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JOBS & EQUITY *in the* URBAN FOREST



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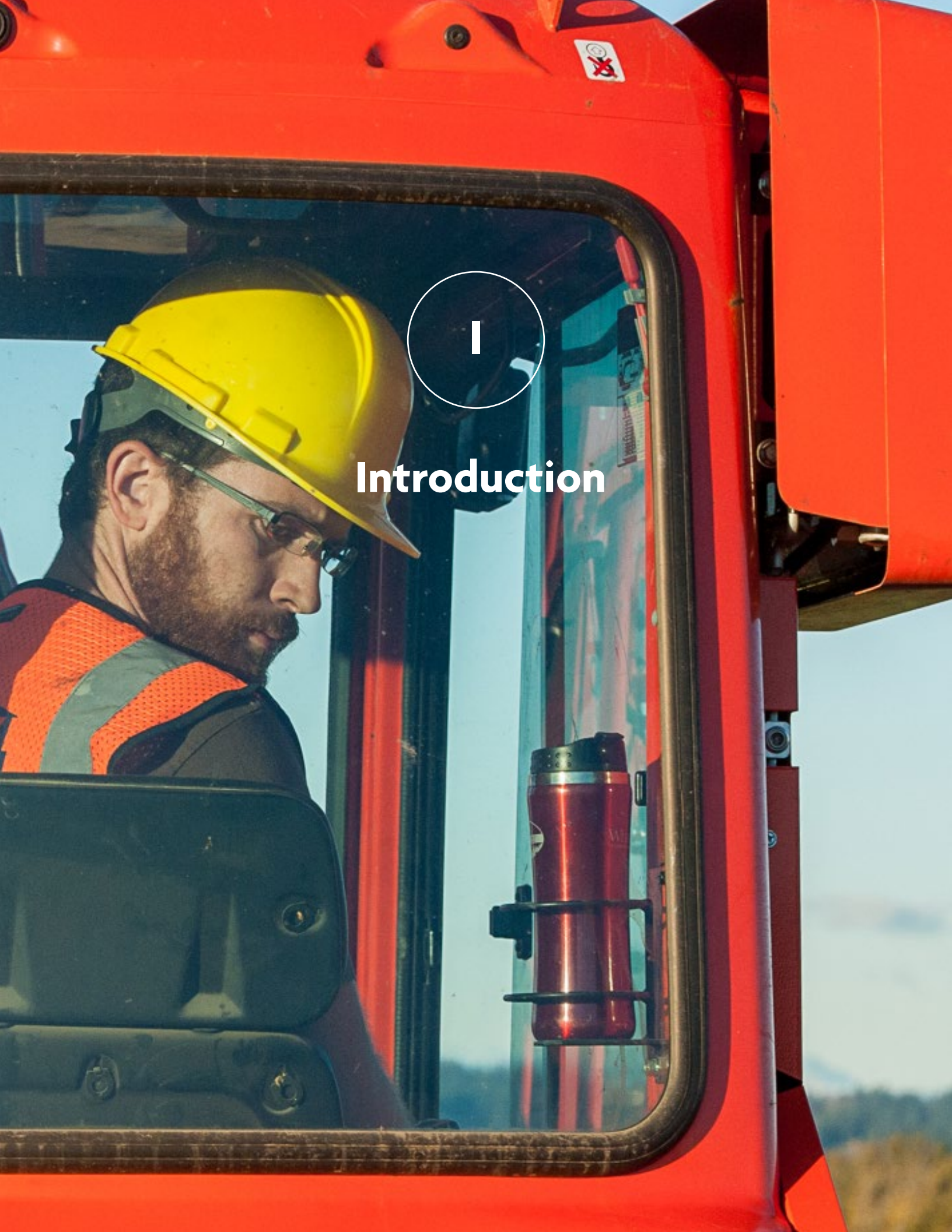
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I

Introduction

How can investments in the urban forest be designed to maximize their positive impacts on historically underinvested communities? How can employment programs targeted toward communities of color and low-income communities become more environmentally oriented? And what examples of success to date point the way forward in creating jobs and building social equity in the urban forest?

This study examines the economic, ecological, and social impacts of existing community-based urban forestry investments designed to benefit low-income communities and communities of color. Urban forestry refers to the science and management of forest resources in cities and urbanizing areas, ranging from single trees to groves, on public and private property (Wolf 2003).[1] Urban forestry in the United States dates back to the early-20th century and has grown consistently with increasing urbanization and citizen concern for environmental protection and restoration.

Recently, a small but growing range of policies, programs, and investments to create jobs and build social equity in the urban forest have met with demonstrable success. These investments are creating a range of economic and social opportunities for underserved communities, including living-wage jobs, opportunities for skill-building and advancement, and chances to increase involvement in municipal and regional planning processes.[2] Our results reveal a growing landscape of opportunities for connecting communities of color and low-income communities to investments in urban forestry and urban landscape restoration.

Urban forestry can be viewed as one of many forms of green infrastructure. Green infrastructure is broadly defined as "an interconnected network of green space that conserves natural systems and provides assorted benefits to human populations" (Rowe and Bakacs 2016; Benedict and McMahon 2006). Typical green infrastructure facilities include bioswales, vegetated planters, green roofs, rain gardens, restored open space, and street trees. The urban forest, which includes all trees along streets and roadsides, in privately owned yards, on institutional campuses, and on public properties including parks, can be viewed as one of the primary green infrastructure elements that provide ecosystem and human health benefits in a city.

1 Since grassroots and volunteer activities have contributed significantly to urban forestry, the practice of urban forestry has also been described as community forestry.

2 Jobs in the urban forest are one subset of a larger category often called "green-collar jobs": stable, living-wage jobs that protect the environment and support families (Jones 2008).

In general, green infrastructure provides positive net benefits to urban ecosystems and the people that inhabit them. Stormwater filtration, pollution reduction, temperature regulation, biodiversity conservation, and habitat for birds and other beneficial wildlife are all benefits shared by urban forests and other forms of green infrastructure.

Numerous studies have demonstrated that a healthy and well-maintained urban forest—including neighborhood trees, open spaces, parks, and natural areas—can benefit communities in multiple ways, including improvements in air and water quality, physical and mental health, social cohesion, and public safety (Donovan and Prestemon 2010, Donovan, Michael, et al. 2011, Harnik and Welle 2009, Heckert and Mennis 2012, Wells 2010, Hanson and Frank 2016). Yet despite growing efforts nationwide to plan, expand, and maintain the urban forest, not all urban communities have reaped the full benefits of urban forestry. Many existing urban policies and plans have excluded low-income communities and communities of color from urban forestry investments. These underinvested communities tend to be located in areas with sparser tree canopy, fewer parks, greater proportion of impervious surface, and lower air and water quality. As a result, people living in these communities tend to suffer from higher rates of respiratory illness, lower rates of physical activity, and higher levels of stress.

Municipal funding of the urban forest is often scarce, penalizing low-income communities, which by definition have fewer resources available to invest in their own urban forests. For example, in cities such as Portland, Oregon, private homeowners and business owners must pay for street tree maintenance, replacement, and removal. People living on low incomes, though, often cannot afford to maintain street trees on or in front of their properties. Communities of color have suffered similarly from the lack of urban forestry resources, from the siting of polluting industries and power plants, and from the routing of high-emissions truck traffic in proximity to their residences.

Report Organization

This report will proceed as follows: Chapter II profiles existing policies and public-sector initiatives around the country, at both the municipal and state levels, to promote social equity in the distribution of the urban forest while creating jobs in underinvested communities. Chapter III identifies the barriers and opportunities faced by members of communities of color and low-income communities in finding living-wage jobs and building careers in the urban forest, and profiles four successful workforce development programs targeted toward preparing members of underserved communities for skilled jobs in the urban forest. Chapter IV reviews the data on the composition and projected growth of the workforce for installing, operating, and maintaining the urban forest and related green infrastructure in Greater Portland, Oregon. Chapter V analyzes the economic impact of a single successful social enterprise, Portland-based Verde Landscape, which employs low-income people of color at living wages to build and maintain green infrastructure facilities. Chapter VI provides recommendations for policymakers, workforce development organizations, grassroots community groups, and social enterprises for ways to build social equity and create living-wage jobs in the urban forest, and offers concluding thoughts. A series of appendices offer a more detailed look at the benefits of green infrastructure (Appendix A), California's Greenhouse Gas Reduction Fund equity policies and procedures (Appendix B), technical information on green jobs classifications (Appendix C), and the complete IMPLAN analysis of Verde Landscape (Appendix D).



II

Public Initiatives in the Urban Forest:

Building Equity into Municipal and Regional Policymaking

A. Chapter Introduction

Linking positive environmental outcomes to economic development in communities of color and low-income communities can provide true "triple bottom line" returns: economic well-being, social equity, and a clean environment and thriving ecosystem. Neighborhood greening initiatives in underinvested communities are an important strategy to reverse historical legacies of environmental injustice and disinvestment. Across the United States, communities of color and low-income communities in urban areas experience scarcity in both natural assets such as open space and parks as well as economic development opportunities including living-wage jobs, local investment, and business development resources. These communities also tend to suffer from higher than average levels of toxic pollutants, which jeopardize human health. Are there policies or initiatives that can protect and enhance the urban forest in underserved communities while also creating jobs and promoting local economic development?

This chapter profiles some examples of a growing number of public-sector initiatives and policies relating to urban forestry and related green infrastructure. These initiatives are occurring across the country at multiple levels of government: state, regional, and municipal. They have created, and are continuing to generate, business opportunities, jobs, and job-training opportunities for people from historically underinvested communities—particularly youth and young adults of color and formerly incarcerated people, as well as low-income people more generally. Many of these initiatives have articulated "triple bottom line" goals of achieving environmental, economic, and social benefits in their projects.

The next sections profile three state and municipal policies and public programs to support job creation and build social equity in the urban forest:

1. The urban forestry initiatives formed within the State of California's Greenhouse Gas Reduction Fund, which has set aside substantial resources for the environmental restoration and revitalization of disadvantaged communities.

2. The City of Philadelphia's Green City, Clean Waters program, which has taken up the challenge of building green infrastructure solutions to pressing stormwater management needs, while focusing its efforts on historically disinvested areas of the inner city, where needs are greatest.

3. The range of current efforts under way in Portland, Oregon, to apply a social equity lens to public procurement and regional planning, including both the accomplishments to date and the challenges that remain.

In all the examples given in this chapter, we explore the strategies that government agencies, through policies and planning initiatives, can use to target their investments toward equity goals.

B. An Urban Forest with Clear Equity Goals: California's Greenhouse Gas Reduction Fund

California's Greenhouse Gas Reduction Fund (GGRF) offers an example of the way in which community involvement in the design of state policies can lead to clear policy language that serves broader equity goals. The GGRF is a large, multibillion-dollar investment by the State of California that has set aside funds specifically for urban forestry in disadvantaged communities. The origins of the investment lie in the State of California's aggressive state legislation to reduce greenhouse gases, which led to the adoption of a cap-and-trade system for greenhouse gas emissions in 2013. When cap-and-trade was initially proposed, many environmental justice advocates and communities voiced strong concerns that the policy would fail to address localized concentrations of co-pollutants in communities affected by industry, which are disproportionately in low-income communities of color. Through significant organizing and advocacy efforts, activists were able to include strong targeting language to ensure that a portion of the funds generated by cap-and-trade (more than $2 billion to date) benefit disadvantaged communities through the GGRF. Urban forestry projects received a small percentage of overall total funds ($18 million to date), but a significant portion of the urban forestry projects funded are located in disadvantaged communities and have explicit goals of hiring local residents from these communities.

In 2006, the California state legislature passed AB 32, a bill to reduce greenhouse gas emissions in the state to or below 1990 levels by 2020. One of the main programs created to achieve this goal was the cap-and-trade program, which sets a statewide limit on emissions and creates a market for the purchase and sale of credits based on this target (California ARB 2015).

Under cap-and-trade, a single facility can still continue to emit significant quantities of greenhouse gases and other co-pollutants that can have negative health and environmental impacts by purchasing additional credits on the market. These localized impacts are disproportionately concentrated in low-income communities of color within California. Throughout the state, environmental justice advocates organized against these inequities to promote stronger environmental and racial justice outcomes. One victory came with the passage of SB 535, which mandated that 25 percent of the revenues generated from cap-and-trade would be set aside for projects benefiting disadvantaged communities, and that 10 percent of the revenues would be spent within disadvantaged communities (California EPA 2014). Whether a community is designated as "disadvantaged" is determined by using a tool called the CalEnviroScreen, which provides a composite score of factors in each census tract in the state, incorporating pollution burdens and socioeconomic characteristics of the residents (OEHHA 2016).

Of the roughly $2.4 billion in revenues raised by cap-and-trade since 2013, nearly $18 million has been allocated for investments in urban forestry through 2016, with an additional $15 million allocated for the 2016–17 fiscal year. While urban forestry represents less than one percent of all funds generated from cap-and-trade, these new investments have been significant for the Department of Forestry and Fire Protection

(CAL FIRE), which is responsible for distributing urban forestry funding throughout the state (CAL FIRE 2016).

CAL FIRE awarded a total of $15.6 million in 2014–15 to projects to promote urban forestry through the GGRF (California ARB 2016). Grants ranging from $150,000 to nearly $1.5 million were given out to 29 organizations. These included organizations such as Plant with Purpose, California ReLeaf, Neighborhood Grow, and Trees for All. Strategic investments in large intermediary organizations like California ReLeaf enabled state investments to reach organizations that may have otherwise struggled to achieve the capacity to qualify for direct grant funding. California ReLeaf received a grant for $749,500, which it then subgranted to smaller local organizations across the state. These subgrants ranged from $18,500 to $70,000 to groups like Amigos de los Rios in Los Angeles County (California ARB 2016).

The GGRF funding guidelines contain clear and specific language for targeting benefits for disadvantaged communities. The California Air Resources Board, which oversees the cap-and-trade program and the dispersal of revenues from it, developed interim funding guidelines in 2014 and final funding guidelines in 2016, in order to provide administering agencies such as CAL FIRE guidance on how to distribute GGRF funds. These documents, which were developed with community input, include specific language on how to meet SB 535's mandate of targeting benefits for disadvantaged communities, as well as how to calculate the job creation and greenhouse gas reduction impacts of the various programs and investments (California ARB 2014). The Air Resource Board's guidelines for urban forestry and urban greening projects include the following criteria:

- The majority of the trees are to be planted in a disadvantaged community.
- At least 25 percent of the project work hours will be performed by residents of a disadvantaged community.
- At least 10 percent of the project work hours will be performed by residents of a disadvantaged community who are currently participating in a job-training program that leads to an industry-recognized credential.

Based on the above guidelines provided by the Air Resources Board, CAL FIRE developed grant guidelines for specific urban forestry projects. These guidelines give preference to projects located in or serving a disadvantaged community. Projects located in or serving disadvantaged communities can also have their cost-share requirement reduced or waived entirely. Ultimately, of the 29 grants given out by CAL FIRE, every single one of them included benefits to disadvantaged communities, whether through jobs or new investments (CAL FIRE 2016).

All GGRF-funded projects must provide annual data on the number of jobs, work hours, median pay, and job classification or trade that went to residents of disadvantaged communities. While it is too early in the process to have data for urban forestry projects, these reporting requirements will ensure that the data will be provided in the future to determine the jobs and equity impacts of these projects.

The Importance of Using Clear and Targeted Language:

California Proposition 84 Bond for Flood Control and Water Supply Improvements

Clear language that targets specific communities is the key to achieving real results. California's Proposition 84—a $5.4 billion statewide initiative to fund park, natural resources, and water projects through general bonds—became a test case for the importance of explicit targeting.

Approved in 2006, the Proposition 84 bond included $400 million to be set aside for "local parks and urban greening" efforts in "disadvantaged communities" and "severely disadvantaged communities"—defined as those with median incomes below 80 percent and 60 percent of the statewide average, respectively. "Critically underserved communities" were also defined as having less than five acres of usable park land per 1,000 residents.

Of the funds spent on urban greening under the set-aside section, approximately 97 percent went to urban communities, more than 87 percent went to park-poor communities, and 77 percent and 42 percent went to projects in disadvantaged and severely disadvantaged communities, respectively (UCLA Institute of the Environment and Sustainability 2016).

By contrast, of the other funds spent through the bond—those without clear language—there was markedly more spending in more affluent and park-rich areas. Combined, "disadvantaged communities" and "severely disadvantaged communities" received only 45 percent of the funding, while 55 percent went to communities with higher median household incomes. In addition, 56 percent of the funding overall was spent in areas that already had more park acres per resident, while 44 percent was spent in park-poor areas (UCLA Institute of the Environment and Sustainability 2016).

C. A Partnership to Weather the Storms: Philadelphia's Green City, Clean Waters Program

Philadelphia's Green City, Clean Waters program (GCCW) provides an example of a large-scale municipal green infrastructure initiative that has successfully targeted contracting and employment opportunities toward communities of color and low-income communities through a robust partnership between private-sector firms, public agencies, and workforce development organizations. In Philadelphia, the city had long recognized that its antiquated combined sewer system was in need of an upgrade, in order to address challenges with water quality and degradation of the watershed. Initially developed in 2009, and approved by the EPA in 2011, the program devotes $1.2 billion toward green stormwater infrastructure management over 25 years. Rather than expand traditional, "grey" infrastructure solutions such as sewer pipes, the program uses bioswales, rain gardens, tree plantings, and other "green" infrastructure solutions to capture stormwater before it enters the sewer system.

The program seeks to leverage the efficiency gains and sustainability of green stormwater management technologies, and builds a robust workforce pipeline to provide access to jobs and business opportunities in the growing urban greening sector for local residents, while cutting long-term maintenance costs (Philadelphia Water Department 2011a). Through partnerships with local businesses, community-based organizations, and the Youth Conservation Corps, the Philadelphia Water Department (PWD) has leveraged these green infrastructure investments to increase access to business opportunities and good-paying jobs in green infrastructure fields, including tree planting and maintenance.

Almost 900 different green stormwater projects have been completed in the first five years, nearly one-third of which directly involved tree planting. This includes both publicly funded projects and private projects that have been incentivized by regulatory changes created by the GCCW program. An interactive online map is available to track where projects are occurring across the city (Philadelphia Water Department 2016a). The majority of these projects—58 percent—are located in low- and moderate-income neighborhoods (Econsult Solutions 2016).

..the city's investments in green stormwater infrastructure have had an economic impact of nearly $60 million to the local economy...

An economic analysis of the first five years of GCCW commissioned by the Sustainable Business Network and GSI Partners found that the city's investments in green stormwater infrastructure have had an economic impact of nearly $60 million to the local economy, supporting 430 local jobs (Econsult Solutions 2016). GSI Partners member businesses saw their revenues increase by nearly 14 percent—from $129 million to $147 million—in one year alone, from 2013 to 2014. The analysis also notes that GCCW has created more contracting opportunities for small businesses compared to a similar investment in grey infrastructure, because green infrastructure projects tend to generate smaller contracts that small, local businesses can successfully compete for. In addition, the city has incorporated requirements for participant goals for minority-owned and women-owned business enterprises (MWBEs) into its grant programs to incentivize green stormwater

infrastructure on private land (Philadelphia Water Department 2016c). In 2015 alone, the city awarded $8.25 million in grants for 11 properties that will improve 92 acres of privately owned land (Philadelphia Water Department 2015b).

Building a support network for small businesses has become an important part of the GCCW program, for which a local nonprofit called Green Stormwater Infrastructure (GSI) Partners has played a central role. In 2013, the Sustainable Business Network of Greater Philadelphia, also a local nonprofit organization, launched GSI Partners to develop local business capacity in this industry and support the success of GCCW. GSI Partners provides professional development grants for business owners in the industry, hosts a directory of more than 60 local member businesses—including material suppliers and architecture, engineering, landscape design, building, and maintenance firms—and conducts networking and educational opportunities to help those businesses secure both public and private contracts for the new investments generated by GCCW. GSI Partners also engages in advocacy to maximize the local economic impact of both public and private investments in green stormwater infrastructure and to ensure the longevity of GCCW (GSI Partners 2016).

Since the beginning of implementation of the GCCW plan, the Philadelphia Water Department has expanded its use of minority-owned and women-owned business enterprises significantly, thanks in part to a mayoral executive order to require project labor agreements (PLAs) for most city-funded projects greater than $5 million (Living Cities 2013). These PLAs must include requirements for diversity in both hiring and contracting (City of Philadelphia 2011). In fiscal year 2010, only 17 percent of all contracts went to MWBEs; by fiscal year 2014 this had increased to 24 percent, and by the first half of fiscal year 2015, the participation rate was on track to achieve 30 percent. PWD has added a director of participation and held workshops to help MWBEs build capacity. By fiscal year 2015, PWD had 13 PLAs in place for seven projects ranging in size from $4.5 to $45 million, with several more in the pipeline (Philadelphia Water Department 2015a). Figure 1, below, documents the growth in the percentage and dollar amount of contracts to minority-owned, women-owned, as well as disadvantaged business enterprises (DBE).

Figure 1. Green City, Clean Waters: Philadelphia Water Department Contracts Summary

CONTRACTS SUMMARY (*AS OF DECEMBER 2014)

	FY10	FY11	FY12	FY13	FY14	FY15*
Total amount of contracts	$58,790,962	$130,695,391	$105,653,665	$145,599,508	$171,861,087	$125,472,044
Total amount to MWDBE	$10,013,494	$32,535,549	$22,336,432	$33,113,328	$39,335,707	$37,590,607
Participation Rate	17%	25%	21%	23%	23%	30%

D. Designing Equity for Green Infrastructure Businesses: Portland, Oregon

In the Greater Portland metropolitan area, municipal and regional government agencies are currently developing a suite of initiatives to incorporate equity into municipal and regional policymaking, including public procurement contracting, hiring for public works projects, and regional planning. The most significant initiatives to promote social equity in municipal contracting in the City of Portland have taken place in the construction industry. In Portland, and across the nation, the construction industry suffers from a long history of significant and persistent disparities in the contracting of minority-owned and women-owned firms, as well as the hiring and promotion of women and minority workers (Chorpenning et al. 2015; Wilkinson and Kelly 2016). Creating jobs and building equity in the urban forest requires an examination of the challenges facing the construction industry in these areas.

Effective minority contracting and equitable hiring policies hold the potential to strike at the heart of the racial inequalities in the Greater Portland area. As of 2013, in Multnomah County—the largest county in the Portland metropolitan area—average income per capita in communities of color was half that of white communities ($16,636 vs. $33,095); child poverty in communities of color was almost triple that of white communities (33.3% vs. 12.5%) (Curry-Stevens 2010). Communities of color suffer environmental inequities as well: a 2011 study found that communities of color were disproportionately exposed to toxic air pollutants in the Portland area (Oregon Department of Environmental Quality 2011).

Until recently, the City of Portland's vaunted efforts to protect and restore open space and manage stormwater sustainably did not prioritize social equity or environmental justice, or address the city's historical legacy of environmental injustice and racial exclusion. However, increasingly, Portland has begun to recognize the linkages between building social equity, creating economic development opportunities, and protecting environmental resources. The 2015 Climate Action Plan provides an example of this thinking: in its 2050 vision statement for Portland and Multnomah County, the Climate Action Plan highlights "plentiful employment and small business opportunities led by and employing under-served and under-represented minorities" (City of Portland 2015, 3). This statement demonstrates an increasing awareness of social equity issues in the context of regional planning in the face of climate change, and it accurately identifies the importance of equitable employment and business opportunities in an effective urban sustainability strategy.

The Climate Action Plan's language about equitable opportunities taps into an emerging conversation about social equity in contracting and hiring on publicly funded projects throughout the metropolitan area. To date, the City of Portland has addressed these issues through a suite of municipal programs. These programs, including the Prime Contractor Development Program, Subcontractor Equity Program, and Minority Evaluator Program, have led to measurable increases in the proportion of contract dollars going to minority-owned and women-owned firms since they were adopted (City

of Portland 2016; Chorpenning et al. 2015). Due in part to these programs, as well as the individual efforts of city employees, the City of Portland increased the proportion of procurement dollars awarded to minority-owned firms from 0.09 percent in FY 2007–08 to 7.9 percent in FY 2012–13 (Chorpenning et al. 2015). Recent equity contracting efforts, such as the Community Benefits Agreement developed for two Portland Water Bureau projects, have also shown success in setting and meeting contracting and hiring targets.

While these programs and project agreements demonstrate an increasing effort to include minority-owned firms and workers in the process of municipal procurement, they have yet to correct the persistent regional disparities in access to public-sector contracts and living-wage jobs (Chorpenning et al. 2015). For example, when individual projects have met predetermined hiring targets for people of color, such hires often take place for the lowest-paid, lowest-skill jobs without pathways toward promotion. There is a documented gap in hiring people of color in the building trades at journey level (Chorpenning et al. 2015; Haines 2016). In addition, data on the utilization rates of minority contractors has been inconsistent, making tracking of outcomes difficult (Chorpenning et al. 2015).

Most projected green infrastructure-related jobs are either construction and building trades jobs, or related jobs such as materials transport, as demonstrated in Chapter IV, Section C of this report. The construction industry builds all of the infrastructural elements that surround and complement green infrastructure. These elements include curbs, planter boxes, parking strips, pervious pavement, and any other built elements that surround bioswales, green streets, rain gardens, and other green stormwater management facilities. Construction crews also build the parking lots, restrooms, playgrounds, sports facilities, and public access points for parks, trails, and urban natural areas, as well as the site work often necessary to remediate brownfields, develop new parkland, reclaim urban open space, and prepare for ecological restoration activities. Thus the structure and outcomes associated with equity agreements in the construction trades will by necessity affect the equity outcomes of green infrastructure projects.

1. SUMMARY OF DISPARITIES IN PUBLIC CONTRACTING

Most of the demographic data on disparities in public construction contracting have been collected by the public sector on specific projects: only recently have government agencies called for comprehensive data to investigate racial composition of private construction firms in the region (Equity Strategy Advisory Committee 2016). The first attempt to collect data and address systemic disparities in public construction contracting occurred in 1995, when the City of Portland and the Portland Development Commission took part in the Oregon Regional Consortium Disparity Study, which examined public construction contracting methods with a focus on disparities affecting racial and ethnic minorities and women.[3]

3 A disparity is defined as the difference or gap between a measured outcome and a reference point. In the case of contracting, disparities are measured as the gap between the utilization rate of firms (the measured outcome) and their availability to perform the work required (the reference point).

The disparity study measured differences between the utilization of minority-owned and women-owned construction firms, and their availability as qualified contractors or subcontractors to perform specified services. The study concluded that minority- and women-owned businesses were underutilized at prime contract level (BBC Research 2016, 1). From this original 1995 disparity study came a list of recommendations that led to the implementation of the city's Fair Contracting and Employment Strategy to promote equity and equal opportunity for certified minority-owned, women-owned, and emerging small businesses (MWESB).[4] As part of this strategy, the City of Portland implemented a suite of initiatives to encourage the utilization of minority- and women-owned firms on city contracts as part of its fair contracting and small business support program, including:

- The **Professional Services Marketing and Outreach Program** advertises small business opportunities and services, gives presentations to organizations that represent minority-owned and women-owned firms, and conducts one-on-one consultations with business owners, outreach events, and networking groups.

- The **Prime Contractor Development Program** (formerly called the Sheltered Market Program) is designed to improve opportunities and build the capacity of certified MWESBs in the regional construction industry to compete in the open market at a prime contracting level.

- The **Subcontractor Equity Program** requires that any construction projects estimated at or above $150,000 set a goal that 20 percent of hard construction cost dollars will be contracted to MWESB-certified firms as subcontractors.

To evaluate the results of these original efforts, the City of Portland conducted a follow-up disparity study in 2009. Table 2, below, presents a compiled list of disparities in contracting and hiring from the 2009 disparity study (BBC Research 2016). The table identifies five existing disparities in contracting and hiring in the construction industry, identifies current interventions to address them, summarizes the successes of those interventions to date, and identifies the limitations of those interventions to date.

4 An MWESB certification covers not only minority-owned and women-owned businesses, but also small-scale businesses owned by men who are not minority group members (i.e. non-Hispanic White).

Table 2. List of Primary Disparities in Contracting and Hiring in the Construction Industry in the City of Portland

	Existing Disparity	Current Interventions	Successes to date	Limitations to date	Source
1	City is not required to publicly advertise small construction contracts	Professional Services Marketing and Outreach Program	None documented	Inclusion of majority- (white)-owned small businesses dilutes outreach program's effectiveness at reaching minorities and women	BBC Research 2016; Chorpenning et al. 2015
2	City prequalification process limits opportunities for MBEs and WBEs	None to date; BBC consulting recommends various options to simplify, limit, or discontinue the "prequal"	None documented	Prequal requirements remain highly onerous for small and newly established firms	BBC Research 2016, Ex.Sum. 4
3	Significant disparity in prime contracting	Prime Contractor Development Program/ Sheltered Market Program (SMP)	No documented successes to date outside SMP	SMP represents very small percent of market; outside SMP, 0.3 percent of prime contract dollars go to MBEs or WBEs	BBC Research 2016, ch.8, p.4
4	Significant disparity in subcontracting	Good Faith Effort Program; Subcontractor Equity Program	Within the program, GFE succeeded in eliminating disparities in utilization of MBEs and WBEs as subcontractors	Outside the GFE program, disparities persist; inside the program, Asian-Pacific American– and Native American owned–firms remain underrepresented	BBC Research 2016
5	Hiring and wage disparities for people of color and women	Portland Development Commission (PDC): Workforce Training and Hiring Program	Hiring goals were met on the Sellwood Bridge Project	Wage disparities persisted on the Sellwood Bridge Project	Chorpenning et al. 2015, pp. 29–34

The information presented above in Table 2 demonstrates that although the city has implemented a suite of strategies for addressing disparities in contracting and hiring in the construction industry, none of these strategies has been successful in changing outcomes consistently.

2. MINORITY-OWNED, WOMEN-OWNED, AND EMERGING SMALL BUSINESSES: PERSISTENT INEQUITIES

One of the primary tools adopted in states and municipalities around the country to address disparities in public contracting across all industries has been the creation of a certification for minority-owned, women-owned, and emerging small businesses (MWESBs). Disadvantaged Business Enterprise (DBE) certification is the federal analogue to state-level MWESB certification, and applies to federally funded projects under the jurisdiction of the U.S. Department of Transportation (MWBE 2016, Business Oregon 2016a). The State of Oregon's economic development agency has developed a one-stop certification process for all federal and state targeted certifications (Business Oregon 2016b).

The City of Portland encourages the utilization of MWESB- and DBE-certified firms in order to promote inclusion and a sustained, vibrant local economy (City of Portland BRFS 2016). For example, the Subcontractor Equity Program requires that any construction projects estimated at or above $150,000 will set a goal that 20 percent of hard construction cost dollars will be contracted to MWESB-certified firms. The MWESB certification, and the programs that support it, indicate support for the idea of social equity in business contracting. Yet the current evidence on the racial, ethnic, and gender composition of certified MWESB firms indicates that, in the case of urban forestry and green infrastructure, the certification does not act as an effective tool to address racial or gender inequities.

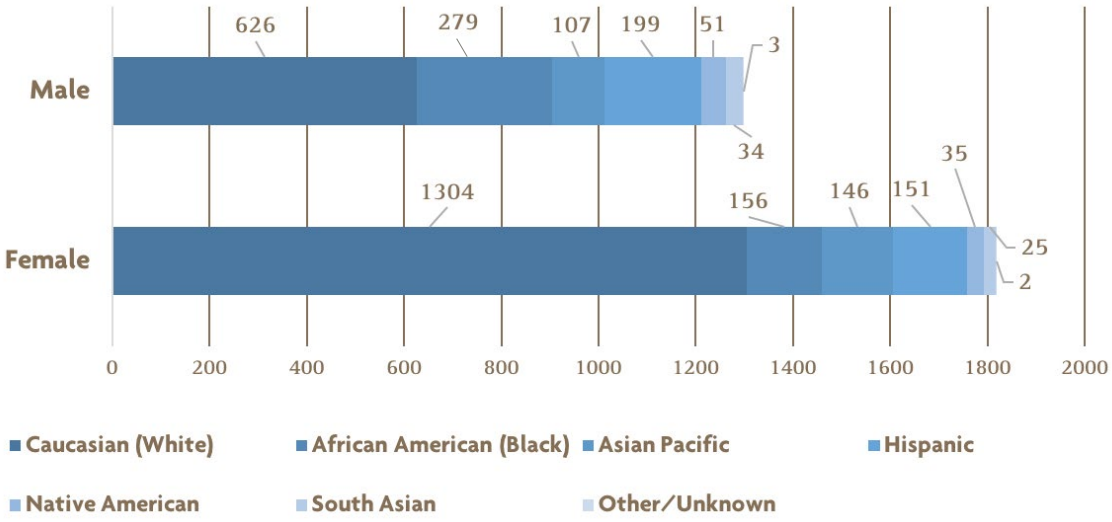
Table 3, (p. 22), presents data on the racial and ethnic breakdown of all firms that have attained Oregon-based MWESB certification in the three largest counties that make up the Greater Portland metropolitan area: Multnomah, Washington, and Clackamas counties. The figure demonstrates that among firms that have attained the certification, the majority are owned by Caucasian (white) people. For instance, people of Caucasian (white) descent own 1,926 out of a total of 3,111 firms with the MWESB certification across the four counties measured as part of the metropolitan area (61.9%). This pattern of majority white ownership of MWESB-certified firms persists across all three major counties. This result suggests that the certification is an ineffective tool to promote contracting for minority-owned firms specifically. Figure 2, below, presents data on the racial/ethnic and gender breakdown of all firms that have attained MWESB certification in the three major counties of Greater Portland metropolitan area. The figure demonstrates that females own the majority (58.3%) of all MWESB certified firms; however, 1,304 out of the 1,819 female business owners (71.7%) are of Caucasian (white) descent.

Table 3. Racial and Ethnic Breakdown by County for All MWESB Firms in the Greater Portland Metropolitan Area

	COUNTY			
Race/Ethnicity	**TOTAL**	**Multnomah**	**Washington**	**Clackamas**
African American (Black)	433	350	40	43
Caucasian (White)	1,926	1,117	413	396
Native American	86	32	29	25
Asian Pacific	253	165	48	40
Hispanic	349	169	118	62
South Asian	59	12	40	7
Other/Unknown	5	4	0	1
Total	3,111	1,849	688	574

Source: Business Oregon (2016b)

Figure 2. Racial/Ethnic and Gender Breakdown for All MWESB Firms in the Greater Portland Metropolitan Area



The industry most important to the direct installation and maintenance of urban forestry and green infrastructure facilities is landscaping services (NAICS 561730). Table 4 and Figure 3, below, present the racial and ethnic breakdown of all MWESB-certified landscaping services companies located in the four largest counties that make up the Greater Portland metropolitan area. The graph demonstrates that people of Caucasian (white) descent own 46 out of a total of 61 MWESB-certified landscaping firms (75.4%), while all other racial/ethnic groups own the remaining 15 firms (25%). The table also provides a gender breakdown by race and ethnicity. Men own the large majority (68%) of all MWESB-certified landscaping services companies in the Greater

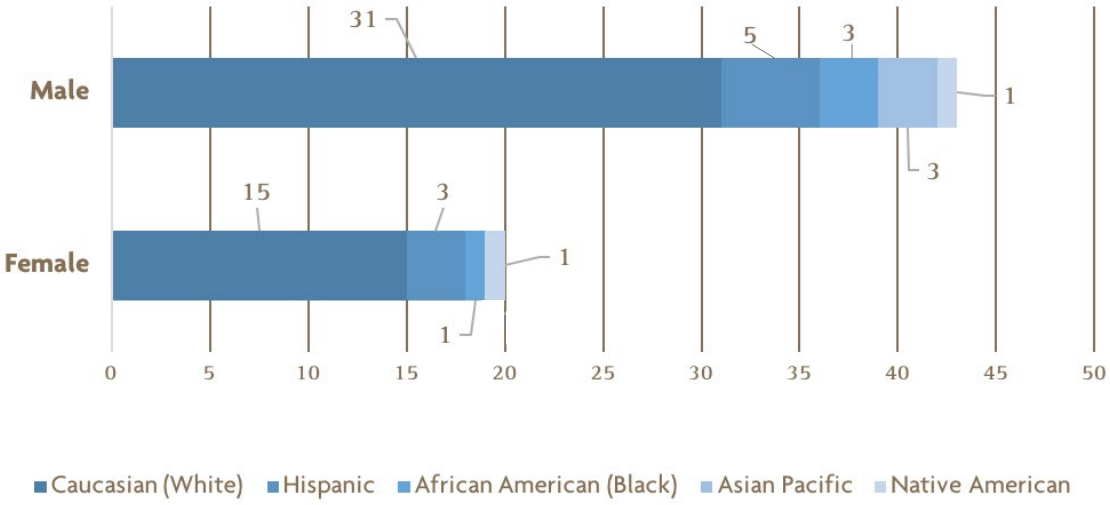
Portland metropolitan area. Within each gender, Caucasian (white) individuals own the majority of firms: 75 percent of female firm owners and 72 percent of male firm owners are Caucasian (white). In the case of landscaping, the proportion of Caucasian and male ownership of MWESB-certified firms is significantly higher than the aggregate of all MWESB-certified firms.

Table 4. Racial and Ethnic Breakdown of MWESB Ownership in Landscaping Services (NAICS 567130)

		COUNTY			
Race/Ethnicity	**TOTAL**	**Multnomah**	**Clark**	**Washington**	**Clackamas**
African American (Black)	4	3	0	0	1
Caucasian (White)	46	21	0	15	10
Native American	1	0	1	1	0
Asian Pacific	3	2	0	1	0
Hispanic	7	5	0	2	0
TOTAL	61	31	1	19	11

Source: Business Oregon (2016b)

Figure 3. Racial and Ethnic Breakdown of MWESB-Certified Firms in Landscaping Services in the Greater Portland Metropolitan Area



Though citywide efforts to incorporate racial and gender equity into public procurement have met with limited success to date, two bright spots stand out. First, a regional strategy for social equity in the construction trades has begun to develop, called the Construction Career Pathways Project (C2P2). This project, still in its early stages, will create a framework for ensuring baseline social equity standards in construction contracting and workforce development funding (Fortney 2016). Second, measurable

successes in contracting of minority-owned and women-owned businesses, and hiring, training, and promotion of minority and women workers, have recently been attained at the level of individual projects. The next section profiles two recent city construction projects for which social equity gains have been made, and lessons learned in the process. The final section of this chapter profiles a nascent initiative to incorporate social equity into the Portland metropolitan area's regional planning process, with implications for urban forest access for communities of color.

3. BUILDING EQUITY IN CONTRACTING AND HIRING: PORTLAND WATER BUREAU

Two recent Portland Water Bureau projects demonstrate marked improvements in equity contracting and hiring, as compared to previous city construction projects.[5] In September 2012, the City of Portland piloted its first Community Benefits Agreement (CBA) on two Portland Water Bureau projects: the Kelly Butte Reservoir and the Interstate Maintenance Facility Renovation. The Kelly Butte Reservoir project replaced the 10-million-gallon aboveground steel tank atop Kelly Butte in Southeast Portland with a 25-million-gallon underground reservoir, for a total budget of $57.25 million. For the Interstate Maintenance Facility, the Water Bureau replaced an aging maintenance building with a new, highly efficient facility to meet the bureau's current operation and maintenance programs for a $35 million budget (Barnard and Hood 2016).

The CBA was signed by a large group of more than 40 community organizations, labor unions, and businesses, and contains legal and binding language on hiring, contracting, workforce training, and community oversight. It was implemented and monitored via an Oversight Committee that consisted of representatives from labor unions, the prime contractor (Hoffman Construction), the city government, and community groups representing minority and women workers and contractors. The Oversight Committee established the processes of the CBA, administered the funds it raised, and established a Compliance Subcommittee to track and monitor outcomes. Community partners on the Oversight Committee included Urban League of Portland, Oregon Tradeswomen, Portland Youth Builders, and Constructing Hope.[6] The project funds, raised through a set-aside of one percent of hard construction costs, were administered by a partnership between a nonprofit, Construction Apprenticeship and Workforce Solutions (CAWS), and Worksystems, Inc., the Portland Metro region's workforce development agency. The nonprofit Emerald Cities Portland provided project management, strategy development, and other support to the partnership (Barnard and Hood 2016). Project funds were distributed across three main functions: Construction Training, Outreach, and Recruitment; Technical Assistance; and Compliance.

5 For example, the Sellwood Bridge Project set clear hiring and contracting targets for minority workers and minority-owned firms, but fell short of those targets in several important areas (Chorpenning et al. 2015).

6 For a complete set of the partners on the Oversight Committee, please see Barnard (2016).

The most significant set of outcomes sought by the CBA was a set of workforce diversity goals for minority and women workers, and minority construction contractors. These goals included the following provisions:

- 20 percent of all worker hours utilized by apprentice utilization
- 18 percent of apprentice hours utilized by minority apprentices
- 9 percent of apprentice hours utilized by female apprentices
- 9 percent of journey work hours utilized by female journey workers
- 10 percent of all work hours utilized by local HUBZone[7] workers
- 22 percent of all contracts/subcontracts utilized by DMWESB contractors[8]
- 12 percent of all contracts/subcontracts utilized by minority-owned and/or women-owned contractors (DMWBE), not including the ESB designation

According to data collected by an independent consultant (Barnard and Hood 2016), the project met all goals except the utilization of female journey workers, which the CBA Oversight Committee attributed to an overall underrepresentation of female workers in the construction industry. The project made use of a variety of strategies to meet its goals, including targeted outreach and recruitment, close coordination between the prime contractor and the oversight committee, careful data collection and tracking of outcomes, targeted technical assistance for contractors, workforce training for apprentices and journey-level workers, and most importantly, the active participation of the Oversight Committee itself. Oversight Committee members cite the shared accountability among all of the project partners as a key to its success in targeted contracting and hiring (Barnard and Hood 2016).

The Portland Water Bureau CBA provides an example of a successful strategy for achieving diversity in contracting and hiring on public projects. CBAs hold the potential to increase accountability of private contractors and project managers for utilizing DMWESBs on public projects. The Oversight Committee has underscored the effectiveness of targeted contracting and hiring goals in bringing about diversity, equity, and inclusion outcomes on public contracts (Barnard and Hood 2016). However, the criticisms brought to the Portland Water Bureau's CBA process have led to difficulties in replicating it for other city projects. The issue is currently the subject of contentious debate within the Portland municipal government, and has not yet been resolved.

Although the Portland Water Bureau CBA successfully increased utilization of DMWESBs in contracting, and successfully hired significant numbers of minority and women workers, it has drawn two criticisms that are important to note. First, the involvement of construction unions on the Oversight Committee raised alarms for some open-shop minority contractors. Open-shop contractors, who are not signatories with construction trade unions, can be disadvantaged by provisions in project labor agreements (PLAs) that often require them to use union hiring halls (Chorpenning et al. 2015). However, the Kelly Butte and Interstate projects did make use of multiple open-shop contractors.

7 A HUBZone is a geographical area that is targeted by the federal government for workforce recruitment due to high levels of unemployment.

8 In this section, following Barnard and Hood (2016), we use the acronym "DMWESB" to refer to the composite of MWESB and DBE, as defined above.

Second, critics suggested that the CBA presented a conflict of interest, through having the same organizations oversee the implementation of the CBA and provide professional services to administer it (Andrews 2016). Kelly Haines, senior manager at Worksystems, Inc., argued that some overlap of organizations who manage and implement the CBA was inevitable, given the small number of local organizations with the capacity to work in this space (Haines 2016).

4. EQUITY IN REGIONAL PLANNING

In addition to targeted contracting and hiring, the social equity strategies currently being pursued in the Portland metropolitan area include increased participation by communities of color in regional planning processes. This section profiles a recent social equity strategy in regional planning conducted by the Greater Portland regional government agency, Metro. Metro engages in regional planning processes with communities, businesses, and residents in the tri-county area of the Portland metropolitan region, serving more than 1.5 million people in Clackamas, Multnomah, and Washington counties. Metro manages a number of the region's key assets, including the Oregon Zoo, the Oregon Convention Center, and 17,000 acres of natural areas. The agency's jurisdiction includes Portland, Oregon, and 24 additional cities, stretching from the banks of the Columbia River in the north to the bend of the Willamette River near Wilsonville, and from the foothills of the Coast Range near Forest Grove to the banks of the Sandy River at Troutdale (Metro 2016).

One of Metro's most important functions is its Parks and Nature department. Metro's Parks and Nature department ensures water quality, protects and restores fish and wildlife habitat, and creates opportunities to enjoy nature close to home through a connected system of parks, trails, and natural areas. It now manages 17,000 acres of open space and natural areas, with significant voter investments funded through two bonds (in 1995 and 2006) and an operating levy (Metro 2016).

a. Gabbert Butte

In close proximity to downtown Gresham are the East Buttes, a cluster of ancient lava domes more than two million years old. The East Buttes encompasses about 1,000 acres of protected wildlife habitat near a growing urban area. Metro and the City of Gresham are collaborating to create a master plan for one of the East Buttes, Gabbert Butte, to create better entries and access to trailheads, improve the trail system, and enhance connections to nearby trails. This jointly developed natural areas plan underscores the importance of the regional planning partner, Metro, in building equity at the regional level by assisting a relatively underinvested city within the region, Gresham, in developing its natural and recreational resources. The plan will identify opportunities to experience nature such as hiking, biking, viewing wildlife, picnicking, nature-based play, and educational opportunities (Metro 2016).

Gabbert Butte is among the first park planning projects undertaken by Metro Parks and Nature to have a specific equity focus identified as part of its planning process. While it does not promise to create jobs directly, the project will serve as a pilot for reaching out to communities of color and ensuring that parks and natural areas are welcoming and inclusive of all cultures. The master planning process is expected to take 12 to 18 months, and design, permitting and construction another 18 to 24 months, with the new Gabbert Butte Nature Park open in 2019. The planning process will include three phases of outreach with open houses, neighborhood and group presentations, a stakeholder committee, a project website, social media, sign-ups for project updates, and one-on-one conversations.

b. Connect with Nature

The Gabbert Butte planning process dovetails with Metro Parks and Nature's social equity initiative Connect with Nature, which seeks to develop a region-wide understanding of how to make parks and natural areas more welcoming for underserved communities, and ensure a more inclusive park planning process. Metro has hired Portland nonprofit Verde to co-develop an inclusive outreach strategy to ensure that the initiative reaches communities of color. The Connect with Nature initiative bolsters the social equity component of the Gabbert Butte project by organizing workshops that specifically target communities of color, thereby giving Metro an opportunity to hear specifically from communities of color prior to engaging with the broader public. Connect with Nature workshops will be held at each phase of planning for Gabbert Butte, as well as East Council Creek, a second site in Washington County. In addition, community leaders participating in the Connect with Nature workshops have the opportunity to serve on the stakeholder committee of the Gabbert Butte master plan process, and are offered a stipend to support their ability to do so. Through the Connect with Nature project, Metro is adjusting the typical planning process to break down institutional barriers of participation. At the same time, the project increases the capacity of communities of color to participate in planning, by supporting their process of becoming familiar with typical planning systems like stakeholder committees.

As the Metro's lead consultant on the project, Verde convened a team of community-based organizations including the Native American Youth and Family Center (NAYA), the Asian Pacific American Network of Oregon (APANO), the Immigrant and Refugee Community Organization (IRCO), and Multicultural Collaborative (MCC). Verde also sub-contracted with a landscape architecture firm, ESA, to create a design driven by community priorities. The project's structure ensures community leadership by positioning the community-based organization Verde as the lead consultant, with the landscape architecture firm as a sub-consultant. The team has identified 14 community leaders to engage with community members in the park planning process, and identify priorities for how their communities seek to experience nature. The project provides these selected leaders with a stipend to serve on a Community Involvement Committee, whose roles are to bring members of their community to the workshops and help facilitate the workshops.

The outcomes of the Connect with Nature outreach will specifically inform planning for Gabbert Butte and East Council Creek, and more broadly inform how Metro plans for, and designs access to nature throughout the regional system of parks and natural areas.

Linking these newly developed participatory planning processes with job creation remains a question to be resolved; it is difficult to build job creation targets into natural areas planning processes. However, evidence from Chapter V of this report suggests that engaging community-based social enterprises in implementing natural areas restoration could be an effective means of creating accessible jobs for communities of color and low-income communities.

E. Persistent Challenges

Each of the projects profiled in this chapter has made gains in ensuring greater access to the urban forest, and the jobs created in installing and maintaining it, for underinvested communities. Since 2013, California's Greenhouse Gas Reduction Fund has demonstrated the benefits of clear targeting language and objective criteria for community benefit, using the CalEnviroScreen as a rigorous targeting tool and ensuring a reliable funding stream for urban forestry in disadvantaged communities. In Philadelphia, the Green City, Clean Waters program has successfully developed a diverse and inclusive green infrastructure workforce through building partnerships with the local business community, community-based organizations, and Youth Conservation Corps, conducting outreach and business development through a local nonprofit called Green Stormwater Infrastructure (GSI) Partners. In Portland, targeted contracting and hiring agreements for public projects have become more rigorous and effective over time; the region has also begun explicitly incorporating social equity into its regional planning processes.

The projects and initiatives profiled above have also experienced challenges. For instance, the $18 million set aside for urban forestry in disadvantaged communities under California's GGRF is a small fraction of the $2.4 billion raised by the program to date. It is also not clear yet how many direct jobs will be created by the urban forestry investments in these communities. In the City of Philadelphia, where there has been some progress on increasing contracting opportunities for minority-owned and women-owned businesses, more can be done to bring these efforts to scale. In Portland, the accomplishments of the Community Benefits Agreement for the Kelly Butte and Interstate Maintenance Facility projects have been diluted by controversy over the implementation of the agreement. And the City of Portland still lacks a comprehensive strategy for ensuring social equity in municipal contracting and hiring. Meanwhile, efforts to build social equity in regional planning for parks and natural areas show promise, but as of yet they are too early-stage to produce measurable results. In each of these projects and initiatives, bold and creative leadership from community and government partners has helped to address these challenges.

III

Barriers and Opportunities in the Urban Forest:

The Role of Workforce Development



A. Chapter Introduction

A primary objective of our study is to identify the principal barriers and opportunities for communities of color and low-income residents to obtain employment and develop successful careers working in the urban forest. This chapter presents the results of such an inquiry conducted between April and September 2016, focusing on the Greater Portland metropolitan area. We divide barriers and opportunities in workforce development into six categories by educational level and economic sector: pre-college programs, community college programs, apprenticeships and internships, private-sector employment, public-sector employment, and nonprofit-sector employment. Each educational level and sector is characterized by different points of entry, requirements, and overall dynamics and trends. Hence, barriers and opportunities differ across the levels and sectors.

In the second half of the chapter, we present four brief case studies of successful workforce development programs and initiatives in the urban forest. Two of the initiatives we profiled are based in Portland, Oregon and two are based in two Northeast cities, Philadelphia and New Haven, Connecticut. All of these programs target youth, young adults, and adults from low-income communities and communities of color and prepare them for skilled jobs and careers in urban forestry sectors. In Portland, the Parks and Recreation youth programs provide young people with a range of urban forestry-related skills; the Youth Mentoring Collaborative assists in placing qualified young people of color in jobs within environmental fields, including urban restoration. In Philadelphia, PowerCorps PHL trains young adults in the skills required to maintain green stormwater infrastructure facilities and provides them with pathways to employment in these fields. In New Haven, the Urban Resources Initiative leverages its exclusive tree contract with the City of New Haven to provide workforce training to vulnerable people, including young people of color and formerly incarcerated people in transition.

B. Analysis of Barriers and Opportunities

This section summarizes the principal barriers and opportunities facing people from communities of color and low-income communities seeking employment in the urban forestry and related green infrastructure sectors. To identify these barriers and opportunities, the authors conducted a series of 16 interviews with professionals engaged in workforce development, entrepreneurship, job training, outreach, and education in the urban forestry and green infrastructure sectors throughout the Greater Portland metropolitan area. The team also conducted two site visits during August 2016: one to the Portland Parks and Recreation's Youth Conservation Crew, and one to an urban restoration site managed by the nonprofit social enterprise Verde Landscape. Finally, the team attended two workshops led by the U.S. Environmental Protection Agency (EPA) devoted to socially equitable, environmentally restorative economic development in Greater Portland, entitled "Making a Visible Difference." The next six subsections present the results of this analysis by workforce development category. For each section, we present a table listing the principal barriers and opportunities associated with urban forest workforce development, accompanied by a brief discussion of each barrier and opportunity.

1. PRE-COLLEGE PROGRAMS

Pre-college programs in urban forestry and green infrastructure can include summer employment, paid or unpaid internships, and a range of outdoor education opportunities. In the case of Portland, these programs can be run by public agencies (e.g. Portland Parks and Recreation) or nonprofits (e.g. Groundwork Portland).

Table 5. Opportunities and Barriers to Workforce Development in Pre-College Programs, Portland Metropolitan Area

Opportunities	Barriers
Diversity of program offerings	Youth program saturation
Company outreach and retention programs for youth	Lack of training or internship opportunities
	Lack of agency support for programs

A range of opportunities do exist for youth of pre-college age to become involved in the urban forest. The most important opportunities we identified are as follows:

- **Diversity of program offerings for youth.** There currently exist a suite of programs for high school students in environmental fields, including urban forestry, park development, restoration, and remediation or cleanup. These programs range from paid summer employment to internships and apprenticeships in technical fields (Rosteck 2016a, M. Hanson 2016). Currently the number of applicants for these programs far exceeds the number of positions available, suggesting that the programs could be expanded (Rosteck 2016a).

- **Company outreach and retention programs.** Some companies and nonprofits target outreach and hiring to youth and young adults and engage in mentoring and skill-building in order to promote retention. The qualifications and skills that youth acquire through these organizations make them better qualified for higher-paying or supervisory positions than self-taught workers or workers trained by low-bid landscape or tree contractors (Tarver 2016).

Despite the range of opportunities, there is still a relative scarcity of positions in these programs. We identified the three primary barriers to enrollment in summer employment and internship programs for pre-college students as follows:

- **Youth program saturation.** The Youth Conservation Crew (YCC), offering entry-level conservation technician positions, had more than 200 applications for 36 positions last year (Rosteck 2016a).

- **Lack of training or internship opportunities.** Youth and young adults who are not bound for college, but are seeking employment with job training directly from high school, often find that internships and apprenticeships are scarce (Rosteck 2016a).

- **Lack of agency support for programs.** In designing youth programs, municipal agencies often focus on recreational opportunities; agency managers often underestimate the importance of summer employment in nature-related jobs for building motivation, self-esteem, job readiness, economic self-sufficiency, financial literacy, and good work habits among teenagers (Rosteck 2016a).

2. COMMUNITY COLLEGE PROGRAMS

Community college programs in arboriculture and horticulture play an important role in feeding into career pipelines in urban forestry (Schrosk 2016). However, people from communities of color often find these programs difficult to access (Harber and Nelson 2016). Table 6, below, presents the primary barriers to and opportunities for workforce development in community college programs that we identified in our survey of the Greater Portland metropolitan area.

Table 6. Opportunities and Barriers to Workforce Development in Community College Programs, Portland Metropolitan Area

Opportunities	Barriers
New degree and certificate programs	Language barriers
Scholarship funding	Financial barriers
Bilingual workshops on campus	Lack of outreach and community connections

The three primary opportunities at the community college level that we identified are as follows:

- **New degree and certificate programs.** Community colleges are increasingly offering degrees and certificates in green infrastructure–related industries. For example, the new associate's degree in arboriculture offered by Clackamas Community College trains students to be job-ready at graduation (Harber and Nelson, 2016). Unfortunately, while many of the workshops offered through the new program will be presented bilingually, the classes themselves will not.

- **Scholarship funding.** Inclusion is a mission for community colleges. In horticulture and arboriculture, some programs are increasing scholarship funding. For example, at Clackamas Community College, the horticulture department funds $42,000 in scholarships every year. Combined with targeted outreach, these funds can be used to enroll students from underserved communities (Harber and Nelson 2016).

- **Industry workshops on campus.** Programs at community colleges, including Clackamas Community College and Portland Community College, engage industry professionals to provide workshops on campus, offering students skills and pathways to employment (Harber and Nelson 2016; O'Connor 2016). Some of the workshops presented as part of the Clackamas Community College arboriculture program will be bilingual (English and Spanish).

We identified the three primary barriers to enrollment in community college programs as follows:

- **Language barriers.** Most community college programs in urban forestry or related disciplines (such as horticulture) do not have full-time bilingual teaching capacities. Scarcity of bilingual instruction poses a barrier for English-language learners, especially for technical training that require specialized vocabulary (Harber and Nelson 2016).

- **Financial barriers.** People from low-income backgrounds may be unable to afford tuition and course credit fees associated with community college programs; financial aid and scholarship resources for these programs historically have been scarce (Harber and Nelson 2016).

- **Lack of outreach and community connections.** Community college programs in natural resource sectors often lack significant capacity for targeted outreach to bridge divides of culture and class (Harber and Nelson 2016).

3. APPRENTICESHIPS AND INTERNSHIPS

Apprenticeships and internships are crucial ways for youth and young adults to gain important job skills, increase exposure to professional fields, and make professional connections. However, these resources are often difficult or impossible to access for people from communities of color and low-income communities. Table 7 presents the primary barriers to and opportunities for workforce development in apprenticeship and internship programs that we identified in our survey of the Greater Portland metropolitan area.

Table 7. Opportunities and Barriers to Apprenticeships and Internships in Urban Forestry and Green Infrastructure, Portland Metropolitan Area

Opportunities	Barriers
Cross-sector mentoring collaboratives	Lack of cultural competency among staff
Free certifications and training	Disconnection from professional certifications
	Lack of targeted outreach and promotion

The most important opportunities at the internship or apprenticeship level that we identified are as follows:

- **Cross-sector mentoring collaboratives.** Diversity has become a high priority for many public agencies, including Portland's regional government agency Metro. The Youth Mentoring Collaborative (YMC) is a group of public agency professionals devoted to expanding opportunities for youth from underserved communities through mentoring, apprenticeships, and internships (Rosteck 2016a, De la Hoz 2016). YMC focuses on youth of color within conservation fields and provides support to the adult professionals who mentor them. A profile of YMC is provided below.

- **Free certifications and training.** The apprenticeship programs offered by some public and private agencies provide free certifications and training as part of their contract (Schrosk 2016; Hanson 2016).

We identified the three primary barriers to apprenticeship and internship programs as follows:

- **Lack of cultural competency among staff.** Difficulties in communication may arise between the organizational staff and the interns and apprentices, due to cultural or class barriers or biases, and/or intergenerational divides. If the organization has neither staff from the underserved communities nor training resources to foster communication across these divides, the interns and apprentices may experience difficulties integrating into the organization (M. Hanson 2016).

- **Disconnection from professional certifications.** Many urban forestry or green infrastructure jobs require certifications; most apprenticeships and internships do not offer certifications as part of their programs. Thus, job seekers may face difficulties transitioning to employment after apprenticeship (Rosteck 2016a).

- **Lack of targeted outreach and promotion.** Internship programs often do not promote themselves strategically to underserved communities (M. Hanson 2016). Further, unpaid internship programs are not possible for many young people from low-income backgrounds, for whom paid work is necessary to support their families.

The Youth Mentoring Collaborative

The Youth Mentoring Collaborative is a group of 50-plus partner organizations in the Greater Portland, Oregon, metropolitan area, working together since 2013 to help provide clear pathways for the next generation of diverse leaders in environmental education and conservation. Partner organizations include Portland Parks and Recreation, Metro, the U.S. Fish and Wildlife Service, the Audubon Society, and many others. The partners convene regular meetings to share best practices, build capacity, and coordinate on service areas and program offerings (Youth Mentoring Collaborative 2016).

A key component of the Youth Mentoring Collaborative is creating recruitment tools for youth that are seeking green careers, with organizations that offer job and volunteer opportunities. For instance, the annual Youth Environmental Job Fair is an initiative that has been implemented to connect youth with on-the-job skills training and better access to employment opportunities. The fair offers opportunities in networking, meeting employers, and applying for jobs on the spot. Organizations that are represented at the Youth Environmental Job Fair include the TALON Program (Audubon Society of Portland), Friends of Trees, Tillamook Forest Center, Oregon Zoo, and the Nature Conservancy. Youth participating in this work are being mentored in skills that help them excel in environmental conservation- and restoration-related professions, environmental education, and urban farming practices.

Through its work in convening partnerships, sharing best practices, and reaching out to underserved communities, the Youth Mentoring Collaborative is playing an important role in mobilizing and giving priority to youth of color seeking careers in environmental restoration and conservation, fields long lacking in diversity and inclusion. The collaborative has stated: “We believe that exposure to environmental fields with conscientious mentors is key to a more diverse and inclusive environmental field” (Youth Mentoring Collaborative 2016).

4. PRIVATE-SECTOR EMPLOYMENT

Getting a job in the private sector is the most reliable way to acquire job skills and build a career; the majority of jobs in urban forestry and related green infrastructure construction, installation, and maintenance are with private-sector firms (Tarver 2016). However, in this area as well as others, members of minorities and low-income communities face barriers. Table 8, below, presents the results of our analysis of barriers to and opportunities for private-sector employment in these sectors.

Table 8. Opportunities and Barriers to Private-Sector Employment in Urban Forestry and Green Infrastructure in the Portland Metropolitan Area

Opportunities	Barriers
On-the-job training and education opportunities	Lack of mentorship
Industry-workforce partnerships	Disconnect between urban forestry businesses and communities of color and low income
Overall industry growth	Scarcity of full-time job openings

The three primary opportunities for private-sector employment that we identified are as follows:

- **On-the-job training and education opportunities.** High-road employers in arboriculture, such as Treecology, offer funded opportunities for on-the-job training, education, and professional development including conference attendance. These opportunities build skills, deepen professional networks, and increase job satisfaction among workers (Schrosk 2016; Tarver 2016).

- **Industry-workforce partnerships.** Community-based organizations can work with workforce training providers, labor unions, and private-sector firms to create collaborative partnerships. These partnerships can bridge the divides of race and class within environmental fields (Satterfield 2016; Haines 2016). The Green Careers Training Project, profiled below, is an example of a cross-sector workforce training partnership that was oriented specifically toward green jobs in Portland. In Philadelphia, the Philadelphia Water Department provides another example of a successful partnership that has brought together workforce development organizations with private-sector firms.

- **Overall industry growth.** Since the recovery from the Great Recession, private-sector demand for urban forestry services has been on an overall upward trajectory (Schrosk 2016; O'Connor 2016). Demand for green infrastructure facilities on private residences, such as rain gardens, ecoroofs, and disconnected downspouts, is on the increase (O'Connor 2016). Growth in demand for urban forestry services brings about increased employment in the sector. According to one of our private-sector interviewees, the majority of demand for entry-level workers in urban forestry is in the nursery industry (O'Connor 2016).

The three primary barriers to private-sector employment in urban forestry for people from communities of color and low-income communities that we identified are as follows:

- **Lack of mentorship.** Even with educational qualifications, it is difficult for graduating students to find reliable employment in the private sector. Mentorship is necessary to assist young adults in climbing the job ladder and identifying a viable career path (Tarver 2016).

- **Disconnect between urban forestry businesses and communities of color and low-income communities.** Most businesses in urban forestry and green infrastructure are small-scale arborist and landscaping companies; in general—though there are exceptions—the owners of such businesses tend to not be well connected to communities of color or other underinvested communities (Haines 2016). Small-scale urban forestry businesses tend to recruit through a narrow range of channels, including professional networks, trade associations, community college programs, and public agencies. People of color, and people from low-income backgrounds, are underrepresented in these arenas (Schrosk 2016; Haines 2016). Once hired, retention can be a challenge for companies, due to cultural barriers and unconscious biases (Haines 2016).

- **Scarcity of full-time job openings.** There simply are not many jobs available specific to green infrastructure facilities such as rain gardens, bioswales, or street trees (Tarver 2016). Street-tree plantings are often conducted by volunteers, and there are relatively few full-time paid positions available (Karps 2016; Fogarty 2016). Many landscaping and arborist jobs are temporary or seasonal in nature; mid-level, full-time jobs in the sector are scarce (Tarver 2016; Maginnis 2016).

The Green Careers Training Project

The Green Careers Training Project was a two-year Portland-based job-training partnership (2010–12) between workforce training organization Worksystems, Inc. (WSI), local community colleges, and a group of community-based organizations, including Verde, Constructing Hope, Oregon Tradeswomen, Inc., Urban League of Portland, Native American Youth and Family Center (NAYA), and others. The project provided job-training opportunities and career-coaching services to unemployed people of color, ex-offenders, veterans, and the homeless, in order to help people from these groups enter green occupations that pay living wages (Green Careers Training Project 2012).

The project was initiated in March 2010, when the U.S. Department of Labor awarded WSI $4 million to convene the partnership, funded through the American Recovery and Reinvestment Act (ARRA). The partnership created several pathways to obtain training and support services to help secure living-wage employment in a suite of rapidly growing industries. Job skills acquired through the program included energy-efficient construction techniques including the use of efficient building materials, HVAC technology, and insulation, as well as skills related to a wide range of auxiliary occupations including transport, administration, information technology, and manufacturing (Green Careers Training Project 2012). Unfortunately, funding for the project was cut in 2012, probably due to expiration of stimulus funds dedicated for this purpose.

Over its two-year life span, the program trained 403 participants, of which 241 were employed at the end of the program, which exceeded program goals. The average cost of the program was less than $10,000 per trainee; workers were hired at an average wage of $15.75 per hour, generating an annual average of $1,091,520 in federal, state, and local income taxes. A total of 218 employers were involved in the program. Of the participants, 58 percent entered the program with high school equivalency or less, and 63 percent entered the program on some form of public assistance. People of color represented over 59 percent of program participants (Green Careers Training Project 2012).

5. PUBLIC-SECTOR EMPLOYMENT

A substantial proportion of the resources devoted to expanding the urban forest are generated by the public sector. The structure of the public sector, including its complex employment applications and career pathways, often creates difficulties for people facing language or culture barriers, educational barriers, or severe time and resource constraints. However, the funding available at the state and federal levels for mitigation, combined with municipal funds for tree planting and neighborhood greening, create a set of opportunities that can benefit people facing these barriers, if properly targeted. The barriers and opportunities we identified are presented below in Table 9.

Table 9. Opportunities and Barriers to Public-Sector Employment in Urban Forestry and Green Infrastructure, Portland Metropolitan Area

Opportunities	Barriers
Mitigation funding creating job opportunities	Lack of targeted outreach and cultural competency
Federally funded workshops and technical assistance	Difficult employment application process
	Lack of job pipeline and career tracks

The most important opportunities for public-sector employment that we identified are as follows:

- **Mitigation funding creating job opportunities.** Mitigation of industrial development, driven by regulatory (EPA) compliance, is a primary driver of public-sector demand for urban forestry, green infrastructure, and urban restoration services (O'Connor 2016).

- **Federally funded workshops and technical assistance.** Federal funding can support workforce-training and technical-assistance programs oriented toward the urban forest. For instance, the EPA's program Making a Visible Difference has funded a series of collaborative workshops and technical-assistance offerings related to equitable development, green infrastructure, and environmental justice for community-based organizations in several cities around the country, including Portland (Carr 2016). The EPA's work in Portland has included providing technical assistance on neighborhood greening for the Jade District, a predominantly Asian-American district located on the east side of Portland (U.S. EPA 2016). In Philadelphia, PowerCorps PHL (profiled on p. 42) is a city-led AmeriCorps initiative designed to provide at-risk youth and young adults with job-training opportunities related to environmental stewardship, including green infrastructure.

The three primary barriers to public-sector employment in urban forestry for people from communities of color and low-income communities that we identified are as follows:

- **Lack of targeted outreach and cultural competency.** Public agencies often lack robust equity strategies and thus overlook important equity-related actions, such as targeted outreach, needs assessments, and participatory planning with and for the benefit of communities of color and low-income communities. Agencies that intend to promote diversity and inclusion often lack organizational capacity, including cultural competency (Rosteck 2016a, Carr 2016, De la Hoz 2016).

- **Difficult employment application process.** Public-sector employment applications are often difficult, convoluted, and require a high level of technical resources and capacity. The application process poses a barrier for people who lack prior experience or mentoring, face language barriers, or lack access to information technology resources (Maginnis 2016).

- **Lack of job pipeline and career tracks.** In general, there aren't many entry-level jobs in the public sector; upward mobility in the public sector is difficult (Rosteck 2016a, M. Hanson 2016). Low-bid contracting is very common in public-sector urban forestry work, entailing unstable employment at low wages (Schrosk 2016).

6. NONPROFIT-SECTOR EMPLOYMENT

Nonprofit-sector organizations tend to hold closer relationships to underserved communities than either private-sector firms or public agencies. In recent years, an increasing number of nonprofit-sector organizations have devoted attention to the urban forest, organizing tree-planting campaigns and engaging communities in participatory needs assessments and planning processes. Though employment in nonprofit urban forestry work can be difficult to obtain, the increased involvement of nonprofits in the urban forest can also lead to increased community participation in neighborhood greening efforts. This increased community participation can, in some cases, open up contracting and hiring opportunities. Table 10, below, identifies the barriers and opportunities associated with nonprofit-sector employment in urban forestry and green infrastructure.

Table 10. Opportunities and Barriers to Nonprofit-Sector Employment in Urban Forestry and Green Infrastructure in the Portland Metropolitan Area

Opportunities	Barriers
Increased community involvement in green infrastructure planning	Scarcity of funding and organizational capacity
Targeted contracting and hiring opportunities	Tree planting dominated by volunteers
Social enterprise development	

The three most important opportunities in nonprofit-sector employment that we identified are as follows:

- **Increased community involvement in green infrastructure planning.** Communities of color and low-income communities are increasingly taking the lead on setting planning priorities in the context of gentrification and climate change. In these planning processes, green infrastructure plays an important role alongside emergency preparedness, transit access, and leadership development (Satterfield 2016; Native American Youth and Family Center 2016). The Jade District greening process—a community effort to increase tree canopy, green infrastructure, and transit access and safety in a low-income, predominantly Asian-American community in Portland—is a prime example of such a process (Satterfield 2016). Community-led planning processes can dovetail with public-sector efforts: for example, Portland's Bureau of Environmental Services targets tree-planting resources to neighborhoods with low tree canopy, including the Jade District. The targeted tree-planting effort has involved extensive outreach to the Jade District community (Fogarty 2016; Karps 2016). Chapter II of this report profiles two recent participatory planning strategies by Metro, Portland's regional government agency: the Gabbert Butte project and their Connect with Nature program.

- **Targeted contracting and hiring opportunities.** Municipalities often hire nonprofits to plant trees and manage open spaces, translating to economic opportunities (Tarver 2016; Fogarty 2016; Karps 2016). Further, nonprofit organizations such as Friends of Trees are conducting targeted outreach to underserved communities to hire youth into paid positions leading tree planting crews, as well as positions canvassing neighborhoods to build support for tree planting (Fogarty 2016).

- **Social enterprise development.** A social enterprise is a business created to further a social purpose in a financially sustainable way (NESst 2016). Social enterprises offer an opportunity for community-based organizations to earn revenue through forming and developing businesses oriented toward meeting the needs of underinvested communities. In Buffalo, New York, local nonprofit PUSH (People United for Sustainable Housing) owns and manages a green infrastructure nonprofit, PUSH Blue, profiled on p. 43. In Portland, the neighborhood-based nonprofit Verde owns and manages a landscaping and restoration business, Verde Landscape, with the dual social purpose of urban ecological restoration and workforce development. Chapter V provides an economic analysis of Verde Landscape's 2015 activities.

The primary barriers to nonprofit-sector employment in urban forestry for people from communities of color and low-income communities that we identified are as follows:

- **Scarcity of funding and organizational capacity.** Nonprofit organizations often suffer from insufficient and/or inconsistent funding streams; funding availability often fluctuates with the economy, and therefore does not provide a safety net during recessions. Many nonprofits are not business-minded and thus often lack market readiness, making contract revenue relatively scarce (Tarver 2016).

- **Tree planting dominated by volunteers.** Nonprofits working in arboriculture often rely on volunteers for the bulk of tree planting; full-time tree-related jobs in the nonprofit sector are primarily in training and administration (Fogarty 2016; Karps 2016).

PUSH Blue

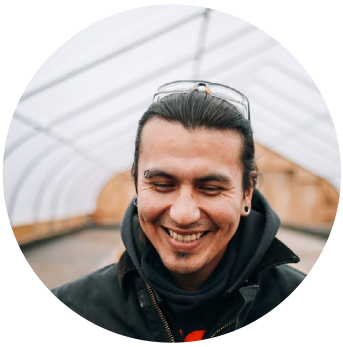
PUSH Buffalo (People United for Sustainable Housing) is a membership-based organization founded in 2005 that works on sustainable economic development and housing initiatives across the city of Buffalo. After decades of disinvestment on the city's West Side, PUSH launched the "Block by Block" action campaign to empower local residents to voice their concerns and vision for what they wanted their neighborhoods to look like; this process set the foundation for the neighborhood greening and revitalization effort known as the Green Development Zone (GDZ) (PUSH Buffalo 2012).

PUSH Blue is a social enterprise created by PUSH Buffalo to build green stormwater infrastructure projects in the GDZ neighborhood, increasing local environmental resources while employing local residents. With an installation crew of three and a general maintenance staff of two, all employed directly by PUSH, the enterprise is working on 25 projects in the GDZ over a two-year period, including planting rain gardens and installing green roofs and permeable pavements. Initial funding for PUSH Blue came from a $640,000 grant from the New York State Environmental Facilities Corporation Green Innovation Grant Program (Buffalo Sewer Authority 2014). The social enterprise has also raised revenue through fee-for-service contracts. More recently, they have become a green infrastructure general contractor with the Buffalo Sewer Authority.

PUSH Blue has actively sought to hire employees from underrepresented groups, and finds people through recruitment events and neighborhood outreach. PUSH Buffalo has leveraged its community network to build recruitment pipelines through workforce development and training organizations including YouthBuild, Outsource Center, Erie County Community College, the New York Boards of Cooperative Educational Services, and Environmental Education Associates (PUSH Buffalo 2012). By bringing workers on as employees rather than contractors, PUSH Blue offers their employees greater rights and more stability than hiring on contract, which is increasingly common. The company starts employees at a livable wage of at least $14 per hour, highlighting their commitment to providing quality jobs; PUSH is seeking to create long-term employment opportunities in its social enterprises such as PUSH Blue, and has seen little turnover of its staff.

The experience of PUSH Blue demonstrates that a focus on a single neighborhood greening effort, Buffalo's Green Development Zone, can give rise to a viable organization that recruits successfully from underserved urban communities, pays living wages to workers, partners with workforce development agencies to create job and career pipelines, and attains general contractor status.







C. Examples of Success: Emerging Models of Workforce Development in the Urban Forest

This section will examine four successful and emerging models of workforce development, training, and apprenticeship for green infrastructure and urban forestry. Two of these programs are located in Portland, one is located in Philadelphia, and one is located in New Haven. The first two models, Portland Parks and Recreation and Groundwork Portland, are targeted at youth and young adults seeking to obtain employment and gain job-related skills in environmental sectors. The third and fourth models, PowerCorps PHL and the Urban Resources Initiative, are oriented toward youth and young adults facing barriers to employment, as well as adults transitioning from prison.

1. PORTLAND PARKS AND RECREATION

a. Overview

Portland Parks and Recreation (PP&R) offers a suite of youth and young adult summer employment, education, and internship programs in conservation, environmental education, and job training. The programs conduct targeted outreach through a network of partners including community-based organizations, nonprofits, and schools. The programs focus restoration activities on PP&R's large portfolio of public properties, including the 5,000-acre Forest Park; they also benefit from a network of partnerships with environmental organizations on identifying and providing internship opportunities for youth.

The targeted outreach strategy includes developing partnerships with more than 50 separate community organizations: program coordinator Kelly Rosteck describes her first three years on the job as consisting almost entirely of relationship building (Rosteck 2016a). The program pays alumni to give recruiting presentations in local schools and community centers to which the alumni belong, including mosques, churches, and other community organizations. The program also recruits through e-mail, postal mail, and hand delivery of reminders to schools and homes, written in multiple languages.

The program's successful outreach to underserved communities ensures a truly diverse group of youth. For example, in 2015, out of 383 total youth conservation program participants, 77 percent were people of color, and 86 percent qualified for the free and reduced-price lunch program, an indicator of low household income. Of the program participants, 55 percent spoke a language other than English at home. Aware of the need for cultural competency in fostering a diverse and mutually supportive workforce and staff, the program conducts training for the entire crew of youth and full-time staff in ally-ship across lines of race, ethnicity, class, gender, and sexual orientation. For full-time staff, the program conducts additional training in culturally responsive mentoring. Portland Parks and Recreation offers four programs specifically oriented toward building job skills and readiness, including the following:

1. The Youth Conservation Crew

The Youth Conservation Crew (YCC) is an eight-week, paid summer program in natural-areas restoration, job skills, and job readiness. The program is made up of four main crews: Trees, Trails, No Ivy League, and Environmental Education. In 2015, the program employed 36 teens, ages 14 to 18, who in total worked 6,468 hours and earned $66,243. The programs work on sites throughout the City of Portland: the No Ivy League works primarily on the west side of Portland, the Tree crew and the Environmental Education crew work primarily on the east side, and the Trails crew works across the entire city.

The No Ivy League program consists of paid work of several types, primarily in natural-areas restoration and invasive-plant removal, including the ever-present English ivy. The work is informed by ecological monitoring and is conducted in collaboration with a professional ecologist on the staff of PP&R. Students perform ecological assessment under the direction of the ecologist, identifying the baseline and target outcomes of the area to be restored; they identify key plants in the transect and perform ongoing monitoring.

The authors visited the No Ivy League work site in August 2016. Observing the work process of the No Ivy League revealed a competent, hardworking, and highly diverse crew of high-school-age crew members and post-college-age supervisors. The crew members knew and understood the work to be performed, and they required very little instruction. Crew members displayed a positive attitude toward the work and revealed knowledge of key tree and shrub species, including Latin names. Crew members worked in small teams of six per supervisor. The tasks consisted of cutting and pulling large patches of English ivy from the vicinity of trees within Forest Park. The supervisors provided good safety supplies and practices including work gloves, tools in good condition, and warm-up stretches.

The YCC program, which includes the No Ivy League, also contains a suite of enrichment activities that occur during the paid workday. The participants attend site visits with professionals and learn about a variety of environmental fields. Job-readiness workshops are built into the program. The program also takes an overnight camping trip to the Oregon Coast with an accompanying marine biology lesson.

2. GRUNT (Greenspaces Restoration and Urban Naturalist Team)

The GRUNT program is a 65-hour volunteer naturalist training program for high school students (Portland Parks and Recreation 2016a). Participants explore a range of natural resources jobs while engaging in a range of environmental education and training activities, including plant identification, data collection, and animal observation, all within Portland parks and natural areas. Graduates are guaranteed a summer job with Nature Day Camp or the Youth Conservation Crew and may participate in internships through age 25. The related Jr. GRUNT program offers year-round opportunities for outdoor environmental science, college and career exploration, stewardship, and mentoring for middle school students.

3. Internships and Apprenticeships

Portland Parks and Recreation offers a series of internships and apprenticeships for graduates of the above three programs. Internships may or may not be paid; they consist of 20 to 40 hours of work and allow high school youth to explore career paths; in 2016 the program accepted 33 internship participants (Rosteck 2016a). Apprenticeships are appropriate for participants who are either not college bound, or have finished college. The apprenticeships consist of 200 hours of paid work and offer advanced skill building, certifications, and access to networking. In 2016, there were 12 apprenticeship participants (Rosteck 2016a).

b. Challenges Facing Portland Parks Youth Programs

The PP&R youth programs are overwhelmingly considered by their participants and staff to be successful; they build job skills and readiness, increase environmental knowledge and awareness, and provide youth from underserved communities with summer job opportunities at reasonable wages, as well as a range of educational opportunities in environmental fields. As of 2016, the program faces three major challenges: cultural competency of partner organizations, rising demand without corresponding budget increases, and challenges in finding full-time paid work for young adult program graduates.

1. Partner Organizations' Cultural Competency

The program has faced some recent challenges in working with partner organizations related to race and class. In one incident, according to the YCC supervisors and program staff, the representative of a partner organization attempted to micromanage crew members who were people of color, but did not subject white crew members to the same treatment. The same representative reportedly made repeated assumptions that the crew members of color lacked the same level of outdoor skills as the white crew members.

2. Rising Demand, Stable Budget

Both the paid YCC summer program and the related paid internship program face a problem of severe excess demand. For example, in 2015 there were 170 applicants for 36 paid positions available in YCC. In 2016, the number of applicants exceeded 200, but the number of positions stayed the same. Total program enrollment peaked in 2009 with 65 paid positions, but the budget was cut in 2011. Program coordinator Kelly Rosteck identifies a general lack of understanding of the importance of teenage employment in nature-related jobs among city decision makers. According to Rosteck, "teenage employment can promote exposure to a wide range of fields, stoking career aspirations; it fosters a sense of independence, provides youth with pocket money, and in some cases can even bolster budgets of low-income families" (Rosteck 2016a).

Further, there is evidence that the apprenticeship programs, which aim to provide a bridge between summer jobs and full-time employment, are insufficient to meet demand. Kelly Rosteck estimates that there are about 25 young adult graduates of the YCC program who are not college bound but seek job skills and experience, and thus would benefit from additional opportunities for paid apprenticeships, entry-level employment, and on-the-job training in conservation fields. Given that apprenticeships pay $14 per hour for 200 hours, such an expansion would cost an estimated $75,000 per year (Rosteck 2016a).

3. Retention and Promotion

Once a young person has passed through YCC and the internship program, the next job level available for youth who are not college bound and are interested in working in a nature-related sector is a seasonal maintenance worker for Portland Parks and Recreation, an entry-level position. It is possible to advance within the Portland Parks system to become full-time; it is also possible to become a YCC supervisor. However, program staff have cited difficulties in finding full-time work for YCC graduates within the conservation and urban forestry fields.

2. GROUNDWORK PORTLAND

a. Overview

Groundwork Portland is a nonprofit environmental justice organization established in 2007, part of the large GroundworkUSA Trusts network: it is one of the only Portland-based environmental organizations currently led by and focused on solutions for communities of color. As one of its mission strategies, Groundwork Portland offers opportunities for members of communities of color to better engage in regenerative economic development activities through workforce development programs focused on three main areas: restoration of urban spaces, construction of green infrastructure, and community capacity building. The organization also runs a youth leadership program and advocates for environmental justice at policymaking, planning, and implementation tables.

Groundwork's work includes four areas of focus: green workforce development, eco-entrepreneurism, culturally-responsive urban ecology education, and environmental-based equity engagement. Below, we focus on two of these areas through the lens of two of Groundwork's major initiatives: the elevation of youth workforce development via the Green Team model, and environmental equity engagement through the Portland Harbor Community Coalition.







b. Youth Workforce Development: Green Team

The Green Team is a year-round program that offers part-time, paid positions for young people to learn about and lead local environmental initiatives, thereby increasing their applied knowledge of the local environment and capacity to act within it. Green Team youth receive extensive training, build their community and conservation skills, and learn to work professionally and effectively as a team. In addition to their paid work, Green Team members are required to complete community service hours through a variety of Groundwork programs such as maintaining parks, trails, and gardens with community partners like Metro, Dharma Rain Zen Center, and Ecumenical Ministries of Oregon.

For one of its projects, the Green Team participated in the planning, implemention, and caretaking of an urban restoration project on a blighted residential brownfield on North Emerson Street, in a historically disinvested neighborhood in Northeast Portland. The project's objectives were to remediate an urban brownfield[9], improve neighborhood food access, reduce blight, and raise awareness about environmental justice. The project included planting a community garden, which allowed community members to grow organic vegetables and fruit.

c. Environmental Equity Engagement: Portland Harbor Community Coalition

Groundwork serves as an active member and strategic partner of the Portland Harbor Community Coalition (PHCC), a broad and diverse community coalition whose overarching goal is to ensure that communities participate in and benefit from the Willamette River's Superfund site cleanup. The PHCC includes community of color organizations, conservation and environmental justice organizations, higher educational institutions, Native organizations, advocates for the unhoused, and individual community members (Portland Harbor Community Coalition 2016).

The PHCC works to raise community voices and build capacity for environmental justice advocacy, and to ensure that communities are able to influence and benefit from the final decision outcomes of the Portland Harbor Superfund cleanup process. The coalition strives to create an inclusive, equitable community-based cleanup process by actively engaging environmental justice communities in early and meaningful decision making, as well as ensuring that the communities most impacted by the pollution of the river receive economic and environmental benefits from its cleanup. A key objective of the coalition is to work with partners and municipal collaborators to assess, develop, and deliver equitable and engaged services advancing "triple bottom line" outcomes, including workforce training, affordable housing, and health care. The coalition works toward these goals by using communities' stories and statements to advance their priorities on equitable involvement, public health, and sustainability in the cleanup process, and to speak up if the record of decision and cleanup plan do not reflect community needs and priorities (Portland Harbor Community Coalition 2016).

9 Brownfields are defined by EPA as "real property – the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant." (U.S. EPA 2016b)

In 2000, the EPA declared the Portland Harbor, a 10-mile stretch of Willamette River between the Broadway Bridge and Columbia Slough, a Superfund site.[10] To organize the cleanup process, the EPA selected among nine separate cleanup alternatives based on a cost-effectiveness standard. The alternative selected (Alternative I) entailed dredging or capping eight percent of the total site area, on the premise that the areas chosen for dredging and capping were the most heavily affected by contaminants and that the remaining 92 percent could recover naturally without undue risk to human health. The Portland Harbor Community Coalition, however, has advocated for a more rigorous cleanup alternative (Alternative G), which would dredge or cap approximately 30 percent of the total affected site. The coalition argues that this expanded cleanup would ensure the safety of fish consumption for all residents of adjacent communities who depend on, by basis of cultural practice or economic condition, the river for a key source of protein and nutrition (Portland Harbor Community Coalition 2016).

3. POWERCORPS PHL

Launched in 2013, PowerCorps PHL is a city-led AmeriCorps initiative designed to support the three goals of environmental stewardship, youth violence prevention, and workforce development for Philadelphia youth. PowerCorps PHL annually enrolls 100 residents between the ages of 18 and 26 in a six-month training program on green stormwater infrastructure projects with the city and other service partners. Recruits are required to have a high school diploma or GED and be referred by one of PowerCorps' 13 recruitment partners. One of PowerCorps' recruitment partners is RISE, a city-led prisoner re-entry initiative that provides résumé development, interviewing skills, and other training and support to recently incarcerated residents.

Through the program, participants learn how to perform routine surface maintenance of green stormwater infrastructure systems to serve the dual purpose of beautifying neighborhoods and increasing the functionality of existing and new green infrastructure. Tasks include trash, debris, and sediment removal, tree and vegetation maintenance, and site reporting (Philadelphia Water Department 2016b). PowerCorps PHL also creates internal opportunities for advancement and training to its participants, including opportunities to learn computer skills, hone urban forestry–related skills, and lead crews in project work.

The Philadelphia Water Department (PWD) and city contractors have made active efforts to hire PowerCorps PHL alumni—as of May 2016, this included three alumni referred through the RISE program who had moved into apprenticeships and eventually regular, full-time positions with PWD. Additionally, at least eight PowerCorps alumni have been hired by AKRF, Inc., a New York City–based environmental planning and construction firm and one of the City of Philadelphia's largest public works contractors.

10 A Superfund site is any land within the United States that has been contaminated by hazardous waste and identified by the EPA as a candidate for cleanup because it poses a risk to human health and/or the natural environment.

The pipeline developed by PWD, PowerCorps, and partners such as RISE and AKRF, Inc., demonstrates that robust partnerships and credible commitments can generate tangible pathways to good jobs in urban greening for those who might otherwise have faced barriers to accessing these opportunities. The role that city agencies have played has been particularly important to the development of these pathways, with PWD leading the development of new PowerCorps training in managing Green City, Clean Waters–specific projects.



Darren Brown, Philadelphia Water Department Apprentice

Photo courtesy Darren Brown

"My experience with PowerCorpsPHL provided me with transferable skills so I can go into the workforce and break any boundaries I face,"

said Darren Brown, age 25. Brown, who grew up in West Philadelphia, was connected to PowerCorpsPHL through the RISE program, which provides re-entry services. He began in Parks and Recreation as a regular crew member and advanced to become an assistant crew leader. After he finished the training, he was recruited to join Philadelphia Water as an apprentice in the Green Stormwater Infrastructure Maintenance Group, with the help of a referral from his supervisors at PowerCorps. He was recently hired by Philadelphia Water as a regular employee. In addition to working, he is also taking classes at the local community college to learn more about business, and he hopes to start a real estate business someday.

"PowerCorps PHL made me view myself as not just a person who wanted to be productive in life—it made me want more for myself."

(Brown, Kirkland and Warwood 2016, PowerCorps PHL 2016)

4. URBAN RESOURCES INITIATIVE: GREENSKILLS PROJECT

The Urban Resources Initiative (URI) in New Haven is a nonprofit founded in 1991 that works in close partnership with the city and the Yale School of Forestry and Environmental Studies to promote environmental education and advance the practice of urban forestry. URI began 25 years ago by mostly conducting community forestry projects with volunteer labor, but has since expanded to create important job pathways for youth and people returning from prison. In 2007, URI launched the GreenSkills project with local schools to create a summer jobs program for high-school-age youth that provides hourly wages and environmental education. Young people work in crews of six workers for 10 weeks planting trees and promoting urban forestry.

In 2009, the mayor of New Haven set a bold goal to plant 10,000 street trees over 10 years; shortly thereafter, the city identified URI as the sole-source contractor for all city tree plantings. The new exclusive contract with the city created economic efficiencies and a stable revenue source, which allowed URI to expand the GreenSkills program to include people returning from incarceration as well as other vulnerable residents (Walsh 2013).

GreenSkills participants are hired through local nonprofits that provide transitional jobs programs and other support for returning citizens. Workers earn $10 to $12 per hour, and URI provides additional funding to its nonprofit partners to help cover their costs (Murphy-Dunning 2015; Pazniokas 2016). GreenSkills hires 30 to 40 workers each season, including youth and returning citizens. More than 100 people have come through the program, and they have collectively planted 4,000 trees.

One of the workforce partners is EMERGE, a nonprofit that addresses the many challenges people face when they leave prison, including addressing mental health challenges arising from the experience of incarceration and connecting people to jobs through programs such as GreenSkills. While 79 percent of people released from prison in New Haven are re-arrested within five years, participants of EMERGE's programs have a recidivism rate of just 16 percent, five times lower than the city average (Currey 2016). URI has also had some success growing beyond the initial contract with the city. They have been a subcontractor on a state construction project, which paid workers the prevailing wage. They have also built more than a dozen stormwater management projects, which have provided additional job opportunities for GreenSkills workers.

D. Chapter Conclusion

Cities around the country have employed a range of successful strategies to build an inclusive and diverse, well-trained urban forestry workforce. Though there exist significant barriers to employment in urban forestry for people from underinvested communities, there do exist youth programs, workforce development resources, scholarships, and apprenticeship and internship opportunities that either already are accessible or can be made more accessible to members of these communities over a wide range of ages and educational levels. Scarcity of funding, lack of organizational capacity, and relatively thin resources for targeted outreach and recruitment are three important factors that often impede the accessibility of these programs. The good news is that these programs have their champions, whose enthusiasm has led to adoption of innovative strategies for their programs' continued development.



IV

The Urban Green Infrastructure Workforce:

A Snapshot of Greater Portland

A. Chapter Introduction

The need for a robust urban forest and a strong green infrastructure is greatest in large cities and metropolitan areas with significant impervious areas, dense concentrations of people, and hence a profound necessity for stormwater management; each city is slightly different in its needs and capacities. Most green infrastructure and urban forestry decisions are made at the municipal level, and municipal procurement accounts for a large proportion of contracts and jobs related to these sectors. This section provides a data profile of the employment outlook for jobs related to green infrastructure and urban forestry in the Portland metropolitan area, weaving together several datasets on occupations, wages, and workforce demographics.

The City of Portland's 2015 Climate Action Plan places green economy jobs front and center: its 2050 vision for prosperity declares, "Green living-wage jobs are a key component throughout the regional economy" (City of Portland 2015). In this chapter, we identify that subset of green jobs that make up the fields of urban forestry and related green infrastructure; provide data on mean, median, and decile wages and workforce demographics; and cite projections of future job openings.[11]

B. Urban Forest Occupations: Inclusion Criteria

We created our list of urban forest–related occupations as a subset of the extensive list of occupations profiled in the Pacific Institute's 2013 report *Sustainable Water Jobs* (Moore et al. 2013). That report provides a typology of conservation-oriented water projects, and then identifies and categorizes the principal occupations involved in developing such projects. The five types of projects analyzed are urban water efficiency, sustainable stormwater management, restoration and remediation, alternative water supply, and agricultural water efficiency. The six occupational categories are research and development, manufacturing and distribution, wholesale and retail sales, design and planning, installation, and operations and maintenance.

We chose the following subset of occupations to profile: those that are involved in the *installation, operations, and maintenance of urban water efficiency, sustainable stormwater management, and restoration and remediation projects*, and which do not require a college degree. We divided that list further into two categories: jobs that are directly related to the care, management, and growth of plants and soils (plant and soil jobs); and jobs that are related to complementary infrastructure that, together with the plants and soils, comprise green infrastructure facilities (complementary jobs).

In our analysis, we focused on the 10 fastest-growing occupations across both job categories, measured in terms of the total number of projected job openings over the next 10 years.

11 This work updates, builds on, and is directly inspired by previous research conducted by green jobs nonprofit Green for All, in collaboration with conservation group American Rivers (Sanchez Sanchez, Quinn, and Hays 2013).

C. Projected Job Openings

Table 11 presents a list of the top-10 green infrastructure–related occupations, categorized by the total *number* (not percent growth) of projected job openings, in the Greater Portland metropolitan area (Multnomah, Washington, and Clackamas counties) between 2014 and 2024.[12] Metropolitan-level forecasts were provided directly to the authors by the Oregon Employment Department (Oregon Employment Department 2016). Each column is categorized by Standard Occupational Classification (SOC) job name, the survey year (2014), the job projection year (2024), the percentage change in number of openings, and the total number of job openings, quantified as the sum of growth plus replacement openings. *Replacement openings* are defined as those created by retirement or transition, while *growth openings* are defined as those created by increased total demand for that occupation. If total employment in a given occupation is projected to decline, then there are no job openings due to growth.

According to Table 11, in the Greater Portland metropolitan area, the 10 fast-growing green infrastructure– and urban forestry–related occupations constitute 66,396 full-time positions as of 2014, and are projected to make up 76,932 positions as of 2024. The total number of openings is projected to be 24,434, of which the number of growth openings for these occupations is projected to be 10,536.

Most of the fastest-growing occupations listed in Table 11 are those related to either the transportation of production inputs and materials (e.g., freight and material movers, truck drivers, and truck or tractor operators), or the construction and maintenance of the built elements that surround and contain green infrastructure and urban forestry facilities (e.g., construction laborers, carpenters, and plumbers). The plant and soil jobs—involving the preparation, installation, and care of the trees, shrubs, grasses, soils, and related growing media—make up only two of the top-10 fastest-growing occupations related to urban forestry and green infrastructure. Over the next 10 years, the metropolitan area is expected to add 1,839 job openings for landscaping and groundskeeping workers, and 1,707 jobs for farmworkers and laborers in crop, nursery, and greenhouse.

12 A complete list of the occupations we examined is provided in Appendix 3.

Table 11. Top-10 Green Infrastructure– and Urban Forestry–Related Occupations by Projected Total Job Openings in Greater Portland (Multnomah, Washington, and Clackamas Counties), 2014–24

Occupation Name	2014	2024	% Change	Total Openings (Growth + Replacement)
Laborers and Freight, Stock, and Material Movers	13,364	15,372	15.0%	5,986
Carpenters, Construction	8,343	10,463	25.4%	3,079
Truck Drivers, Heavy and Tractor-Trailer	9,853	11,188	13.6%	3,011
Construction Laborers	6,141	7,548	22.9%	2,632
Maintenance and Repair Workers, General	5,837	6,502	11.4%	2,195
Landscaping and Groundskeeping Workers	5,386	6,254	16.1%	1,839
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	5,006	5,380	7.5%	1,707
Electricians	4,846	5,642	16.4%	1,536
Industrial Truck and Tractor Operators	4,106	4,602	12.1%	1,518
Plumbers, Pipefitters, and Steamfitters	3,514	3,981	13.3%	931
TOTAL	66,396	76,932	15.9%	24,434

Table 12 (p. 57) divides the occupations into four major types, roughly following the Bureau of Labor Statistics job classification scheme: transportation/material moving, construction/extraction, and maintenance/repair. To create the category of plant and soil jobs, we aggregate two occupational categories: farming/fishing/forestry, and building and grounds maintenance. Of the four top-level categories, the transportation/material moving category contains the largest number of existing jobs, and the largest number of future job openings. The construction category contains the second largest, and plant and soil jobs, the third.

Table 12. Top-10 GI/UF-Related Occupations Sorted by Type

	Farming / Forestry & Grounds Maintenance	Transportation / Material Moving	Construction / Extraction	Maintenance / Repair
2014 Employment	10,392	27,323	22,844	5,837
2024 Employment	11,634	31,162	27,634	6,502
Percentage Change	12.0%	14.1%	21.0%	11.4%
Total Openings	**3,546**	**10,515**	**8,178**	**2,195**

NOTE: Each blue icon represents 1,000 openings for each category



Table 12, above, demonstrates that of the fastest-growing occupations that perform work duties related to the urban forest and green infrastructure, the subset of occupations directly related to plant and soils is not the fastest-growing group. The group of occupations related to material moving and transport is the fastest-growing, followed by the group related to construction and extraction. The next subsection classifies these jobs according to three additional criteria developed by the U.S. Department of Labor.

D. Job Classifications: Green, Bright, and Qualified

Table 13 (p. 59) categorizes the top-10 occupations listed above according to the job classification system developed by O*NET, the Occupational Information Network of the U.S. Department of Labor. The first two columns provide the occupation name and six-digit Standard Occupation Code (SOC) classifier (Bureau of Labor Statistics [BLS] 2016). The next three columns present three classifications that O*NET uses to characterize each occupation. The first occupational classification we report is "Green Job," which according to O*NET is one which meets any of three criteria at the national level (Dierdorff et al. 2009):

- Demand for this occupation is projected to increase due to the greening of industries (green increased demand).
- The greening of industries is projected to lead to a change in skill requirements or work tasks (green enhanced skills).
- An entirely new occupation is expected to be created due to emerging green industries, technologies, or production practices (green new and emerging).

A quick look at Table 13 reveals the strange result that the two directly plant-related occupations related to urban forestry and green infrastructure—farmworkers and laborers, crop, nursery, and greenhouse; and landscaping and groundskeeping workers—are in fact the only ones that do not classify as "Green Jobs."[13]

The second occupational classification we report is "Bright Outlook," which is defined as an occupation that meets one of two criteria: either demand is expected to grow rapidly in the next several years, or the occupation itself is new and emerging (due to technological innovation, for example). All of the occupations that meet our top-10 list by job openings in Greater Portland are classified as "Bright Outlook" at the national level, indicating that job trends are similar between Greater Portland and the nation as a whole.

The third occupational classification system we report is O*NET Job Zone. As part of its occupational profiling service, O*NET groups jobs into broad categories based on the level of education and skills required to perform the work. There are five total Job Zone categories, labeled 1 through 5. In our study of the green infrastructure and urban forestry workforce, we focus on Job Zones 1 through 3, which are defined as follows:

13 The authors are currently investigating this oversight; it may stem from the relatively recent rise of green stormwater infrastructure and native plant habitat restoration as economic sectors worthy of study.

- Job Zone 1: These occupations may or may not require a high school diploma or GED, and do not require significant previous work-related skills or experience.

- Job Zone 2: These occupations usually require a high school diploma or GED and some previous work-related skills and experience.

- Job Zone 3: These occupations usually require technical or vocational training or an associate's degree, and always require previous work-related skills or experience.

Based on the above classification, we see from Table 13, that the two directly plant-related jobs in urban forestry and green infrastructure are the only ones from the list that are categorized as Job Zone 1. The majority of the remaining jobs are categorized as Job Zone 2, including all of the transportation and material moving occupations and most of the construction occupations.

*Table 13. O*NET Job Classifications of Top-10 Green Infrastructure–Related Occupations*

Occupation Name	BLS Code	O*NET "Green Job"?	O*NET "Bright Outlook"?	O*NET Job Zone
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	45-2092	N	Y	1
Landscaping and Groundskeeping Workers	37-3011	N	Y	1
Laborers and Freight, Stock, and Material Movers	53-7062	Y	Y	2
Carpenters, Construction	47-2031	Y	Y	2
Truck Drivers, Heavy and Tractor-Trailer	53-3032	Y	Y	2
Construction Laborers	47-2061	Y	Y	2
Maintenance and Repair Workers, General	49-9071	Y	Y	3
Electricians	47-2111	Y	Y	3
Industrial Truck and Tractor Operators	53-7051	Y	Y	2
Plumbers, Pipefitters, and Steamfitters	47-2152.01	Y	Y	3

E. Wage Structures: Mean, Median, and Distribution

The next step of our analysis examines the wage structure of the urban forestry and green infrastructure occupations that are projected to experience the largest number of openings. Table 14 (p. 61) presents data on the mean, median, and decile wages for the top-10 green infrastructure– and urban forestry–related occupations by job openings in the Portland-Vancouver-Hillsboro metropolitan statistical area (MSA), as of May 2015. All wages are reported in 2015 U.S. dollars. Each column is categorized by occupation name, hourly mean wage, annual mean wage, annual 10th percentile wage, annual median wage, and annual 90th percentile wage. Of this group, the highest wages in all categories belong to plumbers, pipefitters, and steamfitters, with mean annual wages of $76,090. The lowest wages in all categories belong to farmworkers and laborers, crop, nursery, and greenhouse, with mean annual wages of $24,030.

The final column presents the annual decile ratio, which is the ratio of the 90th percentile wage to the 10th percentile wage in a given year. For example, the 2015 annual decile wage for plumbers, pipefitters, and steamfitters is 2.33, which means that workers in the 90th percentile of wages for this occupation earn 2.33 times more than workers in the 10th percentile in the same occupation, in 2015. Carpenters are the occupation with the highest decile wage ratio from this group (2.78), while crop, nursery, and greenhouse farmworkers/laborers have the lowest (1.61).

It is worth noting that the two occupations directly related to plant and soils are both near the bottom of this list in terms of wages, coming in eighth and 10th respectively. Within the world of green infrastructure and urban forestry, in general, the higher-paying jobs are those that construct the complementary infrastructure that surrounds the plants, soils, and other natural media. The workers who directly install, maintain, and care for the plants and soils that comprise the natural elements of urban forestry and green infrastructure are, in general, some of the lowest-paid workers in these fields.

Table 14. Mean, Median, and Decile Wages, Top-10 Green Infrastructure–Related Occupations by Job Openings in the Portland-Vancouver-Hillsboro MSA, May 2015

Occupation	Hourly mean wage	Hourly median wage	Annual 10th percentile wage	Annual median wage	Annual 90th percentile wage	Annual decile ratio
Plumbers, Pipefitters, and Steamfitters	$36.58	$36.77	$46,760	$76,480	$109,150	2.33
Electricians	$34.05	$35.07	$40,850	$72,950	$96,610	2.36
Carpenters	$23.15	$22.35	$26,650	$46,480	$73,960	2.78
Maintenance and Repair Workers, General	$20.66	$19.49	$25,330	$40,540	$63,650	2.51
Heavy and Tractor-Trailer Truck Drivers	$20.35	$20.21	$32,040	$42,030	$54,780	1.71
Construction Laborers	$18.94	$17.23	$22,910	$35,840	$60,760	2.65
Industrial Truck and Tractor Operators	$18.32	$18.02	$25,130	$37,490	$50,730	2.02
Landscaping and Groundskeeping Workers	$15.14	$14.01	$21,050	$29,150	$46,850	2.23
Laborers and Freight, Stock and Material Movers	$14.07	$12.68	$20,100	$26,370	$41,880	2.08
Farmworkers and Laborers, Crop, Nursery and Greenhouse	$11.55	$10.71	$19,490	$22,270	$31,330	1.61

F. Workforce Demographics

What are the demographics of the occupations most closely associated with urban forestry and green infrastructure? How do these workforce demographics compare to the demographics of Greater Portland as a whole?

The next set of four tables and figures provides data from the Equal Employment Opportunity (EEO) Tabulation for 2006 to 2010 for occupations, the most recent period for which data is available (U.S. Census Bureau 2016). The data are aggregated at the level of the greater Portland-Vancouver-Hillsboro MSA. In this section, we depart from the top-10 list generated in Table 14 for two reasons. First, not all of the green infrastructure–related occupations we surveyed were tracked as part of the EEO Tabulation. Second, we have chosen to emphasize the demographic differences between related supervisory and nonsupervisory occupations. We examine two pairs of related supervisory and nonsupervisory occupations: landscaping/groundskeeping workers and supervisors, and construction laborers and supervisors.

Overall, the data demonstrate clear demographic patterns. People of Caucasian/white ancestry are overrepresented as construction supervisors and slightly underrepresented as landscaping supervisors, relative to their percentages of the population in Greater Portland. People of Hispanic/Latino descent are overrepresented in both supervisory and nonsupervisory occupations in landscaping/groundskeeping; people of Hispanic/Latino and black/African-American descent are overrepresented in general construction labor and underrepresented in construction supervision. People of black/African-American descent are underrepresented in nonsupervisory landscaping occupations, and according to the data are not present at all in supervisory landscaping occupations. People of Asian descent, and people of all other races/ethnicities, including Native Americans, are underrepresented in all four occupational groups. Women are dramatically underrepresented in all four occupations. Underrepresentation of women is more extreme in general construction than in landscaping/groundskeeping.

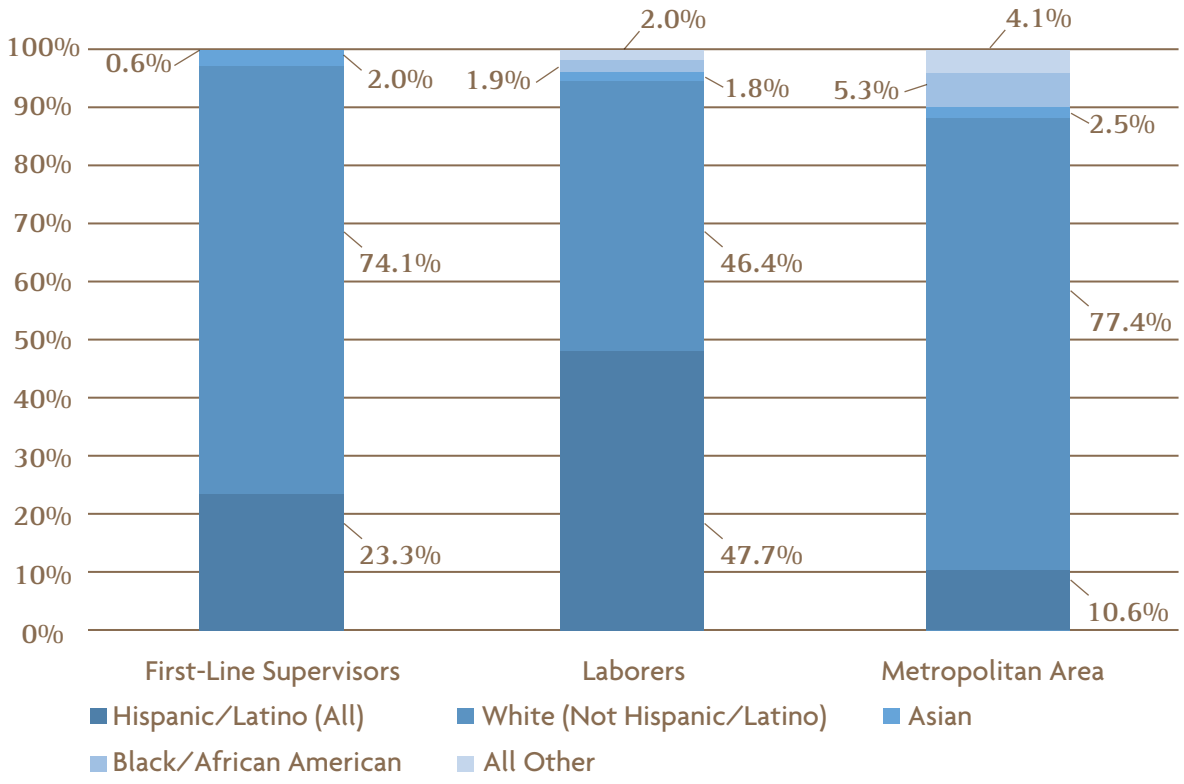
1. LANDSCAPING AND GROUNDSKEEPING WORKERS AND SUPERVISORS

Table 15 (p. 63) presents data on workforce demographics for first-line supervisors of landscaping, lawn service, and groundskeeping workers, in the Portland metropolitan area from 2006 to 2010. The table reports the number and percentage of employees, compared to the total race/ethnicity percentage breakdown in the Portland metropolitan region as of 2009. According to Table 15, Hispanic/Latino people are overrepresented in both occupations listed below, though this overrepresentation is more dramatic in the nonsupervisory workers. Caucasian/white people are overrepresented as supervisory workers, and all other races/ethnicities (besides Hispanic/Latino) are underrepresented. Caucasian/white, black/African-American, Asian, and all other people are underrepresented as nonsupervisory workers. According to these data, there appear to be virtually no landscaping supervisors of black/African-American descent.

Table 15. Workforce Demographic Breakdown in the Landscaping and Groundskeeping Industry in the Portland-Vancouver-Hillsboro MSA, 2006–10 (37-1012)

	Grounds Maintenance Workers (37-3010)		First-Line Supervisors (37-1012)		Portland MSA 2009 (ACS Survey 1 Year)
Race/Ethnicity	Number	% Breakdown	Number	% Breakdown	
Caucasian/White (Not Hispanic/Latino)	4,505	47.7%	1,115	74.1%	77.4%
Hispanic/Latino (All)	4,380	46.4%	350	23.3%	10.6%
Asian	170	1.8%	30	2.0%	5.3%
Black/African American	180	1.9%	-	0.0%	2.5%
All Other	185	2.0%	15	0.6%	4.1%

Figure 4. Workforce Demographic Breakdown in Landscaping and Groundskeeping in the Portland-Vancouver-Hillsboro MSA (2006–10)



Looking at gender breakdowns, we find a dramatic pattern of underrepresentation of women. Table 16, below, presents the male/female breakdown[14] of landscaping and groundskeeping workers and supervisors from the 2006 to 2010 EEO Tabulation. For both supervisory and nonsupervisory occupations, men held more than 90 percent of the positions.

Table 16. Workforce Demographic Breakdown by Gender among Landscaping and Groundskeeping Workers and Supervisors in the Portland-Vancouver-Hillsboro MSA, 2006–10

Occupation Name	SOC Code (BLS)	Male	Female
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	37-1012	91.7%	8.3%
Landscaping and Groundskeeping Workers	37-2010	92.1%	7.9%

2. CONSTRUCTION LABORERS AND SUPERVISORS

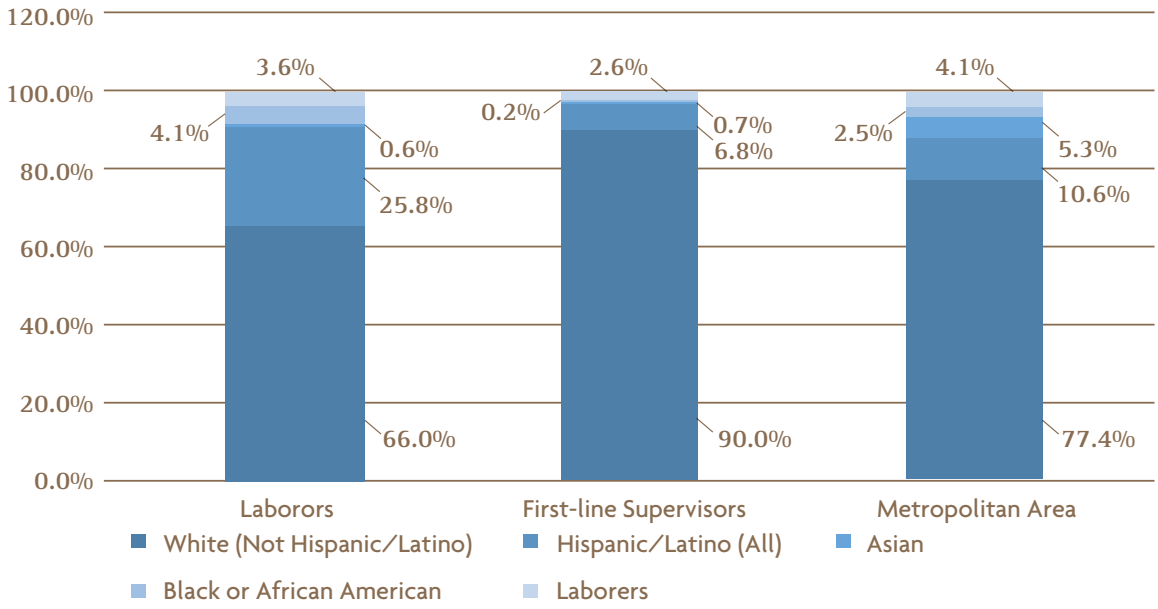
Table 17, below, presents data on workforce demographics for first-line supervisors of construction trades and extraction workers (SOC 47-1011), alongside those of construction laborers (SOC 47-2061) in the Portland metropolitan area from 2006 to 2010. According to Table 17, people of Caucasian/white descent are overrepresented as first-line construction supervisors, compared to all other groups that are underrepresented. Among construction laborers, Hispanic/Latino and black/African-American people are overrepresented, and all other groups are underrepresented.

Table 17. Workforce Demographic Breakdown of Construction and Extraction Workers in the Portland-Vancouver-Hillsboro MSA, 2006–10

	Construction Laborers (47-2061)		First-Line Supervisors (47-1011)		%, Portland MSA 2009 (ACS Survey 1 Year)
Race/Ethnicity	Number	% Breakdown	Number	% Breakdown	
Caucasian/White	7,715	66.0%	6,660	90.0%	77.4%
Hispanic/Latino (All)	3,020	25.8%	500	6.8%	10.6%
Asian	75	0.6%	55	0.7%	5.3%
Black or African American	485	4.1%	15	0.2%	2.5%
All Other	425	3.6%	204	2.6%	4.1%

14 As of the 2006–10, no other genders besides male and female were recognized.

Figure 5. Workforce Demographic Breakdown of Construction Laborers and First-Line Supervisors in the Portland-Vancouver-Hillsboro MSA, 2006–10



In terms of gender, women are even more underrepresented in the construction field than in the landscaping/groundskeeping field. Table 18, below, presents the male/female breakdown of construction laborers and supervisors from the 2006 to 2010 EEO Tabulation. For both supervisory and nonsupervisory occupations, men held more than 97 percent of the positions.

Table 18. Workforce Demographic Breakdown by Gender among Construction Laborers and Supervisors in the Portland-Vancouver-Hillsboro MSA, 2006–10

Occupation Name	SOC Code (BLS)	Male	Female
First-Line Supervisors of Construction Trades and Extraction Workers	47-1011	97.0%	3.0%
Construction Laborers	47-2061	97.4%	2.6%

G. Conclusion: Accessible Jobs?

The data presented above demonstrates a few underlying trends. First, a wide range of occupations perform work activities related to urban forestry and green infrastructure; however, the bulk of these occupations do not work directly with the plant materials and soil media that make up the urban forest itself. From the fastest-growing occupations that relate to green infrastructure, the bulk of job openings projected over the next 10 years will be in occupations related to materials transport and construction, not direct maintenance of plants and soils. Further, of these fast-growing occupations, those that pay the highest wages are not the plant- and soil-related jobs, but rather the skilled construction trades. Finally, examination of different job levels within a given occupational category reveals patterns of over- and underrepresentation by race and ethnicity. For example, while people of black/African-American and Hispanic/Latino descent are overrepresented in construction laborer occupations, they are underrepresented in construction supervisor occupations. Can workforce development programs bridge the gap between these occupational levels, and provide members of communities of color and low-income communities with viable career tracks in fast-growing urban forestry occupations? If so, what successful models of workforce training might provide people with opportunities to break into these fields? The next section profiles and analyzes the economic impact of Verde Landscape, a social enterprise based in Portland, Oregon, that combines workforce training services with living-wage employment.



V

The Economic Impact of Community-Based Urban Forestry Projects

What role can social enterprises play in creating jobs and building equity in the urban forest? And what economic impact can these enterprises have—on jobs, labor income, value added, and total economic activity? This section provides an economic impact analysis of the activities of Verde Landscape, a dynamic social enterprise working on creating jobs and building social equity in the urban forest in Portland. The results of our analysis suggest that social enterprises working in green infrastructure and urban forestry sectors are capable of creating significant numbers of jobs per unit of investment, while enhancing the urban forest in underserved neighborhoods. For instance, Verde Landscape's activities in 2015 created about 10 direct full-time, living-wage jobs, and 14 total jobs, through $615,821 in direct output. Our study finds that for each $1 million of output created by Verde Landscape's model of urban restoration and green infrastructure, 16 direct jobs and 23 total jobs are created. These numbers compare favorably to the measured impacts of rural ecosystem restoration activities (Nielsen-Pincus and Moseley 2010).

A. Introduction: Verde Landscape

Verde Landscape is the flagship social enterprise of an innovative community-based nonprofit organization called Verde, based in Northeast Portland's Cully neighborhood. Verde's mission is to serve communities by building environmental wealth through social enterprise, outreach, and advocacy (Verde 2016a, Enelow and Hesselgrave 2015). Social enterprise is at the core of Verde's strategy; through social enterprise development, Verde creates jobs and raises revenue directly, while also engaging in the day-to-day work of neighborhood improvement and urban restoration. To date, Verde has pursued three social enterprise ventures, of which Verde Landscape is the most mature enterprise. Verde Landscape offers a suite of urban forestry and green infrastructure services including urban restoration, stormwater management, urban tree planting, and sustainable landscaping for affordable housing providers, general contractors, environmental groups, and other property owners (Verde 2016b). The enterprise recruits crew members from within the Cully neighborhood, primarily via outreach activities and word of mouth. Crew members are recruited from affordable housing developments located within the neighborhood, with a focus on housing owned and operated by the Hacienda Community Development Corporation (CDC), a developer and provider of affordable housing and social services including education, financial literacy, and microenterprise development.

Verde Landscape's social enterprise model works through pairing living-wage employment with workforce development, training, and complementary education and skill-building. When Verde Landscape creates a full-time job, it begins a three-and-a-half-year investment in the new crew member by providing livable wages, benefits, training, and asset-building opportunities. Each regular crew member earns a starting wage that reflects the living wage for a single person in Multnomah County; crew members are offered annual raises. Verde Landscape pays 100 percent of a regular crew member's health insurance premium and offers up to $225 per month toward dependent premiums. After being employed for six months, a regular crew member creates an Individual Learning Plan (ILP), and receives 80 hours per year of classroom training per that plan.

Verde Landscape's growth attests to the high demand for affordable landscape services conducted in a manner that provides workers with a decent livelihood and development opportunities. The company commenced operations in 2005 by providing landscape maintenance services to Hacienda CDC's affordable housing properties, generating $33,919 in earned income in 2006. Per its business plan, Verde Landscape has steadily progressed to offer higher value, higher-skilled services in and outside of Portland's Cully neighborhood, serving as lead landscape contractor for large landscape projects. In its most recent year of operation, 2015, the company earned $614,687 in revenue. Verde Landscape has also benefited from complementary social enterprises initiated and developed by its parent nonprofit. Verde Nursery, another branch of the organization's work, is a licensed nursery stock grower and collector of native plants, and operates a 120-square-foot greenhouse at Hacienda CDC's Salon Comunal Community Center. From 2009 to 2012, Verde Nursery operated a 9,400-square-foot outdoor production area at the local Native nonprofit, Native American Youth and Family Center (NAYA). From these sites, Verde Nursery produced native plants and trees for use by Verde Landscape and in other community-based projects.

The range of community-based projects developed by Verde Landscape includes new green stormwater management facilities at Hacienda CDC's affordable housing properties, as well as at NAYA. Working with Verde Nursery's production manager and other project partners, youth participants in Hacienda CDC programs and NAYA programs participated in the design of bioswales for green stormwater management, engaged in growing native plants at Verde Nursery, and installed these plants alongside Verde Landscape crew members in the bioswales they had helped design. In 2013, Verde Nursery transferred production to the site of Cully Park, a 25-acre park that Verde is developing collaboratively with a group of nonprofits in the Cully neighborhood, producing plants for use in Cully Park improvements (Living Cully 2016a).

B. The Economic Impact of Social Enterprise: Verde Landscape's 2015 Operations

When a community-based green infrastructure enterprise, such as Verde Landscape, pursues a suite of urban forestry and related restoration and green stormwater infrastructure projects, how many jobs can it create over the course of one year? And how much total economic activity is generated in its community, district, and municipality as a result? This section presents the results of an economic impact analysis of the 2015 activities of Verde Landscape, which during that year engaged in a diverse suite of urban forestry, green infrastructure, restoration, and related landscape maintenance services.

1. MODEL AND DATA SOURCES

For this analysis, we make use of IMPLAN, an input-output economic model constructed through a compilation of public datasets. The IMPLAN model contains 440 separate economic sectors, interrelated through a series of matrices that determine the input-output structure, labor and value added, and taxation of each industry as it is related to all of the others. The model can be defined at the national, state, county, or ZIP code levels.

We used private data from Verde Landscape from the year 2015 to estimate the impact of the enterprise's activities. For our IMPLAN analysis, we were able to access the 2010 model for the state of Oregon, disaggregated to the county level. We measured the impact of Verde Landscape's activities at the level of the Greater Portland metropolitan area within Oregon, defined as Multnomah, Washington, Clackamas, Columbia, and Yamhill counties. We were not able to access the corresponding model for the state of Washington; thus, Clark and Skamania counties, the two Washington state counties that form part of Greater Portland, are omitted from our analysis. Since the Verde Landscape data were from 2015, we set the "event year" within the model to 2015.

In order to construct a robust economic impact analysis, we were required to modify the default industries of the IMPLAN model to fit the input-output structure of Verde Landscape. The IMPLAN model defines 440 generic industries in terms of the inputs and labor used in their production processes, and the division of revenue between labor income and profits (or proprietor income). However, the structure of an individual firm operating in the real economy may differ substantially from that of any default industry in the model. For example, as a landscaping firm, Verde Landscape falls under the generic IMPLAN sector 388, "Services to buildings and dwellings." But the actual pattern of expenditures that characterizes Verde Landscape differs sharply from that of the default industry spending pattern for sector 388: for instance, Verde Landscape uses much more plant material, and much less use of manufactured inputs, than does the typical firm characterized by IMPLAN sector 388.

Estimating the economic impact of a set of activities that does not fit any of the default industries requires a method called Analysis-By-Parts. Our Analysis-By-Parts included the following elements:

- A change in the industry spending pattern (input-output structure), based on IMPLAN sector 388, and modified to match the actual expenditures on inputs and equipment conducted by Verde during the year 2015.

- A change in labor income to match the fully loaded salary (wages, benefits, and payroll taxes) earned by all of Verde Landscape's employees during 2015.

- An expenditure on program administration, estimated by Verde Landscape's finance staff as seven percent of total program expenditures, and characterized as an "industry change" in sector 424, "Grantmaking, giving, and social advocacy organizations" (Walen 2016). We chose nonprofit economic sector 424 since the social enterprise Verde Landscape is a program of a nonprofit organization, Verde. The nonprofit organization Verde allocates administrative expenses based on the ratio of each program's full-time equivalent (FTE) to the total of FTEs.

Table 19, below, summarizes the expenditures conducted by Verde Landscape in 2015, divided into the three top-level categories of inputs and equipment, labor, and administrative expenditures. The exact breakdown of inputs and equipment by industry sector is provided in Appendix 3 (p. 100).

Table 19. Expenditures by Top-Level Category for Verde Landscape (2015)

Category	Expenditures—All Activities
Inputs and Equipment	$162,378
Labor Costs	$412,097
Administrative Expenditures (est.)	$40,213
TOTAL	$614,688

2. ECONOMIC IMPACT ANALYSIS: BRIEF OVERVIEW

As mentioned above, we use the input-output model IMPLAN to conduct an economic impact analysis of Verde Landscape's activities. An input-output model such as IMPLAN tracks the circulation of earnings by a firm or set of firms in a given economic sector throughout a local or regional economy, in order to estimate the total impact of the initial earnings on the entire economy. When a dollar is earned by a firm conducting a project, a portion of that dollar is used to purchase inputs, while another portion is used to pay laborers' wages and firm owners' profits. Laborers use their wage income to purchase goods and services for consumption, such as food, housing, health care, and clothing. Finally, a portion of the firm's earnings leaves the economy in order to purchase commodities produced outside the region (imports). However, the process does not stop there: the dollars spent by the firm on inputs to production are then earned by other firms supplying inputs, who spend various portions of their earned dollars on inputs, wages, profits, and imports. An input-output model runs through several rounds of spending on inputs, wages, profits, and imports, until the additional impact caused by the next round of expenditures is negligible.

The economic impact of a project can be divided into three categories: direct, indirect, and induced impacts.

Direct impacts simply refer to the initial expenditures and employment on the project itself: if the project costs $1 million, then the direct impact of the project is $1 million.

Indirect impacts account for the secondary demand for inputs, services, supplies, and equipment purchased by the firm conducting the project, as well as the firms that supply inputs to the project. For example, the purchase of plant material by Verde Landscape in order to conduct a native plant restoration project would be classified as an indirect impact; the purchase of seeds and potting soil by the nursery that supplies the plant material to Verde Landscape would also be classified as an indirect impact.

Induced Impacts capture the increased consumption spending and economic activity that result when those employed in sectors linked directly and indirectly to project activities spend their income on goods and services. For instance, when Verde Landscape's crew members spend their income on rent, utilities, food, clothing, and education, these expenditures qualify as an induced impact. Also, when the employees of the nursery that supplies plant material to Verde Landscape spend their income on basic goods and services, these expenditures also qualify as an induced impact.

3. THE ECONOMIC IMPACT OF VERDE LANDSCAPE: RESULTS

Table 20, below, presents the results of our analysis of the economic impacts of Verde Landscape's activities in 2015, using the Analysis-By-Parts method with the data presented above in Table 19. A more complete presentation of the input structure associated with Verde Landscape's business is presented in Appendix 4 (p. 107). Table 20 shows that in total, Verde Landscape's activities in 2015 generated 9.8 direct jobs and 14.2 total jobs; $432,340 in direct labor income and $634,423 in total income; and $615,821 in direct output as well as $1,153,991 in total output.

Table 20. Economic Impact of Verde Landscape Expenditures in the Greater Portland Area (2015)

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct	9.8	$432,340	$432,340	$615,821
Indirect	0.8	$37,082	$56,927	$85,254
Induced	3.5	$165,312	$288,112	$454,049
Total Impact	14.1	$634,734	$777,379	$1,155,124

Given that Verde Landscape is a Portland-based company located in Multnomah County, what proportion of the results presented above apply to Multnomah County? Table 21, presents the results of the analysis for Multnomah County only. Comparison between Table 21 and Table 20 demonstrates that the substantial majority of the impact of Verde Landscape's activities are estimated to occur within Multnomah County. For instance, 89 percent of the total output generated by Verde Landscape's activities is estimated to be generated within Multnomah County.

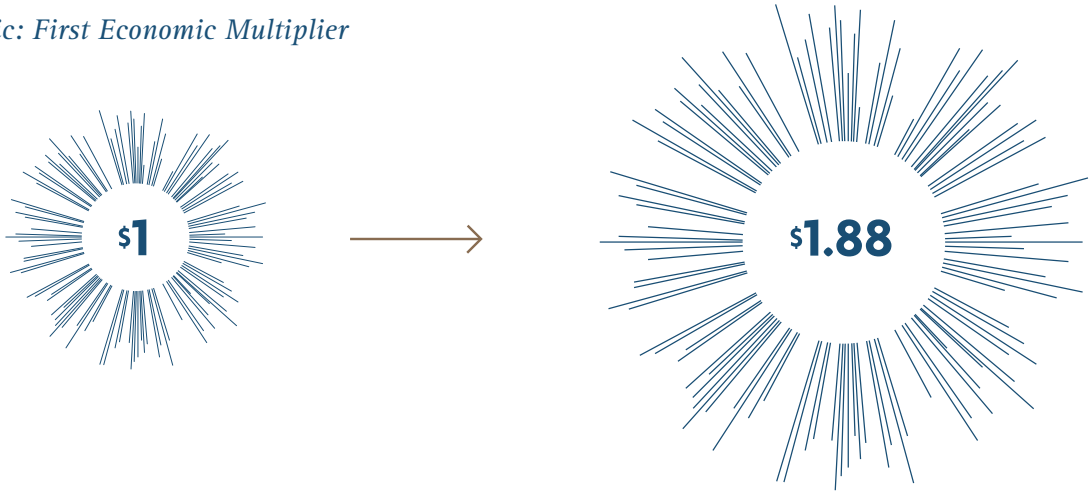
Table 21. Economic Impact of Verde Landscape Expenditures in Multnomah County (2015)

Impact Type	Employment	Labor Income	Total Value Added	Output
Direct	9.8	$432,028	$431,403	$614,687
Indirect	0.7	$33,960	$52,466	$78,159
Induced	2.6	$123,399	$210,219	$333,262
Total Impact	13.1	$589,387	$694,088	$1,026,108

4. MULTIPLIER EFFECTS

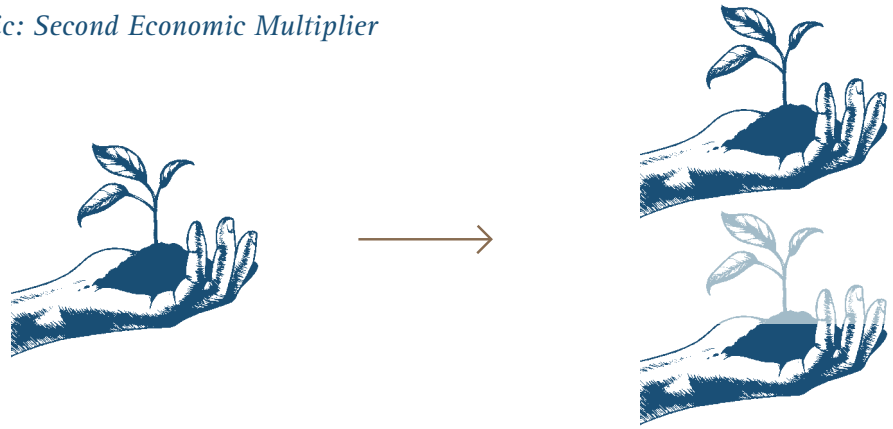
An economic multiplier represents the impact of a given amount of direct economic activity on total (direct, indirect, and induced) economic activity. For instance, if a project generates $1,000 in direct output alone but $2,000 in total output, its output multiplier is 2. Table 22 (p. 75), presents three important economic multipliers derived from Verde Landscape's activities. The first multiplier given, *output*, answers the question: for each dollar of direct output from Verde Landscape's activities, how much total (direct, indirect, and induced) output is generated throughout the Greater Portland economy? The output multiplier associated with Verde Landscape's activities is 1.88: this means that for each $1.00 in output generated directly by Verde Landscape, a total of $1.88 in output is generated throughout the Greater Portland economy. In other words, every dollar spent on a Verde Landscape project generates almost two dollars of economic activity in Greater Portland.

Infographic: First Economic Multiplier



The second multiplier, *employment*, answers the following question: For each full-time equivalent job created by Verde, how many total (direct, indirect, and induced) jobs are created throughout the Greater Portland economy? The employment multiplier associated with Verde Landscape's activities is 1.44: this means that for each full-time equivalent job generated directly by Verde Landscape, a total of 1.44 jobs are generated throughout the Greater Portland economy.

Infographic: Second Economic Multiplier



The third multiplier given, *value added*, answers the following question: For each dollar of value added generated directly from Verde Landscape's activities, how much total (direct, indirect, and induced) value added is generated throughout the Greater Portland economy? The value added multiplier associated with Verde Landscape's activities is 1.8: this means that for each $1.00 in output generated directly by Verde Landscape, a total of $1.80 in value added is generated throughout the Greater Portland economy. In other words, every dollar of value added generated by a Verde project generates almost two dollars of value added in Greater Portland.

Table 22. Economic Impact of Verde Landscape: Key Multipliers

Output Multiplier	1.88
Employment Multiplier	1.44
Value Added Multiplier	1.80

Table 23, below, presents two additional measures of job creation: direct and total jobs created per $1 million in direct output. These measures answer the question: for each $1 million invested directly into a Verde Landscape project, how many direct jobs, and how many total jobs, will be created?

The table shows that for each $1 million invested directly in a Verde project, 16 direct jobs and 23 total (direct, indirect, and induced) jobs will be created. These numbers are broadly comparable to those created by forest and watershed ecosystem restoration projects analyzed in a recent study at University of Oregon (Nielsen-Pincus and Moseley 2010). The University of Oregon study found that each $1 million invested in forest and watershed restoration in Oregon created between 4.8 and 13.1 direct jobs, and between 15.7 and 23.8 total jobs. The lower bound direct jobs figure stemmed from the highly equipment-intensive type of certain watershed restoration projects, such as those requiring large-scale earth-moving equipment. Verde Landscape's urban forestry and green infrastructure projects are highly labor-intensive and thus create a relatively large number of direct jobs per unit of investment.

Table 23. Economic Impact of Verde Landscape: Direct and Total Jobs per $1 Million Direct Output

Direct Jobs per $1 Million Direct Output	16.0
Total Jobs per $1 Million Direct Output	23.1

C. Chapter Conclusion: Community-Based Urban Forestry as a Social Enterprise Opportunity

The results of our economic impact analysis of Verde Landscape suggest that social enterprises working in green infrastructure and urban forestry sectors are capable of creating significant numbers of jobs per unit of investment, while enhancing the urban forest in underserved neighborhoods. The experience of Verde Landscape demonstrates that a social enterprise can expand beyond a single underserved neighborhood to develop green infrastructure, urban forestry, and urban restoration projects across an entire metropolitan region, all while paying living wages and benefits, providing workforce training, and serving the wider community.



VI

Conclusions & Recommendations

The case studies presented in this report, from the state of California and cities of Buffalo, New Haven, Philadelphia, and Portland, highlight a range of successful strategies to create jobs and build social equity in the urban forest. These strategies, ranging from state-level climate policy initiatives to grassroots, neighborhood-based social enterprises, have all succeeded in building and maintaining a healthy urban forest and green infrastructure, and also in increasing business opportunities, jobs, and job-training opportunities for low-income people, people of color, and other people facing barriers to employment. The work of these policymakers, workforce developers, nonprofit organizations, and private-sector firms demonstrates a range of promising practices that organizations across sectors can use to create jobs and build social equity in the urban forest.

Given the increased uncertainty around environmental and workforce policies resulting from the change in federal administration in January 2017, the successful strategies we've identified at the neighborhood, municipal, and state levels have become even more relevant for the years to come. In this conclusion, we provide a suite of recommendations to municipal policymakers and agencies, workforce development organizations, community-based organizations focusing on environmental justice, and social impact organizations (including social enterprises, foundations, and nonprofits), based on the success stories we've identified over the course of this report.

A. For Policymakers and City Agencies

1. MAKE EQUITY A REQUIREMENT OF MUNICIPAL PROGRAM DEVELOPMENT

Equity goals, such as ensuring low-income and disadvantaged communities benefit from urban forestry investments, should be mandatory for municipal programs and stated at the outset of programs to provide leadership and direction. These goals can be stated in general terms from the initial authorization of the program; for example, social equity was stated explicitly as part of the Philadelphia Water Department's overarching vision for the initial combined sewer overflow control plan it developed to fulfill the consent decree with EPA in 2011 (Philadelphia Water Department 2011a). Social equity goals can then be refined and stated in more specific terms, such as contracting and hiring targets, as the program develops.

Making equity a component of all municipal programs entails a more comprehensive metropolitan-wide approach to address disparities. Identifying and alleviating barriers faced by firms owned by people from racial or ethnic minorities, as well as other historically disadvantaged groups, should be part of this strategy. Priority actions may include expediting onerous prequalification ("prequal") processes for small businesses; making separate contracting targets for minority-owned, woman-owned, and "all other" emerging small business; and developing a dedicated funding stream (e.g., from a construction cost levy) to make these goals achievable.

2. USE CLEAR GUIDELINES AND TARGETED LANGUAGE TO ENSURE HISTORICALLY UNDERINVESTED COMMUNITIES BENEFIT

Particularly when new investments are being made in the urban forest, providing clear guidelines and targeted language can help to direct resources to underinvested communities. Quantitative data can play an important role in identifying communities and geographic areas of greatest need, and in targeting investments to maximize the benefits they receive. For example, in the state of California, the CalEnviroScreen has played a critical role in allocating revenues from the state's carbon emissions cap-and-trade system to disadvantaged communities, by defining a disadvantaged community through objective criteria (California EPA 2014).

3. DEVELOP PARTNERSHIPS WITH COMMUNITY ORGANIZATIONS WHEN INITIATING NEW PROGRAMS

Community organizations can assist government partners, whether elected officials or agency staff, in program development to establish equity goals and develop guidelines and targeted language. Community organizations also can facilitate relationships with communities that otherwise might not have access to government agency resources, and can hold government agencies and other stakeholders accountable for following the established guidelines and ultimately meeting the equity goals. Advisory councils, if appropriately empowered, or having reserved seats on governing bodies for equity representatives from communities, can help to institutionalize these partnerships.

For example, in California, community organizations began advocating for their constituents' interests from the beginning of the decision-making process around cap-and-trade. Eventually, environmental justice advocates were included in governance and decision-making bodies, ensuring that cap-and-trade revenues included strong targeting language to ensure that a portion of the funds benefited disadvantaged communities directly. In New Haven, the relationship between the community organization Urban Resources Initiative (URI) and the City of New Haven led to URI's attaining the exclusive tree-planting contract with the City, ensuring living-wage jobs and workforce training to youth and adults transitioning from incarceration.

4. MEASURE WHAT MATTERS, AND REPORT ON IT

A strategy to improve equity outcomes and create jobs in urban forestry and green infrastructure will require municipal, regional, and statewide interventions to change the practices of public contracting and hiring as a whole, including improved data collection, benchmarking, and credible commitments to correcting disparities (Chorpenning et al. 2015). It is important to define measurable success criteria for equity outcomes, and collect and report performance data to gauge progress. Success criteria may include such measurable outcomes as percentage or dollar contracting goals with minority-owned and women-owned businesses, a certain percentage or number of hires from disadvantaged communities into living-wage jobs, and a certain percentage or dollar increase of the total value of urban forestry investments into underinvested communities. Regular (annual) reporting helps to maintain transparency and public accountability. Some

success metrics are more difficult to track, but no less important. These include long-term employment rates beyond the project or program period, reduction in recidivism among formerly incarcerated people hired by programs, or increased educational attainment resulting from youth programs. Program directors should, whenever possible, attempt to address these outcomes by integrating qualitative surveys and interviews into outcome measurement.

B. For Workforce Development Agencies

1. ALIGN JOB PROFILES AND CAREER PATHWAYS TO COMMUNITY NEEDS, GOALS, AND OPPORTUNITIES

The quality and character of urban forestry work varies tremendously, including volunteer labor; temporary, low-paying jobs such as those in the California Conservation Corps (bearing the inspiring motto: "Hard work, low pay, miserable conditions ... and more!"); and high-quality, oftentimes unionized, careers in the public sector as well as some private-sector jobs. When undertaking an urban forestry project, it is important to consider the types of jobs that will be created, and how people with barriers to employment will navigate these career pathways. The goals of workforce development programs should be aligned with the priorities and goals of the community being served. Workforce development programming targeting full-time, permanent adult employment should provide career pathways toward living-wage jobs with strong union representation and advancement opportunities. Youth summer programs in natural resources may instead focus on expanding STEM education opportunities, improving college prospects, and increasing interest in environmental issues, while also providing a temporary, seasonal job that pays an appropriate living wage or stipend.

2. WORK WITH PUBLIC AGENCIES TO CONNECT PUBLIC CONTRACTS TO WORKFORCE TRAINING

Workforce development organizations should work with public agencies to ensure that public contracts contain both targeted language for disadvantaged communities and line items around job training. People from disadvantaged communities, as well as people with barriers to employment, often need training and support to develop industry skills and navigate career pathways, including in urban forestry and green infrastructure industries. The resources required to achieve success in a targeted hiring or contracting program may go above and beyond what a private firm could afford or be able to provide. For example, formerly incarcerated people may require transition services including counseling. People who have been living on very low incomes or suffering long-term unemployment may require fuel assistance for commuting or job readiness supplies such as job-appropriate clothing. Low-income parents may require child care subsidies (Wilkinson and Kelly 2016). Collecting data on employment status, certifications, wages, and other key outcomes for trainees as they pass through apprenticeships, credentialing programs, and jobs can help workforce development organizations track their progress toward goals.

3. MAKE TARGETED OUTREACH TO UNDERINVESTED COMMUNITIES STANDARD PROCEDURE

Targeted outreach, including ongoing relationships with community institutions, regular attendance at community events, and providing informational materials in all relevant languages, has been proved to be an effective method of recruiting people from underinvested communities into training, education, and workforce development programs (Rosteck 2016b). Some companies and nonprofits are already targeting outreach and hiring to youth and young adults, and engage in mentoring and skill-building in order to promote retention. The qualifications and skills that youth acquire through these organizations make them better qualified for higher-paying or supervisory positions (Tarver 2016). Combining this targeted outreach effort with networking events and mentoring opportunities can lead to the initiation and building of relationships between small business owners and aspiring professionals from communities of color and low-income communities (Haines 2016).

C. For Grassroots Environmental Justice Organizations

1. INCREASE ENGAGEMENT IN WATERSHED AND OPEN-SPACE PLANNING

Every city neighborhood belongs to at least one watershed. Restoration of local watersheds and open spaces benefit communities through increased access to nature, improved air and water quality, and reduced stress.[15] However, watershed and open-space restoration projects located in low-income, underinvested communities are often not prioritized in local spending. Grassroots, community-based organizations can play important roles in advocating for social equity in ecological restoration priorities, and identify potential job opportunities for local residents in the process. Further, by building public support and insisting on inclusion in decision making around municipal projects, community organizations can help to integrate social equity strategies and goals into municipal- and metropolitan-level watershed and natural-areas management plans. Grassroots organizations can also help to build coalitions with local watershed councils to include members of underinvested communities, and jointly push for an equitable allocation of city dollars for restoration and nature access.

2. BUILD COALITIONS ACROSS SECTORS IN PURSUIT OF SHARED GOALS

Building robust coalitions across sectors can amplify community-based organizations' influence on the planning, design, and execution of urban forestry and green infrastructure projects. For instance, community-based organizations can ally with workforce development agencies, local labor unions, and high-road local businesses to advocate for targeted contracting and hiring for urban forestry and green infrastructure projects. These coalitions can include advocacy groups that are not issue-specific, including faith-based organizations and youth groups.

15 For details of the community benefits of ecosystem restoration and open-space provision, please see Appendix 1, 'The Community of Benefits of Green Infrastructure.'

Community groups can also build alliances with state-level conservation and environmental advocacy groups around shared goals that support environmental justice, including watershed protection and restoration in underinvested communities. And finally, community environmental justice groups can reach out directly to state urban and community forestry agencies, demonstrate their commitment to a healthy urban forest, and advocate for expanded state funding for urban forestry programs based on an understanding of their benefits to communities.

3. ADVOCATE FOR AND ACQUIRE A SEAT AT THE TABLE

To maximize impact, community-based environmental justice organizations must advocate vigorously for a seat at the table where decisions on urban forestry and green infrastructure are made, whether at the municipal, county, metropolitan, or state levels. Once at the table, community organizations must identify opportunities to improve equitable economic, environmental, and social outcomes early in the decision-making process. Organizations must advocate for equity goals and requirements around project siting and accessibility, as well as contracting, hiring, and workforce training. And finally, community organizations must learn the legislative process and budget structure for appropriating and allocating funds at the level at which they seek to intervene (municipal, county, metropolitan, or state), and identify the committees and staff members who are instrumental in making funding decisions.

D. For Social Impact Businesses

1. PARTNER WITH OTHER ORGANIZATIONS TO PROVIDE WRAPAROUND SERVICES

To maximize their impact, social impact organizations, such as social enterprises, may need to provide complementary services to their staff. Providing these services may require partnering with other organizations in areas such as workforce development, community health, and education. Social enterprises can also provide some services directly, such as on-the-job training. Though social enterprises operate primarily through earned revenue, much of these services will need to be provided through philanthropic and public grants.

2. PUBLICIZE RESULTS AND FOCUS ON POSITIVE OUTCOMES

Social enterprises focused on urban forestry can raise their public profile, build their client base, and attract grant funding and in-kind donations through publicizing the positive outcomes of their programs. For instance, Verde Landscape has publicized its living-wage job creation, workforce training, and positive environmental outcomes through its website, as well as that of the Living Cully coalition of nonprofits of which it forms a part (Living Cully 2016b).

3. THINK LONG TERM

Social impact organizations seeking to build a diverse, inclusive, and well-trained green infrastructure workforce must think beyond the project cycle or fiscal year, toward a longer-term vision of the direction of their organization and its staff. Like a private-sector firm, a social impact organization must identify industry and market trends; like a nonprofit, it must also track trends in philanthropy and advocacy.

REFERENCES

Andrews, Garret. 2016. *Oregon's Building Connections*. September 21. Accessed October Thursday , 2016. http://djcoregon.com/news/2016/09/21/community-benefits-agreements-draw-city-opposition/.

Barnard, Casey, and Carlyn Hood. 2016. *The Community Benefits Agreement(CBA): A Proven Tool for Advancing Portland's Commitment to Equity In Contracting and Workforce Diversity*. Portland, OR: Worksystems, Inc.

BBC Research. 2016. "City of Portland Disparity Study." *City of Portland*. Accessed September 30, 2016. https://www.portlandoregon.gov/brfs/54613.

Benedict, M.A., and E.T. McMahon. 2006. *Green Infrastructure: Linking Landscapes and Communities*. Island Press.

Braga, A. A., and B.J. Bond. 2008. "Policing Crime and Disorder Hot Spots: A Randomized Controlled Trial." *Criminology*, September 15: 577-607.

Brown, D., A. Kirkland, and A Warwood, interview by Chris Schildt. 2016. *PowerCorps PHL* (July 18).

Buckley, Mark, Tom Souchlas, Jeffrey Odefey, Stacey Detwiler, Katie Rousseau, Amy Trice, Roxanne Blackwell, Kevin O'Hara, Seth Brown, and Pallavi Raviprakash. 2012. "Banking on Green: A look at How Green Infrastructure Can Save Municipalities Money and Provide Economic Benefits Community-wide."

Buffalo Sewer Authority. 2014. "Green Infrastructure Master Plan." *BSA CSO Improvements*. January. http://bsacsoimprovements.org/wp-content/uploads/2014/03/BSA-LTCP-Appendix-12-3.pdf.

Bureau of Environmental Services. 2010. *City of Portland Post-2011 CSO Facilities Plan*. Portland, Oregon: CH2MHIll.

Bureau of Labor Statistics [BLS]. 2016. "Standard Occupational Classification." *Bureau of Labor Statistics*. Accessed September 14, 2016. http://www.bls.gov/soc/.

Business Oregon. 2016b. *Certification Office for Business Inclusion and Diversity*. Accessed January 3, 2017. http://www.oregon4biz.com/How-We-Can-Help/COBID/.

—. 2016a. *Federal Disadvantaged Business Enterprise Certification*. Accessed January 3, 2017. http://www.oregon4biz.com/How-We-Can-Help/COBID/DBE/.

CAL FIRE. 2016. *CAL FIRE*. http://www.fire.cal.gov.

—. 2016. “Cal FIRE Urban and Community Forestry Program Greenhouse Gas Reduction Fund Grants 2014/2015.” *Cal FIRE*. http://calfire.ca.gov/Grants/downloads/UrbanForestry/CAL_FIRE_GGRF_UCF_Awards_14_15.pdf.

California ARB. 2016. “California Climate Investments: 2016 Annual Report.” *California Air Resources Board*. March. https://arb.ca.gov/cc/capandtrade/auctionproceeds/cci_annual_report_2016_final.pdf.

—. 2016. “Greenhouse Gas Reduction Fund Programs.” *California Air Resources Board*. February 4. http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/summaryproceedsappropriations.pdf.

—. 2014. “Investments to Benefit Disadvantaged Communities.” *California Air Resources Board*. November 3. https://arb.ca.gov/cc/capandtrade/auctionproceeds/cci_annual_report_2016_final.pdf.

—. 2015. “Overview of ARB Emissions Trading Program.” *California Air Resources Board*. February 9. https://www.arb.ca.gov/cc/capandtrade/guidance/cap_trade_overview.pdf.

California EPA. 2014. “Approaches to Identifying Disadvantaged Communities.” *California Air Resources Board*. August. https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/workshops/calepa-approaches-to-identify-disadvantaged-communities-aug2014.pdf.

Carr, Erik, interview by Noah Enelow. 2016. *Urban Forestry in Portland: Opportunities to Build Social Equity* (February 10).

Center for Neighborhood Technology; American Rivers. 2010. *The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental, and Social Benefits*. Publication, Chicago, IL: Center for Neighborhood Technology.

Chorpenning, Matt, Ann Curry-Stevens, Greg Schrock, and Nathen Lamb. 2015. *Economic Equity in Communities of Color: The Effectiveness of Minority Contracting Initiatives*. Portland, OR: Center to Advance Racial Equity, Portland State University.

City of Philadelphia. 2011. “Executive Order No. 15-11: Public Works Project Labor Agreements.” *City of Philadelphia*. Accessed November 16, 2016. http://www.phila.gov/ExecutiveOrders/Executive%20Orders/2011_EO15-11.pdf.

City of Portland. 2015. “2015 Portland Climate Action Plan.”

City of Portland BRFS. 2016. “Minority-Owned, Women-Owned and Emerging Small Businesses.” *City of Portland Office of Management and Finance*. Accessed September 30, 2016. https://www.portlandoregon.gov/brfs/article/396799.

City of Portland. 2016a. "Social Equity Contracting: Building Portland Businesses." *City of Portland, Oregon*. Accessed September 30, 2016. https://www.portlandoregon.gov/brfs/index.cfm?&c=27355.

City of Portland. 2016b. *Stormwater Management Manual*. Portland, Oregon: City of Portland.

Currey, B. 2016. "Life with Parole." *The Yale Herald*, April 22. http://yaleherald.com/news-and-features/covers/life-with-parole/.

Curry-Stevens, A., Cross-Hemmer, A., and Coalition of Communities of Color. 2010. *Communities of Color in Multnomah County: An Unsettling Profile*. Portland, OR: Portland State University.

De la Hoz, Jenny, interview by Brody Abbott and Noah Enelow. 2016. *Youth Mentoring Collaborative: Equity and Inclusion in the Public Sector* (July 1).

Dierdorff, Erich C, Jennifer J. Norton, Donald W. Drewes, Christina M. Kroustalis, David Rivkin, and Phil Lewis. 2009. "Greening of the World of Work: Implications for O*NET-SOC and New and Emerging Occupations." *O*NET*. Accessed September 14, 2016. http://www.onetcenter.org/reports/Green.html.

Donovan, Geoffrey H., and Jeffrey P. Prestemon. 2010. "The Effect of Trees on Crime in Portland, Oregon." *Environment & Behavior*, October 19: 1-28.

Donovan, Geoffrey H., Yvonne L. Michael, Bavid T. Butry, Amy D. Sullivan, and John M. Chase. 2011. "Urban trees and the risk of poor birth outcomes." *Health & Place* 390-393.

Econsult Solutions. 2016. "The Economic Impact of Green City, Clean Waters: The First Five Years." *Sustainable Business Network Philadelphia*. January 29. Accessed November 16, 2016. http://www.sbnphiladelphia.org/images/uploads/Green%20City,%20Clean%20Waters-The%20First%20Five%20Years(1).pdf.

Enelow, Noah, and Taylor Hesselgrave. 2015. *Verde and Living Cully: A Venture in Placemaking*. Case Study, Portland, OR: E3 Network.

Environmental Protection Agency. 2016. *Rain Gardens*. Accessed August 10, 2016. https://www.epa.gov/soakuptherain/rain-gardens.

Equity Strategy Advisory Committee. 2016. *Strategic Plan to Advance Racial Equity, Diversity, and Inclusion*. Strategic Plan, Portland, OR: Metro.

Fogarty, Scott, interview by Noah Enelow. 2016. *Friends of Trees: Opportunities to Build Social Equity in the Urban Forest* (August 18).

Fortney, David, interview by Noah Enelow. 2016. *The Construction Career Pathways Project* (November 8).

Green Careers Training Project. 2012. *Pathways Out of Poverty*. PowerPoint Presentation, Portland, OR: Worksystems, Inc.

GSI Partners. 2016. "Advocacy." *Green Stormwater Infrastructure Partners*. Accessed November 16, 2016. http://gsipartners.sbnphiladelphia.org/advocacy/.

Haines, Kelly, interview by Noah Enelow. 2016. *Workforce Development and Community Benefits Agreements* (July 18).

Hanson, Megan, interview by Noah Enelow. 2016. *Portland Bureau of Environmental Services' Internship Programs* (May 26).

Hanson, Pia, and Matt Frank. 2016. *The Human Health and Social Benefits of Urban Forests*. Minneapolis: Dovetail Partners, Inc.

Harber, Renee, and Bruce Nelson, interview by Noah Enelow. 2016. *Clackamas Community College's Arboriculture Program* (June 2).

Harnik, Peter, and Ben Welle. 2009. *Measuring the Economic Value of a City Park System*. The Trust for Public Land.

Heckert, Megan, and Jeremy Mennis. 2012. "The economic impact of greening urban vacant land: a spatial difference-in-differences analysis." *Environment and Planning 3010-3027*.

Homann, P.S., P. Sollins, M. Fiorella, T Thorson, and J.S. Kern. 1998. "Regional Soil Organic Carbon Storage Estimates for Western Oregon by Multiple Approaches." *Soil Science Society of America Journal* 789-796.

Jones, Van. 2008. *The Green Collar Economy: How One Solution Can Fix Our Two Biggest Problems*. New York: HarperOne.

Jurries, Dennis. 2003. *Biofilters (Bioswales, Vegetative Buffers, & Constructed Wetlands) for Storm Water Discharge Pollutant Removal*. Oregon Department of Environmental Quality.

Karps, Jennifer, interview by Noah Enelow. 2016. *Portland Bureau of Environmental Services' Tree Contract: Social Equity and Community Engagement* (August 23).

Kuo, F. E., and W. C. Sullivan. 2001. "Aggression and Violence in the Inner City: Effects of Environment via Mental Fatigue." *Environment & Behavior*, 543-571.

Kuo, Frances E., and William C. Sullivan. 2001. "Environment and Crime in the Inner City: Does Vegetation Reduce Crime?" *Environment & Behavior* 343-367.

Living Cities. 2013. "Green Stormwater Infrastructure: Leveraging Investments to Create Career Pathways for Low Income Communities." *ELP Advisors*. May. Accessed November 16, 2016. http://www.elpadvisors.com/wp-content/uploads/2013/05/6-Living-Cities-Green-Stormwater-Infrastructure-Report.pdf.

Living Cully. 2016a. "Health and Environment." *Living Cully*. http://www.livingcully.org/programs/health-and-environment/.

—. 2016b. "Jobs and Economic Development." *Living Cully*. Accessed December 12, 2016. http://www.livingcully.org/programs/jobs-and-economic-development/.

Maginnis, Larry, interview by Noah Enelow. 2016. *Urban Forestry in the City of Portland* (April 19).

McPherson, E. Gregory, Scott E. Maco, James R. Simpson, and Paula J. Peper. 2002. "Western Washington and Oregon Community Tree Guide: Benefits, Costs, and Strategic Planting." *iTree Streets*. Silverton, Oregon: International Society of Arboriculture, Pacific Northwest Chapter, March.

Metro. 2016. *What is Metro?* Accessed October 19, 2016. http://www.oregonmetro.gov/regional-leadership/what-metro.

Moore, Eli, Heather Cooley, Juliet Christian-Smith, Kristina Donnelly, Kristian Ongoco, and Daryl Ford. 2013. *Sustainable Water Jobs: A National Assessment of Water-Related Green Job Opportunities*. Oakland, CA: Pacific Institute.

Murphy-Dunning, C., interview by Chris Schildt. 2015. *The GreenSkills Program* (August 5).

MWBE. 2016. *Certification Overview*. Accessed January 3, 2017. http://www.mwbe.com/cert/certification.htm.

National Oceanic and Atmospheric Administration. 2010. *Data Tools: 1981-2010 Normals*. http://www.ncdc.noaa.gov/cdo-web/datatools/normals.

National Vacant Properties Campaign. 2005. *Vacant Properties: The True Costs to Communities*. Washington, D.C.: National Vacant Properties Campaign.

Native American Youth and Family Center. 2016. *Tyee Khunamokwst "Leading Together": Cross-Cultural Climate Justice Leaders*. Portland: Native American Youth and Family Center.

NESst. 2016. *Defining social enterprise*. http://www.nesst.org/social-enterprise/.

Nielsen-Pincus, Max, and Cassandra Moseley. 2010. *Economic and Employment Impacts of Forest and Watershed Restoration in Oregon*. Working Paper Number 24, 2010: University of Oregon, Ecosystem Workforce Program.

O'Connor, Dennis, interview by Brody Abbott and Noah Enelow. 2016. *Green Infrastructure and Sustainable Landscaping in Greater Portland* (August 4).

OEHHA. 2016. "CalEnviroScreen." *Office of Environmental Health Hazard Assessment*. http://oehha.ca.gov/calenviroscreen.

Oregon Department of Environmental Quality. 2011. *Portland Air Toxics Solutions Report and Recommendations*. Portland, OR: Oregon Department of Environmental Quality.

Oregon Employment Department. 2016. *Occupational Employment Forecast, Portland Tri-County Area (Multnomah, Washington, Clackamas counties)*. Portland, OR, August 5.

Pazniokas, Mark. 2016. "A lesson on crime, redemption, and trees at Yale." *The CT Mirror,* February 24. http://ctmirror.org/2016/02/24/a-lesson-on-crime-redemption-and-trees-at-yale/.

Perlman, Michael. 1998. *The Power of Trees: The Reforesting of the Soul*. Woodstock, Connecticut: Spring Publications, Inc.

Philadelphia Water Department. 2011a. "Green City Clean Waters: The City of Philadelphia's Program for Combined Sewer Overflow Control. Amended Program Summary." *Philadelphia Water Department*. June 1. Accessed November 16, 2016. http://www.phillywatersheds.org/doc/GCCW_AmendedJune2011_LOWRES-web.pdf.

—. 2011b. *Green City, Clean Waters: The City of Philadelphia's Program for Combined Sewer Overflow Control*. Philadelphia, PA: City of Philadelphia.

—. 2016a. "Green Stormwater Infrastructure Project Map." *Philadelphia Water Department*. Accessed November 16, 2016. http://www.phillywatersheds.org/BigGreenMap.

—. 2015a. "Philadelphia Water Department Fiscal Year 2016 Budget Testimony: Executive Summary." *Philadelphia City Council*. April 28. Accessed November 16, 2016. http://phlcouncil.com/wp-content/uploads/2015/12/FY2016-Water-Department-Testimony.pdf.

Philadelphia Water Department. 2016b. *PowerCorps PHL*. Fact Sheet, Philadelphia: Philadelphia Water Departent.

—. 2015b. "Stormwater Incentive Grants Awarded!" *City of Philadelphia*. Accessed November 16, 2016. http://www.phila.gov/water/PDF/SMIP-GARP-11.14.pdf.

—. 2016c. "Stormwater Incentives Grant Manual." *City of Philadelphia*. September. Accessed November 16, 2016. http://www.phila.gov/water/wu/Stormwater%20Grant%20Resources/StormwaterGrantsManual.pdf.

Portland Bureau of Environmental Services. 2010. *Portland's Green Infrastructure: Quantifying the Health, Energy, and Community Livability Benefits*. Portland, Oregon: Entrix.

Portland Harbor Community Coalition. 2016. *Portland Harbor Community Coalition*. Accessed October 25, 2016. http://ourfutureriver.org/.

Portland Parks and Recreation. 2016a. "Greenspaces Restoration & Urban Naturalist Team (GRUNT)." *Portland Parks and Recreation*. Accessed September 14, 2016. https://www.portlandoregon.gov/parks/index.cfm?&tc=64362.

—. 2016b. "Jr. GRUNT (8th Grade Program)." *Portland Parks and Recreation*. Accessed September 14, 2016. https://www.portlandoregon.gov/parks/article/566222.

PowerCorps PHL. 2016. "Darren Brown Alumni Highlight." *PowerCorps PHL*. Accessed December 8, 2016. http://powercorpsphl.org/impact/powercorpsphl-alum/darren-brown-alumni-highlight/.

PUSH Buffalo. 2012a. "History of the GDZ." *Green Development Zone*. http://greendevelopmentzone.org/introduction/history-of-the-gdz/.

—. 2012b. "Job Training Pipelines." *Green Development Zone*. http://greendevelopmentzone.org/jobs/job-training/.

—. 2012c. "PUSH Blue." *Green Development Zone*. http://greendevelopmentzone.org/jobs/push-blue/.

Rosteck, Kelly, interview by Noah Enelow. 2016a. *Portland Parks and Recreation's Youth Programs* (May 18).

Rosteck, Kelly, interview by Noah Enelow. 2016b. *Follow-Up Interview* (August 23).

Rowe, Amy, and Michele Bakacs. 2016. "An Introduction to Green Infrastructure Practices." *Rutgers New Jersey Agriculture Experiment Station*. Accessed November 28, 2016. http://njaes.rutgers.edu/pubs/fs1197/intro-to-green-infrastructure.asp.

Sanchez Sanchez, Alvaro, Andrea Quinn, and Jeremy Hays. 2013. *Staying Green and Growing Jobs*. Oakland, CA: Green For All.

Satterfield, Vivian, interview by Noah Enelow. 2016. *Green Infrastructure and Environmental Justice* (August 19).

Schlesinger, William H. 1997. *Biogeochemistry: An Analysis of Global Change*. San Diego: Academic Press.

Schrosk, Damon, interview by Noah Enelow. 2016. *The Arboriculture Sector in Portland* (May 9).

State of Oregon. 2016. “Directory of Minority-Owned, Women-Owned, and Emerging Small Businesses.” *Certification Office for Business Inclusion and Diversity*. http://www.oregon4biz.com/How-We-Can-Help/COBID/.

Tallamy, Douglas W. 2009. *Bringing Nature Home*. Portland, Oregon: Timber Press.

Tarver, Jr., Gregory, interview by Noah Enelow and Chris Schildt. 2016. *Barriers and Opportunities for Urban Forestry Interventions in Low Income Communities* (April 5).

Thorp, Laurie, and Christine Townsend. 2001. “Agricultural Education in an Elementary School: An Ethnographic Study of a School Garden.” *28th Annual National Agricultural Education Research Conference*. 347-360.

U.S. Census Bureau. 2016. “Equal Employment Opportunity Tabulation 2006-2010.” *U.S. Census Bureau*. Accessed September 16, 2016. http://www.census.gov/people/eeotabulation/.

U.S. EPA. 2016. *Portland Making a Visible Difference*. Portland, OR, August 17.

UCLA Institute of the Environment and Sustainability. 2016. “What has Proposition 84 done for California?” *UCLA Institute of the Environment and Sustainability*. Accessed November 16, 2016. http://calfire.ca.gov/Grants/downloads/UrbanForestry/CAL_FIRE_GGRF_UCF_Awards_14_15.pdf.

Ulrich, Roger S. 1981. “Natural Versus Urban Scenes: Some Psychophysiological Effects.” *Environment & Behavior*, September: 523-556.

—. 1984. “View through a window may influence recovery from surgery.” *Science*, April 27: 420-421.

United States Geologic Survey. 1988. *THE USGS Water Science School*. http://water.usgs.gov/edu/earthrain.html.

University of Washington. 2010. *Green Cities: Good Health*. June. Accessed August 10, 2016. http://depts.washington.edu/hhwb/Top_Introduction.html.

University of Wisconson Arboretum. n.d. *Planting a School Rain Garden*. Educational Publication, Madison, Wisconson: Earth Partnership for Schools.

Verde. 2016a. “Home: Verde.” *http://www.verdenw.org. http://verdenw.org/*.

—. 2016b. “Verde Landscape.” *Verde*. http://verdenw.org/social-enterprise/verde-landscape.

Walen, Stacie, interview by Noah Enelow. 2016. *Verde’s Administrative Costs* (September 7).

Walsh, Dylan. 2013. “Green Jobs for Ex-Offenders: The Urban Resource Initiative’s “GreenSkills” Program.” *Cities and the Environment* 6 (1). http://digitalcommons.lmu.edu/cgi/viewcontent.cgi?article=1125&context=cate.

Wells, Gail. 2010. “Calculating the Green in Green: What’s an Urban Tree Worth?” *Science Findings*, September.

Wilkinson, Lindsey, and Maura Kelly. 2016. *(Still) Building A More Diverse Workforce in the Highway Trades: 2016 Evaluation of the ODOT/BOLI Highway Construction Workforce Program*. Evaluation, Portland, OR: Portland State University.

Wolf, Kathleen L. 2003. “Introduction to Urban and Community Forestry Programs in the United States.” *Landscape Planning and Horticulture* 4 (3): 19-28.

Youth Mentoring Collaborative. 2016. *Youth Mentoring Collaborative: Vision, History, Guiding Principles, Goals*. Portland, OR: Youth Mentoring Collaborative.

APPENDIX 1: THE COMMUNITY BENEFITS OF GREEN INFRASTRUCTURE

This appendix investigates the community benefits of seven common types of urban forestry and green infrastructure facilities, all of which can be constructed, installed, and maintained by community-based enterprises. These types are street trees, bioswales, rain gardens, open-space restoration projects, parks, native plant restoration projects, and green streets.

Before analyzing the benefits of these projects, precise definitions are necessary. Table 24 provides descriptive definitions of the seven types of green infrastructure presented in the sections that follow, by identifying the key physical features and processes that characterize them.

Table 24. Descriptive Definitions of Common Green Infrastructure Types

Type	Definition
Bioswale	Gently graded drainages that capture and filter surface stormwater runoff, located adjacent to streets, highways, or large industrial parks, and vegetated. They can be small areas adjacent to parking lots or curbs, but can also be large, covering a catchment area of up to several acres.
Street Tree	Trees that are located on public streets and are typically the responsibility of the city.
Rain Garden	Small depressions that capture rain, reduce surface runoff, and are planted with vegetation that thrive in wet habitats. Similar to bioswales, but smaller and more likely to be located on private property.
Open-Space Restoration	Refers to the conversion of empty, abandoned urban properties into green spaces that can be open or closed to the public.
Parkland	Public parks, open to anyone, which offer recreational, cultural, and social opportunities.
Native-Plant Restoration	The removal of invasive plants and their replacement with native plants.
Green Street	Public streets that include vegetated facilities like bioswales, rain gardens, vegetated planters, street trees, and/or native plants. May include permeable pavement to infiltrate stormwater where it falls.

Green infrastructure (GI) projects use or mimic natural functions of the Earth to enhance the environments in which they are located, using a range of natural functions to deliver these benefits to communities. The following table briefly lists three community benefits produced by each GI project type and documented in the scientific and public agency literature. Descriptions of each benefit, including an overview of the ecosystem functions that provide it, and citations of all sources that document the benefits are provided in the sections that follow.

Table 25. Principal Community Benefits of Major Green Infrastructure Types

Green Infrastructure Type	Community Benefit # 1	Community Benefit #2	Community Benefit #3
Bioswale	Improves water quality	Improves community livability	Improves neighborhood aesthetics
Street Tree	Reduces crime	Reduces domestic violence	Reduces stress
Rain Garden	Improves air and water quality	Improves community livability	Creates education opportunities
Open-Space Restoration	Reduces crime	Increases social cohesion and social capital	Increases property values
Parkland Development	Improves community health	Increases social cohesion and social capital	Increases tourism
Native-Plant Restoration	Supports community identity	Creates education opportunities	Reduces noise pollution
Green Street	Increase air and water quality	Increases property values	Provides wildlife habitat

1. BIOSWALES

Bioswales provide cost-effective methods to reduce water turbidity and filter pollutants, especially suspended solids, oil, and grease from surface runoff during high rainfall events (Jurries 2003). The effectiveness of a bioswale can be maximized by careful selection of vegetation, regular maintenance, and efficient design. A trapezoidal form has proven most effective to retain and thus purify stormwater (Jurries 2003).

Improve Water Quality

Since bioswales' principal function is to filter and retain stormwater, the principal community benefit of a bioswale is improved local water quality, which relieves pressure on city sewer infrastructure (City of Portland 2016b). This benefit is most important in areas serviced by combined sewer systems (CSS), which combine surface runoff and sanitary sewer flows through the same pipes. During high rainfall events, this combined volume can exceed capacity, causing the system (and the sewage within it) to back up or overflow into local waterways in a combined sewer overflow (CSO) event.

In 1991, Portland began a 20-year CSO management plan to combat this issue, a plan that included constructing major green infrastructure projects such as bioswales, green streets, and street trees, in conjunction with enlargement of combined sewer pipes. The Grey to Green strategy has been, by all relevant measures, a success. By the time the project finished in 2011, CSO events had been reduced from an average of 50 per year to five per year (Bureau of Environmental Services 2010).

Improve Community Livability; Aesthetics

Bioswales can also improve the livability of communities and add aesthetic value to neighborhoods (Center for Neighborhood Technology; American Rivers 2010). Their native vegetation requires less maintenance than traditional landscape features, reducing noise pollution and gas combustion from landscaping crews. Also, growing evidence is linking green spaces, urban trees, and vegetation with mental and emotional benefits for people (University of Washington 2010).

2. STREET TREES

Trees profoundly shape our communities in tangible and intangible ways. They purify our air, create habitat for birds and pollinating insects, and recharge our groundwater supplies. Additionally, they can have a calming effect on people in urban environments that lowers crime, reduces domestic conflict, and improves their quality of life (Kuo and Sullivan 2001).

Reduce Crime and Domestic Violence

A study in 2010 in Portland found that street trees can reduce burglary rates by signaling to burglars that the area is cared for and, by association, that they are more likely to be seen by an authority if they attempt a break-in (Donovan and Prestemon, 2010). Street trees have also been shown to reduce domestic violence: a study of 145 urban public housing female residents in Chicago found that women in apartments that had at least some nature outside their apartments reported statistically lower levels of aggression and violence toward them and their children (Kuo and Sullivan 2001). Notably, the study controlled for all other observable and measurable features of the apartments such as architecture, geographical location, and proximity to highways. Apartment residents' socioeconomic status was also a control variable.

Reduce Stress

Besides making neighborhoods safer, street trees can also reduce stress and lead to increased happiness. Being in view of trees has been shown to reduce post-operation hospital recovery time (Ulrich 1984), has been linked to improved human well-being (Perlman 1998), and can reduce the risk of poor birth outcomes (Donovan et al. 2011).

3. RAIN GARDENS

Rain gardens produce ecosystem services and render community benefits similar to bioswales. However, rain gardens are typically smaller and installed in private homes and small businesses, as opposed to bioswales, which are most often larger and found abutting major roads and large commercial parks. Like bioswales, rain gardens improve local water quality, alleviate stormwater runoff pressure (Buckley et al. 2012), and make communities more livable and attractive (Center for Neighborhood Technology; American Rivers 2010).

Create Educational Opportunities

Rain gardens often offer public education benefits due to their location in or near homes, residential areas, neighborhood streets, or small businesses, which places them in the public eye. This exposure can lead to opportunities for public education about the benefits of green infrastructure, and foster public participation in green infrastructure planning and maintenance. Using rain gardens as an educational tool has gained momentum in the past few decades: studies are investigating their effects on childhood development (Thorp and Townsend 2001), government agencies are promoting their spread (Environmental Protection Agency 2016), and state universities are creating lesson plans to help elementary schools integrate them in their childhood education plans (University of Wisconson Arboretum n.d.).

4. OPEN-SPACE RESTORATION

Virtually all urban environments contain spaces that are vacant or underutilized. These can be former industrial sites, empty lots, neglected stream corridors, or dilapidated properties. Vacant urban spaces, in general, do not enrich the economic or social fabric of a community. Restoring the ecological functions of these spaces—as streams, wetlands, floodplains, meadows, or other ecosystem types—can create animal habitat, mitigate urban heat island effects, store carbon, and purify local air and water.

Reduce Crime

A principal benefit of open-space restoration is crime reduction. Several studies have associated unimproved vacant properties with higher crime rates, holding all other variables constant (Braga and Bond 2008; National Vacant Properties Campaign 2005). Restoring native open spaces on these properties may deter criminal activity.

Increase Social Cohesion and Social Capital

In addition to lowering crime rates, restoring open spaces to natural areas for public use can also bring communities together. Some studies have attempted to quantify, in dollar amounts, the value of this social cohesion (Harnik and Welle 2009) based on donations and volunteer hours. Additional studies have suggested that restored open spaces may create intrinsic value to individual citizens, over and above the value of the social cohesion created through the restoration effort.

Increase Property Values

Open-space restoration can increase property values for nearby homes and businesses. In 2015 a study was conducted in Philadelphia to assess the causal impact of converting open space into green space on nearby property values. The study found that for nearly half of the properties showed, converting abandoned lots to green spaces did lead to an increase in nearby property values (Heckert and Mennis 2012).

5. PARKLAND DEVELOPMENT

Parks build upon many of the community benefits already discussed by other green infrastructure projects: they increase pervious surface areas, relieving pressure on stormwater treatment facilities; their vegetation and trees can improve local air quality (Portland Bureau of Environmental Services 2010); they can provide public education opportunities through outdoor education (Harnik and Welle 2009); they can foster social cohesion and social capital; and they can reduce mental fatigue and stress (Kuo and Sullivan 2001).

Increase Community Health

Parks give people an outdoor area in which to engage in recreational activities (e.g., sports, children's play, exercise), increasing community health. A recent study estimated that the presence of a nearby park led to regular engagement in recreational activities that led to benefits in human physical and mental health, reduced stress, and lowered health-care costs by an estimated $250 to $500 per person per year (Harnik and Welle 2009).

Increase Tourism

Some cities have expanded and promoted their parks in order to increase tourism to the city itself: examples include Central Park in New York, the Mall in Washington D.C., and Balboa Park in San Diego. A study done by the Trust for Public Land estimated that parks in San Diego added over $40 million in tourism revenue in 2006 alone (Harnik and Welle 2009).

6. NATIVE-PLANT RESTORATION

Native plants, because they are naturally suited to their environments, require less money, fertilizer, fossil fuels, pesticides, and infrastructure repairs required to maintain these landscape features than their nonnative counterparts. Native plantings thus improve local water quality by reducing fertilizer and pesticide runoff during rain events. Due to reduced fuel use in maintenance from lawn mowers, leaf blowers, chainsaws, and other equipment, increased native plantings can improve local air quality. In general, the reduction in external inputs needed to maintain native plantings directly improves local environmental conditions.

Support Community Identity

In addition to improved air and water quality, native plants can bring communities together by fostering connection with the local surroundings. Similarly to the ways that cultural elements such as art, music, and community organizations shape people's sense of place, native plants can help form bonds between people and the places where they live.

Create Educational Opportunities

The sense of place, community identity, and botanical knowledge fostered by native-plant restoration can lead to educational opportunities. In parks, public areas, and schools where native vegetation has been restored, informational and interpretive signage can help illuminate the cultural and environmental importance of native vegetation.

7. GREEN STREETS

According to the Portland Bureau of Environmental Services (BES), green streets are "vegetated curb extensions, streetside planters, or infiltration basins (rain gardens) that collect stormwater runoff from streets" (Portland Bureau of Environmental Services 2010). Therefore, they combine many of the benefits of those individual GI projects. Chief among the benefits they provide to a community is the ability of their trees and plants to purify air and water in the same way that natural ecosystems do. Additionally, according to the BES, a Seattle study found property values for homes increased 3 to 5 percent thanks to close proximity to green streets (Portland Bureau of Environmental Services 2010). Finally, the vegetated spaces and/or trees provided by the planter areas of green streets can provide habitat to birds, small animals, and pollinating insects.

APPENDIX 2: DETAILS OF EQUITY PROGRAMS AND POLICIES

California Greenhouse Gas Reduction Fund

The two figures that follow demonstrate examples of the equity language used in the State of California's Greenhouse Gas Reduction Fund (GGRF). These examples serve to demonstrate that clear equity language can be incorporated into state-level environmental policies.

Figure 6. Final Guidelines for GGRF-Funded Urban Forestry Projects, State of California (Table 2.A-7; 2015)

Table 2.A-7 Urban Forestry and Urban Greening

Projects will achieve GHG reductions through net increases in carbon sequestration as a result of planting, cultivating, and maintaining trees and related vegetation in urban areas. Projects may also reduce energy usage by improving the green canopy and providing shade. Potential administering agencies: CAL FIRE, SGC

CRITERIA TO EVALUATE PROJECTS *Agencies can also use criteria in other applicable tables.*	
When selecting projects for a given investment, give priority to those that maximize benefits to disadvantaged communities (e.g., use scoring criteria that favor projects which provide multiple benefits or the most significant benefits).	
Step 1 - Located Within	Evaluate the project to see if it: meets at least one of the following criteria for being located in a disadvantaged community census tract*; provides direct, meaningful, and assured benefits to a disadvantaged community; and meaningfully addresses an important community need**. Project must meet the following criteria focused on environmental improvements for disadvantaged community residents: *A. The majority of the project is in a publicly accessible area within a disadvantaged community and the project terms provide for maintenance of the trees and related vegetation.*
Step 2 - Provides Benefits To	If the project does not meet the above criteria for "located within," evaluate the project to see if it: meets at least one of the following criteria for providing direct, meaningful, and assured benefits to a disadvantaged community; and meaningfully addresses an important community need**. Project mus meet at least one of the following criteria focused on economic opportunities or providing green space or open space, for disadvantaged community residents: *A. The majority of trees planted by the project are accessible by walking within 1/2 mile of a disadvantaged community and the project terms provide for maintenance of the trees and related vegetation: or* *B. Project significantly reduces flood risk to one or more adjacent disadvantaged communities; or* *C. Project includes recruitment, agreements, policies or other approaches that are consistent with federal and state law and result in at least 25% of project work hours performed by residents of a disadvantaged community; or* *D. Project includes recruitment, agreements, policies or other approaches that are consistent with federal and state law and result in at least 10% of project work hours performed by residents of a disadvantaged community participating in job training programs which lead to industry-recognized credentials or certifications.*

*For maps of disadvantaged community census tracts, refer to: http://www.calepa.ca.gov/EnvJustice/GHGInvest/

**To determine community needs, agencies or applicants can use a variety of approaches such as: looking at the factors in CalEnviroScreen that caused an area to be defined as a disadvantaged community; hosting community meetings to get local input; referring to the list of common needs in Table 2-2; or receiving documentation of community support (e.g., letters or emails).

Figure 7. Final Guidelines on Jobs Reporting for GGRF-Funded Projects, State of California (Table 3.A-16; 2015)

Table 3.A-16 Jobs and Job Training
(submit this data if your GGRF program resulted in jobs or job training as a component of funded projects). ARB will begin compiling data from agencies in early December and will complete data collection by mid-January.

End of Year Report - Jobs Component Only

Submit once a year, if applicable (between December 1 - January 15)

Provide the following summaries for jobs or job training that resulted from a project funded by the GGRF. [Note: Don't include jobs held by State administering agency staff. If project is complete, submit the following information with the "Project Closeout" report]

1. Project Identification Number [assigned by administering agency]

2. Description of jobs/job training component [if applicable, describe how the project has provided jobs and job training, including the use of Project Labor Agreements, Community Workforce Agreements, etc.]

3. Total project work hours

4. Number of project work hours for jobs provided to disadvantaged community residents and the associated census tract numbers* [if applicable]

5. Total number of jobs and the associated jobs classification/trade [e.g. # of electricians; # of carpenters; # of weatherization energy auditors; # of landscape architects; # of arborists; # of construction laborers; # of plumber helpers, etc.]

6. Number of jobs that were provided to disadvantaged community residents and the associated jobs classification/trade [if applicable]

7. Entry-level and median hourly wage or entry-level and median total compensation (hourly wage plus benefits) for each job classification/trade

8. For all job training:
   - Total number of people that completed job training and the associated job training classification/trade; and
   - The type of credentials earned [e.g., certifications, licenses, degrees]

9. For job training provided to disadvantaged community residents [if applicable]:
   - Number of disadvantaged community residents that completed job training and the associated job training classification/trade; and
   - The type of credentials earned [e.g., certifications, licences, degrees]

10. GGRF dollars expended for projects that resulted in jobs or job training, cumulative to date

*To find census tract numbers, zoom in and click on the maps provided by the "SB 535 Online Mapping Application of Disadvantaged Communities", available at http://www.calepa.ca.gov/EnvJustice/GHGInvest/

APPENDIX 3: DETAILED DATA ON GREEN INFRASTRUCTURE OCCUPATIONS

Table 26. List of Plant- and Soil-Related Urban Forestry Occupations

Occupation Name	BLS Code	Occupation Type
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	45-2092	Farming, fishing, and forestry occupations
Landscaping and Groundskeeping Workers	37-3011	Building and grounds cleaning and maintenance occupations
Pesticide Handlers, Sprayers, and Applicators, Vegetation	37-3012	Building and grounds cleaning and maintenance occupations
Tree Trimmers and Pruners	37-3013	Building and grounds cleaning and maintenance occupations
First-Line Supervisors of Landscaping and Groundskeeping Workers	37-1012	Building and grounds cleaning and maintenance occupations
Forest and Conservation Technicians	19-4093	Life, physical, and social science occupations
Forest and Conservation Workers	45-4011	Farming, fishing, and forestry occupations
First-Line Supervisors of Agricultural Crop and Horticultural Workers	45-1011	Farming, fishing, and forestry occupations

Table 27. List of Complementary Infrastructure-Related Urban Forestry Occupations

Occupation Name	BLS Code	Occupation Type
Septic Tank Servicers and Sewer Pipe Cleaners	47-4071	Construction and extraction occupations
Helpers - Carpenters	47-3012	Construction and extraction occupations
Helpers - Installation, Maintenance, and Repair Workers	49-9098	Installation, maintenance, and repair occupations
Helpers - Plumbers, Pipelayers, and Steamfitters	47-3015	Construction and extraction occupations
Earth Drillers, Except Oil and Gas	47-5021	Construction and extraction occupations
Pump Operators, Except Wellhead Pumpers	53-7072	Transportation and material moving occupations
Industrial Truck and Tractor Operators	53-7051	Transportation and material moving occupations
Laborers and Freight, Stock, and Material Movers	53-7062	Transportation and material moving occupations
Refuse and Recyclable Material Collectors	53-7081	Transportation and material moving occupations
Truck Drivers, Heavy and Tractor-Trailer	53-3032	Transportation and material moving occupations
Carpenters, Construction	47-2031	Construction and extraction occupations
Construction Laborers	47-2061	Construction and extraction occupations
Operating Engineers and Other Construction Equipment Operators	47-2073	Construction and extraction occupations
Pipelayers	47-2151	Construction and extraction occupations
Cement Masons and Concrete Finishers	47-2051	Construction and extraction occupations
Control and Valve Installers and Repairers, Except Mechanical Door	49-9012	Installation, maintenance, and repair occupations
Construction and Building Inspectors	47-4011	Construction and extraction occupations
Water and Liquid Waste Treatment Plant and System Operators	51-8031	Production occupations
Maintenance and Repair Workers, General	49-9071	Installation, maintenance, and repair occupations
Electricians	47-2111	Construction and extraction occupations
First-Line Supervisors/Managers of Construction Trades and Extraction Workers	47-1011	Construction and extraction occupations
Plumbers, Pipefitters, and Steamfitters	47-2152.01	Construction and extraction occupations

Table 28. Job Classifications, Plant- and Soil-Related, Green Infrastructure and Urban Forestry Occupations

Occupation Name	O*NET "Green Job"?	O*NET "Bright Outlook"?	O*NET Job Zone
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	N	Y	1
Landscaping and Groundskeeping Workers	N	Y	1
Pesticide Handlers, Sprayers, and Applicators, Vegetation	N	N	2
Tree Trimmers and Pruners	N	N	2
First-Line Supervisors of Landscaping and Groundskeeping Workers	N	N	3
Forest and Conservation Technicians	Y	N	3
Forest and Conservation Workers	Y	N	3
First-Line Supervisors of Agricultural Crop and Horticultural Workers	Y	N	3

Table 29. Job Classifications, Complementary Infrastructure-Related, Green Infrastructure and Urban Forestry Occupations

Occupation Name	O*NET "Green" Job?	O*NET "Bright Outlook"?	O*NET Job Zone
Septic Tank Servicers and Sewer Pipe Cleaners	N	Y	1
Helpers - Carpenters	Y	N	2
Helpers - Installation, Maintenance, and Repair Workers	Y	N	2
Helpers - Plumbers, Pipelayers, and Steamfitters	N	N	2
Earth Drillers, Except Oil and Gas	N	Y	2
Pump Operators, Except Wellhead Pumpers	N	N	2
Industrial Truck and Tractor Operators	Y	Y	2
Laborers and Freight, Stock, and Material Movers	Y	Y	2
Refuse and Recyclable Material Collectors	Y	N	2
Truck Drivers, Heavy and Tractor-Trailer	Y	Y	2
Carpenters, Construction	Y	Y	2
Construction Laborers	Y	Y	2
Operating Engineers and Other Construction Equipment Operators	Y	N	2
Pipelayers	N	N	2
Cement Masons and Concrete Finishers	Y	N	2
Control and Valve Installers and Repairers, Except Mechanical Door	N	N	3
Construction and Building Inspectors	Y	N	3
Water and Liquid Waste Treatment Plant and System Operators	N	N	3
Maintenance and Repair Workers, General	Y	Y	3
Electricians	Y	Y	3
First-Line Supervisors/Managers of Construction Trades and Extraction Workers	N	Y	3
Plumbers, Pipefitters, and Steamfitters	Y	Y	3

Table 30. Mean and Median Wages, Plant- and Soil-Related Occupations

Occupation	Hourly Mean Wage	Annual Mean Wage	Hourly Median Wage	Annual Median Wage
Landscaping and Groundskeeping Workers	$15.14	$31,500	$14.01	$29,150
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	$11.55	$24,030	$10.71	$22,270
First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	$25.18	$52,380	$22.92	$47,680
Forest and Conservation Technicians	$22.39	$46,570	$21.33	$44,360
Forest and Conservation Workers	$16.22	$33,730	$16.38	$34,070
Pesticide Handlers, Sprayers, and Applicators, Vegetation	$19.05	$39,630	$18.37	$38,220
Tree Trimmers and Pruners	$20.25	$42,130	$20.59	$42,830

Table 31. Mean and Median Wages, Complementary Infrastructure Occupations

Occupation	Hourly Mean Wage	Annual Mean Wage	Hourly Median Wage	Annual Median Wage
First-Line Supervisors of Construction Trades and Extraction Workers	$33.27	$69,190	$32.33	$67,250
Carpenters	$23.15	$48,150	$22.35	$46,480
Cement Masons and Concrete Finishers	$22.87	$47,570	$19.87	$41,320
Construction Laborers	$18.94	$39,390	$17.23	$35,840
Operating Engineers and Other Construction Equipment Operators	$27.70	$57,610	$27.72	$57,650
Electricians	$34.05	$70,820	$35.07	$72,950
Pipelayers	$24.73	$51,440	$25.00	$52,010
Plumbers, Pipefitters, and Steamfitters	$36.58	$76,090	$36.77	$76,480
Helpers - Carpenters	$14.38	$29,910	$15.36	$31,950
Helpers – Pipelayers, Plumbers, Pipefitters, and Steamfitters	$19.24	$40,020	$19.88	$41,360
Construction and Building Inspectors	$32.39	$67,380	$32.94	$68,520
Septic Tank Servicers and Sewer Pipe Cleaners	$21.86	$45,470	$21.36	$44,430
Earth Drillers Except Oil and Gas	$26.54	$55,200	$24.60	$51,170
Control and Valve Installers and Repairers Except Mechanical Door	$26.88	$55,920	$26.01	$54,100
Maintenance and Repair Workers General	$20.66	$42,970	$19.49	$40,540
Helpers - Installation Maintenance and Repair Workers	$14.24	$29,620	$13.29	$27,650
Water and Wastewater Treatment Plant and System Operatorrs	$30.88	$64,230	$28.98	$60,270
Heavy and Tractor-Trailer Truck Drivers	$20.35	$42,330	$20.21	$42,030
Industrial Truck and Tractor Operators	$18.32	$38,110	$18.02	$37,490
Laborers and Freight Stock and Material Movers Hand	$14.07	$29,260	$12.68	$26,370
Pump Operators Except Wellhead Pumpers	$23.71	$49,310	$18.96	$39,430
Refuse and Recyclable Material Collectors	$21.10	$43,880	$22.07	$45,910

Table 32. Current Employment and Projected Job Openings, Plant- and Soil-Related Occupations

Occupation Name	2014 Employment	2024 Employment	Percent Change	Total Openings (Growth + Replacement)
Landscaping and Groundskeeping Workers	5,386	6,254	16%	1,839
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	5,006	5,380	7%	1,707
First-Line Supervisors of Landscaping and Groundskeeping Workers	519	609	17%	176
Forest and Conservation Workers	N/A	N/A	16%	N/A
Tree Trimmers and Pruners	N/A	N/A	13%	N/A
Pesticide Handlers, Sprayers, and Applicators, Vegetation	N/A	N/A	13%	N/A
Forest and Conservation Technicians	170	N/A	9%	N/A
First-Line Supervisors of Agricultural Crop and Horticultural Workers	120	N/A	7%	N/A

APPENDIX 4: TECHNICAL DETAILS OF IMPLAN ANALYSIS

In this appendix we present the technical details of the IMPLAN Analysis conducted in Chapter V. To conduct the analysis, we made use of Verde Landscape's categorization scheme for expenditures, and coded each expenditure category to one of IMPLAN's 440 generic sectors. Table 33 presents the verbal definitions of the project expense categories, and Table 34 matches each expense category to one of the 440 generic sectors in the IMPLAN model.

Table 33. Definition of Project Expense Categories, Verde Landscape

Expense Category	Definition
Planting Materials	Plants purchased from nurseries and/or brokers, to be used as project inputs
Vehicle Fuel	Fuel for trucks and other utility vehicles
Job Supplies	Small hardware inputs used for projects, including cable ties, fasteners, twine, etc.
Small Equipment and Tools	Small durable equipment and tools used in projects, including weed whackers, hand clippers, pruning shears, etc.
Program Supplies	Safety equipment and incidentals needed for project execution
Uniform Expense	Work boots, T-shirts, sweatshirts, rain gear, safety vests, galoshes, etc.
Vehicle Insurance	Self-explanatory
Vehicle Rental	Rental of any trucks or other utility vehicles necessary for project completion
Dump Fees	Self-explanatory
Equipment Rental	Rental of any durable nonvehicle equipment necessary for project completion (e.g., port-a-potties)
Vehicle Repairs	Self-explanatory
Equipment Repair	Self-explanatory
Vehicle Licensing	Self-explanatory

Table 34. Expense Categorization by IMPLAN Sector, Verde Landscape

Expense Category	IMPLAN Sector Code	IMPLAN Sector Name
Planting Materials	6	Greenhouse, nursery, and floriculture production
Vehicle Fuel	115	Petroleum refineries
Small Equipment and Tools	185	Handtool manufacturing
Job Supplies	193	Hardware manufacturing
Job Supplies (Retail)	323	Retail Stores - Building material and garden supply
Planting Materials (Retail)	323	Retail Stores - Building material and garden supply
Small Equipment (Retail)	323	Retail Stores - Building material and garden supply
Uniform Expense (Retail)	327	Retail Stores - Clothing and clothing accessories
Program Supplies (Retail)	329	Retail Stores - General merchandise
Vehicle Insurance	357	Insurance carriers
Vehicle Rental	362	Automotive equipment rental and leasing
Equipment Rental	365	Commercial and industrial machinery and equipment rental and leasing
Dump Fees	390	Waste management and remediation services
Vehicle Repairs	414	Automotive repair and maintenance, except car washes
Equipment Repair	417	Commercial and industrial machinery and equipment repair and maintenance
Vehicle Licensing	437	* Employment and payroll only (state & local goverment, noneducation)
Administrative Expenditures	424	Grantmaking, giving, and social advocacy organizations

Verde Landscape codes expenditures by activity; each activity is given a code based on its type. Table 35 provides the classification system for the set of activities we examine as part of this impact analysis.

Table 35. Verde Landscape: Activity Coding System

Activity Type	Activity Code
Landscape Maintenance	4001
New Installation	4002
Stormwater Facility	4003
Restoration	4005
Tree Planting	4010
Tree Watering	4011
General Labor	4015

The next step is to construct the input coefficient matrix for all of Verde Landscape's activities. We identify the proportions of each input, categorized by the scheme defined above in Table 33 and Table 34, used to produce each unit of output produced by Verde Landscape, categorized by activity. In categorizing expenditures, the IMPLAN model makes a distinction between wholesale and retail sectors; however, Verde Landscape does not make use of this distinction in its expenditure records. As a rule of thumb, we used a threshold of $1,000 per expenditure to distinguish between wholesale and retail expenditures. Each expenditure of less than $1,000 was considered to be a retail expenditure, and each expenditure of greater than $1,000 was considered to be a wholesale expenditure. Table 36 provides the input coefficient matrices for each of Verde Landscape's activity types defined in Table 35, as well as for the aggregate (total) of all activities.[16]

Table 36. Verde Landscape: Input Coefficient Matrices by Activity Type

Expense Type	4001	4002	4003	4005	4010	4011	4015	Total
Planting Materials	0.000	0.295	0.269	0.109	0.000	0.000	0.000	0.145
Vehicle Fuel	0.020	0.031	0.009	0.001	0.015	0.003	0.002	0.015
Small Equipment and Tools	0.000	0.005	0.004	0.002	0.000	0.000	0.000	0.002
Job Supplies	0.000	0.071	0.018	0.007	0.000	0.000	0.000	0.023
Job Supplies (Retail)	0.013	0.043	0.015	0.001	0.003	0.001	0.000	0.017
Planting Materials (Retail)	0.036	0.056	0.013	0.001	0.050	0.011	0.008	0.029
Small Equipment (Retail)	0.004	0.006	0.002	0.000	0.003	0.001	0.001	0.003
Uniform Expense (Retail)	0.004	0.006	0.002	0.000	0.003	0.001	0.000	0.003
Program Supplies (Retail)	0.023	0.025	0.008	0.001	0.013	0.003	0.002	0.014
Vehicle Insurance	0.009	0.013	0.004	0.000	0.007	0.002	0.001	0.007
Vehicle Rental	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.001
Equipment Rental	0.005	0.009	0.002	0.002	0.003	0.001	0.000	0.004
Dump Fees	0.021	0.015	0.009	0.000	0.006	0.001	0.001	0.011
Vehicle Repairs	0.004	0.006	0.002	0.000	0.003	0.001	0.000	0.003
Equipment Repair	0.007	0.010	0.003	0.000	0.005	0.001	0.001	0.005
Vehicle Licensing	0.002	0.002	0.001	0.000	0.001	0.000	0.000	0.001
TOTAL	0.146	0.596	0.359	0.124	0.111	0.025	0.018	0.283

Verde Landscape's activities differ in their input structures. In order to understand the differences between the firm's activities, we aggregated total expenditures by input type and by activity type. Table 37 (p. 110) presents the expenditure breakdown by activity type using the top-level classification system presented in Table 19 (p. 71): inputs and equipment, labor costs, and administrative expenditures. Table 38 presents the percentage of expenditures by activity type. We see that activity 4002, new installation, is most intensive in its use of inputs and equipment (56%), while activity 4015, general labor, is most intensive in its use of labor (92%).

16 Due to rounding, totals may differ slightly from sums of columns.

However, general labor comprised only $9,436 of Verde Landscape's total income in 2015. The more economically significant activities of landscape maintenance (4001) and restoration (4005) were also relatively intensive in their use of labor, as were tree planting (4010) and tree watering (4011).

Table 37. Verde Landscape: Total Expenditures by Activity Type

	4001	4002	4003	4005	4010	4011	4015	Total
Inputs and Equipment	$18,569	$89,958	$32,290	$16,686	$4,031	$689	$155	$162,378
Labor Costs	$108,799	$60,947	$57,554	$117,468	$32,170	$26,493	$8,664	$412,097
Administrative Expenditures	$8,916	$10,563	$6,289	$9,391	$2,534	$1,903	$617	$40,213
TOTAL	$136,284	$161,469	$96,133	$143,545	$38,735	$29,085	$9,436	$614,687

Table 38. Verde Landscape: Percentage Expenditures by Activity Type

	4001	4002	4003	4005	4010	4011	4015	Total
Inputs and Equipment	14%	56%	34%	12%	10%	2%	2%	26%
Labor Costs	80%	38%	60%	82%	83%	91%	92%	67%
Administrative Expenditures	7%	7%	7%	7%	7%	7%	7%	7%



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