Confluence

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Introduction

Although most of the focus on reducing nutrient loss to the Gulf of Mexico with regard to nonpoint source pollution is directed at agriculture, there is much activity within the basin focused on managing urban stormwater. According to the US Environmental Protection Agency, stormwater runoff is defined as runoff generated from rain and snowmelt events that flow over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not soak into the ground. The runoff can pick up pollutants like trash, chemicals, oils, and dirt/sediment that can harm our rivers, streams, lakes, and coastal waters.

Some stormwater is regulated by EPA under the National Pollutant Discharge Elimination System, or NPDES) including municipal separate storm sewage systems (MS4), construction and industrial activities. Cities defined as a MS4's often collect and transport stormwater runoff separately from municipal waste water and often discharge it directly into streams and rivers untreated. In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) stormwater program. The Phase I program for MS4s requires operators of "medium" and "large" MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a stormwater management program as a means to control polluted discharges from these MS4s. The Stormwater Phase II Rule

extends coverage of the NPDES stormwater program to certain “small” MS4s but takes a slightly different approach to how the stormwater management program is developed and implemented.

One of the permit requirements for MS4’s is public education and outreach. Many municipalities looked to partners to provide the required public education. For example, since July 2004, the cities of Bentonville, Bethel Heights, Elkins, Elm Springs, Farmington, Fayetteville, Greenland, Johnson, Little Flock, Lowell, Springdale and Rogers along with Benton and Washington Counties and the University of Arkansas have jointly contracted with the University of Arkansas Cooperative Extension Service through the Northwest Arkansas Regional Planning Commission.

This regional urban stormwater education program is a successful and cost-effective approach to public education and participation as well as annual municipal employee training as required in their EPA Phase II Stormwater Management permits. Another example includes the development of the Stormwater Management Guide in Tennessee, a joint venture between the State of Tennessee and the University of Tennessee-Knoxville. The guide overviews best management practice for stormwater including Low Impact Development, rain gardens, retention ponds, permeable pavers, etc.

We have dedicated this issue to ongoing stormwater management activities within the Mississippi River Basin.

Sincerely, your Co-Editors:

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Northwest Arkansas Sormwater Outreach

Northwest Arkansas Regional Planning Commission

Over the past decade, the Northwest Arkansas Regional Planning Commission has partnered with the University of Arkansas Division of Agriculture Cooperative Extension Service (UACES) to assist communities, counties and the University of Arkansas in Washington and Benton Counties to meet EPA’s Phase II stormwater regulations. In urbanized areas, stormwater picks up pollutants and flows, untreated, through Municipal Separate Storm Sewer Systems (MS4s), into local creeks, streams and lakes. To prevent harmful pollutants from being washed or dumped into a storm drain system, the USEPA requires that jurisdictions obtain permits to properly manage and discharge stormwater. On August 1, 2015, the Arkansas Department of Environmental Quality issued the third consecutive five-year MS4 Stormwater General Permit which mandates that each of 21 regulated jurisdictions in Northwest Arkansas develop and implements their own stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges.

Northwest Arkansas MS4 Stormwater Compliance Group

A key role of the NWARPC is coordinating regular meetings of the MS4 Stormwater Compliance Group (SCG). Composed of local MS4 representatives, NWARPC staff and the UACES, the SCG meets monthly to discuss permit compliance challenges, local stormwater education program needs and accomplishments, and regional coordination of stormwater protection efforts.

The MS4 Stormwater Compliance Group continues to be a model for other MS4s in Arkansas. The NWARPC will continue with the work of assisting the NWA MS4s, as well as others, in the development of their stormwater management programs and meeting the EPA Phase II requirements.

Regional Stormwater Education Program

The NWARPC and the individual MS4 jurisdictions sign a new Memorandum of Understanding each year in order to receive programming of the UACES for the Northwest Arkansas Regional Stormwater Education Program. A 23-member Stormwater Education Steering Committee meets annually to guide and direct the UACES's regional urban stormwater education and involvement programs. The focus topic for 2015 was Yard Waste and Debris.

UACES programming is increasing public awareness and understanding of stormwater runoff, through the development and distribution of print and electronic educational materials, displays, mass media promotion, youth and adult education programs, and public engagement events including creek and lake clean ups. UACES staff provides Quarterly Reports and Annual Reports for the MS4s and conducts annual municipal employee trainings.

Stormwater Planning
US Environmental Protection Agency

Community Solutions for Voluntary Long-Term Stormwater Planning

On October 27, 2016, EPA announced a draft guide, toolkit, and technical assistance to promote comprehensive, community-wide planning approaches to manage stormwater. EPA considers this guide a draft that will be supplemented with an integrated online tool to assist communities in implementing

the planning process, piloted through community-based technical assistance efforts, and updated over time with feedback from users.

EPA has released a step-by-step guide to help communities develop long-term stormwater plans, a web-based toolkit for the planning process, and technical assistance for five communities to develop plans as national models. This approach was built on input from states, communities, industry, academia, and nonprofits.

"When communities link the timing and implementation of stormwater projects with broader planning activities, they can reduce costs and support more sustainable local development," says Joel Beauvais, deputy assistant administrator for the Office of Water. “As stormwater increasingly threatens public health and the environment, EPA can help communities integrate stormwater management with broader plans for growing their economies, investing in critical infrastructure and meeting their water quality objectives.”

Initially the draft guide will be utilized by five communities selected for $150,000 each in technical assistance to develop long-term stormwater management plans:

- Burlington, Iowa
- Chester, Pennsylvania
- Hattiesburg, Mississippi
- Rochester, New Hampshire
- Santa Fe, New Mexico

These communities will also be the beta testers for EPA’s web-based toolkit, which will be refined and released more broadly next year.

Each year billions of gallons of runoff laden with trash, nutrients, metals, and other pollutants flow into waterways. Stormwater runoff is one of the fastest growing sources of pollution across the country and it can overwhelm wastewater systems and overflow sewers. Many cities have utilized green infrastructure as part of a comprehensive, long-term approach to managing stormwater. Communities are finding the benefits from such approaches go well beyond helping to meet regulatory requirements and actually turn hazards into opportunities. Comprehensive, long-term plans can guide smart investments by tying together multiple community objectives like street improvements, outdoor open spaces, greenways or recreation areas, as well as community revitalization.

For more information, visit https://www.epa.gov/npdes/stormwater-planning.

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University of Tennessee Stormwater Management

University of TN-Knoxville & TN Stormwater Training

The University of Tennessee Knoxville operates a Phase II Municipal Separate Storm Sewer System (MS4). The MS4 is governed by the State of Tennessee National Pollutant Discharge Elimination System (NPDES) permit. This permit is required by the Tennessee Department of Environment and Conservation as mandated by the Environmental Protection Agency under the Clean Water Act of 1972.

The primary goal of the MS4 is to improve and/or maintain the quality of surface waters by reducing the amount of pollutants in storm water as a result of continued urbanization. Polluted runoff is commonly transported through MS4s, from which it is often discharged untreated into local water bodies. To prevent harmful pollutants from being washed or dumped into an MS4, operators must obtain a NPDES permit and develop a Stormwater Management Plan which consists of six components.

The implementation and enforcement of these components, listed below, is collectively referred to as the Stormwater Management Plan.

- Public Education and Outreach
- Public Participation and Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-Construction Stormwater Management for New Development and Redevelopment
- Pollution Prevention and Good Housekeeping for University Operations

In order to achieve our Stormwater Management goals UT works to maintain compliance with all applicable state and federal regulations regarding water resources, provide a regulatory framework to ensure our development has minimal impact on the environment, promote low impact development to help protect our natural hydrologic cycle, manage our ever growing Stormwater Infrastructure, and engage our community through public participation and education outreach events.

Some of that education and outreach is accomplished through a Stormwater Control Measures (SCM) Inspection and Maintenance workshop. The Stormwater Control Measures Inspection and Maintenance workshop is a 2 day foundation building course for individuals responsible for the inspection and maintenance of permanent stormwater management practices. The course is intended for design professionals, engineers and landscape architects; landscape and other green industry professionals; and inspection personnel from all levels of government. The SCM I&M course aims to build a solid working knowledge of proper operation and maintenance of permanent stormwater measures. Topics include the permanent stormwater management requirements in the MS4 general permit; the function, inspection and maintenance of key SCMs based on the new permanent stormwater manual; and annual inspection and reporting requirements by owners/operators of permanent SCMs. The SCM I&M course provides a Certification with 12 PDHs upon successful completion for a short certification exam The SCM I&M certification is valid for 3 years.

Further education is available for individuals to become proficient with the Tennessee Runoff Reduction Assessment Tool (TNRRAT). TNRRAT was designed to help engineers, landscape architects, and other designers to create successful permanent stormwater management designs that protect water quality and meet the Tennessee MS4 Permanent Stormwater Permit requirements. A one-day course for engineers, landscape architects; stormwater plans preparers and local government plan reviewers. The course describes how to create stormwater management systems using green infrastructure and evaluate performance with the TNRRAT so that stormwater management plans for new and redevelopment projects meet the requirements of the Tennessee MS4 permit. Topics discussed in the course include: what it means for a design to meet permit requirements; rainfall analysis; soil infiltration science; use of TNRRAT and the Manual for site evaluation and design of permanent Stormwater Control Measures (SCMs); site design examples and inspection and maintenance requirements for SCMs.

Additionally, the state of Tennessee and University of Tennessee-Knoxville, have collaborated to develop a stormwater management guide. The primary purpose of the guide is to serve as design guidance and technical reference for designated and non-designated (unregulated) MS4 communities in Tennessee. It is intended to provide the information necessary to properly meet minimum permanent stormwater management requirements as specified in MS4 permits.

The guide's target audience is:

- Local officials and administrators in designated MS4 communities that must comply with Permanent Stormwater Management requirements.
- Other localities or entities in Tennessee that choose to develop a stormwater management program or implement stormwater SCMs to protect their water resources.
- Designers, consultants, or other individuals or companies that engage in regulated new and/or redevelopment activities.
- Others interested in stormwater management technical criteria (e.g. businesses, state agency staff, watershed groups and citizens).

The guide will provide design professional the information needed to develop the proper design of a functioning system that meets all the applicable requirements and considers all unique conditions of individual sites. However the guide does not cover every aspect of engineering necessary for proper

SCM system design, construction, and implementation, nor does it cover every possible design scenario. Where the designer determines that conformance with this manual would not be technically or financially feasible, alternative design approaches, materials, and methods will be considered on a case-by-case basis.

For more information on Tennessee's stormwater management guide, outreach and education visit: http://tnstormwatertraining.org/index.asp

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Arkansas Forests and Urban Stormwater

Jon E. Barry

Trees and forests are important to water management in all settings in Arkansas. Most people recognize the valuable role forests play in storm water management in rural settings, but often the role trees play in assuring healthy water supplies and in stormwater management for urban areas goes unrecognized. This article will focus on the functions and uses of trees in storm water management in urban areas.

Arkansas' landscape is changing. As we enter the 21st century, urban areas are spreading rapidly. As urbanization of the landscape increases, stormwater management problems increase. Existing storm water facilities in some places are being swamped by the volume of storm water generated by new development. Many past management practices have proven inadequate to handle current stormwater volume and also have proven detrimental to the environment. Clearly, we need to change our thinking and view our existing landscape and forests as part of our stormwater infrastructure. Storm water management is evolving in that direction as traditional management costs increase and we learn to reduce costs by retaining storm water for utilization on-site rather than transporting it off-site to the nearest body of water.

What is stormwater?

Stormwater is the flow of water that results from precipitation and which occurs immediately following rainfall or as a result of snowmelt. When a rainfall event occurs, several things can happen to the precipitation. Some of the precipitation infiltrates or soaks into the soil surface, some is taken up by plants and some is evaporated into the atmosphere.
Stormwater is the remaining portion of the precipitation that drains from the land surface and from soils.
In urban and suburban areas, much of the land surface is covered by con structed and impervious sur faces, such as buildings and pavement, which do not allow rain to soak into the soil sur face as it does in naturally vegetated areas, so more of the rainfall becomes stormwater runoff. Most developed areas rely on storm drains to carry large amounts of runoff from roofs and paved areas to nearby waterways.

Why is stormwater a problem?

Storm sewer systems concentrate runoff into smooth, straight conduits. This runoff gathers speed and ero sional power as it travels underground. When this runoff leaves the storm drains and empties into a

stream, its excessive vol ume and power blast out stream banks, damaging streamside vegetation and wiping out aquatic habitats

The stormwater carries sediment from construction sites and other denuded surfaces. Water from streets, roof tops and parking lots is often warmer than that from other surfaces, which can be harm ful to the health and reproduction of aquatic life.

Not only does stormwater volume and peak flow increase, but storm flow from urban areas carries more pollutants into streams than storm water from forests. Many home owners use pesticides and fertilizers on their lawns. Some of these homeowners ignore recommendations and use more, or far more, than necessary. These materials, along with grass clippings, pet wastes and petroleum wastes from streets and driveways, directly enter streams or enter through municipal stormwater systems. Since stormwater is not treated, anything that enters a storm sewer system is dis charged directly into the waters we use for swimming, fishing, and as drinking water. Where it enters drinking water sources, the cost of municipal water treatment is increased. If water treatment is inadequate, this can affect human health.

Household hazardous wastes like pesticides, paints, solvents, used motor oil and other auto fluids can poison aquatic life. Debris such as plastic bags, sixpack rings, bottles, cups and cigarette butts which enter water bodies can choke, suffocate or disable aquatic life like ducks, fish, turtles and birds (Figure 2). Bacteria and other patho gens in stor m water can wash into swimming areas and create health hazards. Land aimals and people can become sick or die from eating diseased fish or drinking polluted water.

The sediments in stormwater can cloud the streams and lakes and make it difficult or impossible for aquatic plants to grow. Sediment also fills in the spaces around rocks and woody debris in streams. These spaces are critical habitats for aquatic organisms which are the foundation of the aquatic food web. Excess nutrients can cause algal blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't survive in water with low dissolved oxygen levels.

How do trees fit into the stormwater picture?

Wild forests (as opposed to urban forests) are ideal settings for stormwater management; however, they are incompatible with some human activities. For example, one would not want to play football in a forest. Also, light automobile traffic, or even heavy foot traffic, can compact soil, which can kill tree roots. Urban forests, because of their lower stand density, are less effective at stormwater management than wild forests, but they still provide many benefits in stormwater management.

Let's look at the value of trees in stormwater management, starting with the point where rain first contacts the tree – the canopy. The canopy of a tree is the layer of leaves and twigs that forms the top of the tree. Because urban trees are frequently solitary, the crown may form a shell that covers the upper half or more of the trunk. Raindrops fall at a speed of 5 to 20 mph, depending upon size of the raindrop. An individual raindrop won't pack much wallop, but what about a rain storm? A one-inch rain can deliver about 45 foot-pounds of energy per square foot of soil. That's enough energy to break soil into fine particles which are easily transported. Some of those particles are transported down slope while others clog pores in the soil, reducing infiltration and increasing runoff.

Raindrops falling through a forest canopy impact leaves and twigs and dissipate energy into the tree rather than the soil. Much of this water will be retained on the leaves and twigs for a time. Some of the water retained on the tree drips off the leaves or runs down the limbs and trunk to the soil over a

period of time. That time lag delays and reduces the volume of peak storm flow, which reduces the impact of stormwater on stream channels.

Some of the water which is retained on the leaves and twigs never reaches the ground. It evaporates directly from the leaves and twigs and does not con tribute to stormwater. Research in forests similar to those found in Arkansas indicates that 12% to 18% of rainfall that falls over mature forests never reaches the ground. A 15% reduction in stormwater doesn't sound like much, but think about it this way. If we assume a storm dropping one inch of rain, a modest storm, this reduces stormwater by more than 4,000 gallons per acre of watershed. Obviously, urban forests are less dense than wild forests, so stormwater reduction will be less.

Both deciduous and evergreen forests annually drop leaves which accumulate on the forest floor as leaf litter. Leaf litter absorbs the energy of the falling rain that gets through the canopy without striking a leaf or twig. Leaf litter also slows surface flow of stormwater and traps much of the sediment and other pollutants carried by stormwater. Most homeowners remove leaf litter in urban areas, leaving the soil vulnerable to erosion and compaction. Dense grass can substitute for some of these benefits; however, grass cannot provide all of the benefits provided by urban forests.

Trees also use a substantial volume of water. This water is absorbed from the soil by the roots and released through the leaves to the atmosphere in a process called transpiration. A mature tree can transpire around 50 gallons of water per day, every day through the summer. This is more water than will evaporate from nonforested soils. This process pro vides two benefits. First, some of the water from storm events is transpired by trees before it reaches streams. That's 50 gallons per tree per day that doesn't enter streams as stormwater. Even well after a storm event, trees continue to extract water from soil. By reducing soil water content below the saturation level, trees make room in the soil for even more water from the next storm event.

Tree roots provide another benefit, as well. Roots are not permanent. Trees continually lose and replace some of the roots. As these dead roots decay, they provide larger channels for water infiltration into the soil. Some evidence indicates that water moving along the root surfaces may infiltrate even dense soil layers. As a result of these processes, less water is available for overland flow and some water infiltrates deeply enough to enter groundwater. Tree roots also absorb some of the pollutants, such as fertilizers, present in stormwater.

Forests provide many benefits in stormwater management. They intercept rain before it becomes stormwater and return part of the rain to the atmosphere. Forests also return water to the atmosphere through transpiration. Forests deposit mulch, which protects the soil from rain impact, and their roots create infiltration channels and absorb some pollutants

How can we use trees to manage and mitigate stormwater?

When we discuss using trees in urban stormwater management, we really need to discuss two separate situations. First, we need to consider some of the issues we will deal with when wild lands are newly converted to urban or industrial uses. Second, we need to consider some of the issues associated with areas long ago converted to urban or industrial uses. These differences are important because areas which have not been in urban use have a much more dense forest than those which have been in urban use for many years.

Land Conversion

Often when wild land is converted to urban uses, the site is first cleared of all vegetation to facilitate regarding the site to improve construction efficiency. Ornamental trees may be added to the site afterwards. The reduction in forest cover that comes with development will increase the stormwater runoff from the site and change the character of the runoff.

Clearing the vegetation from the site has several negative effects. First, the volume of stormwater increases dramatically. Only about 10% of rain from moderate storms enters streams as stormwater from an intact forest. The remaining 90% is returned to the atmosphere through evapotranspiration or percolates into the soil and is held there until it is taken up by plant roots. In contrast, 40% to 55% of rain falling on lawns runs off as stormwater. The percentage is even higher for impervious surfaces such as streets or roofs. This increase in storm flow erodes stream channels. When this stormwater is diverted away from natural systems and into storm drains, a significantly greater load is placed on municipal stormwater systems.

Stormwater volume isn't the only thing that changes. Stormwater runs off lawns more quickly than off forests, so the stormwater from a rain event is delivered to the stream over a shorter period of time. Since a greater volume of water is being discharged during a shorter time period, peak storm flow is greater, which causes higher water levels, more erosion in stream channels and potentially more flooding.

Several general guidelines will be helpful for planning stormwater management before development begins. First, leave buffers of undisturbed forest along streams. Thirty-five feet on each side of the stream channel should be considered the minimum. Wider buffers should be considered on sloped sites. It may be tempting to incorporate these buffers into parks, but this should not be done because most parks are raked clean to facilitate usage. Leaf litter is important to the function of buffer strips. Removing the leaf litter and the foot traffic associated with park uses results in soil compaction and greater runoff. Light foot traffic will not harm buffer strips, but heavy foot traffic should not be encouraged. Don't set up picnic tables in the buffer strips. Paved walking trails through the buffer strips will not greatly impede buffer function; however, care should be taken to preserve water flow through the buffer strip. Do not place walking trails within 25 feet of the stream channel.

Trees in buffer strips should not be removed unless absolutely necessary. Removing a few hazardous trees will not impair the function of the buffer strip, but do not remove more trees than necessary. Trees absorb water from the soils of the buffer strip before that water reaches the stream channel. Fewer trees result in more water delivered to the stream. Trees also provide the leaf litter which protects the soil from overland flow and erosion.

All of the trees on the site are important to stormwater management; however, development cannot take place without removing some of the trees. Developers must balance the need to remove trees for safe and efficient development with leaving trees for stormwater management. Remove only trees which must be removed to safely accomplish development. To the extent possible, the healthiest trees should be left on the site. In general, healthy trees will be part of the upper forest canopy on the site. Seek the advice of a consulting forester to determine which trees should remain after development. Construction activities around trees can severely damage root systems. See UACES fact sheet FSA5011, *Ten Easy Ways to Kill a Tree (And How to Avoid Them*), for more information about protecting trees during construction. The fact sheet is available from the Cooperative Extension Service web site or your county extension agent. Also, consider planting trees after development is complete. Don't forget to look for tax breaks and conservation easements to help offset some of the cost of leaving trees for stormwater management.

Peak storm flows can be delayed and reduced by holding stormwater in detention or infiltration basins. Detention basins can take the form of con structed wetlands which hold water permanently and serve as sinks for stormwater. Detention basins usually have wetland vegetation, including trees, around the edges and may have an outlet to a creek or other drain for excess stormwater. Infiltration basins serve a similar function; however, they do not hold water permanently. They are dry most of the time and are designed to hold water only immediately after a storm event. Infiltration basins have no surface outlet. As the name implies, water soaks into the soil from infiltration basins. Infiltration basins contain vegetation which may include shrubs and trees which can tolerate flooding for short periods.

Existing Urban Areas

While it is relatively easy to plan stormwater management before development is conducted, changing stormwater management practices in existing urban areas is much more difficult. Streams have already been moved to surface or underground concrete conduits, buffer zones have been covered with lawns or impervious surfaces, and almost all available land has been put to residential or commercial use. Little land is available to manage storm water on-site in these situations. Municipalities can maintain the health of existing trees and plant new trees where opportunities are available. Isolated trees still catch rainfall before it enters the storm water stream and help remove soil water before it enters streams.

Sometimes opportunities may be found in existing urban landscapes. Most urban areas contain at least some land suitable for urban forests. These areas include lawns, parks, athletic complexes, schools, road medians and cemeteries. While some parks and athletic complexes will not be suitable for trees because of the type of use, often parts of these public lands can support an urban forest. Public lands are the easiest to incorporate into a stormwater management system because they are publicly owned and already under control of the local government. Protect existing trees on these properties and plant trees where they are appropriate. Cemeteries and lawns, even though privately owned, could be incorporated into stormwater management systems through offering incentives to maintain or establish tree cover. Tree protection ordinances can be used to maintain forest canopies on private properties where incentives produce inadequate results, but these ordinances often are unpopular. Many private citizens and businesses are eager to participate in green redevelop ment. Those who own land adjacent to streams may be willing to donate easements along streams so that buffer strips can be installed where none currently exist. Citizens are often willing to help plant trees, as well.

When urban sites are redeveloped, opportunities arise to install stormwater management systems. Soils under parking lots, roads and sidewalks can be used to temporarily store stormwater. Engineered soils are available that provide greater water storage capacity than compacted soils typically found under parking lots without a loss in soil strength. Storm water should be directed to the storage under the parking lot instead of being directed into stormwater drains. These systems should be used in conjunction with trees to dispose of stormwater on-site. The trees are important to making this system work because the trees reduce the stormwater volume entering the system and remove stormwater from the engineered soils through transpiration. The tree roots penetrate compacted subsurface soils and provide channels for infiltration to further remove water from the engineered soils. Trees must be carefully matched to local rainfall patterns to provide a good balance between tolerance to flooding and tolerance to drought.

Urban soils are often compacted enough to reduce stormwater infiltration. Compaction results in poor plant growth and increased stormwater runoff. In the long term, trees can remediate compacted soils and improve water infiltration. Tree roots growing through the soil create open channels for air and

water infiltration. Besides increasing infiltration, the increase in soil porosity will improve plant growth and further increase the value of the site for stormwater management.

Conclusion

Stormwater management is a significant cost for many cities and can have a significant impact on our environment; however, the costs and impacts can be reduced. Appropriate planning at the time of development or redevelopment greatly reduces the cost of stormwater management in terms of dollars and environmental impact. Even when redevelopment is not an option in the near future, proper management of the urban forest can reduce stormwater costs and impacts.

Available Resources

The concept of Low Impact Development (LID) and other sustainable stormwater management techniques is gaining popularity. Increased aware ness of "green development and construction" in urban areas is causing urban planners to develop new approaches to stormwater management.

The Low Impact Development Center, Inc. promotes a planning and design approach with the goal of maintaining and enhancing the predevelopment hydrologic regime of urban and developing watersheds. The link to their site is: http://www.lowimpact development.org/index.html

The Watershed Forestry Resource Guide provides information on the role of trees in stormwater management. The link to their site is: http://www.forestsforwatersheds.org/

The Stormwater Management consortium has a web site which describes uses of trees in "structural soils" for stormwater management. The link to their site is: http://www.cnr.vt.edu/urbanforestry/stormwater/index.html

The Urban Forestry South Expo web site contains information on a wide range of urban forestry topics including stormwater issues. The link to their web site is: http://www.urbanforestry south.org/

The Urban Design Tools web site has a number of design tools and ideas for low impact urban development. Some of these designs make use of trees for stormwater management. The link to their web site is: http://www.lid-stormwater.net /index.html

The Environmental Protection Agency web site provides abundant information on stormwater management. Links to their sites are: http://www.epa.gov/guide/stormwater/ http://www.epa.gov/npdes/pubs/nps_urban-facts_final.pdf http://www.epa.gov/nps/lid/

The American Forests web site has documents describing the benefits and uses of trees in urban stormwater management. The link to their site is: http://www.americanforests.org /graytogreen/stormwater/

The Villanova Urban Stormwater Partnership web site provides information on stormwater management. The link to their web site is: http://www3.villanova.edu/vusp/

The Stormwater Center provides an array or resources for stormwater management planning. The link to their site is: http://www.stormwatercenter.net/

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Environmental Markets Help Improve Water Quality

Kari Cohen, USDA-NRCS

Environmental trading markets are springing up across the nation with goals of facilitating the buying and selling of ecosystem services and helping more private landowners get conservation on the ground.

USDA Secretary Tom Vilsack and EPA Administrator Gina McCarthy joined Virginia Governor Terry McAuliffe in December 2014 to announce the state's first trade under its nutrient trading program for stormwater.

Through the transaction, the Virginia Department of Transportation (VDOT) purchased phosphorous credits generated on farms to offset phosphorous runoff from a road construction project. By purchasing the credits, VDOT saved approximately 50 percent of the cost of installing traditional engineered structures and paved the way for similar transactions.

Since then, Virginia's stormwater trading program has blossomed—the state has approved almost 30 nutrient banks that can sell credits.

Recently, the National Network on Water Quality Trading—a forum for advancing the policy and practice of water quality trading—met to set the stage for development of a road map for innovative approaches to stormwater mitigation. Through these new approaches, cities and rural communities across the Nation would have access to online tools and models to help address stormwater challenges through market-based approaches and green infrastructure incentives.

"We want to make sure that our rural communities and agricultural producers are part of the stormwater conversation," said USDA Natural Resources Conservation Service Chief Jason Weller.

The Willamette Partnership administers the National Network on Water Quality Trading through a Conservation Innovation Grant from USDA's Natural Resources Conservation Service (NRCS). Conservation Innovation Grants are funded through the NRCS' Environmental Quality Incentives Program, which is part of the Farm Bill. "I like to call the Farm Bill the Nation's largest green infrastructure program," said Weller.

USDA is seeking new proposals for cutting-edge projects, like environmental markets, that will provide new conservation opportunities through its Conservation Innovation Grants (CIG) program. Through USDA's Natural Resources Conservation Service (NRCS), the department will invest up to $25 million for projects that spark the development and adoption of innovative conservation technologies and approaches in areas like conservation finance, data analytics, and precision conservation to benefit producers on private agricultural and forest lands.

The next National Network on Water Quality Trading meeting is tentatively scheduled for the spring of 2017, and will focus on water quality trading challenges and opportunities for agricultural producers. Producers or organizations interested in participating in this meeting, should contact Kari Cohen, the National Leader for Environmental Markets and Conservation Finance at NRCS.

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Hypoxia Task Force December 2016 Public Meeting

Tuesday, December 6, 2016

Public Meeting: 8:30 AM – 12:00 PM (Central), 9:30 AM – 1:00 PM (Eastern)

In person: Renaissance New Orleans Pere Marquette French Quarter Area Hotel
Storyville Ballroom
817 Common Street
New Orleans, LA 70112
Phone: 504-525-1111

Webcast: For those unable to attend in person, there is an option to view the meeting via webcast. The only requirements for attending the webcast are that you register and have a computer with sound so that you can see and hear the presentations. You can listen to the webcast through your computer speakers or headphones connected to your computer. A phone line will not be provided. After you register for the webcast, instructions about how to join the webcast will be emailed to you.

To register, go to the registration page and indicate whether you will be attending in person or via the webcast.

There will also be a networking session with the Task Force on Monday, December 5 from 6:00 PM to 7:30 PM Central Time in the Storyville Ballroom Section I and Storyville Foyer of the Renaissance New Orleans Pere Marquette French Quarter Area Hotel for in-person attendees.

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Mississippi Governor's Task Force Water Conservation Summit

Tuesday, December 13, 2016

Capps Center, Stoneville, Mississippi

Hosted by Governor's Delta Sustainable Water Resources Task Force. Begins at 9:30 a.m. and concludes at 2 p.m. Lunch will be served at no charge and no registration fee is required. Participants can expect to learn how to increase profit margins while conserving the region's vital irrigation water supplies. During breaks, participants can visit with exhibitors to receive additional information and services for increased irrigation efficiency. The Task Force, which includes the Yazoo Mississippi Delta Joint Water Management District, Delta Council, Delta F.A.R.M., Mississippi Farm Bureau, the U.S. Army Corps of Engineers, the USDA Natural Resources Conservation Service, the Mississippi Soil and Water Conservation Commission, and the Mississippi Department of Environmental Quality, was formed to develop and implement actions to sustain water resources for agriculture, fisheries, and wildlife in the Delta.

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Southern Ag Cover Crops, Soil Health and Water Management Conference

December 13 - 14 2016

Farmers across Arkansas and from across the country are invited to the Southern Agricultural Cover Crops, Soil Health and Water Management Conference December 13 - 14 being held at the Arkansas State University Convocation Center in Jonesboro, Ark. The conference, co-sponsored by the USDA's Natural Resources Conservation Service (NRCS) and the Arkansas Association of Conservation Districts (AACD), is designed to help farmers learn how to successfully adopt a cover crop management system, improve soil health and water management on their operations.

The conference provides a forum for farmers to exchange information, discuss opportunities for collaboration, and learn about new and successful practices related to cover crops, soil and water management. Case study presentations will identify and discuss strengths and pitfalls of real applications.

Specific conference sessions will include: soil management; irrigation water management; pest management; growing cover crops to graze cattle on cropland; cover crop management, climate change, no-till farming, using gypsum and the economics of soil health. Guest speakers will include NRCS and USDA Agricultural Research Service scientists, farmers, crop consultants, and university researchers who have extensive experience with various focal points of the conference. One of the featured speakers for this year's conference will be Gabe Brown who will make a presentation on soil health.

Cover crops enhance soil health, increase soil water retention and keep nutrients in the fields. Although cover crops can be effective under conventional tillage, they also improve soil health and ease the transition to continuous no-till.

“Southern farmers cannot simply rely on the tried and proven management techniques that the Midwest employs to manage cover crops and improve soil health,” said John Lee, USDA NRCS state agronomist in Arkansas. “Conditions in the South are different, and we need to plan to improve soil health according to southern agricultural farming practices and conditions farmers are facing here in the South.”

Part of the second day of the conference will focus on methods to improve water management. Irrigation water management saves money while reducing water use, improving water and air quality, and saving energy. “Irrigation water management just makes good dollars and sense,” said Walt Delp, USDA NRCS state conservation engineer. “Every drop of water that does not runoff is water that is available for crop use and does not have to be pumped.”

One emerging field for conservation is selling carbon credits on the environmental market. Several speakers will talk about how to use less water for rice production which in turn will produce fewer greenhouse gases.

Certified crop advisors can earn continuing education units for attending training at the conference. For more information or to register for the Southern Agricultural Cover Crops, Soil Health and Water Management Conference, contact Debbie Moreland, AACD program administrator, at (501) 682-2915. Registration packages are also available at www.aracd.org.

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Arkansas Soil & Water Education Conference & Expo 2017

Wednesday, Jan 25, 2017

The 19th annual Arkansas Soil and Water Education Conference and Expo 2017 will address the latest issues and trends in soil and water conservation. Once again this year’s conference will include a vendor trade show – the ASWEC Expo.

The conference cost if registered by January 9th is $20 per person which includes lunch. To register online, visit Arkansas State Universities website here .

Soil & Water continuing education units for certified crop advisors will be awarded.

For more information, contact Chris Jones at (870) 972-2043 or chrisjones@astate.edu

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