RESOURCES

NATURAL

Utilizing Urban Wood: A Study for Urban and Community Forestry

October 2013

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Utilizing Urban Wood: A Study for Urban and Community Forestry

October 2013

By Nikkole Hughes
Washington State Department of Natural Resources
Urban and Community Forestry Program

WASHINGTON STATE DEPARTMENT OF
Natural Resources
Peter Goldmark - Commissioner of Public Lands

Acknowledgements

U.S.D.A. Forest Service
State & Private Forestry, Urban & Community Forestry

Washington State Department of Natural Resources
Urban and Community Forestry Program
Pacific Cascade Region
Correctional Camps Program
Recreation Program

Washington Department of Corrections - Cedar Creek Corrections Center
Douglas O. Cole
Charlie Washburn

Washington State Parks
Rob Fimbel

Washington State University Extension
James Freed

The Evergreen State College
Daryl Morgan
Kelli Bush

The City of Olympia
Joe Roush
Marcus Goodman
Michelle Bentley

Arbutus Folk School
Stacey Waterman-Hoey
Kirk Hanson
Dave King

Sound Urban Forestry
Kevin McFarland

Washington State Department of Natural Resources
Urban and Community Forestry
1111 Washington St SE
MS 47037
Olympia, WA 98504-7037

www.dnr.wa.gov

Cover photo is of Legion Way in Olympia, Washington, taken by Janet Pearce.

Table of Contents

Executive Summary

Background

Urban waste wood—wood derived from vegetation management in urban environments—is a significant portion of the nation's municipal waste stream and an often overlooked component of urban forest management. Many of the trees that are mulched, chopped, or dumped after routine tree removals or land development projects have the potential to be recycled and utilized for a higher and better use.

The Washington State Department of Natural Resources (DNR) offender work crews represent a ready workforce to recycle and utilize wood in a manner that benefits the communities into which offenders will ultimately re-enter. These crews are employed by DNR in a number of correctional centers across the state for the primary purpose of firefighting assistance in the summer. Although crews already perform forest restoration work in the off-season, the opportunity exists for DNR to also employ them in wood technology programs in order to diversify a practical skill-set revolving around forest resources. Cedar Creek Corrections Center in Littlerock, Washington, is a prime location for this programmatic expansion by merit of its existing sawmill and woodworking shop. DNR's Urban and Community Forestry program (UCF) aims to unite the issues of gainful skills development among DNR crew members and wood waste reduction in an urban wood utilization (UWU) program.

The following report was initiated by UCF to assess the feasibility of developing an UWU program in Western Washington. Throughout the report, potential challenges to program implementation are discussed, and possible solutions are recommended. It concludes with an assessment of the proposed program's environmental, economic, and social components and a list of potential future actions. Below are summary highlights from the report.

Partnership Opportunities

For urban wood utilization projects across the country, diverse partnerships are vital to the achievement of program goals. In Washington, an UWU program would be best facilitated with UCF in the center of a regional network of wood suppliers, such as Tree City USA communities and public lands agencies, and end-users, such as non-profit groups and partnering communities.

Policy and Legal Context

While some municipal codes are not currently responsive to utilizing cities' urban wood waste, policies including UWU mechanisms in urban forest management plans could facilitate the expansion of an UWU program throughout the South Puget Sound.

Employment of DNR offender work crews in an UWU program would raise unique ethical and legal considerations. Marketing of urban forest products made by offenders is restricted to public agencies and non-profit organizations. Establishment of a vocational certification program with Department of Corrections and the State Board for Community and Technical Colleges would open up additional market possibilities as well as provide for more rigorous wood technology training for program participants.

Benefits of an UWU Program:

- **Economic** – can reduce landfill tipping fees and transportation costs for participating jurisdictions; provides cost-effective, locally-sourced wood for public projects; nurtures the local economy by networking with local artisans and entrepreneurs
- **Environmental** – sequesters carbon dioxide in urban forest products; provides an alternative to burning wood waste; contributes to LEED and Built Green credits
- **Social** – increases public awareness of the value of urban forests and local wood resources; provides resources to train an at-risk population in vocational wood technologies; can help reduce recidivism among program participants

Technical Aspects of UWU

In order for an UWU program to be successful, it would need to recruit technical expertise in all the procedural phases of utilization. This need can be met by hiring a carpentry shop supervisor at Cedar Creek and leveraging the volunteered time of experts in forestry, arboriculture, milling, and woodworking. Important technical considerations include transporting wood to the mill, drying lumber to appropriate moisture content, and contracting a professional grader to inspect the end-products. A preliminary accounting of the estimated costs associated with starting an UWU program is provided in Chapter VI.

Marketing Urban Forest Products

Because UCF's proposed wood waste utilization program model would be publically funded, the market opportunities for value-added products are limited. Any sales of products must be conducted under a contract or on a commission basis. The finished goods produced by offenders at Cedar Creek may not directly compete with those by private businesses. Five potential commission opportunities have already been identified for urban forest products: partnering communities, the Evergreen State College woodshop, Habitat for Humanity, Arbutus Folk School, and Correctional Industries.

Budgetary Considerations

In order to initiate an UWU program, a number of start-up costs will need to be addressed. This includes capital costs, such as equipment purchases; processing costs, such as transporting, milling, and drying wood; and labor costs. Processing and labor costs could be recovered through the commissioned and contracted sale of lumber and other urban forest products to appropriate end-users. Capital costs, however, would need to be satisfied through additional program funding.

Introduction

Purpose of the Feasibility Study

The following report was initiated by Washington State Department of Natural Resources' (DNR) Urban and Community Forestry (UCF) to assess the feasibility of developing an urban wood utilization (UWU) program in Western Washington. Funding support was provided by the USDA Forest Service. The report bases its assessment for long-term programmatic development upon the opportunities and challenges identified through initiation of an UWU pilot project during the 2013-2015 biennium. In the pilot[1], trees from municipal and agency partners, such as the City of Olympia, Washington State Parks, and DNR's Recreation Program, will be milled by the Cedar Creek Corrections Center sawmill for wood technology skills training and urban forest products manufacturing. This report considers the potential to expand the UWU pilot project into a self-sustaining program, evaluates potential challenges, and recommends potential solutions. It also investigates the possibility of developing a certified vocational fine carpentry, cabinetmaking, and woodworking program as a potential outgrowth of an UWU program.

Specifically, this study addresses:

- Opportunities for partnership
- Policy and legal barriers
- Benefits of an UWU program
- Technical aspects of an UWU program
- What markets currently exist for offender-made urban forest products
- Budget details and requirements
- Levels of involvement in implementation

Background and Description

In "Utilizing Municipal Trees: Ideas from across the country," Stephen Bratkovich credits Ed Lempicki of New Jersey's Forestry Services with igniting the nation's interest in urban wood[2]. Since Mr. Lempicki first sought to establish a market for urban forest products in the 1990s, dozens of state-sponsored urban wood utilization projects have sprung up across the country in response to increased concern over municipal waste production. In Illinois, the Emerald Ash Borer (EAB) Wood Utilization Team has forged an extensive network of arborists, sawyers, woodworkers, and end users to reclaim EAB-killed ash[3]. Meanwhile, in Lompoc, California, milling urban wood for city projects saved $40,000 in landfill tipping fees associated with urban tree removals (Bratkovich, p. 23). At the national scale, a report sponsored by the USDA Forest Service states that approximately 14.8 million

[1] Funding for the pilot project was provided by the USDA Forest Service.
[2] Bratkovich, S. 2001. Utilizing Municipal Trees: ideas from across the country. NA-TP-06-01. St. Paul, MN: USDA Forest Service, Northeastern Area State and Private Forestry.
[3] Illinois EAB Wood Utilization Team. 2012. Retrieved from http://www.illinoisurbanwood.org/index.html#aboutus.

metric tons of wood chips, logs, stumps, tree tops, and brush entered the municipal solid waste (MSW) stream in 2002 alone[4]. The author of the report makes a point to note that "the volume of woody yard trimmings generated as part of MSW in 2002 exceeded the volume of timber harvested from National Forests" (McKeever, p. 9). Although most of this volume was recovered as mulch, compost, or some other low end-use, the potential exists to utilize non-traditional forest resources for their highest and best use.

As urban areas grow and protected forestlands are increasingly constrained, for many communities the urban forest will become an important linkage to the natural world. Healthy urban forests not only add to the aesthetic appeal of communities, but they also improve energy efficiency and water quality, provide wildlife habitat, and sequester atmospheric carbon[5]. Additional study of the effects urban trees have on our social environment has shown that as green space increases, crime decreases[6]. Among those who have committed crimes, engagement with nature may go a long way in reducing recidivism as well.

DNR's UCF and Correctional Camps programs seek to unite the issues of urban waste reduction and green-collar training for offenders by using wood that is removed for public safety or development in urbanized or recreational settings. This program would create marketable products such as dimensional lumber, flooring, and furniture. While several communities throughout the Puget Sound Region of Western Washington have attempted to or are currently implementing their own low-end use utilization programs, no comprehensive effort has been made at the state level to encourage the widespread adoption of wood waste recycling and re-use into value-added products. The central focus of a comprehensive, regional UWU program would be to develop guidance protocols for wood utilization programs throughout Washington State and provide meaningful green-collar employment for DNR's offender fire crews in the off-season.

Goals of an UWU program could be characterized as:

Goal I: Close tree lifecycles by providing environmentally sustainable, socially conscious, and economically viable alternatives to low-end uses of urban wood, such as woodchips and firewood

I-A: Lead communities in managing tree resources to fully realize the benefits of the urban forest

I-B: Reduce costs associated with wood disposal in Washington communities and on state lands

I-C: Address regional air quality issues by diverting use of wood waste as residential firewood

Goal II: Support vocational and employment programs that use urban waste wood to develop jobs skills for at-risk populations

II-A: Improve group cohesion of and promote offender participation in DNR Camps fire crews through off-season employment and training opportunities

II-B: Reduce recidivism and increase re-entry employment among program participants

[4] McKeever, D. B. 2004. Inventories of Woody Residues and Solid Wood Waste in the United States, 2002. Madison, WI: USDA Forest Service, Forest Products Laboratory. Retrieved from http://www.fpl.fs.fed.us/documnts/pdf2004/fpl_2004_mckeever002.pdf.

[5] Bratkovich, S., S. Sherrill, J. Howe, K. Fernholz, S. Stai, & J. Bowyer. 2011. Carbon Sequestration in Solid Wood Products from Urban Forests. Minneapolis, MN: Dovetail Partners, Inc.

[6] Kuo, F., and W. Sullivan. 2001. Environment and Crime in the Inner City: Does Vegetation Reduce Crime? *Environment and Behavior* 33:3, p. 343.

Chapter I. UWU and DNR: Opportunities for Partnership

For urban wood utilization projects across the country, diverse partnerships are vital to the achievement of program goals. For example, New Jersey Forest Services' Ed Lempicki spearheaded the administration of a project entitled "Municipal Forest Products Marketing Service" during the 1990s. This project, enabled by funding from the USDA Forest Service (USFS), linked New Jersey municipalities with local private sawmills and resulted in the publication of "Recycling Municipal Trees: A guide for marketing sawlogs from street tree removals in municipalities"[7]. Lempicki also developed interagency partnerships between his department, the New Jersey Bureau of Recycling, and the New Jersey Office of Sustainability to assist local entrepreneurs in selling third-party certified lumber manufactured from urban logs.

Among the objectives of UCF's proposal to develop an UWU program is the establishment of a network of partners who receive a net benefit from their participation. An UWU program would be best facilitated if the partnership network is self-sustaining. As Washington State's urban forestry coordinating team, UCF is in an ideal position to implement an UWU program in Washington. The UCF program's existing relationships with Tree City USA communities across the state make it an optimal facilitator of USFS grants and intergovernmental partnerships. Furthermore, UCF's location within the Resource Protection Division of DNR, which partners with the Department of Corrections for coordinating offender work crews for various internal projects such as wildfire suppression, gives it access to contacts at Cedar Creek and other state corrections centers.

Potential Program Partners

USDA Forest Service (USFS)

The vertical structure an UWU program's network of participants would be headed by the United States Department of Agriculture (USDA) Forest Service Urban and Community Forestry Program. Federal funding assistance provided to DNR UCF through Consolidated Payment Grants and Urban and Community Forestry Challenge Cost Share Grants has supported a number of intergovernmental projects in the area of urban forestry throughout Washington, including those related to the Tree City USA program. These grants facilitate creativity and flexibility in program implementation as well as broaden the potential scope of project outcomes. In addition to funding, the Pacific Northwest Region of the Forest Service provides technical assistance to the State Forester and DNR's UCF program.

DNR Pacific Cascade Region – Correctional Camps Program

In partnership with DOC, the offender work crews employed by DNR Correctional Camps

[7] Cesa, E. T., E. A. Lempicki, and H. J. Knotts. 1994. Recycling municipal trees: a guide for marketing sawlogs from street tree removals in municipalities. NA-TP-02-94. Morgantown, WV: USDA Forest Service, Northeastern Area State and Private Forestry.

Program provide fire suppression and forest restoration support to DNR. Training in milling and crafting wood products would provide off-season activity for these crews.

DNR's Recreation Program
DNR's Recreation Program has expressed interest in providing wood from agency campgrounds and recreation sites for wood use projects.

Washington State Parks (State Parks)
One of the unique and potentially limiting features of urban wood waste is that its supply is often inconsistent. Major weather events, funding, and development projects all contribute to total urban wood supply, but low volumes and inconsistency would challenge program sustainability. State Parks could supplement the volume of wood acquired from community partners with trees removed as part of hazard mitigation or trail development activities on parks lands.

Department of Corrections (DOC) – Cedar Creek Corrections Center
Cedar Creek is a logical partner for an UWU program due to its proximity to DNR headquarters, its existing camp crews' fire support and suppression activities, and its previous wood utilization projects with State Parks and DNR's Recreation Program. Cedar Creek has a mill and a fully-equipped woodshop as well as a gravel yard that can be used to store logs and for construction of a lumber kiln. One potential outgrowth of the pilot project is the establishment of a vocational wood technologies program at Cedar Creek. In addition, a potential market for lumber has been identified through Correctional Industries, a business subsidiary of DOC.

City of Olympia
As both the state capital and a Tree City USA community, the City of Olympia is in a unique position to serve as the center of a regional UWU program. Olympia is independently implementing a long-term tree removal project from which DNR can acquire wood. The Legion Way Project in the heart of downtown Olympia aims to eventually remove and replace all the pin oak (*Quercus palustris*), Northern red oak (*Quercus rubra*), and sweetgum (*Liquidambar styraciflua*) trees that were planted along the street to commemorate the 10th anniversary of Armistice Day. Poor management practices such as topping have left the trees aesthetically displeasing and structurally unsound (Figure 1). However, the bole wood of the trees is still healthy and can be utilized for a higher use than firewood or chipping.

The Evergreen State College (TESC) – Sustainability in Prisons Project (SPP)
SPP is a partnership between DOC and TESC which aims to bring science and nature into prisons, provide training in green jobs, and make correctional operations more environmentally friendly. At Cedar Creek, SPP currently provides environmental education and research assistantship opportunities for offenders. SPP has the ability to utilize low-grade logs for shiitake mushroom cultivation with its organic gardening program at Cedar Creek. SPP could also assist in developing an UWU program by providing technical assistance in tracking the re-entry employment and recidivism rates of program participants.

Arbutus Folk School
Arbutus Folk School is a 501(c)(3) non-profit educational cooperative in Olympia. The school aims to promote indigenous and local Northwest crafts by bringing teacher-artisans together with students of all ages, and is a potential market for green and milled lumber and specialty wood materials produced by the Cedar Creek crew.

Habitat for Humanity
The Tacoma/Pierce County Chapter of Habitat for Humanity, another 501(c)(3) non-profit, partners with families to build affordable, sustainable homes. The Chapter currently performs some wood utilization on its own by milling trees on Habitat property for dimensional timbers to be used in new homes. The Chapter has expressed interest in being an end-user of hardwood flooring and dimensional lumber crafted from urban wood.

Washington State University (WSU) Extension
WSU Extension's Forestry program will serve as a partner in promoting educational and informational outreach to community members about the benefits of and opportunities for urban wood utilization.

Tree City USA Communities & Other Partners
Potential partner communities for an UWU program in Western Washington include Lacey, Tumwater, Centralia, DuPont, Steilacoom, and Tacoma. County and tribal governments, local colleges, public and private utilities, and private developers may also serve as wood providers and end-users of urban forest products.

Washington State Board for Community & Technical Colleges (SBCTC)
In order to establish a certified vocational program in conjunction with urban wood utilization, SBCTC will have to review and approve a program proposal and curriculum development plan. Additional partners for certifying educational programs include DOC and local community colleges.

Chapter II. Policy and Legal Context

Urban wood utilization programs involve numerous stakeholders, thereby demanding an interdisciplinary approach. Policy and legal considerations must, therefore, span the local, state, and federal levels of government and incorporate two key policy domains: environmental and correctional policy.

Municipal Code & Policies

Tree City USA communities are characterized by their tree ordinances, as well as by a programmatic emphasis on urban forest management. Existing management strategies make these communities amenable to developing an UWU program. However, each city approaches urban forest management in different ways (Table A, below). Some cities' management practices and municipal code will be more accepting of wood utilization

programs than others. A policy at the City of Lacey permits donation of firewood cut from city tree removals to the local Kiwanis chapter. It would be easy to incorporate sawlog donation for higher-uses into this existing policy. Other cities, however, have more legal requirements associated with removing publically-owned trees. For example, Chapter 12.44 of Olympia's Municipal Code establishes street trees as public property subject to control of the city. According to the City's Wood Waste Recycling report compiled by Joe Roush and Scott Royer[8], trees felled due to hazard tree abatement must be assessed for economic value or any other beneficial use before they can be declared surplus and dispensed to end-users (Roush and Royer, p.4).

Cities often have policies or ordinances requiring permits in order to remove hazard or street trees. To avoid the complications associated with permitting and other legal constraints, an UWU program should focus on those trees already being removed for municipal projects. To bypass the issue of having to declare wood as surplus, participating communities can partner with land developers who may be willing to donate trees removed during development activities on private land to UWU programs. If legal or policy barriers are such that participation in an UWU program is not feasible for a given community, then DNR could provide technical assistance by drafting model UWU policies to include in amendments to the community's local urban forest management plan or tree ordinance.

Table A. Summary of South Sound Tree City USA Communities' Urban Forestry Programs

Urban Forestry Program Characteristics	Olympia	Lacey	DuPont	Tumwater	Tacoma	Steilacoom	Puyallup
Urban Forest Management Plan	✓	✓			✓		
Removal permit exemption for hazard trees	✓	✓	✓	✓	✓	✓	
Removal permit exemption for street trees	✓			✓			
Legacy/specimen tree protection	✓	✓	✓	✓			
Tree replacement requirements	✓	✓	✓	✓	✓	✓	
City tree account	✓	✓		✓			
Wood waste considered a public asset	✓		✓			✓	
Wood yard	✓	✓				✓	✓

[8] Roush, J. and S. Royer (2002). Wood Waste Recycling. Retrieved from http://olympiawa.gov/city-services/urban-forestry/urban-forestry-resources .

Washington State Law and Regulations

Environmental

Evergreen Communities Act (ESSHB 2844)

Urban wood utilization aligns with the goals set forth by the Evergreen Communities Act of 2008 (ECA) to assist Washington communities by developing model ordinances and providing technical expertise on tree maintenance (RCW 35.105.020). The bill was enacted as an interagency and intergovernmental commitment to preserving and improving Washington's urban and community forests. Initial funding under ECA provided the UCF Program and the Department of Commerce (formerly the Department of Community, Trade and Economic Development) with the resources to provide technical assistance to local urban forestry programs and to develop an urban forestry inventory implementation plan. According to Section 12 of the ECA (RCW 35.105.070), wood waste utilization programs are a potential element to include in urban forest management plans aimed at achieving Evergreen Communities recognition, once funding resumes for the activities designated under ECA.

Evergreen Jobs Initiative (RCW 43.330.370)

Initiated in 2010, Washington's Evergreen Jobs Initiative is a comprehensive strategy for developing a competitive green economy within the state. Among other goals, the Initiative tasks the Department of Commerce with:

- *Creating 15,000 new green economy jobs by 2020 with a target of 30 percent of those jobs going to veterans, members of the national guard, and low-income and disadvantaged populations*
- *Empowering local agencies and organizations to recruit green economy businesses and jobs into the state by providing state support and assistance*

Implementing an UWU program could positively contribute to the fulfillment of these goals. By training Washington's incarcerated population in sustainable, green economy vocations such as environmentally-friendly fine carpentry and wood working, a prison-based UWU program would give participants viable tools with which to enter into Washington's green jobs market upon release.

Forest Practices Act (76.09 RCW)

The Forest Practices Act (FPA) establishes a complex regulatory framework for oversight of forest practices on non-federal lands to be administered by DNR. "Forest practices" are defined under the law as "any activity conducted on or directly pertaining to forest land and relating to growing, harvesting, or processing timber" (RCW 76.09.020 § 17). This blanket definition applies to activities such as tree salvage, harvesting, and reforestation in contiguous forests. The FPA designates four different classes of forest practices and stipulates permitting requirements accordingly. Forest practices deemed to be "Class IV" are

regulated by the county or city in which they take place, though DNR retains the authority to set standards state-wide.

For the purpose of urban wood harvesting, FPA permitting requirements established by county governments may be applicable if wood is acquired from contiguous urban forest, such as those in city or county parks. All FPA permits are required to undergo Environmental Review under the State Environmental Policy Act (SEPA). Each county has developed individual protocols to address their Forest Practices responsibilities. For example, Thurston County is responsible for the following activities:

> ***Class IV forest practices*** *(Conversion of forested lands to other uses, i.e. roads, housing, agriculture etc.) In general a Class IV forest practice permit is required from Thurston County for timber harvest in:*
>
> - *Rural Thurston County (areas outside of urban growth areas) when a timber harvest operation removes 5,000 board feet or more from an ownership within a given year and the area is to be converted to another use such as pasture, housing, roads, stormwater ponds etc.*
> - *Urban Growth Areas (UGAs i.e. Lacey, Olympia and Tumwater etc.) when a timber harvest operation removes timber from a 5,000 square foot area and converts this area to another use such as pasture, housing, roads etc.*[9]

Urban wood utilization programs in rural jurisdictions would likely be implemented in partnership with land developers or public and private land managers, so the primary party conducting the timber removal would be responsible for FPA permits, rather than DNR. Forest Practices Rules would also be applicable to trees removed on state forest land by Washington State Parks. Forest Practices Act permits are managed by State Parks.

Correctional

Offender Work Programs (RCW 72.09.100)

In Washington, offender work programs are organized according to four different classifications for the purpose of protecting private businesses from unfair competition in addition to providing offenders with opportunities for meaningful employment. The offender work crews employed by DNR's Correctional Camps Program for activities based at correctional centers are designated as Class IV: Off-Site Work Crews. Programs in this class "shall be designed and managed to provide services in the inmate's resident community at reduced cost" [RCW 72.09.100 § 4(a)]. Neither the law nor internal DOC policy (DOC 700.400) make reference to the sale or commissions of any goods produced by Class IV crews. However, the law does state that the services of Class IV crews may be provided to public agencies, to persons who are "poor or infirm," or to nonprofit organizations [RCW 72.09.100 § 4(a)].

[9] Thurston County Resource Stewardship Department. 2012. Land Use Ordinances. Retrieved from http://www.co.thurston.wa.us/permitting/landuse/landuse-forest.html.

Purchasing Preference (RCW 39.26.251)

Washington State law stipulates that state agencies must give purchasing preference to any necessary goods and services made available by Class II offender work programs operated by Correctional Industries, a government-owned enterprise operated by DOC. Correctional Industries holds state contracts for a wide range of products and services, from embroidery to office furniture[10]. Any products produced by a prison-based UWU program must not directly compete with those provided by Correctional Industries to state agencies and institutions. However, long-term implementation of this UWU model could be facilitated by a regulatory or statutory exception to purchasing preference rules for goods produced by DNR work programs.

Vocational Programs (72.62 RCW)

Vocational education programs are mandated components of the state's rehabilitation policies. These programs are distinct from work programs in that they are characterized by "a planned series of learning experience, the specific objective of which is to prepare individuals for gainful employment" (RCW 72.62.020). Vocational education programs must be accredited by the Washington State Board for Community and Technical Colleges (SBCTC). Under the law, items produced in conjunction with certified vocational programs may be sold on the open market, with proceeds credited to a revolving fund for the recovery of program costs (RCW 72.62.030, 72.62.040). However, marketing of these products must be conducted in such a way as to not directly compete with private businesses.

At present, no accredited carpentry or woodworking program exists at Cedar Creek Corrections Center, although facilities with such a program may easily incorporate it into a wood utilization project. Both Monroe Corrections Center and Washington State Penitentiary have vocational construction carpentry programs in place, though neither currently owns a mill. Larch and Olympic Corrections Centers have DNR work crews in place that may also be employed in wood technology activities.

According to SBCTC, which administers educational programs in Washington's correctional institutions, it takes approximately two years to develop certified vocational programs: one year for program proposal and planning, and another for curriculum development[11]. In partnership with the Board, local community colleges, and DOC, a certified fine carpentry and woodworking program could be established and operate parallel to the proposed DNR Camps carpentry work crew as an UWU program develops at Cedar Creek.

[10] WA DOC. 2013. CI State Contracts. Retrieved from http://www.washingtonci.com/_content/general_info/state_contracts.aspx .
[11] Sarah Sytsma, Education Director at Cedar Creek. Personal communication August 22, 2013.

Federal Laws and Regulations

Environmental

Cooperative Forestry Assistance Act – Urban and Community Forestry Assistance (16 U.S.C. 2105)

The Cooperative Forestry Assistance Act of 1978 provided financial and technical assistance to states and private landowners on issues relating to forest health and management, fire protection, urban and community forestry, and disease control. It was amended in 2008 by Sec. 8003 of the Farm Bill (the Food, Conservation, and Energy Act of 2008, P.L. 110-234) to clarify funding opportunities for urban and community forestry programs across the country. The Act states that the Secretary of Agriculture, acting through the U.S. Forest Service, has the authority to

> ". . .provide financial, technical, and related assistance to State foresters or equivalent State officials for the purpose of encouraging States to provide information and technical assistance to units of local government and others that will encourage cooperative efforts to plan urban forestry programs and to plant, protect, and maintain, and *utilize wood* from, trees in open spaces, greenbelts, roadside screens, parks, [etc.]" [16 U.S.C. 2105 (c)] (emphasis added)

This authority is implemented via the Cooperative Forestry Assistance program administered by the State and Private Forestry organization of the Forest Service. Available grants include a Consolidated Payment Grant (CFDA 10.664), an Urban and Community Forestry challenge cost share grant (CFDA 10.675), and a Forest Stewardship grant (CFDA 10.678). These grants represent an opportunity for the vertical implementation of the broader policy goals of the Act, which include utilizing urban wood.

Endangered Species Act of 1973

While the urban forest does not readily come to mind as a reservoir of rare or endemic species, the rapid urbanization of many regions of the United States means that as cities grow, so do people's encounters with federally endangered or threatened species. Among the many ecosystem services provided by urban forests is the enhancement of animal and plant habitats, allowing biogeographic interconnectivity between populations within heavily developed areas[12]. Endangered or threatened populations may use urban trees for nesting, cover, or forage. The Washington office of the U.S. Fish and Wildlife Service provides a frequently-updated map of federally listed, threatened, or candidate species in each county in the state[13]. In Thurston County, for example, only four animal and two plant species are federally listed, although there are currently four more proposed species and 21 species of concern. Any state-wide urban forestry project featuring tree removal would have

[12] Nowak, D. J., S.M. Stein, P.B. Randler, E.J. Greenfield, S.J. Comas, M.A. Carr, & R.J.. Alig. 2010. Sustaining America's Urban Trees and Forests. General Technical Report NRS-62. Newtown Square, PA: USDA Forest Service, Northern Research Station.

[13] WA Fish and Wildlife Office. 2013. Washington Species Map. Retrieved from http://www.fws.gov/wafwo/speciesmap_new.html.

to be conscious of what threatened or endangered species may be involved. This consideration becomes especially important if the project utilizes trees provided by Washington State Parks, DNR's Recreation Program, or county governments.

Summary of Policy & Legal Challenges and Solutions

Potential Challenge	Recommended Solutions
Urban waste wood is often considered a public asset, and must be categorized as surplus	- Work with communities to write appropriate mechanisms for UWU into municipal code or urban forest management plan - Utilize stockpiled surplus wood - Partner with private land developers to donate trees to UWU programs
Permits are required for hazard or street tree removals	- Utilize trees pre-approved for removal by the partnering jurisdiction
FPA permits may be required for removal of trees on state or county lands	- Verify that parties responsible for tree removals have applied for appropriate permits
Sales of goods and services produced by Class IV offender work programs may be restricted	- Identify public agencies and nonprofit organizations as contracted end users - Establish a certified vocational program, which can produce goods for the open market
Items produced by a prison-based UWU program must not directly compete with those produced by Correctional Industries	- Long term implementation of an UWU program could be facilitated by statutory exception to purchasing preference rules for goods produced by DNR crews
No accredited vocational carpentry program currently exists at Cedar Creek	- Collaborate with SBCTC, DOC, and local community colleges to develop a vocational curriculum

Chapter III. Benefits of an UWU Program

The potential benefits of UWU programs fall into three main categories: economic, environmental, and social. UCF's proposed program enhances these benefits by adding an element of offender rehabilitation and seeking a diverse arrangement of program partners.

Economic

As a multi-dimensional partnership among public, private, and non-profit entities, UCF's proposed UWU program has a viable economic model which includes multiple potential wood suppliers and end-users. In 2010, Minnesota's Division of Forestry compiled a fact sheet aimed at highlighting the market potential of urban ash trees killed by Emerald Ash Borer (EAB)[14]. Among the economic and financial factors impacting ash products marketability were distance to markets and volume. A regional UWU program centered at Cedar Creek would address these two problems via the facility's proximity to potential wood

[14] Jacobson, K. and L. Sorensen. 2010. Twin Cities—Markets for Urban Wood With an Emphasis on Ash. Minnesota Department of Natural Resources, Division of Forestry. Retrieved from http://files.dnr.state.mn.us/forestry/um/urbanWoodMarket_Ash.pdf.

suppliers and the program's focus on local and regional non-profit and public sector markets. A high-end estimate of how much wood an UWU program would salvage in the South Puget Sound region is 10,000 board feet per year. By employing DNR work crews of 5-10 offenders, an UWU program could produce enough high-quality end-products with this volume to cover operational costs (see Chapter VI for specific cost details). Given initial start-up resources, DNR could cover the cost of transporting logs from storage sites in partnering communities/recreational areas. Benefits of the proposed UWU network arrangement can include:

- Reduction of landfill tipping fees and log hauling costs to public partners
- Nurturing the local economy by networking with local artisans and entrepreneurs as end-users of urban wood
- Cost-efficient log transportation through the establishment of wood storage yards in partnering communities
- Cost-efficient wood production volumes through partnerships with State Parks, DNR Recreation, Tree City USA communities, and other jurisdictions
- Cheaper wood products for partnering jurisdictions who wish to be an end-user of their own urban wood resources

Environmental

Wood utilization programs complete the urban forest management loop—which begins with state-sponsored tree plantings, tree inventories, and urban forestry planning assistance—by providing an end-use for urban trees. Providing alternatives to low-end uses for urban wood, such as firewood and mulch, promotes carbon storage and reduces air pollution associated with wood smoke in urban areas. A study by Bratkovich et al. demonstrates that over a 30 year period, net cumulative carbon sequestration in urban hardwood products across the nation could amount to as much as 124.1 million tons given baseline conditions[15]. Having wood waste utilization mechanisms in place also diverts tons of wood from local landfills.

Using locally-sourced and salvaged wood products also earns Washington builders LEED and Built Green credits[16]. An UWU program which produces goods such as non-dimensional and dimensional lumber, hardwood flooring, paneling, and molding could contribute to local sustainable building practices by:

- Reducing the carbon footprint of wood building products, especially those made from exotic hardwoods
- Recycling trees cleared for public facilities projects within the facilities themselves
- Conserving virgin timber resources

[15] Bratkovich, S., S. Sherrill, J. Howe, K. Fernholz, S. Stai, & J. Bowyer. 2011. Carbon Sequestration in Solid Wood Products from Urban Forests. Minneapolis, MN: Dovetail Partners, Inc.
[16] Built Green. 2013. Checklist of Criteria. Retrieved from http://www.builtgreen.net/verification.html. U.S. Green Building Council. 2013. Building product disclosure and optimization. Retrieved from http://www.usgbc.org/node/2616388?return=/credits/new-construction/v4.

Social

The key social benefit of UCF's proposed UWU program is in offering green-jobs training to offender work crews through employment and educational opportunities. By providing off-season employment opportunities, this program could reduce idleness, reduce recidivism, and boost re-entry employment rates among DNR's Correctional Camps crews. In addition, collaboration with SBCTC, DOC, and local community colleges could result in a one-year vocational fine carpentry and woodworking certificate program at Cedar Creek.

A 2011 report commissioned by the U.S. Department of Justice (DOJ) entitled "The Greening of Corrections: Creating a Sustainable System" assesses the current state of the corrections system from the perspective of sustainability[17]. As the U.S. economy becomes more "green" in both processes and products, incarcerated populations will benefit from green-collar training as they re-enter the workforce and rehabilitate their lives. In the new green economy, individuals with criminal records may have the most luck in pursuing occupations in the areas of construction, manufacturing, natural resources protection, and renewable energy (DOJ, p. 23). This is certainly true in Washington, where in 2008 manufacturing accounted for 12.5 percent and construction for 15.9 percent of offender employment[18].

Skills training in the occupational areas of carpentry and wood products manufacturing can be strongly associated with an UWU program. The DOJ report states the projected growth in demand for carpentry helpers and other green construction jobs is much faster than other career paths, with 353,000 projected job openings from 2008-2018 (DOJ, p. 29). In Washington, the projected average annual growth rate for helper carpenter positions is 2.2 percent, while demand for cabinetmakers/bench carpenters is expected to increase at an average rate of 2.0 percent annually, and sawmill and woodworking machine operator positions are expected to grow at an average of 1.5 percent annually (Appendix B)[19]. By training an at-risk population in these fields, UWU programs at Cedar Creek and other state corrections centers would benefit not only individual offenders, but society at large.

Another social benefit of UWU programs is the increased awareness of the value of urban wood resources among the public. Public outreach and education are important components of any UWU program. Wood harvesting field guides, videos, and workshops could inform local arborists and homeowners on how to identify merchantable logs from urban tree removals. A harvest-to-market directory, such as those produced by the University of Wisconsin Extension, could be compiled to connect communities, sawyers, arborists,

[17] Feldbaum, M., F. Greene, S. Kirchenbaum, D. Mukamal, M. Welsh, & R. Pinderhughes. 2011. The Greening of Corrections: Creating a Sustainable System. NIC No. 024914. Washington, DC: National Institute of Corrections.
[18] Evans, M. and S. Koenig. 2011. Tracking Washington State Offenders Pilot Study: Do Education Programs Affect Employment. Olympia, WA: Dept. of Corrections.
[19] Washington Employment Security Department. Occupational Reports Database. Retrieved from https://fortress.wa.gov/esd/employmentdata/reports-publications/occupational-reports/occupations-in-demand.

developers, and homeowners with local wood crafters and artisans[20]. Furthermore, guidance in the form of technical assistance could be provided to municipalities seeking to include wood utilization in their urban forest management plans or tree ordinances.

UWU Benefits Summary

Urban wood utilization programs provide many benefits. They sustainably close urban trees' lifecycles, reduce the costs of tree removal projects, and provide locally-sourced wood products for local use.

Table B. Benefits Associated with DNR's Proposed UWU Program Model

Benefits	Beneficiaries				
	Wood-Suppliers (Municipalities, Public Agencies)	WA Dept. of Natural Resources	End-Users (Artisan Groups, Non-Profits)	Program Participants (Offender work crews)	Citizens
Economic	Reduced landfill tipping fees & log hauling costs Potential turn-around of wood products	Commissioned or contract sales of urban forest products recovers program costs	Cost-effective source of high-quality green and dried wood & finished wood products	Employment opportunity through DNR Camps Program	Tax dollars go farther when urban forestry programs reduce wood disposal costs
Environ-mental	Reduces the carbon footprint of urban forest and forest land management practices	Closes lifecycle of trees planted with DNR grants Conserves virgin timber resources	Locally-sourced wood can count toward LEED & Built Green credits	Connects offender crews with value of natural resources	Conserves value of natural community assets
Social	Can connect suppliers with end-users Enhances public and private sector relationships in an innovative industry	Restorative justice as rehabilitation method Idleness reduction among DNR offender crews	Can connect end-users with suppliers Promotes the story of UWU	Provides viable green-jobs experience and training Potential to obtain 1-year vocational certificate	Increased awareness of the value of urban wood resources Ex-offenders are given tools for re-entry into communities

Chapter IV. Technical Aspects of UWU

In order for an UWU program to be successful, it would need access to technical expertise in all the procedural phases of utilization: identifying wood, cutting trees to appropriate lengths, drying, sawing, milling, and crafting. This need can be met by hiring a carpentry supervisor at Cedar Creek and leveraging the volunteered time of experts in forestry, arboriculture, and wood technologies. A rudimentary understanding of the procedures for processing urban wood waste is also helpful for determining budget restrictions and start-up costs.

[20] University of Wisconsin Extension. Wisconsin's Wood Using Industry Online Database. Retrieved from http://www.woodindustry.forest.wisc.edu/.

In 1999, researchers at California Polytechnic State University assembled an extensive guide (referred to hereafter as the CalPoly report) on utilizing urban wood waste in California for the California Department of Forestry and Fire Protection[21]. This guide includes a detailed technical outline of the infrastructure, equipment, and personnel needed for a successful urban sawmill operation (Calpoly report, Chapters 7 and 8). The procedural outline below has been adapted from the instructions provided by the CalPoly team. At every step of the utilization process, appropriate safety guidelines must be followed.

Acquiring and Transporting Urban Wood

While the overall vision for UWU is to facilitate a zero-waste approach to urban forest management, not all urban trees are suitable for higher-use utilization. Trees destined for milling would have to be inspected by a knowledgeable eye for appropriate cutting length and end-use prior to removal. To maximize efficiency, wood quality would have to be determined before logs are hauled to Cedar Creek; it is also recommended that DNR work with community partners to establish designated storage yards for logs earmarked for utilization.

Preferred urban tree species: western redcedar, red and Garry oak, Port Orford cedar, walnut, cherry, red alder, big leaf maple

Ideal log dimensions: 6-16 feet long, 8-32 inches in diameter

A low-end estimate for how much wood a regional UWU program would likely receive each year is 6500 board feet, with state agencies such as State Parks contributing 4000 board feet. This estimate is based on the assumption of A) minimal log dimensions (8 inches in diameter and 10 feet log for urban wood, 12 inches in diameter and 12 feet long for timber) and B) receiving sawlogs from 10 trees annually from each of 6 potential partner communities in the South Sound and 10 trees each year from State Parks. A high-end estimate is 10,250 board feet each year, assuming that 60 urban sawlogs contain at least 100 board feet each and 10 State Parks' trees contain 425 board feet each (Appendix A, Table 1).

One limiting factor for UWU programs is transportation. Three options exist for transporting wood:

1. Contract a third-party hauler to transport wood from a harvest or storage site to Cedar Creek
2. Purchase equipment and vehicles for hauling (utility trailer and winch; dump trailer; self-loading dump truck)
3. Assist partner communities in writing stipulations for transportation into tree removal bids

In the case of the pilot UWU project with Olympia, the cost of transporting will be mitigated by the availability of a dump truck to transport logs through Olympia Public Works. The contractor hired to remove the trees will be instructed to deliver the sawlogs to a pre-

[21] Plumb, T. R., M. M. Wolf, & J. Shelly. 1999. California Urban Woody Green Waste Utilization. Technical Report No. 8. San Luis Obispo, CA: Urban Forests Ecosystems Institute.

determined holding yard, from which Olympia Public Works will then transport the wood to Cedar Creek (Figure 4).

In most cases, transportation costs are assessed either by hour, weight, hauling distance, or board feet. A standard log from tree removal projects may be 18 inches in diameter and 12 feet in length, which equates to 170 board feet (Table 1)[22] . Though the sawlogs acquired for utilization would be relatively short (6-16 feet long), green wood is heavy. For example, a single 10 inch-diameter red oak log that is 10 feet long would weigh about 350 lbs (Appendix A, Table 2). If logs are picked up at a harvest site or wood storage yard, a self-loading dump or log truck would need to be on hand in order to both collect and transport them to Cedar Creek. For a contracted self-loading 40 yard dump truck, one load is estimated to cost $250-$300 for a 2-hour load and haul operation[23]. Liability and safety issues constrain the ability of the DNR/Cedar Creek team to simply pick up logs themselves. The cost of contracting a private hauler for transportation would likely be offset by commissions of finished goods and lumber (see Chapter VI).

Log Handling and Preparation

Once at the mill, logs will have to be transported from the delivering vehicle to either a storage shed or the mill itself. The CalPoly report states that a crane truck or fork lift, along with incidental and inexpensive hardware, would be sufficient for log handling. Cedar Creek has a fork lift at its disposal. If a storage shed is used to group logs together prior to milling, it is recommended that the ends of each log be coated with a waterproof wood sealant.

An important step to urban sawlog utilization is detecting and removing metal and other embedded material from logs. Recovering buried metal will require a metal detector (approx. $500).

Lumber Drying

Most wood utilization studies cite moisture content (MC) of about 6-8 percent as ideal for interior furniture manufacturing and floorboards. Milled lumber can be either air- or kiln-dried. Air-dried lumber takes longer to reach the ideal moisture content than kiln-dried; some wood species can be dried using a combination of methods, while others gain the highest value from one over the other. Drying methods depend on a variety of factors, such as wood species, dimensions, and end-use. However, even with the fastest combination of drying methods, the process of lumber drying alone will take several months to complete.

Air Drying

It is typically recommended to air dry lumber within an open shed structure for about 2-3 months before kiln drying, bringing the MC to about 16 percent in the Pacific Northwest.

[22] Cesa, E. T.; E. A. Lempicki, and H. J. Knotts. 1994. Recycling municipal trees: a guide for marketing sawlogs from street tree removals in municipalities. NA-TP-02-94. Morgantown, WV: USDA Forest Service, Northeastern Area State and Private Forestry.
[23] Dave Williams, Olympic Tree Service. Personal communication July 11, 2013.

Some applications, such as outdoor furniture, do not require kiln drying at all. Softwood lumber from logs acquired from State Parks and DNR Recreation and destined for outdoor applications can be stacked and stickered in a shed and left to air-dry, saving up valuable kiln space of urban hardwood lumber. For example, Douglas fir takes 20-200 days to air dry to the ideal moisture content for outdoor and construction use, while Western larch takes 60-120[24]. Drying time depends on season, sun exposure, air flow, and climate. Some construction applications call for "green," or un-dried, Douglas fir.

Kiln Drying

In general, kiln-dried wood commands a higher market price than air-dried, both because it improves the quality of the lumber and because it costs more to produce (approximately $0.95 per board foot [bdft] vs. $0.55/bdft)[25]. DNR has two options for kiln drying lumber for an UWU program:

1. Build a solar or dehumidifying kiln at Cedar Creek.
    a. A solar kiln design plan provided by Virginia Cooperative Extension has the capacity to hold approximately 1,000-2,000 board feet of lumber at a time and would cost approximately $3,000 to construct in 2013 dollars (listed price is $1,866 in 2005 dollars)[26]. A dehumidifying kiln plan by Wisconsin Extension has a capacity of 600 board feet and costs approximately $3,000 (Appendix C)[27].
2. Contract a private sawmill operator to lease out kiln space at a cost of about $350 per 1000 board feet[28].

The cost of either option could be offset through commissions of lumber and finished products.

Lumber Finishing

To produce finished products for an UWU program, planing and sanding equipment will be necessary. Cedar Creek currently has a planer, router, and table-saw on-site. However, in order to produce molding or flooring, DNR would need to acquire a shaper/molder (approx. $3,000). To produce construction-grade materials, DNR would need to develop a contract for a professional grader to inspect lumber. Finishing the lumber at Cedar Creek will also require at least an 8" jointer. It would also be helpful to have a wide-belt sander of at least 16"-20" capacity and a radial arm saw.

---

[24] Hiziroglu, S. & K. Hitch. Practicalities in Air Drying Lumber. NRM-5042. Oklahoma Cooperative Extension.
[25] Darwin Sivara, Sivara Milling and Resawing. Personal communication August 17, 2013.
[26] Bond, Brian. 2009. Design and Operation of a Solar Heated Dry Kiln. Publication 420-030. Virginia Cooperative Extension (Virginia Tech, Virginia State University). Retrieved from http://pubs.ext.vt.edu/420/420-030/420-030.html.
[27] Bowe, S., P. Molzahn, B. Bond, R. Bergman, T. Mace, & S. Hubbard. Dehumidification Drying for Small Woodworking Firms and Hobbyists. Publication FR-396-2007. Wisconsin Extension. Retrieved from http://dnr.wi.gov/topic/forestmanagement/documents/pub/FR-396.pdf.
[28] Darwin Sivara, Sivara Milling and Resawing. Personal communication July 25, 2013.

Summary of Technical Challenges and Solutions

The table below summarizes the potential challenges and recommended solutions associated with the technical aspects of UWU. A full accounting of the costs noted in the preceding section is discussed in Chapter VI.

Potential Challenge	Recommended Solutions
Accessing technical expertise for UWU program	- Hire carpentry supervisor - Leverage volunteered time of experts in forestry, arboriculture, and wood technology
Assuring wood quality	- When possible, examine standing trees for appropriate log length and end-use prior to removal - Visually and mechanically inspect logs for metal prior to hauling and milling - Contract lumber grader - Develop technical education guides that define and demonstrate components of usable wood
Sustaining wood volumes for long-term program	- Identify diverse network of potential wood suppliers, including state agencies, cities, tribal governments, and counties - Work with private developers to donate logs from road-widening and land-clearing projects to UWU programs - Match volume intake with the availability of labor and anticipated end-uses; an estimated baseline volume is 10,000 bdft/year
Ensuring cost-effectiveness of transportation options	- Encourage communities to establish wood storage yards - Contract log hauler to pick up logs from community stockpiles on semi-regular basis - Only transport logs with an identifiable end-use
Achieving necessary lumber moisture content for desired end-use	- Determine drying schedule for lumber based on end-use, wood species, board thickness, and project timeframe - Build a solar or dehumidifying kiln at Cedar Creek - Contact a private sawmill operator to lease out kiln space in the interim
Meeting end-user demand for specific products	- Be honest and realistic about program capacity and capabilities - Survey end-users for desired urban forest products prior to program implementation - Pursue resources to purchase necessary equipment and supplies to meet demand

Chapter V. Marketing of Offender-Made Urban Forest Products

Because UCF's proposed wood waste utilization program model would be publically funded, the market opportunities for value-added products are limited. Any commissions of products must be priced to recover costs, but not to generate net profit. The finished goods produced by offenders at Cedar Creek may not directly compete with private goods and

services. Contracts for finished goods will have to be written between DNR and end-users, which are limited to public entities and non-profits. Public outreach for an UWU program would be limited to word-of-mouth, agency bulletins, and press releases through local newspapers, SPP's website, and other agency communications channels.

Finding an appropriate market niche for urban forest products and ensuring procedural transparency is vital. Partnership plans and informational resources for the public should be explicit about the destination and purpose of funds received from the sale of lumber or finished products.

Identifying Potential Markets

Five potential market opportunities have already been identified for urban forest products: commissions from partnering communities, the Evergreen State College woodshop, Habitat for Humanity, Arbutus Folk School, and Correctional Industries. Evergreen's woodworking courses are offered through its Visual and Environmental Arts Program. The program's educational mission is to "emphasize the linkages between art making and cultural contexts" and to "design programs that encourage students to put art and art making in the context of environmental stewardship and sustainability"[29]. Both the story of urban wood utilization and that of developing offender job skills fit neatly within the stated priorities of Evergreen's arts program. An additional educational venue is the new Arbutus Folk School in downtown Olympia[30]. The school aims to bring together teacher-artisans and students to promote Northwest crafts and indigenous arts. An UWU program would be able to supply the both schools' woodworking programs with milled and green urban wood. Both of these educational venues would be receptive to spreading the core messaging of urban wood utilization. Finished products made by artists in these venues could then be donated back to participating communities. It is possible that other communities have similar artisan or craft programs.

Correctional Industries (CI) may use Cedar Creek as a vendor of lumber for furniture manufacturing. CI operates a fully-functioning furniture shop at Stafford Creek Corrections Center in Aberdeen, WA. Partnering with Correctional Industries can also resolve the issues of infrastructure and marketing limitations at other corrections centers. Habitat for Humanity, meanwhile, has expressed interested in stocking urban hardwood boards in the Tacoma Re-Store and in acquiring flooring made at Cedar Creek. Flooring and boards can be produced on a contract or commission basis and priced to recover program costs.

Wood Product Uses

While the concept of reclaiming urban wood seeks specifically to divert higher-grade wood from being chipped or bucked for firewood, alternative uses for sub-quality wood should be developed. In the long-term, UCF should consult with WSU Extension to develop

[29] The Evergreen State College. About Visual Arts at Evergreen. Retrieved from http://studies.evergreen.edu/visualarts/.
[30] Arbutus Folk School. 2013. Retrieved from http://www.arbutusfolkschool.org/.

training modules for local arborists in participating communities on identifying and cutting high-quality sawlogs during tree removal. In the meantime, low-grade sawlogs can potentially be used to cultivate shiitake mushrooms in Cedar Creek's organic gardening program, or can be made into other low-value wood products.

Market uses must be identified specifically for hardwoods acquired from municipal partners in an UWU program. For example, Legion Way's pin oak and Northern red oak trees (which are both considered "red oak" lumber species) can be used for furniture, flooring, and cabinets (Figure 2)[31]. While Northern red oak is considered a premier lumber species, pin oak is less commercially desirable. Historically, sweetgum has been used for furniture and cabinetry, as well as for pallets, crates, and railroad ties, though the popularization of non-wood manufacturing materials has displaced it commercially (Figure 3)[32]. Large limbs acquired from tree removals can also be donated to crafters for wood turning, jewelry making, and other unique uses. The Legion Way oak lumber can also be supplied to Arbutus Folk School for its woodworking courses, as well as to local artisan groups.

Douglas fir and Western larch (*Larix occidentalis*) are among the two most common tree species on state forest lands. They are also highly valued for their applications in both structural and appearance-grade sustainable building materials[33]. Both species can be used for interior flooring, wood panels, structural beams and posts, and exterior furniture such as park benches and picnic tables. In addition to exterior furniture, softwood timber can be used for state-sponsored green building projects. Washington state law mandates that all new state-funded building and renovation projects must adhere to certified green building standards (RCW 39.35D, "High Performance Buildings"). The Leadership in Energy and Environmental Design (LEED) certification program, developed by the U.S. Green Building Council, prioritizes the use of locally-extracted resources, building materials, products, and manufacturers (RCW 39.35D.090). Wood acquired from Cedar Creek could satisfy this local-sourcing goal. Additional points for the LEED Silver Standard are awarded for the use of products from certified sustainable forests or from forests regulated under the Forest Practices Act. Correctional Industries already has an umbrella contract with the State for a number of products; this contract could be expanded to include building materials, which can be supplied by Cedar Creek. While construction applications may not be the "highest and best use" of hardwood salvage, it is a beneficial end-use for softwoods.

[31] Roush, J. and S. Royer (2002). Wood Waste Recycling. Retrieved from http://olympiawa.gov/city-services/urban-forestry/urban-forestry-resources.

[32] Cassens, D. L. Hardwood Lumber and Veneer Series: Sweetgum. FNR-300-W. Purdue University Extension. Retrieved from https://www.extension.purdue.edu/extmedia/FNR/FNR-300-W.pdf.
Purdue University Extension's "Hardwood Lumber and Veneer Series" is an excellent resource for identifying market uses for a variety of common urban hardwoods.

[33] Western Wood Products Association. 2002. Douglas fir and Western larch species facts. Retrieved from http://www2.wwpa.org/SPECIESPRODUCTS/DouglasFir/tabid/405/Default.aspx.

Summary of Marketing Challenges and Solutions

Potential Challenge	Recommended Solutions
Urban forest products made by offenders cannot be priced to make a profit, nor can they compete with private businesses	- Price commissioned products at the cost of production - Constrain market to nonprofits and public agencies
Not all urban wood is suitable for high-quality uses	- Use low-quality logs for restoration or educational purposes - Produce line of low-value goods such as pallets, crates, dump truck boards, and wood stakes
Meeting end-user demand for specific products	- Be honest and realistic about program capacity and capabilities - Survey end-users for desired urban forest products prior to program implementation - Pursue resources to purchase necessary equipment and supplies to meet demand

Chapter VI. Budgetary Considerations

The mill and woodshop at Cedar Creek Corrections Center provide a valuable infrastructure for an UWU program. Equipment currently housed at Cedar Creek include a planer, table saw, router, sawmill, sanding equipment, forklift, and storage shed. The total value of the facility is estimated to be $700,000.

However, in order to initiate an UWU program, a number of start-up costs will need to be addressed. During the UWU pilot project, grant funding from USFS allocated for FY2013 will go toward supporting establishment of a 2-year carpentry supervisor position at Cedar Creek as well as providing for work crew wages. According to Bob Pickens, DNR Correctional Camps Superintendent at Cedar Creek, DNR offender workers and the carpentry supervisor are available for approximately 105 work days during the 2013-2015 biennium. At an estimated rate of about $640.00 per crew day (including both worker and supervisor wages), the cost of labor amounts to a total cost of $67,200 per year[34].

Continued funding from state and federal sources, such as a State and Private Forestry Western Competitive Grant (FY2014), would be needed in order to fulfill long-term UWU program and remaining start-up costs (summarized below in Table C and Table E). Revenue derived from the sale of urban wood products to end-users such as Correctional Industries, Arbutus Folk School, and Habitat for Humanity could offset the production and some labor costs associated with an UWU program (Table C). Capital costs as well as the cost of paying for the DNR supervisor position is unlikely to be offset by lumber sales or commissions. Hourly crew labor costs could be folded in to product and commission pricing, however.

[34] Bob Pickens, personal communication August 2013.

Table C. Breakdown of Estimated Non-Labor Costs and End-User Willingness to Pay

<table>
<tr><th colspan="2">Capital Costs[35]</th><th colspan="2">Non-Labor Production Costs for Kiln-Dried Lumber[36]</th><th colspan="2">End-User Willingness to Pay</th></tr>
<tr><td rowspan="4">$3,000 Lumber dry kiln
$500 Metal Detector
$400 Dehumidifier (optional)
$5,500 Training, equipment repairs
$3,000 Shaper/Molder
$2,600 Incidental supplies</td><td rowspan="4"></td><td>$0.20/bdft</td><td>Transporting</td><td rowspan="2">$2.50-$3.50/bdft for rough sawn green or air dried lumber</td><td rowspan="2">Arbutus Folk School</td></tr>
<tr><td rowspan="2">$0.40/bdft</td><td rowspan="2">Milling, planing</td></tr>
<tr><td rowspan="2">$1.80/ft² for flooring</td><td rowspan="2">Habitat for Humanity</td></tr>
<tr><td>$0.35/bdft</td><td>Kiln Drying</td></tr>
<tr><td colspan="2">Total Capital Costs = $15,000</td><td colspan="2">Total Production Cost = $0.95/bdft</td><td colspan="2"></td></tr>
</table>

Table D. Wood Transportation Options

Option	Description	Cost	Pros	Cons
A (recommend)	Pay for cost of hauling from harvest site or city wood yard to Cedar Creek using 3rd party hauler	25 yd. dump truck with self-loader = **$105/hour** (1500 bdft/load) 40 yd. end dump with self-loader = **$125/hour** (2000 bdft/load) Self-Loader Log Truck = **$150/hour** (3500 bdft/load)	- No burden to partnering jurisdiction - Adaptable to supply and demand	- Storage in city wood yard increases risk of rot and pest damage - Some species best milled ASAP - Cost to DNR
B	Purchase equipment for hauling	Utility trailer + winch (used) = approx. **$5,000 OR** Dump trailer = approx. **$5,000 + Cost of gas, maintenance, insurance, & operation**	- One-time purchasing cost - Adaptable to supply and demand - Keeps operations in-house	- Liability and safety issues - Insurance and licensing costs - Cost to DNR
C	Assist cities in writing cost of transportation into tree removal bids	UCF staff time	- Puts onus on contracted tree service to transport logs - No additional cost to DNR	- More technically/legally demanding - Potential burden to cities - Little oversight

Table E. Estimated Program Cost—Summary

Capital Costs (one-time expenditures)	**Labor Costs (Annual)**	**Production Costs (Annual)** *(assuming transportation option A and an annual volume of 10,000 bdft)*
$15,000	$67,200	$9,500
		Year One Total = $91,700 Additional Years = $76,700 per year

[35] Required equipment and supplies are discussed in Chapter IV of this report. Prices are approximated.
[36] Darwin Sivara, Sivara Milling and Resawing. Personal communication August 17, 2013. Galen Wright, Washington Forestry Consultants, Inc. Personal communication September 5, 2013. Prices are approximated.

Conclusion

Washington is nicknamed "The Evergreen State" as recognition of its vast and beautiful forest resources. Working forests characterize the state's approach to public land management. However, an opportunity exists to extend the definition of a working forest to Washington's urban and community forests. Using urban trees retains their value within communities. Washington's Urban & Community Forestry Program is an ideal entity to initiate an urban wood utilization program due to its leading role in assisting communities with tools and information useful to urban forest management and program development.

Triple Bottom Line Assessment

The triple bottom line assessment is a performance-based evaluation framework which gives equal weight to economic, environmental, and social components to programs[37]. Throughout this report, these three elements have been used to guide the assessment of whether or not an UWU program is feasible in Washington.

Economic

The economic benefits of an UWU program are diffuse, from providing employment opportunities to individual offenders to reducing tree disposal costs for municipal urban forestry departments. At a programmatic level, DNR is restricted from gaining positive revenue from the sale of urban forest products due to its employment of offender workers. The presence of potential market areas in the non-profit and public sectors allows for the recovery of baseline production and some labor costs, however. By pricing urban forest product commissions at the cost of production, DNR provides a net benefit to potential end-users. In order to preserve a net economic benefit to end-users, initiate an UWU program, and employ DNR offender crews, capital costs would have to be recovered through additional funding sources.

The current model for an UWU program proposed by UCF has the potential to be cost-effective and productive, given additional resources to satisfy start-up requirements. If urban forest products could be priced so as to recover the costs associated with labor and production, the UWU program could also be self-sustaining in the long run. However, doing so may eliminate any net economic benefit end-users receive by purchasing urban forest products over traditional wood products.

Environmental

Incorporating waste wood utilization into urban forest and public lands management is a best practice for sustainability. Both Washington State, through the language of the Evergreen Communities Act, and the United States Forest Service, through the 2008 Farm Bill, recognize the need to reduce the waste of an increasingly valuable natural resource. An

[37] Slaper, T. F. and T. J. Hall. 2011. The Triple Bottom Line: What is it and how does it work? *Indiana Business Review* 86:1.

UWU program at the state level would supplement local efforts to utilize wood waste for restoration projects, firewood, and mulch by providing an opportunity to produce high-value urban forest products. If at least 6 local jurisdictions, Washington State Parks, and DNR Recreation were enlisted in a regional UWU program, then an average of 10,000 board feet of wood per year could be diverted from area landfills or carbon-emitting use.

Social

The most unique feature of UCF's proposed urban waste utilization project is its integration with the issue of green-jobs training for Washington offenders. By partnering with the Department of Corrections, DNR would bring environmental education, meaningful skills training, and an opportunity for vocational certification to an at-risk population. Upon program participants' re-entry into their communities, these benefits would be magnified as they use their vocational experiences to meet an increasing demand for carpentry helpers, bench carpenters/cabinetmakers, and sawmill/woodworking machine operators statewide. In order to obtain the full social benefit of the proposed UWU program, DNR would have to collaborate with DOC and SBCTC to establish a vocational curriculum at Cedar Creek, which can take up to two years to develop.

In addition to rehabilitating Washington offenders, the proposed UWU program would promote increased public awareness of the value of urban forests and local wood resources. To maximize the potential for public involvement, DNR should partner with groups such as WSU Extension and Evergreen State College to develop urban wood utilization protocols and educational materials. Relationships built during the initiation of the pilot UWU project have already laid the groundwork for a full UWU outreach program.

Going Forward

Implementation of an urban wood utilization program could be characterized by three levels of involvement by DNR. Below is a list of actions for each ascending level of involvement the agency could take in order to achieve the dual goals of reclaiming wood waste and providing jobs training for offenders:

Level 1

- Serve as a facilitator of relationships between municipalities and urban wood end-users
- Introduce ordinance templates and draft policies to help communities overcome common legal barriers to urban wood utilization at the city and county levels
- Partner with WSU Extension to host urban wood workshops or produce educational documents for city and commercial arborists, urban foresters, sawmill operators, and property owners about utilization opportunities, methods/techniques, and solutions to common challenges
- Establish a digital directory or catalogue of local and regional end-users such as crafters, artisans, vocational programs, construction groups, and sawmills that

includes details about end-products, species and log size desirability, and wood transportation capacity.
    - Match end-users with appropriate wood suppliers
- Initiate further study into implementing urban wood utilization programs
    - Conduct formal survey of Washington communities focused on policies and procedures related to handling wood waste

Level 2

- Sustain Level 1 actions
- Establish a DNR wood technology work crew at Cedar Creek
    - Hire a carpentry supervisor to manage the sawmill and woodshop in a permanent capacity
- Fund start-up costs associated with a regional UWU program (transportation, processing, labor, and capital costs)
- Serve as a vendor of urban forest products to markets such as Correctional Industries, Arbutus Folk School, Habitat for Humanity, local communities, and other public and non-profit entities
- Develop a curriculum for a vocational fine carpentry and wood technologies program at Cedar Creek in partnership with DOC and SBCTC
- Partner with South Sound Tree City USA communities, State Parks, DNR Recreation, and other public jurisdictions to supply wood
- Identify metrics for evaluating program success, such as
    - Tracking the change in the amount of wood entering the waste stream from community and agency partners
    - Encouraging communities to document what percentage of their utilized wood is used for firewood versus higher end-uses.
    - Recording participation rates in both a DNR wood tech program and a vocational program

Level 3

- Sustain Level 1 & Level 2 actions
- Develop a comprehensive UWU program model based on Level 1 and Level 2 actions and documented performance measures
- Collaborate with DOC to invest in purchasing portable sawmills for other DNR carpentry crews in state correctional facilities
    - Coordinate with surrounding communities to establish UWU projects centered at additional state correctional facilities
- Continue developing metrics for evaluating program success, such as:
    - Tracking participants' re-entry employment and recidivism rates up to five years after release

Appendices

Appendix A: Referenced Tables and Figures

Table 1.International ¼ Inch Log Scale[38]

Small end diameter (inches)	Length of Log (feet)					
	6	**8**	**10**	**12**	**14**	**16**
	Contents in Board Feet					
6	5	10	10	15	15	20
7	10	10	15	20	25	30
8	10	15	20	25	35	40
9	15	20	30	35	45	50
10	20	30	35	45	55	65
11	25	35	45	55	70	80
12	30	45	55	70	85	95
13	40	55	70	85	100	115
14	45	65	80	100	115	135
15	55	75	95	115	135	160
16	60	85	110	130	155	180
17	70	95	125	150	180	205
18	80	110	140	170	200	230
19	90	125	155	190	225	260
20	100	135	175	210	250	290
21	115	155	195	235	280	320
22	125	170	215	260	305	355
23	140	185	235	285	335	390
24	150	205	255	310	370	425

Table 2. Weight Table for Various Woods[36]

	Weight per Standard Cord (lbs)	Tons per Standard Cord Ratio	Weight per 1000 B.F. of Green Lumber (lbs)
Ash, white	4300	2.2	4000
Beech	4900	2.5	4500
Birch, yellow	5100	2.6	4800
Birch, white	4500	2.3	4200
Cedar, red	3300	1.7	3100
Cherry, black	4000	2.0	3800
Cottonwood	4400	2.2	4100
Elm	5000	2.5	4600
Gum, red & black	4500	2.3	4200
Locust, black	5200	2.6	4800
Maple, hard	5300	2.7	4600
Maple, soft	4300	2.2	3900
Oak, red	5700	2.9	5200
Oak, white	5600	2.8	5200
Pine, white	3200	1.6	3000
Poplar, yellow	3400	1.7	3200
Spruce	3000	1.5	2800
Sycamore	4700	2.4	4300
Walnut, black	5200	2.6	4800

[38] Reference Handbook for Foresters. USDA Forest Service, NA S&PF. NA-FR-15, Sept. 1989.

Figure 1. Topped Legion Way oak (Source: Nikkole Hughes)

Figure 2. Red Oak Grading (Source: Purdue Extension)

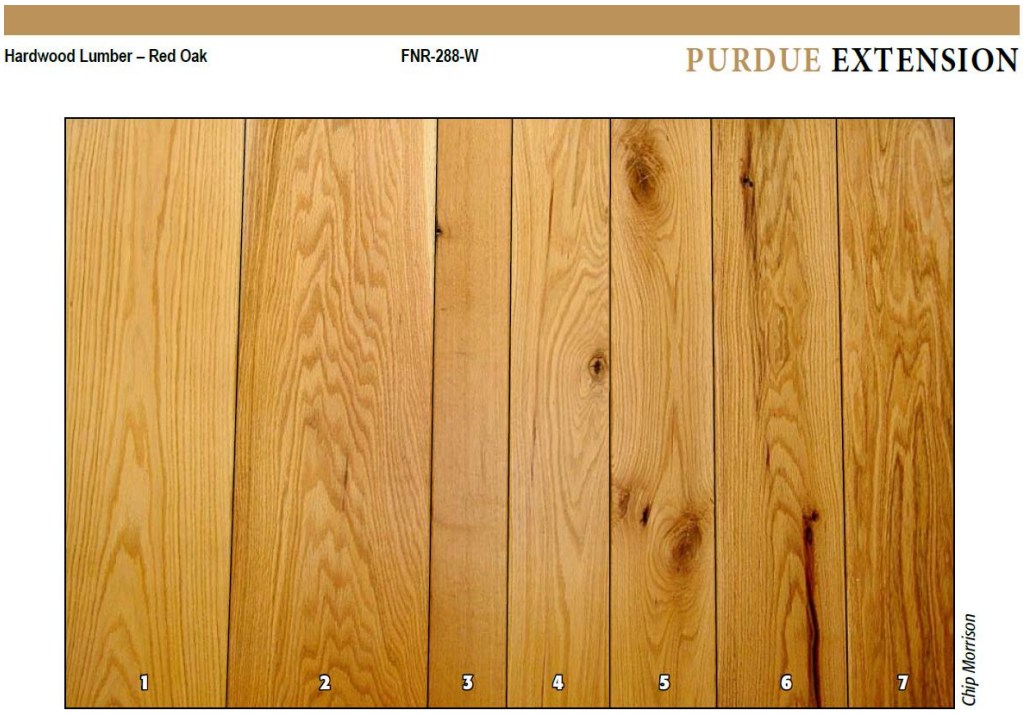
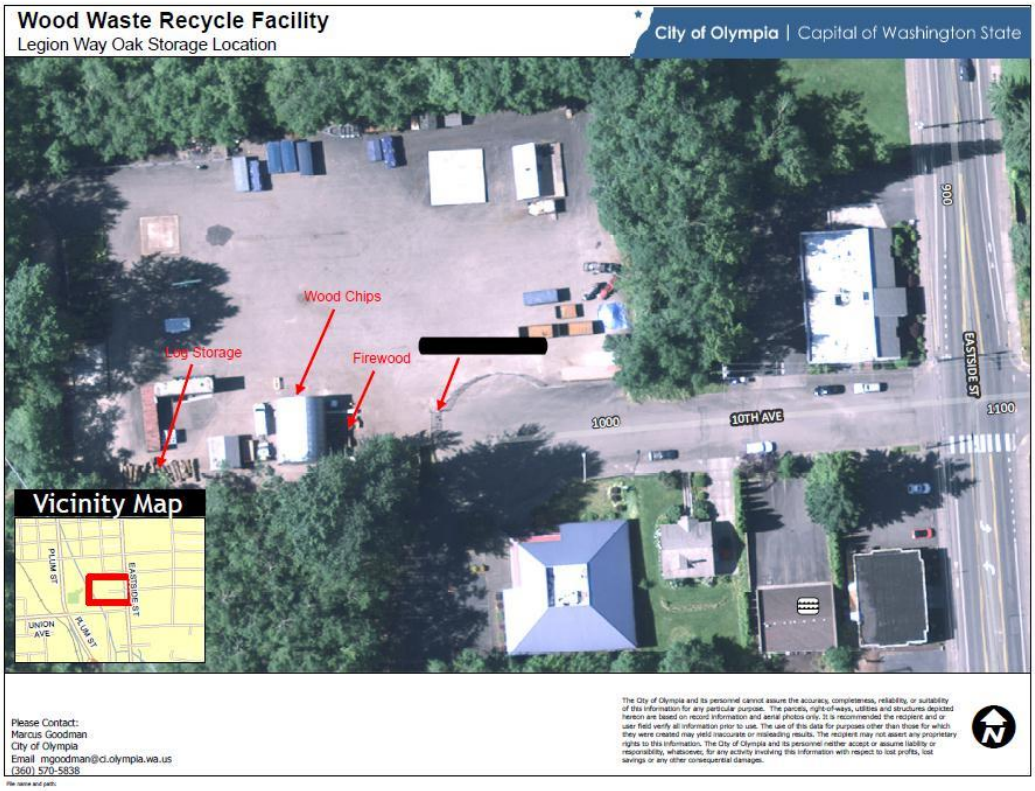


Figure 3. Sweetgum Grading (Source: Purdue Extension)

Figure 4. City of Olympia Storage Yard, Aerial View (Source: Marcus Goodman)



Appendix B: Employment Outlook

I. Employment Outlook for Cabinetmakers & Bench Carpenters. (Source: Employment Security Department [ESD])

Cabinetmaker & Bench Carpenter (SOC# 517011)	
South Central WDAs I-IV	
Demand	Positive
Green Job	No
Average annual wage (March 2012)	$31,113.00
Average hourly wage (March 2012)	$14.95
Short-term trend	Growth
Long-term trend	Growth
Estimated employment (2010)	575
Average annual total openings (2010-2020)	28
Average annual growth rate (2010-2020)	2.0%

II. Employment Outlook for Sawing Machine Setters, Operators, & Tenders (Source: ESD)

Sawing Machine Setters, Operators, & Tenders (Soc #517041)	
Eastern Washington WDA I-II, Pacific Mountain WDA, Whatcom County, Kitsap County, Skagit County, Olympic Consortium WDA II, Pierce County, Northwest WDA III	
Demand	Positive
Green Job	No
Average annual wage (March 2012)	$36,609.50
Average hourly wage (March 2012)	$17.60
Short-term trend	Growth
Long-term trend	Growth
Estimated employment (2010)	1,592
Average annual total openings (2010-2020)	65
Average annual growth rate (2010-2020)	1.5%

III. Employment Outlook for Woodworking Machine Setters, Operators, & Tenders (Source: ESD)

Woodworking Machine Setters, Operators, and Tenders (Soc #517042)	
Pacific Mountain WDA, Whatcom County, Kitsap County, Skagit County, Olympia Consortium WDA II, Northwest WDA III, Eastern Washington WDA I, Eastern Washington WDA III	
Demand	Positive
Green Job	No
Average annual wage (March 2012)	$35,393.70
Average hourly wage (March 2012)	$17.00
Short-term trend	Growth
Long-term trend	Growth
Estimated employment (2010)	1,555
Average annual total openings (2010-2020)	37
Average annual growth rate (2010-2020)	1.3%

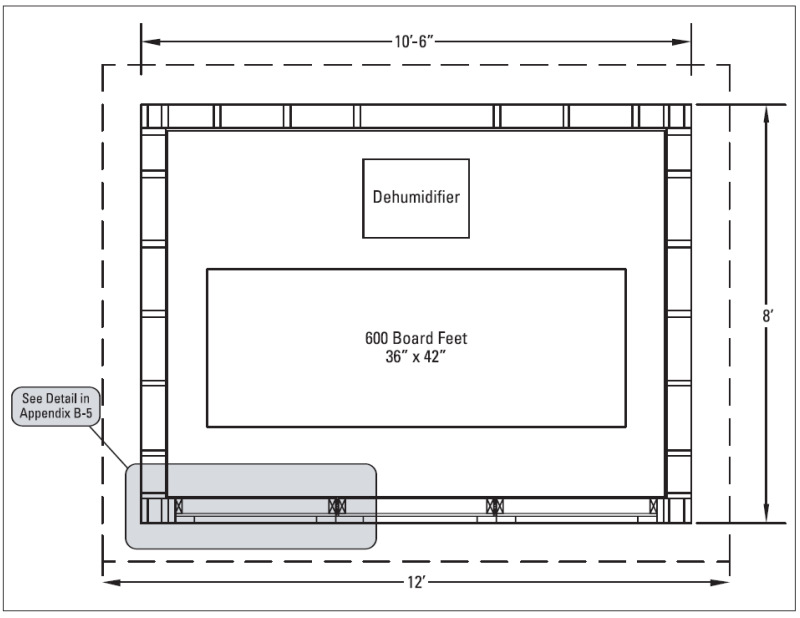
IV. Employment Outlook for Helper Carpenters (Source: ESD)

Helper Carpenter (SOC# 473012)	
Statewide	
Demand	Balanced
Green Job	Yes
Average annual wage (March 2012)	$32,438.00
Average hourly wage (March 2012)	$15.60
Short-term trend	Stable
Long-term trend	Growth
Estimated employment (2010)	142
Average annual total openings (2010-2020)	7
Average annual growth rate (2010-2020)	2.2%

Appendix C: Kiln Plans

Wisconsin Dehumidifying Kiln (Source: University of Wisconsin Extension)

APPENDIX B-1: Plan View



Virginia Tech Solar Kiln (Source: Virginia Cooperative Extension)

Virginia Cooperative Extension

PUBLICATION 420-030

Design and Operation of a Solar-Heated Dry Kiln

Brian Bond, Assistant Professor and Extension Specialist, Department of Wood Science and Forest Products, Virginia Tech

Introduction

Lumber is usually dried to a specific moisture content prior to further manufacturing or use. The amount of water in wood is usually expressed as moisture content and can be directly measured or calculated. The moisture content of wood is defined as the ratio of the weight of water in wood to the dry weight of the wood material. While lumber can be air-dried, the humidity in most localities prevents the lumber from reaching the moisture content required for the stability needed for interior use. A dry kiln is required to dry lumber to the necessary final moisture content and does so fairly rapidly. This publication discusses the design and operation of a solar-heated lumber dry kiln that is designed to be inexpensive to construct and simple to operate.

While there are several different types of solar kilns for drying lumber, the kiln described here was designed with two major objectives: 1) be relatively inexpensive to construct and 2) be simple to operate. Drying lumber can be a complex process where accelerating drying without having quality loss often requires extensive knowledge and experience. The design of the Virginia Tech solar kiln is such that extensive knowledge, experience, and control are not required. The size of the collector keeps the kiln from overheating, which causes the wood to check and split. The kiln is simple to construct and utilizes a passive solar collector, four insulated walls, and an insulated floor. The roof is made of clear, greenhouse-rated, corrugated polycarbonate.

Virginia Tech Solar Kiln Design

The solar kiln described in this publication was designed, constructed, and tested at Virginia Tech. This design is based on 25 years of research and development on the solar drying of lumber in the United States and foreign countries. Previous versions of this kiln were designed to hold up to 2,000 board feet[1] of lumber. Plans for the older and larger kiln are available for download at *www.woodscience.vt.edu/about/extension/vtsolar_kiln.asp*. The version described here holds 750 to 1,000 board feet of lumber. The kiln dries a load of lumber in approximately one month of moderately sunny weather at its location in Blacksburg, Va.

Design Fundamentals

The Virginia Tech solar kiln can hold up to 1,000 board feet of 1-inch thick lumber per charge (or load) and dry a charge in approximately one month of moderately sunny weather in the mid-latitudes of the United States. The kiln is heated when solar energy enters the clear glazing and is absorbed on one of the black painted interior surfaces. The solar energy heats the air in the collector space and it is circulated through the lumber using fans. As the heated air circulates, it absorbs moisture from the surface of the lumber. The evaporated moisture increases the relative humidity of the air and when the humidity in the chamber is too high, it is vented from the chamber through the vents in the rear of the kiln.

[1] *A board foot is 1-inch thick by 12 inches wide by 12 inches long. To obtain the total number of board feet in a piece of lumber, measure the width in inches, multiply by the length in feet, divide by 12 then multiply by the nominal thickness.*

www.ext.vt.edu

Produced by Communications and Marketing, College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University, 2009

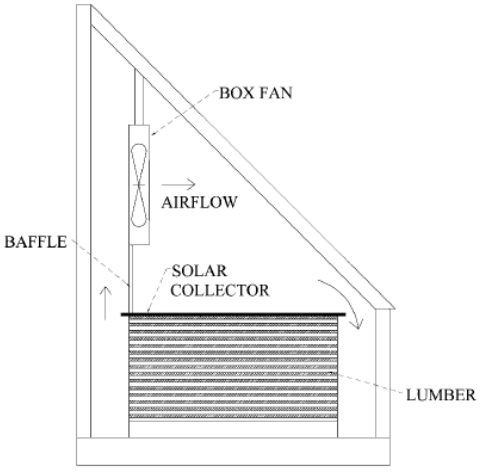


Figure 6. Diagram of solar kiln showing fans, baffle, solar collector, and airflow spacing between lumber and walls of kiln.

Figure 4. Rear view of kiln showing access doors.

Figure 5. Front view of kiln showing fan placement.

Appendix D: Wood Collecting Protocol

Urban Wood Utilization
Wood Collection Protocol for City Partners[39]

July 2013 Draft

Successful marketing of urban forest products begins at the source: street and hazard trees. The goal of this project is to provide an alternative use for trees that are slated for removal and would otherwise end up as mulch or firewood. However, the reasons why city trees are often removed—disease, branch failure, etc.—also impose unique limitations on the usability of the wood. This draft protocol aims to provide a guide to sawing, sorting, and storing urban wood waste in order to maximize utilization potential.

I. Species Desirability

Although most urban trees have the potential to be utilized for a higher use than firewood, some species are particularly desirable for the production of furniture, flooring, and other high-end uses. City partners can keep an eye out for choice tree species as they reserve wood for the Cedar Creek sawmill.

Best = walnut, ash, bigleaf maple, oaks (red, white/Garry, pin), cherry, Douglas fir, madrone, Port Orford cedar, exotics
Good = sweetgum, sycamore, western redcedar, poplar, fruitwoods, American and Chinese elm, hard maple, Pacific yew, western larch, silver maple
Fair = birch, aspen, beech, white pine, black locust
Poor = cottonwood (however, cottonwood does have outdoor and utilitarian applications)

II. General Size Requirements

Best = 14-24" diameter at small end of log; 10-20 feet in length
Good = 12" or larger diameter at small end of log; 8-16 feet in length
Fair = 8" or larger at small end of log; 6 feet or longer in length
Poor = small in length and diameter

III. Wood Quality

Before cutting, a wood expert or the wood's end-user should come and inspect trees slated for removal. Wood should be visually inspected for defects. Common defects include: log curvature, pests and disease, excessive knots, sun check and end check (cracks in the wood), and heart rot. Embedded metal is also a common flaw in urban wood. It is important to visually inspect logs for metal and

[39] Adapted from Cesa, E. T., E. A. Lempicki, and H. J. Knotts. 1994. Recycling municipal trees: a guide for marketing sawlogs from street tree removals in municipalities. NA-TP-02-94. Morgantown, WV: USDA Forest Service, Northeastern Area State and Private Forestry.

discoloration before sawing. A metal detector should also be used to inspect logs for metal. Before pickup, logs should also be evaluated by a wood consultant to determine acceptability for furniture-grade use. Some wood species are made more desirable for artistic or interior applications by the presence of certain "flaws," such as spalting, figuring, burls, and crotchwood. Trees should be cut in order to maximize the benefit from these unique characteristics, as well as to satisfy the desired end-use.

IV. Log Quantities and Volume Determination

A certain quantity of logs is desired before a log truck can be send to city wood yards or tree removal sites. A standard log truck can legally transport about 2,500 to 3,500 board feet of logs measured by the International ¼ Inch Log Scale Rule. One board foot is equal to a piece of wood 12" wide x 12" long x 1" thick. For this project, logs will generally be hauled by a self-loading dump truck, which is limited in terms of load weight. At least 10 logs of variable size should be accumulated in the wood yard before pickup, in order to maximize the cost-effectiveness of transportation.

Appendix E: Model Ordinance

Urban Waste Wood Utilization
(Draft Model Ordinance)

Sections:

- Findings
- Purpose
- Definitions
- Scope
- Utilization Strategies and Planning
- Authority

Findings

Evaluation of the City's urban forestry practices revealed an opportunity to retain the community benefits derived from public trees by utilizing urban waste wood to its highest and best use.

Purpose

The purpose of this Chapter is to provide for the full utilization of urban waste wood originating from tree removals conducted by, under contract for, or on behalf of the City. Utilization of waste wood encompasses end-uses which divert wood from municipal landfills, such as composting, chopping for firewood, chipping for landscape applications, or milling for lumber. As a source of high-quality native and non-native tree species, the urban forest represents an opportunity for higher-use applications such as hardwood furniture and specialty wood crafts. By identifying strategies for wood utilization, the City shall:

A. Reduce the costs and tipping fees associated with disposal of street and hazard trees
B. Complete the life cycle of trees under a holistic Urban Forest Management Plan
C. Enhance the potential for carbon sequestration in urban wood products
D. Create local opportunities for green-collar jobs in wood manufacturing sectors

Definitions

A. City. City of _____

B. City Tree Advisory Board. The body appointed to evaluate and recommend City policies for implementing the City's Urban Forest Management Plan.

C. Green-collar job. A green-collar job is a job within the environmental sectors of the economy.

D. Risk Tree. The combination of potential for a tree (or tree part) to fail within the presence of an adjacent target.

E. Public Tree. Trees growing on property owned by the City.

F. Street Trees. Trees growing within the City's rights-of-ways.

G. Urban Forester. The Individual charged with managing public trees within city jurisdiction.

H. Urban Waste Wood. Urban waste wood is the portion of the wood waste stream that can include pruned branches, stumps, and whole trees from street and park maintenance and development.

Scope

The provisions of this Chapter shall apply to the removal and utilization of all public trees as defined in this ordinance.

A. Trees on lands managed by the City Parks and Recreation Department. Tree removal in these areas shall be subject to review and approval of the Parks and Recreation Department. Utilization of removed trees will be subject to input and review by the Urban Forester.

B. Trees on lands managed by the City for storm water management and development purposes. Tree removal in these areas shall be subject to review and approval of the Public Works Department. Utilization of removed trees will be subject to input and review by the Urban Forester.

Utilization Strategies and Planning

The City's Urban Forester, in consultation with the City Tree Advisory Board, shall identify strategies for urban waste wood utilization and incorporate these strategies within the City's Urban Forest Management Plan. These strategies shall:

A. i. Address and clarify the legal implications of utilizing urban wood as a community asset, and
   ii. Specify appropriate end-uses and markets for public trees
      a. Merchantable timber for high-value applications may be auctioned or donated as City surplus
      b. Non-merchantable timber may be dispersed or sold as chips or firewood through a City wood yard

B. Encourage local or recycled wood products as a component of the City's environmentally preferential purchasing program

C. Reference data compiled by tree inventory activities conducted by the Urban Forester

D. Be implemented in partnership with relevant community stakeholders

E. Strive to create educational programs for private homeowners and local arborists.
F. Incorporate opportunities, when possible, for green-collar jobs development in the areas of carpentry, woodworking, and green building construction

Authority

A. Authority of the Urban Forester.

1. The Urban Forester shall manage the City's Urban Forestry Program, which includes, but is not limited to the administration of the Urban Waste Wood Utilization ordinance and the provisions of the Urban Forest Management Plan.

2. The Urban Forester shall develop and periodically review and revise as necessary The Urban Forest Management Plan which shall contain at a minimum, standards for Tree Plan Development, Tree Planting, Tree Protection, Specimen Tree Evaluation, and Utilization Strategies and Planning. The Urban Forestry Manual and all revisions and amendments to it shall be available for public inspection at the office of the City Clerk.