Urban Wood Utilization Guide:

A PLAYBOOK FOR ESTABLISHING A MUNICIPAL PROGRAM

UNIFIED WOOD
ECONOMY

The funding for this guide was provided to Unified Wood Economy by the USDA Forest Service and Cal Fire.

Urban Wood Utilization

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Executive Summary

The **Urban Wood Utilization Guide** is a technical framework designed to help California municipalities and other organizations transition from wood waste disposal (or low-value uses) to a value-added "circular economy" model.

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1. Introduction and Framework

The Guide is funded by **CalFire** and the **USDA Forest Service**. It is specifically structured to align with the **California Urban Forests Council's Urban Forest Management Plans (UFMP) Toolkit**, which is recognized by the Governor's Office of Land Use and Climate Innovation.

- **Objective:** To equip municipal arborists, city departments, non-profits, and private sector with a roadmap for creating **Urban Wood Utilization Plans** or wood utilization elements within broader **UFMPs**.
- **Definition of Urban Wood:** The guide defines "urban wood" as any tree not traditionally harvested for products, spanning from the Wildland-Urban Interface to city centers—essentially all "unwanted wood".

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2. Pre-Planning: The Four Pillars

Successful programs are built upon four foundational "pillars" addressed during the pre-planning phase:

- **The Resource:** Organizations must estimate the quantity and quality of wood available annually. Tools like the **My City's Trees app** (using USDA Forest Inventory data) and local tree inventories are recommended to project consistent supply for a supply chain.
    - **Critical Questions - Resource Assumptions:** How accurate and reliable are current estimates of urban wood availability, given limited data on annual removals and mortality?
- **The Site:** Identifying optimal receiving and processing facilities is critical. Considerations include real estate costs, zoning (industrial vs. residential), and proximity to transportation networks (roads, railways, or ports) to minimize log travel distances. The site must balance accessibility, zoning, and community acceptance.
    - **Critical Questions** - Community Acceptance: What strategies will ensure local support for siting facilities, especially in areas sensitive to land use changes?
- **The Partnerships:** A "Team of Teams" approach is suggested, involving public agencies, private businesses (tree care companies, sawmills, investors), and NGOs (for community outreach and workforce development).
- **The Funding:** Sources vary by project "lens" and can include state or federal grants, conventional loans, philanthropic program-related investments (PRI's), or private investors interested in carbon and/or social impact returns.
    - **Critical Questions - Financial Sustainability:** Does the proposed funding mix (grants, loans, private investment) realistically cover upfront capital costs, provide an adequate run-way for 1-2 years of stabilization, and possible long-term operational needs?

3. The Urban Wood Utilization Plan

The guide outlines a structured planning process that moves from vision to actionable monitoring.

A. Vision and Mission

The process begins with establishing a **Vision Statement**—an aspirational description of what the community wants the effort to achieve (e.g., "100% landfill diversion and local job creation"). This is distinct from the **Mission Statement**, which describes the operational tasks required to reach that vision.

B. Strategic Plan

This phase involves analyzing wood flows and identifying "Issues and Trends" and development of the following:

- **Goals:** Broad outcomes desired by stakeholders.
- **Objectives:** Specific, limited outcomes (e.g., "process 50,000 board feet by Year 3").
- **Key Performance Indicators (KPIs):** Quantifiable metrics used to track progress.

Aligning urban wood utilization with climate action, sustainability, and waste reduction plans can strengthen funding and policy support.

C. Implementation Plan

The implementation plan focuses on "what, by when, and by whom". It requires prioritizing actions, assigning responsibilities to specific staff or partners, and developing detailed annual budgets that include equipment leases and labor costs.

Set up periodic reporting and real-time communication channels to keep funders and stakeholders informed and engaged.

D. Monitoring and Adaptive Management

Because a 20-year plan cannot account for every future obstacle, the guide emphasizes the **Plan-Do-Check-Act (PDCA)** cycle: **Plan:** Set goals and changes; **Do:** Implement changes; **Check:** Evaluate performance against KPIs; **Act:** Standardize what works or develop **Countermeasures** (actions taken to realign with the original intent) if performance lags.

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4. Motivations and Economic Value

The guide highlights several "lenses" through which a project can be justified to decision-makers. These can relate to Revenue, Profit, Avoided Costs, and Community Benefit.

- **Legislative Compliance:** California's SB 1383 mandates a 75% reduction in organic waste sent to landfills by 2025. Highest/best use of urban wood offers a direct path for municipalities to meet these diversion targets, satisfying mandatory recovery of organic products.
- E**conomic Opportunity:** Nationally urban wood waste is valued between $89M to $786M annually; in California, this represents a potential value of $5.5M to $48.7M depending on the products created (e.g., dimensional lumber vs. biochar).

- **Circular Economy:** Shifting from a "take-make-waste" model to a regenerative one allows wood to be upcycled into higher-value products such as furniture, flooring, or biochar, sequestering carbon for significantly longer periods than mulch or firewood.

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5. Key Tools and Appendices

The guide includes several practical tools to assist managers:

- **Checklists:** Appendices A, B, and C provide step-by-step worksheets for the Pre-Planning, Planning, and Post-Planning phases.
- E**conomic Valuation:** Appendix E introduces pro forma modeling to help forecast returns on investment and secure capital.
- **Sustainability Criteria:** Appendix F provides performance indicators for urban forest sustainability based on the **Vibrant Cities Lab** framework.

Table 1 below shows some of the risks and opportunities related to an urban wood utilization program.

TABLE 1

CATEGORY	RISKS	OPPORTUNITIES
Supply & Feedstock	Inconsistent and fragmented supply due to storm damage, disease removals, and tree maintenance schedules.	Large, often overlooked volume: estimated 36 million urban trees moved per year in the US, Local sourcing reduces transport emissions and fees.
Operations & Logistics	Complex logistics coordinating among arborists, municipalities, mills, and manufacturers, Costs for processing, drying, and storage infrastructure	Saves on landfill tipping fees and disposal coordination. Opportuntity to integrate with biomass and bioenergy initiatives
Market & Economics	Niche demand; limited awareness	Premium pricing; job creation and circular economy
Environmental & Climate	Potential pest/disease spread risk	Carbon sequestration; climate resilience; landfill avoidance; green infrastructure
Regulatory & Policy	Zoning, compliance, biomass regulations, and agency coordination required	California's Climate Investments and GO-Biz biomass framework (+Wildfire Resilience goals) can provide funding and policy support
Community Engagement	Low public awareness, potential pushback if projects seen as waste operations	Enhances public awareness, civic pride, and environmental education. Local demos or installations (eg. school furnitute, art installations) showcase opportunities

By following the Guide, California communities can transform "unwanted wood" into a source of revenue, environmental health, and social stability.

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Audience

The intended audience for this Guide includes entities eligible to receive Urban & Community Forestry Grants (ex.: cities, counties, other political subdivisions, 501c3 non-profits) and their potential private sector partners.

For public sector readers, we hope that this Guide provides a recognizable framework to support pursuit of grant resources for cities, counties, and non-governmental organizations (NGOs) for funding to create Urban Wood Utilization Plans, or to develop wood utilization elements for Urban Forest Management Plans (UFMPs).

The Guidebook Framework

This document uses the framework found in the California Urban Forests Council's Urban Forest Management Plan (UFMP) Toolkit.[1] This framework is recognized by CalFire and by the CA Governor's Office of Land Use and Climate Innovation. The intent is that by using this framework, a wood utilization plan can easily interface as an element of a more comprehensive UFMP. However, it can also be used as a stand-alone to create or enhance a wood utilization program. Appendices A-C contain checklists to work through the pre-planning, planning, and post planning processes we describe in the Guide. Appendices D-I contain supplemental information to support your planning effort.

It is important to note that you don't need to do all of the things in this Guide to start or operate an urban wood utilization program. While we tried to provide as much information as possible to support operating a comprehensive program, its applicability will depend on your objectives and your resources.

What is Urban Wood?

For ease of differentiating the materials we describe here from traditional forest products, we use the term "urban wood". However, this is not intended to refer only to wood generated and recovered in urban areas. We refer to any trees not traditionally harvested for products that range from the Wildland-Urban Interface to city centers. In other words, the Guide can be applied to smaller communities or larger urban areas, and to all "unwanted wood".

Camp Small, Baltimore City Parks & Rec Urban Wood Recycling

1 Building a Greener Future. California Urban Forests Council. https://caufc.org/building-a-greener-future/. Accessed 6/13/2025.

Pre-Planning

GOOD PLANS make the difference between cost-effective, proactive management, and costly crisis management. When developing a work plan, consider available expertise, time, interest, financial resources and include tools to organize, track, and manage the planning process.

Include a tracking list of what, when and who:

- What is the task?
- What is the timeframe it should be accomplished by?
- Who will be responsible for completing it?
- What countermeasures should be considered?

What is a Countermeasure?

A countermeasure is an action taken to counter the present course and realign with your original intent.

Countermeasures for your plan could include:

- **Modifying the scope, breaking it up into separate parts, or appending it to another task**
- **Reassigning a task to a different party**
- **Adjusting the timeline due to unrealistic expectations, unforeseen obstacles, or changes in conditions**

Why should you develop a plan?

There are many reasons to develop an urban wood utilization plan. They may relate to generating revenue to develop circular economies by supporting tree planting and care; creating profit to offset the use of general funds; avoiding costs associated with landfilling material; or providing community benefits by creating jobs.

These are not mutually exclusive and there may in fact be overlapping motivations with varying degrees of importance. It is helpful to identify the why up front as you develop partnerships and pursue resources. More on the motivations and lenses for developing a plan can be found here and in Appendix D.

The Four Pre-Planning Pillars

There are four key pillars upon which you will build your plan. They are:

1. **The Resource**
   What is the quantity and quality of urban wood material available? What kind of operation and goods production can it consistently support on an ongoing basis?

2. **The Site**
   Where are the locations that you could optimally site receiving and/or processing facilities? Ideally, they would be near where the materials are generated to make it easy to access for those entities generating the materials. They should also be close to processing facilities and located in areas

where minimal neighbor conflicts are anticipated. To satisfy both of these, they should be close to major transportation networks. The green or partially processed materials resulting from generation, sorting, and processing may not be close to manufacturing and wholesale and retail sales, but will have to be shipped to those facilities.

3. **The Partnerships**
   Who are the agencies that can facilitate siting and permitting? Who are the stakeholders that may be impacted by the operation or interested in employment or revenue associated with the operation? Who are the entities involved in generation, processing, manufacturing, and sales that would participate in the creation of a supply chain?

4. **The Funding**
   What funding sources are available? Are there public sector grants or loans to support all or parts of the effort? Are there investors potentially interested? If so, what questions would they need to have answered in order to participate?

Addressing these four pillars in the pre-planning stage will go a long way to support a successful plan and execution of the plan.

The Resource

An urban wood utilization operation requires significant investments in equipment, labor, site acquisition and development, etc. Most parties will be reluctant to make such investments before the following question can be answered: If I invest in the project, will there be a flow of material of sufficient quantity and quality to maintain the supply chain?

Whether your estimates of available material are in cubic yards, tons, or board feet, you will need some way to estimate the amount of material available on an annual basis. The units may change depending on what is produced. For example, mulch is measured in cubic yards.

Knowing the amount of material you will be working with at any point in the operation will also help you with what size yard, what equipment, and what other capacities you'll need.

The type of materials is also important as is the species and condition of the wood. The species and condition of the wood will impact potential end uses.

The My City's Trees app[2] provides a wide range of data from the USDA Forest Service's Urban Forest Inventory and Analysis program, including the volume of standing trees in cubic feet. Until a city has been measured more than once, there is not enough information on how much of that material dies or is cut down in a year.

A local tree inventory may also be helpful. If information on annual removals is available, you may be able to generate volume estimates from it. Other potential sources of data include landfills and organic waste recycling facilities.

The Site

A facility for receiving or processing urban wood may or may not be seen as an asset by the surrounding community. Determining stakeholder acceptance of the needed land uses in the location(s) will be very important.

2 https://mct.tfs.tamu.edu/app. My City's Trees. Texas A&M Forest Service. Accessed 9/12/2025

In order for the operation to run efficiently, transportation networks should be considered. For smaller facilities, this includes the road and highway network. For larger ones, it may extend to railways and ports.

Some key considerations to where you base your receiving facility and processing facility are:

- Real estate costs, availability, and zoning
- Transportation networks, including obstacles and accessibility advantages
- Existing infrastructure such as tree care companies, lumber yards, milling and drying facilities
- Access to a National Forest as there is likely to be some existing wood processing infrastructure nearby

What areas/trees will be addressed?
Will the plan only cover certain public trees or all public trees? In either case, will both in-house and contract crews be allowed to bring material to the facility?

Will it be open to certain residential, commercial, and utility tree care operations? If so, what criteria will be used to designate who can participate and who cannot? You will want to spend your time processing urban wood rather than separating trash from it. Establishing who can use the facility and requirements for their participation will be important to maintaining an efficient and productive operation.

Potential site owners & operators may include arborists, NGO's, investors, cooperatives, agencies, public/private partnerships, or a combination of those.

The Partners

What personnel will be involved in plan development? Will it be in-house staff, consultants, or a combination? If the latter, how will the tasks be shared?

Who will be responsible for plan development?
There may be a single in-house Project Manager on the municipal/client side and contract Project Manager on the consultant team with primary responsibility for the plan.

Who will help with plan development?
There may be additional layers of management on the client team that have to review, comment on, and approve the plan before it is finalized. To gather the support and resources necessary to develop and implement the urban wood utilization plan, you will need to determine the key people and groups in your community who can make it happen. Seek input from a variety of stakeholders to:

- Develop a common vision
- Assess community values and awareness concerning urban wood utilization, facility location and operations, and job opportunities
- Review the plan

The impetus for the plan can come from the top down including administrators and elected officials. If from the bottom up, such as by citizens or an urban forester, the concept of an urban wood utilization plan might need to be justified to decision makers or other community stakeholders.

Stakeholder analysis is the process of identifying those affected by a project and analyzing their attitudes towards the project and potential changes. Do some brainstorming with others to help identify stakeholders, staff, agencies, groups, businesses, and concerned residents.

- Who are the key people and groups that are impacted?
- Who are the people and groups whose support you will need?
- Who might be good at helping to develop or review the plan?
- Which stakeholder groups are likely to influence the success of the plan?

Working with teams of stakeholders, NGO partners, agencies, businesses, and investors, you will develop a Team of Teams - an overarching umbrella group that will coordinate their interests and consider the varying amounts and types of motivations and lenses they have regarding the project.

Organization	Role
Non-Governmental Organizations	
Local	Community outreach, engagement, and development.
Local/National	Training support for grading wood; promoting reuse in the hardwood industry.
National	Expertise in processing wood; facilitation of partnerships among local, state, and national levels and sectors.
National	Workforce development for local residents from distressed communities.
Business	
Tree care	Material generating operations and capacity to maximize the value of urban wood; securing and managing a receiving and/or processing facility for wood.
Processers, producers, and sellers	Providing capacity in producing dimensional lumber, guaranteed markets for both green and dried dimensional lumber, and informing operations and providing investor confidence for the project.
Investors	Providing the capital needed to fund or prepare the site and finance needed equipment.
Government	
State Departments of Agriculture, Forestry, Environment, or Conservation	Technical, financial, and social network resources based on understanding of the diverse issues and opportunities for partnership.

The Funding

Funding sources may vary depending on the motivations and lenses guiding the project. Those sources may include grants, conventional financing, vendor financing, philanthropy, PRIs (Program-Related Investments, which are mission-driven investments by foundations to advance charitable goals), investors, or a combination of those.

Projections on needed investments (site purchase or lease, equipment purchase or lease, etc.) and timelines for return on investment may be needed to secure the capital needed to implement the project. *Appendix E - Introduction to Economic Valuation for Urban Wood Programs can help you in this process.*

When will the plan be developed and how long will it cover?

Establish a timeline or schedule for developing the plan. If a contract will be awarded to a consultant team, it will have a timeframe in it.

If funds are limited or the plan has to be developed by staff, it might be necessary to take an incremental approach rather than going for the most comprehensive plan possible in the first attempt.

What is the timeframe (horizon) that the plan will address? What planning and management horizons will be addressed—6, 12, 24 months? 5, 10, 20 years?

Plans, Policies, Regulations, and Contracts

- Review organizational records, including prior plans, policies, and ordinances. Cities and counties, as well as other public entities typically have multiple layers of planning documents. These may include a general plan, specific plans, a sustainability plan, a climate action plan, etc.
    - How will the Plan be related to other plans, policies and regulations?
        - Is there a climate or organic waste recovery and reuse component in other plans?
        - Do any plans need to be amended/updated to reference urban wood utilization or to ensure compatibility?

Plans

A variety of plans may inform the availability of the resource and where and facilities may be sited. These may include:

- Tree inventories and/or management plans that identify hazard trees
- Sustainability plans
- General or Comprehensive plans
- Net zero climate and/or waste plans
- Urban forest inventories such as Urban Forest Inventory and Analysis

Policies

- Do current policies consider urban wood a fixed asset that must be disposed of similar to a computer or a vehicle?
- Are there urban wood disposal policies? If so, are they current?

Regulations

- How would regulations impact management? For example, do regulatory agencies require permits before a receiving or processing facility can operate?
- Do ordinances need evaluation/revision?
- Do state or federal regulations (e.g., California's AB32, The Global Warming Solutions Act) need consideration in regard to the plan?

Contracts

Are any contract revisions needed? For example, does the tree care contract require that the contractor buck logs in the longest length practicable and haul and dump wood at your receiving facility?

Responsibilities

A variety of positions and people may have a significant impact on the plan. These may include:

- City Forester or Arborist
- Waste Management Director
- Procurement Director
- Air Quality Official
- Sustainability Officer
- Director of Public Works
- Director of Parks and Recreation

These may vary depending on whether your facilities are public, private, or a combination of the two. They may also vary depending on what products you will produce.

Memphis Urban Wood Upcycling Campus, 2025

Urban Wood Utilization Plan

Vision: What do you want?

Vision statements ensure that developers of a plan have a common understanding about the outcome. Vision statements identify the desired state achieved if the plan is successful. The plan is the bridge between the present state and the desired state. The planning process is one through which a community creates a shared vision for its future and begins to make it a reality.

What do you want the urban wood utilization effort to look like as a result of the plan?

What is the community's/organization's vision for the plan?

As you proceed through the urban wood utilization planning process, you may decide to re-visit and change your initial vision statement to include updated findings.

Sometimes the terms "mission statement" and "vision statement" are conflated, but they are not the same. Your mission statement is what your organization does, while your vision statement is what you aim to accomplish. One is operational and one is aspirational.[3]

3 Mission statements vs. vision statements. https://www.atlassian.com/work-management/strategic-planning/mission-and-vision Accessed 6/16/2025.

Strategic Plan: How do you get what you want?

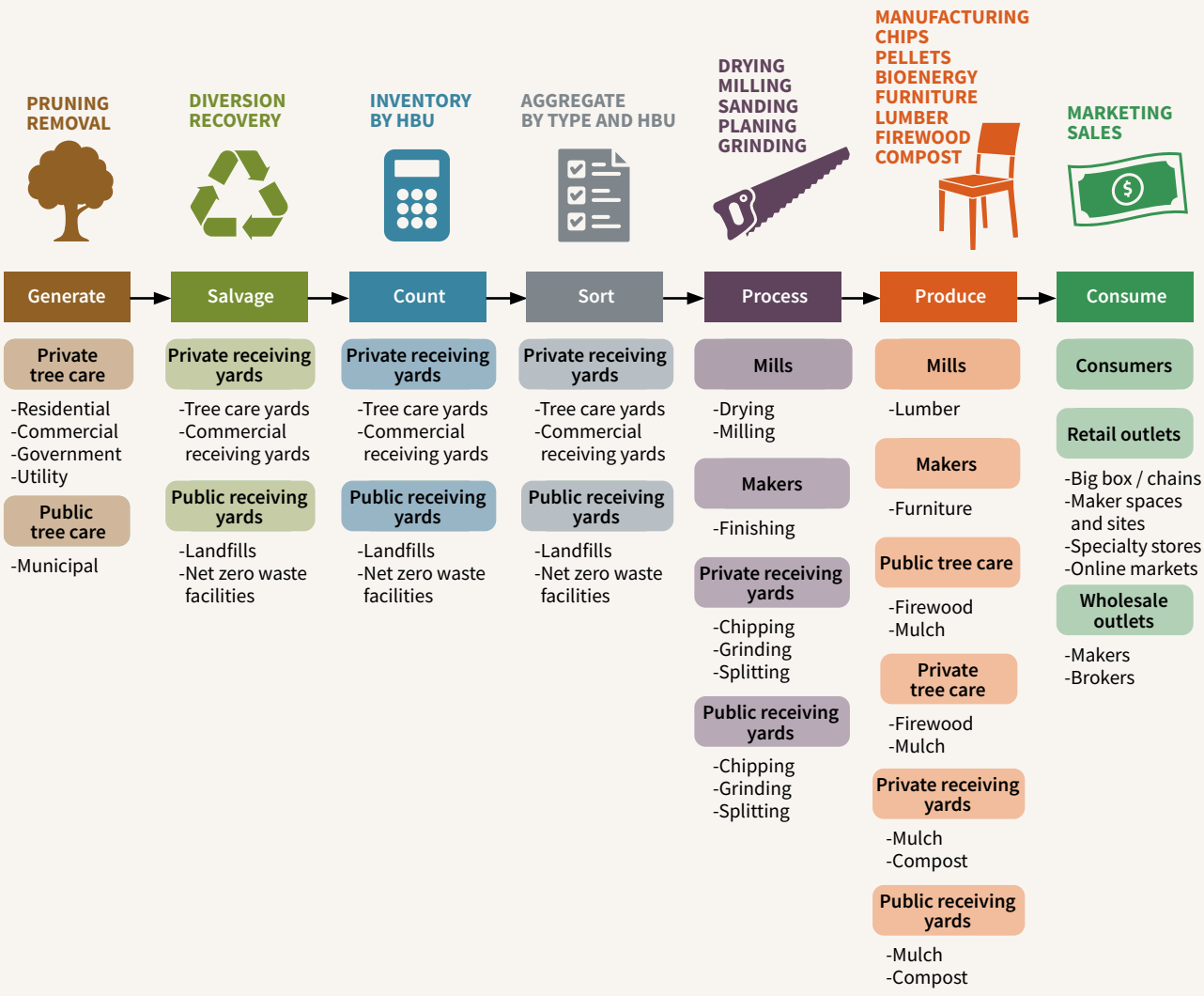
Analysis Synthesis

As you analyze the data that you collected from inventories and assessments, try to determine how the urban wood utilization practices arrived at their current state. For instance, how many trees are removed each year? Are there receiving facilities that do anything other than chipping biomass?

Understanding urban wood flows

The urban wood flows diagram in Figure 1 can help you understand the urban wood supply chain. Use it as a template. What pieces do you have information on? Where are the gaps? You have to start where you have information and follow the progression in either direction until you have a complete chain. Many entities generate urban wood, but unless you have salvage, inventory, sorting, processing, production, and sales, you can't have products that will support the operation.

FIGURE 1



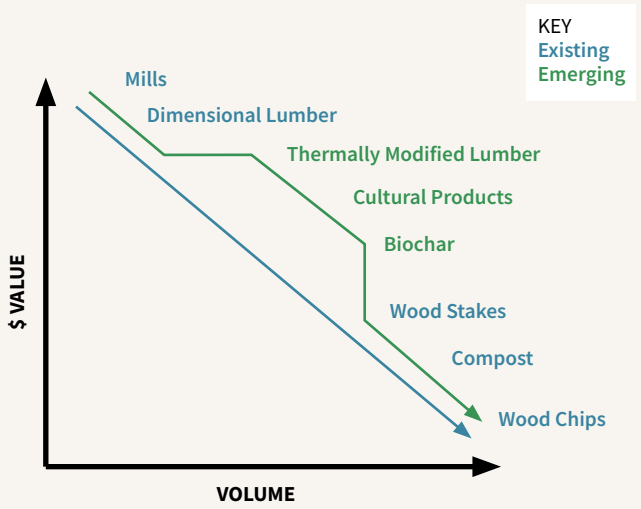
Issues and Trends

You can project what your urban wood utilization effort is likely to look like in the future based on current conditions and practices. One way to organize the data analysis and synthesis is to consider the needs related to major urban forestry program areas. It might help you to refer to criteria for urban forest sustainability for each:

- Vegetation: the tree resource
- Management needs
- Community needs

What issues and trends have been identified relative to the following questions:

FIGURE 2 ***Types of Products: Volume and Value***



- What are the quantities and qualities of urban wood being generated in the study area?
- What existing and potential receiving and processing facilities and sites are there?
- What networks of processors, producers and manufacturers, and wholesale and retail sales outlets exist?
- What opportunities exist to supplement or create supply chains with urban waste products like mulch, compost, biochar, pallets, dimensional lumber, etc. (Figure 2)? Definitions and images of products can be found in Appendix D.

▶ When you have completed the data analysis and synthesis, you should have an understanding of why your urban wood utilization opportunity is in its current state.

Establishing Goals

Goals are summative statements that spell out the overall general outcomes that you seek to achieve. Develop broad goals that address the needs you have identified.

You might find it helpful to review Criteria and Performance Indicators for urban forest sustainability for each program area (see Appendix F - Criteria and Indicators).

Goals need to include the concerns and desires of the stakeholders. General consensus on the management plan's goals can help ensure that the necessary resources will be made available to implement the plan. If funding is limited, goals should be prioritized so resources can be directed toward the most important or urgent goals first.

Setting Objectives

Like goals, objectives are desired outcomes, but objectives are more specific and limited in scope. Goals set the overall outcomes that are envisioned by the plan. Objectives provide more specificity by breaking goals into the components.

Developing Key Performance Indicators (KPIs) is a useful way to track progress towards your goals and objectives. KPIs are a tangible and quantifiable way to evaluate your progress (ex:, generate 1 million board feet annually by 20XX; create 8 new green jobs by 20XX).

Actions

The combination of goals and objectives spell out what you want for your urban wood initiative. They describe your desired destinations. The specific actions describe **how** you get to those destinations.

An action is a step you need to achieve an outcome, e.g., secure a lease for a processing facility; buy a kiln to accelerate drying time; hire a yardmaster. Generate actions for each objective.

A single action can actually require a number of specific steps. Before choosing a given action, you should consider the steps needed to implement it. This will help you compare the feasibility, cost, and effectiveness of alternative actions.

Implementation Plan: Who will take action and when?

The Strategic Plan sets goals and objectives, which provide the overall destinations of the plan. It also lists actions needed to accomplish the goals and objectives. The implementation plan describes how these actions will be carried out. It is likely that the implementation plan will span shorter time blocks and will be revised based on the pace of the implementation. For each action, the implementation plan spells out:

- Priority ranking
- What by when by who (who is responsible for completing a specific action by what date)
- Specific budget needs on an annual or multi-year basis, and funding source(s)

Review Priorities

Priority rankings are used to phase activities over time so that high priority tasks are completed before low priority tasks. (Use the previously established priority rankings of goals and objectives to determine how to allocate the budget.)

What are the highest priority actions?

Which actions need to occur in a specific sequence?

Establish Time Frames and Timelines

The implementation plan should include realistic timelines for conducting actions and meeting objectives. Some activities need to be completed in a certain order. Budget and funding affect the timeline for plan activities. Implementation plans are regularly revised and adjusted according to factors that speed or slow progress.

Assign Responsibilities

The implementation plan should indicate who and which entities are going to carry out which actions. This is another place where the the what/by when/by who framework can be helpful.

Budget Development

Budgets are needed to help develop annual work plans. Based on available funds, you might be able to accelerate or defer specific priority activities called for in the plan. Will your site be leased, purchased, or provided by a partner? Will your equipment be leased, purchased, or provided by a partner? How many employees will you need to hire in order to generate the needed return on investment from your site, equipment, and other inputs?

The budget should include timelines for expenses and revenues. In general, you first want to have a site, then equipment that can be stored and used at the site, then personnel to inventory, sort, and possibly do some processing of materials brought to the site. Sometimes a grant or other opportunity for a specific aspect of the project may come available and require you to respond in a different sequence than what is listed above.

Going through the exercise in Appendix E should help you with budgeting the effort over a certain timeframe and then breaking that up into annual budgets based on funding.

Funding

Funding may come from a variety of places, including investment capital, philanthropy, grants, loans, and public agency general or special funds. It is important to be able to tie funding back to its purposes, such as investment capital generating returns on investment, and grant funds completing the goals and activities the funds were awarded for. Dedicated funding, when available, is typically more reliable than funding from common sources such as the general fund, as during budget downturns, general funds may be reduced or redirected to serve other needs. However, some municipal urban wood utilization programs have benefitted from having a budget line item specifically for their program. It may be part of another department's (parks, sustainability, forestry) overall budget.

Monitoring Plan: How will you know when you're achieving your goals?

The goal of the monitoring plan is to provide the data needed to understand what is happening, why it is happening, and how specific management adjustments will change the outcome. The possible situations that may arise over the course of a 20-year plan period cannot all be accounted for in the plan. Actions and plans will need to be adjusted over time. By monitoring your KPIs, information can be gathered to make these adjustments (adaptive management).

The type of monitoring plan you develop will depend on factors such as scope, size of area, and costs. If your available resources limit the scope of monitoring, you may need to set priorities and focus monitoring on the highest priority areas.

The overall scope of the monitoring activities is defined including what will be monitored, when the data will be collected, how the monitoring data will be gathered and analyzed, and who will collect, analyze, and use the information.

Evaluation, revision of the plan, and public review can also help keep stakeholders aware of the urban forest program. To help build and maintain support for the urban wood utilization program, stakeholders and decision makers need to be kept aware of the program's successes and challenges. Your stakeholders (management, the public, elected officials, etc.) need to be made aware that conditions can change and that the plan will need to be adjusted accordingly.

Compiling the Plan

The process of developing an urban wood utilization plan takes an extended period of time while you and your team work on the major elements.

The main sections of the draft plan will include:

- Vision statement
- Introduction
- Strategic plan
- Implementation plan
- Monitoring plan
- Appendices

Plan Review

Stakeholders are invited to review the draft plan, and revisions are made as needed. Any plan developed by a government agency or quasi-governmental organization will be presented to the public for review and comment. The draft plan is usually presented at one or more public meetings.

Plan Approval and Adoption

The final version will need to be approved by the entity that approves budget expenditures. The decision makers who will approve the plan should already be aware of the plan and its importance, and should be ready to approve it. That is, any questions that they have raised should be answered and any stakeholder concerns should be addressed prior to seeking approval.

> Having an approved plan is really a starting point rather than an end point. To implement the plan requires ongoing financial and administrative support and momentum.

Biochar unit

Post-Planning

Adaptive Management

The possible situations that may arise over the course of a long-term planning period cannot all be accounted for during the planning process. Actions and plans will need to be adjusted over time. By ongoing monitoring, information can be gathered to make these adjustments through adaptive management.

Adaptive management promotes flexible decision making that can be adjusted in the face of uncertainties, as outcomes from management actions and other events become better understood. Some of the characteristics of adaptive management include:

- monitoring
- outcomes in consideration of the original objectives
- incorporation of the results into plan revisions

Regular monitoring can reveal new issues that were not addressed in the plan. For example, severe storms, pest outbreaks, or availability of new markets or partnerships could require changes to the plan. New management goals or objectives may need to be added, with corresponding actions and monitoring. By providing for regular evaluation and revision of the plan as part of the ongoing management process, the need for change can be identified before a crisis develops.

> Adaptive management is a systematic, practical approach to improving resource management policies and practices. It provides a structured process for learning which actions best meet management objectives, and for reducing resource management uncertainty.

The Plan-Do-Check-Act (PDCA) framework is a useful one for developing countermeasures to iteratively improve your project. A countermeasure is an action taken to counter the present course and realign with your original intent. The PDCA cycle has four stages:

1. **Plan** — determine goals for a process and needed changes to achieve them.
2. **Do** — implement the changes.
3. **Check** — evaluate the results in terms of performance
4. **Act** — standardize and stabilize the change or begin the cycle again, depending on the results[4]

You use your (KPIs) in the Plan stage to define success and set measurable objectives. In the Check stage, you use them to evaluate whether those objectives were met. In the Act stage, you use the insights from the KPI analysis to develop countermeasures which you adopt in the Plan stage and then implement in the Do stage for a cycle of continuous improvement.

4 Plan, Do, Check, Act (PDCA). https://www.lean.org/lexicon-terms/pdca/#:~:text=Plan%20%E2%80%94%20determine%20goals%20for%20a,ensures%20the%20improvement%20is%20stable. Accessed 6/16/2025.

Reporting

As the old saying goes, “untold is unsold.” It will be difficult for you to secure continued support for your program if no information is forthcoming about the progress you are making and the outcomes you are realizing.

Periodic

Funders, whether they are public agencies through grants or loans, investors, or some combination, will require and benefit from some type pf periodic reporting. This will most likely be annual but may be semi-annual, quarterly, or monthly.

It will be important that you have KPIs that align with your funder’s objectives. Tracking these will facilitate reporting and inform them on the value they are obtaining for the funding they have provided. These can vary widely, from the volume of organics diverted from landfills to the number of jobs created through workforce development to the gross economic development resulting from the project.

Real time

Social media is part of the fabric of everyday life. Communicating with fresh content on various channels regarding your progress will help keep your stakeholders informed and energized about where the program is at and where it is headed.

This can help grow support and create engagement with new stakeholders. The information shared here may also be useful in your periodic reporting in the form of photos, project profiles, and other content.

Wood aggregation yard

Appendices

APPENDIX A - Pre-Planning Worksheet

Why should you develop a plan? Identifying the “why” will help you develop KPIs to measure your success
The Four Pre-Planning Pillars: The Resource How much and what kind of wood is available?
The Four Pre-Planning Pillars: The Site Is the site accessible for inbound materials and outbound products and located where there is not public opposition?
The Four Pre-Planning Pillars: The Partners Who are the willing and available private, NGO, and public partners needed to make the project successful?
The Four Pre-Planning Pillars: The Funding What are the funding sources to take the project from each phase of development to operation and profitability?
When will the plan be developed and how long will it cover? Timelines for development and execution of plan phases will help keep the project on track.
Plans to consider Are there Master, Comprehensive, Sustainability, Net Zero, Economic Development, Workforce Development, or other plans that can provide synergy and support?
Policies to consider Do existing procurement, disposal, or tree care policies pose opportunities or barriers to the effort?
Regulations to consider Do existing procurement, disposal, or tree care regulations pose opportunities or barriers to the effort?
Contracts to consider Do existing procurement, disposal, or tree care contracts pose opportunities or barriers to the effort?
Officials to consider Are there key public people or positions whose support will be important to project success?

APPENDIX B - Planning Worksheet

Vision Statement An aspirational statement about what you intend your plan to accomplish
Strategic Plan: Understanding urban wood flows Where does the wood come from? What type and amount is available in a given timeframe?
Strategic Plan: Issues and Trends What sources, facilities, networks, and markets are using the available material?
Strategic Plan: Analysis and Synthesis of Urban Wood Flows, Issues, and Trends What opportunities and challenges exist given the availability of materials and sources, facilities, networks, and markets?
Strategic Plan: Establishing Goals Goals set the broad overall outcomes that are envisioned by the plan.
Strategic Plan: Setting Objectives Objectives provide more specificity by breaking goals into the components.
Strategic Plan: Actions An action is a step you need to achieve an outcome and realize your goals and objectives.
Implementation Plan: Prioritize Goals, Objectives, and Actions
Implementation Plan: Establish Time Frames and Timelines
Implementation Plan: Assign Responsibilities
Implementation Plan: Develop Budget(s)
Implementation Plan: Secure Funding

Appendix C - Post-Planning Worksheet

Plan: Identify the goal, KPIs, and actions or countermeasures Have KPIs to measure your success and actions to achieve your KPI targets.
Do: Carry out the plan
Check: Evaluate progress relative to KPIs Assess performance to KPIs
Act: Develop countermeasures as needed to inform next Plan cycle If performance relative to KPIs falls short, develop countermeasures to close the gap and realize your desired progress. These countermeasures will be actions for your next plan cycle.

APPENDIX D - Motivations and Lenses for Urban Wood Utilization Plans

Motivations/Lenses

Urban wood utilization programs will arise from a combination of motivations, including: 1) generating profit, 2) increasing revenue, 3) avoiding costs, and 4) creating community goods, benefits, and services.[5] While these may be thought of as four circles that have some degree of overlap, the size of the circles (their importance) and the degree of overlap (their relationship to each other) will vary based on the motivations and lenses of project participants.

For example in Figure 1 at right, an NGO may view Community Benefit as the predominant consideration, followed by Revenue, Avoided Costs, and Profit.

However, a private biomass power plant may have different motivations and lenses (Figure 2).

REVENUE

A variety of goods can be produced from urban wood. Revenue from these goods will vary significantly.

These may include goods such as:

1. Logs
   a. Slabs and Milled Lumber
      i. Green
      ii. Dried
      iii. Thermally modified
2. Chips and Mulch
3. Compost
4. Biochar
5. Firewood
6. Mass timber
   a. Cross-laminated timber (CLT)
   b. Glued-laminated timber (glulam)
7. Products such as:
   a. Flooring and paneling
   b. Raised garden bed kits
   c. Outdoor furniture such as benches, picnic tables, and pergolas
   d. Tree stakes
   e. Custom built products

FIGURE 1

example NGO perspective

FIGURE 2

example private biomass plant perspective

5 Ashley Kite-Rowland, Morgan Grove, Phillip Rodbell, and Lance Davisson. 2024. Urban and Community Wood Reuse in Memphis Provides Model for Local Regenerative Economies. City Trees, Nov/Dec 2024, Vol 61, No. 6. Urban and Community Forestry Society. 40 pp.

Depending on the capacities of the operation, additional revenue and job creation can be derived from providing services related to urban wood, such as:

1. Milling
2. Drying
3. Planing
4. Log hauling
5. Equipment operations
6. Sales, site management, project oversight
7. Material (green technician) handling

Palms

This document focuses primarily on use of hardwood species. Palms are not woody and have limited application in recovery and reuse, have a high silica content that makes them tough to shred, and often have sand and grit that causes issues in processing. They can be used as mulch but because of the difficulties in processing, adoption of this practice is not yet widespread.

Exotics

Some exotic species are used as street trees and may have application as wood products. This is a potential area of future research as there is limited available research on the use of exotics that were planted as amenity trees in the U.S. in urban wood products.

Waste to Wealth

It is estimated that the annual value of urban wood waste nationally is $89-$786 million depending on the products made from it.[6] In California, this value ranges from $5.5-$48.7 million.

Circular Economies

There are opportunities available in using urban wood in a circular economy model rather than in a linear economy "take, make, waste" model.[7] Urban wood use may also be framed in a regenerative versus degenerative culture, or in "thinking like nature" by using wastes in one part of a system as a feedstock or resource for another part of the system.[8]

PROFIT

Profit is not typically part of *municipal* urban wood utilization efforts. Rather, the focus in that setting is on avoided costs, community benefit, and revenue. "Excess revenue" in a public sector setting will normally be considered a surplus and revert to the general, special, or reimbursable funds pool. It may revert to the fund source that funds the operation, or it may revert to the general fund and support other activities.

If there is a public-private partnership, profit will be a requirement for private sector participation.

6 David J. Nowak, Eric J. Greenfield, Ryan M. Ash. Annual biomass loss and potential value of urban tree waste in the United States. Urban Forestry & Urban Greening, Volume 46, 2019, 126469, ISSN 1618-8667, https://doi.org/10.1016/j.ufug.2019.126469.

7 Pitti, A. R., Espinoza, O., and Smith, R. (2020). "The case for urban and reclaimed wood in the circular economy," BioRes. 15(3), 5226-5245.

8 Grove M, Carroll J, Galvin M, Hines S, Marshall LL and Wilson G (2022). Virtuous cycles and research for a regenerative urban ecology: The case of urban wood systems in Baltimore. Front. Sustain. Cities 4:919783. doi: 10.3389/frsc.2022.919783

AVOIDED COSTS

Landfill Avoidance

Urban land is expected to grow from 6.7 million acres in 2010 to 16.3 million acres by 2060.[9] As populations grow and landfill space becomes more limited, some states are already declining to accept urban wood waste at landfills and diverting 100% to private recyclers. Jurisdictions around the country are increasingly adopting "Net Zero" goals. These may be net zero carbon or emissions goals that have a net zero solid waste subgoal, or they may be a net zero waste goal focused on landfill avoidance. One strategy is to have a wood processing facility located at the landfill so that logs dropped off for disposal can be processed there rather than landfilled.

In California, AB 939, the Integrated Waste Management Bill, required a 25% reduction in solid waste deposited in landfills by 1995, and 50% by 2000.[10] AB 32, the California Global Warming Solutions Act of 2006, included a 75% recycling goal. AB 1826 (2014) established organic waste collection and recycling. SB 1383 (2016) set targets to reduce methane pollution and other short-lived climate pollutants as well as a target of 75% less organic waste sent to landfills by 2025. It also requires cities and counties to procure a certain quantity of recovered organic waste products to meet their annual procurement target.[11] This provides a great opportunity for urban wood utilization.

While California's law is unique in requiring municipalities to create organics plans rather than banning organics from landfills, other states have banned yard debris from landfills. According to the US Composting Council, these states include Arkansas, Delaware, Illinois, Indiana, Maine, Maryland, Michigan, Minnesota, Missouri, New Hampshire, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, South Dakota, West Virginia, and Wisconsin. They also report that Florida, Georgia, Iowa, and Nebraska have banned yard debris, with exemptions for landfills with gas collection systems.[12]

Tree Planting and Maintenance

Depending on processing and production capabilities, the urban wood utilization effort can produce tree stakes, mulch, compost, and biochar to support tree planting and care, contributing to "full life-cycle urban forestry" and avoiding costs for the purchase of these materials. This model could include a capital investment approach where species selection at the time of planting is made in consideration of future harvesting for manufacturing into forest products.

Municipal buildings and other structures

With the right processing and production capabilities, an urban wood utilization program can produce flooring, paneling, and furniture for public buildings, posts and beams for framing, and cross-laminated timber panels, providing these materials at the cost of production rather than at retail or wholesale price.

Municipalities that require that wood from tree care operations, land clearing, and other municipal operations is disposed of in the same manner as other municipal fixed assets such as

9 David J. Nowak, Eric J. Greenfield, Ryan M. Ash. Annual biomass loss and potential value of urban tree waste in the United States. Urban Forestry & Urban Greening, Volume 46, 2019, 126469, ISSN 1618-8667, https://doi.org/10.1016/j.ufug.2019.126469.

10 Plumb, T.R., Wolf, M.W., Shelly, J. (1999) California Urban Woody Green Waste Utilization. Urban Forests Ecosystems Institute, California Polytechnic State University, San Luis Obispo. Technical Report No. 8. 238 pp.

11 Using Recycled Organics Products. https://calrecycle.ca.gov/organics/slcp/ Accessed 5/20/2025.

12 Organics Bans & Mandates. US Composting Council. https://www.compostingcouncil.org/page/organicsbans?&hhsearchterms=%22ban%22 Accessed 9/18/2025.

vehicles or computers may face barriers in establishing an urban wood utilization program.

Municipalities that require that a certain percentage of wood-based goods be made from recovered urban wood can help to establish and support an on-going urban wood use effort.

Recreation & Recreation Facilities

A variety of products can be generated to contribute to play spaces and other park amenities. Schools and other educational systems and facilities are also end-users of wood products ranging from mulch, compost, lumber (outdoor projects) to natural playground equipment.

COMMUNITY BENEFITS (GOODS AND SERVICES)

Emergency Response

Pest outbreaks, storms, fires, and other acute events can result in large pulses of wood waste. If this material can be staged and sorted rather than just chipped or shipped, it can be diverted to highest and best use and sold to help offset the cost of the incident response. It can also help people suffering devastating losses to retain a tree that meant a great deal by upcycling the wood as a piece of furniture or other item.

The University of California Agriculture and Natural Resources & USDA Forest Service - Pacific Southwest Research Station have developed a Post-Fire Restoration and Recovery Manual for Western Urban Forests that is useful for tree-related disaster response.[13]

Job Creation

While traditional forestry and logging industries have relatively small employment numbers in materials generation (30,790), both tree care (42,380) and waste management (523,400) have large and growing employment opportunities. Both of these feed into wood manufacturing (415,000) as well as furniture and related product manufacturing (338,400).[14]

Costs of unemployment, incarceration, lack of housing, health care, food

The economic opportunities associated with job creation help avoid or mitigate certain social costs. The State of California annually spends roughly $6.7 billion on unemployment benefits,[15] approximately $7.2 billion on homelessness,[16] approximately $14.9 billion on food assistance,[17] and $40.1 billion on health.[18]

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13 I Lacan, F J Escobedo, and A S Thomas. 2025. Post-Fire Restoration and Recovery Manual for Western Urban Forests. https://34c031f8-c9fd-4018-8c5a-4159cdff6b0d-cdn-endpoint.azureedge.net/-/media/calfire-website/what-we-do/grants/urban-and-community-forestry/updates-resources/post-fire-urban-forest-manual-draft-feb-28.pdf?rev=334c61fa769444b39e7343b40cb42c72&hash=075984A9B74D686ED3C2DF4DD3ABFA53. Accessed 11/13/2025.

14 US Bureau of Labor Statistics. https://www.bls.gov/ Accessed 5/20/2025.

15 California's unemployment insurance fund has a stubborn multibillion-dollar problem. CalMatters. https://calmatters.org/commentary/2024/01/california-unemployment-insurance-debt-problem/#:~:text=There%20is%20a%20widespread%20misconception,and%20want%20reforms%20in%20benefits. Accessed 7/23/2025.

16 The 2021-22 California Spending Plan: Housing and Homelessness. Legislative Analyst's Office, the California Legislature's Nonpartisan Fiscal and Policy Advisor. https://lao.ca.gov/Publications/Report/4468#:~:text=the%20middle%20class.%E2%80%9D-,Homelessness%20Spending%20Actions,the%20major%20homelessness%2Drelated%20proposals. Accessed 7/23/2025.

17 The 2025-26 Budget: Food Assistance Programs. Legislative Analyst's Office, the California Legislature's Nonpartisan Fiscal and Policy Advisor. https://lao.ca.gov/Publications/Report/4971#:~:text=As%20shown%20in%20Figure%201,the%20revised%202024%2D25%20budget. Accessed 7/23/2025.

18 The 2024-25 California Spending Plan: Health. Legislative Analyst's Office, the California Legislature's Nonpartisan Fiscal and Policy Advisor. https://lao.ca.gov/Publications/Report/4930. Accessed 7/23/2025.

The average annual cost to incarcerate a person in the state is $133,000.[19] In Baltimore between 2017 and 2019, 30,000 tons of materials were diverted from landfills, the NGO utilizing urban wood had a 97.5% reduction in recidivism rate for its ex-offender employees, 195 jobs were created, and 500+ houses were deconstructed.[20]

Creating jobs with liveable wages, particularly those accompanied by benefits, can help avoid some of these public costs.

Carbon sequestration

Long-lived wood products such as paper, pallets, wood panels, and dimensional lumber store carbon over their life cycle. Short-lived wood products such as mulch and biomass pellets are considered immediate emissions of carbon.[21]

Grant opportunities

There might be organizational reasons why it would be especially advantageous to develop or revise a plan, including but not limited to:

- Grant funding is available
- A top-down expression of interest from leadership or a grass roots expression of interest
- A need to document an "it's in my head" plan due to changes in personnel

Materials and wood products can support households, businesses, and non-profit organizations. Households might want wood for making furniture such as tables or bookshelves, household goods such as cutting boards and bowls, and firewood. In some cases, they need milling services so that wood is dimensioned to better suit their needs. Businesses might want wood that would otherwise be difficult to source and, perhaps, support their marketing for locally and sustainably produced goods. Household, community organizations, and landcare businesses might need wood chips and mulch for outdoor applications. Community organizations might order benches and picnic tables for their greenspaces while schools might order wood logs and benches for their outdoor playspaces.

Combined, these community goods and services can support the goals and targets of municipal sustainability plans while creating civic pride in innovative uses of local materials that would otherwise be treated as a waste. These practices can also contribute to a municipality's local and regional reputation for innovation and taxpayer responsibility as well as residents' concern for ethical use of materials in their community or city.

19 How much does it cost to incarcerate a person? Legislative Analyst's Office, the California Legislature's Nonpartisan Fiscal and Policy Advisor. https://www.lao.ca.gov/PolicyAreas/CJ/6_cj_inmatecost Accessed 7/23/2025.

20 Humanin Case Study. Quantified Ventures. https://static1.squarespace.com/static/5d5b210885b4ce0001663c25/t/5e136bea2d86de4a84bd768c/1578331149111/Humanim+Case+Study_Quantified+Ventures Accessed 11/18/2025.

21 Coulston, John W.; Brooks, Evan B.; Butler, Brett J.; Costanza, Jennifer K.; Walker, David M.; Domke, Grant M.; Caputo, Jesse; Markowski-Lindsay, Marla; Sass, Emma M.; Walters, Brian F.; Guo, Jinggang. 2023. Forest Resources. In: U.S. Department of Agriculture, Forest Service. 2023. Future of America's Forest and Rangelands: Forest Service 2020 Resources Planning Act Assessment. Gen. Tech. Rep. WO-102. Washington, DC: 6-1–6-38. Chapter 6. https://doi.org/10.2737/WO-GTR-102-Chap6.

APPENDIX E - Introduction to Pro Forma Financial Modeling

WRITTEN BY **QUANTIFIED VENTURES, LLC**

In evaluating any business or program, having a clear view of forecasted costs and revenues is invaluable for making sound business decisions and mitigating risks. A financial model captures this information in an accessible format that highlights key considerations such as annual operating costs, upcoming major expenses, and expected cash flow.

This document outlines the main steps any program can take in creating their own financial cash flow pro forma, a financial model that projects forecasted revenues and costs for a business or program. Modeling cash flow year-over-year can give a high-level financial picture well suited for informing decision making and program design. A month-to-month pro forma will give you significantly more information about your monthly cash flow needs and a clearer picture of your program's financial health. The month-to-month version requires a much more detailed understanding of your own operations, so it may be better suited for later stages of program development.

STEP 1: Develop a Clear Understanding of Your Program Before Beginning Modeling

PROGRAM DESIGN

A financial model is a quantitative reflection of your program and can be difficult to create without first being able to describe your program *qualitatively*. Taking time to articulate how the program operates, and when things need to occur, will make the modeling process more straightforward and accurate.

Begin by ensuring you have a clear understanding of how your *operations flow*. For example:

- What kind of products will your operation produce, and how much of each?
- Who will buy your products, and how much demand do you expect?
- What pricing do you expect for each of those products?
- What is the cost to produce each of those products?
- Where will your operation take place, and what expenses are associated with that choice (rent, transportation, utilities, etc.)?
- What kind of equipment do you need? For equipment you already own, when do you expect you'll need to replace or upgrade it?
- Who is employed by your program, and what do they do? What is their anticipated salary? Will they be full-time, or part-time?

It is important to develop your understanding of *timing*:

- If you buy a new piece of equipment this year, when will you need to replace it?
- If you ramp up production over the next five years, what kind of revenue growth do you expect, and by when?
- When will you need additional staff?
- What kind of grants might you need or be able to secure that help with early years that may require more upfront investment?

The more detailed you can be in your own understanding of the operation, the easier it will be to create a financial model. At its base, a model is driven by a series of numerical assumptions associated with all program elements, like those mentioned thus far in this section. But a pro forma can and should be viewed as more than just a list of cost assumptions and a list of forecasted revenues: it is a method for transforming your qualitative understanding of your program into a quantitative one. Developing a pro forma allows you plot your revenue and cost data over time, test what the aggregation of those data points looks like from a cash flow perspective, and adjust the model assumptions to ensure that those elements together create a cash positive program.

FINANCIAL MODELING NEEDS

Before you even open a spreadsheet, consider what you want your financial model to reveal. This guide walks through a cash flow pro forma, or a forward-looking view of your program's total cash in vs total cash out. Questions to consider include:

- What information will help my team or my supervisors better understand our program?
- How long will it take to start up the operation?
- How many years out do I want to include in this pro forma to get the most useful snapshot of operations for decision making?

These kinds of questions can help inform the assumptions and design of your model.

STEP 2: Make Informed Assumptions About Revenues and Costs

By taking the time to clearly articulate the program's design in Step 1, generating a list of numerical assumptions will be much easier. This step is broken into three sections: Revenue, Capital Expenses, and Operating Expenses. Together, these make up the bulk of your financial model.

REVENUE ASSUMPTIONS

Revenue represents total sales of a good or service. It is worth flagging that profit is different than revenue: profit is total sales less costs. They are commonly interchanged despite these important differences. For your revenue assumptions, create a list over time of your price assumptions and sale volume assumptions for each product you will produce. Multiplying these inputs provides a gross revenue assumption. As you consider what revenues may look like over the next few years, it is common that prices increase over time so consider what that might look like for your own products.

Another note of consideration: Not all programs can produce products at their full capacity right away. Will you need a ramp up period to get to full production? How long do you expect that ramp up period to take? Ensure your product volume assumptions year-over-year reflect this.

COST ASSUMPTIONS: CAPITAL EXPENSES

Capital expenses, or "Capex", are your big one-time investments that require a larger amount of funds. Capital expenses often happen in the program start-up phase, and can happen periodically over time with a project. Examples include equipment, building costs if you are building a new facility, vehicles, or other large expenses.

Equipment is a major capital expense. When considering equipment, the lifespan of each item will be important for creating a realistic model. To be prepared for expected future capital costs,

be sure to estimate when you might need to replace equipment, and at what expected cost. If you are using equipment you already own, or getting equipment second hand, you may need to replace these items sooner than if they were brand new—and add assumptions to your model accordingly. Lastly, consider if you want to plan for expansion down the line: if, for example, you anticipate that in five years you'll be ready to add a new business line, consider adding capital expense assumptions for any larger associated purchases in the year you expect to expand.

Many programs will require a fair amount of upfront investment due to these items. One benefit of a pro forma is that it can help show if a program has sufficient funds to make these large payments. A pro forma can also help you if the case is that you do not have enough cash. For example, the model can help the program decide to a) finance the purchase with a loan you repay through sale of products, b) delay purchases that can wait, or c) find grants that can cover large upfront costs (these are more common solutions, though not an exhaustive list). Funds that are often used to bridge the upfront costs to when revenue starts sustainably contributing to the business or program operations are commonly referred to as your "runway". A good question to ask is whether or not you anticipate having enough runway to get you to the point in your operations where the revenue starts to support the business operations.

[*Note: this overview does not discuss in any further detail financing and what impact it may have on your model. Consider whether financing is a helpful tool for your program after fully assessing your complete cash flow pro forma].*

COST ASSUMPTIONS: OPERATING EXPENSES

Operating expenses, "Opex", come in two main categories: fixed and variable.

Fixed costs are the essential costs to running your program that regardless of output, you need to spend. For example, you need staff to operate your program, even on days you don't sell products. Having a strong estimate of the number of staff, and their costs (for example, annual salary, hourly rates, benefits, etc.), that enable the full operation to run, is a key input. You'll also need to know your annual rent or mortgage payment budget, costs of utilities (internet, electric, heat, etc.), sales and marketing needs, and other administrative costs.

On the other hand, variable costs are expenses that can fluctuate with operating activities. This may include costs that may vary with production volumes, transportation costs, contractors or consultants, or other one-time expenses that don't generally appear as a cost month-over-month. Variable costs can be difficult to estimate, so models often estimate them using a percent of revenues. In many cases, it's wise to also include a second percent-based line item for "contingency" costs to prepare for unexpected costs that may emerge as your program runs.

For all costs, it is important to consider when they begin and if they continue and/or increase over time.

STEP 3: Assemble Your Model

Armed with all of your revenue and cost assumptions, the next step is to organize them into an Excel document and create your pro forma. As mentioned, this pro forma overview discusses the creation of a *cash flow* pro forma, which differs from another common financial model like a profit and loss statement. Each are valuable to create, but cash flow is paramount to understanding your operations and their sustainability.

A clean, simple model will include the following tabs: **Assumptions** tab, for neatly documenting all assumptions driving your program; at least one **Calculations** tab where you can more easily show your work in getting to annual costs or revenue numbers; and a **Pro Forma Summary** tab, where all the calculations and assumptions are pulled together into a clean, snapshot view of the program's annual cash flow.

A) Organize Your Assumptions

First, create an orderly Assumptions tab in your Excel document. For all assumptions, include source notes for future reference. This is particularly useful as you adapt your model to reflect new or updated information, or to help you remember what informed decisions you made in the assumptions tab months or even years ago. Best practice calls for all editable assumption numbers to be grouped on one tab, and any editable cells to be a different text color than all other cells to help make this distinction even clearer for users.

FIGURE 3 *Assumptions Tab Example*

Model Assumptions			
Fixed Assumptions			**Notes/Sources**
Price growth rate	5%		[Add notes here, Date]
Volume (units sold) growth rate	3%		
Inflation	3%		
Product/Service	**Unit Sale Price (FY 0)**	**Unit**	**Notes/Sources**
Slabs	$10.00	Board feet	[Add notes here, Date]
Lumber	$1.00	Board feet	
Mulch	$30.00	Cubic yard	
Pellets	$300.00	Ton	
Compost	$25.00	Cubic yard	
Woodchips	$30.00	Cubic yard	
Infrastructure/Housing			
Veneers/Cabinets			
Biochar/Biomass	$200.00	Ton	
Carbon Credits	$100.00	Ton	

Program Related Assumptions			
Revenues	**Units Sold**	**FY**	**Notes/Sources**
Slabs	96,000	0	[Add notes here, Date]
Lumber	75,935	0	
Mulch	10000	3	
Pellets	0	3	
Compost	3000	3	
Woodchips	1000	0	
Infrastructure/Housing	100	4	
Veneers / Cabinets	20	5	
OpEx	**Start Cost**	**Start FY**	**Notes/Sources**
Fixed Costs		0	[Add notes here, Date]
Management salaries	$ 100,000.00	0	
Operating salaries	$ 50,000.00	0	
Sales & marketing	$ 25,000.00	0	
Office rent / facilities holding	$ 10,000.00	0	
Utilities	$ 3,000.00	0	
Other administrative Exp (finance, IT,s	$ 10,000.00	0	
Fuel	$ -	0	
Other Op Ex			
Variable Operating Costs (sales commissions, etc..):			**Notes/Sources**
% of Earned Income	5%		[Add notes here, Date]
CapEx	**Cost**	**FY**	**Notes/Sources**
Wood	$ 250,000.00	0	[Add notes here, Date]
Sawmill	$ 240,000.00	0	
Front end loader	$ 200,000.00	0	

Keeping all assumptions on the same tab will make it easier to limit what anyone edits in the model, and make it clear what you should not (formulas, for example, are not something you should edit regularly). It can also cause problems if anyone can edit any cell in your pro forma, as this invites errors and will make your pro forma less reliable, so making that distinction clear will help keep things clean.

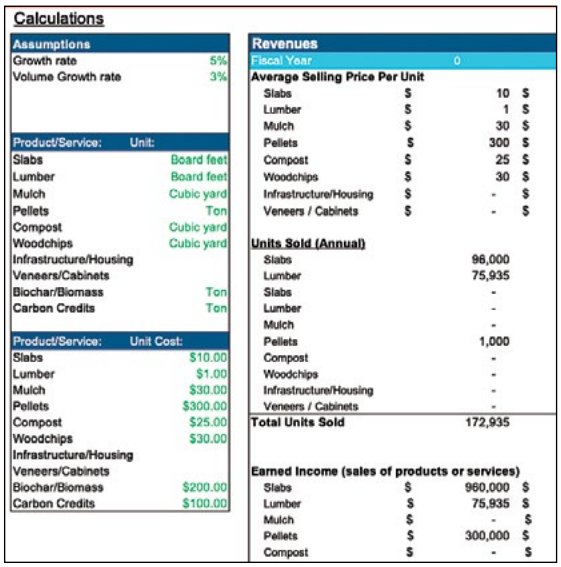
Your assumptions should include an inflation rate for costs (or prices) that might increase over time (for example, we expect rent to increase 2% each year), or any growth rates (for example, we will sell 3% more mulch each year) that are relevant to your business or program so that you can create a more accurate picture of costs and revenues over time.

Group your assumptions in a way that follows the logic of your project. Often this includes two sections: cash in (revenues from sales, grants, and other sources of cash) and cash out (variable and fixed operating costs, expenses, and other costs); within each of those sections, organize by project stage, or by like information. For all inputs that may start at different years, be sure to also include as an input the start year.

B) Group Any Necessary Calculations

It is helpful to include tabs that let you "show your math" for things you want in your pro forma. In doing so, it makes it much easier to review how your assumptions translate to dollars that will inform your pro forma. For example, having a Revenue tab that draws from inputs on your Assumptions tab can help you easily calculate a growth in prices for each of your products over time, with less room for error than if you did all of your calculations in a summary tab.

FIGURE 4 *Revenue Calculations Example*



Calculations

Assumptions	
Growth rate	5%
Volume Growth rate	3%

Product/Service:	Unit:
Slabs	Board feet
Lumber	Board feet
Mulch	Cubic yard
Pellets	Ton
Compost	Cubic yard
Woodchips	Cubic yard
Infrastructure/Housing	
Veneers/Cabinets	
Biochar/Biomass	Ton
Carbon Credits	Ton

Product/Service:	Unit Cost:
Slabs	$10.00
Lumber	$1.00
Mulch	$30.00
Pellets	$300.00
Compost	$25.00
Woodchips	$30.00
Infrastructure/Housing	
Veneers/Cabinets	
Biochar/Biomass	$200.00
Carbon Credits	$100.00

Revenues				
Fiscal Year		0		
Average Selling Price Per Unit				
Slabs	$	10	$	
Lumber	$	1	$	
Mulch	$	30	$	
Pellets	$	300	$	
Compost	$	25	$	
Woodchips	$	30	$	
Infrastructure/Housing	$	-	$	
Veneers / Cabinets	$	-	$	
Units Sold (Annual)				
Slabs		96,000		
Lumber		75,935		
Slabs		-		
Lumber		-		
Mulch		-		
Pellets		1,000		
Compost		-		
Woodchips		-		
Infrastructure/Housing		-		
Veneers / Cabinets		-		
Total Units Sold		172,935		
Earned Income (sales of products or services)				
Slabs	$	960,000	$	
Lumber	$	75,935	$	
Mulch	$	-	$	
Pellets	$	300,000	$	
Compost	$	-	$	

C) Put Together Your Pro Forma Summary

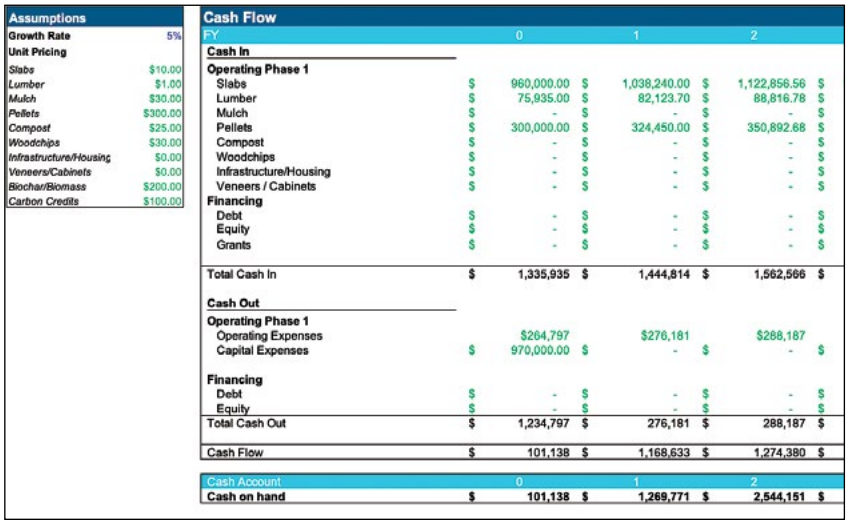
With your assumptions documented, all calculations made, you can now assemble your summary.

A pro forma summary should include:

- **Cash In:** lines for all revenue sources (include any grants, other sources of cash)
- **Cash Out:** all costs, organized by Capex and Opex
- **Net Cash Flow:** a line calculating cash in less cash out
- **Cash on Hand:** It is also good practice to have a line item for 'cash on hand' or 'cash reserves'. This could just be your remaining cash balance at the end of each month or year, or a dedicated line where you want to ensure, say $100,000 of cash in reserves, per month or year.

As mentioned earlier, your final pro forma should have a summary of a defined number of years

FIGURE 5 *Summary Pro Forma Example*



Assumptions	
Growth Rate	5%
Unit Pricing	
Slabs	$10.00
Lumber	$1.00
Mulch	$30.00
Pellets	$300.00
Compost	$25.00
Woodchips	$30.00
Infrastructure/Housing	$0.00
Veneers/Cabinets	$0.00
Biochar/Biomass	$200.00
Carbon Credits	$100.00

Cash Flow						
FY		0		1		2
Cash In						
Operating Phase 1						
Slabs	$	960,000.00	$	1,038,240.00	$	1,122,856.56
Lumber	$	75,935.00	$	82,123.70	$	88,816.78
Mulch	$	-	$	-	$	-
Pellets	$	300,000.00	$	324,450.00	$	350,892.68
Compost	$	-	$	-	$	-
Woodchips	$	-	$	-	$	-
Infrastructure/Housing	$	-	$	-	$	-
Veneers / Cabinets	$	-	$	-	$	-
Financing						
Debt	$	-	$	-	$	-
Equity	$	-	$	-	$	-
Grants	$	-	$	-	$	-
Total Cash In	$	1,335,935	$	1,444,814	$	1,562,566
Cash Out						
Operating Phase 1						
Operating Expenses		$264,797		$276,181		$288,187
Capital Expenses	$	970,000.00	$	-	$	-
Financing						
Debt	$	-	$	-	$	-
Equity	$	-	$	-	$	-
Total Cash Out	$	1,234,797	$	276,181	$	288,187
Cash Flow	$	101,138	$	1,168,633	$	1,274,380

Cash Account	0	1	2
Cash on hand	$ 101,138	$ 1,269,771	$ 2,544,151

of operations with cash in and cash out reflected. With the full summary, you should be able to easily see the net cash of your operation, and deduce when you are at risk of not having enough cash, or when you are in a good position to feel like you are operating sustainably.

STEP 4: Adjust Your Model as New Information Comes In

A) Keep the model aligned with current understanding

Any good model is dynamic: it is not a static picture of your program but rather updated as new information comes to light. This will help your model to best reflect the reality of the program. As mentioned above, making any adjustments on only the Assumptions tab helps to keep a clean and accurate model, without inviting new errors with each update.

B) Use the model to inform decisions

An accurate model will help inform decision-making and highlight potential financial risks in your program or business. For example, if you are worried about production or sales volume, you can adjust your assumptions to be more conservative and see what impact that has on your cash flow. Continuous refinement will help any program adjust to new challenges, forecast growth, and seize new opportunities.

APPENDIX F - Criteria and indicators

There are a number of models from which to derive criteria and indicators, including the Model of Urban Forest Sustainability developed by Clark et al. (1997)[22], The Sustainable Urban Forest: A Step-by-Step Approach[23], and the UN Sustainable Development Goals[24].

Model of Urban Forest Sustainability

The Clark Model offers four key principles:

1. Sustainability is a broad, general goal.
2. Urban forests primarily provide services rather than goods.
3. Sustainable urban forests require human intervention.
4. Trees growing on private lands compose the majority of urban forests.

These principles are supported by three key ideas:

1. Communities must acknowledge that city trees provide a wide range of net benefits.
2. Given the goal of maintaining net benefits over time, the regeneration of urban forests requires intervention and management by humans.
3. Sustainable urban forests exist within defined geographic and political boundaries: those of cities.

The model is then based on three components:

1. Vegetation resource.
2. Community framework.
3. Resource management.

The authors provide criteria and indicators for each component. These components can be related to the "triple bottom line" of environment-social-financial/political/administrative frameworks.

Clark et al. assert that "Descriptions of sustainable systems usually focus on the goods that system provides, i.e. sustained yield. Forests provide fuel and fiber, agronomic systems provide food and fiber, fisheries provide food, etc. In such examples, goods are the primary output. In contrast, goods comprise a rather limited output of the urban forests. The most important outputs are services…"

We disagree with this assertion, instead adopting the position of Grove et al. (2022), which frames using urban wood in a regenerative versus degenerative culture, or "thinking like nature" by using wastes in one part of a system as a feedstock or resource for another part of the system. We add the concepts of "full cycle urban forestry" and "circular economies" to the concept of a sustainable urban forest. Urban forests generate significant amounts of organic waste.

22 James R. Clark and Nelda P. Matheny. Arboriculture & Urban Forestry (AUF) March 1998, 24 (2) 112-120; DOI: https://doi.org/10.48044/jauf.1998.014.

23 Leff M. 2016. The sustainable urban forest: A step-by-step approach. Washington (DC, USA): United States Department of Agriculture Forest Service. 109 p.

24 The 17 Goals. https://sdgs.un.org/goals. Accessed 5/30/2025.

If this waste can be used as a resource, it can support other parts of the cycle, i.e., planting and maintenance.

United Nations Sustainable Development Goals

Urban wood utilization can support a number of the UN Sustainable Development Goals, primarily Goal 12: Ensure sustainable consumption and production patterns.

Less directly but also importantly, it can also support action towards:

- Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable.
- Goal 13: Take urgent action to combat climate change and its impacts.
- Goal 15: Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Vibrant Cities Lab Urban Forest Assessment

The Vibrant Cities Lab framework is based on The Sustainable Urban Forest – A Step-by-Step Approach (we refer to this document subsequently as the Leff Report). This framework is based on the Clark et al. model noted above. Due to this history, we can link the Vibrant Cities Lab framework and its results back to the Clark Model. We prefer to use the Vibrant Cities Lab framework as it is more current and includes issues like equity and urban wood reuse that were not as common in urban forestry literature in the 1990s when the Clark model was published.

A very useful aspect of the Vibrant Cities Lab process is that rather than comparing your program to an arbitrary benchmark, it lets you compare your current state to your desired state and then make a plan to bridge the two.

The Assessment has three main topic areas: the Vegetation Resource; the Community Framework; and, Resource Management. As some of the items are more applicable to an overall UFMP than to an urban wood utilization plan, we suggest the following are useful focus items in this context.

VEGETATION RESOURCE
This will help you assess the amount of annually available urban wood.

Urban Forest Inventory and Assessment.
Current and comprehensive inventory of tree resources to guide its management, including data such as age distribution, species mix, tree condition, and risk assessment.

COMMUNITY FRAMEWORK
This will help you with partnerships and stakeholders.

Engage Residents in Planning and Implementation
Enable community stakeholders to participate in and help shape the planning process.

Engaging peers and residents in process
Align affected municipal departments, county and regional authorities and state agencies behind a common agenda.

Creating Essential, Effective Public/Private Partnerships
Large private landholders - including school systems, universities and corporate campuses - embrace and advance municipality-wide urban forest goals and objectives by implementing specific resource management plans.

RESOURCE MANAGEMENT
This will help you align with municipal planning processes.

Forestry plan integrated into other municipal plans
Forestry plan is designed to reinforce, and be reinforced through comprehensive plans, sustainability plans, park development, stormwater and watershed plans, neighborhood revitalization, climate mitigation and sustainability plans, etc.

Tree Risk Management
Comprehensive tree risk management program fully implemented, according to ANSI A300 "Tree Risk Assessment" standards, and supporting industry best management practices.

Urban Wood and Green Waste Utilization
Create a closed system diverting all urban wood and green waste through reuse and recycling.

APPENDIX G - Some Issues to Consider at the Outset

What is a Measurement Unit?

Definitions of urban wood are highly variable and may include residues from public agency and commercial arboricultural operations (pruning and removal), yard trimming from homeowners (Municipal Solid Waste, or MSW), construction and demolition debris (C&D), and land clearing.[25]

In addition, units of measure are variable. Wood waste generators, receiving facilities, and processors may report in trees (saw or pole size), tons, loads, cubic yards, or board feet. Because volume to weight ratios can vary significantly depending on the species involved, this makes mixing the two even more problematic.[26]

How is wood measured? Helpful tools.

Some confusion and inconsistency resulting from the variety of measurement units used with urban wood can be avoided by using the same tools that are used in traditional forestry and lumber industries.

Tree & Log Scale Sticks are used to measure tree size (DBH or diameter at breast height, measured at four-and-a-half feet above grade), determining merchantable tree height, finding volumes for standing trees, and finding volumes for bucked logs. However, even in this instance there is some variation as there are three types of Tree & Log Scale Sticks that use three different systems of measurement: Doyle, Scribner, and International ¼". Information on these tools and how they are used is available from Forestry Suppliers[27] as well as from a variety of state cooperative extension services. As they each use different systems of measurement, they will result in different estimations of volume. It is important to disclose which one you are using so that the lumber buyer can modify their estimate accordingly.

Is urban wood dealt with opportunistically or strategically?

A survey of municipal tree care operations found almost 60% of public trees removed are declining, dead, or pose an unacceptable level of risk. This may limit what types of products are generated from them. It also found that when a public tree is removed, over 83% of the time it is chipped to mulch; 30% of the time it is landfilled; 13.5% of the time it is milled to lumber; and 5.6% of the time it is sold as roundwood. The survey did not address whether or not the surveyed community has an urban wood utilization plan.[28]

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25 Lyon, Scott & Bond, Brian. (2014). What is ''Urban Wood Waste?". Forest Products Journal. 64. 166-170. 10.13073/FPJ-D-14-00023.

26 Timson, Floyd G. 1974. Weight and volume variation in truckloads of logs hauled in the central Appalachians. NE. Forest Exp. Sta., Upper Darby, Pa. 9 p., illus. (USDA Forest Serv. Res. Paper NB-300)

27 Forestry Suppliers. 2021. Using a Tree Scale & Log Stick. https://www.forestry-suppliers.com/Documents/4287_msds.pdf Accessed 11/12/2025.

28 Hauer R. J. and Peterson W. D. 2016. *Municipal Tree Care and Management in the United States: A 2014 Urban & Community Forestry Census of Tree Activities*. Special Publication 16-1, College of Natural Resources, University of Wisconsin – Stevens Point. 71 pp.

While most states and major cities have Net Zero Carbon and/or Waste plans, few cities have urban wood utilization plans. A 2021 study on Urban & Community Forestry's economic impact to the State of California found direct and value-added contributions of $12.9 billion to the state economy[29]. It did not, however, consider the economic impact of the 3,900,000 metric tons of urban wood generated annually in CA[30].

Who does that? Goods versus Services

According to the North American Industry Classification System (NAICS) code order, each industry sector and subsector is placed into the appropriate group: Goods-Producing Industries or Service-Providing Industries.[31] It is the primary bifurcation in the classification system. However, the people that generate and recover urban wood are in the services sector and the people that create products from that material are in the goods sector.

On the services side, tree care and waste management employ large numbers of people (~ 560,000+) but generate a relatively smaller amount of material than traditional forestry. It also must be noted that not all people in tree care or waste management are generating or recovering urban wood that can be produced into goods.

On the goods side, over 750,000 people are employed in wood, furniture, and related product manufacturing.

There are not a lot of obvious or even natural connections at scale between these goods and services industries. In fact, NAICS considers Forestry and Logging, the materials generation piece of traditional forest products industries, to be Goods-Producing rather than Service-Providing.

The urban wood utilization network

The network of entities involved in urban wood utilization has historically been a highly decentralized network of many small actors and passionate champions with very little aggregation at scale. The Urban Wood Network formed around "Working to fulfill a mission to inform, collaborate, and connect to build community, business, and consumer confidence in the urban wood industry." It represents an ever-growing national network of urban wood industry professionals, from Municipalities and Arborists to Sawmills, Suppliers, Manufacturers & Makers, Design Professionals, and beyond.[32]

29 R Parajuli, S Pokhrel, E Wiseman, B Christensen, N Love. 2024. Urban and Community Forestry Economic Impact to California. Statewide Report. California ReLeaf. 36 pp.

30 A. Milbrandt. 2005. A Geographic Perspective on the Current Biomass Resource Availability in the United States. National Renewable Energy Lab. Technical Report NREL/TP-560-39181. 70 pp.

31 Industries by Supersector and NAICS Code. https://www.bls.gov/iag/tgs/iag_index_naics.htm. Accessed 5/27/2025.

32 About the Urban Wood Network. https://urbanwoodnetwork.org/about/. Accessed 5/27/2025.

APPENDIX H - How a tree inventory can support your urban wood utilization program

A tree inventory is an invaluable tool for managing a municipal urban wood utilization program if it is used as a dynamic rather than a static tool. If the inventory is continually updated as service requests are completed, the data stays accurate real time. As removals are scheduled, the inspector can assess the standing tree for potential end uses. This can determine whether the tree will be limbed and bucked as logs and brush, as firewood and brush, or sent through a chipper. Crews can then respond to the scheduled removal with the equipment needed to realize the highest and best use of the tree.

Knowing the species and volumes of scheduled removals supports the short term planning of the wood yard. As that data is built up over time, it supports long term planning by knowing what the expected flows are and what market opportunities the operation may be able to respond to.

If you have data on the entire urban forest, it can support planning for a municipal, private, or joint venture urban wood utilization effort. The US Forest Service has a program called Urban Forest Inventory and Analysis, also known as Urban FIA, that collects plot sampling data on the urban forest in various cities, It then reports out on various statistics including wood volumes by species. Data from cities where Urban FIA has been performed can be viewed on the My City's Trees app (My City's Trees). Once a city has been inventoried multiple times, key data on growth, removals, and mortality will support planning for availability of urban wood.

APPENDIX I – Trees and Carbon

Trees store and sequester carbon. The average carbon content of a tree is 50% of the tree's total volume.[33] Approximately 74% of a tree's biomass is the above-ground portion[34] (we do not usually harvest and make products from the root system). So about 37% of the material we use from urban wood is carbon.

Calculating the amount of carbon being stored in wood is a bit complex; a "how to" guide from the University of New Mexico can be found here: https://www.unm.edu/~jbrink/365/Documents/Calculating_tree_carbon.pdf#:~:text=Determine%20the%20weight%20of%20carbon%20in%20the,dry%20weight%20of%20the%20tree%20by%2050%25.

There are also tools like iTree tools that can help you calculate carbon storage and sequestration from your tree population.[35] If you are seeking carbon credit, it is important that you use the calculations required by the carbon credit scheme you seek to obtain and maintain credits from.

While the specifics of calculations can be complex, there are some simple points related to trees and carbon to keep in mind:

- Trees store and sequester carbon.
- If a tree is harvested and made into durable goods (furniture, building materials, etc.), that carbon stays bound up in the wood rather than being released into the atmosphere.
- If a tree is burned or chipped, the carbon it has stored is released back into the system rapidly.
- An exception to this is creation of biochar. While it does involve burning, biochar results in excellent carbon sequestration and is also a very positive plant health care tool for urban trees.

33 Carbon Storage and Accumulation in United States Forest Ecosystems, General Technical Report W0- 59. Richard A. Birdsey, United States Department of Agriculture Forest Service, Northeastern Forest Experiment Station, Radnor, PA, August 1992.

34 David J. Nowak, Eric J. Greenfield, Ryan M. Ash, Annual biomass loss and potential value of urban tree waste in the United States, Urban Forestry & Urban Greening, Volume 46, 2019, 126469, ISSN 1618-8667, https://doi.org/10.1016/j.ufug.2019.126469.

35 https://www.itreetools.org/. Accessed 12/12/2025.