THE COMMUNITY FOREST

A useful tool to help mitigate nonpoint source pollution and manage stormwater

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Green Infrastructure

The trees and associated vegetation that make up the community forest are an effective infrastructure component providing a range of benefits. The mitigation of nonpoint source pollution and stormwater management are provided as well as many other valuable services. Utilizing the community forest has been shown to be very cost effective with returns on services ranging up to $3.00 or more for every $1.00 spent on management.

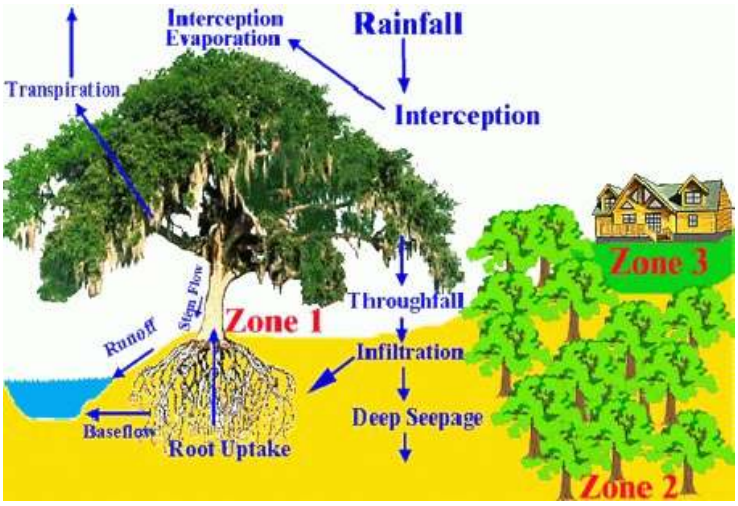
Management is the key to realizing maximum benefits from your community forest. This brochure will outline management practices, benefits, and sources of technical and financial assistance.

Basic Concepts

Urban and community forestry practices can satisfy many stormwater mitigation requirements. In fact, trees, greenspace, and other natural systems have been effectively managing stormwater since long before the advent of concrete ditches. Natural systems are effective water managers that can reduce peak flows and stabilize base flows. The basic components of natural systems can be enhanced by managing evapo-transpiration, infiltration, and stormwater flow.

Evapo-transpiration

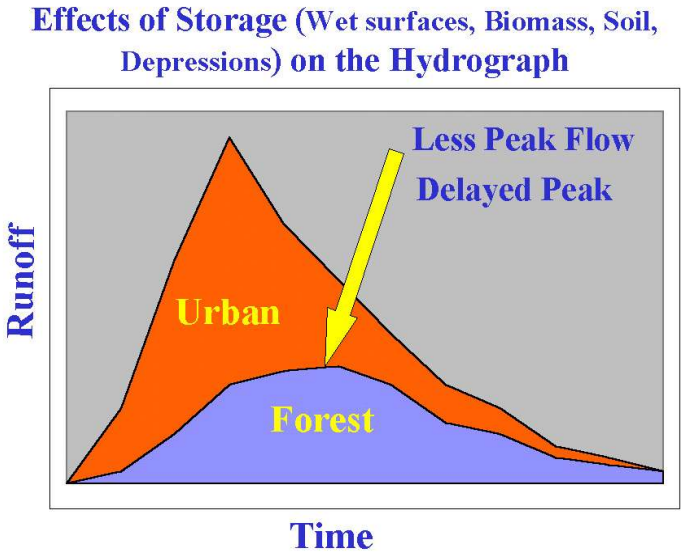
Trees are amazingly effective at catching and processing water through the process of evapo-transpiration. A recent study by the USDA Forest Service showed that a 28-foot-tall tree intercepted 58.1 gallons, or 68%, of a 0.5 inch rain event that fell within its crown area. If we conclude that every space without tree canopy contributes at least 58.1 gallons (larger trees process larger amounts) for a similar rain event, we can see the dramatic influence of trees on the volume of stormwater that must be processed. Following a rain event and the initial interception, wind and increasing temperature cause evaporation of the water caught on leaves and an increase in the transpiration process (i.e., moving water from the ground through the roots and up to the leaves where much is evaporated back to the atmosphere). This process removes water from the saturated ground, further reducing the transfer to streams or stormwater control systems.



The effect of trees and vegetation on the water cycle.

Infiltration

Infiltration of water into the ground during a storm is important not only for reducing the amount of water entering stormwater systems, but also for recharging deep aquifers that most people depend on for drinking water. Trees aid this process by the canopy slowing the impact of water on the ground, dropped leaves and limbs reducing flow across the ground, and roots increasing soil porosity. Infiltration occurs at much higher rates in areas with trees and greenspace than in areas with impervious surfaces such as buildings, roads, and parking lots. By utilizing trees in strategic locations, flow from impervious surfaces can be managed. Buffer zones for streams have been shown to be one of the most effective methods of reducing water pollution and sedimentation in streams. A recent study completed by the University of Southern Mississippi showed that forest cover over a local stream moderated stream temperature variation and conductivity (an estimate of dissolved pollutants).



Stormwater Flow

Flow of water is critical in designing systems that can tolerate the base amount and the peak. Trees and associated vegetation lessen the peak flow (the maximum amount a stormwater system must handle) by evapo-transpiration and infiltration. Due to the slowing of water movement by trees, peak flow is delayed and dispersed over a longer period of time than in areas of impervious surface. The use of trees, greenspace, infiltration areas, natural land forms, and other natural systems reduces the need for expensive, man-made stormwater structures and supplies multiple other benefits to the community.

Incorporating natural systems into stormwater management plans makes sense financially and environmentally.

Management Practices

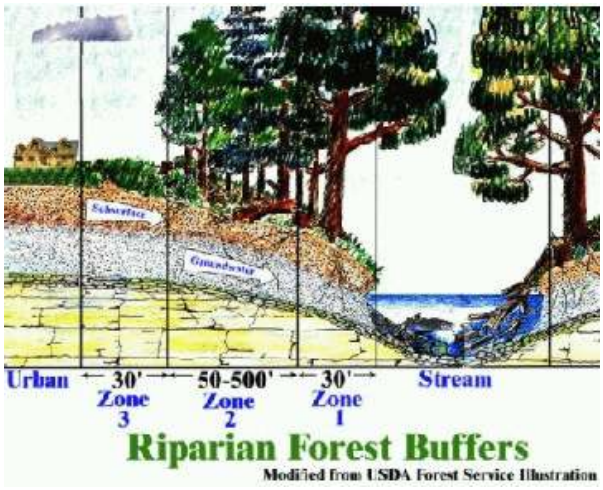
Many management practices can be employed to obtain maximum benefit from the function of the community forest. Of particular importance is the proper use and management of buffers, infiltration areas or rain gardens, parking lot islands and borders, trees on construction sites, street trees, and residential trees.

Buffers

Buffers can be one of the most effective tools for reducing nonpoint source pollution into streams and other bodies of water. Effectiveness of the buffer is based on width, species composition, ground slope, health and age, and soil type. Trees and the associated understory vegetation form a network of roots which absorb water and elements or pollutants being transported, slow movement across the ground and to the water table, and trap particles such as sediment. The leaves, twigs, and branches that fall to the ground augment the function of the roots by slowing water movement, trapping particles, and increasing soil porosity as they decompose. Mulch can be applied during establishment of new buffers to simulate forest conditions.

Forested stream buffer protects water quality.

The wider the buffer, the more effective it will be. Conditions within the buffer affect how water and the pollutants it carries slow, infiltrate, are trapped, and absorbed. Minimum recommended width is 60 feet (30 feet on each side of a perennial or intermittent stream). Width should be increased as slope increases, as soil becomes less permeable, if trees are very young or very old, if species composition is not optimal (such as lack of understory vegetation), and if the health of the trees is not optimal. More information can be obtained from *Best Management Practices for Forestry in Mississippi*, Mississippi Forestry Commission Publication #107. Other sources recommend slightly different buffer widths and configurations such as the three tiered system found in the CD publication, *Restoring the Urban Forest Ecosystem*. This system recommends a mature forested buffer bordered by a young and vigorous stand of trees, and finally by a grass or herbaceous vegetation strip where minimal disturbance occurs. This system advocates the proven theory that wider is better. While some communities and locations may be hesitant to restrict use on this land, creative use of zone 2 and zone 3 (as identified in the adjacent buffers diagram) for recreational or other limited disturbance purposes may offset the space sacrifice.



The bottom line is that well-managed buffers mitigate pollutants, stabilize stream temperature, and reduce flooding potential.

Infiltration Areas

Rain gardens or infiltration areas are planned water management areas that utilize land form and vegetation to treat water on site to mitigate impacts from runoff. Utilizing naturally low areas or creating them can provide benefits both for the landowner and the community. Water is directed into these areas to infiltrate into the ground and/or be filtered by vegetation prior to leaving the site. These areas may provide many recreational, wildlife habitat, and aesthetic benefits, in addition to providing potential products such as fruits and nuts, herbs, flowers, and wood products. Trees and vegetation that tolerate wet conditions are important to the proper function of the area. *A Guide to Bottomland Hardwood Restoration*, published by the U.S. Department of Agriculture, and other agencies, provides guidance on suitable species for planting. Rain gardens may be very small on residential sites to expansive areas for commercial or industrial facilities. Recent research has suggested infiltration areas are more beneficial and less costly to maintain than traditional retention ponds.

Even small areas of trees and vegetation can intercept and treat water effectively.

Parking Lot Islands and Borders

Parking lots account for a large portion of the impervious surface of any community and are a substantial contributor to polluted runoff. Oil, anti-freeze, solid waste, soaps, and other pollutants are transported by water in each storm event. On site treatment and/or storage of much of this polluted runoff is possible through the utilization of rain gardens in parking lot islands, land form, and borders. By retaining patches of native vegetation or creating depressions that are planted as rain gardens, water may be directed, treated, and infiltrate in multiple small areas throughout the lot. Borders of trees and vegetation surrounding the lot and between large areas of parking spaces supplement the interior rain gardens and provide an additional barrier to runoff leaving the site. Curbing must be eliminated or modified with openings for water to enter these systems. Land form enhances the effectiveness of the trees and vegetation by utilizing natural swales or creating topography that will slow and direct water into multiple treatment locations. Engineered systems may be necessary to augment natural management practices to fully treat water on site.

Curb cuts, water slowing rocks, trees, and vegetation are part of this multi-tiered treatment system.

Trees in and around parking lots supply the additional benefit of mitigating air pollution by reducing air temperatures by up to 30 degrees, thus greatly reducing the volatilization of gasoline from the tanks of parked cars. Other benefits include extended asphalt duration due to slower volatilization of structural components, lower vehicle temperatures for shoppers, and proven greater incentive for people to stop and extend their stay at a business. Larger canopy trees supply the largest benefits for both air and water quality, especially when associated with compatible understory vegetation.

Trees on Construction Sites

Construction can be one of the largest contributors to sediment loading and other pollutants in runoff. Retaining healthy trees and associated vegetation on and surrounding construction sites can help mitigate off-site water movement during and after construction. Although this process is sometimes challenging, time delays and other conflicts can be minimized with proper planning and coordination.

Involve an urban forester or professional arborist in the pre-planning stage of a project to assess the forest condition and make recommendations. The assessment will identify areas of trees to retain, buffers, trees to protect, needed maintenance, and recommended tree removals. The assessment report will contain information on inventory, forest

health, distribution, sensitive plant communities, special site conditions and considerations, and other requested items. Site variables evaluated may include soils, presence of invasive species, history of use, elevation, proximity to conflicting uses, and many others. The assessment is the first step toward the goal of a healthy and sustainable forest on the site.

Once planning is complete pre-construction measures must be installed for those areas identified, and specimen trees identified to protect. Tree protection must be planned for the above and below ground portions of the tree. Most tree roots are found in the upper 18 inches of soil. Fences should be installed around protected trees to prevent soil disturbance or compaction, thereby protecting the critical root zone. Specifications for individual tree protection measures can be found in, *A Guide To Preserving Trees in Development Projects*, published by Penn State College of Agricultural Sciences Cooperative Extension. Other measures that may be conducted during pre-construction include: installing temporary watering systems in strategic locations; pruning low limbs and other limbs in conflict with activities; removing hazardous, unsuitable, or unhealthy trees; removing trees from the building site, roads, parking, etc.; mulching; and installing root protection measures such as bridging, laying mats, or boards. The urban forester or designee can ensure that all recommended measures are properly conducted.

During construction, monitoring tree health and construction activities is important. Tree protection zones should be maintained with little or no activity occurring inside the designated boundaries. Communication should be maintained with all parties as to the intent of the tree protection plan and measures. Education for the local public and especially for the contractors working on the project can bring recognition of the importance of the protected trees, as well as satisfy regulatory requirements. Marketing the development to potential buyers or future customers can be done with assistance of the tree protection plan and installed protection measures during the construction process. To maintain optimal tree health, provide water and mulch as needed, minimize soil compaction to the maximum extent possible, and minimize changes of grade. Tree replacement and landscaping can occur before, during, and after construction. Soil structure protection should be completed for planned replanting sites.

After construction is complete, trees should be assessed for the need of maintenance pruning, watering, mulching, and/or other treatments. Some trees may need to be removed. Education to new tenants of the development is important for the continued health and maintenance of the trees.

Street Trees

Street trees can provide the first line of defense against numerous pollutants being transported to a water supply. In buffers and infiltration areas, trees absorb water and water-borne pollutants. With proper care and maintenance, trees can also provide the same functions in areas adjacent to the street. Trees should be given adequate space to develop root systems which provide for both absorption of water and pollutants, and optimal tree health. Tree “alleys” or “islands” that provide extended linear space where roots can grow are preferable to “tree wells” that restrict rooting space. Bridging or permeable materials may be installed in these areas as an alternative to asphalt or concrete. Reducing compaction and root disturbance in adjacent areas such as sidewalks will promote tree health. Permeable materials should be utilized where practical.

Street trees that develop an overhanging canopy reduce temperatures on the road thus slowing the volatilization of asphalt components and extending the time between repaving. Shade produced by the canopy also reduces thermal pollution of water due to the surface it is flowing over. Managing healthy and productive street trees for the benefits they provide is an opportunity for every municipality.

Residential Trees

Education is the key to promoting good management of residential trees. Education in the form of workshops, seminars, brochures, neighborhood tree groups, and signage is invaluable to influencing the hundreds or thousands of individuals who manage the majority of the community forest. Proper selection, placement, and care of trees by residential property owners can have a dramatic impact on the community as a whole. Providing information to residents is a service that will benefit them personally, as well as satisfy certain water quality regulations. Trees on residential lots can increase property values, decrease heating and cooling costs, and provide recreational opportunities.

Sources of Assistance

Technical Assistance

Technical assistance for urban and community forestry may be obtained by contacting the Mississippi Forestry Commission.

Information on tree selection, planting, benefits, and a multitude of other subjects is available on the Mississippi Forestry Commission's web site at www.mfc.state.ms.us. Other sources of technical assistance include the Mississippi Urban Forest Council, the Mississippi State University Extension Service, the Professional Arborist Association of Mississippi, the Natural Resources Conservation Service, the USDA Forest Service, and local professionals.

Financial Assistance

Financial assistance is available through a wide variety of sources. The Mississippi Forestry Commission currently administers two grant programs that may be applicable to assisting a community. A brochure explaining these programs, *Urban Forestry Grant Programs for Mississippi*, is available on the Forestry Commission's web site. Other sources of financial or material assistance, including the National Tree Trust and the National Urban and Community Forestry Advisory Council, are listed at the web site.

References

Restoring the Urban Forest Ecosystem, University of Florida, available on-line at http://hort.ifas.ufl.edu

Best Management Practices for Forestry in Mississippi, Mississippi Forestry Commission, Publication # 107

A Guide to Bottomland Hardwood Restoration, USDA Forest Service

A Guide to Preserving Trees in Development Projects, Penn State College of Agricultural Sciences Cooperative Extension.

Urban Forestry Grant Programs for Mississippi, Mississippi Forestry Commission, publication # 113.

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