

AN ABSTRACT OF THE THESIS OF

Abbey N. Driscoll for the degree of Master of Science in Forest Ecosystems and Society presented on May 13, 2014.

Title: Managing Our Urban Forest: What do Officials and Managers Think and Need?
A Case Study from the Portland-Vancouver Metropolitan Area.

Abstract approved:

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Urban forests are fundamental to the health and sustainability of urban communities. In 2012, the U.S. Forest Service launched the Vibrant Cities, Urban Forests: A National Call to Action initiative which posed a variety of recommendations to advance urban forest management and programs throughout the country. In response to that initiative, the *Portland-Vancouver Metropolitan Regional Urban Forestry Strategy* was created. Under the *Strategy*, project partners are focused on fostering regional collaboration around trees and expanding the management capacity of the urban forest by completing a variety of objectives such as needs assessment survey, stakeholder workshops, and local projects focused on the health of the urban forest as a whole.

As part of the *Strategy*, a needs assessment survey was sent to 350 community officials and program managers in the 30 cities and four counties in the Portland-Vancouver region to identify current

trends in urban forestry attitudes and practices. Results indicated that, in general, urban forestry programs were important to community officials and program managers alike with both expressing an avid interest in implementing and expanding tree programs. Program components relating to tree health were regarded as the most important items to an urban forestry program by respondents; however, management components such as a certified arborist, a tree board, and an urban forest management plan were considered least important, and respondents indicated that their jurisdictions had been least successful in achieving these items. Difficulty exists in implementing or expanding programs in the Portland-Vancouver region due to inadequate funding and lack of political and public support, but respondents indicated that increased community education and the creation or revision of urban forest management plans and tree related ordinances were priorities for their jurisdictions.

Survey results will serve to inform the development of the *Regional Urban Forestry Strategy* and contribute to professional knowledge and urban forestry activities occurring in the region. In addition, this research provides interesting insight into attitudes and practices surrounding urban forest management which are applicable to federal, state, and local programs. These programs can use the results of this study to re-examine current areas of focus to better direct resources and assistance to those areas of need in the Portland-Vancouver Region. Although many challenges to increasing the management capacity of the urban forest in the study area were identified by this research, additional opportunities to improve the livability of this urban ecosystem were recognized. By advancing current and future urban forestry efforts in the region, this research aims to help local jurisdictions achieve successful urban forestry programs that increase the health of our urban forests while reaping the ecosystem benefits trees provide.

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Managing Our Urban Forest: What do Officials and Managers Think and Need?
A Case Study from the Portland-Vancouver Metropolitan Area

by
Abbey N. Driscoll

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Abbey N. Driscoll, Author

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Managing Our Urban Forest: What do Officials and Managers Think and Need?
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1. INTRODUCTION

“At the root of every vibrant city is an urban forest” (Vibrant Cities & Urban Forests Task Force 2011). Today, cities in the United States and around the world face an intricacy of issues related to the natural environment within them. Problems such as rapid urbanization, urban heat islands, degrading infrastructure, human and environmental health concerns, and loss of green space (Satterthwaite 2003) are currently plaguing cities while natural features and ecosystem services provided by them are declining.

Historically, western society viewed cities and nature as distinct from one another. Recent research has shown however that all resource and social systems are interconnected (Wolf and Kruger 2010). This cross-disciplinary research has changed the way we think about and understand our urban environments (Vibrant Cities & Urban Forests Task Force 2011) and has made us increasingly aware of the complexities of urban issues. The recognition that cities are ecosystems, with interacting human, structural, and ecological components, has also elevated the importance of managing landscape features not only within jurisdictions but extending to the surrounding region. Effective urban planning and management must, therefore, now address the full range of issues between natural resources and human built environments and has sparked the need for new strategies and integrative approaches to address these issues.

Urban forestry and green infrastructure, the management of trees and natural processes to create healthier urban environments (EPA 2014), offer one such strategy through which these issues can be addressed. The purpose of this thesis is to examine the current management of the urban forest using the Portland-Vancouver metropolitan area as a case study. By investigating the perceptions of community officials and program managers regarding the importance of the urban forest and its successful management, challenges and opportunities to increase the health and sustainability of the Portland-

Vancouver urban forest will be revealed. This research has important implications for the Portland-Vancouver metropolitan area by contributing to the region's ability to sustain its urban forest, making it a more vibrant place to live and work.

1.1. The Relationship Between Cities and Trees

The term urban forest refers to all publicly and privately owned trees within an urban area. This may include individual trees along streets, public rights-of-way, open spaces, and backyards as well as stands of remnant forests (Dreistadt et al. 1990; Nowak et al. 2001).

However, because of its urban connotation, the climatic, political, and cultural conditions that foster or inhibit the growth and survival of trees must also be considered in the definition of urban forestry (APA 2009). The National Urban and Community Forestry Advisory Council (NUCFAC) definition echoes this holistic approach. It defines urban forestry as the combined “art, science, and technology of managing trees and natural systems in and around cities, suburbs, and towns for the health and well-being of all people” (NUCFAC 2006). This emphasis on benefits to people largely encompasses the purpose of urban forestry. The American Planning Association (APA) further articulates these benefits by stating that urban forestry is the “planned and programmatic approach of the development and maintenance of the urban forest [...] in an effort to optimize the resulting benefits in social, environmental, public health, economic, and aesthetic terms” (APA 2009). In applying this definition, therefore, urban forests represent the aggregate of all community vegetation and green spaces that provide benefits vital to enriching the quality of life within cities (Sustainable Urban Forest Coalition n.d.).

In fact, the urban forest covers a significant and expanding part of the world's urban and metropolitan areas (Dwyer et al. 2003). The U.S. Census Bureau (2013) defines urban areas as high density areas of at least 50,000 people and metropolitan areas as region consisting of a densely populated urban core (population greater than 50,000) and its less-populated surrounding territories over which the

major city exercises a commanding economic and social influence. Applying this definition, it is estimated that urban areas cover approximately 9.2% of the land mass of the United States (U.S. Census 2013), and that nearly 25% of this land mass is located in or functionally tied to an urban area (Nowak et al. 2001) in the form of greater metropolitan areas. These urban and metropolitan areas are also greatly increasing in size. Between 1950 and 1990, metropolitan areas grew threefold while urban areas doubled in size within a similar time frame (Dwyer and Nowak 2000). Population growth has also continued outside of these areas, however, and has made urban sprawl a significant environmental concern of the 21st century (Dwyer et al. 2003).

Today, nearly 81% of the U.S. population lives in urban areas (U.S. Census 2013). This national figure or percentage is reflected within the Pacific Northwest states, with Oregon having an urban population of 81% and Washington at 84% (U.S. Census 2013). Similarly, regional population growth indicators mirror those of other U.S. regions and suggest that urban populations will only continue to expand (Wolf and Kruger 2010).

These substantial growth and demographic changes continue to extend urban influences into forest resources across the landscape (McGranahan 1999; Stewart 2001). Across urban and metropolitan areas in the U.S., tree canopy cover ranges from 27% to 33%, respectively. The Portland-Vancouver metropolitan region is no different with an estimated 30% of the region being covered by tree canopy (The Intertwine Alliance 2011). This percentage reflects the national tree cover figure of 33% (Dwyer et al. 2003) and, combined with regional population growth indicators, suggest that urban forest conditions and issues in the Pacific Northwest are similar to other regions of the United States. As metropolitan areas continue to grow throughout the Pacific Northwest and across North America, a greater recognition of the urban forest has emerged. These metropolitan areas include substantial urban forest resources that have the potential to substantially improve the quality of life for its residents through the benefits provided by

trees (Dwyer et al. 2003). As such, this recognition has sparked the need for a better scientific understanding of the urban ecosystem (Wolf and Kruger 2010) and the influence of the urban forest resource within it.

1.1.1. The Benefit of the Urban Forest

Urban forests are an increasingly valuable component of the urban environment (Dwyer et al. 1992), and if managed properly, can offer many benefits in an urban landscape. Perhaps the most recognized benefit is a tree's ability to improve air quality. Trees filter emissions and pollutants which can be harmful to people by exchanging gases with the atmosphere and capturing particulates such as ozone and carbon monoxide in their canopy (Dwyer et al. 1992; McPherson et al. 2002). Since the emission of many air pollutants increases with higher temperatures, trees can further improve air quality by lowering air temperatures through their shade factor.

Similarly, the presence of trees can temper local climate by lowering air temperature and increasing humidity. Inner cities are commonly known as "heat islands" because the buildings and pavement absorb solar energy and radiate it back. However, trees lining streets or near buildings provide shade that can reduce the heat-island effect. The effect of tree canopies reflecting solar radiation and providing shade also helps cool the pavement and can increase pavement life up to 60% (Maco and McPherson 2002). In addition to reducing the heat island effect, the proper placement of urban trees can contribute to cost saving energy conservation. For example, strategically planting trees on an exposed southern side of a building can shade the building, reducing cooling costs by as much as 25% (Akbari 2002). Trees can act as windbreaks as well, shielding a home or building from prevailing winds and cold temperatures, thus reducing heating costs.

Street and yard trees also assist in facilitating urban hydrological processes. Tree canopies capture precipitation, and root systems intercept and retain rainwater (Nowak and Dwyer 2007), reducing the

amount and volume of storm water runoff. This interception reduces the likelihood of urban flooding events and stormwater management costs (Dwyer et al. 1992) and can even improve water quality by ensuring that pollutants present on hard surfaces are not deposited into waterways. Furthermore, tree roots decrease erosion by holding the soil in place and allow water to slowly infiltrate the soil (Brienzo 2005; Chaloux 2012). These mechanisms help reduce flooding in the streets and sedimentation in streams.

The urban forest can provide additional ecological benefits to urban environments in the form of wildlife habitat (Dwyer et al., 1992). Trees and associated plants provide shelter and food for a variety of birds and animals increasing the biodiversity of urban natural systems. Parks and riparian areas containing trees also provide valuable wildlife corridors reducing habitat fragmentation.

Apart from their ecological impact, urban forests contribute many other social and economic benefits to our cities. Urban trees in downtown shopping areas have been shown to positively affect judgments of visual quality, and to positively influence consumer responses and behaviors (Dwyer and Nowak 2000; Wolf 2005). Real estate sales can also be enhanced by the presence of urban trees (Anderson et al. 1985; Nowak and Dwyer 2007). Buyers are attracted to a green landscape and are willing to pay as much as \$25,000 more for a home that has a treed landscape (Burden 2008). Not only do individual trees affect property value for individual residents, but having a park nearby or street trees adjacent to a house will increase property value as well. Many towns plant trees along street boulevards to increase adjacent property values, which in turn directly benefit the local community through property taxes (Dwyer et al. 1992).

Parks and greenways also have significant, positive health influences. Trees and their associated vegetation have a relaxing effect on humans, giving us a general feeling of calmness and well-being. Access to urban greenspace, the natural areas within cities, has been shown to help reduce stress levels by providing a place for reflection and physical activity (Parsons et al. 1998). Patients with a window view

of greenery also recover faster, suffer fewer complications, and need less medication than those without such views (Ulrich 1984). Urban greenspace also encourages increased physical activity which can further improve human health and reduce medical conditions such as obesity (Pikora et al. 2003).

Finally, urban trees increase the aesthetic quality of the urban environment, promoting human well-being and a greater sense of connectedness among urban residents (Dwyer et al. 1992). A stronger sense of community, an empowerment of inner city residents to improve neighborhood conditions, and the promotion of environmental responsibility and ethics can be attributed to involvement in urban forestry efforts (USDA Forest Service 2003). These benefits have even been shown to reduce crime rates as communities interact more and improve their quality of life (Kuo et al. 2001).

As illustrated, urban forests are important resources that provide many essential social, economic, and environmental functions and benefits within the cities where we live (Dwyer et al. 1992; McPherson 2006). In fact, according to the United States Department of Agriculture, Forest Service (USDA Forest Service or U.S. Forest Service) Pacific Southwest Research Station, a single large tree in the Pacific Northwest will provide \$2,820 in environmental and other benefits over its lifetime (USDA Forest Service, Pacific Southwest Research Station 2011). Although benefits will vary over space and time, with an estimated total of 77 billion trees in urban and metropolitan regions in the U.S., the magnitude of the urban forest resource should not be ignored (Dwyer and Nowak 2000).

Communities should capitalize on the benefits that the urban forest provides. It is important that trees are managed properly to sustain the health of the urban forest and to provide the greatest benefit to residents (Miller 1997). The livability and sustainability of urban centers can be increased with such management. In addition, because humans are an intrinsic part of the urban environment, effective planning and management of the urban forest resource must also involve the people that live, work, and

recreate within cities. Urban forestry managers must therefore address the full range of issues related to urban forest conditions and human stakeholders (Wolf and Kruger 2010).

1.2. Vibrant Cities & Urban Forests: A National Call to Action

In recognition of the benefits of trees within cities, regional and national science initiatives increasingly address ecology and natural resource issues within urban areas (Wolf and Kruger 2010). In fact, the most recent U.S. Forest Service strategic plan (USDA Forest Service 2007) directly targets urban conditions. This plan specifies that the U.S. Forest Service should “engage urban America with forest service programs” (Goal 6) and “provide science based applications and tools for sustainable natural resource management” (Goal 7) (USDA Forest Service 2007). These goals reinforce the need to address urban systems recognizing the important ecosystem services that trees provide to these communities.

Following these goals, in 2010, the U.S. Forest Service created the *Vibrant Cities & Urban Forests* Task Force (Trees are the Key 2011). The Task Force represents a multidisciplinary group of professionals brought together from the fields of urban forestry, urban planning, sustainability, and others to discuss and promote urban forestry, green infrastructure, and related subjects in America’s cities. Together, the Task Force established the joint purpose to “explore the implications of integrated natural and built urban environments and their possibilities for the future and to address many issues currently facing community urban forestry programs” (Vibrant Cities & Urban Forests Task Force 2011, pg. 2).

Drawing on their collective knowledge, the Task Force published the *Vibrant Cities & Urban Forests: A National Call to Action* report (Vibrant Cities & Urban Forests Task Force 2011). This report represents a set of integrative and collaborative recommendations to advance urban forestry and urban natural resources in the U.S. These recommendations call for new approaches to urban forestry and span the subjects of education, stewardship, environmental equality, political support, and sustainability.

Specifically, Recommendation No. 6 of the document calls for the creation of urban regional natural resource plans that cross jurisdictional boundaries (Vibrant Cities & Urban Forests Task Force 2011, pg. 21). The Task Force identifies that regional natural resource plans are critical to address natural resource planning issues within urban borders and their surrounding regions on both public and private properties. It further recommends that metropolitan alliances be created, or existing ones supported, within each metropolitan region for the purpose of creating these plans. These alliances will also serve to encourage community collaboration and interagency coordination at federal, state, and local levels. Such collaboration can remove barriers to implementation of urban natural resource plans while supporting and promoting urban forestry and other natural resources within each region.

1.3. Portland-Vancouver Metropolitan Regional Urban Forestry Strategy

In response to that recommendation, the *Portland-Vancouver Metropolitan Regional Urban Forestry Strategy (Regional Urban Forestry Strategy)* was born. Under a grant from the U.S. Forest Service, the Oregon Department of Forestry (ODF) and Washington Department of Natural Resources (WADNR), along with partners from local, regional governments, metropolitan alliances, and non-profits, are currently developing the *Regional Urban Forestry Strategy*. This strategy represents a collaborative partnership between these institutions and is unique in its attempt to take a bi-state approach to the concepts of urban forest management. The goal of the *Regional Urban Forestry Strategy* is to promote the advancement of urban forestry in the Portland-Vancouver metropolitan region by increasing urban tree canopy, fostering regional collaboration around trees, and expanding the capacity of agencies and organizations to address urban forest management. To accomplish this goal, the *Regional Urban Forestry Strategy* will create a regional urban natural resource plan for the Portland, Oregon and Vancouver, Washington metropolitan region, recognizing that trees and their collective benefit adhere to no jurisdictional boundaries.

Now in its second year, the project team is working to complete a variety of objectives. These include: 1) an ecosystem analysis and needs assessment with respect to management of the urban forest, 2) stakeholder workshops and forums, and 3) local projects focused on the health of the urban forest as a whole. In addition, this strategy will provide a replicable template for other metropolitan areas to emulate that are looking to advance regional urban forestry efforts as part of the Vibrant Cities & Urban Forests initiative. This research fulfills a portion of the needs assessment objective of the Regional Urban Forestry Strategy.

1.4. Portland-Vancouver Metropolitan Area

The Portland-Vancouver metropolitan area is a metropolitan region spanning the states of Oregon and Washington centered on the area's largest city, Portland, Oregon. According to the U.S. Office of Management and Budget (OMB), the Portland-Vancouver metropolitan area is the 24th largest Metropolitan Statistical Area (MSA) in the United States (U.S. Census Bureau 2013). An MSA is an area containing one or more large population cores and adjacent communities that have a high degree of social and economic integration with that core (National Archives and Records Administration 2010). Applying this definition, the U.S. OMB classifies the Portland MSA as comprising Clackamas, Columbia, Multnomah, Washington, and Yamhill Counties in Oregon along with Clark and Skamania Counties in Washington (OMB 2007).

The Portland MSA is the largest metropolitan area in Oregon and the second largest in Washington (U.S. Census Bureau 2013). Together this region has a total population of 2,226,009 (U.S. Census Bureau 2010), comprising 46.7 percent of Oregon's population and 6.7 percent of Washington's respectively. Within the Portland MSA, the City of Portland represents the largest incorporated city with a total population of 583,776 (U.S. Census Bureau 2010). The remaining incorporated cities range in size

from 161,791 in Vancouver, Washington to Rivergrove, Oregon being one of the smallest with a population of 289 residents.

Despite being largely an urban population center, the Portland MSA contains a unique range of land uses. According to the recently published Regional Conservation Strategy (RCS), across the entire Portland-Vancouver region, urban/developed uses encompass only approximately 13% of the total regional acreage (The Intertwine Alliance 2011). Central to this area is also agricultural development which covers roughly 22% of the regional land area. In addition to urban and agricultural uses, the Portland MSA has also placed a high value on protecting natural areas within and surrounding core urban areas. According to the RCS, approximately 27% of the region has been designated as parks or natural areas and public or protected lands (The Intertwine Alliance 2011). Such emphasis on protecting natural areas is demonstrated by the strict urban containment laws that exist within the Portland MSA that attempt to manage competing land uses while preserving the region's most valuable undeveloped resources.

Mandated establishment of urban growth boundaries (UGBs) or urban growth areas (UGA) by the state is unique to the states of Oregon and Washington, with the exception of Tennessee. Although they differ in name, the UGB, as established in Oregon, or the UGA, used by Washington jurisdictions, imply the same concept. According to the American Planning Association, a UGB is established to “promote compact and contiguous development patterns that can be efficiently served by public services and to preserve or protect open space, agricultural land, and environmentally sensitive areas” (Ding et al. 1999, p. 53). In Oregon, the Portland UGB is managed by a regional governmental agency, Metro, that is responsible for establishing the UGB and creating land use planning policies, in conjunction with cities and counties, within that boundary. This UGB is distinctive in that it incorporates a large portion of the Portland MSA encompassing 25 cities that cover the urban portions of Clackamas, Multnomah, and

Washington Counties. In Washington, UGAs define individual cities within the Portland MSA each with their own land use planning department.

1.4.1. Study Area

Under the project coordinated by ODF and WADNR, a subset of the larger Portland MSA was chosen as the study area for this research. The study area was limited to cities and counties, including incorporated municipalities and urban unincorporated land, within the Portland UGB as well as the largest incorporated municipalities and urban unincorporated areas within and including Clark County, Washington. This area was chosen because it represents the urban core of the Portland MSA and cohesively managed metropolitan units each with their own land-use planning agencies or departments. This area will hereafter be referred to as the Portland-Vancouver Metro Region for the purposes of this research. Together, the Portland-Vancouver metro encompasses an area of approximately 340,000 acres and includes 30 cities, four counties, and two state governments. Table 1.1 provides a list of the cities and counties included in this study area. This same research area also encompasses the project area of this research's parent project, the *Portland-Vancouver Metropolitan Regional Urban Forestry Strategy*.

Table 1.1. A list of cities and counties within the study area

State	County	Incorporated Cities
Oregon	Clackamas, Multnomah, and Washington	Beaverton, Cornelius, Damascus, Durham, Fairview, Forest Grove, Gladstone, Gresham, Happy Valley, Hillsboro, Johnson City, King City, Lake Oswego, Maywood Park, Milwaukie, Oregon City, Portland, Rivergrove, Sherwood, Tigard, Troutdale, Tualatin, West Linn, Wilsonville, and Wood Village
Washington	Clark	Battleground, Camas, Ridgefield, Vancouver, and Washougal

1.4.2. Urban Forest Management

The Portland-Vancouver metro has a long history of urban tree management. This region has had a significant relationship with its forest resource since 1825 with the establishment of Vancouver, WA, the oldest, permanent non-native settlement in the Pacific Northwest (City of Vancouver 2007). As early as the 1860s, civic leaders sought to create a natural preserve near Portland and formally dedicated a roughly 4,000-acre parcel of land known as Forest Park in 1948. Today, Forest Park ranks as the 19th largest city park in the U.S. (Trust for Public Lands 2005).

However, it was not until the early 1970's that local jurisdictions began to actively manage their street trees. Such management trends began with the City of Portland under directive from the city council, and in 1974, the city hired its first urban forester (Portland Parks and Recreation 2004). Portland was also nationally recognized for its commitment to the urban forest receiving Tree City USA recognition in 1978 (Arbor Day Foundation 2013). The City of Vancouver followed this trend of urban forestry stewardship and became recognized as a Tree City USA in 1989 (City of Vancouver 2007). Since that time, the sustainable design and management of urban greenspace has become a long-term goal of an increasing number of communities in the Portland-Vancouver metropolitan region and throughout the Pacific Northwest (Wolf et al. 2008).

Today, urban forest management has expanded in the Portland-Vancouver metro region. Not only do the two largest cities, Portland and Vancouver, actively manage their trees, but communities of all size have begun to recognize the benefit of well-managed urban vegetation and greenspace. Although many jurisdictions do not have a specific urban forestry program or department, many departments have assumed responsibilities related to the management of trees on public and private property. In the Portland-Vancouver metro, land use planning, community development, public works, and parks and recreation rank among the top departments responsible for urban tree management (Driscoll).

In addition to the many departments responsible for tree care, many local to national tools also exist for cities and counties to manage their tree populations. Citizen tree boards, urban forest management plans, Tree City USA recognition, tree inventories, and tree preservation ordinances represent just a few of those options. Cities and counties within the Portland-Vancouver Metro Region vary considerably in their adoption of these tools. According to a recent survey published by Portland State University (PSU), 70% of jurisdictions within the Portland-Vancouver Metro Region have urban tree preservation ordinances containing regulations and requirements governing the removal of trees (PSU 2009). In addition, seven jurisdictions have developed and adopted urban forest management plans (PSU 2009). The American Public Works Administration (APWA) suggests that urban forest management plans are an essential planning tool for protecting the health and benefits of the forest resource within cities and counties (APWA 2011).

Tree City USA is a national program administered by the Arbor Day Foundation that provides a framework for community forestry management for cities. Excluding counties within the study area, 14 cities are also nationally recognized with Tree City USA status (Arbor Day Foundation 2013). Cities can achieve Tree City USA status by meeting four core standards of urban forest management which are 1) maintaining a tree board or department, 2) having a community tree ordinance, 3) spending at least \$2 per capita on urban forestry, and 4) celebrating Arbor Day (Arbor Day Foundation 2013). These standards allow all communities regardless of size or budget to be recognized for a high standard of urban tree management. Participation can greatly benefit a city, increasing publicity, public image, citizen pride, and education within the jurisdiction related to its municipal trees (Fazio 1992).

Despite many jurisdictions having adopted urban tree management measures, there is still considerable variation in local urban forestry policies and programs throughout the region (PSU 2009). Findings from the PSU study show that policies and programs relating to trees vary with respect to their

applicability, strength and enforcement, financial investment, and public involvement within city and county governments in the Portland-Vancouver metropolitan region. Several studies have suggested that active management of municipal trees, through such programs as Tree City USA, is directly related to factors such as city population, acres of tree cover, expenditure per capita on trees, and city acreage (Galvin and Bleil 2004; Zhu and Zhang 2008). Others have proposed that more intrinsic measurements of attitude, knowledge, and experience of municipal officials relating to urban trees and their benefits directly influence a city's participation in urban forest management (Grado et al. 2006; Zhang and Zheng 2012). It is still unclear from these studies and research conducted by PSU why some jurisdictions within the Portland-Vancouver Metro Region actively manage their urban trees while others are not.

1.5. Research Need

Despite differences in management approaches, it is clear that urban forests are diverse and interconnected ecosystems (Dwyer et al. 2003). However, although the urban forest ecosystem spans multiple governmental jurisdictions, management of the urban forest resource does not. This research and the larger *Portland-Vancouver Urban Forestry Strategy* are needed to overcome the inconsistent management of the urban forest on the local level and to better strategize on how regional scale management can be improved.

Researchers such as Dwyer et al. (2003) have offered strategies to increase management capacity for the urban forest. They surmise that a "one-size fits all" management strategy will not be successful. Managers should instead develop locally specific strategies to meet the needs of the local population within a regional context. Furthermore, the authors' advise that dialogue must increase among forest resource policy makers, managers, and users and that collaboration among agencies and stakeholder groups will be necessary for effective management. Only by coordinating activities among different

stakeholders and managers, from across jurisdictions, can collaborative stewardship of the urban forest resource take place.

Additional research has further refined these recommendations for the United States and the Pacific Northwest region. Wolf (2007), in the “Goals of the National Urban Forestry 10 Year Research Plan”, states that researchers must “expand knowledge and innovation about urban forest resource management to promote ecosystem health and sustainability”. Wolf further refines this goal to emphasize that the challenges to the urban forest and its successful management must be identified on a local level. Because the urban forest is central to the lives of many urban residents, maintaining and increasing the health and benefits offered by the urban forest is vital. Unfortunately, improper management and a lack of knowledge about the benefits of an urban forest on the part of community officials and managers can greatly reduce the sustainability, the health and function of the vegetation and associated systems, of the resource.

Following national studies, Wolf and Kruger (2010) identified additional research foci based on the needs of local communities within the Pacific Northwest region. Interviews of local urban forestry professionals and managers suggested how the urban forest could be better managed. Citing the need for greater vision concerning the urban ecosystem, urban forestry professionals identified the need to implement nationally accepted, or “best management practices,” among jurisdictions and to increase interest from political leadership in urban forest management. Professionals also recognized that urban forestry efforts must be better coordinated within local governments and across regional landscapes in order to optimize ecosystem services and green infrastructure in the Pacific Northwest.

These suggestions mirror those of the national *Vibrant Cities & Urban Forests* Task Force and its recommendation for the creation of regional natural resource plans which address urban natural resource planning issues. Additionally, the need for a regional approach to urban forestry has been further

encapsulated by the *Portland-Vancouver Metropolitan Regional Urban Forestry Strategy* that is currently underway. Although the cities and counties within the Portland-Vancouver Metro Region will vary with respect to the resource, issues, and needs relating to their urban trees (Schroeder et al. 2003), the creation of comprehensive and adaptive management strategies for the urban forest that span jurisdictional boundaries will lead not only to a more cohesively managed urban ecosystem, but also to a healthier urban forest.

1.6. Research Focus

1.6.1. Goals and Objectives

In response to the recommendations and initiatives from the *Vibrant Cities & Urban Forests* Task Force, this research will identify and address local and regional urban forest management issues in the Portland-Vancouver Metro Region. This research will contribute to the following broad, long-term goals:

1. Improve the size and health of the urban forest in the Portland-Vancouver by contributing to professional knowledge and urban forestry activities already occurring in the region.
2. Promote effective management of the urban forest resource on a regional scale by understanding issues currently facing urban forest management at the municipal or county level.
3. Encouraging collaboration and dialogue between stakeholders on strategies to enhance current practices and attitudes concerning the urban forest.
4. Increase the success of the *Portland-Vancouver Metropolitan Regional Urban Forestry Strategy* by identifying management barriers and supporting inter-jurisdictional coordination to enhance urban forestry efforts in the Portland-Vancouver Metro Region.

5. Provide recommendations to other metropolitan regions looking to develop regional urban forestry strategies and advise individual communities on implementing or advancing current and future programs.

In order to complete those goals, the objectives of this study are fourfold:

1. Assess community officials and managers' perception of urban forest management in the Portland-Vancouver metro region, and determine if there are differences in attitude between the two types of position.
2. Identify the factors attributed to urban forestry program importance and success and compare these to national urban forestry reporting standards.
3. Capture reported needs and barriers to advance urban forestry program management in jurisdictions within the region and examine city or county priorities to fulfill those needs.
4. Examine how jurisdiction size or county level administration correlates with attitudes and perceptions of urban forest management.

The following chapters will highlight these objectives as fulfilled by an urban forestry survey conducted in the Portland-Vancouver metro region. Because the urban forest knows no political boundaries, this research is necessary to encourage collaboration across jurisdictional boundaries while advancing current and future urban forestry efforts in the region. By focusing research efforts in the cities of Portland and Vancouver, this research endeavors to increase the livability and environmental sustainability of this metropolitan area, making it a more vibrant place to live and work.

2. MANUSCRIPT 1: TRENDS IN URBAN FOREST PRACTICES AND PROGRAMS IN THE PORTLAND-VANCOUVER METRO REGION

2.1. Introduction

The management of urban forests to achieve sustainable, healthy communities is the long-term goal of urban forestry professionals as well as many elected officials. Not only are trees widely recognized as an important component of urban landscapes, but they provide a variety of well-documented environmental, economic, and social benefits and services (Dwyer et al 1992; Nowak and Dwyer 2007). The quality of life in cities and counties can be enhanced by taking advantage of these benefits through adopting programs that foster efforts to plan for, plant, protect, and maintain community trees. Furthermore, partnerships created through such programs can also lead to increased political support and an engaged citizenry committed to building healthy and viable communities for themselves and future generations. An effective urban forestry program provides a foundation for meeting these goals.

Broad recommendations have been put forth regarding important components of an effective urban forestry program. In a national assessment, Dwyer et al. (2000) provided several broad program components important to advancing urban forestry such as an improved tree inventory and monitoring, improved dialogue among stakeholders, collaboration among agencies and groups, and improved dissemination of information. Clark and Matheny (1998) provide another, more adaptive, model which includes criteria for the vegetative resource, a community framework, and resource management. Meeting the criteria can be accomplished in a variety of ways given the specific resources of a city or county. Examples of criteria could include jurisdictions utilizing inventories or canopy cover assessments to assess their existing forest resource, creating community tree boards or commissions or neighborhood planting events to establish a cooperative community framework, or offering a comprehensive tree

maintenance program and sustainable funding sources to manage the resource. Although general in scope, both approaches provide a general range of activities and management strategies that communities can participate in concerning their urban forest resource.

Several national organizations and governmental agencies have also identified essential program components for assessing programmatic success. The Arbor Day Foundation provides one such set of measurements applicable to municipal governments that are used to determine a city's qualification for Tree City USA (TCUSA) status. These core standards include: 1) maintaining a tree board or department, 2) having a community tree ordinance, 3) spending at least two dollars per capita on urban forestry, and 4) celebrating Arbor Day (Table 2.1) (Arbor Day Foundation 2013). The standards provide a framework to assess sound urban forestry program management whereby all cities regardless of size or budget can demonstrate and be recognized for their commitment to the urban forest.

Another program is carried out by state governments under guidance from the United States Department of Agriculture, Forest Service. In 2005, the U.S. Forest Service selected and implemented a set of performance measures to document management performance in communities across the U.S. known as the Community Accomplishment Reporting System (CARS) (USDA Forest Service 2014). Under CARS, state urban and community forestry programs are responsible for collecting four performance measures from city governments pertaining to successful municipal urban forestry program management. The programs then submit their measurements to the U.S. Forest Service in order to be eligible for federal funding and to assess urban forestry programs across the nation. To achieve the CARS measures, municipalities must have: 1) an active urban forest management plan, 2) professional urban forestry staff, 3) local ordinances or policies that focus on planting, protecting, and maintaining urban trees, and 4) local advisory organizations, such as tree boards, that advise and advocate for the planting, protection, and maintenance of urban forests (USDA Forest Service 2006). Jurisdictions meeting one to

three of these performance measures qualify as “developing” programs, while those having all four are considered “managing” programs (USDA Forest Service 2006). These measures encourage the creation and strengthening of local urban forestry programs while providing states and the national government ways to track the progress of local jurisdictions and provide avenues for technical assistance. Table 2.1 presents the CARS program measurements as well as those applicable to the TCUSA program.

Table 2.1. National urban forestry program measurement systems for the Tree City USA (TCUSA) and Community Accomplishment Reporting System (CARS) programs

Component	TCUSA	CARS
Maintaining a tree board or department	Yes	Yes
Tree related ordinance	Yes	Yes
Per capita program spending	Yes	No
Arbor Day celebration	Yes	No
Urban forest management plan	No	Yes
Professional urban forestry staff	No	Yes

However, characterization of local programs by strict criteria has been met with some criticism. Several researchers have claimed that it is seemingly unclear how the U.S. Forest Service selected the four CARS measures as opposed to other measures that might be equally or more informative such as those used by the Arbor Day Foundation (Freilicher 2010). These measures have also received criticism as they only evaluate management of the urban forest but do not take into account the condition of the forest itself (Freilicher 2010). Furthermore, researchers have cited the need for local governments and communities to establish urban forestry programs suited to their unique situations, claiming that a one size fits all approach to urban forestry will likely not be successful given differences in the forest resource and political climate between jurisdictions (Dwyer et al. 2003).

Despite these critiques, such measures do provide city and county governments with concrete, nationally accepted standards to pursue when implementing or expanding an urban forestry program.

Unfortunately, although local jurisdictions may be familiar with or recognize the importance of these recommended program elements, many still choose not to implement them in their jurisdiction. To address this discrepancy, several studies have investigated the prevalence of urban forestry program components, including the CARS measures, within city governments (Elmendorf et al. 2003; Schroeder et al. 2003; Treiman and Gartner 2004; Ries et al. 2007). Results from these studies indicate that difficulties exist in gauging the relative importance of each measure and their aggregate result as well as in completing each practice (Elmendorf et al. 2003; Freilicher 2010). Furthermore, marked differences exist between community officials and managers' attitudes toward such urban forestry practices and the successful completion of them (Elmendorf et al. 2003). Such findings spark questions about what practices, or program components, jurisdictions find most important, and how well local practices are supporting adequate urban forestry programs.

To explore options for advancing the management of the urban forest in the Portland, Oregon and Vancouver, Washington metropolitan area (hereafter referred to as the Portland-Vancouver Metro Region), the *Portland-Vancouver Metropolitan Regional Urban Forestry Strategy (Regional Urban Forestry Strategy)* was established. The *Regional Urban Forestry Strategy* represents a regional, urban natural resource partnership, that includes state and local governments as well as regional non-profit agencies in the Portland-Vancouver Metro Region with the goal of advancing urban forestry locally and on a regional level. In accomplishment of that goal, one objective of the *Regional Urban Forestry Strategy* was to complete a survey assessment of city and county governments to examine attitudes and program trends relating to urban forestry both within and across jurisdictional boundaries in the Portland-Vancouver Metro Region. By gauging the perceived importance and successful completion of program components, the *Regional Urban Forestry Strategy* can compare these to national performance measures

and make recommendations to further advance urban forestry throughout the region. This research fulfills a portion of the survey assessment objective of the *Regional Urban Forestry Strategy*.

The objective of this manuscript is to summarize the perceived importance and success of various urban forestry program management components in municipal and county governments in the Portland-Vancouver Metro Region. In addition, this thesis explores how community officials and program managers as well as jurisdictions of different size and type differ in their perception in these practices, and identify trends that could strengthen and advance urban forestry throughout the Portland-Vancouver Metro Region.

2.2. Literature Review

Research has shown that although many jurisdictions are familiar with the importance of certain aspects of urban forest management, not all are interested in or actively managing their urban forest resource (Grado et al. 2006). Furthermore, discrepancies occur between jurisdictions' attitudes toward these urban forestry practices and their completion of them (Elmendorf et al. 2003). To understand the relationship between attitudes and actions, many statewide assessments have been conducted on attitudes and perceptions of urban tree programs.

Multiple studies conducted in the Midwestern (Allen 1995; Green et al. 1998; Schroeder et al. 2003; and Treiman and Garner 2005) and Southern United States (Grado et al. 2006) have found that most community officials have strong, positive attitudes towards urban trees in their jurisdictions, and that municipal employees consider urban forest management important regardless of region, population size, or metropolitan or rural classification. Such studies also indicate that communities have an avid interest and enthusiasm for starting new projects or programs and larger jurisdictions (>10,000) may have a stronger interest in promoting urban forestry projects compared to smaller ones.

When considering specific program components, Stevenson et al. (2008) found that in existing programs that had urban forestry ordinances, a tree commission, inventory, and management plan, officials had more positive attitudes about trees than in developing programs. In cities without programs, half of officials also believed the benefit of managing trees outweighed the cost. Likewise, Elmendorf et al. (2003) completed a survey in Pennsylvania comparing attitudes about urban forestry practices to their successful implementation and completion in municipal governments. The authors' findings indicated that program components such as routine tree maintenance, street tree ordinances, tree commissions, and urban forest management plans ranked among the most important elements of an urban forestry program. However, few programs had successfully implemented and practiced these elements.

In looking at municipal officials and managers' perspectives in Alabama, Zhang and Zheng (2012) found that tree pruning, preservation, and ordinances were most common program elements, but that statistically significant differences existed between the perceived importance of such elements amongst municipal officials and managers. Furthermore, officials paid more attention to managing trees for socio-economic benefits (such as increased property value and community pride) rather than ecological values. The authors' surmise that such findings indicate that not all local officials and managers have the same understanding of trees, and that the differences in perception of program elements could indicate that knowledge about tree programs may be incomplete and not fully understood. A more complete understanding of urban tree program components is important to help municipal officials and managers better oversee and allocate the jurisdiction's resources to create a healthier urban forest.

In the Pacific Northwest, several assessments have been conducted in both Oregon and Washington collecting information about urban trees and urban tree programs from municipalities (Ries et al. 2007; PSU 2009; Wolf 2007). In Washington, an assessment conducted by Washington Department

of Natural Resources found that although many jurisdictions complete routine tree care, have established tree ordinances, and celebrate Arbor Day, other program elements such as completing a tree inventory and adopting an urban forest management plan are considerably lacking (Wolf 2007). Similarly, a statewide survey conducted in Oregon, revealed that program managers allocated most of their funding to urban forestry maintenance activities while administration of and education about urban forestry received relatively less support (Ries et al. 2007). This survey also found that urban forestry programs were more common in large cities (population greater than 25,000) compared to small or medium sized ones.

A recent program assessment conducted by Portland State University (2009) found that only a relatively small number of cities and counties in the Portland-Vancouver Metro Region have made a strategic investment in their urban forests, and that jurisdictions vary considerably in their adoption of urban forestry practices. In considering the CARS and TCUSA performance measures (Table 2.1), roughly 67% jurisdictions within the Portland-Vancouver Metro Region have urban tree preservation ordinances while only 23% have developed and adopted urban forest management plans (PSU 2009). Forty-six percent of jurisdictions also have a designated tree board or similar commission responsible for advising the city or county regarding their urban trees, and 37% have professional staff dedicated to the care of the urban forest in either the capacity of an urban forester or certified arborist. Finally, 47% jurisdictions have fulfilled the TCUSA requirement of per capita program spending and an annual Arbor Day observance. Researchers from PSU suggest that such variation in program element adoption may be indicative of the inconsistent policy, funding, and staffing levels associated with urban forestry program management in these jurisdictions. This gap is further widened in county governments that appear to have the least resources and political and community interest in urban forestry (PSU 2009). Figure 2.1 displays the relative percentage of jurisdictions in the Portland-Vancouver Metro Region that have achieved either the CARS or TCUSA performance measures.

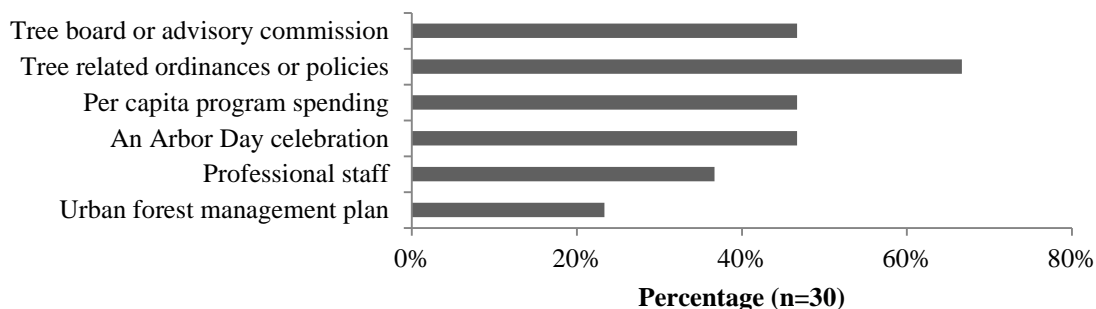


Figure 2.1. Percentage of jurisdictions (out of 30) obtaining each of the CARS or TCUSA performance measures in the Portland-Vancouver Metro Region (PSU 2009; Driscoll)

2.3. Knowledge Gaps

Taken as a whole, these studies reveal that significant variation exists in local practices and programs related to the urban forest, and spark questions about how well local practices are supporting both adequate urban forestry programs and healthy forest resources. Although national recommendations and performance measures exist that provide clear objectives for urban forestry programs, relatively few jurisdictions have actually achieved the CARS or TCUSA standards. This discrepancy suggests that perhaps other measures may serve as better indicators of a successful urban forestry program in the Portland-Vancouver Metro Region. Research is needed to examine the importance of urban forestry program components to municipal and county governments, comparing those attitudes to the completion of each component (Elmendorf et al. 2003), and providing means for jurisdictions to assess their programs' success.

Additional research has tried to characterize municipal officials' attitudes toward urban forest management. These studies have revealed that, in general, officials and program managers may have positive attitudes toward urban trees. However, it is not clear if there is any variation among these

positions regarding their perceptions of urban forestry programs (Zheng and Zhang 2012). More research is also needed to assess how city size may affect differences in perception about urban tree management.

Finally, most studies have focused their attention only on municipal governments rather than also addressing county or regional tree programs. Although urban forests are typically the responsibility of city governments, counties, particularly ones with high amounts of unincorporated urban areas, also have similar issues and needs related to trees but often lack the organizational structure to adequately manage those trees. It is likely that significant differences may exist in the importance of particular program practices to counties and where these governments have concentrated their resources regarding the urban forest. Urban forests do not adhere to strict political boundaries, therefore research is needed to address urban forestry related issues on a regional scale to ensure that communities work collectively in establishing shared goals and adopting similar strategies to meet those objectives. This research aims to contribute to the literature from these aspects.

2.4. Research Objectives

This research focuses on the Portland-Vancouver Metro Region in order to assess current urban forestry programs in both city and county jurisdictions. To better understand these issues, this research will identify the overall importance of the urban forest to jurisdictions in the region. Additionally, this research will assess what program components respondents feel are most important to a successful urban forestry program and evaluate the perceived success of jurisdictions in achieving those components, comparing the responses to national standards.

In that regard, the specific objectives of this research include:

1. Assess local officials' and program managers' perceptions of urban forest program management in the Portland-Vancouver Metro Region, and determine if there are differences in attitude between the two groups of respondents.

2. Explore reported importance and success of urban forest management within the region.
3. Identify the program practices and components that are important to a successful urban forestry program for jurisdictions in the Portland-Vancouver Metro Region, and compare responses to nationally accepted performance measures
4. Examine how jurisdiction size or county level administration may influence attitudes and perceptions of urban forest management.

This information is currently unknown for the jurisdictions within the Portland-Vancouver Metro Region. This information will provide a better understanding of how the urban forest resource is currently being managed, and allow state and national programs to make better and more targeted recommendations and services to local governments to help them better manage their urban forest resource. Collecting this information to identify strategies that address these current management priorities is a primary goal of the *Regional Urban Forestry Strategy*. This information can be further distributed and used by governmental leaders and agencies, communities, urban forestry professionals, and the public in the Portland-Vancouver area to enable the initiation and/or promotion of urban forestry activities, projects, and programs and to move urban forestry efforts forward collectively as a region (Grado et al. 2006). Since there are few studies aimed at regional approaches to urban forest management, this research can also help form a basis for implementing regional urban forest management approaches in other metropolitan areas across the U.S.

2.5. Methods

A literature review was conducted to synthesize existing, applicable methods and information to develop a survey questionnaire (Grado et al. 2006). Survey questions were designed to collect information about common program practices and components characteristic of many urban forestry programs. The survey was reviewed and edited by the Urban and Community Forestry program managers for the states

of Oregon and Washington to better reflect program components of the jurisdictions that they serve. Upon completion of this internal review, three in-person, preliminary interviews were conducted with urban forestry stakeholders from the Portland-Vancouver Metro Region to inform and aid in the development of the survey questionnaire. Information generated from the literature review was presented to these stakeholders who were asked to rate the importance of and the success of their jurisdiction in achieving each program component and add additional program information representative of their jurisdictions' urban forestry programs. These stakeholders were selected based on their involvement in the management of the urban forest and represented key officials and managers from both city and county governments. Stakeholders selected for the preliminary interviews were reflective of the targeted population of the survey questionnaire.

The population targeted for this survey consisted of two designated groups of urban forestry stakeholders: community officials and program managers. Community officials represent key members of city and county governments' leadership including mayors, city council members, county commissioners, and city or county administrators. Likewise, program managers include staff level employees responsible for tree care in public works, parks and recreation, land use planning, and community development sections of city and county governments. Approval was obtained from Oregon State University, Institutional Review Board prior to contacting these individuals and distributing the survey (Institutional Review Board 2014).

The survey was sent to a total of 350 community officials and program managers in 30 city and four county governments within the Portland-Vancouver Metro Region (see Table 1, pg. 13 for a complete list). Survey participants were identified by ODF and WADNR for the purposes of the Regional Urban Forestry Strategy and represent those with the most potential to initiate, promote, and implement urban forestry programs and projects within their jurisdictions. After identifying the appropriate

participants, information including names, email addresses, and mailing addresses that were accessible through the public domain were collected (Grado et al. 2006). If such information was not available on the internet, jurisdictions were contacted by telephone prior to sending the survey to identify the appropriate individuals to receive the survey.

The survey questionnaire consisted of nine-pages and contained 23 questions (Appendix A) applicable to both types of identified participants (community officials and program managers) and the two types of jurisdictions (city and county). Prior to sending the survey, an introductory postcard was sent to all participants announcing the forthcoming survey. The formal survey process (Dillman 2000) consisted of emailing the web link and private access code to the survey to participants, and then one week later sending a reminder email with the same access information. Electronic surveys were distributed using Qualtrics, an online survey distribution tool. Surveys were accompanied by a cover letter (Appendix B) explaining confidentiality, project goals, and end products. The on-line survey portal also included information about the study, research partners, and implied consent and provided participants with a way to opt-out of the survey if so desired.

Approximately three weeks after the electronic mailing of the survey, an additional, print survey and cover letter were mailed to participants who had not yet responded to the survey. The cover letter also included a web link and private access code private for the online survey if participants still wished to participate in that manner. A final notification email was sent to remaining participants approximately 10 days after mailing the print copy. Survey responses were tabulated and analyzed upon return (IBM Corp. 2012).

A copy of the survey is included in Appendix A. The survey included questions about the following aspects: 1) the importance of urban forestry to jurisdictions; 2) jurisdictions' interest in implementing or expanding urban forestry programs; 3) the importance of program practices and

perceived success in achieving each component; 4) perceived needs and barriers to urban forest program management; 5) future priorities relating to the urban forest; 6) public perception of urban forestry; and 7) the desired outcomes of the Regional Urban Forestry Strategy.

For this study, descriptive statistics were computed for the data set and frequency tables were analyzed for trends in attitudes and program practices and to make comparisons across respondent position or jurisdiction type (Elmendorf et al. 2003). No formal statistical hypothesis tests were conducted due to small sample sizes. Here, the results from only those questions pertaining to the general importance of an urban forestry program and the importance of various program practices and components and perceived success in achieving those elements to each jurisdiction are summarized.

2.6. Results

2.6.1. Response Rate

A total of 350 community officials and program managers from 30 cities and four counties comprised the survey population. Of these 350, 234 met the position description of community official and 116 that of a program manager. Redistributed according to city population/jurisdiction level, 134 in the survey population represented small cities with fewer than 17,883 inhabitants (median population size for cities), 173 from large cities with population greater than 17,883, and 43 represented county governments. All surveys were successfully delivered. Table 2.2 lists the response details comparing the sample population to the target population.

A total of 96 surveys were returned for an overall response rate of 27.4%. The response rate for both community officials and program managers, individually, was 13.7%. The response rate for small cities was 9.4%; for large cities, it was 15.4%; and for counties, 2.6% (Table 2.3). Though response rates were lower than expected, those who did respond represented the majority of cities and counties in the Portland-Vancouver Metro Region (Table 2.2 and Table 2.3).

Table 2.2. Details of the survey participants compared to the total population

Jurisdiction Type	Survey Participants, count (% of sample population)			Target Population, count (% of target population)		
	Position			Position		
	Community Officials	Program Managers	Total	Community Officials	Program Managers	Total
Small City (< 17,883 pop.)	20 (20.8)	13 (13.5)	33 (34.4)	104 (29.7)	30 (8.6)	134 (38.3)
Large City (> 17,883 pop.)	24 (25.0)	30 (31.3)	54 (56.3)	109 (31.1)	64 (18.3)	173 (49.4)
County	4 (4.2)	5 (5.2)	9 (9.4)	21 (6.0)	22 (6.3)	43 (12.3)
Total	48 (50.0)	48 (50.0)	96 (100.0)	234 (66.9)	116 (33.1)	350 (100.0)

Table 2.3. Survey response rates. Values are counts and percentages (of row total) of the sample population compared to the target population

Jurisdiction Type	Position		
	Community Officials	Program Managers	Total
Small City (< 17,883 pop.)	20 (5.7)	13 (3.7)	33 (9.4)
Large City (> 17,883 pop.)	24 (6.9)	30 (8.6)	54 (15.4)
County	4 (1.1)	5 (1.4)	9 (2.6)
Total	48 (13.7)	48 (13.7)	96 (27.4)

Chi-squared statistics were used to test if the distribution across jurisdiction type or position differed between respondents and non-respondents (Vaske 2008). Results indicated that there was strong evidence that the distribution across position differed between respondents and non-respondents ($\chi^2=16.41_{df=1}$, $p<.001$); however, there was no evidence that the distribution across jurisdiction type differed between respondents and non-respondents ($\chi^2=2.69_{df=2}$, $p=0.261$) (Table 2.4).

Table 2.4. Chi-squared comparison of respondents and non-respondents by known position and jurisdiction type. First value in each table entry is the number of participants who responded or did not respond (out of the row total); the second is the percentage of the number out of the row total

Position, count (% of row total)					χ^2 value (df=1)	p-value
Responded	Community Officials	Program Managers	Total			
Yes	48 (50.0)	48 (50.0)	96			
No	186 (73.0)	68 (27.0)	254		16.41	<0.001
Total	234 (66.9)	116 (33.1)	350			

Jurisdiction Type, count (% of row total)					χ^2 value (df=2)	p-value
Responded	Small City (less than 17,883 pop.)	Large City (greater than 17,883 pop.)	County	Total		
Yes	33 (34.3)	54 (56.3)	9 (9.4)	96		
No	101 (39.8)	119 (46.9)	34 (13.4)	254	2.69	0.261
Total	134 (38.3)	173 (49.4)	44 (12.6)	350		

To help alleviate any biases caused by possible differences between the non-respondents and respondents, the demographics (jurisdiction type and respondent position) of respondents in the sample population compared to the known demographics of the target population were explored (Table 2.4). To account for the fact that community officials responded less than expected in the sample compared to the target population (Table 2.4), data were weighted based on respondent position (Vaske 2008). The non-response weights were calculated by dividing the expected proportion in each position from the target population by the observed proportion in the sample (Vaske 2008) (Table 2.5). When using non-response weighting, a group that is underrepresented in the sample is given a higher weight, and overrepresented groups are given lower weights. For this research, because community officials responded less than expected, each case from a community official is multiplied by 1.338 in the analysis based while the over-represented group, program managers, is multiplied by 0.662.

Table 2.5. The weighting factor applied to data after taking the proportion of the target population divided by the proportion of the sample population across respondent position

Position	Population proportion	Sample proportion	Weighting factor (population / sample)
Community Official	0.67	0.50	1.338
Program manager	0.33	0.50	0.662

These weights are multiplicative factors that were applied to the number of respondents when computing percentages. To compute the weight adjusted percentages consider the following example. Assume that a total of 11 respondents answered a yes/no question, and that of those 11, five met the description of community official and six that of program manager with non-response weights of 1.338 and .662, respectively. A total of six respondents answered “yes” to the question including four community officials and two program managers. To calculate a proportion without accounting for the non-response weights, simply add up the number of respondents that answered “yes” and divide that by the total number of respondents to the question. In this example, 6/11 is .54. To calculate a weighted proportion using the non-response weights, we add up the weights of all the respondents that answered “yes” and divide by the sum of the weights for all respondents that answered the question. The sum of the weights of the “yes” respondents in this example is 6.676, the sum of the weights for all respondents is 10.662, and the estimated weighted proportion is 6.676/10.662 or .63. This proportion can therefore be used to compute a weight adjusted percentage of 63% of respondents answering “yes” to this question. All estimated percentages given in this chapter are weighted percentages based on the non-response weights shown in Table 2.5.

2.6.2. Importance of an Urban Forestry Program

Information was collected on the general importance of an urban forestry program to respondents in the Portland-Vancouver Metro Region. Respondents were also asked to rate the importance of an urban

forestry program compared to other programs such as land use permitting or fire protection in their jurisdictions. Respondents were asked to rate the importance of urban forestry in each scenario on a scale from 1 to 5, where 1 indicated not very important and 5 indicated very important. The scale was collapsed to three categories of “not important”, “neutral”, and “important”. Respondents who indicated “don’t know” were removed from the analysis. Table 2.6 shows the weight adjusted percentages who specified the importance of an urban forestry program as well as the weight adjusted percentages who reported on an urban forestry programs importance compared to other programs and services offered by the jurisdiction. The unweighted, or “actual”, number of responses for each question is reported in Table B-1 in Appendix B.

After applying the appropriate weight adjustment depending on respondent position, 80.4% of respondents felt that an urban forestry program was somewhat or very important to their jurisdiction while only 14.7% indicated that an urban forestry was not important. When looking at response by respondent position, 74.2% of community officials and 69.5% of program managers indicated that an urban forestry program was important to their community. When disaggregating data by jurisdiction size, 77.1% of respondents from small cities (population less than 17,883) and 83.4% from large cities (population greater than 17,883), indicated that urban forestry was important to their jurisdictions. However, only 55.0% of respondents in counties felt that a program was important to their county governments.

Applying the weight adjusted proportions, 46.6% indicated that urban forestry program was important compared to other essential programs or departments such as fire or land use planning while 37.9% reported that it was not important to their jurisdiction. An urban forestry program was rated as more important compared to other programs by 51.9% of respondents in small cities. Respondents from

counties indicated it was the least important compared to other programs and services offered with only 16.7% of rating it as important.

Table 2.6. Importance of urban forestry programs by jurisdictional type and respondent position. The first value in each table entry is the weighted percentage of respondents who identified the general importance of an urban forestry program. The second value is the weighted percentage of respondents who identified the importance of an urban forestry program relative to other programs offered by the jurisdiction.

Jurisdiction Type	Position	Importance (% general importance** / % importance relative to other programs***)*		
		Not important	Neutral	Important
Small City (<17,88)	Community Official	10.0 / 23.1	5.0 / 23.1	85.0 / 53.8
	Program Manager	30.8 / 37.5	0.0 / 12.5	69.2 / 50.0
Large City (>17,883)	Community Official	8.3 / 47.1	4.2 / 11.8	87.5 / 41.2
	Program Manager	13.8 / 28.0	6.9 / 16.0	79.3 / 56.0
County	Community Official	50.0 / 66.7	0.0 / 0.0	50.0 / 33.3
	Program Manager	20.0 / 75.0	20.0 / 25.0	60.0 / 0.0
Total		14.7 / 37.9	4.9 / 15.5	80.4 / 46.6

* Percentages are weight adjusted percentages. Respondents meeting the description of community official were weighted by a factor of 1.338; those meeting the description of program manager were weighted by 0.662.

**“How important is an urban forestry program to your jurisdiction?”

***“How important is an urban forestry program compared with other programs in your jurisdiction such as land use permitting or fire protection?”

2.6.3. Importance and successful achievement of urban forestry program components

A list of 24 components (e.g., tree inventories, tree preservation ordinance, management plans, community involvement) important to a successful urban forestry program was generated based on a literature review. Respondents were asked to rate the general importance of each of these components to a successful urban forestry program on a scale from 1 to 5, where 1 indicated “not very important” and 5 indicated “very important”. Respondents were next asked to rate the perceived success of their jurisdiction’s urban forestry program in each of the 24 areas on a similar 5-point scale, where 1 indicated “not very successful” and 5 indicated “very successful”. Respondents giving “don’t know” or “not

applicable” answers were omitted from the analysis. Table 2.7 reports both the weight adjusted percentage of respondents who indicated that the various urban forestry components were “somewhat” to “very important” to a successful urban forestry program and those who rated their jurisdiction as being “somewhat” to “very successful” in achieving each component across respondent position and jurisdiction type. The unweighted number of responses for each question is reported in Table B-2 in Appendix B.

2.6.3.1. Tree Health

When considering a healthy tree population, 94.8% of respondents felt that this was important, while reported 75.8% having successfully achieved a healthy urban forest. A healthy tree population was of particular importance to program managers (97.9%) and to respondents from large cities (97.3%) and county governments (100.0%) with large cities (80.0%) reporting the most success in achieving healthy urban trees. The majority of respondents (91.9%) thought that a structured street and park tree maintenance program was important to a successful program; however, only 59.9% of respondents reported their jurisdiction had a successful maintenance program.

2.6.3.2. Program Staff

With regard to the presence of trained staff in proper tree care, 83.6% said that it was important to a program, while 61.5% had trained staff in their jurisdiction. The importance of trained staff was highlighted by program managers (87.5%) and by small and large municipalities (87.2% and 85.1%, respectively). Of respondents from large cities, 68.1% also reported having been more successful in having trained staff within their programs; however, only 23.1% of respondents from counties reported having trained staff. Technical expertise on the part of staff was also considered important by 82.6% of respondents with 62.7% indicating their current staff was proficient in this area. However, when asked about the importance of having a certified arborist on staff (achieving certification from an organization such as the International Society of Arboriculture), only 46.9% of respondents felt that it was important

Table 2.7. Importance and successful achievement of urban forestry program components by respondent position and jurisdiction type. The first value in each column is the weight adjusted percentage of respondents who identified a component as “somewhat” to “very important”; the second is the weight adjusted percentage who identified that their jurisdiction had been “somewhat” to “very successful” in achieving that program element.

Component	Importance and successful achievement of program components (% important** / % successful***)*					
	Community Officials	Program Managers	Small Cities (<17,883)	Large Cities (>17,883)	Counties	Overall
<i>Tree Health</i>						
A healthy public tree population	93.2 / 80.0	97.9 / 68.2	89.8 / 76.2	97.3 / 80.0	100.0 / 50.0	94.8 / 75.8
Structured street and park tree maintenance program	93.2 / 64.1	89.6 / 52.3	95.9 / 65.0	91.9 / 59.5	76.9 / 46.2	91.9 / 59.9
<i>Program Staff</i>						
Trained staff in proper tree care	81.4 / 61.5	87.5 / 61.4	87.2 / 62.5	85.1 / 68.1	61.5 / 23.1	83.6 / 61.5
Certified arborist on staff	42.9 / 43.3	54.2 / 51.2	19.1 / 21.4	66.6 / 62.3	38.5 / 25.0	46.9 / 46.5
Technical expertise such as proper tree pruning knowledge	81.4 / 63.6	84.8 / 60.0	79.6 / 55.3	87.5 / 70.7	63.7 / 40.0	82.6 / 62.7
Staff initiative to start or promote new programs	68.2 / 51.4	72.3 / 54.8	71.4 / 44.4	69.9 / 68.3	61.6 / 0.0	69.6 / 52.7
<i>Program Services</i>						
Tree planting program	76.7 / 55.3	83.3 / 68.9	75.5 / 55.8	79.1 / 69.2	92.4 / 30.7	79.1 / 60.3
Preferred species planting lists	77.3 / 65.8	89.6 / 77.3	89.8 / 70.7	75.6 / 74.2	84.6 / 46.0	81.6 / 70.0
Riparian restoration	69.0 / 66.7	97.9 / 83.3	71.0 / 71.1	81.0 / 76.1	100.0 / 61.5	79.5 / 72.8
Managing trees for environmental benefits such as stormwater mitigation	86.4 / 55.3	91.7 / 71.1	81.6 / 53.5	94.6 / 70.7	76.9 / 38.4	88.2 / 61.1
Managing trees for wildlife habitat	70.5 / 52.6	89.4 / 72.1	75.5 / 53.5	79.4 / 69.8	69.3 / 30.7	77.0 / 59.6

* Percentages are weight adjusted proportions. Respondents meeting the description of community official were weighted by a factor of 1.338; those meeting the description of program manager were weighted by 0.662.

**“How important are each of the following items to a successful urban forestry program?”

***“How successful do you think your jurisdiction has been at each of the following items?”

Table 2.7. Importance and successful achievement of urban forestry program components by respondent position and jurisdiction type. The first value in each column is the weight adjusted percentage of respondents who identified a component as “somewhat” to “very important”; the second is the weight adjusted percentage who identified that their jurisdiction had been “somewhat” to “very successful” in achieving that program element (continued).

Component	Importance and successful achievement of program components (% important** / % successful***)*					
	Community Officials	Program Managers	Small Cities (<17,883)	Large Cities (>17,883)	Counties	Overall
<i>Resource Management</i>						
A tree inventory	65.1 / 35.1	66.7 / 43.2	70.2 / 30.8	66.2 / 44.8	46.2 / 25.0	65.7 / 38.1
Tree canopy goals	65.1 / 30.3	70.8 / 41.0	59.2 / 17.6	74.3 / 48.4	54.4 / 0.0	67.2 / 34.3
A tree board or committee	41.9 / 20.6	45.8 / 45.0	32.7 / 9.4	51.4 / 45.2	38.5 / 0.0	43.3 / 29.6
Tree preservation ordinances	79.5 / 63.2	85.4 / 85.7	77.6 / 76.2	86.5 / 78.1	69.3 / 16.6	81.5 / 41.1
An urban forest management plan	70.5 / 39.4	80.9 / 43.9	61.2 / 31.4	84.9 / 50.0	61.6 / 25.0	74.0 / 29.6
Designated program funding	65.9 / 34.3	79.2 / 47.5	69.3 / 31.5	71.6 / 51.7	69.3 / 0.0	70.6 / 39.1
<i>Educational Awareness</i>						
Community involvement	79.5 / 60.5	81.2 / 51.1	83.7 / 46.5	81.1 / 73.9	61.6 / 7.6	80.1 / 57.0
Public education on proper tree maintenance	79.5 / 37.8	83.3 / 43.6	77.6 / 31.7	81.1 / 53.3	92.4 / 0.0	80.9 / 39.8
Public awareness on the benefits of trees	79.5 / 58.3	91.7 / 52.3	79.6 / 50.0	86.5 / 63.5	84.6 / 38.4	83.8 / 56.0
<i>Additional Program Support</i>						
Active political support	67.4 / 51.4	87.5 / 53.3	57.4 / 48.8	86.5 / 60.7	69.3 / 23.1	74.6 / 52.2
Administrative support	67.4 / 60.0	89.6 / 47.6	65.9 / 52.5	82.4 / 66.2	69.3 / 0.0	75.3 / 55.4

* Percentages are weight adjusted proportions. Respondents meeting the description of community official were weighted by a factor of 1.338; those meeting the description of program manager were weighted by 0.662.

**“How important are each of the following items to a successful urban forestry program?”

***“How successful do you think your jurisdiction has been at each of the following items?”

Table 2.7. Importance and successful achievement of urban forestry program components by respondent position and jurisdiction type. The first value in each column is the weight adjusted percentage of respondents who identified a component as “somewhat” to “very important”; the second is the weight adjusted percentage who identified that their jurisdiction had been “somewhat” to “very successful” in achieving that program element (continued).

Component	Importance and successful achievement of program components (% important** / % successful***)*					
	Community Officials	Program Managers	Small Cities (<17,883)	Large Cities (>17,883)	Counties	Overall
A local tree champion to promote and support urban forestry in the community	59.1 / 37.5	68.1 / 39.5	46.9 / 30.3	69.9 / 48.3	76.9 / 9.0	62.2 / 38.2
Partnerships with local non-profits or organizations to promote community engagement	72.1 / 53.1	83.0 / 52.5	73.4 / 54.2	75.3 / 57.7	91.0 / 19.9	75.9 / 52.9

* Percentages are weight adjusted proportions. Respondents meeting the description of community official were weighted by a factor of 1.338; those meeting the description of program manager were weighted by 0.662.

**“How important are each of the following items to a successful urban forestry program?”

***“How successful do you think your jurisdiction has been at each of the following items?”

with 46.5% reporting having a certified arborist on staff. Staff initiative to promote new or existing urban forestry program was considered important by 69.6% of respondents with 52.7% reporting the success of their staff in such efforts. Such staff initiative was severely lacking in counties in particular with no respondents reporting the presence of this component in their jurisdiction.

2.6.3.3. Program Services

A tree planting program was considered important by 79.1% of respondents with 60.3% reporting having achieved a successful planting program. A planting program was of particular importance to respondents from county jurisdictions (92.4%); however, only 30.7% of these respondents indicated their jurisdiction had a successful planting program. When asked about the importance of a preferred species planting list, 81.6% of respondents indicated it was important to a successful program with 70.0% having such a list in place in their jurisdiction. Program managers (89.6%) , small cities (89.8%,) and county governments (84.6%) highlighted the importance of species planting lists to a successful program, but respondents from large cities (74.2%) reported having the most success with implementing such planting lists in their jurisdictions. Riparian restoration was also an important program component to 79.5% of respondents with 72.8% indicating that their jurisdiction had been successful in riparian restoration efforts. This was particularly true in large cities and counties with 81.0% of respondents from large municipalities and 100.0% from counties reporting its importance.

Information was also sought on the importance of managing trees for environmental benefits and wildlife habitat. A slightly larger percentage respondents (88.2%) indicated that managing for environmental benefits was important to a successful program compared to managing for wildlife habitat (77.0%). When considering jurisdiction's success in these areas, 61.1% of respondents indicated their jurisdiction successfully managed for environmental benefits such as stormwater mitigation and 59.6% reported managing for wildlife habitat.

2.6.3.4. Program Management

When considering a tree inventory, 65.7% of respondents felt it was important to a successful program with 38.1% having successfully completed a full or partial inventory. Relatively fewer respondents from small cities (30.8%) and county governments (25.0%) reported having successfully completed an inventory compared to large cities (44.8%). Information was also sought about tree canopy goals with 67.2% of respondents reporting the importance of these goals to a successful program, with 70.8% of program managers indicating the importance of such goals. However, only 34.3% of respondents indicated having set or achieved tree canopy goals in their jurisdictions, with 17.6% of respondents from small cities and none from counties having set tree canopy goals.

With regards to a tree board or committee, only 43.3% of respondents indicated that a tree board was important to a successful urban forestry program, while 29.6% reported having a tree board in their community. In general, relatively few community officials (20.6%) and respondents from small city (9.4%) and county governments (0.0%) reported successfully achieving a tree board or committee in their jurisdiction. Tree preservation ordinances were considered important by 81.5% of respondents with 41.1% reporting having achieved successful ordinances in their jurisdiction. Ordinances were of particular importance to program managers (85.4%) who also frequently reported (85.7%) their jurisdiction being successful in enacting and enforcing tree related ordinances. Relatively few respondents from county jurisdiction (16.6%) however indicated that their jurisdiction had been successful with such ordinances. A management plan was considered important to 74.0% of respondents with 29.6% indicating that they had a success management plan in place. Program managers (80.9%) and large cities (84.9%) in particular highlighted the importance of these plans; however relatively few respondents from small cities (31.4%) and counties (25.0%) reported having urban forest management plans in place in their jurisdictions.

When considering designated program funding, 70.6% of respondents said funding was important while only 39.1% reported their jurisdiction having successfully set aside such funding. Relatively fewer community officials (65.9%) indicated that designated program funding was considered important to a successful program compared to program managers (79.2%), and no respondents from county governments reported that their jurisdiction had been successful in designating funding for urban forestry programs.

2.6.3.5. Educational Awareness

Community involvement was considered to be important to an urban forestry program by 80.1% of respondents while 57.0% indicated that they had successfully achieved the involvement of the community in their program. Although 83.7% of respondents from small cities and 61.6% from counties reported on the importance of such involvement, fewer respondents (46.5% and 7.6%, respectively) from these jurisdictions indicated that they had been successful in this area. Respondents were also asked about the importance of public education on proper tree maintenance and public awareness on the benefits of trees. With regards to public education on proper tree care, 80.9% of respondents indicated that it was important while 83.8% reported that public awareness on the benefits of trees was important to a successful program. Only 39.8% of respondents reported that they had been successful with public education efforts, however, with slightly more (56.0%) reporting their success on public awareness campaigns about the benefits of trees. Respondents from large cities indicated that they had been more successful in both of these areas compared to smaller municipalities; however, no respondents from counties reported being successful in public education efforts on proper tree maintenance.

2.6.3.6. Additional Program Support

When considering the importance of active political support, 74.6% of respondents indicated that it was important to a successful program, while 52.2% indicated having achieved political support. Fewer

community officials (51.4%) rated the success of their jurisdictions in this area compared to program managers (53.3%). Additionally, only 57.4% of respondents from small cities indicated that political support was important to a successful program with 48.8% indicating they had successful political support in their jurisdictions. Relatively few respondents from counties (23.1%) reported their jurisdiction achieving political support. The importance and practice of administrative support was similarly rated with 75.3% of respondents viewing it as important and 55.4% indicating they had successful administrative support structures in their jurisdiction; however, no respondents from county governments reported having such support within their programs.

When considering a local tree “champion” who promotes and supports urban forestry in the community, 62.2% of respondents indicated this was important to a successful urban forestry program, but only 38.2% indicated having such a person in their community. Respondents from counties (76.9%) in particular indicated the importance of this role, yet just 9.0% reported success in having a tree champion in their jurisdiction. Finally, when asked about partnerships with local non-profits or organizations that support community engagement such as tree planting organizations, 75.9% of respondents indicated this was important to a successful program and 52.9% answered having successful partnerships with such organizations. Such partnerships were regarded as important by small and large municipalities and county governments alike; however, only 54.2% of respondents from small cities and 19.9% from counties indicated having successful partnerships.

2.7. Discussion

The response rate of 27.4% for this survey was low compared to similar urban forestry surveys. Comparable surveys at the state wide level obtained a response rate on average of approximately 51.0% with 22.0% (Schroeder et al. 2003) being the lowest response rate and 71.0% (Elmendorf et al. 2003) being the highest. There may be a number of reasons contributing to this low response rate such as the

time of year the survey was distributed or the types of jurisdictions targeted. Elmendorf et al. (2003) reviewed several studies which suggested that small communities and counties typically have limited or no urban forestry programs. This finding may account, in part, for the lower response rate because these jurisdictions did not see urban forestry in their purview (Grado et al. 2006). However, because the survey targeted a very specific population within a small geographic area, the responses captured are representative of the targeted population as a whole. Further adjustments were also applied to the data to ensure that proportions of the groups who responded reflected those who did not, thereby reducing non-response bias.

The findings of this study indicate that in general an urban forestry program is important to the jurisdictions in the Portland-Vancouver Metro Region. When asked to rate its importance compared to other programs and essential services offered by the city or county, however, relatively fewer respondents reported that an urban forestry program was as important as these other program. These results are consistent with similar studies that reported staff and leaders from communities of all sizes having a strong positive attitude toward community trees and agreeing that urban forest management is important (Elmendorf et al. 2003; Schroeder et al. 2003). These previous studies suggested that larger communities (<10,000) showed greater support and interest in urban forestry programs compared to smaller ones (Schroeder et al. 2003; Grado et al. 2006), whereas results of this research indicated that respondents from *both* small and large cities view urban forestry as important to their jurisdictions, and that small municipalities in the Portland-Vancouver Metro Region viewed the relative importance of urban forestry programs compared to other city programs higher than large cities or counties.

Prior to this study, little information was available regarding county perceptions of urban forestry programs in the Portland-Vancouver Metro Region. Results presented here suggest that urban forestry programs may be less important to counties compared to municipalities. Reasons for this lack of

importance could stem from inadequate knowledge about the benefits of urban trees, lack of funding sources, or a lack of demand on the part of their constituents or officials. These counties differ in their organizational structure compared with cities and may offer fewer or less stringent services related to public trees. For these reasons, urban forests may not be considered such an important resource in increasing community livability in counties. Counties may also lack the tools and resources needed to expand their urban forestry programs as they are typically not targeted by state and national urban forestry assistance programs.

When considering which program components respondents as a whole felt were most important to a successful urban forestry program, elements such as a healthy public tree population, a structured street and park tree maintenance program, managing trees for environmental benefits, and public awareness on the benefits of trees were considered important by the most number of respondents. Specific program components that were most important to community officials and program managers included: trained staff, community involvement, and public education on proper tree maintenance were important. While small, municipal government respondents indicated the above components as most important; respondents from larger cities also emphasized the importance of political support to a successful urban forestry program. Respondents from counties, on the other hand, indicated that a healthy tree population, riparian restoration, and a tree planting program were among the most important components of a successful program.

Program components that were considered important by the fewest number of respondents (indicating items of lesser importance) independent of jurisdiction size or respondent position included: a certified arborist on staff, a tree board or commission, a tree inventory, tree canopy goals, an urban forest management plan, and designated program funding. Additionally, program managers and respondents from small cities also indicated that political and administrative support was less important to a successful

program. County jurisdictions indicated similar results and including tree preservation ordinances and designated program funding as least important to respondents.

With regards to the jurisdictions' perceived success in the same program components, those items considered most important to a successful program were, in general, those that the cities and counties in the Portland-Vancouver Metro Region reported achieving higher levels of success. Such areas included: a healthy tree population, a maintenance program, managing trees for environmental benefits, tree related ordinances, a tree planting program, riparian restoration, preferred species planting lists, and trained staff. These trends were consistent across respondent position and jurisdiction type with large cities also reporting success in achieving community involvement and administrative support. In contrast, respondents reported being least successful in the areas of technical expertise, the presence of a certified arborist on staff, a tree inventory, tree canopy goals, a tree board or commission, an urban forest management plan, and designated program funding. Similar areas of low success were reported across respondent position and by respondents from municipalities. Very few respondents from counties also reported success in the areas of tree preservation ordinances, public education, administrative support, and partnerships with community organizations.

Such findings are consistent with similar studies which looked at urban forestry practices in municipalities. Several researchers have discussed the low percentage of active tree boards or commissions involved in urban forestry programs and have found evidence that the number of trained arborists and urban foresters involved in urban forestry programs are limited (Reeder and Gerhold 1993; Ricard 1994; Green et al. 1998). These same studies also provide evidence that there is a desire and need for education and technical assistance, or expertise, to support and expand community involvement in existing tree programs. Additional studies have identified policy documents such as inventories and management plans to be infrequent among municipalities, and, that of those communities which have

adopted such measures, questions have been raised about the degree of use and enforcement of these policies (Clark and Matheny 1998). Finally, designated program funding has been found to be lacking in many tree programs, yet has been listed as one of the most important elements to starting or improving tree programs (Grado et al. 2006; Stevenson et al. 2008). Researchers have provided evidence that smaller municipalities typically have less money to support public services such as urban forestry programs, thus spending and doing proportionately less than larger ones on tree management and maintenance.

The results of these analyses provide interesting insight into the perceived importance and success concerning urban forestry programs of jurisdictions in the Portland-Vancouver Metro Region. Whereas national programs, such as CARS, have established performance measures including the presence of tree related ordinances, a tree advisory board, an urban forest management plan, and professional urban forestry staff, these same program components, with the exception of ordinances, were considered of least importance by respondents in the Portland-Vancouver Metro Region. Instead, jurisdictions in the in the Portland-Vancouver Metro Region indicated that measures related to the health and maintenance of the forest resource may be of more importance to these cities and counties compared to more traditional program measures. The areas of importance to these jurisdictions have also been translated to those they have been most successful in achieving, with the available resources being directed in such capacities.

Such findings raise questions as to what urban forestry practices constitute an effective program, and whether national performance measures adequately assess the success of urban forestry program management. Several researchers have offered opinions regarding the measures of a successful urban forestry program. Dwyer et al. (2003) suggests that while urban forest management practices focused on the health of urban trees are necessary, they is not a sufficient requirement for urban forest sustainability. Several additional researchers have suggested that more comprehensive management approaches that

include broadly based measures related to forest health and diversity, resource management, and a community framework provide a more useful tool for the evaluation of urban forest management success (Wolf and Kruger 2010; Kenney et al. 2011). Although the CARS performance measures have been criticized for not including specific measures of tree health (Freilicher 2010), the performance measurement system does provide a comprehensive management framework described by Wolf and Kruger (2010) and Kenney et al. (2011) in which to judge the accomplishment and sustainability of a program.

Results of this research suggest that the importance of a more comprehensive management framework regarding the urban forest may be unknown to the city and county jurisdictions in the Portland-Vancouver Metro Region, or that such a framework does not meet the needs and goals of the communities in this geographic area. Findings from this study and others indicate that national and statewide urban and community forestry programs (which collect performance measures and provide assistance to municipal governments) may need to increase educational efforts to jurisdictions regarding the importance of the program components that they monitor, or to find new ways to assess program success. In the Portland-Vancouver Metro Region, state and national programs could also find strategies to pair the areas of importance identified by the survey with those standards set by the national government, thus creating more comprehensive management frameworks that still focus on forest health. An example could include educating managers on the importance of creating urban forest management plans and providing them with a template document that plans for the long-term health of the urban forest and offers strategies on how to sustain valued ecosystem services.

It should also be noted that no national or statewide recommendations currently exist for county governments concerning the management of the urban forest. In general, respondents from counties reported on the importance of similar program components, such as healthy tree population, riparian

restoration, and a tree planting program, as did respondent from municipalities. Because counties may lack a specific urban forestry department, such practices may be included in other program areas such as land use or environmental services. More efforts are needed on the part of national and statewide assistance programs to develop comprehensive recommendations for counties regarding their urban forest. Organizations such as the Arbor Day Foundation may also consider establishing standards, the same or similar to those it has adopted for its TCUSA program, by which counties could achieve recognition for their work in urban forestry. Furthermore, strategies to partner county governments with organizations that engage in urban forestry related activities should be increased in the Portland-Vancouver Metro Region. Several organizations (SOLVE 2013; Friends of Trees 2014) are active in the Portland-Vancouver area and assist in organizing activities such as community tree plantings. By establishing connections with such groups, county governments could simultaneously work to increase their urban tree population while alleviating the demand on county staff and building the support and engagement of the constituents that they represent in urban forestry related activities.

Furthermore, the findings of this research suggest that the establishment of regional frameworks regarding the urban forest should be explored. With the majority of officials and managers from both city and county governments in the Portland-Vancouver Metro Region sharing opinions about the importance of the urban forest and various program components and focusing their efforts in similar management areas, such collaborative networks could work to advance urban forestry efforts throughout the region. These networks could offer jurisdictions outlets to share program knowledge or seek advice and assistance from other communities that have already developed specific program components.

The *Regional Urban Forestry Strategy* offers a framework to achieve such regional collaboration. By bringing together urban forestry stakeholders from across jurisdictional boundaries in the Portland-Vancouver Metro Region, the *Regional Urban Forestry Strategy* can create a forum for discussion and

collaboration to take place. Such a forum, where jurisdictions are encouraged to share successes, best management practices, and even lessons learned, could allow the acceptance of a more comprehensive management approach to the urban forest and enable local governments to develop and pursue a shared vision throughout the region. Such efforts are already underway through the oversight of the Regional *Urban Forestry Strategy* with various forums and events bringing stakeholders together from a variety of jurisdictions throughout the region to discuss these complicated urban forestry issues. Although concrete action items or regional goals have yet to be established, such forums and the results of this research will assist in developing this regional framework.

2.8. Conclusion

This study provides interesting insight into the current trends in urban forestry practices and programs throughout the Portland-Vancouver Metro Region. The findings of this research reveal that similarities exist between respondents' attitudes toward particular urban forestry practices and the successful implementation of these practices or program components in their jurisdictions. However, those practices and program components deemed important and that the jurisdictions in the Portland-Vancouver Metro Region have successfully accomplished are not those same program components considered important by national standards. This difference raises several important questions for national and statewide urban forestry programs pertaining to the measures of a successful urban forestry program, including: 1) what urban forestry program components constitute an effective program?; 2) do traditional performance measures, under the CARS or TCUSA programs, adequately assess program success and sustainability?; and 3) does such a framework meets the needs and goals of the jurisdictions in the Portland-Vancouver Metro Region?

Assessing the current management efforts in the Portland-Vancouver Metro Region reveals that a one size fits all approach to managing the urban forest, as dictated by traditional performance measures,

may not be successful or adequate. However, herein lies a two-pronged problem. Whereas Dwyer et al. (2003) suggests that perhaps locally specific strategies that meet the needs of local populations within a regional context should be developed, questions continue as to how well such local practices are supporting adequate levels of sustainable urban forest resources on a broader scale (Elmendorf et al. 2003). While there are examples of excellence in both large and small municipalities and counties, it may be concluded that there is much room for improvement in both local and national urban forestry program management structures in establishing practices and measures important to sustainable urban forests. A more comprehensive and adaptive management approach, including an array of social, political and ecological management considerations, is needed to sustain the urban forest ecosystem. Although more research is needed to determine how national and local urban forestry priorities can be coupled to achieve healthy, sustainable urban forests, it is only through such efforts that these priorities can be achieved and programs expanded in the Portland-Vancouver Metro Region and beyond.

3. MANUSCRIPT 2: NEEDS AND BARRIERS TO URBAN TREE PROGRAMS, A PROGRAM MANAGERS' AND COMMUNITY OFFICIALS' PERSPECTIVE

3.1. Introduction

Implementing and advancing urban forestry activities is an important consideration for many communities (Grado et al. 2006). It has been well documented that a properly managed urban forest can provide a wide range of benefits and structural assets to local governments and those living in urban areas (Dwyer et al 1992; Nowak and Dwyer 2007). In fact, information about urban trees that is well understood and correctly applied can lead to a successful tree care program that is continually cost effective (Grado et al. 2006).

Although there are many jurisdictions familiar with the value of urban trees, not all are actively managing their urban forest resource (Grado et al. 2006; Stevenson et al. 2008; Zhang and Zheng 2012). Research has also shown that not all community officials have a clear and thorough understanding of the urban forest (Grado et al. 2006) and that local administrators and urban forest managers may have varying perceptions about the costs, problems, and benefits associated with urban trees (Zhang and Zheng 2012). Urban tree management can therefore be largely ineffective if tree care or the benefits that urban forests provide are not well understood or if significant differences in perception regarding its importance and management exist among officials and managers. Lack of understanding, failure to implement a program, or mistakes made in maintaining a program can incur greater costs and reduce potential benefits as well compared to programs that take steps to ensure the health, diversity, and longevity of their forest resource (Dwyer et al. 1992). Even if jurisdictions are managing their urban forest resources, ineffectiveness on the part of urban forestry managers can lead to improperly managed, stagnant programs (Grey 1978).

The lack of knowledge and experience regarding urban trees on the part of community officials and program managers leads to poorly managed urban forestry programs. Grado et al. (2006) suggest that

such a lack of understanding can be traced to information gaps on the subject or absence of educational resources (Zhang and Zheng 2012). Furthermore, an incomplete understanding of the benefits of trees and tree care practices on the part of both officials and managers can be directly reflected in the specific problems and needs of the community related to the urban forest resource, and can lead to issues such as low public support, insufficient funding, or inadequate allocation of personnel and equipment.

Regardless of the current institutional structure and knowledge levels of officials and managers, jurisdictions will vary in their resources, barriers, and needs related to their urban forest. For the purposes of this research, barriers to program management can be considered obstacles at the policy or implementation level that inhibit effective management of the urban forest resource. Examples of common barriers to urban forest management include insufficient funding, poor urban forest condition, or lack of political support. Likewise, needs, or requirements essential or important to successful management, also exist within program management and could include tools for community outreach, training in best management practices, or increased citizen demand. These hindrances to program management, reflected in both barriers and needs, can occur at both the policy or implementation level, and can inhibit effective management of the urban forest resource.

Improper management on the part of one or multiple jurisdictions can also affect an entire region. Because the urban forest is a collective resource, spanning multiple governmental jurisdictions, management and decision-making on the part of an individual jurisdiction may inhibit or enable the successful management of other jurisdictions or the region as a whole. Although management of the urban forest may end at one jurisdictional boundary, a better understanding of the hindrances to urban forest management at the local level is critical to overcome these issues and advance urban forestry regionally.

Identifying barriers and needs to urban forestry program management was recently recognized as a national priority by the U.S. Forest Service and the Vibrant Cities & Urban Forests Task Force (2011). To address this issue, the Task Force put forth several recommendations to make cities more livable and ecologically sustainable by advancing urban forestry and urban natural resource management in the U.S. Specifically, the Task Force recommended the creation of Urban Regional Natural Resource Plans. The purpose of these multi-jurisdictional plans is to coordinate urban natural resource planning across both public and private land ownerships and to support interagency and regional coordination around urban forestry. This recommendation also called for the identification of needs and removal of institutional barriers in individual jurisdictions and regionally so that such natural resource plans could be more successfully implemented.

In response to this recommendation, the *Portland-Vancouver Metropolitan Regional Urban Forestry Strategy (Regional Urban Forestry Strategy)* partnership was created. This partnership represents state and local governments as well as regional organizations in the Portland, Oregon and Vancouver, Washington metropolitan area (hereafter referred to as the Portland-Vancouver Metro Region), whose goal is to advance urban forestry on a regional level. To accomplish that goal, one objective of the *Regional Urban Forestry Strategy* was to complete a needs assessment survey and identify the specific barriers and needs to urban forestry program management of individual jurisdictions and the Portland-Vancouver Metro Region as a whole. Understanding such obstacles will ensure that greater regional collaboration around the urban forest resource can take place and will increase the success of the *Regional Urban Forestry Strategy*. This research reports on this needs assessment and contributes to the larger strategy.

This thesis summarizes municipal and county governments' interest implementing or advancing urban forestry programs in the Portland-Vancouver Metro Region. Furthermore, this thesis identifies the

specific barriers and needs of these jurisdictions related to urban forestry to assess the obstacles to implementing or advancing urban forestry programs in the region. In addition, this thesis explores how community officials and program managers and jurisdictions of different size and type differ in their perception of these barriers and needs, and if future priorities related to urban tree management align with these obstacles.

3.2. Literature Review

Individual jurisdictions vary with regard to their urban forest resource and progress in developing urban forestry programs. In that regard, problems and associated needs relating to urban trees are unique to each jurisdiction depending on its size and current institutional structure (Ries et al. 2007 and Schroeder et al. 2003). Attitudes of program managers and community officials will also vary by jurisdiction and will influence the jurisdiction's interest in expanding urban forestry programs and might help to explain some of the obstacles to program management. In that regard, several surveys have recently been conducted at the statewide level that attempt to synthesize the status, needs, and barriers of individual community tree programs in the U.S.

In Mississippi, a statewide survey was conducted to identify communities' interest in expanding urban forestry as well as which factors are considered a hindrance, or barrier, in adopting or advancing an urban or community forestry programs (Grado et al. 2006). The researchers found that in general, most communities showed a need for and interest in urban forestry programs, but that eight common program management barriers such as information, funding, technical expertise, and administrative support existed in these communities. This study also determined that a lack of funding was considered the greatest barrier to implementing or advancing a program particularly for communities with a population of less than 2,000 people. However, in comparing communities of all sizes, staffing limitations represented one of the largest hindrances for cities in Mississippi.

In Pennsylvania, focus groups were asked what was needed and what the largest difficulties were in completing urban forestry practices (Elmendorf et al. 2003). Results indicated that a volunteer citizen tree advisory board, outreach and education, an urban forest management plan, and professional staff were cited as the greatest needs, while political support and citizen involvement were the largest difficulties to advancing urban forestry program management. Stevenson et al. (2008) also surveyed municipal officials and program administrators in Pennsylvania and found that insufficient funding, lack of personnel, and low public support represented the largest barriers to advancing urban forestry programs and was regarded as equally important by both types of survey respondents.

Similar studies were conducted across the Midwestern United States in both Illinois and Missouri (Schroeder et al. 2003; Treiman and Gartner 2004). These studies focused on the attitudes of local officials toward urban trees and sought to determine which issues found to be most pressing regarding the management of urban trees. Response indicated that managers from communities of all sizes (ranging from less than 2,500 to greater than 100,000) have a strong positive attitude toward and interest in urban forestry (Schroeder et al. 2003), but that municipalities often have a reactive approach to caring for their urban forest (Treiman and Gartner 2004). The researchers suggest that the lack of proactive management can be directly attributed to an absence of basic information on tree care. These communities also often lack a public tree ordinance or urban forest management plan and allocate insufficient resources to adequately manage and maintain public trees.

Several urban forestry surveys have also been conducted in both Oregon and Washington collecting information about urban tree programs (Ries et al. 2007; PSU 2009; Wolf 2007). Multiple surveys carried out by the Oregon Department of Forestry, Urban and Community Forestry Program have assisted in determining the extent of the urban forest resource and the perceived needs of Oregon communities for management assistance (Reichenback 1992; Ries et al. 2007). Results indicate that cities

in Oregon have made significant gains in urban forest management over the past two decades; however, 30% of cities reported that they expected programs to be reduced in size and scope, rather than expanded, due to budgeting issues (Ries et al. 2006). Furthermore, survey findings revealed that tree/infrastructure conflicts and safety concerns such as hazard trees or root problems and tree preservation and protection are important issues in Oregon cities.

In Washington, surveys conducted by the Washington Department of Natural Resources and the University of Washington revealed that organizational, administrative, and technical capacity for managing urban forests is low (Studer 2003; Wolf 2007) and that the majority of jurisdictions lack clear goals and objectives for tree care (Studer 2003). Additional statewide assessments suggest that Washington cities may have inadequate or unknowledgeable urban forestry staff (Dugan 2004) and that very few communities have up-to-date tree inventories (Wolf 2007). Local managers also noted the poor condition of the urban forest and the lack of best management practices for preserving and maintaining trees as significant barriers to program management (Corletta 2001).

A program assessment was also recently conducted in the Portland-Vancouver Metro Region specifically (PSU 2009). Researchers identified that only a relatively small number of cities and counties have made a strategic investment in their urban forest by implementing such program elements as an urban forest management plan (PSU 2009). These results may indicate that inconsistent policy, funding, and staffing levels exist in these communities with counties lacking the most resources and community interest.

3.3. Knowledge Gaps

Studies such as these are foundational to identifying and understanding perceived interest, needs, and barriers to urban forestry program management in both the Pacific Northwest and around the country. Identifying these issues is important so that resources and assistance, whether federal, state, or local, can

be directed toward management to assist in overcoming these obstacles in individual jurisdictions and across a geographic region. Similarly, information about the jurisdictions' future priorities relating to urban forestry is also needed to ensure that they align with the perceived needs or barriers of the community and to ensure that assistance is directed accordingly.

While much research has been done to characterize the urban forest resource and the attitudes of municipal officials toward their community tree programs, additional research is still needed on several fronts. First, although many aspects of municipal officials' attitudes have been explored, most surveys have primarily assessed the positive aspects or benefits of urban forestry and have not evaluated the problems and needs of its management (Zheng and Zhang 2012). Furthermore, it is not clear whether different types of leaders and employees in city and county governments differ with respect to their perceptions of urban tree programs (Zheng and Zhang 2012). Although much research has focused on the opinions of municipal officials, such as mayors, there is a need to explore the differences in attitude between these officials and those managers actually implementing programs.

Many studies have also focused their attention on municipal governments rather than addressing county or regional tree programs. Although urban forests are typically the responsibility of city governments, counties also have issues and needs related to trees on unincorporated land. It is likely that differences may exist in the needs and priorities related to county urban trees because these areas are often more rural or operate between urban municipal boundaries and have a different organizational structure. Because urban forests do not adhere to strict political boundaries, research is likewise needed on a regional scale to address larger problems and concerns about the urban forest resource across jurisdictional boundaries. More work is required to identify these issues as well as establish collaborative community-wide structures to address regional needs and barriers. This research aims to contribute to the literature from these aspects.

3.4. Research Objectives

Additional research is needed to assess current urban forestry program management in both city and county jurisdictions in the Portland-Vancouver Metro Region. This research will identify the specific needs and barriers of these jurisdictions and the region as a whole and align them with the anticipated future priorities of these communities. In addition, this study will explore the differences in perceived interest, obstacles, and future priorities between jurisdictions of different sizes and types of government as well as between community officials and program managers.

In that regard, the specific objectives of this research are to:

1. Assess local officials and managers' perception and interest in urban forest management in the Portland-Vancouver Metro Region, and determine if there are differences in attitude between the two positions.
2. Identify reported needs and barriers to implementing or advancing urban forestry program management within the region, and identify future program priorities to address those obstacles.
3. Examine differences in attitude and perceptions of urban forest program management between jurisdiction size or county level administration.

This type of detailed information is currently unknown for the jurisdictions within the Portland-Vancouver Metro Region. In addition, collecting this information is a primary goal of the *Regional Urban Forestry Strategy* and will be used to identify approaches to address these obstacles by the larger strategy. This information can be further distributed to and used by government agencies, communities, urban forestry professionals, and the public in the Portland-Vancouver area to enable the initiation and/or promotion of urban forestry activities and programs and to move urban forestry efforts forward collectively as a region (Grado et al. 2006).

3.5. Methods

A literature review was conducted to synthesize existing, applicable methods and information to develop a survey questionnaire (Grado et al. 2006). Information collected included common barriers and needs of jurisdictions to implement or advance urban forestry and priorities directed towards future programs or management components. The survey was then reviewed and edited by the Urban and Community Forestry program managers for the states of Oregon and Washington to better reflect the specific barriers, needs, and priorities of the jurisdictions that they serve. Upon completion of this internal review, three in-person preliminary interviews were conducted with urban forestry stakeholders from the Portland-Vancouver Metro Region to inform and aid in the development of the survey questionnaire. Information generated from the literature review was presented to these stakeholders who were asked to prioritize or add additional information, such as specific needs or barriers, representative of their jurisdictions' urban forestry programs. These stakeholders were selected based on their involvement in the management of the urban forest and represented key officials and managers from both city and county governments.

Stakeholders selected for the preliminary interviews were reflective of the targeted population of the survey questionnaire. The population targeted for this survey consisted of two designated groups: community officials and program managers. Community officials represent key members of city and county governments including mayors, city council members, county commissioners, and city or county administrators. Likewise, program managers include staff level employees responsible for tree care in public works, parks and recreation, land use planning, and community development. Because formal surveys qualify as human subjects' research under the Code of Federal Regulations by the U.S. Department of Health and Human Services, approval was obtained from Oregon State University,

Institutional Review Board prior to contacting these individuals and distributing the survey (Institutional Review Board 2014).

The survey was sent to a total of 350 community officials and program managers in 30 city and four county governments within the Portland-Vancouver Metro Region (see Table 1, pg. 13 for a complete list). Survey participants were identified by ODF and WADNR for the purposes of the *Regional Urban Forestry Strategy* and represent those with the potential to initiate, promote, and implement urban forestry programs and projects within their jurisdictions. After identifying the appropriate participants, information including names, email addresses, and mailing addresses that were accessible through the public domain were collected (Grado et al. 2006). If such information was not available on the internet, jurisdictions were contacted by telephone prior to sending the survey to identify the appropriate individuals to receive the survey.

The survey questionnaire consisted of nine-pages and contained 23 questions (Appendix A) applicable to both types of identified participants (community officials and program managers) and the two types of jurisdictions (city and county). Prior to sending the survey, an introductory postcard was sent to all participants announcing the forthcoming survey. The formal survey process (Dillman 2000) consisted of emailing the web link and private access code to the survey to participants, and then one week later sending a reminder email with the same access information. Electronic surveys were distributed using Qualtrics, an online survey distribution tool. Surveys were accompanied by a cover letter (Appendix B) explaining confidentiality, project goals, and end products. The on-line survey portal also included information about the study, research partners, and implied consent and provided participants with a way to opt-out of the survey if so desired.

Approximately three weeks after the electronic mailing of the survey, an additional, print survey and cover letter were mailed to participants who had not yet responded to the survey. The cover letter also

included a web link and private access code private for the online survey if participants still wished to participate in that manner. A final notification email was sent to remaining participants approximately 10 days after mailing the print copy. Survey responses were tabulated and analyzed upon return (IBM Corp. 2012).

A copy of the survey is included in Appendix A. The survey included questions regarding the following aspects: 1) the importance of urban forestry to jurisdictions; 2) jurisdictions' interest in implementing or expanding urban forestry programs; 3) the importance of program elements and perceived success in achieving those elements; 4) perceived needs and barriers to urban forestry program management; 5) future priorities relating to the urban forest; 6) public perception of urban forestry; and 7) the desired outcomes of the *Regional Urban Forestry Strategy*.

For this study, descriptive statistics were computed for the data set and frequency tables were analyzed for trends in response and program obstacles and priorities and to make comparisons across respondent position or jurisdiction type (Elmendorf et al. 2003). No formal statistical hypothesis tests were conducted due to small sample sizes. Here, the results from only those questions pertaining to jurisdictions' interest in implementing or expanding urban forestry programs and the perceived needs, barriers, and priorities relating to urban forestry program management in the Portland-Vancouver Metro Region are summarized.

3.6. Results

3.6.1. Response Rate

A total of 350 community officials and program managers from 30 cities and four counties represented the survey population. Of these 350, 234 met the position description of community official and 116 that of a program manager. Redistributed according to city population/jurisdiction level, 134 in the survey population represented small cities with fewer than 17,883 inhabitants (median population size

for cities), 173 from large cities with population greater than 17,883, and 43 represented county governments. All surveys were successfully delivered. Table 3.1 lists the response details comparing the sample population to the target population.

A total of 96 surveys were returned for an overall response rate of 27.4%. The response rate for both community officials and program managers, individually, was 13.7%. The response rate for small cities was 9.4%; for large cities, it was 15.4%; and for counties, 2.6% (Table 3.2). Though response rates were lower than expected, those who did respond represented the majority of cities and counties in the Portland-Vancouver Metro Region (Table 3.1 and Table 3.2).

Table 3.1. Details of the sample population compared to the total population

Jurisdiction Type	Sample Population, count (% of sample population)			Target Population, count (% of target population)		
	Position			Position		
	Community Officials	Program Managers	Total	Community Officials	Program Managers	Total
Small City (less than 17,883 pop.)	20 (20.8)	13 (13.5)	33 (34.4)	104 (29.7)	30 (8.6)	134 (38.3)
Large City (greater than 17,883 pop.)	24 (25.0)	30 (31.3)	54 (56.3)	109 (31.1)	64 (18.3)	173 (49.4)
County	4 (4.2)	5 (5.2)	9 (9.4)	21 (6.0)	22 (6.3)	43 (12.3)
Total	48 (50.0)	48 (50.0)	96 (100.0)	234 (66.9)	116 (33.1)	350 (100.0)

Table 3.2. Survey response rates. Cells are counts and percentages (of row total) of the sample population compared to the target population

Jurisdiction Type	Position		Total
	Community Officials	Program Managers	
Small City (less than 17,883 pop.)	20 (5.7)	13 (3.7)	33 (9.4)
Large City (greater than 17,883 pop.)	24 (6.9)	30 (8.6)	54 (15.4)
County	4 (1.1)	5 (1.4)	9 (2.6)
Total	48 (13.7)	48 (13.7)	96 (27.4)

Chi-squared statistics were used to test if the distribution of the sampled population across jurisdiction type or position differed between respondents and non-respondents (Vaske 2008). Results indicated that there was strong evidence that the distribution across position differed between respondents and non-respondents ($\chi^2=16.41_{df=1}$, $p<.001$); however, there was no evidence that the distribution across jurisdiction type differed between respondents and non-respondents ($\chi^2=2.69_{df=2}$, $p=0.261$) (Table 3.3).

Table 3.3. Chi-squared comparison of respondents and non-respondents by known position and jurisdiction type. First value in each table entry is the number of participants who responded or did not respond (out of the row total); the second is the percentage of the number out of the row total

Position, count (% of row total)						
Responded	Community Officials	Program Managers	Total	χ^2 value (df=1)	p-value	
Yes	48 (50.0)	48 (50.0)	96	16.41	<0.001	
No	186 (73.0)	68 (27.0)	254			
Total	234 (66.9)	116 (33.1)	350			
Jurisdiction Type, count (% of row total)						
Responded	Small City (less than 17,883 pop.)	Large City (greater than 17,883 pop.)	County	Total	χ^2 value (df=2)	p-value
Yes	33 (34.3)	54 (56.3)	9 (9.4)	96	2.69	0.261
No	101 (39.8)	119 (46.9)	34 (13.4)	254		
Total	134 (38.3)	173 (49.4)	44 (12.6)	350		

The response rate for the survey was low, and there were substantial differences between the respondents of the mail survey and the non-response check. To help alleviate any biases caused by possible differences between the non-respondents and respondents, the demographics (jurisdiction type and respondent position) of respondents in the sample population compared to the known demographics of the target population were explored (Table 3.3). To account for the fact that community officials responded much less than expected in the sample compared to the target population (Table 3.3), data were

weighted based on respondent position (Vaske 2008). The non-response weights were calculated by dividing the expected proportion in each position from the target population by the observed proportion in the sample (Vaske 2008) (Table 3.4). When using non-response weighting, a group that is underrepresented in the sample is given a higher weight, and overrepresented groups are given lower weights. For this research, because community officials responded less than expected each case from a community official is multiplied by 1.338 in the analysis based while the over-represented group, program managers, is multiplied by 0.662. (See Manuscript 1, pg. 32 for detailed information on how the weighted percentages below were computed.)

Table 3.4. The weighting factor applied to data after taking the proportion of the target population divided by the proportion of the sample population across respondent position

Position	Population proportion	Sample proportion	Weighting factor (population / sample)
Community Official	0.67	0.50	1.338
Program manager	0.33	0.50	0.662

3.6.2. Interest in Expanding Urban Forestry Programs

Information was collected on the respondent's interest in expanding local urban forestry projects and programs of jurisdictions in the Portland-Vancouver Metro Region. The survey asked respondents to rate their jurisdiction's interest on a scale from 1 to 5, where 1 indicated "not very interested" and 5 indicated "very interested". The scale was collapsed to three categories of "not interested", "neutral", and "interested". Table 3.5 shows the weight adjusted percentages (instead of the actual sample percentages) who specified an interest in expanding urban forestry programs. The unweighted, or "actual", number of responses is reported in Table B-3 in Appendix B.

After applying the appropriate weight adjustment, results indicate that 62.3% of respondents felt that their jurisdiction was somewhat or very interested in expanding urban forestry programs; whereas,

27.6% tended to be uninterested. When looking at response by respondent position, 49.4% of community officials and 66.9% of program managers indicated that their community was interested in expanding urban forestry projects and programs. When disaggregating data by jurisdiction size, the data suggested that municipal jurisdictions, including both small and large cities, are more interested in implementing or advancing urban forestry compared to counties; 62.1% of respondents from small cities (population less than 17,883) and 69.8% from large cities (population greater than 17,883), indicated an interest in expanding their urban forestry programs. However, only 42.5% of respondents in counties felt that their county governments were interested in developing these programs.

Table 3.5. Interest in urban forestry programs. The value in each table entry is the weighted percentages of respondents who identified an interest in implementing or expanding an urban forestry program in their jurisdiction.

Jurisdiction Type	Position	Interest (%**)*		
		Not interested	Neutral	Interested
Small City (<17,88)	Community Official	25.0	20.0	55.0
	Program Manger	30.8	0.0	69.2
Large City (>17,883)	Community Official	27.3	4.5	68.2
	Program Manager	17.9	10.7	71.4
County	Community Official	75.0	0.0	25.0
	Program Manager	20.0	20.0	60.0
Total		27.6	10.2	62.3

* Percentages are weight adjusted proportions. Respondents meeting the description of community official were weighted by a factor of 1.338; those meeting the description of program manager were weighted by 0.662.

**“How interested is your jurisdiction in expanding local urban and community forestry projects and programs?”

3.6.3. Urban Forestry Program Needs

To help the *Regional Urban Forestry Strategy* target its assistance to local jurisdictions in the Portland-Vancouver Metro Region, the survey sought information regarding management needs to make urban forestry efforts more successful. A list of ten common management needs was generated from the literature, and respondents were asked to identify the three greatest needs of their jurisdictions.

Respondents were also given a chance to generate and identify three additional needs. No additional needs of note were provided. Those respondents who did not answer the question were removed from the analysis. Figure 3.1 through Figure 3.3 display the weighted proportions of reported needs of all respondents as well as across position and jurisdiction type. The unweighted, or “actual”, number of responses is reported in Table B-4 in Appendix B.

Results indicated that 38.5% of respondents considered increased or sustainable funding to be the greatest need to advance current urban forestry efforts. Increased political support (19.6%) and tools for community outreach and education (11.1%) also ranked as the greatest needs of jurisdictions in the Portland-Vancouver Metro Region. These results are consistent with other urban forestry related surveys which identified funding issues as a common hindrance to urban forestry program management (Grado et al. 2006; Stevenson et al. 2008); however, relatively fewer identified the need for increased political support (Elmendorf et al. 2003).

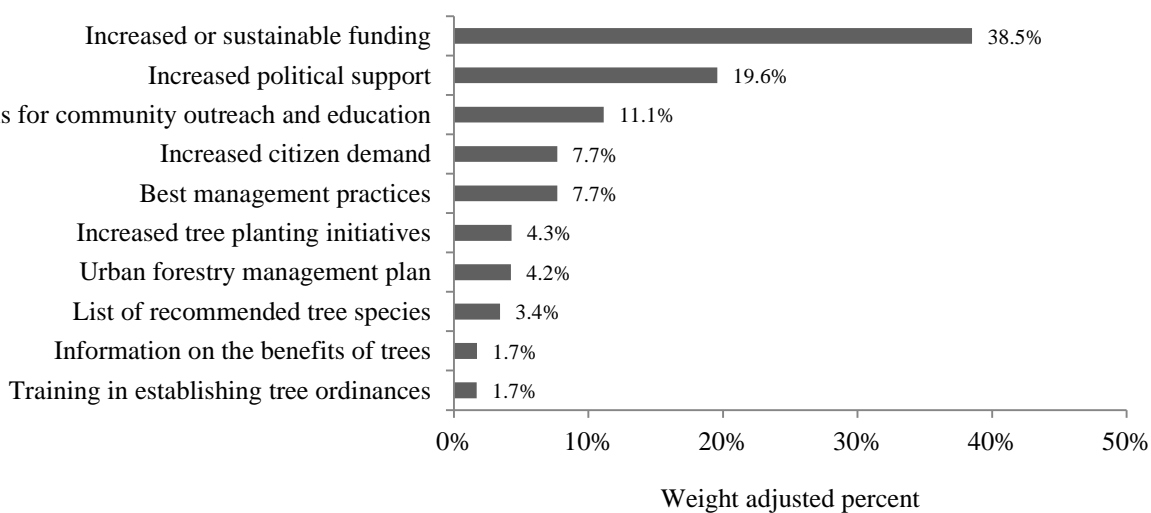


Figure 3.1. Greatest urban forestry needs of jurisdictions in the Portland-Vancouver Metro Region

Classifying data by respondent position, 47.2% of community officials indicated that increased or sustainable funding is the greatest need of their jurisdiction (Figure 3.2). Several community leaders

(13.9%) also indicated that tools for community outreach and education were needed within their respective jurisdictions. In contrast, 37.8% program managers answered that increased political support represented the largest need of their city or county, followed by the need for increased or sustainable funding (11.1%). Such findings suggest that while community officials ranked their own support of urban forestry programs as a relatively low need, program managers may feel that urban forestry programs are not being supported by their leaders.

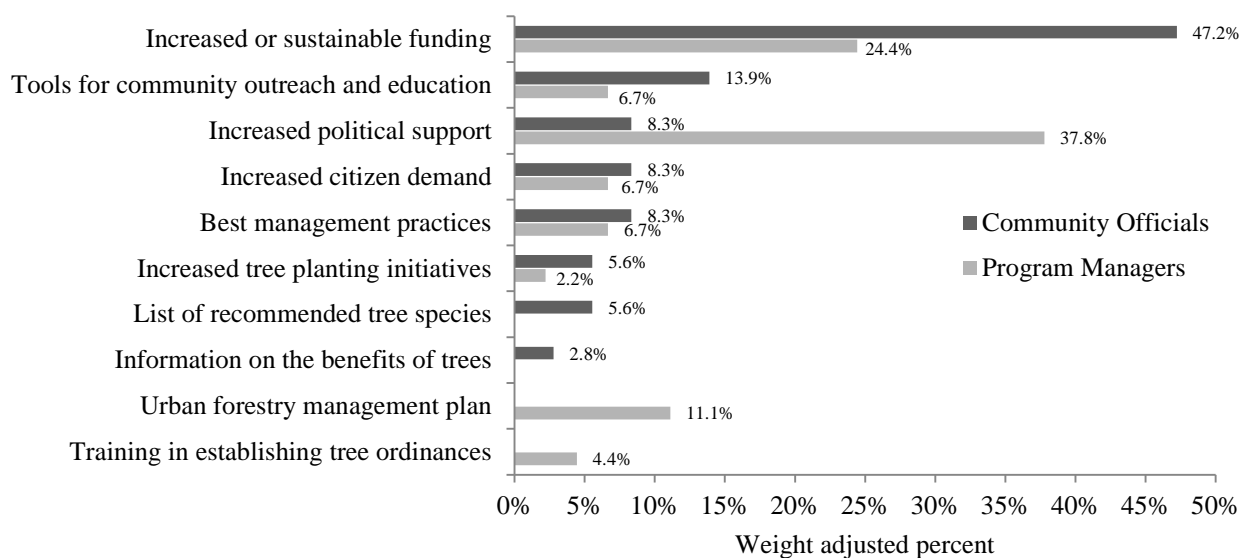


Figure 3.2. Greatest urban forestry needs of jurisdictions in the Portland-Vancouver Metro Region across respondent position

Disaggregating data by jurisdiction type revealed similar trends with 31.3% of respondents from small cities and 43.9% from large cities indicating that increased or sustainable funding was the greatest need in their jurisdictions. When considering the reported need of increased political support across all three jurisdiction types, there appears to be a difference suggesting that the need for increased political support increases with jurisdiction size. For example, 60.8% of respondents from county jurisdictions

indicated that their greatest need was increased political support, whereas 20.1% of respondents from large cities and only 6.9% from small cities reported the need for increased political support.

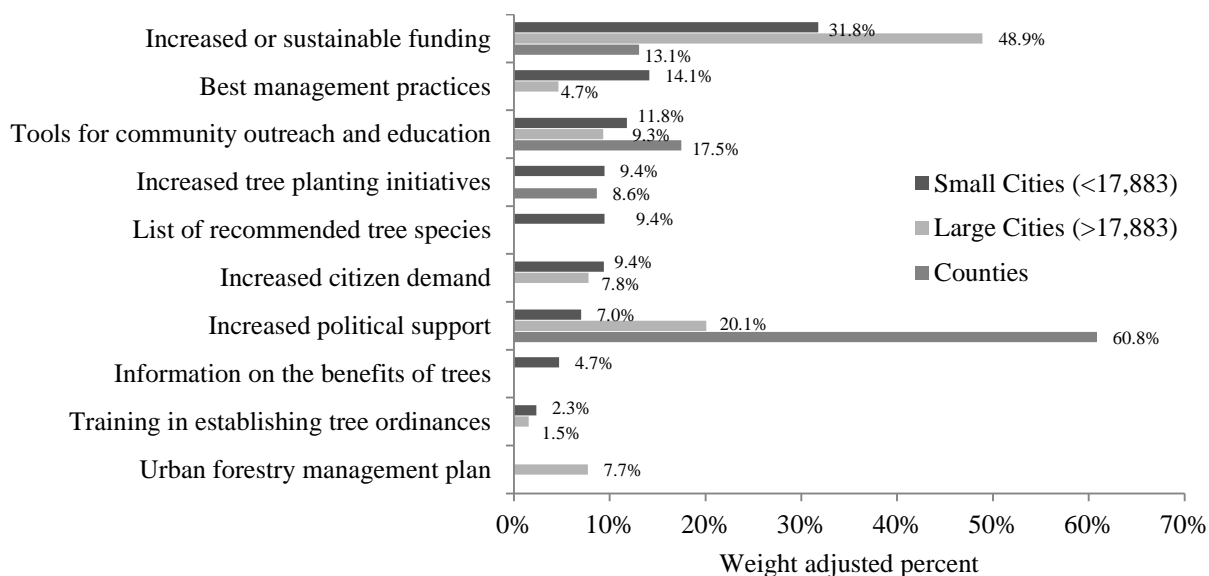


Figure 3.3. Greatest urban forestry needs of jurisdictions in the Portland-Vancouver Metro Region across jurisdiction type

3.6.4. Urban Forestry Program Barriers

In addition to assessing the management needs of jurisdictions in the Portland-Vancouver Metro Region, this research also examined the factors that jurisdictions consider a barrier, or hindrance, in adopting or advancing urban forestry programs. A list of ten barriers was presented to respondents who were asked to identify the three largest barriers to urban forestry program management in their jurisdiction. Respondents were also given a chance to generate and identify three additional barriers; however, no additional important barriers were provided. Figure 3.4 through Figure 3.6 display the adjusted counts of reported barriers of all respondents as well as across position and jurisdiction type.

Those respondents who did not answer the question were removed from the analysis. The unweighted, or “actual”, number of responses is reported in Table B-5 in Appendix B.

The most frequently reported barrier by 41.4% of respondents was insufficient funding regardless of respondent position or jurisdiction type. The next most frequently mentioned barriers were low public support and interest (14.0%) and a history of conflicts, such as too strict regulations, surrounding urban trees (12.4%) and lack of political support (11.5%). Lack of funding was also identified as the most important barrier to urban forestry program management in Mississippi and Pennsylvania studies, independently (Grado et al. 2006; Stevenson et al. 2008). Ries et al. (2007) revealed that in many cities, regardless of their size, there were fiscal constraints at the local level and lack of funding support for urban tree programs. Such issues as low public and political support and a history of conflicts are reflected by additional statewide assessments. These assessments specifically identified a history of problems and tree conflicts such as hazard trees and root problems as management concerns of municipalities in Oregon and Illinois (Schroeder et al. 2003; Ries et al. 2007).

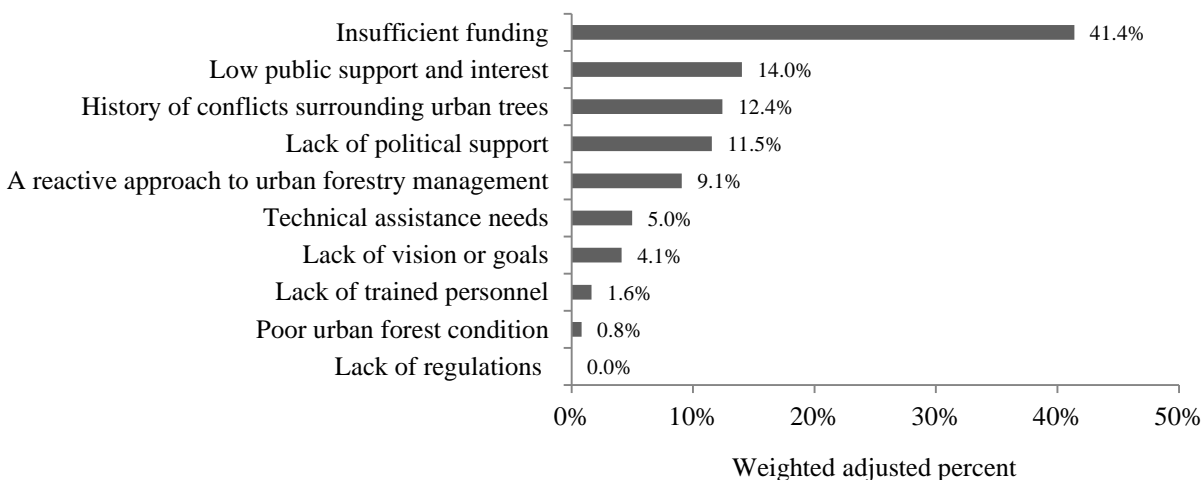


Figure 3.4. Largest barriers to urban forestry program management in the Portland-Vancouver Metro Region

Considering respondent position, 51.4% of community officials and 25.5% of program managers also ranked insufficient funding as the largest barrier to advancing urban forestry program management in their jurisdiction. A history of conflict surrounding urban trees was also ranked a large barrier by 16.2% of community officials followed by low public support and interest (8.1%), lack of political support (8.1%), and technical assistance needs (8.1%). In contrast, 23.4% of program managers indicated that a lack of political support was the largest barrier to urban forestry program management in their jurisdiction followed by a lack of political support (17.0%) and a reactive approach to management (14.9%).

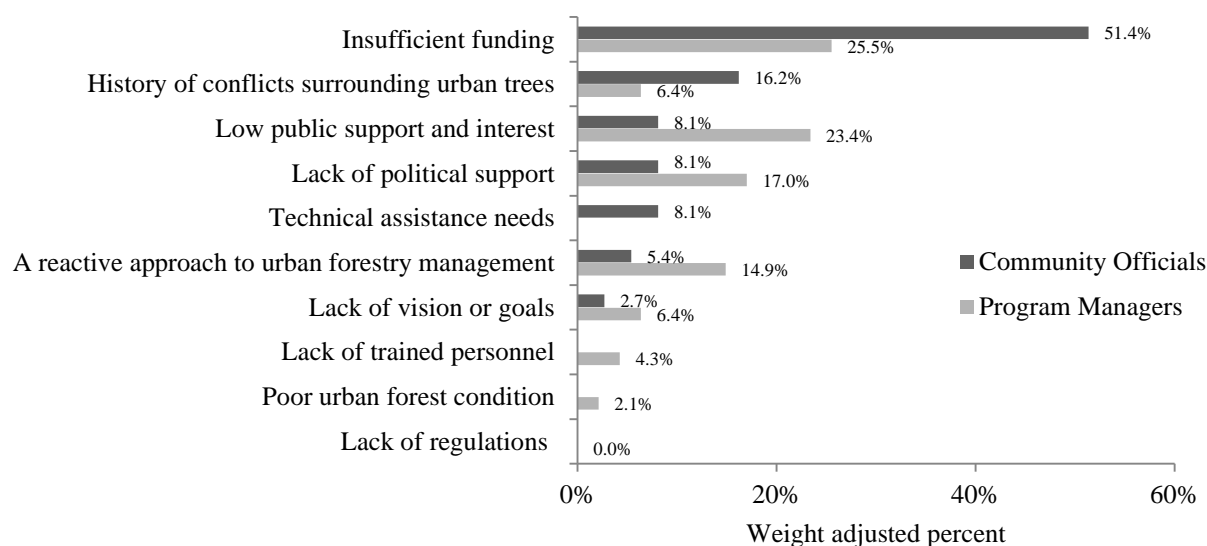


Figure 3.5. Largest barriers to urban forestry program management in the Portland-Vancouver Metro Region across position

Breaking down response data by jurisdiction type, 33.4% of respondents from small cities and 51.6% from large cities identified insufficient funding as the largest barrier in their jurisdiction, with relatively more respondents from large cities answering this way. However, 58.3% of respondents from counties indicated the lack of political support was the largest barrier. Low public support was also ranked as the largest barrier to urban forestry program management by several respondents from small

(23.7%) and large cities (10.6%); however, no respondents from county jurisdictions indicated that public support was a barrier to urban forestry program management within their jurisdictions. This data reveals a trend that suggests that as community size decreases, a lack of public support increases as a barrier to urban forestry program management.

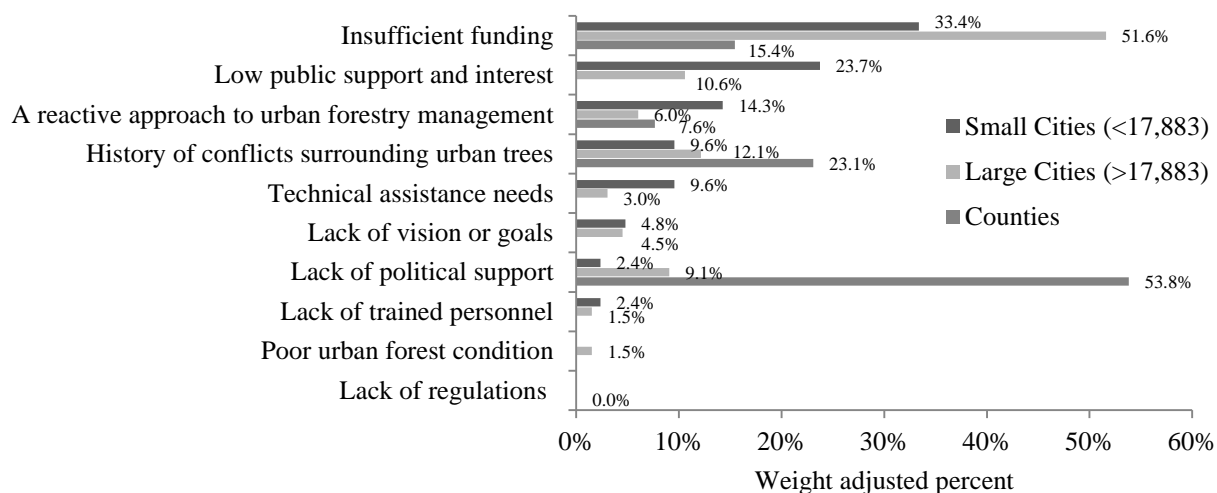


Figure 3.6. Largest barriers to urban forestry program management in the Portland-Vancouver Metro Region across jurisdiction type

3.6.5. Urban Forestry Program Future Priorities

Finally, future management priorities were assessed to see if priorities aligned with perceived needs and barriers. Respondents were also given a chance to list and identify three additional future priorities in their respective jurisdictions. No additional priorities of significance were provided. Figure 3.7 through Figure 3.9 display the adjusted counts of reported future priorities of all respondents as well as across position and jurisdiction type. Those respondents who did not answer the question were removed from the analysis. The unweighted, or “actual”, number of responses is reported in Table B-6 in Appendix B.

After applying the appropriate weight adjustment, the majority of respondents (29.6%) indicated that increased community education on the benefits of urban forestry was the highest future priority for a jurisdiction to complete. The creation or revision of an urban forest management plan (17.7%) and the establishment or revision of tree related ordinances (15.9%) also ranked high among the remaining respondents. These future priorities suggest that information about urban trees is not currently fully understood within the jurisdictions in the Portland-Vancouver Metro Region on the part of their residents or community officials. However, these priorities reveal that jurisdictions see the need to plan for the future management of the forest resource and increase its significance with their communities by educating residents on the benefits derived from urban trees.

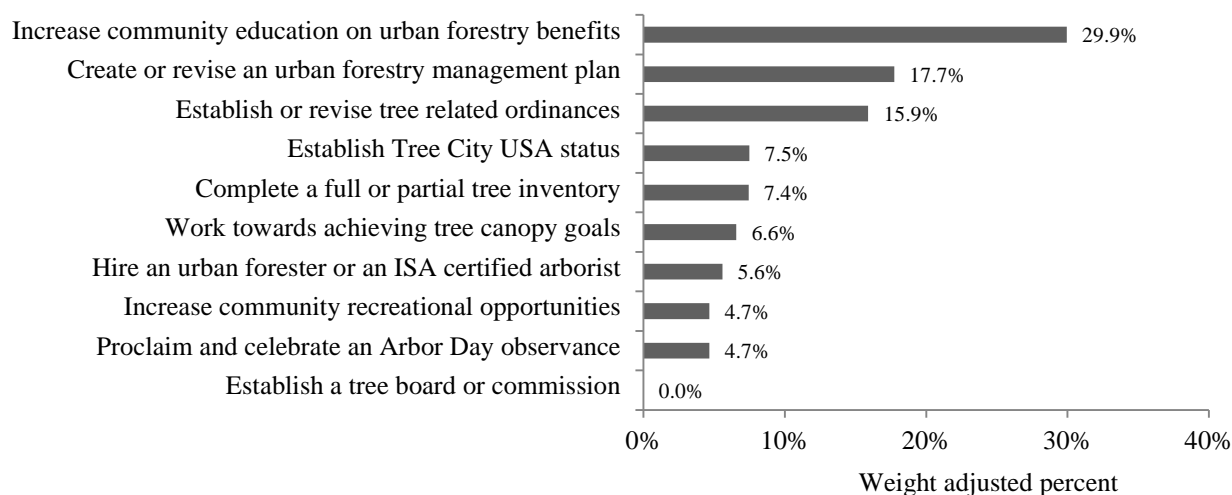


Figure 3.7. Highest priorities for urban forestry program management in the Portland-Vancouver Metro Region

When considering response across respondent position, the data showed similarities to the total population with 36.4% of community leaders indicating their jurisdictions highest future priority was

increased community education on urban forestry benefits followed by 18.2% indicating ordinances and 15.2% the creation or revision of an urban forest management plan. Program managers differed slightly and were more spread in their response with 22.0% responding that the creation or revision of an urban forest management plan was the highest priority for their jurisdiction. Increased community education on urban forestry benefits (19.5%) and the completion of a full or partial tree inventory (14.6%) also ranked high for program managers in the Portland-Vancouver Metro Region.

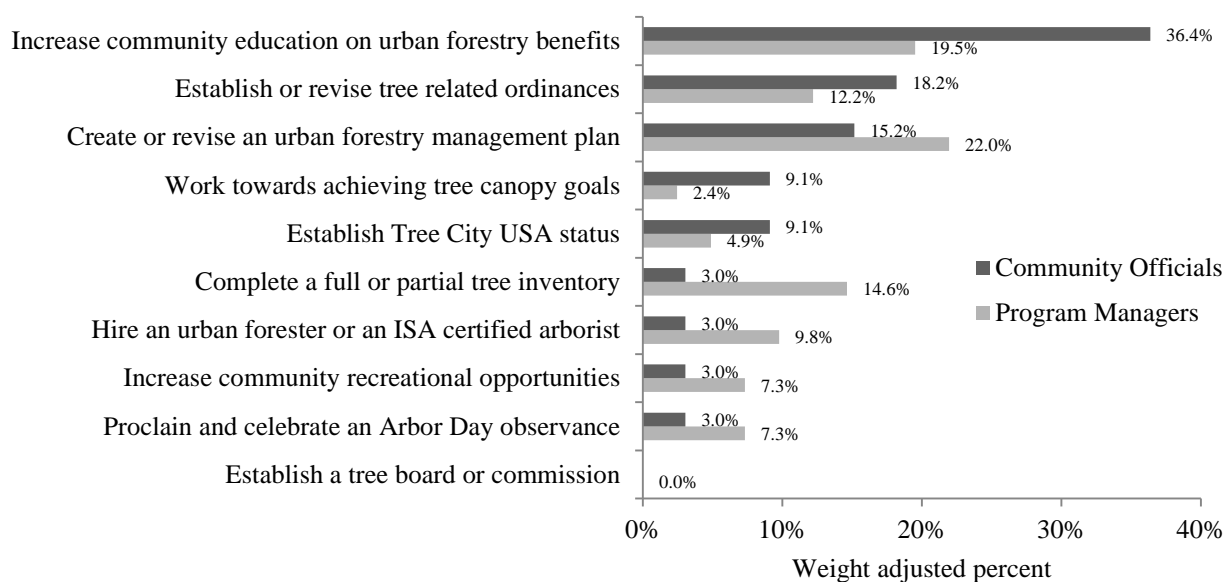


Figure 3.8. Highest priorities for urban forestry program management in the Portland-Vancouver Metro Region across position

Responses classified by jurisdiction type suggested similar patterns as those in the total sample with 33.3% of respondents from small cities, 23.8% from large cities, and 55.6% of respondents from counties all indicating that their jurisdictions highest priority was to increase community education on urban forestry benefits. Several respondents from both small (17.9%) and large cities (18.6%) also ranked

the creation or revision of an urban forest management plan and the establishment or revision of tree related ordinances (15.4% and 18.6%, respectively) as the highest priority in their respective jurisdictions. Respondents from county jurisdictions (22.3%) also ranked working towards establishing tree canopy goals highly.

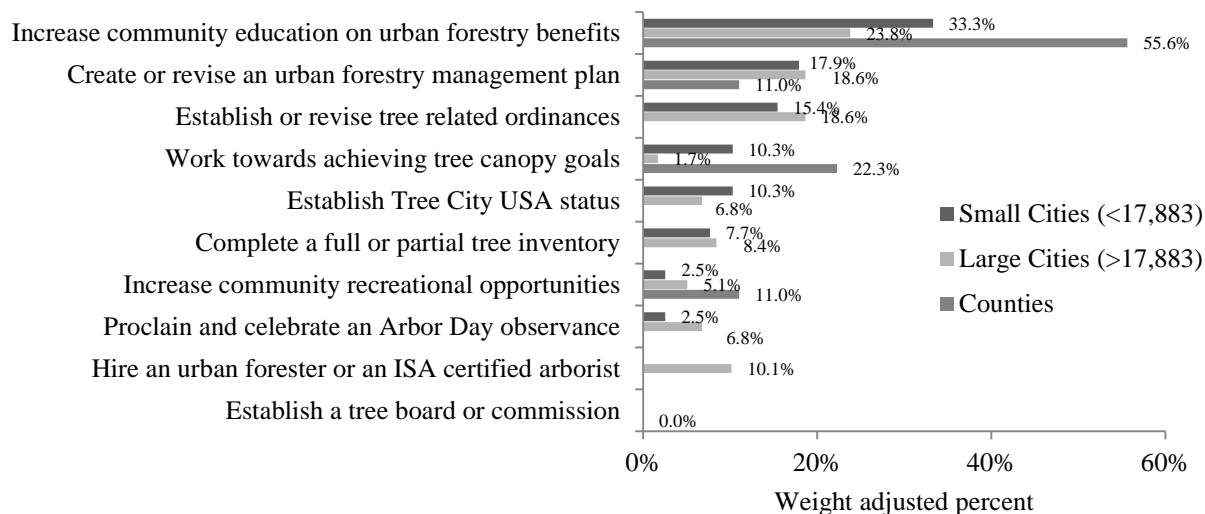


Figure 3.9. Highest priorities for urban forestry program management in the Portland-Vancouver Metro Region across jurisdiction type

The future priorities of creating or revising an urban forest management plan and/or tree related ordinances provide the framework for sustained management of the urban forest. According the American Public Works Association (2014), an urban forest management plan is an essential tool for protecting the urban forest resource and capitalizing on the public services that it offers. Likewise, ordinances provide the authorization and standards for management activities helping to ensure that the urban forest is improved and well maintained (International Society of Arboriculture 2014). Such tools should be based on recent tree inventory data and analysis of available staff, equipment, and budget resources. By establishing an urban forest management plan, jurisdictions can ensure that adequate funding and resources are allocated to care for the urban forest and outline additional goals, and that objectives are

outlined that can meet the perceived needs and barriers related to urban forestry of the community. Tree boards, or technical advisory committees, to a city or county on tree related issues, can provide an additional means to involve community members in urban forestry issues and can assist with these priorities by helping to write or review plans and ordinances and build community support for their adoption and implementation.

3.7. Discussion

The response rate of 27.4% for this survey was low compared to similar urban forestry surveys. Comparable surveys at the state wide level obtained a response rate on average of approximately 51.0% with 22.0% (Schroeder et al. 2003) being the lowest response rate and 71.0% (Elmendorf et al. 2003) being the highest. There may be a number of reasons contributing to this low response rate such as the time of year the survey was distributed or the types of jurisdictions targeted. Elmendorf et al. (2003) reviewed several studies that suggested that small communities and counties typically have limited or no urban forestry programs. This finding may account, in part, for the lower response rate because these jurisdiction did not see urban forestry in their purview (Grado et al. 2006). However, because the survey targeted a very specific population within a small geographic area, the responses captured are representative of the targeted population as a whole. Further adjustments were also applied to the data to ensure that proportions of the groups who responded reflected those who did not, thereby reducing non-response bias.

The findings indicate that there is a strong interest in urban forestry programs by most community officials and program managers in the Portland-Vancouver Metro Region. Results of this analysis are consistent with other survey research conducted on communities' interest in urban forestry programs. For example, Grado et al. found that the majority of cities in Mississippi indicated an avid interest in starting new urban forestry projects and programs, but that larger communities (>2,000 inhabitants) showed a

stronger interest in these programs compared to smaller cities. Prior to this study, little information was available regarding county perceptions of urban forestry programs in the Portland-Vancouver Metro Region. Results presented here suggest that counties may be less interested in expanding urban forestry programs compared to municipalities. Reasons for this lack of interest could stem from inadequate knowledge about the benefits of urban trees or a lack of demand on the part of their constituents or officials. Because these counties differ in their organizational structure compared with cities and offer different services related to public trees, trees may not be considered such an important resource in increasing community livability. Counties may also lack the tools and resources needed to expand their urban forestry programs as they typically are not targeted by state and national urban forestry assistance programs.

Despite an interest in urban forestry programs on the part of most community officials and program managers, difficulty exists in implementing or expanding programs due to a number of reasons including: inadequate funding, lack of political support, low public support, and needed tools for community outreach and education. Funding issues were the most frequently reported need and barrier of jurisdictions in the Portland-Vancouver Metro Region. Results indicate that while additional or sustained funding is needed to expand urban forestry programs, the lack of financial resources is also the greatest hindrance or barrier to advancing these programs. These results are consistent with other research on urban forest management that found a lack of financial resources to be a common barrier or need to starting or improving tree programs across several regions of the United States (Studer et al. 2003; Treiman and Gartner 2004; Grado et al. 2006; Stevenson et al. 2008). Such studies also suggest that the need for funding may be greater in small communities; however, results of this research suggested no differences in the need for funding between large and small jurisdictions with slightly more respondents from large cities indicating a need for greater financial support.

Research has shown that financial support is the most effective way to promote urban forestry programs (Zhang and Zheng 2012). Although actual spending on tree programs is highly variable given the economic situation facing a community and competing demand for other essential services, aspects of urban forestry such as planting and maintaining trees in a jurisdiction and performing citizen outreach require significant input of money and labor (Kielbaso 1990). Zheng and Zhang (2012) further suggest that a high demand for urban trees may not mean that local officials will spend more on tree programs. The cost of urban trees and affordability of their care are primary concerns of officials, and may therefore be determined by the economic situation of the community. These findings suggest that additional research is needed to explore ways to increase spending for urban forestry programs. One such strategy could be to increase education on grants and technical assistance programs available to city and county jurisdictions that are offered by the state urban and community forestry departments or national urban forestry organizations. Additionally, new strategies to assist communities facing funding obstacles for implementing urban forestry programs should be considered. Examples could include pooling limited resources and staff among jurisdictions and sponsoring active participation by local community groups (Grado et al. 2006).

Insufficient funding can also be an indication of other community shortcomings such as an incomplete understanding of the benefits of trees and tree care practices, low public and/or political support, and inadequate personnel and equipment (Zhang and Zheng 2012). The results of this study appear to support this finding with the need for political support being cited as the greatest urban forestry need by both program managers and respondents from county governments. Looking at data across respondent position, results may indicate that while community officials ranked their own support of urban forestry programs as a relatively low need, program managers may feel that urban forestry programs are not being supported by their leaders. This is particularly true in counties and as city size

increases when community officials are faced with significantly more issues which vie for their attention and interest. Although the majority of community officials indicated that they are interested in expanding urban forestry programs, attention to urban forestry related issues can often be neglected due to competition from other essential departments and the needs of the jurisdiction and the constituents that they represent. Urban forestry professionals must therefore make better attempts to raise the importance of urban forestry related needs and issues in their jurisdictions and educate community officials on the economic return that investing in urban forestry can offer.

A lack of political support and low public support were also highly ranked as barriers to urban forestry program management in the Portland-Vancouver Metro Region particularly by small cities. Elmendorf et al. (2003) reported that lack of political support and/or public support has been identified as one of the largest difficulties in completing urban forestry practices. The researchers also suggest that gaining the support of leaders within jurisdictions is difficult because of the turnover of leadership including mayors, city council members, and county commissioners. These officials have limited time for competing issues within their jurisdictions, and communication must be done consistently to build support for urban forestry issues. Additionally, gaining citizen support is challenging because of the diverse personalities and interests represented within the public constituency. Jurisdictions, particularly small cities, should provide more opportunities for citizens to support tree programs and become involved in the management of the urban forest given the survey response. This could be accomplished through community tree plantings or Arbor Day celebrations which offer ways for residents to be more involved and invested in their community (Arbor Day Foundation n.d.). More efforts are also needed on the part of urban forestry managers and professionals to collect information and generate more relatable messages about the urban forest specific to these different audiences. Taking care to target messaging will ensure

that urban forestry information is understood and applicable to these different audiences and hopefully gain the attention and interest of leaders and the public.

Respondents from jurisdictions in the Portland-Vancouver Metro Region appear to recognize the need for increased community outreach and education and indicated that it was the highest priority in many of their jurisdictions particularly among community officials. Such data could suggest that community officials and the citizens they represent are unaware of or have little information regarding the benefits of urban trees and proper tree care and maintenance. Education and outreach should be completed by urban forestry professionals to help jurisdictions become more familiar with the benefits urban trees provide, particularly the lesser known social and economic ones (Dwyer et al 1992; Nowak and Dwyer 2007). Many of these potential benefits, including water quality, social issues, and carbon sequestration, are vitally important issues for municipal and county governments and the lack of association of these with urban forestry presents an opportunity to initiate and direct outreach activities (Grado et al. 2006).

These findings provide further evidence that program managers and urban forestry professionals must take additional steps to disseminate information about the urban forest within the jurisdictions they work. Education about such benefits should increase the priority of trees in the community thus generating a greater significance and demand for urban forestry and more funding allocated to managing the forest resource. Increasing public knowledge about urban trees and their significance in a community should also help to combat the perceived barriers of low public support and lack of political support suggested by respondents. This can be achieved by creating greater public demand for urban forestry programs in the Portland-Vancouver Metro Region. If the importance and demand for urban forestry increases within a jurisdiction, community officials may show greater support for those services their constituents find important (Stevenson et al. 2008).

Stevenson et al. (2008) provides a model for building political support for urban forestry programs among community officials on the part of urban forestry professionals. First, the authors suggest that efforts begin with residents who should be organized and educated about urban forestry benefits. Education efforts should persuade residents to demonstrate strong support for tax-based funding for tree programs. When officials have recognized that strong public support has developed, they too should be reminded of the many benefits, particularly economic ones, that can be realized from an effective street tree program. Information about available technical assistance should also be presented at this time. Finally, officials should be asked to provide adequate funding and make further provisions for essential program elements such as a tree ordinance, tree board, an inventory, and a management plan. Additional research has confirmed such a model, showing that adequate funding for tree programs can be achieved where officials perceive that residents are supportive (Robeson 1984; Elmendorf et al. 2003; Zhang and Zheng 2012).

A similar model could be helpful to the jurisdictions in the Portland-Vancouver Metro Region. Findings from this study indicate that most community officials are interested in adopting or expanding urban forestry programs and that many jurisdictions wish to take steps in this direction as indicated by their priorities for the future. Unfortunately, these communities face many of the same obstacles to implementing or advancing programs as other cities and regions in the U.S. By employing such a model, city and county governments could gradually increase support for urban forestry programs on the part of residents and officials. Providing this basic urban forest information, combined with community desires related to forests and ecosystem services, can provide a strong foundation for developing long-term management plans and build a more solid basis for more comprehensive program structures (Nowak et al. 2010). Counties especially should take steps to this effect because of their need for increased political support. Because county governments do not typically receive urban forestry assistance and have a

different organizational structure for providing urban forestry services, more research is needed on the best strategies to educate their residents and create more demand for tree programs.

The *Regional Urban Forestry Strategy* can contribute to the finding of this research in a multitude of ways. A primary goal of the *Regional Urban Forestry Strategy* is to promote the advancement of urban forestry in the Portland-Vancouver Metro Region by fostering regional collaboration around trees and expanding the capacity of agencies and organizations to address urban forest management. As evident from the findings of this study, the *Regional Urban Forestry Strategy* should begin its efforts with increased education about the benefits of the urban forest. Although management and planning can be complicated at the regional scale where urban forests cross multiple community, county, or other government jurisdictions, a coordinated multi-jurisdictional effort can help to sustain optimal urban forest benefits across a region. Educational efforts should target both the public and community officials, individually, targeting messaging about the urban forest and the benefits it provides to both officials and the public. Examples of educational messages may include promoting more tangible benefits such as the creation of wildlife habitat, recreational opportunities, or reduction in heating and cooling costs to the public, with more specific messaging regarding increases in community pride and aesthetics, increases in property values, positive impacts in consumer spending, reduction of stormwater runoff, and improvements in water quality. Targeting such messages appeals to community officials' political desire to create more livable communities while highlighting the tax-based incentives and improvements in municipal infrastructure that trees provide. Results of previous research suggest that perhaps education efforts of the *Regional Urban Forestry Strategy* should also take a tiered approach, targeting the public first with these messages, followed by community officials (Stevenson et al. 2008).

Professional assistance could also be included in the *Regional Urban Forestry Strategy*. Respondents of the survey indicated future priorities include more community education and outreach as

well as the creation of tree-related ordinances and urban forest management plans. In addition to performing its own educational outreach, the *Regional Urban Forestry Strategy* should provide cities and counties with materials and tools to increase their ability to provide community outreach. Materials such as pamphlets/brochures, a website, videos, and educational kits regarding urban forestry benefits could be created and distributed to jurisdictions. In addition, tools such as workshops on communicating the benefits of trees could be provided in the Portland-Vancouver Metro Region.

Assistance should also be provided to cities or counties wishing to develop an urban forest management plan and/or ordinances regarding public trees. Previous surveys completed in the Portland-Vancouver Metro Region identified that while 70% (roughly 18) of jurisdictions have tree-related ordinances, only seven have adopted an urban forest management plan. The presence of a management plan is critical to creating a long-term vision for the urban forest and establishing specific goals and objectives to reach that vision. Management plans typically also include urban forestry budgets that must be formally adopted by the jurisdiction. Such budgets offer a source of sustained funding for urban forestry programs that can provide a solution for the obstacles reported in this survey. Training in establishing management plans or ordinances should be provided to those jurisdictions expressing this desire. Furthermore, those jurisdictions that have previously adopted successful plans and ordinances should be encouraged to assist those looking to implement new ones, serving as an additional resource within the region.

On a regional scale, the findings of this survey highlight the need for greater collaboration among the communities and officials involved with urban trees. Although barriers, needs, and priorities were reported for individual jurisdictions, the overall consensus among many jurisdictions regarding these obstacles and priorities provides a unified roadmap for federal, state, and local interagency coordination in support of the urban forestry efforts throughout the region. Assistance programs should target multiple

jurisdictions at one time, making more resources available to those jurisdictions and providing a collaborative environment from which to advance urban forestry efforts. These jurisdictions should also be encouraged to work with and support one another on urban forestry related issues, sharing advice, and highlighting success stories as more programs are started or improved.

3.8. Conclusion

This study was the first attempt at evaluating the obstacles and priorities related to urban forestry program management of the jurisdictions in the Portland-Vancouver Metro Region. Additionally, this study provided a approach in differentiating the perception of these obstacles and priorities between community officials and program managers and between different jurisdiction types of small and large cities and county governments. In general, there was interest in urban forestry programs in the Portland-Vancouver Metro Region on the part of both respondent position types and large and small cities. A perceived major obstacle to implementing and expanding these programs was the lack of adequate funding. Budgetary constraints have limited urban forestry programs throughout the region. In addition, many jurisdictions, particularly counties, have failed to advance urban forestry programs because of the lack the necessary political support. Small cities also have low public support for urban forestry efforts. Despite these obstacles, most jurisdictions also reported their desire to advance urban forestry efforts through the expressed priorities of increased community outreach and education together with the creation or revision of urban forest management plans or tree ordinances.

Despite an interest in urban forestry, it may be concluded that there is room for improvement in many municipal and county governments in the Portland-Vancouver Metro Region in accomplishing practices important to advancing and sustaining urban forests and their management. The *Regional Urban Forestry Strategy* provides an opportunity to achieve those goals offering a regional framework and recommendations to move urban forestry efforts forward as a region. By pooling resources and collective

knowledge of the region, the *Regional Urban Forestry Strategy* can assist in overcoming the barriers and achieving the needs related to urban forestry program management in the jurisdictions targeted by this survey. Although individual jurisdictions may struggle to overcome these obstacles, by breaking down political boundaries to traditional urban forestry, more multi-jurisdictional collaboration and coordination around the urban forest can help to increase the health and sustainability of the Portland-Vancouver Metro Region.

4. CONCLUSION

The urban forest is an integral component of the urban ecosystem. With urban centers facing a variety of challenging issues such as rapid urbanization, degrading infrastructure, and loss of green space, urban trees offer a way to improve the health and livability of cities, counties, and metropolitan areas. This was the rationale behind the creation of the *Vibrant Cities, Urban Forests* Task Force initiative upon which this research study is based, namely, to frame urban forestry as a solution to the environmental, economic, and social issues that urban centers face nationwide (Vibrant Cities & Urban Forests Task Force 2011).

This solution cannot be accomplished however without the programs, policies, partnerships, and resources in place to support thriving urban forests. Furthermore, such efforts must be considered across multiple political jurisdictions, taking into consideration the needs of local populations within the context of a larger, regional landscape. This regional approach to urban forestry is important because trees do not recognize the political subdivisions that humans adhere to. Instead, the urban forest is a combined resource in which the health of a single tree contributes to the collective impact of the entire forest, benefiting the community and region as a whole. Regional, comprehensive planning and management strategies are needed therefore to establish collaborative urban forestry frameworks that coordinate urban forestry activities across a region.

The *Regional Urban Forestry Strategy* attempts to provide such a framework in support of regional, interagency coordination around the urban forest in the Portland-Vancouver Metro Region. Despite this region being unique for its long seeded focus on environmental and land use issues, urban forest management can still be improved upon in the Portland-Vancouver Metro Region given its political and geographic diversity that encompasses 30 cities, four counties, and two state governments. Coordinating urban forestry efforts across these jurisdictions requires a strong regional framework in

which all partners understand the importance of and have a shared vision for the sustainable management of the urban forest.

4.1. Research Summary

This research sought to take an in depth look at current practices and attitudes regarding the urban forest in the Portland-Vancouver Metro Region through a program assessment survey. This survey was sent to municipal and county governments alike to explore differences in management approaches and obstacles between these two types of jurisdictions. Additionally, both community officials and program managers were targeted by this research in order to better understand differences in attitudes and perceptions concerning the urban forest that may exist between those governing and funding urban forestry programs and those actually implementing and managing them. Collecting this type of detailed information served to characterize current practices, attitudes, and perceptions of urban forestry program management across respondent position and jurisdiction type thereby aiding the *Regional Urban Forestry Strategy* in identifying areas of need and prioritizing future efforts around urban forest management.

Specifically, this research collected information pertaining to: 1) the importance of the urban forest to the jurisdictions in the Portland-Vancouver Metro Region; 2) jurisdictions' interest, or lack thereof, in implementing and expanding urban forestry programs; 3) the perceived importance and successful implementation of urban forestry program management components; and 4) the greatest needs, barriers, and priorities related to urban forestry program management by municipal and county governments in this region. This type of detailed information has previously not been collected for the jurisdictions in this geographic area, yet is critical to advancing urban forestry efforts on local and regional scales.

Results of this research indicated that, in general, an urban forestry program is important to all jurisdictions and positions surveyed, and that most are interested in implementing and expanding urban

forestry programs. Results suggest that respondents from municipal governments may view urban forestry as more important to their jurisdictions and be more willing to advance these program compared to urban unincorporated areas within counties. When considering the importance of urban forestry program management activities, respondents indicated that such components as a healthy public tree population, structured maintenance program, trained staff, managing trees for environmental benefits, community involvement, and public awareness of the benefits of trees were considered to be the most important items to a successful program. These same items were consistently reported across respondent position and jurisdiction type. Respondents from large cities also noted the importance of political support to a successful program, while respondents from counties reported the importance of such components as riparian restoration and tree planting programs.

When asked to consider which components the jurisdictions in the Portland-Vancouver Metro Region had been most successful in implementing or achieving, respondents reported similar components as those deemed most important above with the added components of tree related ordinances, planting programs, riparian restoration, preferred species planting lists, and trained staff. These items were reported consistently regardless of respondent position and jurisdiction type.

Perhaps more interesting however were those components rated of least importance and least success by respondents in the Portland-Vancouver Metro Region. Such components included a certified arborist on staff, a tree board or commission, a tree inventory, tree canopy cover goals, an urban forest management plan, and sustained program funding. These same components were rated equally low by respondents from municipalities and across position. Respondents from counties reported similar components of least importance and success including tree related ordinances, public education, administrative support, and partnerships with outside organizations.

Respondents were also asked to rank their greatest needs and barriers to urban forestry program management. Needs represent those program components essential or important to successful management while barriers reflect obstacles at the policy or implementation level that inhibit effective management of the urban forest resource. The areas of greatest need reported by respondents included increased or sustainable funding, increased political support, and tools for community outreach and education. Similarly, the largest barriers inhibiting successful program management included insufficient funding, low public support and interest, a history of conflicts surrounding urban trees, and low public support. These components were ranked consistently across respondent position and jurisdiction type. When considering the greatest priorities related to urban forestry program management in the Portland-Vancouver Metro Region, respondents indicated that increased community education, the creation or revision of an urban forest management plan, and the creation or revision of tree-related ordinances were the greatest priorities for their jurisdictions.

Research findings present a telling story of current urban forestry program management in the Portland-Vancouver Metro Region and indicate that there is consensus about the direction that should be taken regarding its management among community officials and program managers in both city and county governments. It is reasonable that the program components related to tree health and ecosystem services which were considered most important to a successful program were also those areas that jurisdictions have achieved the most success likewise dedicating available resources in those capacities. However, while these components are important to an attractive, functioning urban forest, additional components important to the long-term, sustainable management of the resource were seen to be lacking in the Portland-Vancouver Metro Region. These items included an urban forest management plan, a certified arborist on staff, a tree board or commission, and dedicated program funding. Such items, in turn, provide jurisdictions with structures that plan for and address urban forestry at a larger scale than

just tree health and ecosystem services and include elements related to the vegetative resource, a community framework, and resource management of the urban forest. This broader approach ensures that a comprehensive management structure is in place to sustain support and advancement of the forest resource over the long term.

The reported needs and barriers of respondents in the Portland-Vancouver Metro Region also parallel program components of least importance and success. While respondents recognize their current shortcomings and need for increased political support, community involvement, and sustained funding sources, these areas may relate to an underlying need for more coordinated management activities. Coordinated planning and management activities are those that encourage program sustainability and advocate for the broadening of strategies from simply maintaining forest structure to a community wide effort (Dwyer et al. 2003). Such efforts include the exchange of information, prioritizing of benefits, designing management objectives, coordinating management activities, reviewing outcomes, and evaluating progress (Dwyer et al. 2003). Program components such as an urban forest management plan and a tree board or commission offer management tools in which these strategies can be met, and if such strategies are successfully implemented should result in more active political and community support and funding sources.

Future priorities indicated by respondents from the Portland-Vancouver Metro Region suggest that jurisdictions recognize the need for more coordinated management activities through the creation or revision of urban forest management plans and tree related ordinances. As mentioned above, the successful completion of such priorities can assist in addressing the identified needs and barriers related to urban forestry program management for the region as a whole. Additionally, respondents reported on the theme of community involvement throughout this research process. A key element of managing the urban forest in a regional context is the coordination of activities among different owners and

stakeholders across jurisdictions (Dwyer et al. 2003). The public is perhaps the largest owner of the urban forest, with the majority of urban trees located on private property.

Increased efforts should take place in the Portland-Vancouver Metro Region so that the larger community recognizes their importance in the health and sustainability of the forest resource. Strategies to address this collaborative stewardship can be obtained through coordinated management activities that identify common interests and resolve potential problems between the public's relationships with urban trees and the priorities of the local jurisdictions. By increasing educational efforts and opportunities for the public to engage with the urban forest, jurisdictions in the Portland-Vancouver Metro Region can further increase the success of local and regional urban forestry efforts.

In addition to its local applicability, this research discovered information pertinent to state and national urban and community forestry programs as well. The U.S. Forest Service administers the Community Accomplishment Reporting System in which it, through the 50 state urban and community forestry programs, collects performance measures related to the successful management of the urban forest and allocates states funding to administer urban forestry assistance programs. Findings of this research suggest that the majority of those performance measures collected by state and national governments, including: an urban forest management plan, professional urban forestry staff, local ordinances or policies related to trees, and tree boards are of least importance and have met with limited success compared to other program components in the Portland-Vancouver Metro Region indicating they might not be of value to county jurisdictions. This information raises questions as to whether such performance measures adequately gauge urban forestry program management and if such a framework meets the needs and goals of the jurisdictions in the Portland-Vancouver Metro Region.

However, when considering the future priorities of the region, the creation or revision of ordinances and urban forest management plans were ranked highly across both respondent position and

jurisdiction type. This information presents an opportunity for state and national urban and community forestry programs to offer assistance in these areas. Although disparities have existed between these action items and their implementation in the Portland-Vancouver Metro Region, the desire of jurisdictions to complete these items should be capitalized by assistance programs providing jurisdictions with tools and resources to successfully implement or expand such program components. Developing and expanding these program components within communities will further promote the concept of more coordinated management activities within the region.

4.2. Recommendations

This research provides critical information for guiding comprehensive and adaptive management strategies for the Portland-Vancouver Metro Region. Equipped with this information, the *Regional Urban Forestry Strategy* can use the findings of this study to strengthen urban forestry in those areas suggested. Specifically, this research has identified three action priorities for the *Regional Urban Forestry Strategy* to accomplish. These priorities are:

- 1. The creation and distribution of targeted messaging about the ecological, social, and economic benefits and services of the urban forest to community officials and the general public.** Results of this research indicate that there is a consistent need for increased political and public support surrounding urban forest management. However, given the range of benefits provided by urban trees and the distinct differences between these two audiences, no “single message” will resonate across the board. Messaging must therefore be clear and compelling to individuals and jurisdictions and be specifically targeted to each audience individually, appealing to the social and political context in which they operate.
- 2. The development of tools that assist in the implementation of more comprehensive urban forestry program management components.** These tools should include national

performance measures such as the development of urban forest management plans and tree boards or commissions. The partners of the *Regional Urban Forestry Strategy*, particularly Oregon and Washington Urban and Community Forestry programs, should increase educational efforts about the importance of program components that plan for the long-term health of the urban forest as well as a structured community framework and resource management. The *Regional Urban Forestry Strategy* and its partners should encourage and provide jurisdictions with tools and resources to accomplish these program components. Additionally, the *Regional Urban Forestry Strategy* should find strategies to pair current areas of program focus with these more comprehensive measures to increase jurisdictions' willingness to implement such practices within the Portland-Vancouver Metro Region.

3. The structuring of a sustained, collaborative framework by which the Portland-Vancouver Metro Region can achieve long-term support of the urban forest. Given the geographic diversity of the Portland-Vancouver Metro Region, there is a need for an organization framework that works between sectors of local governments and also across jurisdictional boundaries to achieve sustainable urban forest management. This framework should include the commitment of a group of important partners to a common agenda for solving such specific problems as shared measurement, continuous communication, and mutually reinforcing activities among all participants (Kania and Kramer 2011). The common needs, barriers, and priorities identified by this research provide concrete areas from which to structure a problem solving process.

These action items may take the form of physical materials including brochures, pamphlets, or template documents, to be created and distributed to the jurisdictions or public in the Portland-Vancouver Metro Region, workshops and forums held by the project partners for community officials and program

managers alike, or technical assistance packages offered to communities in need by the Oregon and Washington State Urban and Community Forestry programs. The *Regional Urban Forestry Strategy* should also build upon current urban forestry efforts when implementing these action items. It should also encourage individual jurisdictions to work together with neighboring cities and counties, ensuring that cross-sector and cross-jurisdiction coordination surrounds the management of the urban forest.

4.3. Directions for Future Research

This research offers a baseline from which to explore urban forestry program management in the Portland-Vancouver Metro region. However, new approaches that expand the current management focus of urban forests are needed in the Portland-Vancouver Metro Region. Current management efforts focused on tree health and urban forest structure inadequately equate for the complex social, political, and ecological interactions surrounding urban forest management. Although addressing this discrepancy will be a focus of the *Regional Urban Forestry Strategy*, additional strategies to address this gap should be the focus of future research in this region. Future research must keep in mind the needs of local populations within a regional context and should consider the needs and attitudes of the entire community and what urban forest structure is necessary to best address such community needs. Research should also periodically reassess community needs and urban forest structure to ensure that management remains appropriate and is adequately accounting for the complex, interdisciplinary nature of the urban forest (Dwyer et al. 2003).

Similarly, although the national government has set clear standards for jurisdictions concerning comprehensive management of trees in an urban context, more integrated research that examines the applicability of these standards to jurisdictions must take place. Research findings suggest that jurisdictions in the Portland-Vancouver Metro Region specifically may not understand the importance of these standards or that such standards do not adequately meet the needs and goals of this region.

Additional research should explore whether these traditional performance standards adequately assess urban forestry program success and sustainability and whether other jurisdictions or regions throughout the U.S. struggle to attain such program components, or if the Portland-Vancouver Metro Region is unique in this aspect.

Finally, while many collaborative efforts are short term, including the *Regional Urban Forestry Strategy*, there is a need to build a lasting framework to support urban forestry efforts in the Pacific Northwest and across the U.S. Recent research policy has affirmed this need, citing the necessity for large-scale, long-term, and interdisciplinary science to build comprehensive knowledge about landscape and resources, rather than piecemeal efforts (Marzluff et al. 2008). As additional urban forestry program management research is added to the literature, the regional urban forestry framework established in this region should be reevaluated, ensuring that it continually supports the needs and priorities of the community and contributes to the ecological and social health of the Portland-Vancouver Metro Region.

4.4. Summary

Urban forests are fundamental to the health and sustainability of urban communities. This research has aimed to help cities and counties in the Portland-Vancouver Metro Region improve the size and health of the urban forest by exploring current practices and attitudes toward urban forestry program management and the implications of taking a regional approach to the management of the forest resource, contributing to professional knowledge and urban forestry activities already occurring in the region. Although challenges to increase the management capacity of the urban forest still exist in the Portland-Vancouver Metro Region, many opportunities are also present to improve the livability of this urban ecosystem. In considering the findings and recommendations imparted throughout this research process, one fact remains clear – trees are the key.

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APPENDICES

Appendix A: Survey Materials



Portland-Vancouver Urban Forestry Needs Assessment Survey

An effort to understand the importance of and barriers to urban forestry program management in the Portland, OR and Vancouver, WA metropolitan region

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A. URBAN FORESTRY PROGRAM SUCCESS

Urban or community forestry involves the care and management of trees in the urban environment. An urban forestry program is responsible for overseeing the maintenance and enhancement of public trees including street or park trees. An urban forestry program can also encourage community involvement through activities like tree planting events or Arbor Day Celebrations. This program can make up its own department or be part of multiple departments depending on who has responsibilities for managing trees in your jurisdiction, i.e. city or county.

1. How important is an urban forestry program to your jurisdiction? *(Please circle your answer)*

Not very important	Somewhat unimportant	Neutral	Somewhat important	Very important	Don't know
1	2	3	4	5	6

2. How interested is your jurisdiction in expanding local urban and community forestry projects and programs? *(Please circle your answer)*

Not very interested	Somewhat uninterested	Neutral	Somewhat interested	Very interested	Don't know
1	2	3	4	5	6

3. How important are each of the following items to a successful urban forestry program? *(Please circle your answer)*

4. How successful do you think your jurisdiction has been at each of the following items? *(Please circle your answer)*

	Not very important	...	Neutral	...	Very important	Don't know	Not very successful	...	Neutral	...	Very successful	Don't know	NA
3.1 A healthy public tree population	1	2	3	4	5	6	1	2	3	4	5	6	7
3.2 Structured street and park tree maintenance program	1	2	3	4	5	6	1	2	3	4	5	6	7
3.3 Trained staff in proper tree care	1	2	3	4	5	6	1	2	3	4	5	6	7
3.4 Tree planting program	1	2	3	4	5	6	1	2	3	4	5	6	7
3.5 A tree inventory	1	2	3	4	5	6	1	2	3	4	5	6	7
3.6 A tree board or committee	1	2	3	4	5	6	1	2	3	4	5	6	7
3.7 Community involvement	1	2	3	4	5	6	1	2	3	4	5	6	7
3.8 Tree preservation ordinances	1	2	3	4	5	6	1	2	3	4	5	6	7
3.9 Certified arborist on staff	1	2	3	4	5	6	1	2	3	4	5	6	7
3.10 Designated program funding	1	2	3	4	5	6	1	2	3	4	5	6	7
3.11 Public education on proper tree maintenance	1	2	3	4	5	6	1	2	3	4	5	6	7
3.12 Public awareness on the benefits of trees	1	2	3	4	5	6	1	2	3	4	5	6	7
3.13 Active political support	1	2	3	4	5	6	1	2	3	4	5	6	7
3.14 Administrative support	1	2	3	4	5	6	1	2	3	4	5	6	7
3.15 Tree canopy goals	1	2	3	4	5	6	1	2	3	4	5	6	7
3.16 Technical expertise such as proper tree pruning knowledge	1	2	3	4	5	6	1	2	3	4	5	6	7
3.17 Managing trees for environmental benefits such as stormwater mitigation	1	2	3	4	5	6	1	2	3	4	5	6	7

3. Continued. How important are each of the following items to a successful urban forestry program? (Please circle your answer)

4. Continued. How successful do you think your jurisdiction has been at each of the following items? (Please circle your answer)

		Not very important	...	Neutral	...	Very important	Don't know							
		1	2	3	4	5	6	Not very successful	...	Neutral	...	Very successful	Don't know	NA
3.18	Managing trees for wildlife habitat	1	2	3	4	5	6	1	2	3	4	5	6	7
3.19	A urban forestry management plan	1	2	3	4	5	6	1	2	3	4	5	6	7
3.20	Riparian restoration	1	2	3	4	5	6	1	2	3	4	5	6	7
3.21	Preferred species planting lists	1	2	3	4	5	6	1	2	3	4	5	6	7
3.22	Staff initiative to start or promote new programs	1	2	3	4	5	6	1	2	3	4	5	6	7
3.23	A local tree champion to promote and support urban forestry in the community	1	2	3	4	5	6	1	2	3	4	5	6	7
3.24	Partnerships with local non-profits or organizations to promote community engagement	1	2	3	4	5	6	1	2	3	4	5	6	7
3.25	Other:	1	2	3	4	5	6	1	2	3	4	5	6	7

5. Please rank the top three items that your jurisdiction needs in order for urban forestry efforts to more successful. (Please put the number of the factor in the appropriate box from "First Greatest Need" to "Third Greatest Need". Up to three additional needs may be entered and ranked if not represented in the list below.)

FACTORS

RANK

1. Increased political support	<input type="checkbox"/>	5.1 First Greatest Need
2. Tools for community outreach and education		
3. Increased tree planting initiatives		
4. Best management practices for tree preservation and maintenance		
5. Training in establishing tree ordinances		
6. Information on the benefits of urban trees	<input type="checkbox"/>	5.2 Second Greatest Need
7. Creating an urban forestry management plan		
8. List of recommended tree species		
9. Increased or sustainable funding		
10. Increased citizen demand	<input type="checkbox"/>	5.3 Third Greatest Need
11. Other: _____		
12. Other: _____		
13. Other: _____		

6. Please rank the top three items that represent the largest barriers to urban forestry management in your jurisdiction (Please put the number of the factor in the appropriate box from "First Largest Barrier" to "Third Largest Barrier". Up to three additional barriers can be entered and ranked if not represented in the list below.)

FACTORS	RANK
1. Low public support and interest	<input type="text"/> 6.3 First Largest Barrier
2. Technical assistance needs such as education material or best management practices	
3. A reactive, as opposed a proactive, approach to urban forestry management	
4. Lack of trained personnel	<input type="text"/> 6.2 Second Largest Barrier
5. Lack of political support	
6. History of conflicts, such as too strict regulations, surrounding urban trees	
7. Insufficient funding	<input type="text"/> 6.3 Third Largest Barrier
8. Lack of regulations related to the preservation or replanting of trees on development sites	
9. Poor urban forest condition/tree problems	
10. Lack of vision/goals for increasing the urban forest	
11. Other: _____	
12. Other: _____	
13. Other: _____	

7. Please rank the top three future priorities for urban forestry management in your jurisdiction. (Please put the number of the factor in the appropriate box from "First Priority" to "Third Priority". Up to three additional priorities may be entered and ranked if not represented in the list below.)

FACTORS	RANK
1. Complete a full or partial street and park tree inventory	<input type="text"/> 7.1 First Priority
2. Create or revise an urban forestry management plan	
3. Increase community education on urban forestry benefits	
4. Establish or revise tree related ordinances	
5. Increase community recreation opportunities	<input type="text"/> 7.2 Second Priority
6. Establish Tree City USA status	
7. Establish a tree board or commission	
8. Work toward achieving tree canopy cover goals	<input type="text"/> 7.3 Third Priority
9. Hire a city forester or an ISA certified arborist	
10. Proclaim and celebrate an Arbor Day observance	
11. Other: _____	
12. Other: _____	
13. Other: _____	

8. The following is a list of departments/bureaus within a jurisdiction that commonly manage urban forestry programs. Please rank the top three programs that have the greatest involvement in the responsibilities or duties related to urban forestry in your jurisdiction. (Please put the number of the department in the appropriate box)

DEPARTMENTS

RANK

<ol style="list-style-type: none"> 1. Land use planning 2. Community development 3. Parks and recreation 4. Transportation 5. Natural resources 6. Public works 7. Environmental services 8. Sustainability 9. Other: _____ 	<div style="margin-bottom: 10px;"> <input style="width: 40px; height: 25px;" type="text"/> 8.1 Most Involvement </div> <div style="margin-bottom: 10px;"> <input style="width: 40px; height: 25px;" type="text"/> 8.2 Second Most Involvement </div> <div> <input style="width: 40px; height: 25px;" type="text"/> 8.3 Third Most Involvement </div>
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9. How important is an urban forestry program compared with other programs in your jurisdiction such as land use permitting or fire protection? (Please circle your answer)

Not very important	Somewhat unimportant	Neutral	Somewhat important	Very important	Don't know
1	2	3	4	5	6

B. PUBLIC PERCEPTION

10. The following list includes environmental, social and economic benefits that urban trees and forests provide as evident in current literature. How knowledgeable is the public in your jurisdiction on these benefits? (Please circle your answer)

11. What benefits of urban forests are most valued by the public in your jurisdiction? (Please circle your answer)

	Not at all knowledgeable ...	Neutral ...	Very knowledgeable	Don't know		Not at all valued ...	Neutral ...	Very valued	Don't know			
10.1 Increase in property values	1	2	3	4	5	6	1	2	3	4	5	6
10.2 Creation of wildlife habitat	1	2	3	4	5	6	1	2	3	4	5	6
10.3 Decrease in energy costs	1	2	3	4	5	6	1	2	3	4	5	6
10.4 Reduction in storm water runoff	1	2	3	4	5	6	1	2	3	4	5	6
10.5 Improvement in public health and well-being	1	2	3	4	5	6	1	2	3	4	5	6
10.6 Increase in recreational opportunities	1	2	3	4	5	6	1	2	3	4	5	6
10.7 Reduced heat-island effect, i.e. warming of cities due to urban infrastructure and activities	1	2	3	4	5	6	1	2	3	4	5	6
10.8 Increase in community pride	1	2	3	4	5	6	1	2	3	4	5	6
10.9 Improvement in community aesthetics	1	2	3	4	5	6	1	2	3	4	5	6

10. <i>Continued.</i> How knowledgeable is the public in your jurisdiction on these benefits? (Please circle your answer)								11. <i>Continued.</i> What benefits of urban forests are most valued by the public in your jurisdiction? (Please circle your answer)							
		Not at all knowledgeable	...	Neutral	...	Very knowledgeable	Don't know			Not at all valued	...	Neutral	...	Very valued	Don't know
10.10	Shade	1	2	3	4	5	6		1	2	3	4	5	6	
10.11	Community livability	1	2	3	4	5	6		1	2	3	4	5	6	
10.12	Improvement in air quality	1	2	3	4	5	6		1	2	3	4	5	6	
10.13	Reduction in noise levels	1	2	3	4	5	6		1	2	3	4	5	6	
10.14	Decrease in soil erosion	1	2	3	4	5	6		1	2	3	4	5	6	
10.15	Improvement in water quality	1	2	3	4	5	6		1	2	3	4	5	6	
10.16	Positive impact in consumer behavior	1	2	3	4	5	6		1	2	3	4	5	6	
10.17	Reduction in crime rates	1	2	3	4	5	6		1	2	3	4	5	6	
10.18	Other:	1	2	3	4	5	6		1	2	3	4	5	6	

12. How effective is each strategy for engaging the public in your jurisdiction on urban forestry related issues? (Please circle your answer)

		Not very successful	Somewhat unsuccessful	Neutral	Somewhat successful	Very successful	Don't know	NA
12.1	Holding community workshops on issues like tree care	1	2	3	4	5	6	7
12.2	Distributing pamphlets or brochures with information on the proper tree maintenance techniques	1	2	3	4	5	6	7
12.3	Organizing community wide events such as tree plantings	1	2	3	4	5	6	7
12.4	In person communication with city staff about tree related issues	1	2	3	4	5	6	7
12.5	Neighborhood association meetings to raise awareness about tree issues	1	2	3	4	5	6	7
12.6	Information booth on urban forestry programs at city wide events (e.g. farmer's markets)	1	2	3	4	5	6	7
12.7	Tree board or commission meetings	1	2	3	4	5	6	7
12.8	Arbor day or week activities	1	2	3	4	5	6	7
12.9	Urban forestry program website	1	2	3	4	5	6	7
12.10	Environmental education programs through local schools	1	2	3	4	5	6	7
12.11	Public notifications through the local newspaper on issues such as tree removal	1	2	3	4	5	6	7
12.12	Public hearings on tree related ordinances	1	2	3	4	5	6	7
12.13	Social media outlets to communicate benefits of trees	1	2	3	4	5	6	7
12.14	Partnerships with local non-profits or environmental groups, such as watershed councils or master gardener programs, to promote tree planting events or best management practices	1	2	3	4	5	6	7
12.15	Corporate sponsorship of tree planting activities	1	2	3	4	5	6	7

12. *Continued.* How effective is each strategy for engaging the public in your jurisdiction on urban forestry related issues? (Please circle your answer)

		Not very successful	Somewhat unsuccessful	Neutral	Somewhat successful	Very successful	Don't know	NA
12.16	Heritage or Memorial Tree programs	1	2	3	4	5	6	7
12.17	Other:	1	2	3	4	5	6	7

12. How supportive is the public in your jurisdiction to urban forestry in general? (Please circle your answer)

Not very supportive	Somewhat unresponsive	Neutral	Somewhat supportive	Very supportive	Don't know
1	2	3	4	5	6

C. Portland-Vancouver Metropolitan Regional Urban Forestry Strategy

The *Portland-Vancouver Metropolitan Regional Urban Forestry Strategy* is a new project to promote healthy urban forests in the Portland-Vancouver metro area. This strategy was prompted in response to the *Vibrant Cities, Urban Forests* report published by the U.S. Forest Service, recommending the creation of regional urban natural resource plans. The objectives of the *Regional Urban Forestry Strategy* are to increase urban tree canopy in the Portland-Vancouver area, foster regional collaboration around trees, and expand the management capacity of our urban forest. The final outcome of this strategy will be to produce a written urban forestry plan for the Portland-Vancouver region as well as create a template for other cities or large metropolitan areas to replicate.

13. How long ago did you first hear about the Portland-Vancouver Metropolitan Regional Urban Forestry Strategy?

- Greater than 6 months
- 3 – 6 months
- Less than 3 months
- This survey

14. Which elements of the final *Regional Urban Forestry Strategy* are important for advancing urban forestry goals in your jurisdiction? (Please circle your answer)

		Not very important	Somewhat unimportant	Neutral	Somewhat important	Very important	Don't know
15.1	A regional tree canopy cover assessment	1	2	3	4	5	6
15.2	A regional urban forest benefits analysis	1	2	3	4	5	6
15.3	Analysis of local program needs	1	2	3	4	5	6
15.4	Workshops for practitioners on urban forestry best management practices	1	2	3	4	5	6
15.5	A replicable urban forestry plan template for other cities, counties or regions	1	2	3	4	5	6
15.6	Workshops for community leaders on the benefit and importance of urban trees	1	2	3	4	5	6
15.7	Recommendations for increasing forest and habitat conductivity in the region	1	2	3	4	5	6
15.8	Understanding regional barriers to urban forestry management	1	2	3	4	5	6
15.9	Public education on the benefit of urban trees	1	2	3	4	5	6

15. Continued. Which elements of the final *Regional Urban Forestry Strategy* are important for advancing urban forestry goals in your jurisdiction? (Please circle your answer)

	Not very important	Somewhat unimportant	Neutral	Somewhat important	Very important	Don't know
15.10 Setting regional canopy cover targets	1	2	3	4	5	6
15.11 Tools for tree inventory or canopy cover analysis	1	2	3	4	5	6
15.12 Creation of urban forestry contacts list for the region	1	2	3	4	5	6
15.13 Technical assistance in several local projects to advance urban forestry in the Portland-Vancouver region	1	2	3	4	5	6
15.14 Recommendation on how to advance urban forestry regionally	1	2	3	4	5	6
15.15 Workshops on how to adopt or advance an urban forestry management planning	1	2	3	4	5	6
15.16 Workshops on how to apply for state or national urban forestry assistance programs	1	2	3	4	5	6
15.17 Other:	1	2	3	4	5	6

16. Are there any other elements of the *Regional Urban Forestry Strategy* not listed above that would be beneficial to your jurisdiction? (Please explain)

17. Please share any additional thoughts you have about the survey.

Thank you for completing the survey!

Greetings:

As a community leader and/or professional involved with the operations of your community, you have been selected to take part in the *Portland-Vancouver Urban Forestry Needs Assessment Survey* being completed by Oregon State University, in partnership with Oregon Dept. of Forestry and Washington Dept. of Natural Resources. This survey will collect information regarding the management of public trees in your jurisdiction and will help in the creation of a regional urban forestry strategy for the Portland-Vancouver metro region.

A letter containing a unique, customized link to the survey will be sent to you by email in approximately one week. Please note more than one person in your city or county may receive the survey; please do not forward this survey to anyone else – you were specifically selected as a survey participant because you help manage urban forestry issues or are part of leadership in your jurisdiction. The results of this study are for research purposes; your participation in the study is completely voluntary and any information provided in the survey will be kept confidential. There are minimal risks associated with this survey; there is, however, a possibility that we could disclose information that identifies you or that information collected online could be insecure. Researchers are taking all possible measures to ensure that confidentiality is maintained.

Thank you in advance for your help and support in conducting this survey. With your help we can work together to promote healthy urban forests in our region. If you have any questions or do not wish to be involved in this survey, please contact Abbey Driscoll, Student Researcher, by email at abbey.driscoll@oregonstate.edu, or Dr. Jenna Tilt, Principal Investigator at tiltj@onid.orst.edu.



Dear Community Representative,

You have been selected to participate in the Portland-Vancouver Urban Forestry Needs Assessment Survey. We estimate it will take approximately 10-15 minutes to complete the survey. This survey is being conducted by Oregon State University with support from the Oregon Department of Forestry and the Washington Department of Natural Resources. This study is part of the larger *Portland-Vancouver Metropolitan Regional Urban Forestry Strategy*, a collaborative effort to advance urban forests and their management on a regional scale. This particular study is designed to learn about what needs and barriers exist to urban forest program management in the greater Portland, OR and Vancouver, WA metro area. This survey asks community leaders and natural resource professionals in a variety of local jurisdictions, at both the city and county level, about the importance and success of urban forestry programs, the perception of their public about urban forestry issues, and elements they would like to see included in the regional strategy.

The results of this study are for research purposes. This survey will also help the *Regional Urban Forestry Strategy* task force to develop a written strategy as well as workshop and forum events to help cities and counties in the Portland-Vancouver region better manage their urban forests and create more collaboration around trees. By identifying specific needs and barriers to urban forestry management, state agencies and regional organizations can do a better job in providing services and recommendations for improving urban forestry in your jurisdiction and others in the Portland-Vancouver region. However, there are no direct benefits to you or your jurisdiction from participating in this study.

To participate in the study, a unique, customized link to the survey is provided at the end of this letter. Please do not give this link to anyone, or ask any other person to fill out this survey in your place. Once the survey is started, the survey tool will automatically save you place in the survey if you wish to close it and return to the survey later. To reactivate the survey simply re-open the link at the end of this letter. If you decide that you would rather complete the printed version of the survey, simply close the survey. A printed version of the survey will arrive at your address in a few weeks. If you do not wish to receive any future mailings, please contact Abbey Driscoll, Student Researcher, at: abbey.driscoll@oregonstate.edu.

Your answers are confidential and your participation in the study is completely voluntary. Any identifiable information, such as your position or address, will never be placed in the data file with your survey answers. You will NOT be asked to give any personal identifiable information, such as your name or address in the online or printed version of the survey. We will not use your address for any other purposes except this study. We do not foresee any risks or discomforts from taking this survey; however, as your identity is known there is a possibility that we could accidentally disclose information that identifies you. The security and confidentiality of information collected from you online cannot be guaranteed. Confidentiality will be kept to the

extent permitted by the technology being used. Information collected online can be intercepted, corrupted, lost, destroyed, arrive late or incomplete, or contain viruses. You may also skip any question that you do not want to answer.

If you have questions or concerns about the survey, please contact Abbey Driscoll, Student Researcher, with Oregon State University at abbey.driscoll@oregonstate.edu, or Dr. Jenna Tilt, Principal Investigator, at tiltj@onid.orst.edu. If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office, at (541) 737-8008 or by email at IRB@oregonstate.edu.

Funding for this research is provided by Oregon Department of Forestry, Urban and Community Forestry Program: CFDA No. 10.664.

Your cooperation is greatly appreciated.

Sincerely,

Abbey Driscoll, Student Researcher, *Portland-Vancouver Urban Forestry Needs Assessment Survey*



College of Forestry, Department of Forest Ecosystems and Society
Oregon State University, 321 Richardson Hall, Corvallis, OR 97331
T 541-737-2244 | F 541-737-1393 | <http://forestry.oregonstate.edu>

Date

Dear Community Representative,

Over the last month, we sent you a series of emails about an important study being conducted by Oregon State University with support from the Oregon Department of Forestry and the Washington Department of Natural Resources. This survey regards the management of trees in your community and will help inform the development of a regional urban forestry strategy for the Portland-Vancouver region. This will be the last correspondence that we will send to you, and we would like to invite you one last time to please consider completing the survey today. **The survey will be closing in approximately two weeks; we will be unable to accept completed surveys after that time.**

We strongly urge you to consider participating in this survey. We estimate it will take approximately 10-15 minutes to complete the survey. The survey is important because, based on the information you provide, this study will help state agencies and regional organizations do a better job in providing services and recommendations for improving urban forestry for your jurisdiction and others in the Portland-Vancouver region. There are, however, no direct benefits to you or your jurisdiction from participating in this study.

If you have already completed the web survey, please accept our sincerest thanks and kindly recycle the enclosed survey. Hearing from everyone is important for us to assure that the survey results reflect the opinion of community leaders and urban forestry practitioners in the Portland-Vancouver region. The web survey is still open if you wish to complete the survey in this manner. To participate in the study, please click on the link sent you in the previous emails. This link is unique to you and will reactivate the survey when selected. Do not give this password to anyone, or ask any other person to fill out this survey in your place.

We have also enclosed the paper version of the questionnaire if you prefer to complete the survey this way. When finished, please return the questionnaire in the pre-addressed envelope provided. Postage has been paid. If you need any assistance completing the survey, please contact Abbey Driscoll, Student Researcher, at: abbey.driscoll@oregonstate.edu. This will be the last mailing of the survey. You will not receive any further communication from the researchers following this letter.

The results of this study are for research purposes; your answers are confidential and your participation in the study is voluntary. Any identifiable information, such as your address, will never be placed in the data file with your survey answers. You will NOT be asked to give any personal identifiable information, such as your name or address in the online or printed version of the survey. We will not use your address for any other purposes except this study. We do not foresee any risks or discomforts from taking this survey; however, as your identity is known there is a possibility that we could



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accidentally disclose information that identifies you. The security and confidentiality of information collected from you online cannot be guaranteed. Confidentiality will be kept to the extent permitted by the technology being used. Information collected online can be intercepted, corrupted, lost, destroyed, arrive late or incomplete, or contain viruses. You may also skip any question that you do not want to answer.

If you have questions or concerns about the survey, please contact Abbey Driscoll, Student Researcher, with Oregon State University at abbey.driscoll@oregonstate.edu, or Dr. Jenna Tilt, Principal Investigator, at tiltj@onid.orst.edu. If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office, at (541) 737-8008 or by email at IRB@oregonstate.edu.

Funding for this research is provided by Oregon Department of Forestry, Urban and Community Forestry Program: CFDA No. 10.664.

Your cooperation is greatly appreciated.

Sincerely,

Abbey Driscoll, Student Researcher, *Portland-Vancouver Urban Forestry Needs Assessment Survey*

Appendix B: Additional Data Tables

Table B-1. Importance of an urban forestry program by jurisdictional type and management position. The first value in each table entry is the number of respondents (out of the row total) who identified the general importance of an urban forestry program. The second value is the number of respondents who identified the importance of an urban forestry program relative to other programs offered by the jurisdiction.

Jurisdiction Type	Position	Importance (count general importance / count importance relative to other programs)			Total
		Not important	Neutral	Important	
Small city (<17,88)	Community Official	2 / 3	1 / 3	17 / 7	20 / 13
	Program Manager	4 / 3	0 / 1	9 / 4	13 / 8
Large City (>17,883)	Community Official	2 / 8	1 / 2	21 / 7	24 / 17
	Program Manager	4 / 7	2 / 4	23 / 14	29 / 25
County	Community Official	2 / 2	0 / 0	2 / 1	4 / 3
	Program Manager	1 / 3	1 / 1	3 / 0	5 / 4
Total		15 / 26	5 / 11	75 / 33	95 / 70

Table B-2. Importance and successful achievement of urban forestry program components by respondent position and jurisdiction type. First value in each column is the number of respondents who identified a component as “somewhat” to “very important”; the second is the number who identified that their jurisdiction had been “somewhat” to “very successful” in achieving that program element.

Component	Importance and successful achievement of program components (# who indicated important / # who indicated successful)					
	Community Officials (n=48)	Program Managers (n=48)	Small Cities (<17,883) (n=33)	Large Cities (>17,883) (n=54)	Counties (n=9)	Total (n=96)
<i>Tree Health</i>						
A healthy public tree population	41 / 32	47 / 30	28 / 19	51 / 39	9 / 4	88 / 62
Structured street and park tree maintenance program	41 / 25	43 / 23	29 / 16	48 / 28	7 / 4	84 / 48
<i>Program Staff</i>						
Trained staff in proper tree care	35 / 24	42 / 27	26 / 15	29 / 34	6 / 2	77 / 51
Certified arborist on staff	18 / 13	26 / 21	6 / 4	35 / 28	3 / 2	44 / 34
Technical expertise such as proper tree pruning knowledge	35 / 21	39 / 24	25 / 12	44 / 30	5 / 3	74 / 45
Staff initiative to start or promote new programs	30 / 18	34 / 23	23 / 11	36 / 30	5 / 0	64 / 41
<i>Program Services</i>						
Tree planting program	33 / 21	40 / 31	24 / 15	41 / 34	8 / 3	73 / 52
Preferred species planting lists	34 / 25	43 / 34	28 / 18	41 / 36	8 / 5	77 / 59
Riparian restoration	29 / 24	47 / 35	22 / 17	45 / 36	9 / 6	76 / 59
Managing trees for environmental benefits such as stormwater mitigation	38 / 21	44 / 32	25 / 14	50 / 35	7 / 4	82 / 53
Managing trees for wildlife habitat	31 / 20	42 / 31	24 / 15	43 / 33	6 / 3	73 / 51
<i>Resource Management</i>						
A tree inventory	28 / 13	32 / 19	21 / 8	35 / 22	4 / 2	60 / 32

Table B-2. Importance and successful achievement of urban forestry program components by respondent position and jurisdiction type. First value in each column is the number of respondents who identified a component as “somewhat” to “very important”; the second is the number who identified that their jurisdiction had been “somewhat” to “very successful” in achieving that program element (continued).

Component	Importance and successful achievement of program components (number who indicated important / number who indicated successful)					Total (n=96)
	Community Officials (n=48)	Program Managers (n=48)	Small Cities (<17,883) (n=33)	Large Cities (>17,883) (n=54)	Counties (n=9)	
Tree canopy goals	28 / 10	34 / 16	19 / 5	38 / 21	5 / 0	62 / 26
A tree board or committee	18 / 7	22 / 18	10 / 2	27 / 23	3 / 0	40 / 25
Tree preservation ordinances	35 / 24	41 / 36	24 / 20	46 / 38	6 / 2	76 / 60
An urban forest management plan	31 / 13	38 / 18	20 / 8	44 / 21	5 / 2	69 / 31
Designated program funding	29 / 12	38 / 19	23 / 9	38 / 22	6 / 0	67 / 31
<i>Educational Awareness</i>						
Community involvement	35 / 23	39 / 23	26 / 12	43 / 33	5 / 1	74 / 46
Public education on proper tree maintenance	35 / 14	40 / 17	24 / 8	43 / 23	8 / 0	75 / 31
Public awareness on the benefits of trees	35 / 21	44 / 23	25 / 12	46 / 28	8 / 4	79 / 44
<i>Additional Program Support</i>						
Active political support	29 / 18	42 / 24	19 / 13	46 / 27	6 / 2	71 / 42
Administrative support	29 / 21	43 / 20	22 / 13	44 / 28	6 / 0	72 / 41
A local tree champion to promote and support urban forestry in the community	26 / 12	32 / 15	15 / 12	36 / 19	7 / 1	58 / 27
Partnerships with local non-profits or organizations to promote community engagement	31 / 17	39 / 21	24 / 13	39 / 23	7 / 2	70 / 38

Table B-3. Interest in urban forestry programs. The value in each table entry is the number of respondents (out of the row total) who identified an interest in implementing or expanding an urban forestry program in their jurisdiction.

Jurisdiction Type	Position	Interest			Total
		Not interested	Neutral	Interested	
Small city (<17,88)	Community Official	5	4	11	20
	Program Manger	4	0	9	13
Large City (>17,883)	Community Official	6	1	15	22
	Program Manager	5	3	20	28
County	Community Official	3	0	1	4
	Program Manager	1	1	3	5
Total		24	9	59	92

Table B-4. Urban forestry related needs. The value in each table entry is the number of respondents (out of the row total) who identified a specific need to implement or expand an urban forestry program in their jurisdiction.

Jurisdiction Size/Type	Position	Greatest Need (count)										Total
		Increased citizen demand	Increased or sustainable funding	List of recommended species	Creating an urban forest management plan	Information on the tree benefits	Training in establishing tree ordinances	Best management practices	Increased tree planting initiatives	Tools for outreach and education	Increased political support	
Small City (population <17,883)	Community Official	1	5	2	0	1	0	2	2	2	0	15
	Program Manger	2	3	0	0	0	1	2	0	1	3	12
Large City (population >17,883)	Community Official	2	12	0	0	0	0	1	0	2	1	18
	Program Manager	1	7	0	5	0	1	1	0	2	11	28
	Community Official	0	0	0	0	0	0	0	0	1	2	3
County	Program Manager	0	1	0	0	0	0	0	1	0	3	5
Total		6	28	2	5	1	2	6	3	8	20	81

Table B-5. Barriers to urban forestry program management. The value in each table entry is the number of respondents (out of the row total) who identified a specific barrier to urban forestry program management in their jurisdiction.

Jurisdiction Size/Type	Position	Largest Barrier (count)										Total
		Lack of vision or goals	Poor urban forest condition	Lack of regulations	Insufficient funding	History of conflicts surrounding urban trees	Lack of political support	Lack of trained personnel	A reactive approach to urban forest management	Technical assistance needs	Low public support	
Small City (population <17,883)	Community Official	1	0	0	68	2	0	0	2	2	2	15
	Program Manger	0	0	0	2	0	1	1	2	0	6	12
Large City (population >17,883)	Community Official	0	0	0	12	3	1	0	0	1	1	18
	Program Manager	3	1	0	10	2	4	1	4	0	5	30
County	Community Official	0	0	0	1	1	2	0	0	0	0	4
	Program Manager	0	0	0	0	1	3	0	1	0	0	5
Total		4	1	0	31	9	11	2	9	3	14	84

Table B-6. Priorities for urban forestry program management in the Portland-Vancouver Metro Region. The value in each table entry is the number of respondents (out of the row total) who identified a specific priority for urban forestry program management in their jurisdiction.

Jurisdiction Size/Type	Position	Highest Future Priorities (count)										Total
		Complete a full or partial tree inventory	Create or revise an urban forest management plan	Increase community education on urban forestry benefits	Establish or revise tree related ordinances	Increase community recreational opportunities	Establish Tree City USA status	Establish a tree board or commission	Work towards achieving tree canopy goals	Hire an urban forester or an ISA certified arborist	Proclaim and celebrate an Arbor Day observance	
Small City (population <17,883)	Community Official	1	2	4	3	0	2	0	2	0	0	14
	Program Manger	1	3	5	0	1	0	0	0	0	1	11
Large City (population >17,883)	Community Official	0	3	6	3	1	1	0	0	1	1	16
	Program Manager	5	5	2	5	1	2	0	1	4	2	27
County	Community Official	0	0	2	0	0	0	0	1	0	0	3
	Program Manager	0	1	1	0	1	0	0	0	0	0	3
Total		7	14	20	11	4	5	0	4	5	4	74