peterson’s (2016) nation-wide census were encouraging for entities such as the Urban and Community Forestry Program created by The United States Forest Service.

The Urban and Community Forestry Program conducted annual research to quantify the impact of urban forestry in local economies while also providing funding and technical support to state agencies to help create sustainable management plans (US Forest Service, 2020). Hauer and Peterson (2016) found that municipalities around the nation felt urban forestry programs were firmly established and evolving in their communities, indicating that the Urban and Community Forestry Program was effectively encouraging and fostering the creation of urban forests around the country. As more municipalities create urban forestry management plans there will be an increase in private green industry business involvement to provide vegetation management for the newly created urban forests. Lindholst (2017) performed a review of thirteen studies and concluded that contracting out green industry services is economically and managerially positive for municipalities, but the quality of service and the staff are found to be negative (Lindholst, 2017).

Urban forests also provide considerable economic, ecological, and health benefits to the urban community landscape. Norwak et al. (2007) conducted a study in New York City to assess the effects and values of urban forestry to the local economy. An Urban Forest Effects model standardized data collected from randomly chosen plots around the City to quantify the effects of urban forests. The chosen plots accounted for urban forestry structure, air pollution, and meteorological events. Results showed the general make up of species within the forest in addition to the carbon sequestration and projections of canopy cover on energy use in buildings, indicating that an uneven dispersal of urban forests caused positive impacts to certain parts of the City over others (Norwak et al., 2007).
Evolving interest in urban green space could mean increased support from stakeholders, especially if the individual prices of tree benefits outweigh costs. Wolf (2004) utilized economic valuation, hedonic pricing, and the customer valuation method to assign a price to trees of urban forests. Wolf (2004) assigned prices to trees, in addition to lower healthcare costs due to access to green space and walking trails (Wolf, 2004b). In addition to lower healthcare costs, there are extensive ecosystem services provided by street trees, urban forests, and lawns/parks. Bolund and Hunhammar (1999) used the contingent valuation method of quantifying ecosystem services and distributed a questionnaire which asked respondents about their interaction with urban green spaces and what it meant to have green spaces in their communities. Results showed that at least 45% of surveyed citizens visited their local park once a week, indicating frequency of use and highlighting the need for urban forest establishment (Bolund & Hunhammar, 1999). The results of the survey are encouraging to urban forestry programs in municipalities, as it shows there is an increasing interest in urban forests which could mean increased support from stakeholders.

Research focusing on the applicability of urban forests in environments private citizens interact with semi regularly provides additional contextual support for the importance of urban forest planning. Urban forestry is prevalent surrounding retail environments where both businesses and private citizens experience the benefits provided by the urban greening. Wolf (2004) surveyed a group of retail business owners and those living near the selected retail centers. Results of the survey indicated that both consumers and retail owners had generally positive attitudes regarding the urban vegetation, consumers being the more positive of the two groups. When asked to choose between two retail options, the retail centers with urban greening and those without, most of the consumers chose the retail option with urban greening. This
suggested the presence of urban forests can have an influence on the prosperity of a retail business (Wolf, 2004a).
III. Methods

3.1 Study Area and Data Collection

A survey was sent to businesses in the green industry involved in urban forestry activities in the Green Industry in 21 Northeastern and Midwest states in the United States. The 16-question survey was distributed via email, with three reminder emails prior to the survey closing date of November 04, 2020. The study focused on private business entities participating in urban forestry activities in the study states (Figure 1). Targeted states include Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont, West Virginia, Wisconsin, and Washington D.C.

![Figure 1. Map depicting the 21 states involved in the survey.](image-url)

A regional web-based survey with an emailed recruitment invitation was employed to collect the data. We developed the questionnaire and the survey was programmed in Qualtrics to be distributed by the University of Wisconsin Survey Center. The survey instrument was approved with exemption by the North Carolina State University (NCSU) Institutional Review
Board (IRB). The 27,143 email contacts across 21,921 different private businesses involved in
the private green industry were purchased from Exact Data, a private company which compiled
the contact information of the businesses by their NAICS classification codes. Each industry type
has an individual NAICS code which corresponds to statistical data about that industry. The data
provided allows the private business survey results to be interpreted in the context of private
business involvement and contribution to the green industry sectors chosen in the region. The
data provided allows the private business survey results to be interpreted in the context of private
business involvement in and contribution to green industry sectors. Dillman et al. (2014)
approach was applied in survey administration: the initial email invitation was followed by three
email reminders with no incentives included (Dillman et al., 2014). The survey began with an
eligibility question to determine if private businesses were active in 2018 in any of the 21 states
to ensure a representative sample.

3.2 Sample Design and Selection

There was no sampling required from the Wisconsin Department of Natural Resources
(WDNR), the University of Wisconsin Survey Center (UWSC), or Exact Data Company lists.
Meaning; there was no subset of surveys chosen from the sample based on any specific criteria
or selection process. UWSC retained all email addresses and assigned priority labels of primary,
secondary, tertiary, and quaternary. If some samples provided the same email address for
multiple people, they were considered ‘duplicates’ and kept in the sample in case one person
represented multiple businesses. The total sample is comprised of 27,349 total contacts with
21,929 primary contacts, 5,030 secondary contacts, 287 tertiary contacts, and 107 quaternary
contacts.
3.3 Survey Procedure

Each survey sent to the 27,349 private business email addresses was sent a personal link to the survey. Emails and subsequent reminders were sent based on the contact priority. Emails were designated non-responsive if they chose to opt out of the survey or did not complete the survey. Emails were designated null if it bounced or could not be received. Some of the designated contacts replied with a different person’s email address, when this occurred the new contact was added to the sample using the next available priority designation.

The survey program Qualtrics does not allow duplicate email address entries. There was an attempt to deviate from this practice and add the email addresses to into separate contact lists, but the effort was ultimately designated unsuccessful and the idea abandoned. Since the effort to include the ‘duplicates’ was unsuccessful, the email addresses listed more than once were only sent a single email per email notification reminder. The second, third, and fourth reminder emails included similar information to the first but with slightly more emphasis on the importance of responding as the reminders increased. The UWSC stopped accepting survey responses on November 04, 2020.

The survey questions were created so each contact was allowed to complete only one survey. The questions were programmed to allow respondents to continue to the next question even if they did not answer previous questions. This means respondents were allowed to complete as much or as little of the survey as they wished. Respondents were also permitted to exit the survey and return to finish at any point until the November 04, 2020 deadline, or until they reached the final screen and submitted their survey. Following completion or survey deadline, responses were coded as complete and no further access was given to respondents. There were no tracking or locating efforts required.
3.4 Response Rate

After a month with email reminders, roughly 600 surveys were answered and of the 600 surveys 409 were complete enough for analysis. This equates to a 1.5% response rate when using unique emails at the denominator and a 1.9% response rate when using each unique business as the denominator. Response rate was calculated by the UWSC using the American Association for Public Opinion Research (AAPOR), for which UWSC is a member. The response rate formula listed below includes information about screening and final response:

\[ RR_1 = \frac{I}{I+P} + \frac{R+NC+O}{NC+O+P+I} \]

The response rate in Table 1 was calculated using each contact as the denominator, not the individual business.

Table 1. Breakdown of response rate calculation based on each contact email as the denominator.

<table>
<thead>
<tr>
<th>Final Outcome</th>
<th>RR1 Code</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>I</td>
<td>409</td>
</tr>
<tr>
<td>Partial Completes</td>
<td>P</td>
<td>224</td>
</tr>
<tr>
<td>Opted Out (refused and self-reported ineligible)</td>
<td>R</td>
<td>717</td>
</tr>
<tr>
<td>Non-contact, including skipped as duplicate and non-responders to emails</td>
<td>NC</td>
<td>25,996</td>
</tr>
<tr>
<td>Other</td>
<td>O</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>27,346</td>
</tr>
</tbody>
</table>

The response rate was found using the formula:

\[ RR_1 = \frac{409}{409+224} + \frac{(771+25,996)}{27,346} = 0.015 \]
The response rate in Table 2 was found using the individual businesses as the denominator.

Table 2. Breakdown of response rate calculation based on each individual business as the denominator

<table>
<thead>
<tr>
<th>Private Final Outcome</th>
<th>RR1 Code</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete</td>
<td>I</td>
<td>406</td>
</tr>
<tr>
<td>- Primary Contacts</td>
<td></td>
<td>- 368</td>
</tr>
<tr>
<td>- Secondary Contacts</td>
<td></td>
<td>- 41</td>
</tr>
<tr>
<td>Partial Completed</td>
<td>P</td>
<td>224</td>
</tr>
<tr>
<td>- Primary Contacts</td>
<td></td>
<td>- 199</td>
</tr>
<tr>
<td>- Secondary Contacts</td>
<td></td>
<td>- 25</td>
</tr>
<tr>
<td>Opted Out (refused and self-reported ineligible)</td>
<td>R</td>
<td>636</td>
</tr>
<tr>
<td>Non-contact, including skipped as duplicate and non-responders to emails</td>
<td>NC</td>
<td>20,719</td>
</tr>
<tr>
<td>Other</td>
<td>O</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21,922</td>
</tr>
</tbody>
</table>

The response rate was found using the formula:

\[ RR\ 1 = \frac{406}{368+199} + \left(\frac{636+20,719}{21,922}\right) = \frac{406}{21,922} = 1.9\% \]

3.5 Empirical Model

The purpose of our empirical model is to evaluate the factors explaining the private business outlook of urban forestry activities of those businesses active in the green industry in 21 Northeastern and Midwest states. Landscape or tree care services, nursery, greenhouse and tree production, nursery and garden supply stores, nursery and florist’s supplies merchant wholesalers, and landscape and architectural design services represent the industry type of the private businesses sampled. Jobs, years in business, and percentage of jobs in urban forestry (UF) are the numerical values analyzed to quantify the impact to perceived business outlook. The remaining variables are an attempt to quantify how businesses’ perception of these issues related to: inadequate research and development (R&D), inadequate supply chain, workforce
recruitment, and employee retention, impact their overall outlook of future business prospects. Respondents were also asked if their business was structured as a corporation in an attempt to examine if there was any influence of the structure of a business on the perception of urban forestry future success. The empirical model is presented below:

The Model:

\[
\text{outlook} = f(\text{landscape\_treecare, nursery\_supply, nursery\_tree, nursery\_stores, landscape\_design, jobs, years\_in\_business, jobs\_in\_UF, corporate\_structure, inadequate\_R\&D, inadequate\_supplychain, workforce\_recruitment, employee\_retention})
\]

where the ‘outlook’ variable denotes how private green industry businesses think of their future prospects of the business on urban forestry based on current conditions, which was recorded in a 5-point ordinal scale: 1-extremely bad, 2-somewhat bad, 3-neutral, 4-somewhat good, 5-extremely good. The details of each of the explanatory variables are presented below (Table 3).

It is important to note the variability in the ‘no of obs’. Although there were 409 fully completed surveys available for analysis, the number of observations varied for those surveys which included answers to the variable in question. Some respondents may not have answered the survey in full but provided partially completed surveys which gave information for some variables and not others. In ordered logistic regression if there is any missing information from the data, the model completely removes the information in that row. This means some variables will have more ‘observations’ than others because respondents chose to answer some questions over others.
Table 3. Summary of variables used to estimate the regression model explaining the future outlook of the urban forestry activities of private businesses involved in the green industry.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>No. of Obs.</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>outlook</td>
<td>Categorical variable, how respondents described the future outlook of their business; 1-extremely bad, 2-somewhat bad, 3-neutral, 4-somewhat good, 5-extremely good</td>
<td>377</td>
<td>3.67</td>
</tr>
<tr>
<td>landscape_treecare</td>
<td>Binary variable which equals ‘1’ when business engaged in landscape or tree care services (NAICS 561730), ‘0’ otherwise</td>
<td>450</td>
<td>0.50</td>
</tr>
<tr>
<td>nursery_supply</td>
<td>Binary variable which equals ‘1’ when business engaged in nursery supply wholesalers (NAICS 424930), ‘0’ otherwise</td>
<td>450</td>
<td>0.02</td>
</tr>
<tr>
<td>nursery_tree</td>
<td>Binary variable which equals ‘1’ when business engaged in nursery &amp; tree production (NAICS 111421), ‘0’ otherwise</td>
<td>450</td>
<td>0.10</td>
</tr>
<tr>
<td>nursery_stores</td>
<td>Binary variable which equals ‘1’ when business engaged in nursery stores (NAICS 44422), ‘0’ otherwise</td>
<td>449</td>
<td>0.08</td>
</tr>
<tr>
<td>landscape_design</td>
<td>Binary variable which equals ‘1’ when business engaged in landscape and design services (NAICS 541320), ‘0’ otherwise</td>
<td>450</td>
<td>0.16</td>
</tr>
<tr>
<td>jobs</td>
<td>Numerical variable, the sum of full time, part time, and seasonal employees</td>
<td>388</td>
<td>32.33</td>
</tr>
</tbody>
</table>
Table 3. (continued)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>N</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>years_in_business</td>
<td>Numerical variable, years in active business</td>
<td>396</td>
<td>35.25</td>
</tr>
<tr>
<td>jobs_in_UF</td>
<td>Percentage of total jobs in urban forestry activities</td>
<td>381</td>
<td>30.61</td>
</tr>
<tr>
<td>inadequate_R&amp;D</td>
<td>Categorical variable, how respondents rated the impact of the issue about inadequate research and development on their business; 1-none, 5-a great deal</td>
<td>380</td>
<td>1.78</td>
</tr>
<tr>
<td>inadequate_supplychain</td>
<td>Categorical variable, how respondents rated the impact of the issue about supply chain on their business; 1-none, 5-a great deal</td>
<td>380</td>
<td>1.80</td>
</tr>
<tr>
<td>workforce_recruitment</td>
<td>Categorical variable, how respondents rated the impact of the issue about workforce recruitment on their business; 1-none, 5-a great deal</td>
<td>381</td>
<td>3.28</td>
</tr>
<tr>
<td>employee_retention</td>
<td>Categorical variable, how respondents rated the impact of the issue about retaining employees on their business; 1-none, 5-a great deal</td>
<td>380</td>
<td>2.54</td>
</tr>
<tr>
<td>organizational_structure</td>
<td>Binary variable, representing the corporate organizational structure of the business; 1-corporation, 0-otherwise</td>
<td>381</td>
<td>0.39</td>
</tr>
</tbody>
</table>
Business Types

The variable, landscape_treecare, represents the businesses related to private landscaping and tree care services, which is equivalent to NAICS 561730. Similarly, the variable nursery_supply, denotes the businesses related to nursery supply wholesalers, which corresponds to NAICS code 424930 and nursery_tree signifies the businesses involved in nursery or tree care production, symbolized by NAICS code 111421. Other variables nursery_stores and landscape_design, represent the businesses related to nursery stores, corresponding to NAICS code 44422, and landscape design services, NAICS code 541320, respectively. Every variable representing industry business type is binary, each respondent indicating the variable is ‘1’ for business involvement within the industry and ‘0’ otherwise.

Business Metrics

The independent numerical variable ‘total jobs’ is representative of the average number of people employed by private green industry businesses in the sample. Respondents were asked to complete the questionnaire with a numerical response for full-time, part-time, and seasonal employees. The total number of jobs varied from 1 to 650. The questionnaire also asked the year respondents established their business (years_in_busines) to see how many years they have been active and infer if business activity correlates to the overall success of urban forestry activities. The years in business ranged from a minimum of 2 to the maximum of 156 years in operation. Respondents were also asked what percentage of their employees were focused on urban forestry activities (jobs_in_UF). Respondents answered numerically with a written percentage. This variable attempted to capture how many employees were engaged in urban forestry activities to infer if the increased employment numbers contributed to overall outlook on the future of urban forestry. The survey also asked respondents to indicate if they were structured as a corporation.
We included this binary variable (corporate_structure) to analyze if structure of a green industry business impacted the outlook for future urban forestry success.

*Issues Related to Green Industry*

Respondents were also asked their perception on several common issues facing businesses so we could understand if these perceived issues had any impact on the outlook of urban forestry activities of green industry private businesses. The questionnaire asked respondents if inadequate research and development (inadequate_R&D) and inadequate supply chains (inadequate_supplychain) between related industries were an issue impacting successful urban forestry practices. We also asked if there was any difficulty in recruiting an adequate workforce (workforce_recruitment) or retaining that workforce (employee_retention) impacting the successful implementation of UF activities within their businesses. These issues were represented by categorical variables asked on a 5-point ordinal Likert scale according to the perception on the severity of the issue: 1-not at all, 2-a little, 3-some, 4-quite a bit, and 5-a great deal.

*Estimation*

As an estimation procedure of the model, since our dependent variable is a 5-point ordinal scale, we employed the ordered logistic regression technique to evaluate the future outlook of urban forestry activities of the private businesses involved in the green industry in the study region. The goal of the model was to reveal which factors related to businesses within the private green industry explain their perception of the urban forestry activities of the business.

Ordered logistic regression models estimate a score which is a linear function of the independent variables included and the defined cut points (Torres-Reyna, 2008). The cut points vary depending on the study performed and are threshold parameters for the possible outcomes,
telling us how to interpret the given variable outputs (Williams, 2020). In this study the cut points are the probability of a negative outlook on urban forestry activities and the probability of a positive outlook on urban forestry activities. Ordered logistic regression is useful in analyzing the positive or negative relationship of the data to the question but does not give proper magnitude of the positive or negative relationship. The odd ratio estimates change the estimated coefficients to odds ratio, also known as probability (Szumilas, 2010). The odds ratio facilitates interpretation of the magnitude of an independent variable’s ability to explain variation in the dependent variable. The odds ratio model in this study describes the probability of a positive outlook on urban forestry activities and the magnitude with which the probability occurs. Values greater than 1 are increasing the probability of a positive outlook, while values less than 1 are decreasing the probability of a positive outlook.
IV. Results

4.1 Basic Statistics

Number of responses varied depending on business type. Those businesses involved in the landscape or tree care services (NAICS 561730) constituted the majority of the completed surveys with 58% of the responses. Landscape and architectural design services represented 18% of the responses followed by 12% from those in nursery and tree production. Nursery stores and nursery supply wholesalers had the least amount of representation in the survey with 9% and 3% of the responses respectively.

Figure 2. Percentage of survey responses broken out by business sector.
Businesses in the nursery and tree production sector reported the highest number of employees, averaging approximately 60 employees per business with about 27 being full time, 13 being part time, and 22 being seasonal employees. Landscape or tree care services reported the second highest rate of employment with approximately 30 total employees, 15 of which are full time, 3 part time, and 12 seasonal employees. Nursery stores averaged approximately 24 employees 9 of which are full time, 5 being part time, and 9 seasonal. Landscape and architectural design. Landscape design have about 12 total employees, 9 being full time, 1 part time employee, and 2 seasonal employees. Nursery and florist’s supplies merchant wholesalers have the lowest employment numbers with approximately 6 full time employees, 3 seasonal employees, and 1 part time employee.

Figure 3. Average employment by business types within the green industry.
The average number of years each business type have been in business ranges from an average of 28 years to an average of 46 years (Figure 4). Nursery stores have on average 46 years in the business followed by nursery and tree production businesses averaging 45 years in business. Nursery supply wholesalers follow closely with 40 years on average of active business. Landscape or tree care services were in the business, on average, 30 years, with landscape design being in the business the least amount of time, averaging 28 years.

![Figure 4. Average years in business by the business type within the green industry.](image-url)
Figure 5 represents the organizational structure of the private businesses related to the green industry in the study states. Roughly 46% of the surveyed businesses are corporations, followed by 27% structured as an LLC, 22% being under individual ownership, and only 5% structured as a partnership.

Figure 5. Organizational structure of green industry businesses surveyed.
Respondents’ outlook on the future of urban forestry activities in their business varies depending on business type. Outlook is based on a 5-point ordinal scale: 1- extremely bad, 2-bad, 3- neutral, 4- somewhat good, 5-extremely good. Landscape or tree care services (3.87) and landscape design (3.44) had an average outlook between ‘neutral’ and ‘somewhat good’. Both nursery and tree production (3.50) and nursery stores (3.50) also had an average outlook between ‘neutral’ and ‘somewhat good’, but slightly lower than those of the landscape or tree care services and landscape and design. Nursery supply wholesalers (2.75) had the least positive outlook in their urban forestry activities with an average between ‘somewhat bad’ and ‘neutral’.

Figure 6. Outlook of future or urban forestry activities by business type (1- extremely bad, 2-somewhat bad, 3-neutral, 4-somewhat good, 5-extremely good).
The survey asked respondents' perception on the severity of four issues presented on a 5-point ordinal scale. Difficulty in recruiting workforce (3.02) was indicated as the most severely pressing issue, averaging just over 'some' of an issue followed by difficulty in retaining employees (2.39) which averaged between 'a little' and 'some' of an issue. Both in inadequate R&D (1.80) and inadequate supply chain (1.84) averaged between 'not at all' and 'a little' of an issue.

![Figure 7](image-url)

Figure 7. Average severity of perception impacting urban forestry activities in businesses surveyed (1- not at all, 2- a little, 3- some, 4- quite a bit, and 5- a great deal).
Landscape or tree care services reported the highest average number of employees participating in urban forestry activities (43.09%). Nursery supply wholesalers had the second highest average number of employees in urban forestry activities (28.44%), followed by those in the nursery and tree production sector (23.33%). Businesses in both the nursery stores (18.97%) and landscape and design (19.56%) had the lowest reported average number of employees dedicated to urban forestry activities in their businesses.

Figure 8. Average percentage of employees in urban forestry activities per business type.

4.2 Ordered Logistic Regression Results—Prospects of Urban Forestry Business in the Private Green Industry

Responses were run through a full ordered logistic regression model in STATA to determine which variables were statistically significant and could be run through the reduced model. The reduced model was estimated to highlight the statistically significant variables. The variables landscape or tree care services, nursery and tree production, nursery stores, landscape
design, total jobs, years in business, inadequate supply chain, difficulty recruiting workforce, and difficulty retaining employees were found to be statistically insignificant and not included in the reduced model. Those businesses in the nursery and florist’s supplies merchant wholesalers sector produced statistically significant results, in addition to the business metrics of percentage of jobs in urban forestry and corporate structure. Inadequate research and development was the only perceived issues which produced a statistically significant coefficient.

Table 4 presents the ordered logistic regression results from both the full and reduced form model. The level of significance was established as the standard p<0.1. All variables, except for the nursery supply wholesalers, had positive odds ratio results. These results indicate the variable’s influence on the likelihood of having a positive outlook on the future of urban forestry activities. The results are interpreted depending if the odds ratio result is more or less than 1, which represents a corresponding percentage.

Table 4. Logistic regression results in unrestricted (full) and restricted (reduced) model highlighting the statistically significant variables and the corresponding coefficients.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient (standard error)</th>
<th>P value (P&gt;[z])</th>
<th>Coefficient (standard error)</th>
<th>P value (P&gt;[z])</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape or Tree Care Services</td>
<td>0.17 (0.31)</td>
<td>0.58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursery Supply Wholesalers</td>
<td>-1.96 (0.72)</td>
<td><strong>0.00</strong></td>
<td>-1.76 (0.68)</td>
<td>0.01</td>
<td>0.17</td>
</tr>
<tr>
<td>Nursery &amp; Tree Production</td>
<td>-0.37 (0.42)</td>
<td>0.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursery Stores</td>
<td>-0.17 (0.46)</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscape Design</td>
<td>-0.26 (0.38)</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ln (Total Jobs)</td>
<td>0.14 (0.09)</td>
<td>0.11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4. (continued)

<table>
<thead>
<tr>
<th></th>
<th>Ln (Years in Business)</th>
<th>0.24</th>
<th>0.02 (0.01)</th>
<th>0.02 (0.001)</th>
<th>0.00</th>
<th>1.02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Structure</td>
<td>0.37 (0.22)</td>
<td>0.09</td>
<td>0.35 (0.003)</td>
<td>0.00</td>
<td>1.42</td>
<td></td>
</tr>
<tr>
<td>Inadequate R&amp;D</td>
<td>0.25 (0.13)</td>
<td>0.05</td>
<td>0.20 (0.11)</td>
<td>0.08</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td>Inadequate Supply Chain</td>
<td>-0.10 (0.13)</td>
<td>0.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty Recruiting Workforce</td>
<td>0.08 (0.11)</td>
<td>0.46</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty Retaining Employees</td>
<td>-0.06 (0.12)</td>
<td>0.63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The ordered logistic regression reduced model results suggest that the landscape or tree care services businesses have a statistically significant and negative coefficient estimate, indicating that those private businesses involved as nursery and florist’s merchant supplies wholesalers have a negative outlook on the future of their business. The odds ratio value of 0.17 indicates these businesses are 82% less likely to have a positive outlook on the urban forestry activities in their business compared to other business types.

The variable, jobs in urban forestry, has a positive coefficient of 0.02 with an odds ratio of 1.02. The positive coefficient implies that those private businesses which have a higher percentage of employees in urban forestry job have an estimated positive outlook for the future of their business. The odds ratio indicates those businesses who have a higher number of employees in urban forestry activities in their business are 2% more likely to have a positive outlook of the urban forestry activities within their business.
Respondents were asked if their business was structured as a corporation to analyze corporate structure had any influence on the outlook of urban forestry success in green industry businesses. Only the estimated coefficient associated with the corporation structure is found to be statistically significant with a positive value of 0.35, indicating that those businesses structured as corporations are more likely to have a positive future outlook of the urban forestry activities in their businesses. The corresponding odds ratio 1.42 indicates if the business is structured as a corporation they are 42% more likely to have a positive outlook on the future of urban forestry activities in their business.

Similarly, among the perceived severity of the issues impacting the urban forestry activities within green industry businesses, only the issue of inadequate research and development is estimated to be significant with a positive value of 0.20. The estimated positive coefficient indicates those respondents feel there could be an increase in research and development efforts to encourage the urban forestry activities in their business. The odds ratio result of 1.22 implies respondents are 22% more likely to indicate inadequate research and development on urban forestry activities as an issue compared to the other issues presented.
V. Discussion

The purpose of this study was to analyze how private businesses within the green industry perceive the outlook for urban forestry activities in their business and the perception of issues impacting those activities. The reduced ordered logistic regression result for those businesses active as nursery and florist’s supplies merchant wholesalers (-1.76) suggests an estimated negative outlook on the future of urban forestry activities in their businesses. The odds ratio results indicate those active in this sector have an estimated 82% higher likelihood of a negative outlook on the urban forestry activities in their business.

The negative outlook of urban forestry activities for those active in the nursery and florist’s supplies merchant wholesalers is counterintuitive to programs created by cities which call for the creation of urban forestry plans which use nursery stock and flowers (O’Niel-Dunne, 2019). The negative results are also peculiar because Perez-Urrestarazu et al. (2020) showed an increase in consumers preferring indoor plants throughout the pandemic (Pérez-Urrestarazu et al., 2020). Indoor houseplants are part of the flowers and nursery stock produced by the nursery and florist’s supplies merchant wholesalers sector, so it would be logical to assume those businesses involved would see an increase in profit and thus have a positive outlook on their future.

This counter-intuitive finding warrants additional research to understand why businesses related to nursery wholesalers feel negatively about their future prospects. Our results indicate this negative outlook could be due to the low employment numbers, as depicted in figure 3, the nursery and florist’s supplies merchant wholesalers have the lowest employment numbers of all green industries surveyed. Low employment numbers could indicate a lack of available employees or a lack of business requiring labor.
Our results suggest that a private green industry business with a larger number of employees active in urban forestry activities is more likely to have a positive outlook on the future of urban forestry in their business. These results are logical considering the progressive growth in urban forestry related activities in the green industry (Hall et al., 2020; Hodges et al., 2011, 2015). Larger cities as well as smaller municipalities have created programs to educate and train young adults for occupations in urban forestry (Falxa-Raymond et al., 2013; Lindholst, 2017). This training is beneficial for municipalities as the employees hired by the private sector are often contracted back to the local governments for vegetation management. The continued employment growth for urban forestry in the green industry is a positive sign for those businesses involved in urban forestry activities, as increased employment numbers stem from an increase in the work implying an increase in profitability. The increase in employment also indicates an increase in wages paid and these wages could be spent in local and regional economies, contributing to the overall economic health of an area.

Regarding the pertinent issues impacting the business in urban forestry, on average, respondents perceive difficulty recruiting workforce and retaining that workforce to be between ‘a little’ and ‘some’ of an issue. This issue perception indicates the issues most impactful to urban forestry activities of green industry sectors is finding and retaining employees. This finding suggests that programs to train those in urban forestry activities of the green industry would be beneficial to future success (Falxa-Raymond et al., 2013).

Inadequate supply chains and inadequate R&D are between ‘not at all’ and ‘a little’ of an issue. These results are encouraging as it shows those national programs created to encourage growth in the industry (US Forest Service, 2015, 2020) are effective. Although respondents indicate inadequate R&D is only between ‘not at all’ and ‘a little’ of an issue, the estimated
positive coefficient in the reduced ordered logistic regression model indicates that those respondents perceive a lack of research and development into the urban forestry activities within their businesses. The difference in survey responses as opposed to ordered logistic regression results indicates there is a lack of communication between researchers and urban forestry practitioners about their research needs.

The survey results indicating there is not a lack of research and development is in line with the availability of information surrounding urban forestry as a green industry sector. Several studies focused on the impact of trees and other floriculture on housing property costs (Behe et al., 2005; Crompton, 2004; des Rosiers et al., 2002; Tyrväinen, 1997), while other research focuses on how best to involve communities in the establishment and maintenance of urban forests (Austin, 2002; Greenleaf & Ries, 2020; Westphal, 2003). There are numerous studies quantifying the economic impact of the green industry in individual states and the United States as a whole (Hall et al., 2005, 2020; Hodges et al., 2011, 2015; Palma & Hall, 2015), showcasing the continued success and growth of the industry on the whole as well as urban forestry as a substantial contributor. There does not seem to be a lack of information regarding urban forestry in the green industry, but the reduced ordered logistic regression model suggests otherwise which warrants increased communication with urban forestry practitioners.

The positive coefficient (0.02) associated with the number of employees for urban forestry activities in respondents’ businesses indicates those who have more employees engaged in urban forestry have an estimated increased likelihood of having a positive outlook for the urban forestry activities in their business. Urban forestry is a significant sector in the green industry, and many are quantifying that growth. Urban forests are becoming a more integrated part of communities (Austin, 2002), necessitating increased vegetation management. This
increase in management indicates that the urban forestry activities within green industry businesses will see an increase in sales and revenue as communities and cities plan and develop more urban forests (O’Niel-Dunne, 2019; US Forest Service, 2020). It is logical to conclude landscaping services would have some of the highest employment numbers for individuals engaged in urban forestry as it is the sector which most often purchases, plants, and maintains urban vegetation. Our results track with this conclusion as those surveyed in the landscape or tree care services sector reported the second highest levels of employment.

Results also suggest that those businesses structured as a corporation are more likely to have an estimated positive outlook on the future of urban forestry activities in their business. Although TCIA (2021) reported that all businesses involved in the green industry have positive outlooks for their future (Tree Care Industry Association, 2021), the estimated increased likelihood of positive outlook of urban forestry activities associated with those companies structured as a corporation could be influenced by the decreased risk and overall tax breaks associated with the specific organizational type.

Sole proprietorship, or individual ownership, has no corporate business taxes and is relatively inexpensive to start. Although they do not have the corporate tax, there is unlimited personal liability and it can be difficult to obtain business financing (O’Brien, 2020). Business organized into a corporate structure can be designated as either a C corporation or an S corporation. C corporation structure has limited liability and can have an unlimited number of shareholders, although they undergo double taxation and are much more expensive to start (O’Brien, 2020). S corporation structure similarly has limited liability and no corporate taxes, but they have strict requirements which must be met and this structure type is only recognized in
some, but not all, continental United States (O'Brien, 2020). Although corporation structure is more costly to start, the benefit of limited liability appears to outweigh the costs.

The federal government passed two major acts that continue to assist American businesses throughout the COVID-19 pandemic. The Coronavirus Aid, Relief, and Economic Security Act (CARES Act) (2020) was enacted in March of 2020 and established the Employee Retention Credit as a refundable tax credit against some employment taxes equal to 50% of the qualified wages an employer pays to employees (IRS, 2021b). The employee retention credit was extended to June of 2021 through the Taxpayer Certainty and Disaster Tax Relief Act of 2020 (IRS, 2021a). The bill not only extended the program but also modified the contents of the bill to allow employers to claim a refundable tax credit against the employer share of social security tax equal to 70% of the qualified wages they pay to employees (IRS, 2021a).

The federal government also passed The Families First Coronavirus Response Act (FFCRA) (2020) to provide relief for American business owners with 500 or less employees (Families First Coronavirus Response Act, 2020). FFCRA (2020) specifically provides funds for businesses to provide paid leave for employees who are ill or caring for ill family members (Families First Coronavirus Response Act, 2020). Many corporate businesses in the green industry engaged in urban forestry activities could have had the opportunity to participate in this program. These programs provided financial relief to corporations throughout the pandemic and may have had an influence on the subsequent outlooks of urban forestry activities in each business sector.

Although we asked respondents specifically to respond to the survey thinking of their urban forestry activities in 2018, we received many comments on the business outlook accounting for the influence of the COVID-19 Pandemic. Many referenced the COVID-19
Pandemic as an overall economic deterrent to economic growth, implying that the state of their business is dependent on how the economy recovers from the national lockdowns. As the survey was administered in the late summer 2020, some respondents reported that the pandemic has hurt commercial business, but they anticipated recovery in the next one to two years.

Ugolini (2020) reported that those surveyed during the early confinement periods in the pandemic expressed that they sorely missed spending time outdoors and walking in parks (Ugolini et al., 2020). The COVID-19 Pandemic and subsequent confinement periods have shown citizens and municipalities the importance of access to urban forests and parks. If citizens choose to become involved stakeholders in their government, they could push for increased establishment and maintenance of urban forests. If establishment is successful, private vegetation management companies could be contracted for the initial establishment and subsequent maintenance, thus improving their recovery from the COVID-19 economic lockdown.

Although the TCIA (2021) members believe the economy will be “about the same” throughout the next 12 months, some of our respondents believe COVID-19 has positively impacted their businesses and thus improved their outlook for future success. Not all respondents to our survey were in agreement, as some reported how COVID-19 and the economic fall out “took its toll” on the urban forestry activities and success of their business. These respondents would most likely agree with the 37% of the TCIA (2021) members who reported the economy will be “worse than now” in the near future.

The economic ramifications of the COVID-19 Pandemic will be felt in the green industry urban forestry activities in years to come as the established forests will need continued maintenance. The demand for maintenance services will mean an increasing profit for both landscaping and design services as well as nursery and tree production services. Many studies
have focused on the consistent growth in economic contributions of the green industry (Gale, 2021; Hall et al., 2020; Hodges et al., 2011, 2015; Palma & Hall, 2015). The consistent increase in employment and output implies businesses involved in urban forestry activities in sectors throughout the green industry have an increased likelihood for continued growth and success.

Although the focus of this study is private businesses, it is important to note the influence government entities could have on the success or failure of the green industry. The United States Forest Service (USFS) estimated the benefits of urban forests to be valued roughly $18.3 billion by removing air pollution, carbon sequestration, and reducing energy costs (USFS, 2021a). To encourage the continued growth and benefits of urban forests the Urban & Community Forestry Program in USFS has created a cost share grant program which requests plans for urban forest establishment and resiliency (USFS, 2021b). Programs such as these foster the creation of private green industry jobs if those government bodies choose to contract the vegetation management to private businesses.

The execution of the plans approved by the grant program would also entail purchasing products and services to create an urban forest. The USFS tracks and estimates the contributions by urban forestry in each state (USFS, 2018). These projections help track the successful implementation of grant programs and the subsequent impacts of the products and services sourced from private green industry businesses to help make the programs possible. The connected nature of the grant programs and private green industry businesses shows how influential government programs can be on the success of creating urban forests. Success of the green industry is not reliant upon government programs which encourage growth, but it could be an interesting train of research to try and uncover how influential government programs are on the success of sectors within the green industry.
VI. Conclusion

Our reduced ordered logistic regression results suggest that those in the nursery and florist’s supplies merchant wholesalers business had a negative outlook on the future of urban forestry activities in their business. This negative outlook on specifically urban forestry activities can be reasonable considering the increase in purchasing of indoor houseplants throughout COVID-19 confinement (Pérez-Urrestarazu et al., 2020), but lack of involvement in urban forestry planning and establishment. Those who reported a higher percentage of employees engaged in urban forestry activities had an estimated higher likelihood of a positive outlook, leading us to the conclusion that those who invest in the urban forestry revenue streams have an increased likelihood of having a positive outlook on the future.

The variable representing the percentage of employees engaged in urban forestry activities produced a positive coefficient in the reduced ordered logistic regression model. This indicates those businesses who have an increased number of employees involved in urban forestry activities have an estimated increased likelihood on having a positive outlook for the future of urban forestry in their business. Respondents were also asked their perception of R&D on the future success of urban forestry in their business. Results showed a significantly positive coefficient, indicating respondents feel there is a lack of urban forestry research surrounding their business practices. This perceived lack of research could be an influence on the negative outlook on urban forestry success in a business of the nursery and florist’s merchant supplies wholesalers sector.

Our analysis was limited by a low survey response rate which impacted model results. We received 409 completed and usable surveys of the 27,346 surveys sent. This equates to a 1.5% response rate. Paper mail surveys have a higher response rate than emailed surveys (Roy,
Traditionally email surveys generally have roughly a 20% lower on average response rate than mail surveys (Shih & Fan, 2009). This on average lower response rate could have been exacerbated by potential misinformation in the private business contacts purchased from Exact Data. It has been found that the number of contacts, pre-contacts, and personalized contacts are all factors influencing response rate (Cook et al., 2000). If Exact Data did not have the correct contact information for the businesses meant to be surveyed, it could have impacted our response rate. A higher response rate is always preferable, but there has been a declining response rate over the last 30 years, and there has yet to be an agreed upon acceptable response rate throughout the scientific community (Cleary et al.a 2021). Low response rate may have been due to the region surveyed, but we cannot be sure as we did not follow up with phone calls to determine why some respondents did not complete the survey (Cleary et al.b 2021). Answering the survey questions could have been difficult during the time period considering the stressful conditions private businesses were enduring. It could be beneficial to redistribute the survey once life has calmed down and respondents are more open to sharing information.

We also must consider the impact of COVID-19 on our lack of respondent participation. Our survey instruments were already developed and approved by the North Carolina State University Institutional Review Board so it could not be revised to include questions on COVID-19. Although our survey did not specifically mention COVID-19, some respondents mentioned the Pandemic in their responses without prompting. We also recognize because our survey was sent in the middle of the COVID-19 pandemic, we are all spending more time in front of screens, in video meetings, and answering emails. It is not unlikely those contacted saw one more email and deemed it unnecessary to answer due to the overwhelming amount of information already in their inbox. Over-surveying has been found to negatively impact the response rate (Manfreda et
al., 2008), leading us to believe respondents may have been overstimulated and over-surveyed during the response window.

The findings of this study can be used to identify gaps in urban forestry research while identifying the needs of the business community. The negative outlook of the nursery and florist’s supplies merchant wholesalers sector shows a lack of communication between business owners and researchers who could potentially provide beneficial solutions. The lack of agreement between research and business perception could be explored further to better understand the needs of the business community and how research can meet those needs.

Expansive growth of urban forestry in the green industry throughout recent years (Hall et al., 2005, 2020; Hodges et al., 2011; Palma & Hall, 2015) indicates a bright future for business owners engaged in urban forestry activities. The growth of the industry is also impacted by cities creating plans to increase their urban forests and canopy cover (O’Niel-Dunne, 2019; US Forest Service, 2015, 2020). These plans require employees who are trained and knowledgeable in vegetation management and landscape and architectural design, both sectors involved in urban forestry in the green industry which would benefit from an increase in canopy cover. The interaction of different sectors throughout the green industry shows the interconnectedness of these businesses and how the success of one sector can influence the success of another.
VII. Recommendations

Urban forestry is a substantial sector in the green industry and will only continue to grow as municipalities recognize the environmental and socioeconomic benefits of access to green space (Kuo, 2003; O’Niel-Dunne, 2019). As urban forest establishment plans continue to gain popularity there will be a growing need for vegetation management services. Those respondents in the nursery and florist’s supplies merchant wholesalers sector indicated a negative outlook on the future of urban forestry in their business despite the foreseeable increase in demand for their product. We recommend further research be conducted to better understand why those merchant wholesalers have a negative outlook on the future of urban forestry in their business.

COVID-19 has encouraged some of the population to improve their home environment throughout confinement, with emphasis on indoor houseplants as well as outdoor landscaping (Hardy et al., 2000; Pérez-Urrestarazu et al., 2020). It would make sense if those in the merchant wholesalers business had a positive outlook on their urban forestry business activities because they are selling the products which are seeing an increase in demand as the pandemic continues. The resulting negative outlook is perplexing as demand has increased for their product, but they do not view this as a positive outlook for their future. As consumer demand pushes this sector in the green industry to become a larger economic contributor, it would be beneficial to understand why they do not have a better outlook to anticipate any future problems or fluctuations.

We also recommend local municipalities consider long term contracts with those companies who have a basis in urban forestry management to encourage stable sector growth. Municipal contracts with private green industry vegetation management services are a common way governments choose to maintain city vegetation (Lindholst, 2017). Municipalities could push one step further and contract nursery and florist’s supplies merchant wholesalers to provide
the materials the landscaping and vegetation management services require. Developing long term contracts encourages stable sector growth and could combat the negative outlook of those businesses in the nursery and florist’s merchant supplies wholesalers industry.

Our study indicates urban forestry is a substantial, and growing, sector of the green industry. Those businesses with a higher percentage of jobs dedicated to urban forestry activities are more likely to have a positive outlook on their future success. This correlation indicates it would be beneficial for urban forestry to be promoted to encourage private industry growth and participation in urban forestry planning, establishment, and maintenance. We recommend increased state or federal investment in urban forestry practices which will create an increased demand for private industry services. Many cities have already begun to catalogue the status of urban forestry in their boarders, while also planning for increased future establishment (Elmendorf et al., 2003; Gibbons & Ryan, 2015; Norwak et al., 2007; Wolf, 2004b). If more government programs and urban forestry establishment plans are created to encourage urban forestry as a solution to both environmental and socioeconomic issues, there would be an increase in private green industry growth and an improvement in the future of urban forestry success.
References


doi:10.1002/jwmg.21999


doi:10.1002/jwmg.21999


https://doi.org/10.1016/j.landurbplan.2011.02.037


https://www.researchgate.net/publication/316090725


Falxa-Raymond, N., Svendsen, E., & Campbell, L. K. (2013). From job training to green jobs: A case study of a young adult employment program centered on environmental restoration in
https://doi.org/10.1016/j.ufug.2013.04.003

https://digitalcommons.usu.edu/gradreports


https://doi.org/10.1016/j.ufug.2019.126553


IRS. (2021a). *New law extends COVID tax credit for employers who keep workers on payroll.*


IRS. (2021b). *Coronavirus Tax Relief for Businesses and Tax-Exempt Entities.*


https://doi.org/10.1016/j.edurev.2008.01.003


http://dss.princeton.edu/training/

https://tcia.org/TCIA/News/Business/TCIA_Member_Pulse_Survey_Results_Now_Available.aspx


https://doi.org/10.4135/9781526421036885901

https://doi.org/10.3368/lj.23.1.40


APPENDIX
Thank you for your interest in participating in this study to assess contributions of the urban forestry sector in the state economy. In this study, urban forestry is defined as the establishment, conservation, protection and maintenance of trees in cities, suburbs and other developed areas.

This study is a part of a regional project led by the Wisconsin Department of Natural Resources to evaluate the economic contributions of the urban forestry sector in the Northeast-Midwest region (a 20-state region and Washington D.C.). Through this questionnaire, we plan to separate the urban forest industries from the broader green industries for evaluation.

We invite the person at your business who knows most about the urban forestry businesses and activities your company or firm is currently involved with to complete this brief questionnaire, which will take about 5-10 minutes. Your participation in this study is voluntary. You may refuse to take part in the research or exit the questionnaire at any time by simply closing your browser.

All of your responses to this questionnaire are confidential. Any information you share will only be reported in group form and will not be reported in a way that would allow you to be personally identified. Completing the questionnaire acts as your consent to participate.

If you have questions about the study, you may contact Olivia Witthun at (414) 750-8744 or Olivia.Witthun@wisconsin.gov.

Instructions to complete the questionnaire:

To choose a response, click on the button that corresponds to your answer. If you would like to change your answer, click on a different button. You may go back to earlier screens by clicking the 'BACK' button at the bottom of the screen. To advance to the next screen click the 'NEXT' button.

If you start the questionnaire and are unable to finish it, you can exit by simply closing the browser window and return to it later by clicking again on the link in your email. This will take you back to the next unanswered question. If there is a question you leave blank, you will be informed that it was left blank. You may then either return to answer that question or continue on to the next question. You are not required to answer any question you would prefer to skip.

After the questionnaire has been completed and you are ready to submit your data, please click on the 'Submit' option on the last screen. Once you click 'Submit' you will not be able to re-enter the questionnaire.

We appreciate your time and effort in assisting us by completing this web-based questionnaire.
Q1

This is a study of the Northeast-Midwest region, which includes the states of:

- Connecticut
- Delaware
- Illinois
- Indiana
- Iowa
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri
- New Hampshire
- New Jersey
- New York
- Ohio
- Pennsylvania
- Rhode Island
- Vermont
- Washington D.C.
- West Virginia
- Wisconsin

Please think back to the year 2018. In 2018, was your business active in any of the states noted above?

- Yes
- No

Programmer Note:
If Q1 = No, skip to end and display:

End 1

This survey is meant for those businesses with sales and revenues in the Northeast-Midwest region. We thank you for your time!

Q2

Still thinking of 2018, in which of the following state or states was your business active?

- Connecticut
- Delaware
- Illinois
- Indiana
- Iowa
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri
- New Hampshire
New Jersey
New York
Ohio
Pennsylvania
Rhode Island
Vermont
Washington D.C.
West Virginia
Wisconsin

Programmer Note:
If Q2 has more than one state selected, Display:

Q3

In 2018, in which Northeast-Midwest state did you have your highest sales and revenues?

Drop down list of 21 states

Q4

In 2018, in which of the following business activities was your business engaged? Were you engaged in...

<table>
<thead>
<tr>
<th>Activity</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>landscape or tree care services?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples include arboriculture, tree pruning, removal, trimming, landscape care and maintenance, ornamental tree and shrub maintenance, plant appraisal, overhead utility line and rights-of-way maintenance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nursery, greenhouse, and tree production?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples include nurseries with tree production for urban forestry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nursery and garden supply stores?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples include stores retailing nursery trees and garden products that are grown elsewhere.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>farm and garden machinery and equipment merchant wholesalers?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples include wholesale distribution of specialized machinery, equipment and parts used in farm, lawn and garden activities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>nursery and florist’s supplies merchant wholesalers?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples include wholesale distribution of nursery, flowers and tree stocks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>urban forestry consulting services?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples include foresters working in urban forest management – conducting inventories and writing management plans and ordinances.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>landscape architectural and design services?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples include land use and city planning services, urban planning services, parks and other recreational areas planning services.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>other similar services? Please tell us:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Programmer Note:
Ensure a respondent’s answer adds up to 100%

**Q5**

The next question is about the percentage of total sales and revenue you had from each of the business activities below in 2018. The answers should sum up to 100%. For instance, if your nursery supply store also sold garden machinery equipment, please split the total sales and revenues representing both nursery and equipment revenues so they add up to 100%. Please enter zero for activities your business did not engage in at all.

In 2018, in <fill state> where your business had its highest sales, what percentage of total sales and revenues did you have from...

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percent of sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>...landscape or tree care services?</td>
<td>%</td>
</tr>
<tr>
<td>...nursery, greenhouse, and tree production?</td>
<td>%</td>
</tr>
<tr>
<td>...nursery and garden supply stores?</td>
<td>%</td>
</tr>
<tr>
<td>...farm and garden machinery and equipment merchant wholesalers?</td>
<td>%</td>
</tr>
<tr>
<td>...nursery and florist’ supplies merchant wholesalers?</td>
<td>%</td>
</tr>
<tr>
<td>...urban forestry consulting services?</td>
<td>%</td>
</tr>
<tr>
<td>...landscape architectural and design services?</td>
<td>%</td>
</tr>
<tr>
<td>...other similar services? Please tell us:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total: 100 %</td>
<td></td>
</tr>
</tbody>
</table>

**Q6**

In this study, urban forestry is defined as the establishment, conservation, protection and maintenance of trees in cities, suburbs and other developed areas.

In 2018 in <fill state> where you had your highest total sales and revenues, what percent of total sales and revenues by your business were for urban forestry-related products or services?

Percent of sales and revenue  OR  ☐ Not sure

Programmer Note:
If R leaves Q6 blank or Not Sure, display:

**Q6b**

If you are not sure of the exact percentage of urban forestry-related sales and revenue your business had in 2018 in <fill state>, could you estimate the range?

**Was it...**

☐ 0 to 9%
☐ 10% to 19%
☐ 20% to 29%
☐ 30% to 39%
**Q7**

In 2018, how many full-time, part-time, and temporary or seasonal employees did your business in <fill state> have in total?

<table>
<thead>
<tr>
<th>Total number of employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time employees</td>
</tr>
<tr>
<td>Part-time employees</td>
</tr>
<tr>
<td>Temporary or seasonal employees</td>
</tr>
</tbody>
</table>

**Q8**

In 2018, approximately what percentage of your employees’ time was spent on urban forestry-related activities?

Percent

**Q9**

Programmer Note: Answer in YYYY format

In what year was your business established?

YYYY

**Q10**

In 2018, what were the approximate total sales and revenue for your business?

- Less than $10,000
- $10,000 to $49,999
- $50,000 to $99,999
- $100,000 to $249,999
- $250,000 to $499,999
- $500,000 to $999,999
- $1,000,000 to $2,499,999
- $2,500,000 to $4,999,999
- $5,000,000 to $9,999,999
- $10,000,000 or more
**Q11**
In your opinion, how much do each of the following issues affect your business’s urban forestry activities?

How much is your business affected by...

<table>
<thead>
<tr>
<th>Issue</th>
<th>Not at all</th>
<th>A little</th>
<th>Some</th>
<th>Quite a bit</th>
<th>A great deal</th>
</tr>
</thead>
<tbody>
<tr>
<td>...difficulty in recruiting an adequate workforce?</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>...difficulty in retaining employees?</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>...inadequate supply chains, e.g. between nurseries and your business?</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>...inadequate research and development to inform best practices?</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>...public perception of the value of trees?</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**Q12**
Are there any other issues that affect your business’s urban forestry activities?

**Q13**
How would you describe the future outlook of urban forestry for your business?

- [ ] Extremely bad
- [ ] Somewhat bad
- [ ] Neutral
- [ ] Somewhat good
- [ ] Extremely good

**Q14**
Would you like to tell us more about the future outlook of urban forestry for your business?
Q15
Which one of the following best describes the organizational structure of your business?

- Sole Ownership
- Partnership
- Corporation
- Limited Liability Company or LLC
- Other  Please tell us: 

Q16
This project is funded in-part by a federal grant. We will be using eligible time spent responding to this survey as match towards that grant. Is your time, as the survey respondent, funded by federal monies, for example, through grants or special project funding?

- Yes
- No
- Not sure

Submit
When you are ready to submit your data, please click the Submit option and click NEXT below.

You will not be able to re-enter the survey once you click NEXT.

Thank you for participating in this study!