Urban Wood Waste: A Guide to Managing Your Community's Resource

Effective urban wood waste management programs address the wood waste created in a community by treating it as a usable, and sometimes marketable, product. Through careful reuse and recycling, a wood waste management program can decrease forest management costs and the illegal and environmentally harmful dumping of wood waste.

A community's urban forester, urban forestry board, public works director, or solid waste director is often the person who initiates the development of a wood waste management program. To ensure the program's success, many others participate in it at the local level. When administering a community wood waste management program, urban forest decision makers should consider the benefits and limitations of various waste management strategies. Decision makers also must be mindful of state regulations regarding solid waste management.

To reduce urban forest maintenance costs by making the best use out of the related waste, municipalities may want to create a new wood waste plan or update an existing one. An effective plan should reduce waste efficiently. A wood waste plan can also generate revenue through resourceful use of the waste. In a growing municipality with limited funds, a wood waste plan may be especially important for managing resources and controlling costs.

NORTH CAROLINA AND WOOD WASTE

The forestry industry has long been a major component of North Carolina's economy. As cities and municipalities continue to grow, managing urban forests and their related waste is a critical component of forest management.

Statutes and Regulations Governing Wood Waste

North Carolina statutes and regulations governing wood waste classify the material as "yard waste." Despite the term's connotations, yard waste includes more than just leaves and downed limbs in private yards. It also includes the wood waste from trees in parks, cemeteries, and greenways, and from trees along roadways on public and private land in both urban and suburban areas. Yard waste is made up two types of wastes: land-clearing debris and yard trash. Land-clearing debris consists of trees and other vegetation cleared for the building of homes, facilities, or other structures. Yard trash consists of leaves, tree and shrub limbs, logs and wood from routine landscape maintenance, and storm debris. In rapidly growing communities, debris from land clearing can make up 80% of yard wastes. It is this land-clearing debris that may be of greatest interest to urban forest managers in North Carolina looking for cost-effective ways to reuse wood waste.

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The main statute governing wood waste in North Carolina (N.C.G.S. §§130A-309.09B–130A-309.11) was enacted in 1993 with the intent of reducing solid waste in landfills. The statute bans yard waste from traditional landfills and requires it to be managed at separate facilities. As a result, yard wastes must be disposed of in composting facilities with permits from the state Department of Environment and Natural Resources (DENR) or in land clearing and inert debris treatment and processing (LCID T&P) facilities. (See Appendix for relevant portions of the statute.)

The regulations in place as a result of that statute have helped to develop a market for wood waste as a potential resource. DENR's regulations governing yard waste, management of LCID T&P facilities, emergency storm debris management, and composting are located within North Carolina Administrative Code title 15A, subchapter 13B, "Solid Waste Management." Additionally, DENR provides documents on its website (portal.ncdenr.org/web/wm/sw) that are designed to give municipalities further insight into solid waste regulations.

Municipal Ordinances

Some communities in North Carolina have established ordinances to clarify the procedures for handling yard waste in those particular communities. Such municipal ordinances may help alleviate problems with unlicensed tree services hauling wood waste at reduced costs by avoiding LCID tipping fees.

For example, Orange County has an ordinance for recycling wood waste (www.co.orange.nc.us/recycling/ordinance.asp). The ordinance directs construction and demolition projects in the county to establish a written plan for proper handling of wood waste. By placing responsibility on construction and demolition project leaders, the ordinance may be more effective at ensuring that wood waste is recycled properly.

WAYS TO REUSE WOOD WASTE

Leaving Wood Wastes on the Landscape

A simple and cost-effective wood waste management strategy for small-scale operations is to leave wood waste such as downed limbs on the landscape. This strategy has several benefits: it is the lowest-cost option; materials left on site provide wildlife habitat; decomposition of wastes improves soil nutrients; and it may be the best option for reducing urban CO_2 emissions (for more information on the benefits and costs of using biomass residue for renewable energy, see Lawler, 2011). The Town of Wake Forest uses this strategy for its parks and greenways to reduce costs associated with collecting, transporting, and processing downed limbs. This strategy is not appropriate for downed wood from street trees or in areas where leaving debris creates public safety risks. If this strategy is adopted into a formal plan, the conditions under which it is appropriate to leave wastes on the landscape must be defined.

Strategies That Pay Back

Generating products that can be sold or donated can decrease the costs associated with collecting and transporting wood waste.

• **Firewood programs.** Hardwood logs, such as those from planned tree removals, can be sold for firewood or donated to community members in need. The City of Raleigh donates hardwood logs from the removal of high-risk trees to the Warmth for Wake program (www.wakegov.com/humanservices/economic/assistance/warmth.htm). This practice decreases the city's disposal cost while addressing community needs. Using logs for firewood may also be an effective strategy in smaller municipalities. Communities may find it useful to partner with local nonprofits to distribute the firewood. For example, the public works department in Marion partners with local churches to cut hardwood logs for firewood and donate them to community members in

need. As with many natural resources, local usage is recommended for donated firewood. Movement of firewood can spread insects (e.g., pine beetle, emerald ash borer) and disease, which threaten the health of urban forests. If the firewood strategy is adopted, the management plan should include a provision to use the logs only in the community from which they were collected, to prevent the spread of insects and disease.

• **Merchantable timber.** Selling hardwood and softwood logs that are suitable for producing wood products such as two-by-fours may generate funds to offset urban forestry program costs. Raleigh uses monies generated by log sales to fund the city's NeighborWoods program, which extends the urban forest canopy by providing trees that Raleigh citizens can plant and care for in public street rights-of-way (www.raleighnc.gov/environment/content/PRecParks/Articles/NeighborWoodsProgram.html). Wake Forest uses monies from timber sales to buy forestry equipment and train personnel.

Logs used in community projects (e.g., park benches, fences, decorative features) can reduce commercial wood purchases and disposal fees for the community. Additionally, logs that are turned into lumber and other wood products continue to store carbon, reducing CO_2 emissions associated with the decomposition of wood.

Strategies That Build Community and Pay Back

Many creative wood waste management strategies maximize resources by engaging community members.

• **Artisan woodworker partnership.** Local woodworkers and artisans can apply to the urban forester to obtain wood from tree removals. The wood is provided free or at significantly reduced costs if woodworkers and artisans first create an object or product that is donated to the forestry program. This donation is sold or auctioned to support the continuation of urban forestry efforts. The woodworkers and artisans use the remaining wood for personal use or sale.

• **High school woodshop partnership.** Local high school woodshop participation in a wood waste plan is similar to the artisan partnership described above. Wood that cannot be sold or used by artisans can be donated to local schools for practical uses in the wood shop class. This approach provides schools with resources while decreasing wood waste disposal costs for the community. Alternatively, students can use wood waste to create objects for use in the community, such as picnic tables or park benches. This strategy engages students in community service through urban and community forestry.

Strategies That Require LCID T&P Facilities

Producing mulch, compost, and boiler fuel requires processing facilities that operate in compliance with DENR-issued permits or notifications. Communities can pay existing LCID facilities "tipping fees" to deposit urban wood wastes, or they can establish their own facilities for turning urban wood wastes into mulch, compost, or boiler fuel. Communities must weigh the start-up and maintenance costs associated with creating their own facilities against the tipping fees they will pay to use established LCID facilities.

Orange and Cumberland Counties collect tipping fees for wood waste materials deposited at designated county landfills (Orange County: www.co.orange.nc.us/recycling/landfill.asp; Cumberland County: www.co.cumberland.nc.us/solid_waste_mgmt/container_sites/wilkes.aspx).

• **Mulch.** Creating mulch from wood waste, a popular strategy in North Carolina, can be an effective use for otherwise nonmerchantable timber. Communities that have DENR-permitted mulch facilities can sell their product to landscapers or residents to offset mulch production costs and potentially generate profits. Leaves, decaying wood, roots, and other wood wastes with otherwise limited uses can be mulched. The market price of the finished mulch product is dependent upon its quality. "Cleaner" mulches that have less decay, even color, and consistent size bring higher prices.

In many communities in North Carolina, wood chips are generated from utility line clearings. In Raleigh, some of those wood chips are applied as "raw" mulch (mulch that has not gone through the composting process) in parks. In the fall, raw mulch is applied as a soil amendment to trails and paths in Raleigh city parks. Proper application of raw mulches is a good alternative for communities that lack mulch-processing facilities.

When properly applied, mulch is generally good for maintaining moisture content in soils. Although it is not primarily intended as a soil amendment, it does contribute to soil health as it decomposes.

• **Compost.** Wastes such as leaves, roots, decaying materials, and wood from utility line clearing can be used as compost, a soil amendment and an excellent natural alternative to chemical fertilizers.

Communities that have DENR-permitted composting facilities can sell compost to landscapers or residents to offset operating costs or in some cases even generate profits. In Raleigh, most wood is chipped and taken directly to the city's composting center for yard wastes (www.raleighnc.gov/home/content/SolidWaste/Articles/YWProductsForSale.html). Materials that have been stained or pressure-treated are not appropriate for composting because the chemicals in the material will leach into the finished product, creating environmental and human health risks.

• **Hog fuel.** "Hog fuel" is a common term used to describe wood that is chipped and burned in a boiler to generate electricity (e.g., boiler fuel). Specific boilers are built to burn only hog fuel, but hog fuel can be co-fired with coal in standard coal boilers (U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, 2004). Hog fuel emits about half as much CO_2 as coal for any given amount of electricity production (Briggs, 1994; Hong and Slatick, 1994). Therefore, replacing coal with hog fuel reduces reliance on fossil fuels while cutting CO_2 emissions in half. In addition, the use of local hog fuel sources in the wood-fired energy systems of public and private buildings would require less transportation than the use of hog fuel from a more distant location. Such local usage would further reduce CO_2 emissions and costs (U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Federal Energy Management Program, 2004).

Cumberland County currently sells a portion of its wood waste to private companies both in state and out of state for hog fuel. The county's Solid Waste Department screens and grinds wood waste before selling it. In the process of screening and grinding, the fines (unusable for hog fuel) are separated for composting.

DEVELOPING A WOOD WASTE PLAN

The overall goal of a wood waste management plan is to maximize urban forest resources for the benefit of the community. Formally written and adopted plans ensure community recognition, increase community involvement, and facilitate access to grant funding. It is important to consider a variety of stakeholders when creating or updating a community wood waste management plan. Public works departments, solid waste departments, parks and recreation departments, and urban forestry boards often participate in managing a community's wood waste. Other community decision makers involved in wood waste management and local residents should also play a vital role in creating a plan.

Routine Maintenance

A wood waste plan is part of a larger comprehensive urban forestry program. The plan should detail the procedures for routinely managing yard wastes such that the wastes are utilized in the most efficient and cost-effective ways. Routine yard wastes include wastes from utility line clearings, planned tree removals, and landscaping maintenance as part of a range of activities necessary for urban forest health.

Emergency Situations

The plan also should describe a procedure for handling emergency situations that produce unexpected volumes of wood wastes. Across North Carolina, hurricanes and ice storms often create significant volumes of wood waste from downed trees and limbs. Insect infestations, also a potential threat to forest health, often lead to significant volumes of wood waste and should be considered in a wood waste management plan. For example, in the Midwest, the Illinois Emerald Ash Borer Wood Utilization Team has developed an extensive plan to manage and use the wood waste generated from an infestation of the Emerald Ash Borer (www.illinoisurbanwood.org).

An effective plan format can vary, but the plan should contain some basic information as shown in the box at right.

Outline for a Wood Waste Plan

Title: Describes the wood waste management plan.

Purpose and Goals Statement: Defines the goals to be achieved through wood waste plan procedures and management strategies.

Definitions: Defines key terms to be used in the plan (e.g., yard trash, land clearing debris, hog fuel, etc.)

Procedures for Routinely Processing Wood Wastes: Outlines the preferred management strategies for routinely collected wood wastes, including yard trash and land-clearing debris. This section also creates a program budget, including appropriate uses of funds that may be generated from the sale of merchantable timber, mulch, compost, and hog fuel.

Emergency Wood Waste Processing Procedures: Details the steps to be taken in cases of storm debris management or severe insect infestations when large volumes of wood wastes are generated. This part of the plan should include a list of arborists, tree services, and urban sawyers to contact for assistance with cleanup efforts. This section also has predetermined locations for emergency debris storage and processing. DENR guidelines for emergency wood waste procedures can be found online at portal.ncdenr.org/web/wm/sw/dds/lcid.

Performance Evaluation: Periodic assessment of volumes of waste generated, partnerships developed, and funds generated. Scheduled periodic assessments may create opportunities to update the plan according to the community's changing needs.

Effective Date: Date when plan is enacted.

Questions to consider when evaluating existing wood waste management plans:

- Does the current plan put wood wastes to the best use, given your community's needs and resources?
- Does the current plan account for both routine wood wastes (yard debris and land-clearing debris) and emergency situations such as storms or insect infestations?
- Does the current plan generate funds and/or offset operating costs?
- Do staff members have the resources they need to follow plan procedures and achieve plan goals?

Information to consider when developing a wood waste management plan if one does not exist in your community:

- Identify the types of wood waste generated in your community (i.e., yard trash, land-clearing debris, storm-generated debris).
- Quantify the amount of each type of wood waste by approximating on the basis of facility records and expert analysis.
- Identify the stakeholders involved in generating the wood waste and managing each type of wood waste. Identify the extent to which LCID T&P facilities are used and the associated costs of these facilities. Also, consider whether the community contracts with tree service companies, including the terms and cost of such a contract.
- Identify the ways in which wood waste is currently collected and used or where the wood waste is disposed.
- Identify budget restraints that affect wood waste management.
- Identify funding opportunities that may exist for a wood waste management program.
- In addition to state regulations, identify the local ordinances that may affect wood waste management options.
- Identify nearby communities with similar wood wastes and resources that may have a wood waste management plan that your community can adapt.

OVERCOMING POTENTIAL BARRIERS TO ALTERNATIVE USES OF WOOD WASTE

Wood waste management plans will vary depending on a community's size and previous management strategies. In all cases, changing wood waste management entails overcoming certain barriers.

Competing Stakeholder Objectives

Bringing together stakeholders with different perspectives can present challenges (as well as advantages). Safety concerns, environmental concerns, and budgeting restraints and objectives may compete for priority in a plan. Finding an appropriate way to address all these issues requires time and patience from all parties.

Educating Stakeholders About Wood Waste Options

Just as composting education has become widespread over the last decade, more efforts can be made at

the municipal level to educate stakeholders about alternative wood waste management options, including the sale of hog fuel and partnerships with artisans and schools.

Practical and Environmental Challenges of Hog Fuel

The use or sale of wood waste for hog fuel presents exciting opportunities as well as practical and environmental challenges. On a practical level, hog fuel requires more equipment and permitting than other waste management strategies. Communities must have (or secure access to) boilers for burning hog fuel or coal boilers to which they can add hog fuel. It is possible to sell hog fuel to businesses with boilers, but the value of mulch is currently higher than that of hog fuel in some areas.

Some studies suggest that the use of hog fuel rather than fossil fuels may not have much effect on the environment. Hog fuel does not eliminate or even drastically lessen the need for other sources of energy. Studies show that burning a community's urban yard wastes typically can produce less than 2% of the electricity the community needs. Studies also show that using hog fuel to create electricity rather than mulching yard waste has a minimal effect on the reduction of CO_2 emissions due to the energy consumed in the production of hog fuel.

Assess Individual Community Needs

Although wood waste regulations are consistent throughout the state, each community must choose wood waste management strategies that meet its own unique needs. The value of commodities such as mulch may vary across the state, just as the cost of business and energy rates do. Likewise, even if the use of hog fuel accounts for less than 2% of a community's electricity needs, hog fuel use may constitute a dramatic increase in that community's alternative fuel portfolio. All of these factors must be considered when determining ways to manage and utilize wood waste.

For example, communities that have given mulch and compost away for free to residents may want to consider ways to jump-start revenue to support a more comprehensive wood waste management program. Near Weaverville, a growing municipality that has traditionally given away its mulch and compost, organic farming has expanded tremendously. Properly managed compost is more valuable to organic farmers than it is to other farmers. By meeting with farmers and learning their needs, nearby communities may be able to generate previously untapped sources of revenue from the compost they collect and cultivate.

Illegal Dumping

In some communities it may be difficult to create proper incentives for contractors and residents to pay the required fees for depositing wood waste at designated municipal facilities. Illegal dumping of wood waste is a concern in many communities that are trying to establish safe and effective wood waste recycling and disposal. In order for a wood waste management system to work for the benefit of the community as a whole, all users of the system need to follow the same guidelines regarding wood waste disposal.

Developing Community Support

Educating community residents and stakeholders about the benefits of proper wood waste recycling may help reduce unsightly and hazardous wood waste disposal at illegal sites. Guidelines for recycling wood waste at local construction sites encourage hiring licensed contractors who are in turn held accountable for proper disposal. This system creates a standard for paying wood waste disposal tipping fees, which may generate revenue for the community wood waste management program and may reduce waste and illegal dumping at landfill sites.

CONCLUSION

Communities across North Carolina have developed formal and informal wood waste management programs. Although resources vary across communities in the state, each municipality may find more efficient and cost-effective ways to manage its wood waste by examining all of the management options available. Urban forestry decision makers who are implementing a new program or updating an existing program may benefit from learning about existing programs in North Carolina communities. When comparing programs, it is helpful to consider the relative sizes of the communities in terms of physical space and population, both of which affect the amount of wood waste produced. It is also helpful to consider how long a program has been in existence, because that may affect the extensiveness of the plans in place and how much the program has adapted to changing community needs. The most effective approach will likely be to use a combination of waste management strategies because certain types of management strategies are better suited for certain types of waste.

In all cases, clear goals, open communication among stakeholders, and thorough knowledge of state wood waste regulations can facilitate the creation of a formal management plan and may make the developed plan more effective.

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ADDITIONAL RESOURCES

EMAS Network. From parks to energy — biomass logistics in a big city. http://www.emasnetwork.org/FCKeditor/data/File/Best%20Practice%20documents/waste%20to%20energy_Stuttgart[1].pdf.

Illinois Emerald Ash Borer Wood Utilization Team. www.illinoisurbanwood.org/.

U.S. Department of Agriculture, U.S. Forest Service, Forest Products Laboratory, 2002. Successful approaches to recycling urban wood waste. www.fpl.fs.fed.us/documnts/fplgtr/fplgtr133.pdf.

NORTH CAROLINA WEB SITES

City of Raleigh NeighborWoods program. www.raleighnc.gov/government/content/PRecParks/Articles/NeighborWoodsProgram.html.

Cumberland Solid Waste. www.co.cumberland.nc.us/solid_waste_mgmt/container_sites/wilkes.aspx.

North Carolina Department of Environment and Natural Resources, Division of Waste Management, Solid Waste Section. portal.ncdenr.org/web/wm/sw.

Orange County Regulated Recyclable Material ordinance. www.co.orange.nc.us/recycling/ordinance.asp.

Warmth for Wake program. www.wakegov.com/humanservices/economic/assistance/warmth.htm.

Appendix: Relevant Portions of Applicable Wood Waste Management Statute

§ 130A-309.09B. Local government waste reduction programs.

(a) Each unit of local government shall establish and maintain a solid waste reduction program that will enable the unit of local government to meet the local solid waste reduction goals established pursuant to G.S. 130A-309.09A(b)(2). The following requirements shall apply:

. . . .

(3) Units of local government are encouraged to separate marketable plastics, glass, metal, and all grades of paper for recycling prior to final disposal and are further encouraged to recycle yard trash and other organic solid waste into compost available for agricultural and other acceptable uses.

§ 130A-309.10. Prohibited acts relating to packaging; coded labeling of plastic containers required; disposal of certain solid wastes in landfills or by incineration prohibited.

(f) No person shall knowingly dispose of the following solid wastes in landfills:

. . . .

(3) Yard trash, except in landfills approved for the disposal of yard trash under rules adopted by the Commission. Yard trash that is source separated from solid waste may be accepted at a solid waste disposal area where the area provides and maintains separate yard trash composting facilities.

§ 130A-309.11. Compost standards and applications.

(a) In order to protect the State's land and water resources, compost produced, utilized, or disposed of by the composting process at solid waste management facilities in the State must meet criteria established by the Department.

(b) The Commission shall adopt rules to establish standards for the production of compost. Rules shall be adopted not later than 24 months after the initiation of rule making. Such rules shall include:

(1) Requirements necessary to produce hygienically safe compost products for varying applications.

(2) A classification scheme for compost based on:

a. The types of waste composted, including at least one type containing only yard trash.

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