Using Industrial Clusters to Build an Urban Wood Utilization Program: A Twin Cities Case Study

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Executive Summary

Urban tree removals in the U.S. range from an estimated 16 to 38 million green tons per year. Removals of this magnitude—due to pests, storms, construction, hazard trees, etc.—are increasing the interest and adoption of practices to convert urban "waste" wood to useful products. One example is the Minneapolis-St. Paul (Twin Cities) metropolitan area where strong markets for biomass and landscape mulch are contributing to the growth of recycling fallen urban trees. Twin Cities-based tree service firms, wood recyclers, communities, niche businesses, and ancillary wood-using companies all contribute to regional wood utilization activities. State-based initiatives and programs are important in promoting and facilitating the conversion of urban wood residue into useful products. Also, the discovery of the emerald ash borer in the Twin Cities is leading to heightened awareness of urban wood utilization.

The concept of industry clusters—where businesses and/or organizations are located within a geographic region and have developed mutually beneficial cooperative links with one another—can serve as a template for starting or expanding an urban wood utilization program. Ingredients for a successful industry cluster include:

- Feasibility analysis
- Education, technical and research support
- Supportive government actions including financial grants
- Supporting and complementary industries
- Entrepreneurship and innovation
- Access to raw materials, markets and transportation networks
- Leadership, commitment and collaboration
- Business climate

The above ingredients are prominently evident in wood utilization activities in the Twin Cities. Three case studies highlighted in this report—a public urban forestry program, a small start-up business (entrepreneur), and a legislative funded initiative—strengthen the notion that an emerging and successful urban wood utilization cluster exists in the Twin Cities.

Communities, industries, and organizations across the country that seek to develop an urban-based wood cluster need to recognize what key ingredients are either present, absent or need bolstering in their particular situation. This report offers recommendations—using the Twin Cities as a case study—for advancing an urban wood utilization cluster in community and urban areas.

Part I.

Introduction

Today there are about 4 billion urban trees[2] in the U.S., with another 70 billion growing in metropolitan areas[3]. As urban land in the U.S. expands, so do the urban forests. Urban land in the lower 48 states increased from 2.5% of total land area in 1990 to 3.1% in 2000, an area about the size of Vermont and New Hampshire combined. U.S. Forest Service scientists project that urban land in the coterminous U.S. will nearly triple in size to over 8% by 2050, an area larger than the state of Montana (Nowak and Walton 2005).

The number of trees, and hence the volume of wood, removed annually from our nation's urban forests is significant. Estimates of removal (due to pests, wind storms, construction, hazard trees, etc.) range from 16 to 38 million green tons per year. Even the lower value of these estimates is comparable to total annual harvests from America's National Forests (Bratkovich et al. 2008).

Although the utilization of urban trees for wood and paper products is occurring only sporadically, there are signs that momentum is increasing. Community officials, wood-using industries, arborists, tree care firms, researchers, public agencies, non-profit organizations, and others are devoting additional resources and new initiatives to convert urban "waste" wood to useful products.[4]

Nationally, the U.S. Forest Service, State and Private Forestry, has developed publications, case studies, and educational programs, as well as provided financial support for demonstration projects on urban wood use. The Ash Utilization Options project—spearheaded by the Southeast Michigan Resource Conservation and Development Council—is one example of a regional effort (created after the discovery of the emerald ash borer) to promote better utilization of urban trees.[5] Numerous wood-using industries and entrepreneurs—including, as examples, CitiLog in New Jersey, Horigan Urban Forest Products in Illinois, and Pacific Coast Lumber in California[6]—have expanded or created new businesses in recent years based on converting urban trees to value-added products. Even local construction projects in numerous communities—Cross Plains, Wisconsin and Ann Arbor, Michigan as examples—have featured urban tree "take

[2] Urban areas as defined by the Census Bureau include (1) urbanized areas with a population of 50,000 or more and a minimum density of 1,000 people/sq. mi., (2) places that contain some urbanized areas within their boundaries, and (3) places with at least 2,500 people and located outside of urbanized areas. Also, areas totally surrounded by urbanized areas but not within an urbanized area are considered to be an urban area (Nowak et al. 2001)

[3] Metropolitan areas as defined by the Office of Management and Budget defines metropolitan areas by county, not places (except in the six New England states). Metropolitan areas have one or more large core populations that are socially and economically linked to adjacent counties. For example, the New York metro area—the largest in the country—covers 36 counties in New York, Connecticut, New Jersey and Pennsylvania (Sherrill 2003).

[4] This report focuses on "urban wood" derived from trees and other woody vegetation. Construction and demolition wood (C&D), discarded pallets and other forms of dunnage, mill residues, etc., are not included.

[5] For more information on the Ash Utilization Options Project, see http://www.semircd.org/ash/.

[6] See http://www.citilogs.com/, http://www.horiganufp.com/ and http://www.pacificcoastenterprises.com/.

downs" in products such as flooring, paneling, benches, tables and chairs.[7] Also, select communities such as Lompoc, California[8] have ramped up efforts to use all or a portion of their tree removals for a variety of products including mulch, biomass (for energy), animal bedding, specialty products and lumber. Augmenting these initiatives are a variety of books, videos, conferences, art exhibits and partnerships, all of which have been developed during the past decade with a specific focus on urban wood use.[9]

All of these urban wood utilization efforts are important and praiseworthy for their environmental, social and economic benefits for communities. Many do an excellent job of focusing on one or more key elements needed to create awareness and sustain activities of an urban wood utilization project such as education, financing, or entrepreneurship. Each specific effort has the potential for replication or use in other areas throughout the country by community leaders, businesses, government units, non-profit organizations and entrepreneurs.

Another approach for developing a broad-based community-wide urban wood utilization program is to base the effort on a proven business model or economic development strategy. The effort should be comprehensive, i.e., "big picture," and include most or all key elements for success. One such strategy or model that can be used as a template for building an urban or community based wood utilization program is the notion of "industry clusters". Industry clusters—also called business or economic clusters—have received renewed attention in recent years, including a focus on wood-based clusters.[10] This report focuses on an emerging urban wood-based industry cluster in the Minneapolis-St. Paul, Minnesota (Twin Cities) metropolitan area.

Part I of this report provides a broad overview—or sampling—of the scope of actions and current thinking regarding wood utilization activities in the Twin Cities. Part II introduces the concept of industry clusters including ingredients for success and the relationship of clustering to the Twin Cities situation. Recommendations for starting or expanding wood utilization activities on a community-wide basis are offered. Part III showcases three examples of Twin Cities-based wood utilization efforts and their relationship to clusters.

Twin Cities Background

The Twin Cities of Minneapolis and St. Paul are located in the southern half of Minnesota, roughly separated by the meandering Mississippi River. Population of the Twin Cities, including a 7-county metropolitan area is approximately 2.9 million out of a total 5.5 million for the state.

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[7] Libraries in Cross Plains, WI and Ann Arbor, MI both used lumber products from on-site trees. See http://www.scls.lib.wi.us/crossplains/LEEDtour.pdf and http://www.aadl.org/buildings/traverwood.

[8] See http://www.cityoflompoc.com/parks_rec/urbanforestry.htm.

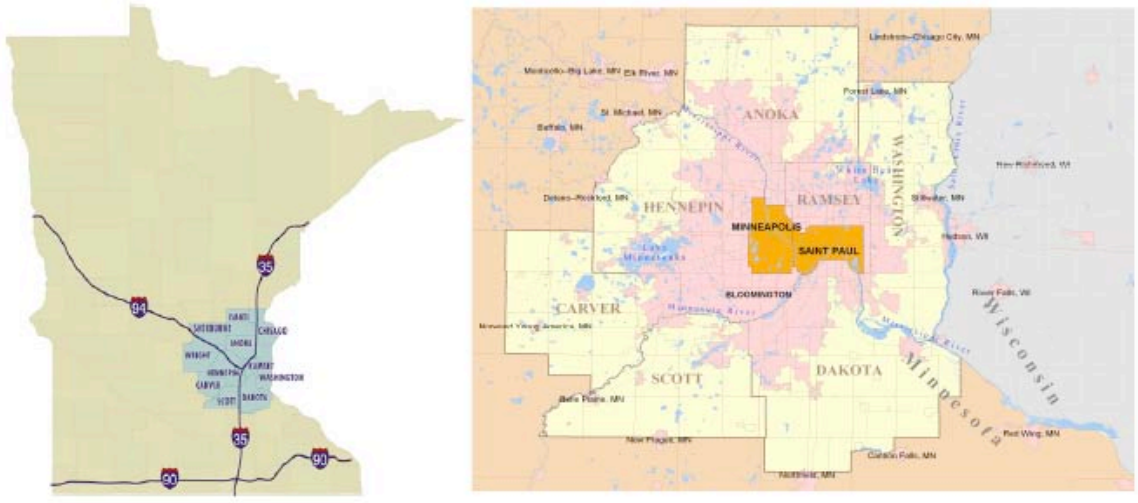
[9] "Harvesting Urban Timber" by Sam Sherrill (http://harvestingurbantimber.com/?page_id=6) is an example of a recent book devoted to urban wood utilization. A recent video on the subject is "Up From Ashes" by KDM Films and Detroit Public TV.

[10] See Part II for a detailed description of clusters.

St. Paul (pop. 280,000) serves as the state capitol and is the headquarters for the Minnesota Department of Natural Resources and other state agencies. St. Paul (Ramsey County) also is home to the Northern Research Station and a State and Private Forestry field office, both units of the U.S. Forest Service. The University of Minnesota, St. Paul campus, houses the College of Food, Agricultural, and Natural Resources Sciences which includes departments specializing in forest resources (including urban forestry) and bio-based products (including wood and paper products).

Minneapolis (pop. 383,000), the largest city in the state, is the county seat of Hennepin County, and home to the "main" campus of the University of Minnesota. The city contains many waterways including over 20 lakes and wetlands, the Mississippi River, creeks and waterfalls, with many connected by parkways. Minneapolis was ranked as America's most literate city in 2007 (third place in 2009) and, according to Popular Science magazine, ranked number one as a high technology city in 2005 (including factors such as number of high tech companies, university R&D expenditures, and number of EPA-lauded Energy Star buildings).[11] Minneapolis, and its Twin, St. Paul, are ranked by various sources as two of the greenest cities in the U.S.

Image 1, Caption: Map of Twin Cities Metropolitan Area



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The Twin Cities metropolitan area is comprised of a seven-county area that includes all or part of 182 cities and townships. The region is home to headquarters of more than a dozen "Fortune 500" companies and nearly three dozen "Fortune 1,000" corporations. The region's average household income is among the highest in the nation and its unemployment rate typically among the lowest. The seven-county metro area boasts one of the most extensive regional parks and trail systems in the country.[12]

[11] See http://www.popsci.com/scitech/article/2005-03/top-tech-city-minneapolis-mn.

[12] For additional information on the Twin Cities region, see http://www.metrocouncil.org/about/region.htm (accessed April 22, 2010).

Twin Cities Wood Utilization Activities

Anchor Institution: District Energy St. Paul

Discussion of urban wood utilization in the Twin Cities invariably leads to a discussion of District Energy St. Paul due to its size and impact on regional wood supplies and markets (http://www.districtenergy.com/). District Energy operates a combined heat and power (CHP) plant that uses up to 1,000 tons of wood chips per day, predominantly sourced from municipal areas.[13] District Energy produces hot water, steam or chilled water at a central point and distributes the energy through underground pipes to buildings. Currently, heating service is provided to 31.1 million sq. ft. of building space, or 80% of St. Paul's central business district and adjacent areas. Cooling (air-conditioning) is provided to more than 18.8 million sq. ft. of downtown building space.

Image 2, Caption: District Energy St. Paul operates the largest biomass-fueled hot water district heating system in North America

District Energy established an affiliate partner, Environmental Wood Supply (EWS), to provide a consistent quality and quantity of wood chips for delivery to the downtown CHP plant. EWS has a wood storage and processing yard in St. Paul (on city property), three miles from District Energy. EWS receives wood at their yard from private tree service firms, municipalities, land clearers, loggers, and other commercial parties engaged in urban tree removal and utilization. EWS pays a "gate rate" of $3/yard for chips and $2.50/yard for mulch. Logs and branches are also accepted but no payment is provided and no tipping fee is assessed. EWS also accepts pallets, clean dimension lumber and other municipal wood debris.

In addition to the St. Paul wood yard—operated through an agreement with the city—EWS operates a "satellite" collection and processing site in the Minneapolis suburb of St. Louis Park. Also, four Ramsey county recycling sites accept woody debris from homeowners (non-commercial) for processing by EWS and delivery to the CHP plant (EWS grinds and leaves some chips at the recycling sites for pick-up by homeowners).

[13] In addition to wood chips, District Energy also burns natural gas, oil and coal although its reliance on oil and coal has been reduced by 70% since converting to wood.

One service provided by EWS is on-site grinding and trucking of wood residue within 50-75 miles of the District Energy CHP plant. A municipality, for example, cleaning up after a major storm event, can negotiate tub grinding and transportation of their wood debris to District Energy, often resulting in significant financial savings to the community.

In sum, District Energy St. Paul and its affiliate Environmental Wood Supply has a significant impact on urban wood utilization in the Twin Cities. Other products such as landscape mulch, soil amendments, animal bedding and saw logs, are "benchmarked" in some degree by the volumes required by the CHP plant, the payments made for woody material, and the services provided (such as grinding and trucking). Consequently, District Energy St. Paul serves as an "anchor" industry in a region where a host of supporting and complementary industries are developing efficient and profitable means of utilizing urban wood residues.

For additional information on District Energy St. Paul and its affiliate Environmental Wood Supply, see Part II, and Part III (Case Study #1) of this report.

Tree Service Firms/Private Arborists

There are over 300 private tree service firms in the Twin Cities metro region (7-county area) with half of these firms located in the counties of Ramsey (St. Paul) and Hennepin (Minneapolis).[14] Some of these firms are small one-person operations while others have employment numbers of 75 or more. Wood utilization strategies employed by these firms often depend on firm size, equipment, location, and interests. The following is a small sampling of Twin Cities' tree service firms and their utilization practices.

Bratt Tree Company (Jon and Stan Bratt) is a small family owned business based in Minneapolis (http://www.bratttree.com/). Most of the firm's work is within a 5-mile radius of their headquarters. In the past, Bratt Tree paid as much as $5/yard as a tipping fee to dispose of their wood. Today, the majority of their tree removals are chipped in-house and sold to Environmental Wood Supply (District Energy) for a price of $3/yard. Stan Bratt noted, "District Energy gives our company a reliable market for chips—day in and day out." Low-end saw logs that are not chipped by Bratt Tree are often sold to a pallet manufacturer. Stan Bratt estimates that over half the trees his company removes have portions of the tree suitable for pallets. High-end logs, usually less than 10% of production, are sorted and provide the raw material for urban tree reclaimers such as Wood from the Hood (see Case Study #3). As an example of walking the talk, Stan Bratt used lumber sawn from Minneapolis tree removals for flooring and cabinets in his home.

[14] The number of private tree service firms was determined from the Minnesota Department of Agriculture's "Tree Care Company Registry" (public tree care organizations were not included in the tally noted above). Recent legislation requires companies and people who remove trees, limbs, branches, brush or shrubs for hire to register with the state of Minnesota. For more information, see http://www2.mda.state.mn.us/webapp/lis/default.jsp (license holders) or http://www.mda.state.mn.us/licensing/licensetypes/treecareregistry.aspx. Also, the Minnesota Department of Agriculture estimates the registry represents 70% of active tree care companies.

Hugo Tree, with 5 employees, is headquartered on the north side of the Twin Cities (http://hugotree.com/). Hugo Tree estimates 75% of its tree removals end up as fuel for District Energy and follow one of three paths. Hugo Tree either (1) delivers unchipped material to the EWS wood yard in St. Paul, (2) delivers unchipped material to different wood yards operated by large aggregators who, in turn, process the wood for use by District Energy (or process mulch products), or (3) stockpiles material at Hugo Tree's yard that is processed on-site by EWS. The remaining 25% of tree removals are stored at Hugo Tree's yard where logs are sold for firewood (long length), processed into firewood for heating the owner's house and business (30 cords per year) or sawn into lumber by an outside portable mill owner. The owners of Hugo Tree have used lumber from their tree removals for shelving, furniture, and flooring in their home. Also, Hugo Tree has either sold or donated logs to businesses that produce value-added products (Wood from the Hood and Forest Products Supply are two firms that have used Hugo Tree logs and are profiled later in this report).

Shadywood Tree Experts is based in Minnetonka, a suburb on the southwest corner of the Twin Cities (http://www.shadywoodtreeexperts.com/). Shadywood tree removals end up in various products including firewood (by homeowners), landscape projects (chips sold to homeowners), and saw logs (delivered to a commercial sawmill on the outskirts of the Twin Cities). The majority of Shadywood wood is chipped and delivered to a wood yard (no tipping fee paid) in St. Louis Park, a Minneapolis suburb. Chips from the wood yard are picked up by Environmental Wood Supply and delivered to District Energy. Shadywood does not transport material directly to District Energy due to the distance which relates to added costs of fuel, vehicle wear-and-tear, and employee wages.

Majestic Tree Care of Minneapolis is a small firm that recognizes some trees are just too good to go into the chipper (http://majestictreecare.com). Majestic has arranged in the past for milling of select logs and has a stockpile of lumber that is air-drying and awaiting further processing. Majestic has used local wood workers to craft products such as furniture and canoe paddles out of their lumber. They have also contracted with a wood turner to produce bowls for homeowners from trees taken down on their property. Majestic continues to set-aside high quality logs for future projects and is contemplating building a solar dry kiln.

> *"Due to the expanding wood markets and increased competition in the Twin Cities, our fees to dump tree removals have been reduced about 200 percent in the past five years."*
>
> -Quote from Keith Erickson, Regional Manager, Asplundh Tree Expert Company

Shorewood Tree Service of Watertown is located on the west side of the Twin Cities and is owned by Randy Schwerin. Operating as a full-time tree service firm, Schwerin purchased a portable sawmill (Wood-Mizer LT28) that was advertised on Ebay about fours ago. Prior to buying the mill Schwerin sold logs to a timber buyer employed by a commercial sawmill. Milling logs and selling lumber has been a good complementary business for Shorewood Tree. Schwerin obtains most of his logs from suburban lot clearing and yard trees. He estimates that he can saw portions of 60% of his "take-downs" plus he buys logs from another tree service firm. Schwerin sells both green and dried lumber—often quarter sawn—with the latter produced in his

1,000 board foot dehumidification kiln. Posting ads for lumber on Craig's List has proven successful with most of his customers being cabinet and furniture makers including individuals installing hardwood flooring. Schwerin also sells firewood from his tree removals and occasionally biomass chips to a nearby greenhouse for winter heating. Chips produced at new housing developments and other commercial areas typically are used on-site for erosion control.

S&S Tree Specialists in South St. Paul is a large family owned tree care business with over 75 employees including 22 International Society of Arboriculture (ISA) certified arborists, five foresters and one Board Certified Master Arborist (http://www.sstree.com/). S&S attempts to use 100% of tree removals for various products including landscape mulch, potting soil mix, and biomass. S&S owns a mulch "colorizer" and produces 100,000 cubic yards per year which is primarily retailed through nurseries and garden centers. S&S will sometimes buy material for grinding from other tree care firms, or obtain it from communities at no charge, to keep up with the demand for mulch products. S&S also sells tree chips to a power plant in Benson, Minnesota where the chips are mixed with poultry litter to generate electricity.

Rainbow Treecare was founded in 1976 and is based in Minnetonka, a southwestern suburb of the Twin Cities (http://www.rainbowtreecare.com/). In 2008, Rainbow and its subsidiaries became an employee owned company with over 40 certified arborists on staff. Approximately 50% of Rainbow tree removals and trimmings are dropped at wood collection and processing yards throughout the Twin Cities and converted by a third-party to a biomass product either for use by District Energy, and to a lesser extent Len Busch Roses (greenhouse). The remaining 50% is dropped at compost and organic recycling centers where mulch and related products are produced. Rainbow pays a tipping fee at most sites of $2/yard for chips and $3/yard for logs (but no tipping fee is paid at the greenhouse since the material is delivered directly to the biomass plant). In 2002 Rainbow Treecare initiated the Urban Forestry Institute (UFI) to create a venue for scientific knowledge of tree health in the Twin Cities. The UFI offers arborist certification training and other tree related courses. Dr. John Lloyd, UFI Director, is interested in developing a Twin Cities-based wood utilization cooperative in order to more completely capture the value of urban tree removals.

Sidebar 1: Tipping Fees

The tipping fee or charge that Twin Cities' tree service firms pay to dispose of wood residue is variable and based on a number of factors. Residue quantity (e.g., one load per day versus one load per month) and quality (e.g., brush/logs versus chips) are important determinants of fees. For example, large quantities of chips consistently delivered to an end-user are more likely to receive favorable tipping options. Also, strong markets for landscape mulch and biomass (fuel) products have increased competition for urban wood and changed the dynamics of tipping fee charges. Some firms that used to pay upwards of $4-6 per yard to tip woody material at a particular site now pay little or nothing, and in some instances are paid for their wood residues. Intangible factors, such as long standing business relationships or negotiated contracts between producers (e.g., tree service firms and communities) and users (e.g., wood recyclers, biomass users and landscapers), impact tipping fees and make it difficult to specify a specific fee or "set rate" for the region.

Wood Residue Recyclers (Large Aggregators)

The Twin Cities supports a half-dozen or more firms that collect (aggregate) tree and other wood residue from tree service firms, land clearers, homeowners, and others. Mulch and related products (potting soil, erosion control products, etc.) are a primary focus of these firms with biomass markets to a lesser extent.

Ceres Environmental Services, Inc. operates wood waste recycling facilities in Minnesota and Texas (http://ceresenvironmental.com/). The Minnesota location is based in Brooklyn Park in the northwest quadrant of the Twin Cities. Ceres is designated by the Minnesota Department of Agriculture as an ash tree waste disposal site. Ceres receives raw material in the form of trees from tree service companies and homeowners. All Ceres wood is processed into four product categories: (1) premium landscape mulch, (2) tree nursery mulch, (3) potting mix (mulch and dirt mixture sold to landscapers), and (4) pellet feedstock (sawdust and mulch mixture). Ceres operates a mulch colorizer and sells its products in bulk to landscapers, garden centers, tree growers, homeowners, and others. Occasionally, Ceres will pull out a high quality log from its inventory but typically high end logs are separated by tree service firms before ever reaching the Ceres wood yard. In 1995 Ceres received the Minnesota Governor's Certificate of Commendation for innovation in the tree recycling industry.

Metro Wood Recycling operates three sites in the Twin Cities (two in Minneapolis and one in St. Paul) and all are designated as ash tree waste disposal sites. Commercial (e.g., tree service firms) and residential wood disposal is permitted at all three sites. No tipping fee is charged for logs four feet or longer in length; a tipping fee of $5/yard is assessed for brush (converted to biomass). Mulch is Metro Wood's primary product (90%) with the remainder going to biomass (District Energy). Metro Wood operates coloring and bagging machines for its mulch products with the bagged product sold to big box stores; bulk product goes to landscape supply stores and dealers. "Fines" from the mulch process go into a potting soil medium. Metro Wood has learned they can "extend the life of the log" by first producing a mulch product and then 2-3 years later converting the deteriorating mulch into biomass. Metro Wood Recycling has periodically provided a very small quantity of saw logs to urban tree reclaimers.

Image 3, Caption: Landscape mulch from urban trees--shown here in various colors and textures--is a popular product in the Twin Cities.

Communities/Local Government Units

The wood utilization programs used by communities and local government units in the Twin Cities metro region vary depending on community/unit size, proximity to markets, wood utilization history and other factors.

In the past, urban tree waste was an issue for St. Paul as good utilization options were not available. Cy Kosel, City of Saint Paul Natural Resources Manager, acknowledged that the city used to spend sizable amounts of money disposing of wood including the costs of breakdowns and repairs of wood chippers and other equipment. With the arrival of District Energy's CHP plant and its affiliate wood procurement firm, Environmental Wood Supply (EWS), the situation has changed completely. Starting in 2003, EWS pays St. Paul—through a contractual agreement—$500 per month for their tree removals (see sidebar on cost avoidance). St. Paul wood can be delivered to EWS in large pieces without incurring a tipping fee. In addition to the monthly payment, St. Paul can pick up from EWS 200 cubic yards of processed wood mulch per month for landscape use in the city's park system. With annual tree removals numbering about 2,000 per year (at an average diameter of 20"), the lease arrangement has been a boon to St. Paul according to Kosel. Also, Kosel is assured that if a big storm hits the city (or insects or disease causes significant tree mortality) District Energy will take the material. On the downside, additional utilization options for city trees would require a change in the annual contract with EWS (for example, high-end saw logs need EWS's approval before being channeled to small businesses and artisans).

Image 4, Caption: Tree trimmings that will be processed into biomass fuel

The Minneapolis Park and Recreation Board (MPRB) is using leasing agreements (contracts) to manage its wood utilization program. Beginning in 2008, the MPRB began leasing one of its wood yards to Metro Wood Recycling for $75,000 per year. As part of the agreement, MPRB delivers limbs, brush, and other small material plus trees larger than 18 inches diameter to the leased site where Metro Wood processes it into mulch and biomass (see earlier discussion of Metro Wood). MPRB and Bailey's Nursery (a local firm) also entered into an agreement where MPRB wood chips and stump grindings are provided to the nursery in exchange for a payment of $75,000. Both of these innovative leases generate revenue and serve as cost-avoidance strategies (for a more detailed description of MPRB and its wood utilization program, see Part III, Case Study #2).

St. Louis Park (pop. 44,000) is a first-ring suburb of Minneapolis. Similar to many communities in the Twin Cities, St. Louis Park paid a tipping fee in the past to dispose of its tree residues. Today, St. Louis Park has a contract with Environmental Wood Supply (District Energy) that enables the city (and its tree removal contractors) to drop tree residue at a EWS-managed yard in St. Louis Park. There is no charge to the city for the tub grinding and trucking service provided by EWS. An added no-cost benefit of the contract to the city is that EWS handles leaf removal and disposal in the fall. According to Jim Vaughn, Environmental Coordinator for the city, St. Louis Park saves $28,000-$30,000 per year with its contract with EWS.

Chanhassen (pop. 24,000) is located in the western suburbs of the Twin Cities. Tree removals—and chipping operations—are done primarily by city crews although private tree service firms

are hired for work that requires quick action (2-3 times per year). Chanhassen utilizes nearly all of its tree removals (chips) for internal use such as city landscape projects including mulching around tree plantings and covering park trails and paths. One chip site in the city is devoted to providing free chips to city residents.

Sidebar 2: Cost-Avoidance Strategy

Declining revenues, financial shortfalls and a reduced workforce are reasons many municipalities and other local governmental units seek innovative solutions to balance local budgets. Others have learned that it is exceedingly difficult to operate a public wood utilization program as a profit center. Heeding the proverb "A penny saved is a penny earned" many have adopted a cost-avoidance strategy relating to urban wood utilization.

As described in Case Study #2 (and highlighted in this section) the Forestry Division of the Minneapolis Park and Recreation Board (MPRB) has sought for many years to develop a financially sound urban tree utilization program. While successful at times in the past, the program could not be justified from a revenue generating perspective. Today the MPRB Forestry Division is focused on "cost avoidance" and "saving taxpayer money" by developing lease arrangements and contracts that return dedicated dollars to the MPRB. These strategies not only save money but create goodwill with residents by demonstrating a business approach to managing scarce public dollars. St. Paul and St. Louis Park also have wood utilization programs in place that have gone from financial outlays of public funds to break-even or better situations.

Strong local markets for wood residues can create one-time opportunities for utilization and cost-avoidance. For example, the northern suburb city of New Brighton (pop. 22,000) was hit with a major wind storm in September 2005. A large quantity of woody debris was collected during the clean-up effort (October and November) and stored at a city site that covered four acres. The storage site was located at the crossroads of two interstate highways thus providing convenient access. The New Brighton city forester accepted bids ranging up to $200,000 to grind and remove the material from city property. Environmental Wood Supply (District Energy) was the low bidder as they offered to grind and transport the material at zero cost if New Brighton could "hold" the wood until winter (February). The city accepted the zero cost bid, saving New Brighton (cost-avoidance) several thousand dollars.

Niche Urban Wood-Based Businesses

Image 5, Caption: White oak logs processed by Wood from the Hood into value-added products

In addition to the biomass and mulch product markets in the Twin Cities, a host of niche-type wood-based and related businesses have developed in recent years. Many of these firms focus on solid wood value-added products.

Wood from the Hood was created in 2008 by entrepreneurs Rick and Cindy Siewert of Minneapolis (see Part II of report and Case Study #3 for additional information). Wood from the Hood obtains urban logs from tree service firms and reclaims them into a host of specialty products including flooring, picture frames, cutting boards, cribbage boards, and drink coasters. Wood from the Hood has established a network of green-oriented retail outlets to carry their products. (Also see: http://www.woodfromthehood.com/.)

Forest Products Supply (http://www.forestproductssupply.com/) is located in Maplewood, immediately adjacent and north of St. Paul. Forest Products Supply is a distribution center, stocking over 70 species of wood including sheet goods, plywood, melamine and hardboard. Custom sanding and custom-made cabinets, furniture, mantels and entertainment centers are also available. For the past 10 years Forest Products Supply has purchased urban logs for milling into specialty items such as stair treads, mantels and other products where "character wood" is an asset. Logs are milled (sawn for "grade" lumber) off-site by a local portable mill operator (see Tim's Timber) and dried at another location before returning to Forest Products Supply. Owner Conrad Solberg estimates he has used "a couple hundred thousand board feet over the years". He occasionally gives 10% of the dry lumber back to people who donate trees; sometimes the urban lumber is crafted into furniture for homeowners. Solberg uses a variety of urban tree species including walnut, oak and ash.[15]

> ***"We milled 20 walnut logs the other day—all from the city—and didn't hit any nails! Unfortunately, another time we hit eight nails—so we have good and bad days." (Quote from Conrad Solberg)***

Tim's Timber (http://www.timstimbermn.com/) is a full-time one-man operation (Tim Harder) based just north of St. Paul in Hugo. A Wood-Mizer HD40 super hydraulic portable sawmill is used for custom milling (at client's location) and to mill wood that Harder sells or uses for his own projects. Harder has operated Tim's Timber since 1998 and obtains 10% of his saw logs from his own woodlot (down and dead trees) with the remaining 90% coming from the urban

[15] Solberg commented that he typically obtains good quality lumber from ash logs. This characteristic might be exceedingly important if the emerald ash borer continues to spread throughout the Twin Cities.

forest. The urban trees that Harder mills come from various sources including tree service firms and their clients (see Forest Products Supply). Harder's work is up to 80% custom sawing with clients using their milled lumber in a variety of ways. Some trees have sentimental value and homeowners will have a special piece of furniture made from it. Many don't want to see good logs chipped or cut into firewood and prefer to have the wood made into furniture, flooring or wood trim. Other clients sell their lumber to woodworkers. One market that Harder has developed is with construction companies where he supplies special cut timbers used for trailer decking. Many tree service firms, according to Harder, mistakenly merchandise their logs incorrectly by cutting them too short (i.e., 8 feet instead of the recommended 8.5 feet). Harder also buys logs, sells lumber, does custom woodworking and makes maple syrup.

Siwek Lumber & Millwork, Inc. (http://www.siweklumber.com/) in Jordan (southwest of the Twin Cities) operates a sawmill enterprise and retail lumberyard including "package" sales of pole buildings, sheds, decks, fences and garages. Siwek also owns a lumberyard and millwork shop in Minneapolis. The Jordan site operates three mills: a circular sawmill (normal sawing), a Lucas mill (for large diameter logs), and a Wood-Mizer portable mill (for logs suspect of containing metal). Approximately 10-15% of the 1.5 million board feet of logs sawn at the Jordan mill are sourced from urban areas although in the past the urban percentage was closer to 25%. Urban logs are purchased from tree service firms who separate saw logs from lower quality material and truck the logs to the mill. The urban tree population provides Siwek with dense hardwoods such as elm and oak which are difficult to find in the area surrounding the mill. One of the challenges facing the Siwek mill is that many tree service firms and other urban tree operators are hesitant to separate saw logs destined for the whole tree chipper.

The Original Tree Swing is a Minneapolis-based family owned and operated business started nine years ago as a part-time venture. In September 2009 owner Bill Pine took the venture full-time as a producer of open-ended children's toys made from natural materials—primarily reclaimed wood. The Original Tree Swing products include nearly two-dozen different toys such as tree swings, castle blocks, bowl/spoon/board play sets, old-time tops, tree puzzles, growth sticks, and more. Ninety-five percent of the lumber used by Pine for his business is from reclaimed urban trees sourced from Wood from the Hood (see above as well as Case Study #3). The Original Tree Swing products are currently carried by more than 50 retail shops across the U.S. plus three foreign countries. For more information on The Original Tree Swing, see http://www.theoriginaltreeswing.com/.

Image 6, Caption: Tree swings are one of many natural wood toys made from urban trees by The Original Tree Swing Company

Other Businesses with Links to Urban Trees and Wood Utilization

Tree nurseries, small construction companies, specialty stores, artists, and greenhouses are a few of the many other businesses in the Twin Cities using urban tree removals for either products (direct) or as a supplement to the firms primary product line (indirect).

Bailey Nurseries, headquartered in St. Paul (Newport), is a fourth-generation family-owned nursery serving customers throughout the U.S. and Canada. Bailey products—deciduous trees and shrubs, evergreens, fruits, perennials, annuals and roses—are distributed by more than 4,500 garden centers, landscapers, growers and re-wholesalers. In the past, Bailey's container products (Minnesota operation) used either pine bark from Canada or wood chips from a distant sawmill (400 mile round trip) as an ingredient in their potting soil. Today, all container products grown in Minnesota use a growing media containing municipal tree waste (wood chips). One source of wood chips is purchased from the Forestry Division of Minneapolis Park and Recreation Board (see Case Study #2). A number of municipalities and tree service firms in the Twin Cities also supply wood chips to Bailey. Annual wood chip use is about 9,000 cubic yards. Field (growing) operations in Iowa and Illinois plan to develop municipal wood-based potting media in the future. For more information on Bailey Nurseries, see http://www.baileynurseries.com/.

Scheftel Construction is a small, full-service construction company located in Minneapolis. The company specializes in vintage home maintenance and remodeling including deck construction, bathroom or kitchen updates, roof repairs and other projects often needed in older homes. Owner Steve Scheftel owns and operates a portable sawmill (Wood-Mizer) and uses urban trees that he custom cuts for products such as trim, wooden counters, custom built-ins and furniture. Scheftel obtains his logs from tree service firms and mills the logs on an as-needed basis, followed by drying the lumber in a solar kiln. He typically does not sell lumber outright but prefers to use his urban reclaimed wood in remodeling and other projects including commercial jobs. Scheftel has used a variety of urban tree species in his projects including black walnut, red elm, honey locust, cherry and spalted maple. For more information on Scheftel Construction, see http://www.scheftel.com/.

Image 7, Caption: Red elm table made by Scheftel Construction from an urban tree for a St. Paul restaurant

Natural Built Home (http://www.naturalbuilthome.com/) was founded in 2005 as a one-stop shop for safe and sustainable building and finishing materials. On Earth Day 2006 a showroom was opened in Minneapolis. Natural Built Home offers an array of earth friendly products including flooring, counter tops, cabinetry, building materials, tile, water saving fixtures, paints and

finishes, and more. One of the flooring options retailed at Natural Built Home is elm flooring manufactured by Wood from the Hood (see above) from Minneapolis trees infected with Dutch elm disease. Natural Built Home advertises this flooring as its most eco-friendly option because it is both locally salvaged and locally milled.

Images 8 and 9, Captions: Wood boiler (left) fueled by urban tree chips keeps greenhouse (right) at 68 degrees F even with an outside temperature of 0 degrees F

Len Busch Roses (LBR), founded in 1965, is the largest year-round grower of cut flowers in the Midwest (http://www.lenbuschroses.com/). Based in the Twin Cities suburb of Plymouth, LBR produces not only roses but lilies, tulips, snap dragons, alstroemeria, gerberas and potted flowering plants. In total, over 7 million stems and pots are produced and sold per year in 14+ acres of greenhouses (over 530,000 sq. ft.). The greenhouses are heated primarily with a 400 horsepower wood-fired boiler installed in 2007 (although the first wood boiler came on line in 1977 following the energy crisis). Today most wood for the boiler is obtained from tree service companies operating within a 25-mile radius of the gre enhouse. LBR collects a tipping fee for logs and brush delivered to its greenhouse site but accepts chips at no charge (the preferred fuel for the boiler), and occasionally purchases additional chips as needed. Over a one-year period as many as 100 different firms supply wood in various forms to LBR which processes the material with either its own small horizontal grinder or a leased tub grinder for larger material. Annually LBR uses about 50-60,000 cubic yards of wood chips (approximately 500-600 semi-trailer loads). As energy prices remain volatile, LBR will continue developing its wood fuel program.

Holasek Greenhouses is a family-owned and operated business since 1957. Located in the southwestern Twin Cities metro area (Chanhassen), Holasek Greenhouses specializes in growing flowers, herbs, perennials, vegetable plants and more for fundraising groups, landscapers, golf courses, garden centers and home gardeners, primarily within Minnesota. Due to rising fuel

"Heating with wood chips has been good for us. I'm not sure we could stay in business without wood."

- Quote from Sharon Holasek

oil costs, the business started heating with wood in 1982 and continues today (primarily during the winter season). A natural gas boiler backs up the wood-fired boiler in providing heat to the 7-acres of greenhouse space available for production. Holasek purchases local wood chips from large producers as well as accepting chips from smaller tree service firms. For more information on Holasek Greenhouses, see http://holasekgreenhouses.com/.

State-based Initiatives and Programs

Legislative actions, including providing funding for new initiatives and long-standing state programs, have contributed positively to urban wood utilization in the Twin Cities.

A project titled "Linking Habitat Restoration to Bioenergy" is an innovative effort to encourage habitat restoration practices while making woody material available for energy use. Funded by the Minnesota Legislature in 2007, $500,000 was provided to the Department of Natural Resources, Division of Ecological Resources, to oversee the project. By law, all restoration projects had to be within 75 miles of St. Paul. To date, 13 biomass removal projects have been completed and include four urban or community park land projects in the Twin Cities metropolitan area. Nearly all of the woody biomass generated from the 13 projects has gone to the District Energy CHP plant in St. Paul. This project created a win-win situation for both habitat restoration that might not have otherwise occurred and urban wood utilization for bioenergy purposes. Additional information on "Linking Habitat Restoration to Bioenergy" is available in Case Study #1.

The Minnesota DNR, Division of Forestry, has maintained a strong utilization and marketing staff for decades, resulting in a heightened awareness of urban wood use issues. Currently, five staff members have assigned duties either full or part-time in utilization and marketing. One staff forester is responsible for wood utilization and related activities in the Twin Cities metropolitan area. This arrangement—several staff members and one with urban responsibilities—is unique since many state DNR programs across the nation struggle to fund one utilization and marketing forester.

In addition to the Minnesota DNR utilization and marketing staff, the urban and community forestry (U&CF) coordinator for the Minnesota DNR is involved in wood utilization activities. Currently, the U&CF coordinator manages a $500,000 forest pest bonding grant program. The focus of the program is the removal, disposal (utilization), and replacement of trees located on public property lost to forest pests or disease. The program was established before the 2009 discovery of the emerald ash borer (EAB) in the Twin Cities. Additional funding from the state legislature—including EAB wood utilization activities—is anticipated in the future.

Sidebar 3: Sawmill and Dry Kiln Listing

One of the services offered by the DNR Forestry Division is a "Sawmill and Dry Kiln Listing for the Metro and Surrounding Areas". Available online and updated regularly, the "Listing" provides key information on businesses conducting sawing and lumber drying operations in the Twin Cities area. Names, addresses, phone numbers, services provided (including log buying and lumber sales), service area (metropolitan area vs. statewide) and general comments on approximately 30 firms are highlighted. Businesses buying and/or accepting urban logs for processing are noted in the Listing. One of the benefits of the Listing is that it connects owners and managers of small woodlands and individual trees with processors who specialize in community-based trees and logs. The sawmill and dry kiln Listing is available at: http://files.dnr.state.mn.us/forestry/um/twincities_sawmill_drykiln_listing.pdf.

Emerald Ash Borer

Emerald ash borer (EAB) was first discovered in Minnesota in a St. Paul neighborhood in May, 2009, and in Minneapolis, in February, 2010. The findings were significant as Minnesota has the third-highest ash population of any state in the U.S. Also, approximately 3 million ash trees exist in Minnesota communities with a large concentration of the urban ash population present in the Twin Cities.[16]

Although EAB awareness and detection programs were in place prior to the confirmed cases in St. Paul and Minneapolis, the official discovery of the exotic pest triggered management actions including quarantine restrictions, tree care programs, tree replacement strategies and wood utilization activities. As of May, 2010, the Minnesota Department of Agriculture (MDA) approved 18 locations in the Twin Cities as ash tree waste disposal sites.[17] These disposal locations or collection points (including both private and public sites) provide opportunities for utilization activities to occur (as was successfully demonstrated at select marshalling yards in the Detroit area).

One example of an ash wood utilization initiative is the effort being lead by the DNR Division of Forestry to develop an ash utilization and marketing plan for Minnesota. The development of the plan included two "listening sessions" with one session held in the Twin Cities with participants representing various urban and community forestry stakeholder groups. The focus being paid to EAB, particularly in the Twin Cities, will likely lead to renewed interest and opportunities for urban wood utilization beyond ash trees (see Mn/DOT sidebar).

[16] EAB was confirmed in April, 2010, in Houston County, Minnesota, just across the Mississippi River from a site in Wisconsin where the insect was discovered in 2009.

[17] See http://www.mda.state.mn.us/sitecore/content/Global/MDADocs/pestsplants/eab/ashtreewaste.aspx.

Sidebar 4: Minnesota Department of Transportation

The Minnesota Department of Transportation (Mn/DOT) manages approximately 32,000 acres of right-of-way and highway surfaces in the Twin Cities metropolitan area. This acreage includes a considerable amount of "green space" that contains trees of various species, size, and quality. Mn/DOT is involved in wood utilization in two ways: highway construction projects and day-to-day maintenance activities. Highway construction—typically using road contractors or sub-contractors to remove trees—generates chips with the goal of using them on-site for Best Management Practices (BMP) erosion control (e.g., silt fences and pathways for construction vehicles). Attempts are made whenever possible to salvage quality saw logs (e.g., elm and oak) for sale to loggers and wood-using industries. Day-to-day maintenance includes vegetation management along roadways for safety purposes with Mn/DOT crews typically used for this activity. Two Mn/DOT-owned chippers produce chips for either on-site use or other Mn/DOT landscape projects. Mn/DOT also delivers chips for use as biomass fuel to District Energy St. Paul.

Dan Gullickson, Mn/DOT forester, noted that current markets eliminate the past practice of paying tipping fees for tree and brush removals. However, Gullickson said efforts are ongoing to develop additional markets for tree removals (especially saw logs) with the effort being lead by Mn/DOT's chief tree inspector in conjunction with the DNR, Division of Forestry. Gullickson also sees a silver lining in the recent discovery of emerald ash borer (EAB) in the Twin Cities. He said, "A positive outcome of EAB might be more collaborative wood utilization work between different groups and organizations. For example, markets for diseased elm [Dutch elm disease] and oak [oak wilt] could be developed in conjunction with ash markets."

Summary of Wood Utilization in the Twin Cities

The above overview of the Twin Cities and sampling of its current wood utilization activities lead to the following observations:

- *The "personality" or cultural identity of the Twin Cities is important* – The greenness or environmental consciousness of the citizenry tends to support and encourage recycling efforts such as converting urban tree removals into useful products.
- *An anchor industry provides a strong foundation for an urban wood utilization* program – The District Energy St. Paul CHP plant and its affiliate Environmental Wood Supply provide a substantial and consistent outlet for urban wood residues generated in the Twin Cities metro area.
- *Markets are diverse and strong* – Biomass and landscape mulch-type products are robust in the Twin Cities. Solid-wood products derived from urban trees are increasing in popularity due to their recycled- and locally produced-attributes.
- *Tipping fees are dropping* – Tree service firms, municipalities, and others are experiencing a reduction in tree disposal fees. This trend relates directly to diverse and strong markets for urban wood residues, resulting in a beneficial situation for many parties.

- *Niche businesses are expanding* – Lumber-type products, such as flooring and millwork that originate from urban trees, are popular as more end-users seek alternatives to traditional products. Also, the diversity of products that originate from urban trees is readily apparent in the Twin Cities (e.g., wood chips and stump grindings for a potting soil product, lumber stock for mantels and stair treads, biomass chips for fuel to heat greenhouses, etc.)
- *A critical mass of devoted urban wood enthusiasts exists* – This includes producers as well as users and the host of intermediaries involved in the process. Private, public, not-for-profit, and other groups all contribute in important ways.
- *Many municipalities have innovative urban and community programs including utilization components* – These programs, often managed by an urban forester, are strengthened by excellent educational and in-service training opportunities that abound in the Twin Cities.
- *Direct legislative support and effective state programs have nurtured urban wood utilization activities* – Including the Twin Cities metro area as a recipient of financial resources, programs and staffing has had positive results (e.g., Habitat Restoration to Bioenergy project, Utilization and Marketing specialists, etc.)
- *Minnesota appears well prepared for EAB* – Unlike some states, Minnesota was able to anticipate many of the environmental, social and economic challenges posed by the EAB. In some instances, EAB utilization opportunities can gain traction and be seen as a "silver lining" amidst the negative consequences of this exotic pest.

Sidebar 5: Tree Trunk Art

Virgil Leih is not a typical Twin Cities urban wood reclaimer. In fact, Leih's creations are not typical anywhere in the world. Leih's specialty is producing one-of-a-kind art pieces—such as vases, spheres and spires—that can range from over six feet in height to more than three feet in width. Leih "turns" these giant sculptures on an 8,000 pound, 1917 Oliver lathe with a seven feet by seven feet capacity. Leih's web page states, "Tree trunks discarded from 'urban forests,' and rescued from landfills, wood chippers and power company burners…these are the raw material and inspiration for my large-scale sculptures." Leih uses a variety of species for his art work including walnut, ash, cottonwood, elm and box elder. A black walnut piece submitted at the 2009 Minnesota State Fair Fine Arts Exhibition sold for $8,000. For more information on Virgil Leih's tree trunk art, see http://virgiltreeart.com/.

Image 10, Caption: Virgil Leih poses with his one-of-a-kind art pieces reclaimed from urban trees

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Part II.

This section introduces the concept of industry clusters, outlines the research-based cluster ingredients for success, and describes the clustering components of urban wood utilization in the Twin Cities. Recommendations for starting or expanding wood utilization activities on a community-wide basis are offered.

What is an Industry or Business Cluster?

Industry clusters are groups of firms and/or organizations located within a defined geographic region who have developed cooperative links with one another through value and supply chains, labor, and use of similar inputs, technology, and complementary products. Another way of stating this is that a "cluster" is any instance of closely located (i.e., geographic proximity) and closely aligned operations (i.e., high frequency or number of transactions, or closely related product lines). For a cluster to flourish, it is necessary that the parties involved receive a mutual benefit.

Clusters can be formally organized through trade associations, buyers groups, or cooperatives, or developed through an informal manner (e.g., via friends, families, or neighbors). Some clusters are developed intentionally through government intervention or actions by a development agency while others evolve as a result of local entrepreneurs that discover, and seize, new market opportunities.

An appealing characteristic of clusters is that they often provide benefits of efficiency, enhanced productivity, and greater resiliency to members due to the synergies and relationships they support. On the downside, clusters have been known to create conditions of co-dependence, which can limit any individual participant's ability to innovate. Interdependence can also contribute to the quick demise of enterprises due to significant changes in economic, social, or environmental conditions.

Examples of well-known clusters throughout the U.S. include the high technology-oriented (computer) industry in "Silicon Valley" California, the automotive industry in and around southern Michigan[18], the "research triangle park" cluster in North Carolina, and movie production in Hollywood. On a smaller scale, wood-based clusters include the Amish furniture industry in Holmes County, Ohio, the Forest Industry Park in Ladysmith, Wisconsin, and the wooden boat cluster in Port Townsend, Washington.

[18] The auto industry has been one of the most recognized industry clusters in the U.S. For decades, hundreds of companies "clustered" around this core industry to provide supporting services and products. Today, some of the shortcomings of clusters can be illustrated within this industry sector.

Ingredients for a Successful Cluster

In 2008, the U.S. Endowment for Forestry and Communities commissioned a study to examine the status of, and opportunities for, business clustering within the U.S. forest products sector and other closely aligned sectors.[19] One of the outcomes of this study was a summary and description of "ingredients" for a successful industry cluster. The ingredients for success include:[20]

- Feasibility analysis
- Education, technical and research support
- Supportive government actions including financial grants
- Supporting and complementary industries
- Entrepreneurship and innovation
- Access to raw materials, markets and transportation networks
- Leadership, commitment and collaboration
- Business climate

In any given cluster, certain ingredients will be more important or critical for success than others. For example, *entrepreneurship and innovation* might be the critical ingredients for a business person developing a new product in an untapped market which can lead to a wave of similar industries in a geographic region. Likewise, *leadership, commitment and collaboration* spearheaded by a champion (individual or group) are often vital to jump-start a cluster such as in the case of an industrial park development. Regardless of the critical key to success, most successful industry clusters will exhibit most, if not all, of the above "ingredients" during their development and initial expansion.

The Cluster Model Applied to the Twin Cities Urban Wood Utilization

This section highlights the above "ingredients for success" with a brief explanation of the ingredient or element adapted from the U.S. Endowment report (*in italics*) followed by a description of activities related to Twin Cities urban wood utilization.

Feasibility Analysis

A feasibility analysis serves as a starting point for activities leading to the development of new, or expansion of existing, business clusters. To capture market potential, the analysis should include assessment of a region's economic conditions, raw material supply, labor resources,

[19] The complete report is available at the U.S. Endowment website: http://www.usendowment.org. An additional summary report is available at the Dovetail Partners' website: http://www.dovetailinc.org/files/DovetailEconClustering0809.pdf.

[20] Because clusters can initially form and grow in different ways (via entrepreneurship, government intervention, cooperatives, etc.) the elements or "ingredients for success" can vary from the above list and include other ingredients such as private financing (private investment), labor resources and overall infrastructure including availability of utilities, buildings, building sites, work force, etc.

existing infrastructure, potential markets and development opportunities—including types of new industries that would complement existing firms.

Two major events during the 1970s created turmoil and a sense of urgency for urban forests and wood in the Twin Cities. First, the ravages of the Dutch Elm Disease (DED) were experienced in both St. Paul and Minneapolis (and surrounding communities). Second, the energy crises led visionaries to explore alternative heating options for the metropolitan area. Feasibility analyses were conducted as a first step in assessing potential solutions to both problems.

Dutch Elm Disease

The DED epidemic that peaked in the 1970s created an environment to explore wood utilization options for the thousands of elm trees being removed annually.[21] Unfortunately, massive amounts of elm materials were disposed through open burning or burial in landfills. State grants attempted to help communities with utilization efforts but success was limited. The need for better wood utilization options continued to grow during the '80s and in 1992 funding was received from the U.S. Forest Service to conduct a multi-year utilization project.[22] The intent of the project was to identify and develop increased uses for urban tree residues. Outcomes from the study included (1) development of Twin Cities urban tree residue statistics (volumes, disposal methods, products, producer categories, etc.), (2) development of markets for three new users of urban wood chips, (3) establishment of a centralized referral system connecting producers and users of saw logs and wood chips, and (4) informational brochures on wood utilization options.[23]

Companion studies during this same time period (early 1990s) by the Minnesota Pollution Control Agency (MPCA) and the Minnesota Department of Public Service investigated landfilling of yard and dry wood waste in the Twin Cities metropolitan area, and the generation of dry wood waste, respectively. Construction debris and non-hazardous waste (wood) received at metropolitan area demolition and construction landfills were also studied by MPCA.

District Energy St. Paul

Concurrent with the explosion of DED during the mid-and late 1970s, many individuals, organizations and businesses were experiencing high energy prices and unstable energy supplies. Following a 1979 fact-finding mission by a Minnesota delegation to Europe, St. Paul mayor George Latimer led an effort to adopt Swedish technology to solve the heating problems of the city. The goal was to prove that a hot water district heating system could be successful in a state with cold winters. Following a series of feasibility studies and lobbying efforts, District Energy became a reality in 1983 as an energy efficient, fuel flexible, heating facility that would provide stable rates for customers. In 1993, District Energy began offering district cooling to downtown building owners in St. Paul.

[21] During the two year period of 1977-1978 Minneapolis removed over 52,000 elm trees. St. Paul and surrounding communities also removed large numbers of elms.

[22] Another driver of urban wood utilization was 1988 State of Minnesota legislation that banned Twin Cities' yard waste, including tree materials, from entering landfills after January 1, 1990.

[23] Minnesota DNR. 1994. Urban Tree Utilization Project: Final Report. St. Paul, MN (in cooperation with Minnesota Shade Tree Advisory Committee Utilization Task Force), 52 p.

During the late 1990s and early 2000s District Energy was involved in a number of different assessments of wood availability in the Twin Cities area. In 2003, a combined heat and power plant (CHP) fueled primarily (70%) by urban wood waste began serving the District Energy system. Currently, the CHP plant simultaneously produces 65 megawatts of thermal energy for District Energy and 25 megawatts of electricity for Xcel Energy. It is the largest wood-fired CHP plant serving a district energy system in the nation, using about 280,000 tons of clean urban tree trimmings, forest residuals and other wood waste per year.

Sidebar 6: Hub and Spoke Cluster Evident in Twin Cities

There are four descriptive categories of clusters. *Marshallian clusters* are typically local small and medium-sized companies that trade their products and services with other cluster members. *Hub and spoke clusters* include one or several large companies serving as anchor companies interacting with numerous small suppliers. *Satellite platform clusters* consist of large companies with multiple branch locations that act independently. *State-anchored clusters* are based on an anchoring institution such as a university, government agency or military installation.

The Twin Cities urban wood utilization cluster can be described as *hub and spoke* whereas District Energy (which can use upwards of 1,000 tons of wood per day) serves as the large anchor industry that is supplied with raw material (directly or indirectly) by 100 or more small firms (arborists, communities, loggers, etc.). Aspects of a *Marshallian cluster* also exist as many smaller cluster members operate "under the radar" of the large anchor company by trading products and services with one another (ex.: a tree service firm supplying logs to a "reclaimer" who uses a custom sawyer and dryer to provide lumber that is manufactured into products that are sold to numerous small retailers).

Recap

Both the DED-related wood utilization project, and the District Energy CHP plant were preceded by feasibility-type studies that evaluated options and alternatives for urban wood use. In the first case, the analysis was broad in scope with the potential to impact a wide array of producers and users of wood. In the latter, the feasibility assessment targeted a specific business end-user. In both instances, the analyses served as a starting point for activities leading to the development of a Twin Cities urban wood utilization cluster.

Education, Technical and Research Support

Education, technical and research support is important for the growth of a business cluster. The role of public and private universities, community and technical colleges, public agency outreach programs, and training activities sponsored by trade organizations are vital.

The Twin Cities metropolitan area provides a wealth of opportunities for urban forestry-related practitioners, businesses and organizations to partake in education, technical training and research. The following is a sampling of such programs.

One of the stalwarts of education, technical training and transfer of applied research related to urban forestry in Minnesota is the annual Shade Tree Short Course (STSC). This program, started in 1963, has grown annually to become the largest state-level urban forestry conference in the nation. The two-day 2010 short course set an attendance record with over 860 participants including private and public arborists, consulting foresters, utility foresters, turf and grounds managers, university and government personnel, representatives of non-governmental organizations and urban forestry business owners. Coordinated by the University of Minnesota (Twin Cities), and supported by many program partners, the STSC is an opportunity for urban forestry-minded individuals to gather and partake in sessions ranging from introductory to an advanced technical, including sessions on urban wood use. International Society of Arboriculture (ISA) certified arborists continuing education credits are offered for attendees.[24]

Since 1974 the Minnesota Shade Tree Advisory Council (MnSTAC) has advanced the state's commitment to the health, care and future of all urban and community forests in Minnesota. MnSTAC not only advises the governor, legislature, state forester and others on urban and community forest issues but provides a forum for communication and exchange of information and experiences regarding these forests. MnSTAC was instrumental in the early 1990s with its Utilization Task Force in assisting the DNR with the urban tree utilization assessment project (see above). Today, monthly educational meetings are held, typically in the Twin Cities, on a variety of urban forestry topics. Also, MnSTAC publishes a quarterly newsletter, the *Shade Tree Advocate*, to advance its mission.[25]

The Twin Cities is the only large metropolitan region in the U.S. that has a 4-year bachelor degree program in urban forestry—a program offered through the University of Minnesota (U of M). Many graduates of the U of M urban forestry program accept employment in communities in the metro-area thus creating a strong connection between on-the-ground urban foresters and the U of M forestry department. This relationship is strengthened by numerous urban forestry student internships within the Twin Cities metro-area. Also, university-level urban forestry research can be implemented efficiently due to U of M-trained foresters and interns located throughout the metro area. This unique relationship between (1) a metro-based urban forestry program, (2) locally educated urban foresters, (3) continuing internship opportunities for urban

[24] For more information on the Shade Tree Short Course, see http://www.cce.umn.edu/Annual-Minnesota-Shade-Tree-Short-Course/index.html.

[25] For more information on MnSTAC, see http://www.mnstac.org/index.html.

forestry students, and (4) ongoing urban forestry research projects in partnership between the university and communities, leads to a strong support system for the numerous Twin Cities-based urban forestry businesses and organizations. It is worth noting that Hennepin Technical College in the Twin Cities has a two-year urban forestry technician program. Also, Rochester Community and Technical College, a short drive south of the Twin Cities, will offer urban forestry classes beginning in 2011.

Another important provider of support service for an expanding urban wood utilization program in the Twin Cities is the Forest Products Utilization and Marketing (U&M) unit of the Minnesota Department of Natural Resources (DNR). For decades, the U&M unit has maintained a full-time staff specialist in St. Paul including additional part-time U&M specialists. DNR U&M staff have provided significant support to urban wood utilization initiatives. For instance, U&M specialists have worked with local urban forestry businesses, communities, and organizations regarding Dutch elm disease wood utilization in the 1970s through more recently assisting District Energy in St. Paul with wood availability studies, procurement strategies, and fuel processing options. Also, the U&M unit has been instrumental in developing metro-area urban wood processing directories and in providing technical assistance to many urban wood using firms.

A new but significant player in educational and technical support for urban forestry practitioners is the Urban Forestry Institute (UFI) at Rainbow Treecare. Started in 2002, the UFI is a unique private venture created to advance the scientific knowledge of tree health in the Twin Cities. The UFI offers educational programs for practicing arborists on topics such as emerald ash borer, oak wilt, tree biology, pruning and more. The UFI is investigating soil modification techniques through the use of mulch and is interested in reducing waste through better wood utilization practices.[26]

Recap

Education, technical training, and research support for urban forestry programs and practitioners in the Twin Cities has been in place for many years. The Minnesota Shade Tree Short Course and the Minnesota Shade Tree Advisory Council are examples of long-standing programs. The University of Minnesota urban forestry degree program and the Minnesota DNR Utilization and Marketing program provide levels of expertise seldom found in large metropolitan areas. The Urban Forestry Institute is a unique private endeavor that builds on the success of public and not-for-profit efforts. These support programs, plus many others present but not described, have contributed to the success of an emerging urban wood utilization cluster in the Twin Cities.

Supportive Government Actions including Financial Grants

Government—local, regional, or federal—often plays a key role in cluster development and/or expansion. In some instances, public dollars or human resources are needed to jump start a cluster initiative. In others, government can contribute by assisting struggling clusters regain lost momentum and direction.

[26] For more information on the Urban Forestry Institute, see http://www.rainbowtreecare.com/institute/.

Minnesota has a number of unique and innovative urban forestry programs spurred by government that have indirectly supported an urban wood utilization cluster in the Twin Cities. Other programs have been supported by government actions to directly impact wood utilization. The following is a brief history and sampling of such programs.

A Minnesota shade tree program was launched in 1974 with key support from three Minnesota governmental departments—Agriculture, Natural Resources, and Transportation—all in cooperation with the University of Minnesota. Approximately $80 million was invested within the first decade for Dutch elm disease and oak wilt tree removal, reforestation, community assistance, research and wood utilization efforts. Many excellent programs were spin-offs of these early shade tree management efforts.[27]

Image 11, Caption: Tree Inspector and Tree Care Advisor Program educational exhibit at 2010 Minnesota Shade Tree Short Course

The Minnesota Tree Inspector Program was started in 1974 in response to inspection of, and sanitation efforts related to, trees infected with Dutch elm disease and oak wilt. Currently, there are 800+ certified tree inspectors in the state with approximately one-half in the Twin Cities metropolitan area. A uniqueness of the tree inspector program compared to many programs in the country is that participants must attend annual recertification workshops to learn the latest on tree care, exotic species management, insect and disease identification, and native tree species including identification of felled and downed trees with bark intact. The tree inspector program is "law" in Minnesota with the authority to oversee the program transferred from the Minnesota Department of Agriculture to the Minnesota DNR in 2007. This change aligns DNR forestry expertise and existing programs, such as the MN ReLeaf Program,[28] with municipal tree programs.[29]

A second example of positive government intervention is the 1993 allocation of federal dollars to the State of Minnesota (via the U.S. Forest Service), to establish a Minnesota Tree Care Advisor Program. This program, focused on training volunteers, has contributed nearly 70,000 hours of volunteer time to topics such as tree health, pest identification, hazard tree detection, and related urban forestry issues. The Tree Care Advisors program involves a network of trained community-based volunteers who assist the University of Minnesota, the state Master Gardener program and county extension offices, and other state agencies and municipalities in promoting

[27] Source: Personal communication with Ken Holman, MN DNR Urban Forestry Coordinator.

[28] A description of the MN ReLeaf Program is available at: http://www.dnr.state.mn.us/grants/forestmgmt/releaf.html.

[29] For more information on the MN Tree Inspector Program, see http://www.dnr.state.mn.us/forestry/urban/certifiedtreeprogram/index.html.

urban and community forestry. Today, the Tree Care Advisor Program is a self-supporting, independently run program. The success of this program—which is rather unique in the U.S.—has contributed to an urban forestry "mind-set" in the Twin Cities that helps spawn innovative and "out-of-the-box" programs including wood utilization.[30]

A direct example of how government actions can support a key player in a business cluster occurred in 2007 when the Minnesota Legislature appropriated $500,000 to the Department of Natural Resources, Division of Ecological Resources, to implement a new and innovative project titled "Linking Habitat Restoration to Bioenergy". The funding was to help assist habitat restoration efforts that might not have otherwise occurred while making the woody material generated as a by-product available to District Energy St. Paul and other bioenergy facilities. By law, all restoration projects funded through this mechanism had to be within 75 miles of St. Paul[31] (see Case Study #1).

Image 12, Caption: The Indian Mounds Regional Park in St. Paul generated 372 tons of biomass as a byproduct of an oak forest, oak savanna and remnant prairie restoration project

Recap

The role of government, at both the State and Federal levels, has made positive contributions to the Twin Cities urban forestry program including funding for shade tree activities during severe pest outbreaks, creation of tree inspector and tree care advisor programs, and direct legislative support for a key urban-based wood-using industry.

Supporting and Complementary Industries

Business clusters often provide benefits of efficiency, enhanced productivity, and greater resiliency to members due to the synergies and relationships they support.

[30] For more information on the MN Tree Care Advisor Program, see http://www.mntca.org/.

[31] For more information on the Linking Habitat Restoration to Bioenergy program, see http://www.dnr.state.mn.us/grants/habitat/biomass.html.

There are numerous industries that either directly or indirectly support one another regarding urban wood use in the Twin Cities. These include a large biomass user (District Energy) which serves as an anchor industry, medium to small-sized biomass users, biomass suppliers, greenhouse operators, tree service firms (private arborists), mulch and chip producers, landscapers and garden centers, lumber wholesalers, lumber dryers, urban saw log reclaimers, green building businesses, food cooperatives and related "natural" businesses, sawmill operators (conventional), custom portable mill operators, tree nurseries, cabinet and furniture makers, habitat and ecological restoration providers, land clearers, and municipalities (public arborists).

To demonstrate the interconnectedness of many of these various industries, consider the following (real world) Twin Cities scenario. A (1) tree service firm provides quality saw logs to a (2) lumber reclaimer who uses a (3) contract sawyer for milling the logs and a (4) custom dry kiln for lumber drying services. After the lumber has been dried, the urban log reclaimer manufactures products that are sold wholesale to various retailers including (5-7) three green building suppliers, (8-9) two food cooperatives, (10-18) green-oriented specialty gift shops with nine retail outlets, (19-21) three secondary manufacturers and (22) a hardwood flooring company. Also, the tree service company that supplies the logs to the reclaimer has options for lower value wood including selling low-end logs to a (23) pallet mill and chips to a (24) biomass energy user. Therefore, in this example, two dozen businesses are directly involved in the manufacturing and marketing of urban wood products originating from tree removals by one tree service firm. In addition, thousands of end users of the "final" products (energy for heating and cooling, pallets for industrial uses, hardwood flooring, cutting boards, etc.) are involved in the cascading impact of one tree service firm.[32]

Recap

Supporting and complementary industries are key to cluster development and success. The Twin Cities urban wood cluster provides strong evidence of such activity.

Entrepreneurship and Innovation

Entrepreneurial thinking by the leadership of cluster businesses, governments and supporting organizations is crucial to success. Entrepreneurship is instrumental in helping identify niche markets, stimulating innovativeness, and in developing competitive advantage.

[32] In addition to the products outlined in this real-world example, any woody material that finds its way into the Twin Cities mulch market will likely be distributed through tree nurseries, landscapers, and garden centers, bringing the total to a minimum of 27 impacted businesses.

Image 13, Caption: District Energy St. Paul developed an innovative biomass educational project, including several outdoor interpretive panels, with its next-door neighbor, the Science Museum of Minnesota

As noted earlier, District Energy St. Paul is not only a large anchor industry for the urban wood cluster in the Twin Cities but an organization with entrepreneurial and innovator characteristics as well. When District Energy was first evaluating the opportunity to use urban wood as a fuel source for its CHP plant, raw material was to be obtained directly from tree service firms and other producers. However, due to fluctuations in raw material delivery (quantity and timeliness) as well as quality of the product and other logistical issues, District Energy realized that a different "raw material model" was needed to lessen challenges. Consequently, a closely affiliated partner—Environmental Wood Supply (EWS)—was created to procure all wood used by the CHP plant. EWS also was responsible for developing agreements with communities, private arborists, loggers, and other entities that were potential wood suppliers for the CHP plant and District Energy. Another component of EWS was managing a "wood yard" at a nearby site so as to maintain a 30-day supply of fuel. Currently, EWS pays a "gate rate" at their wood yard of $3/yard for chips and $2.50/yard for mulch; no charge is assessed for logs and branches (free tip fee for producers). EWS also provides to communities/wood handlers the grinding of tree debris (at locations throughout the Twin Cities metro area) and trucking to the CHP plant.

A second example of entrepreneurship and innovation in the Twin Cities urban wood cluster is Wood from the Hood. Founded by Rick and Cindy Siewert of Minneapolis in 2008, Wood from the Hood obtains logs from tree service firms and converts them into an array of products including flooring, paneling, cutting boards, cribbage boards, picture frames, coasters and more. Logs are sawn on-site by a custom portable mill operator[33] and dried by a custom dryer; Siewert also built his own 300 board foot kiln. The dried lumber is finished and assembled into products at Siewert Cabinet (a family business since 1965). Wood from the Hood typically sells its products through a number of retail outlets including a green builder, flooring company, food cooperatives, and specialty stores. All products—from flooring to cutting boards—are inscribed with the zip code (neighborHOOD) from where the wood was obtained (see Case Study #3).

An example of entrepreneurship and innovation in the public sector is demonstrated by the Minneapolis Park and Recreation Board (MPRB). In the recent past, MPRB paid as much as $318 per hour for tub grinding services at one wood processing site while also incurring a tipping fee for wood residue at a second site. In total, approximately $100,000 was spent annually on

[33] As of April 2010, about 50% of the logs are processed on-site (at Wood from the Hood) with the remaining 50% processed off-site.

tree disposal. Today, due to markets for landscape mulch and biomass, the MPRB was able to negotiate an innovative lease agreement with a private wood recycling firm where MPRB delivers limbs, brush, and large trees (> 18" diameter) to a processing site in the city. In return, the recycling firm pays MPRB $75,000 annually and provides free tipping at a second processing site. Also, MPRB uses their own wood chippers to produce chips from logs not diverted to the lease site (< 18"). MPRB provides the material free-of-charge to homeowners and sells a large volume of the chips and stump grindings to a local nursery where they are used as a potting medium. In return, the nursery pays the MPRB $75,000 for the product. These two revenue streams—lease arrangement and chip sales—are "cost avoidance" strategies as they enable the MPRB to turn an annual expense into an innovative revenue producing operation, thus saving tax payer money while providing a raw material in demand by local industries (see Case Study #2).

Recap

Entrepreneurship and innovation are crucial for the success of business clusters. The Twin Cities urban wood cluster has many examples of these characteristics including large—District Energy—as well as small businesses—Wood from the Hood. The Minneapolis Park and Recreation Board—a public entity—demonstrates that entrepreneurship and innovation are not limited to only private industry. Successful spin-off and affiliated businesses are additional elements of successful clusters and both are evident in the above examples.

Access to Raw Materials, Markets and Transportation Networks

Access to raw materials (inputs) and markets is crucial to cluster development and long-term viability. A dependable flow of raw materials and stable markets for products and services are key to sustainable clusters. An adequate transportation infrastructure is needed to ensure access to raw materials and markets.

The Twin Cities supports an array of urban tree-based businesses due to its ample raw material supply. On a metropolitan-wide basis, the Twin Cities generates about 450,000 green tons of urban tree residue annually (estimate based on a recent study).[34] Minneapolis, for example, has approximately 1 million urban trees. Although many of these trees are small, over 25% are 13 inches or larger DBH.[35] At a conservative 1% annual removal rate (due to storms, pests, construction, etc.), the volume available to large and small businesses, entrepreneurs, and other tree "reclaimers" is significant.

In addition to a significant annual "harvest" of raw materials, the Twin Cities metropolitan area is home to roughly 2.9 million people. Consequently, markets for energy, landscape materials

[34] Green Institute. 2007. Renewing Rock-Tenn: A Biomass Fuels Assessment for Rock-Tenn's St. Paul Recycled Paper Mill. See http://www.greeninstitute.org/media/documents/RenewingRock-Tenn_BiomassFuelsAssessment_GreenInstitute_032907.pdf.

[35] For additional information on the urban tree inventory in Minneapolis, see http://www.na.fs.fed.us/urban/treespayusback/vol1/ufore%20mpls%20summary.pdf.

(mulch), lumber, specialty wood products, etc., are robust. Producers of urban wood products can advertise, sell, and distribute their items locally to a large and growing population.

The Twin Cities are at the crossroads of two interstate highways (I-94 and I-35) which assist in moving raw materials and products to market in a relatively efficient manner. Movement of materials is also facilitated by the fact that public transit is growing in both St. Paul and Minneapolis, helping to reduce congestion on streets and highways.

Recap

Access to raw materials and markets is evident in the Twin Cities urban wood cluster. Compared to some rural forested regions where timber (raw material) availability is dependent on government policies/actions and markets are hundreds of miles distant, the Twin Cities has a relatively steady flow of material and nearby markets.[36] The interstate highway system in and around the Twin Cities facilitates the transport of raw materials and products.

Leadership, Commitment and Collaboration

Leadership by a third party (industry, non-profit organization, public entity, etc.) is often needed to coordinate activities of stakeholders involved in developing a business cluster. An umbrella organization can help cluster businesses and organizations identify niche markets, assist with workforce training and development, seek financial resources, improve networking among cluster members, educate businesses about the benefits of clustering, and gain political support for the cluster. It is important that cluster stakeholders, representing industry, government, and supporting organizations work together to create a long-term vision for the cluster and use strategies and policies that support cluster development.

The Twin Cities urban wood utilization cluster has received outstanding support and leadership from a number of organizations. Three of these key stakeholders are highlighted below.

The Minnesota Shade Tree Advisory Council (MnSTAC), as described previously, has been active in urban forestry issues since 1974. Although MnSTAC's primary focus is not utilization, the organization has contributed immensely by providing a vision for urban forestry and serving as a collaborator and organizer of many educational and related events. Attendees at the monthly MnSTAC programs cross boundaries and represent a who's who of the Twin Cities urban forestry community. MnSTAC members have traditionally thought beyond just "tree planting" and embraced a big picture outlook. When major issues arise, MnSTAC has provided leadership and advocacy in convening special task forces such as the utilization assessment and feasibility study in the 1990s.

The University of Minnesota (U of M), through its sponsorship of the Shade Tree Short Course (STSC), has provided the leadership for education and training since 1963 (see above). This is

[36] A steady-flow of urban raw material is actually a "minimum flow" as volumes available for recovery can increase significantly immediately after a major weather event or pest outbreak.

especially true for the practicing arborist who needs hands-on training and up-to-date practical information that can be used on a daily basis in the field. Also, the University's 4-year degree program in urban forestry has provided a network of graduates for numerous employers in the Twin Cities. This has created a synergy between the University and its many collaborators (communities, private arborists, non-profit organizations, etc.). Outreach by U of M Extension wood products specialists through publications, newsletters, and workshops (as examples) have also contributed to this effort.

The Minnesota DNR, Division of Forestry, has a long history of providing technical assistance to the forest products and related industries and organizations in the state. The DNR has maintained a leadership role in assisting with urban wood availability assessments, market studies, processing and storage options, economic assumptions and more. During the period of District Energy's investigation into a woody biomass system, the Division of Forestry had an assigned wood products specialist devoted to the Twin Cities and surrounding metropolitan area.

Recap

The Twin Cities has been blessed with a number of organizations and individuals who have provided leadership and commitment through a collaborative process to support an urban-based wood cluster. MnSTAC has been the primary advocacy group for urban forestry while supporting many educational efforts over the years. The University of Minnesota manages the popular Shade Tree Short Course, provides undergraduate training in urban forestry, and supports a wood products extension outreach effort. The DNR Division of Forestry has been the "go-to" organization for technical assistance relating to urban wood use.

Business Climate

A supportive business environment is crucial to the development and strength of business clusters.

Urban wood utilization is essentially a *recycling* activity since tree removals are diverted from the waste stream into useful products. Since recycling is typically considered a *green* activity, the utilization of discarded urban trees is acknowledged as a green behavior. The Twin Cities metropolitan area is recognized for its green attitudes and behavior, so it is not surprising that public and private acceptance is high for the development and growth of an urban wood utilization cluster.

Image 14, Caption: 2010 Live Green Expo in St. Paul included over 18,000 attendees and 200+ exhibitors including urban wood reclaimers

According to a recent survey, the Twin Cities of Minneapolis and St. Paul rank as the11th greenest metropolitan area in the nation (out of 41 areas).[37] Minneapolis is home to over 160 green businesses according to the city's Community Planning & Economic Development Department and the city has a commitment to help green businesses succeed as a part of its economic development strategy. Minneapolis also adopted a sustainability initiative in 2003 and enacted policies that require LEED building Silver Level requirements, the use of green cleaning products and putting a preference on environmentally friendly purchasing.

The Twin Cities also is home to the University of Minnesota's Institute on the Environment, the popular Science Museum of Minnesota located in St. Paul, and the Bell Museum of Natural History in Minneapolis. Also, a new professional baseball stadium was opened in Minneapolis in 2010 and is the considered the greenest of any stadium in the country (LEED Silver Certification) with more than 30 percent of all installed materials made from recycled content and more than 70 percent of construction waste diverted or recycled.

On a broader scale, Minnesota is a hub for forest management and chain-of-custody certification, has a strong farmers market and Community Supported Agriculture movement, and has numerous active environmental groups, 80 of which are members of the Minnesota Environmental Partnership (MEP) and supported by over 450,000 Minnesotans. The Live Green Expo in St. Paul, with a mission for the past eight years of inspiring people to live healthier and more sustainable lives, was sponsored in 2010 by the MEP. Another sign of Minnesotan's environmental leadership occurred in November 2008, when in the midst of the worst economic news in a generation, voters statewide approved a sales tax increase to support the environment.[38]

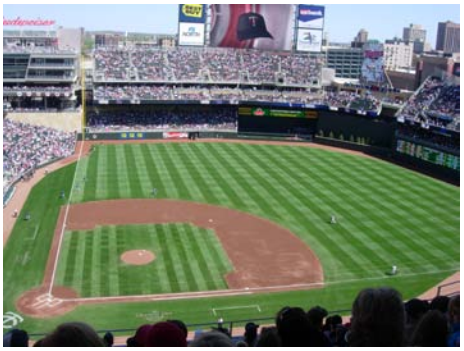

Image 15, Caption: Target Field, home of the Minnesota Twins, is considered the greenest stadium in the country

The previous examples, plus many more, attest to the greenness and environmental literacy that abounds in the Twins Cities and throughout the state.

Recap

Minnesota, and in particular the Twin Cities, has a business climate and citizenship that supports green industries, initiatives and policies. Urban wood utilization activities have directly benefited from this *green* business environment and mindset.

[37] Source: *Minneapolis St. Paul Business Journal*, April 9, 2010.

[38] See http://dovetailinc.org/files/DovetailNatResPriorities0309.pdf for the Dovetail Partners, Inc. report titled: *Building a Constituency of Forest Productivity Advocates: What Do We Know About Minnesotan's Natural Resources Priorities?*

Recommendations for Advancing Urban Wood Utilization Clustering in Communities

Urban wood utilization efforts in the Twin Cities contain many key ingredients of a successful economic cluster. Observations and lessons learned from the Twin Cities cluster lead to the following recommendations within the framework of cluster development.

- *Conduct a feasibility study in the early stages of cluster development* – Examine raw material availability (quantity and quality of tree removals) and existing disposal and/or utilization practices including potential markets.

- *Evaluate economic conditions, existing infrastructure, labor resources and other factors that impact the overall business climate* – This effort can be included in the feasibility study if time and resources permit; if not, a separate analysis should be conducted. An element to include in this analysis is the receptivity or "personality" of a community and its inclination to embark on a wood utilization program. For example, Minneapolis and St. Paul were two of the first cities in the U.S. to ban the land filling of trees, setting the stage for aggressive pursuit of urban wood utilization activities.

- *Collaborate with stakeholders from industry, government and supporting individuals and organizations* – The key is to get buy-in from various stakeholders and develop a vision for the urban wood utilization cluster including next-steps and action items.

- *Engage the leadership of a key, external organization to coordinate activities, facilitate development and to gain policy support* – The leader or champion does not necessarily have to possess a utilization background but should strongly support the utilization effort and should have the ability to use his or her position to "rally the troops." A local and respected urban forestry leader could fill this role.

- *Secure funding* – Financial resources—both private and public—are important to support feasibility studies, technology development, workforce training, capital investment, applied research and other project components. Funding sources can include national, state, or local initiatives. Programs directed at wood utilization and urban forestry efforts are obvious avenues for obtaining funding but broad-based recycling grants, small business loans, and bio-based energy programs (as examples) can also provide direct financial support for an urban wood cluster.

- *Focus on education and engagement of entrepreneurial thinking and innovation* – Support the creation of a position with the assigned duties of "urban wood utilization". A person in this capacity can efficiently focus on education and training opportunities for arborists (log manufacturing, grading, transport, etc.), assist and encourage start-up urban wood businesses, conduct utilization-based feasibility studies (see above), and become a focal point for technical/hands-on utilization activities.

- *Nurture supporting and complementary industries* – An important task of either the cluster champion, urban wood utilization specialist, or a key stakeholder(s) is to facilitate partnerships and relationships (formal and informal) between the numerous industries (and organizations) that are in the cluster. This effort should show cluster members how their businesses are inter-connected and dependent on one another from procurement of raw materials (such as a boulevard tree) to production, marketing and distribution of end-products (mulch, picture frames or energy from biomass).

- *Recognize the differences in types of clusters and act accordingly* – One strategy for cluster development is to select or nurture one of four models as a starting point, or build upon what already exists (see earlier sidebar). This can help focus efforts and provide a framework for collaborative work.

Although not a cluster strategy per se, the Twin Cities case study illustrates how a strong, progressive urban forestry program can serve as a foundation for wood utilization activities. Consequently, targeting communities with vibrant urban forestry programs appears to be an excellent starting point for developing community-based wood utilization projects. Also, urban wood utilization complements existing green and recycling/reuse initiatives in a community. Forging partnerships with these on-going efforts will foster community goodwill, expand recognition and establish legitimacy to an emerging urban wood utilization program.

Bottom Line

Business or economic clusters offer a comprehensive research-based approach for starting and/or expanding an urban wood utilization program. Many communities likely already have one or more elements (ingredients for success) of clusters in place. The key for communities, industries, or organizations seeking to develop an urban-based wood cluster is to recognize what elements (ingredients) are either, present, absent or need bolstering. As described in this report, the Twin Cities urban wood utilization cluster provides a case study of how key ingredients can build upon one another to create an emerging and successful cluster.

References (Part II)

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Bratkovich, S., Bowyer, J., and Fernholz. K. 2010. Urban Wood Utilization and Industrial Clusters: A Twin Cities Case Study. May 20. Dovetail Partners, Inc. (http://www.dovetailinc.org/files/DovetailUrbanTC0510.pdf).

Part III.

Case Studies

This section showcases three examples of Twin Cities-based wood utilization efforts and their relationship to clusters. The case studies highlight how the industry (business or economic) cluster model fits within the context of (1) a legislative program closely linked to a biomass energy producer; (2) an urban forestry program operating within a public park and recreation board; and (3) a small entrepreneur (start-up business).

Case Study #1: Linking Habitat Restoration to Bioenergy

Background

In the Twin Cities metropolitan area, as in and around many U.S. communities, invasive plants and other "ecologically inappropriate" shrubs and trees are becoming not only a nuisance but a threat to natural ecosystems and habitats. Some habitats, such as oak savannas, are "critically endangered". European buckthorn is one invasive species that is invading ecosystems in the upper Midwest, including east-central and southern Minnesota. Most communities, park districts, and public and private land managers are financially strapped and seeking new funding sources to combat the spread of invasive species and other "ecologically inappropriate" woody vegetation.

At the same time, a growing number of entities in the region are looking for alternative sources of energy. District Energy St. Paul distributes thermal energy produced by a biomass-fueled combined heat and power (CHP) plant in downtown St. Paul. The CHP plant is a large consumer of woody biomass, using upwards of 1,000 tons per day of tree trimmings and other wood residue. This woody biomass is procured through Environmental Wood Supply, an affiliate organization that locates and processes wood residues from within the Twin Cities metro area.

Recent legislation created an innovative project and provided funding that brought these two seemingly unconnected "situations" together.

Legislative Action Forges New Partnerships

In 2007 the Minnesota Legislature appropriated $500,000 to the Department of Natural Resources (DNR), Division of Ecological Resources, to implement a new and innovative project titled "Linking Habitat Restoration to Bioenergy". The funding helped facilitate habitat restoration efforts that might not have otherwise occurred and made the woody material generated as a by-product available to District Energy and other bioenergy facilities.

By law, all restoration projects are within 75 miles of St. Paul based on transportation distance determined by Environmental Wood Supply and an informal survey conducted by the DNR Regional Ecologist that identified over 7,000 acres of public and private land suitable for treatment within this distance.[39] These lands are typically prairie, oak savanna, or woodlands overgrown by "ecologically inappropriate" woody vegetation. Examples of identified areas for treatment included city, county and state parks; non-governmental organization lands; private lands (small landowners primarily); state natural areas; state wildlife management areas; and national wildlife refuges. Many of the identified sites are within the metropolitan area of Minneapolis and St. Paul.

In order to implement the project, a 50% part-time project coordinator was hired in December 2007. The project coordinator was responsible for developing project selection criteria and implementation guidelines for grantees (landowners), initiating a Request for Proposals process for selecting sites for funding, establishing a list of woody biomass removal service contractors, developing a working relationship with Environmental Wood Supply, monitoring (on-site) restoration and biomass removal activities, documenting results and preparing reports, and numerous other overall coordination duties.

To date, 13 biomass removal projects have been completed. Four of the projects include urban or community park land (cities of St. Paul, Mendota Heights, Burnsville and Sherburne County). For all of the projects, a total of 272.7 acres were treated, generating over 10,392 tons of woody biomass delivered to the CHP plant in downtown St. Paul. The average total cost per ton as paid to service contractors (for cutting, moving, and staging wood only) was approximately $43. Also, nearly 40 private, public and non-governmental organizations were either hired by the grantees (landowners) or donated their services to mark trees and boundaries, harvest trees, stack brush, prepare wood for collection, treat stumps, plant replacement trees and shrubs, etc.

The project is successful in starting and accelerating the restoration of native habitats, providing an alternative energy source, supplementing landowner resources for habitat restoration and management, and reducing the amount of woody biomass that might otherwise be burned on-site due to lack of resources to cut and transport large quantities of material. The project also enables post-treatment activities such as site mowing, seeding and prescribed fire to be done in a cost effective and labor efficient manner.

Six elements are key in the success of the project.

- Collaboration among the various stakeholders
- Legislation and appropriation of funds (spearheaded by a "champion")[40]

[39] The 7,000 acres represents land suitable for ecological restoration with current management plans in place calling for removal of woody vegetation. The survey that estimated this acreage was not intended to be comprehensive but rather provide a sense if there was a sufficient land base to launch the envisioned project.

[40] There were two primary "champions" of the legislative effort. A leader from a metro-area environmental group provided the project design and legislative language, and sparked interest within the DNR by convening several meetings of diverse professionals. A metro-area Senator championed the effort in the state legislature in the face of considerable skepticism that such a program would provide meaningful amounts of biomass for the funds appropriated. Also vital to the successful initiation of this project were "early supporters" who grasped the significance of such a project for ecological restoration.

- DNRs ability to coordinate all facets of the project in conjunction with land managers on-the-ground
- Biomass user (market) able to use by-products of restoration activities
- Service contractors available to perform restoration work and prepare biomass
- Sufficient quantity of raw material (woody biomass)

An Example: Indian Mounds Regional Park

Indian Mounds Regional Park in St. Paul is illustrative of how the Linking Habitat Restoration to Bioenergy project facilitated the use of urban wood for biomass purposes. It also demonstrates the interconnectedness of the six key elements for success.

Indian Mounds was a restoration project for oak savanna, oak forest and remnant prairie. The project treated (harvested) 11.7 acres and produced an estimated 372 tons of biomass at a cost of $27,000 (funding paid to contractors to cut, move and stage material). The project followed management plan recommendations developed by Great River Greening, a local non-profit. A unique aspect of the plan is that it accounted for a state threatened rare plant species (*Besseya bullii*) that was documented in the park in the 1990s.

Image 16, Caption: Before and After pictures from Indian Mounds Regional Park

The Linking Habitat Restoration to Bioenergy project coordinator facilitated the overall project from site selection to documenting results, with the City of St. Paul managing the day-to-day project activities. The City contracted with Natural Resources Restoration, Inc. who in turn utilized Sentencing to Service (STS) crews for hand-cutting and stump treatment of buckthorn through early summer of 2008. The City of St. Paul cut large trees and additional buckthorn from July through September. Community volunteers were used to move and stage material for transport as well as plant native replacement trees and shrubs. The raw woody biomass was hauled (less than one mile) by City and EWS employees to the City of St. Paul's Wood Recycling Center (managed by EWS); following processing by EWS the biomass fuel was transported to the combined heat and power plant in downtown St. Paul.

Numerous partner organizations assisted with additional funding and coordinating volunteer activities including Hands On Twin Cities, National Park Service, Great River Greening – Corporate Volunteerism Council, Church of Latter Day Saints, REI, Minnesota Conservation Corps and Minnesota Teen Challenge. Funding from the Ramsey-Washington Metro Watershed District was used for erosion control and soil stabilization of the steep slopes addressing a contingency of biomass project funding. The City of St. Paul provided additional resources for buckthorn control and to treat additional acres.

Consequently, this project demonstrates that a public park in a major metropolitan area can implement a major restoration project and provide a raw material for a nearby renewable energy provider. The project also demonstrates how public funding, private contractors, and local volunteers can create a win-win situation for land restoration objectives and urban wood utilization.

Next Steps

By the end of December 2009, the majority of the original funding for the project had been expended. In order to continue the program, the DNR requested funding from the Legislative-Citizen Commission on Minnesota Resources (LCCMR). A total of $600,000 has received final legislative and gubernatorial approval to continue the effort. The new funding will expand the scope of the project beyond supplying raw material to District Energy St. Paul and include additional biomass users such as landscape supply firms.

For additional information on the Linking Habitat Restoration to Bioenergy project, see http://www.dnr.state.mn.us/grants/habitat/biomass.html.

Key Ingredients of Successful Economic Clusters

A number of ingredients of successful economic clusters are evident in this case study. Among them are:

- *Supportive Government Actions including Financial Grants* – The legislation, and appropriation of funds, to link habitat restoration to bioenergy is not only a unique effort but one dependent on public policy. Local government units (LGUs) such as cities and counties also were supportive of the project and key to its success (most projects had to be approved by LGUs before they could move forward).
- *Education and Technical Support* – Critical to success was the DNR Division of Ecological Resources' ability to coordinate all facets of the project. Also, numerous non-profit and other organizations provided valuable expertise and assistance. Specific educational components involved the media, DNR and grantee web pages, project signage, press releases and newspaper articles, a township board meeting, letters to adjacent landowners, and University of Minnesota students who marked the site for applied learning.

- *Access to Raw Materials, Markets and Transportation Networks* – The proximity of habitat restoration sites to a biomass market were vital for this project to succeed. Also, an adequate road system was in place to move raw material to final processor.
- *Supporting and Complementary Industries* – Service contractors were available to perform restoration work and prepare the biomass for processing and transport. Without such supporting and complementary industries, including a host of active organizations, the project would have failed.
- *Entrepreneurship and Innovation* – The development and evolution of District Energy into a cogeneration biomass plant was a remarkable achievement that depended on an entrepreneurial spirit, long-term vision, and innovative actions. Spin-off or affiliated businesses/partnerships are also features of growing clusters and the creation of Environmental Wood Supply is illustrative in this regard.
- *Business Climate* – The popularity of recycling and reuse (green mindset) in the Twin Cities metropolitan area, and the importance of supporting renewable energy initiatives as evidenced by the District Energy plant, created a business environment conducive to an innovative way of utilizing local wood residues.

Sidebar 7: District Energy St. Paul

District Energy St. Paul served its first customer in 1983 and was St. Paul's response to the energy crises of the mid- and late-1970s. The venture was a collaborative effort between the City of St. Paul, State of Minnesota, U.S. Department of Energy and businesses located in the downtown area, all of whom wanted to prove that a hot water district heating system could be successful in a state with cold winters.

St. Paul Mayor George Latimer is credited as the visionary for District Energy. Following a 1979 fact-finding mission by a Minnesota delegation to Europe, Latimer led an effort to lobby state and federal governments for help in adopting Swedish technology to solve the heating problems of the city. The original system was designed to be as energy efficient as possible, be fuel flexible, and provide stable rates for customers.

In 1993, ten years after the successful start-up of the district heating system, District Energy began offering district cooling to downtown building owners. In 2003, a combined heat and power plant (CHP) fueled primarily (70%) by urban wood waste[1] began serving the District Energy system. Currently, the CHP plant simultaneously produces 65 megawatts of thermal energy for District Energy and 25 megawatts of electricity for Xcel energy. It is the largest wood-fired CHP plant serving a district energy system in the nation, using about 280,000 tons of clean urban tree trimmings, forest residuals, and other wood waste per year.

Today District Energy heats more than 185 buildings and 300 single-family homes (31.1 million square feet) and cools more than 95 buildings (18.8 million square feet) in downtown St. Paul and adjacent areas. District Energy's long-term goal (as stated in their 2008 annual report) is "to reduce our fossil fuel usage to zero as soon as possible."

For more information on District Energy and its affiliated businesses, see http://www.districtenergy.com/index.html.

Sidebar 8: Environmental Wood Supply

Environmental Wood Supply (EWS) is an affiliate partner of District Energy St. Paul. EWS was created in 2000 when biomass marketers had problems with wood pricing, volume, storage and delivery. It became clear that a closely affiliated wood procurement company was needed to lessen challenges.

Today, EWS is responsible for all aspects of the wood program that serves the CHP plant and District Energy. This includes purchasing, grinding and trucking, storage, and delivery of the boiler fuel to the plant in downtown St. Paul. EWS has processing equipment, employs workers for grinding and transporting wood and manages a wood yard (on land owned by St. Paul) for commercial biomass suppliers. Municipalities (or commercial entities) within a 50-75 radius of the plant can have their wood processed on a regular or intermittent basis. This translates to a cost-avoidance scenario for many municipalities strapped with shrinking budgets and slapped with a mountain of wood debris following a storm or other major event. In addition to St. Paul, EWS has partnered with the City of St. Louis Park (Minneapolis suburb) to manage a wood marshalling yard that the City and City contractors can use to collect and store tree debris until processing and transport by EWS.

EWS also buys wood for conversion into boiler fuel. Wood delivered to the EWS wood yard in St. Paul (three miles from District Energy) is purchased at a rate of $3/yard for chips and $2.50/yard for mulch (2009-2010 prices) with logs and branches accepted but no payment is made. Pallets, 2x4's, clean dimensional lumber, etc., is also accepted at the wood yard where a 30-day inventory is maintained.

EWS has experienced an uptick in the competition for "waste" wood, especially in the landscape mulch market. Due to the economic recession, wood available from land-clearing operations is negligible. Consequently, during the winter heating season supplemental wood is purchased from loggers in northern Minnesota at market rates. With the discovery of the emerald ash borer in the Twin Cities, EWS is well positioned to convert a sizable portion of the EAB-removed trees into biomass for use by District Energy.

For more information on Environmental Wood Supply, see http://www.ever-greenenergy.com/clients/woodsupply.html.

Case Study #2: Minneapolis Park and Recreation Board—Forestry Division

Overview

The Minneapolis Park and Recreation Board (MPRB) Forestry Division manages and oversees the planting, pruning, and removal of trees on public property, which includes 6,400 acres of park land. The Forestry Division also cares for nearly 200,000 boulevard trees on 1,078 miles of streets. Since 1979 Minneapolis has been annually recognized as a Tree City USA by the National Arbor Day Foundation. Minneapolis also has received the Tree City USA Growth Award annually since 1994, on three occasions the Arbor Day Award of Excellence (most recently in 2009), the Minnesota Society of Arboriculture Merit Award in 2006 and 2007, the Minnesota Shade Tree Advisory Council Committee Award nine times since 1992, and the National Roadside Vegetation Management Association Award of Excellence in 2005.

Staffing, Equipment, and Programs

The MPRB Forestry Division employs approximately 86 individuals including field personnel such as Arborists (41), District Foresters (5), Arborist crew leaders (19), and mobile equipment operators (19). Office staff includes a Director of Forestry, Forestry Programs Manager, Community Forestry Coordinator, Forestry Supervisor, and office support personnel.

Major field equipment owned by MPRB includes seven bucket trucks, eight chipper trucks (seven are 30-yard trucks), several flat bed trucks and trailers, and one log loader/clam truck. Additional equipment (and operators) is rented on an "as needed" basis during the year (especially after severe weather events). The annual budget for the Forestry Division (2010) is approximately $10 million per year.

The Forestry Division is responsible for eight program areas:

- Mature Tree Maintenance – includes trimming, shaping and removing of dead wood from all mature street trees and certain park trees on a rotational basis.
- Small Tree Maintenance – includes trimming, shaping, and training of newly planted trees for the first five years after planting.
- Tree Removal – focus is primarily on elimination and replacement of diseased elm trees and ash trees.
- Stump Removal – work is contracted to private firms.
- Reforestation – includes tree planting, mulching, watering, and other care during the first year after planting.
- Insect and Disease Control – includes prevention and early diagnosis of tree pests.
- Inspection and Surveys – includes work done on contractual tree plantings, private tree removal, stump removal, and inspections made of the total urban forest for diseased and insect infested trees (primarily oak wilt, Dutch elm disease and emerald ash borer).
- Preventive Maintenance and Minor Storms – includes tree bracing, bark and limb repairs, etc., and clean-up of storm-felled limbs and debris from storms of minor nature (not severe wind, ice storms, or tornadoes). Also, the MPRB has the leadership role for

coordination and clean-up of trees and woody debris after major storm events in Minneapolis.

Brief History of Wood Utilization Efforts

The impact of the Dutch elm disease was the stimulus for the first major wood utilization effort by the MPRB. During the peak years of 1977-78, over 52,000 elm trees were removed from public and private property in Minneapolis. A wood "recycling" yard was established in the City of St. Paul and an agreement was made for Minneapolis (and other communities) to dispose of their wood at this site (called Pig's Eye). The goal of the Pig's Eye site was to process the wood into useable products. However, a lack of markets and the low quality of wood resulted in most material being chipped. In addition, due to technological difficulties and the sheer volume of wood residue generated during a short time period, the recycling initiative became more of a disposal program with some of the wood merely open-burned. Also, there were transportation issues (trucks stuck in traffic) which resulted in cost increases so from the viewpoint of the MPRB the effort was scarcely considered a utilization success.

During the early 1980s whole tree chippers were better developed and MPRB adapted them for use on the street. Rental agreements with private firms were used for these initial efforts. Some of the chips generated at this time were used as mulch for tree plantings but there was little use elsewhere in Minneapolis for chips (the neighborhood chip site program had not yet been developed). However, using wood chips for heating was starting to gain interest at this time (following the energy crises of the 1970s) plus the contractors doing the chipping located a few markets including farmers (cattle bedding) and manufacturers (roofing felt for a shingles producer).

Later in the 1980s, the MPRB explored the idea of marketing saw logs. A couple log yards were set-up in Minneapolis but problems were encountered. First, MPRB personnel expended a lot of time making suitable saw logs from "tree trunks" (cutting out forks and crotches, etc.). Second, the debris left-over from the log-making had to be disposed which created another unforeseen cost. Third, the log yards were viewed by some people as a public dump so there was a need to police the sites, resulting in additional costs. Finally, an inquiry sent to log buyers and sawmills in the area to purchase MPRB logs generated no response. Consequently, the log program as originally envisioned was discontinued.

The good news from the ill-fated saw log marketing program is that a procurement forester for a nearby sawmill expressed interest in a trial program with the city. The forester (representing the sawmill) and a Department of Natural Resources forest product specialist provided training to MPRB personnel on saw log specifications including species, diameter, length, etc. MPRB crews then 'manufactured' logs to these specifications. Once a sufficient quantity for a "load" was accumulated the procurement forester would arrange for the logs to be trucked to the sawmill with MPRB receiving a percentage of the log value. Although this arrangement returned money to the MPRB there were still significant costs involved from the tree felling to the actual manufacture of a quality saw log. In addition, some residents saw the log yard as a "beetle breeding area" (many of the saw logs were elm). Consequently, the hidden costs of the log marketing program and potential negative feedback from constituents forced the MPRB to eliminate the program.

Today, new markets for urban wood residue have created a different set of dynamics than existed in the ‘70s, ‘80s, and ‘90s. Wood that had a negative value 30 years ago is in demand today in the Minneapolis-St. Paul metropolitan area. Municipal-sourced woody biomass for energy generation, landscape mulch, soil amendments, and even saw logs have created opportunities for innovative public and private entities. The next section examines the current status of the MPRB wood utilization efforts.

Image 17, Caption: The Minneapolis Park and Recreation Board, Forestry Division, has created an innovative lease arrangement (cost avoidance strategy) with a private firm for trees larger than 18 inches in diameter

Current Status of MPRB Wood Utilization Efforts

Currently, there are three main “revenue” streams associated with the MPRB wood utilization program. These revenue streams can also be thought of as “cost avoidance” strategies as they have enabled the MPRB to turn an annual expense into a revenue producing operation, thus saving tax payer money while providing a raw material in demand by local industries.

#1 – During the recent past, MPRB paid as much as $318 per hour for tub grinding services at one local processing site plus paid a tipping fee for wood residue disposal at a second site. Today, the MPRB has two wood yards located strategically at the north and south sides of the city. Due to the strong markets for landscape mulch and, to a lesser extent woody biomass for energy, the MPRB was able to enter into an agreement with a private wood recycling firm. Beginning in 2008, the MPRB began leasing the MPRB-owned south-side wood yard (Ft. Snelling) for $75,000 per year. As part of the agreement, MPRB delivers limbs, brush, etc. (small material) and trees larger than 18 inches in diameter (large material) to the leased site where it is processed into mulch primarily (90%), biomass and related products. (The majority of the mulch material is processed on-site by the wood recycling firm and then shipped off-site to a coloring and bagging operation). In addition, the MPRB is granted free tipping at a non-MPRB north-side wood yard. The lease agreement and free tipping has enabled the MPRB to replace a $100,000 annual cost with a comparable revenue stream, thus avoiding costs, saving public funds, and facilitating the recycling of municipal trees.

#2 – As noted above, the MPRB has a fleet of chippers. These machines are capable of handling logs up to 16-18 inches in diameter. Chips generated by these machines either go to neighborhood chip sites (see below) or are transported to two staging areas where they are picked up by a private tree nursery and used as a mix with their container media (potting soil). The nursery is pleased with this arrangement since they can now use local wood chips that are

less costly than chips obtained from distant logging operations. The nursery also purchases stump grindings from MPRB since these grindings contain soil which is excellent for use as a potting medium (stump grinding is done by contractors hired by MPRB). The sale of chips and stump grindings annually generates approximately $75,000 in revenue (with the money returned to the MPRB general fund). This scenario is a win-win situation for both the nursery and the MPRB. (Note: This project was sent out for bids and three were received. The high (winning) bid price for chips was $4.25 per cubic yard with the nursery using their employees and equipment to transport the chips from the MPRB sites to the nursery; this results in minimal handling by MPRB personnel.)

3# - The third revenue stream for the MPRB Forestry Division is contract work for the Minneapolis Public Works Department and County Highway Department. Tree selection, planting, mulching, watering, and general maintenance of trees related to public works projects, including removals, is included in these contracts. Although much of this contractual work is not related to wood utilization per se, it demonstrates how a public entity engaged in municipal forestry can generate income. Annually, the MPRB receives approximately $50,000 (dedicated funding) for the tree-related "services" performed by the Forestry Division. Since the Forestry Division is responsible for maintenance of these trees in the future, it is logical to be involved in the initial stages of tree selection, planting, etc. Another benefit is that a share of the income from the contractual services goes into a tree maintenance fund.

Although it does not generate revenue, the 15 free woodchip distribution sites scattered among Minneapolis neighborhoods are responsible for "good will" among citizens. The woodchips are generated on a seasonal basis by Forestry Division personnel (using MPRB chippers) and are available to any city resident who can use them (mulching for trees and other landscape plants are popular uses). In addition, in-house chips are used for mulching new tree plantings, as a cover on trails and dog runs, and for other MPRB purposes. The program also benefits the MPRB from a "cost avoidance" perspective since less fuel is used to transport chips, operator drive time is greatly reduced, and short travel distances reduce wear and tear on trucks.

Keys to Success

Business Person Perspective – A key factor in the success of the MPRB wood utilization program is their 'business person perspective' in managing all aspects of the operation. The Forestry Supervisor (who is responsible for over-seeing all field work) worked for 12 years for a private tree service firm. He brings a 'business philosophy' to all aspects of tree trimming and removal, equipment needs, wood transport and use, etc. For example, evaluating opportunities to minimize handling of wood, comparing the costs and benefits of equipment rentals vs. purchases, repairing machines on-site (in the field) whenever feasible (versus shutting down operations for a day and returning machines to headquarters for repairs), and striving for maximum efficiency in all aspects of the job are just a few of the 'business person' actions taken by the Forestry Supervisor to improve overall performance. An example of maximized efficiency is the immediate removal of "rakings" (leaves, twigs, small branches) which are transported away from the job site thus preventing a second trip to the site for clean-up purposes. Also, if opportunities arise for selling a product or service (such as the wood yard lease and the sale of chips), then a notice of intent is developed and a competitive bidding process is initiated that is open and fair to

all parties. This innovative, entrepreneurial, and business-minded approach enables the Forestry Division of the MPRB to run their operation similar to a private for-profit firm.

Sidebar 9: Log Loader: Rent or Buy?

Whenever a new piece of equipment is needed for efficient operation in the field, the question arises: "Should we (MPRB) rent the equipment on a part-time basis or buy the equipment?" This question arose in 2004 when Dutch elm disease resurfaced to such a degree that multiple log loaders were needed for tree removals. The solution was to analyze the log loader (rent vs. buy) from a business perspective. Although the cost of a new truck seemed like a big expense, a 3-year rental price amounted to more than the purchase price. Consequently, the log loader not only paid for itself but provided Forestry Division staff flexibility on when, where and how to use the truck. Also, the idea of purchasing a log loader was supported by other MPRB divisions (non-forestry) who could use the equipment for erection of large signs, moving large boulders, etc. Basically, a universal piece of equipment was now available to all MPRB units.

Engagement in Educational and Technical Support Programs – The MPRB Forestry Division places a high priority on education and training. For example, in the future in order to be hired as an arborist the applicant needs to be able to earn the credential of 'certified tree worker.' Once promoted to crew leader, employees are required to pass the certified arborist exam (certification for both tree worker and arborist is through the International Society of Arboriculture). Many communities do not have as strict a requirement but Forestry Division supervisory personnel believe their educational and training requirements have been quite important in operating a successful program. It's important to note that the Twin Cities has a wealth of education and training opportunities available including the annual Shade Tree Short Course (STSC) sponsored by the University of Minnesota and the Minnesota Tree Care Conference sponsored by the Minnesota Society of Arboriculture where CEU's (continuing educational units) for ISA certification can be earned. The Division's Forestry Program Manager has been on the STSC planning committee since the 1980s which contributes to the appropriate courses and workshops being offered to arborists both within and outside the MPRB. Annually, the MPRB invests approximately $35,000 in Forestry Division employees for education and training including certification, subject matter updates, and technical support.

Communications and Relationship Building – This is a key to success that takes many years to establish. Communications and relationship building is another way to describe 'networking'. For example, the Forestry Division Director noted that the value of sending employees to seminars and workshops is more than just the educational aspect of the program. He emphasized that employees who attend meetings become "known" and are in a better position to "network" with others about utilization ideas, tree pest problems, or other issues. For example, by being active in educational programs, serving as a volunteer on committees, and publicizing your program to the community and beyond, opportunities 'pop-up' that might not have otherwise (such as the MPRB wood chip sales to a private tree nursery). Also, the Forestry Division's Community Forestry Coordinator is vital in serving as a liaison with neighborhood representatives and local community leaders. The Coordinator keeps Minneapolis residents

"thinking about forestry" by engaging with them on tree planting, tree care, and other forestry topics.

Another example of communications and relationship building is the connection between the MPRB Forestry Division and the University of Minnesota (UMN). According to the MPRB Forestry Programs Manager, "We use our land-grant university [UMN] to the maximum including the departments of forestry, horticulture, plant pathology, entomology, and forest products. We also hire student interns from the "U" and provide some financial support to the university to support studies on Dutch elm disease and other pests. So we have a 'great circle of information flow' that helps support our program".

The MPRB Forestry Division also develops and maintains strong working relationships with the Minnesota Department of Natural Resource's Urban and Community Forestry program, the Minnesota Department of Agriculture, Minnesota Department of Transportation, Minnesota Shade Tree Advisory Council, Minnesota Society of Arboriculture and others. All of these connections make for an informed and effective workforce leading to a strong and vibrant municipal tree program.

Teamwork and Customer Service– Another success factor is the internal teamwork of the Forestry Division staff. Weekly meetings are held with headquarters and supervisory staff (Director of Forestry, Forestry Programs Manager, Community Forestry Coordinator, Forestry Supervisor, office support personnel and District Foresters). The five District Foresters, in turn, communicate and relay messages to the arborists, thus creating a bridge between supervisory staff (at headquarters) and field staff. A division-wide open door policy helps address problems before they develop, generates helpful suggestions for the conduct of business, eliminates unnecessary and negative 'surprises' to staff, and consequently, improves the overall program. Also, day-to-day teamwork at headquarters is enhanced by the physical lay-out of space—grouping of offices in a work-friendly arrangement—that enables staff to stay within earshot of one another.

A second example of teamwork is the detailed records maintained on daily "production" figures. For example, daily volume of chips produced and specific delivery point (two separate sites for chips sold to the tree nursery plus neighborhood sites) are tabulated by each of the five service area crews plus the three city-wide crews. Records also include the specific chip trucks used. All of this information is compiled in an electronic spreadsheet for ease of analysis.

Forestry Division personnel are focused on the reality that they work to serve the public. During summer months, as diseased elms are condemned and marked for removal, the Forestry office may receive over 100 phone calls a week. In addition, the creation of a direct Forestry email address has made electronic correspondence simple and easy. This direct connection with the public shows signs of steady growth especially with the discovery of emerald ash borer in the City.

The burden of dealing with these communications begins with the office support personnel who maintain a polite and professional image during the most challenging encounters. However, the courtesy extended to tax payers continues with the District Forester and all field staff. The

Forestry Division cultivates positive public responses and informs elected Commissioners. This has proven beneficial during budget allocations.

Focus on Urban Forestry (not other 'stuff') – Flexibility is important for the MPRB as staff and equipment is often shared between various departments. As budgets become tighter this pattern of sharing resources between departments will likely become more popular. Today, MPRB Forestry Division staff focuses on urban forestry and the tasks related to managing a municipal forest. Activities such as holiday lighting, snow plowing, street sweeping, and related tasks that sometimes get assigned to community forestry staff in other communities are not issues that confront Forestry Division personnel. The ability to concentrate solely on "tree work" has been an important element in the success of the Forestry Division.

MPRB: An Organization with History – The long history of the MPRB can be traced back to the 19th century. In 1883 the Minneapolis Board of Trade passed resolutions to secure legislation to create a Board of Park Commissioners. Later that same year the city ratified a Park Act. Consequently, parks, trees, lakes, trails and all the amenities of open space have been ingrained into Minneapolis residents for over 125 years. Today, the MPRB is governed by nine commissioners who—acting independently from the mayor and city council—are quite supportive and committed to an urban forestry program. Although rather unique in its structure and governance, the MPRB provides the Forestry Division a legacy and historical context in which to operate, as well as a successful model for other communities.

Links to the Cluster Model

A number of MPRB Forestry Division practices can be directly linked or related to successful industry clusters. The Division's *entrepreneurial and innovative spirit*, active *participation in education, technical and applied-research programs*, eagerness to *work with supporting industries and organizations*, motivation to *access raw materials and markets*, and a *leadership and collaborative mind-set* are just a few of the direct links to the cluster model.

Case Study #3: Wood from the Hood

Background

Rick Siewert and his family have been long-time innovators in the wood products and cabinet manufacturing business (see sidebar at end). In 2001 Rick became intrigued with another innovative woodworking idea: using local municipal trees as a source of lumber and value-added products. Rick's arborist friend, Stan Bratt of Bratt Tree Company,[41] first brought the idea to Rick of "reclaiming" trees in local neighborhoods that were felled due to storms, disease, insect attacks, or other problems. The idea "hit home" with Rick and his wife Cindy when a large ash tree in their yard had to be removed due to disease. Cindy couldn't bear to see the tree hauled to the landfill and asked Rick what could be done to extend the useful life of the wood. As a result of that experience, Rick and Cindy created Wood from the Hood[42] to collect and process trees from the urban landscape that would otherwise be chipped, buried or burned.

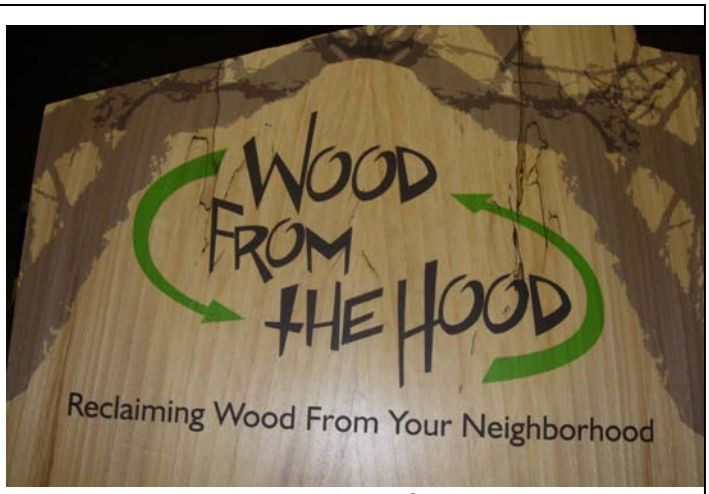


Image 18, Caption: The Wood from the Hood logo

One of Rick and Cindy's first "urban" wood projects was reclaiming felled white oaks. To start the process, Rick hauled the logs to a mill in nearby Wisconsin for processing into lumber. Next, Rick located a local dry kiln that dried the green lumber to a moisture level suitable for indoor use. A nearby Minneapolis millwork plant (A&A Millwork) converted the dried lumber into tongue-and-groove flooring which in turn was marketed by yet another local business (Natural Built Home) specializing in green building materials and home supplies. After an economic evaluation of the process of converting a municipal tree into a saleable product, Rick and Cindy were convinced they had a business model worth pursing.

Today, Wood from the Hood produces a variety of hardwood products including flooring, millwork, furniture, picture frames, cutting boards, cribbage boards, coaster sets and more. All of the lumber and value-added products can be tracked to the zip code (neighborHOOD) where the tree was harvested. In some cases it can be tracked to the specific address. This gives the wood product a connection to the community.

[41] For more information on Bratt Tree Company, see http://www.bratttree.com/.

[42] For more information on Wood from the Hood, see http://www.woodfromthehood.com/.

Image 19, Caption: Picture frames and coasters are two products manufactured by Wood from the Hood

The Process

Wood from the Hood (WFTH) obtains logs from local tree service firms operating in the Minneapolis area. The ideal log length is 8-10 ft. but logs as short as 4 ft. and as long as 20 ft. can be processed. Diameter range is 6 inches up to 40 inches. After the logs are delivered to WFTH, a local sawyer sets up his portable mill on-site and converts the logs into lumber.[43] The next step is the drying process which is either done inside the cabinet shop (in a small 300 bd. ft. kiln built by Rick) or shipped to a nearby commercial dry kiln. Typically, the dried lumber is returned to WFTH which has the manufacturing capacity to produce value-added products. In an effort to "green" the entire operation, all milling, drying, and manufacturing is limited to a 100-mile radius.

Products

There has been a "progression of products" from WFTH. Originally, the plan was to produce and sell lumber. However, secondary products have increased in popularity with customers. After introducing tongue-and-groove flooring as its first value-added product, WFTH started producing picture frames. Some of the first frames were from lumber salvaged from a large silver maple tree that had to be removed from a nearby public park. The picture frames were marketed at a festival in the park and gave patrons an opportunity to buy a product derived from a park icon – the large 93-year old Matthews Park silver maple. Proceeds from the sale of picture frames and other specialty products were used to plant a new tree in the park.

Image 20, Caption: Cutting boards on a display rack at the Seward Co-op in Minneapolis

At the nearby Seward Food Co-op, Cindy noticed that all the cutting boards for sale were made in China. Recognizing an opportunity, WFTH produced 8 or 9 different styles of cutting boards (samples), and Cindy shared them with Co-op management. The staff at the Co-op were impressed with the cutting boards and were eager to add a locally made product to their store offerings. Currently, WFTH sugar maple cutting boards (in 3 sizes with a "belly band" describing the

[43] As of April 2010, about 50% of logs are processed on-site (at WFTH) with the remaining 50% processed off-site.

"localness" of the product) are sold at the Seward Co-op plus other Co-ops and specialty stores in the Twin Cities. A unique promotional twist arranged with the Seward Co-op is that WFTH created a custom-made conference table for the Co-op—with lumber from a log of the same zip code as the store—in exchange for advertising in the Co-op newsletter.

WFTH has been successful in reaching local green architects who specify WFTH flooring and other products in new construction or remodeling projects. For example, a recent passive house project in nearby Hudson, Wisconsin used WFTH services to cut, dry and mill trees taken down on-site to make room for the house. The trees will be used for flooring, stair treads, base moulding, window sills and miscellaneous trim throughout the house.[44] Also, the local Three Rivers Park District contracted with WFTH to produce lumber from white oak trees that were removed during the construction of a new visitor's center at Silverwood Park in Minneapolis. Park District employees used the lumber to produce paneling for the interior of the center. Also, WFTH created squared logs from park trees that were used in building reception and food service counters. The visitor's center won an honorable mention award from "Woodworks" in the category of "Interior Beauty of Wood." [45]

A service provided by WFTH is helping individual homeowners reclaim a fallen tree by crafting a product that will go back to the home where the tree originally grew. This level of individual service to customers distinguishes WFTH from other companies who merely make a green product but provide little or no direct service to the customer.

The following is a sample timeline of WFTH's custom service to a homeowner:

- Homeowner must remove a tree (e.g., because it is a hazard tree due to defects)
- Homeowner contacts tree service company for removal of tree
- Tree service company informs homeowner about WFTH and reclamation service
- Homeowner contacts WFTH[46]
- WFTH and tree service company meet on "tree removal day" to consult on log specifications such as diameter and length
- Tree removed from homeowner's property and log(s) delivered to WFTH by tree service company
- WFTH provides price quote to homeowner on milling/drying cost and expected lumber yield from tree
- Homeowner pays WFTH for sawing and drying of lumber
- Homeowner and WFTH meet to discuss possible products that could be manufactured from the lumber (table for example)
- WFTH provides sketch of table to homeowner with price quote for finished product
- Homeowner agrees to WFTH design and price

[44] For more information on the passive house project, see http://www.passivehouseinthewoods.com/.

[45] See http://www.woodfromthehood.com/Projects/projects.htm for a photograph of the Silverwood Park counter areas.

[46] Homeowner typically maintains ownership of logs and/or lumber throughout the process. The only instance that WFTH takes ownership of the logs at the beginning of the process is when the homeowner chooses to donate the log (for manufacture into products) rather than have it converted into wood chips.

- Table is built by WFTH and paid for by homeowner (and proudly displayed in their home)
- Fallen tree has now been reclaimed and useful life of wood has been extended.

WFTH continues to network with tree service firms to get more of them to offer a "product option" to homeowners removing trees from their property.

Networking Has Been Major Key to Success

Networking—often called collaboration—is a key ingredient in the success of a business or group of businesses (cluster). Rick and Cindy Siewert networked with many knowledgeable people before jumping into their urban tree reclamation business. For example, Rick picked the brain of Bruce Horigan of Horigan Urban Forest Products in Illinois when WFTH was still just an idea. Horigan operates a similar business in a Chicago suburb and provided valuable insights into log reclamation, product marketing, and the day-to-day challenges of operating an urban-based lumber business.

Image 21, Caption: Reclaimed elm table by WFTH

Rick also attended a week-long dry kiln short course sponsored by the nearby University of Minnesota. The workshop encouraged Rick to build his own small dehumidification dry kiln following instructions in a booklet that was distributed at the short course.[47] The dry kiln, although small at 300 board feet, has given WFTH the flexibility to dry small loads of lumber as needed. The experience has also given Rick the confidence to consider building a larger kiln from a semi-trailer.

WFTH has established good relationships with at least three local tree service firms (source of raw materials), primary and secondary processors such as portable mill, dry kiln and millwork operators, product manufacturers (individuals who use WFTH lumber for their own product lines), retailers (businesses that sell WFTH finished products), and public entities such as the Minneapolis Park and Recreation Board. All of these contacts have enabled WFTH to establish a process from start (logs) to finish (final products).

[47] The publication is titled "Dehumidification Drying for Small Woodworking Firms and Hobbyists: Building Your Own Lumber Dry Kiln with Local Building Materials" (2007) and is available at: http://dnr.wi.gov/forestry/publications/pdf/FR-396.pdf.

Other Keys to Success

In addition to their skill at developing and using networks to launch their business, the Siewerts, and their right-hand man Jon Buck, have exhibited other keys to success that parallel key ingredients related to starting and developing a viable industry cluster.

Entrepreneurship and Innovation – Clearly, an entrepreneurial spirit was present to conceive a business idea of converting discarded urban trees into consumer products. Also, the entire WFTH team has demonstrated innovation in product design, market development, and other aspects of creating a new business.

Working with Supporting and Complementary Businesses – As noted above, networking with various businesses has been a vital part of WFTH's growth and development. An important component of working with other industries is WFTH's ability to look for win-win situations. For example, the manufacturing of cutting boards was an opportunity to introduce a new product into a retail outlet (food cooperative) that was interested in sourcing locally-made products. Also, the contract sawing of logs, frequent out-sourcing of lumber drying, and use of other millworkers to manufacture products has supported other local businesses while freeing up WFTH to concentrate on product design and market development (see Figure 1).

Business Perspective – Rick Siewert brought 30+ years of woodworking business experience to the WFTH effort. Creating new products and seeking new markets was somewhat second-nature to him, Cindy and Jon. This deep-seated business perspective has been a guiding force and impacts all management decisions. Also, although WFTH is not a true spin-off business, it is

Sidebar 10: Passion for Wood and Woodworking

Siewert Cabinet and Fixture Manufacturing Inc. is a commercial store fixture and architectural millwork manufacturer. Siewert Cabinet was founded in 1965 by Wayne Siewert in his home garage in south Minneapolis. Since 1965 the business has relocated to different sites (including Wayne's father's hardware store) but has always remained in the same neighborhood. Today, the business occupies approximately 40,000 sq. ft. at 2640 Minnehaha Avenue in Minneapolis.

In 1998, Wayne's son Rick became CEO and President of Siewert Cabinet. Rick lead the company through major expansions and growth during the past 15 years. In 1999, the Woodworking Machinery Industry Association awarded Siewert Cabinet the Innovator of the Year Award. The same year *Wood and Wood Products* magazine recognized Siewert Cabinet as the 10th fastest growing woodworking company in the U.S. In 2002, the Architectural Woodworking Institute presented two Awards of Excellence for Siewert's work on two local projects. And between 2001 and 2006 sales volume at Siewert Cabinet increased 111%.

Rick's lifetime passion for wood and woodworking inspired him and his wife Cindy to look for new opportunities in the wood products field. Wood from the Hood is the result of their passion to be conscientious consumers and a desire to do their part in helping the environment.

For more information, see http://www.siewertcabinet.com/.

closely affiliated to Siewert Cabinets and is able to take advantage of raw material and finished product storage yards, equipment use, product design facilities, and office space.

Cindy grew up in a family business with a focus on marketing and advertising. Her understanding and contacts with printing and graphic arts industry have given WFTH the ability to get off the ground with effective retail marketing materials and industry communications. As president and owner of WFTH, Cindy offers the unique perspective that only a female executive can. Being a minority owner business is also a unique feature of WFTH.

Future Plans

WFTH plans to continue growing the business by manufacturing environmentally-friendly consumer products with a local flavor. A focus on the female customer—as evidenced by current products sold through food cooperatives and specialty gift shops—will continue to be emphasized. Also, green building projects in and around the Twin Cities will be sought for WFTH flooring and millwork products. Even a line of baseball bats, turned by a current Minnesota-based producer of Major League bats, is in the works with the first shipment of 30 sample bats arriving April 2010.

Another effort, separate from working with private tree service firms, is to contract with the Minneapolis Park and Recreation Board (MPRB) for selected tree removals from Board projects. The MPRB has itself developed an innovative wood utilization program (see Case Study #2) and is receptive to working with firms like WFTH whose aim is to convert tree removals into value-added products.

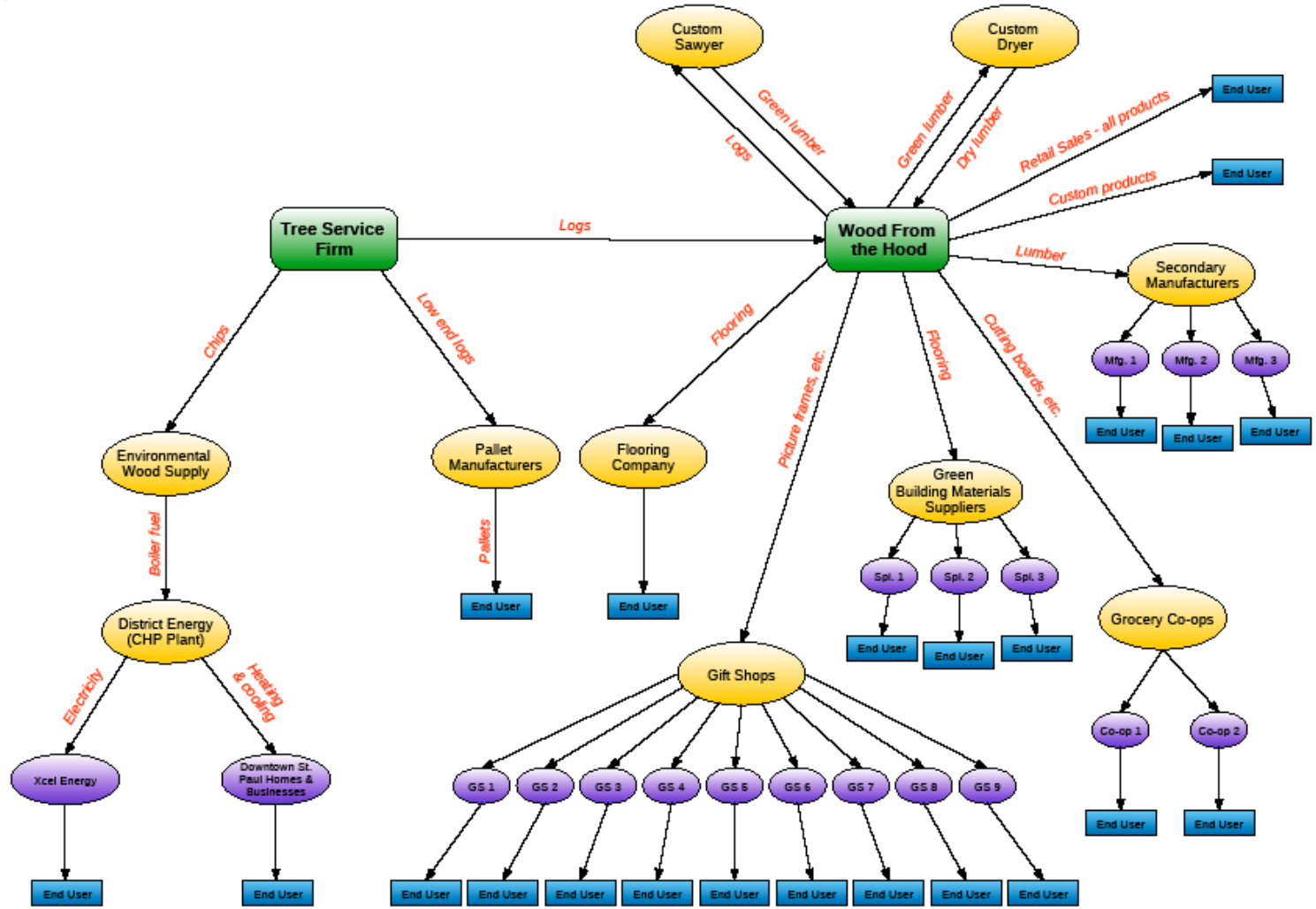
Sidebar 11: Cutting Boards are Hot!

In November 2009, Jon Buck of Wood from the Hood, reflected on his biggest surprise so far with the companies urban tree reclamation effort. Here are his thoughts as quoted in the *Sprout*, the newsletter of the Seward Co-op Grocery & Deli:

"Hands down, the most surprising thing has been how well the cutting boards have been received by the public. They have been flying off the shelves almost faster than we can produce them. In August [2009], we introduced our newest product, 'Mineral Bee,' a cutting board conditioner that also has been flying off the shelves. It really seems that people are very hungry for locally produced products."

Image 22, Caption: Wood from the Hood cutting board (left)

Figure 1: Wood from the Hood and its relationship (network) to supporting and complimentary businesses.



For further information:

www.dovetailinc.org

Short video describing Wood from the Hood, available at the Dovetail Partners website:
http://dovetailinc.org/content/making-use-urban-trees-wood-products-zipcode

Brief report summarizing the Twin Cities Case Study, available at the Dovetail Partners website:
http://dovetailinc.org/reportsview/2010/sustainable-forestry/pdr-steve-bratkovichp/urban-wood-utilization-and-industrial-cl

Recording of Webinar event about the Twin Cities Case Study, available at the Wood Education and Resource Center website:
http://www.na.fs.fed.us/werc/videos/wood_utilization/building_urban_wood_utilization_program.wmv

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