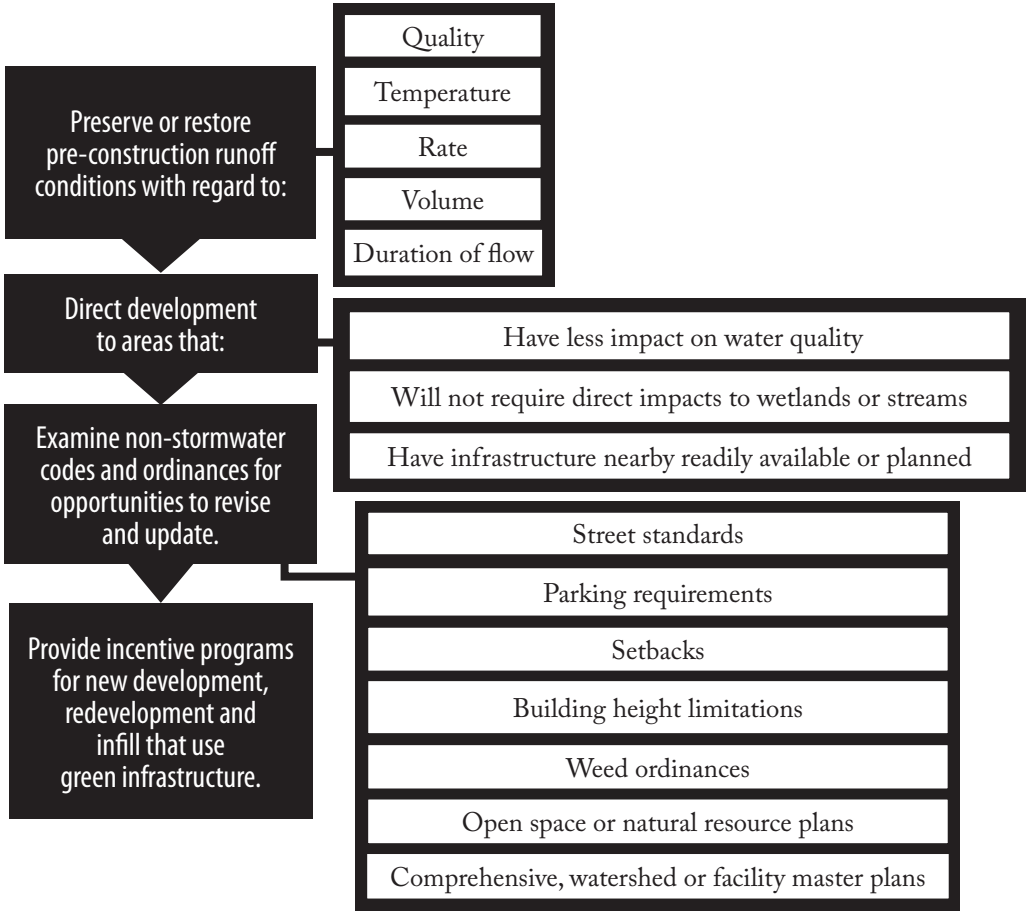
4 Integrating Green Infrastructure Into Ordinances

Ordinances and codes are the legal mechanisms for implementing and enforcing a post-construction stormwater runoff program. MS4 communities desiring to integrate green infrastructure into their program may need to create or revise ordinances relevant to infrastructure, land use and natural resources. Relevant procedures to post-construction management of stormwater runoff include policies that:



Water quality problems due to stormwater runoff typically are associated with the smaller storms and not the design storms used by engineers for drainage. (Pitt-Clark. 2008.) The goal of sustainable stormwater management is to select and implement an optimal array of control practices that meet the water quality goals while minimizing detrimental considerations, including cost. These controls should be selected based on-site characteristics, including soils, and on the rainfall and runoff conditions.

Two options for demonstrating the goal of water quality are described below.

1. The first, and most common option, uses a concept sometimes referred to as "water quality volume." In this option, water quality rain events that occur roughly 90 percent of the time over a given period of record in order to address water quality goals in development. Also, stormwater control measures are designed, constructed and maintained to infiltrate, evapotranspire or reuse runoff to the maximum extent practical. This option is a recognized standard of practice based on studies of small storm impact, and they can help restore site hydrology. However, it may not necessarily maintain or restore the pre-construction runoff condition.

2. Option two involves site-specific engineering analysis to design and model on-site stormwater control measures to mimic pre-construction runoff conditions in new development or prevent runoff pollution to the maximum extent practicable in redevelopment/infill projects. Analysis is typically based on site-specific data such as soil type, slope, depth-to-groundwater, land use and local meteorology (including rainfall frequency). Data can be applied in continuous simulation models to show that post-construction stormwater control measures control the rate, volume, frequency, duration or temperature of runoff in a manner that does not exceed pre-construction conditions.

4.1 Develop, Enhance and Implement Policies to Protect, Restore or Enhance Pre-Construction Runoff Conditions

Policies should establish appropriate performance goals to maintain, restore, or enhance pre-construction runoff conditions to the maximum extent practicable. Common options include capture and treatment of the water quality rainfall event, assumed annual infiltration performance based on applied stormwater controls or a site-specific engineering analysis.

In any option, policies may define pre-construction runoff conditions by land use conditions prior to the proposed development. Pre-construction land use is land function prior to new and redevelopment or retrofit applications. Measures more restrictive than mimicking pre-construction runoff conditions may be warranted in areas where streams are currently impaired. It is most cost-effective to reasonably mimic pre-construction runoff conditions in new development projects, also known as "greenfield" projects.

Which Option to Apply?

Policy may direct which design option to use based on whether the designer can be reasonably expected to have the requisite data and resources needed to analyze annual rainfall, infiltration, evapotransipiration, interception and potential

harvest and reuse scenarios. Water quality event management may be appropriate for small sites proposed in areas of no obvious direct connection to sensitive areas (not adjacent to lakes, wetlands or streams for example), and more detailed analysis may be appropriate for very large sites or any sites adjacent to environmentally sensitive areas.

Potential Constraints

In some cases, site conditions may prevent post-development conditions from meeting the performance criteria. Conditions that could prevent fully restored pre-construction runoff conditions include:

- Shallow bedrock, karst or heavy clay soils, preventing or minimizing potential infiltration.
- Contaminated soils that require minimal infiltration to prevent transport of pollutants to groundwater.
- Groundwater depths less than two feet below finished grade elevations.
- Lime stabilization requirements of subsoils.
- Water harvesting and reuse are not practical or possible because of local plumbing code requirements.
- Retrofits to existing facilities are not feasible because of structural or operational constraints.
- Retention or use of stormwater on-site or discharge of stormwater on-site via infiltration has a significant adverse effect on the site or the down gradient water balance of surface waters, groundwaters or receiving watershed ecological processes.
- State and local requirements prohibiting stormwater collection.
- State and local requirements prohibiting retention in the public right of way.

Where contaminated runoff from hotspots threaten groundwater quality, minimal infiltration to prevent transport of pollutants to groundwater is recommended.

4.2 Directing Development

Directing land development patterns can be used to minimize the potential for negative impacts on water quality. Land use is a primary cause of water quality degradation and impervious surface in urbanized areas can represent the largest increases to runoff volumes on a per square foot basis. In terms of sediment loads, the national average of sediment runoff from roads, commercial and industrial sites averaged up to one-half ton per acre (University of Wisconsin-Extension and Wisconsin Department of Natural Resources, 1997). For comparison, erosion form agriculture cropland average 2.7 tons per acre per year (USDA-NRCS, 2010) and active construction-sites average 30 tons per acre per year (University of Wisconsin -Extension and Wisconsin et al, 1997).

Integrating a Watershed Plan

Integrating watershed plans into comprehensive plans, ordinances and codes is the one direct way of integrating green infrastructure into land use strategies. A watershed approach is a flexible framework for managing water resource quality and quantity that provides assessment and management information for a geographically defined watershed, including the analyses, actions, participants and resources related to developing and implementing the plan. Watershed plans typically consider the cumulative effect of new development, roads and other associated infrastructure, the loss of natural wetlands and floodplains and their potential compounding affect on streams and other water bodies. A more comprehensive discussion on watershed planning can be referenced in Chapter 2.

Sustainability and Development Strategies

Preserving and restoring natural landscape features (such as forests, floodplains and wetlands) is an integral part of green infrastructure. However, there are other strategies that can indirectly improve or ensure the long term health of water resources in a community such as redeveloping already degraded sites. Strategies may include:

- Direct development to infill and other redevelopment areas to make use of existing infrastructure networks and minimize the addition of new impervious surfaces.
- Create range of housing opportunities and mixed land use choices. Allowing housing for all income levels within a mixed use community can reduce the need and cost for extensive road, utility and other infrastructure and their associated land disturbance.
- Create walkable neighborhoods to decrease the need for road and parking networks, indirectly reducing the amount of new impervious surface in a watershed.
- Provide multi-modal transportation planning to help create linear green infrastructure stormwater management networks and lower the long term need for land disturbance during system upgrades.
- Encourage community and stakeholder collaboration to help gain long term support for green infrastructure funding and maintenance.
- Foster distinctive, attractive communities with a strong sense of place. Green infrastructure can be used to increase landscape architectural beauty and distinctiveness.

Make Development Decisions Predictable, Fair and Cost Effective

Applying performance goals, rather than prescriptive standards, for green infrastructure can help create triple bottom line balanced integration with grey infrastructure. The intent is to set performance goals and allow tools and standards to be developed that are specific to local climate and geology while fitting the socioeconomic needs of the community. For example:

1. Favor performance language over prescriptive language, where possible. Performance language can include guidelines such as "infiltration practices shall take into account the permeability of the anticipated limiting soil layer and contain organic content equal to or greater than topsoil typical to the region." Prescriptive language are mandates

such as "a bioretention area shall have 30 inches of biosoil." The distinction is important in terms of material cost. "Biosoil" can cost up to six times that of a less stringent but similarly effective topsoil and sand mix.

2. Preserve Open Space to help increase property values, attract new businesses, preserve sensitive environments and provide outdoor health and recreation opportunities.

3. Plan for Compact or Multi-Story Building, which minimizes the roof top impervious surface and can lessen the physical distance required by road and other infrastructure networks.

New Development Areas

Defining new development versus redevelopment is a local decision. How each is defined may affect their requirements for water quality management. New developments may include restrictions on impervious area or the installation of landscape types or structural stormwater control measures to offset the increase in runoff volume created by the impervious area. Redevelopment requirements may include the reduction in impervious area or the installation of stormwater control measures so runoff water quality is equivalent to a reduction in the impervious area (Maryland Department of the Environment, 2000). In the Kansas City metropolitan area, the *Manual of Best Management Practices for Stormwater Quality* provides a methodology for a community to adopt higher standards for runoff reduction measures instead of just maintaining existing conditions (Mid-American Regional Council; American Public Works Association, 2009).

In any development scenario, reasons to consider setting goals for new development projects that would reduce the volume of runoff or improve runoff water quality from the site include:

- Improving runoff conditions into degraded urban streams.
- Reducing the potential to pollute drinking water sources.
- Improving water quality in impaired waters.
- Meeting requirements/recommendations of total maximum daily load regulations.
- Obtaining public support for the development.
- Reducing the potential for flooding.

These reasons must be weighed against the potential for increased costs of the redevelopment site, reduced land area for redevelopment and the impacts these may have on the development community. The overall vision and goals of the community discussed in Chapter 2 should be a driver in the decision-making process.

4.3 Updating Codes and Ordinances

Some ordinances may be specific to managing stormwater while others address issues with direct or indirect relevance to stormwater. This section describes tools to help communities address:

- Assessment of current codes and ordinances for green infrastructure compatibility.
- Green infrastructure elements in non-stormwater codes and ordinances.
- Legal impediments and considerations.

4.3.1 Assessing Existing Codes and Ordinances

Prior to creating or revising ordinances, a community should perform a self-assessment to determine their current compatibility with green infrastructure principles. Readily available tools for adopting or revising ordinances to better accommodate green infrastructure practices include *EPA's Water Quality Scorecard and the Center for Wartershed Protection's Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program*.

Water Quality Scorecard:

Incorporating Green Infrastructure Practices at the Municipal, Neighborhood and Site Scale (United States Environmental Protection Agency, 2010)

EPA's Water Quality Scorecard addresses:

1. Zoning ordinances specify the type and intensity of land uses allowed on a given parcel. A zoning ordinance can dictate single-use low-density zoning, which spreads development throughout the watershed, creating considerable excess impervious surface.

2. Subdivision codes or ordinances specify development elements for a parcel: housing footprint minimums, distance from the house to the road, the width of the road, street configuration, open space requirements and lot size—all of which can lead to excess impervious cover.

3. Street standards or road design guidelines dictate the width of the road, turning radius, street connectivity and intersection design requirements. Often in new subdivisions, roads tend to be too wide, which creates excess impervious cover.

4. Open space or natural resource plans detail land parcels that are or will be set aside for recreation, habitat corridors or preservation. These plans help communities prioritize their conservation, parks and recreation goals.

5. Parking requirements generally set the minimum, not the maximum, number of parking spaces required for retail and office parking. Setting minimums leads to parking lots designed for peak demand periods, such as the day after Thanksgiving, which can create acres of unused pavement during the rest of the year.

6. Comprehensive plans may be required by state law and many cities, towns and counties prepare comprehensive plans to support zoning codes. Most comprehensive plans include elements addressing land use, open space, natural resource protection, transportation, economic development and housing, all of which are important to watershed protection. Increasingly, local governments are defining existing green infrastructure and outlining opportunities to add new green infrastructure throughout the community.

7. Setbacks define the distance between a building and the right-of-way or lot line and can spread development out by leading to longer driveways and larger lots. Establishing maximum setback lines for residential and retail development will bring buildings closer to the street, reducing impervious cover associated with long driveways, walkways and parking lots.

8. Height limitations limit the number of floors in a building. Limiting height can spread development out if square footage is unmet by vertical density.

Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program
(CWP, 2008)

This guide provides stormwater professionals with practical guidance, insights and tools to build effective programs. The guide is accompanied by several downloadable "tools" designed to be used and modified by local stormwater managers to help with program implementation.

Tool 1: Stormwater program self-assessment. The desired outcome for conducting this self-assessment is to generate short-term and long-term action items to build a more effective program.

Tool 2: Program spreadsheet. The program and budget planning tool is a spreadsheet tool that is meant to assist stormwater managers with program planning, goal setting and phasing.

Tool 3: Post-construction stormwater model ordinance. Provides a menu of code language for local, regional, or state stormwater programs to use to craft or update their ordinances. The ordinance is written so that individual sections can be lifted out and modified to suit individual program needs.

Tool 4: Code and ordinance worksheet. The code and ordinance worksheet allows an in-depth review of the standards, ordinances and codes (i.e., the development rules) that shape how development occurs in your community.

4.3.2 Examples of Relevant Stormwater

As indicated by the water quality scorecard method, opportunities and constraints affecting green infrastructure are present within many different sections of ordinances and codes.

A. Incorporating Natural Resource Protection into Codes and Ordinances

Protecting natural resources can provide a zero-cost solution to helping ensure long-term stormwater quality. The Minnesota Department of Natural Resources, Metro Division, has developed the natural resource guidance checklist *Addressing Natural Resources in a Comprehensive Plan* that helps a community incorporate resource protection into a community's comprehensive plan.

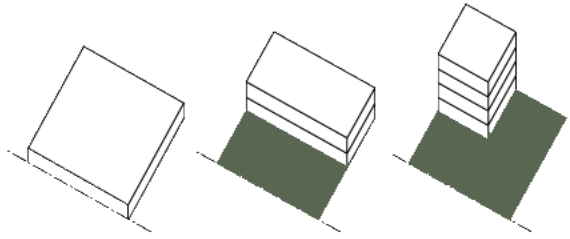


Figure 4.1

B. Overlay Zoning

Overlay zoning is a regulatory tool that creates a special zoning district placed over an existing base zone(s). The overlay district identifies special provisions in addition to those in the underlying base zone. Regulations or incentives are attached to the overlay district to protect a specific resource or guide development within a special area according to the *Center for Watershed Protection's Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program* (Center, 2008).

For example, overlay zoning can provide for:

- Pervious pavement materials for sidewalks, curbs, or on-street parking in specified areas of town.
- Additional landscaping and open space requirements.
- Irrigation restrictions for potable water use can encourage incorporation of re-use tools such as rain barrels.
- U.S. Green Building Council, LEED or other sustainability rating system requirements.

C. Floodplain Ordinances

Floodplain ordinances are required by communities participating in the National Flood Insurance Program administered by the Federal Emergency Management Agency. Such ordinances can include no net loss provisions to limit the placement of fill within floodplains and create compensatory storage programs for areas requiring fill for economic development.

If communities choose to allow development in the floodplain, there should be no exception from water quality requirements. Because the areas are subject to flooding during large storm events, they are sometimes exempted from large storm flood control. However, water quality events do not produce similarly large volumes and should be captured for treatment prior to discharge.

D. Stream Setbacks and Buffers

Ordinances that include stream setbacks and buffers provide a measurable area of vegetation between the streams and development and help protect the functions and values of aquatic habitat. They typically are designed so that almost all types of development or land clearing are prohibited near the stream, with gradually increased development as the distance from the top of the stream bank increases.

Stream setback or stream buffer requirements typically apply to new development and are effective at preserving the natural benefits of riparian corridors. The Center for Watershed Protection's website, The Stormwater Manager's Resources Center, lists model ordinances for stream buffers. According to the model ordinance for stream buffers a stream setback or buffer ordinance should include a minimum of the following elements:

- Background – defines the benefits of the ordinance.
- Intent – provides the purpose of the ordinance.
- Definitions - relevant technical terms.
- Application – outlines where the ordinance would apply and where it would not.
- Plan requirements – defines the information required on development plans to delineate the limits of the setbacks.
- Standards – defines how the limits of the setback are established.
- Management and maintenance.
- Enforcement procedures.
- Waivers/variances.

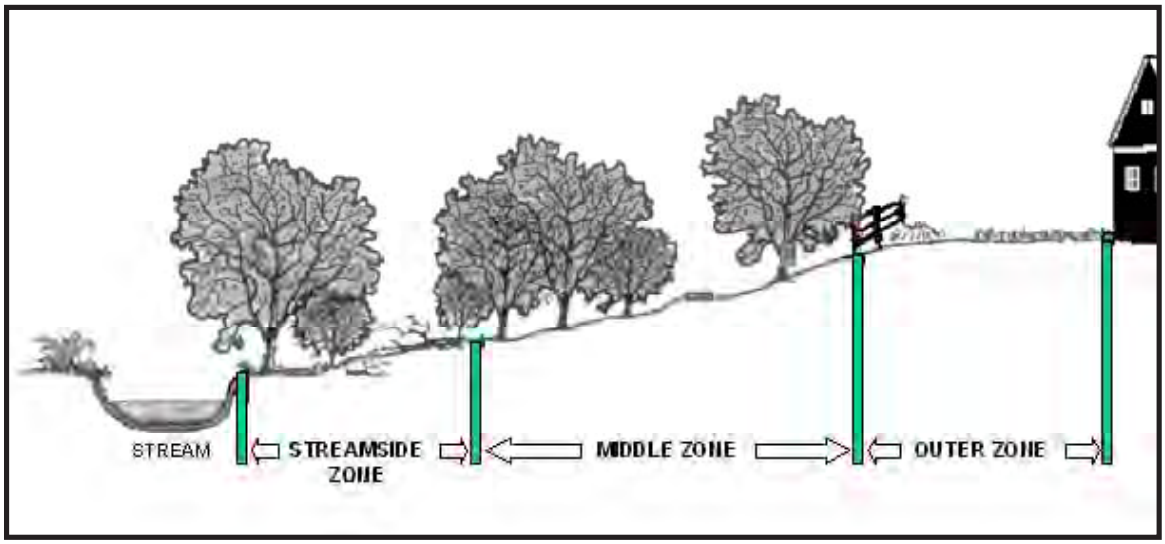


Figure 4.2 Three-Zone Stream Buffer System *Minnesota Stormwater Manual*. November 2005. Source: Adapted from Schueler, 1995.

E. Stream Meander Belt Setbacks

Given the nature of a stream's ability to shift over time, consideration may be given to creating a meander belt setback. Failing to prevent development within the meander belt will eventually put development into conflict with shifting stream banks. Stream bank stabilization requires permitting through state and federal agencies, can be costly to construct, may transfer stabilization problems down or upstream and has no guarantee of success.

Given their physical location, meander setbacks can be incorporated into either stream setback or floodplain ordinances. A meander belt setback is a line drawn parallel at the top of the bank at each existing meander. The setback should be from the meander belt setback line.

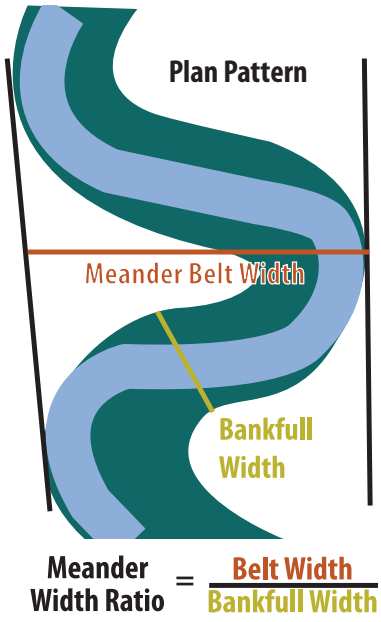


Figure 4.3 Meander width ratio of natural channels.

F. Urban Forestry Management

An urban forestry management ordinance is a municipal scale planning tool for preserving and protecting trees. The ordinance can prescribe goals to protect, preserve and reforest areas to establish a healthy, mature street tree canopy within an urban area. Trees have a higher capacity for uptaking water than smaller plants.

G. Tree Preservation Ordinance

Similar to riparian setbacks and urban forestry ordinances, tree preservation ordinances can assist with preserving trees outside of these corridors.

Trees provide a wide range of benefits for stormwater management as well as other environmental, economic and community benefits. Tree preservation ordinances are designed to mitigate any negative impacts of land development and will assist with other tangible benefits, such as maintaining property values, air pollution, stormwater management, urban heat island cooling and providing a sense of place.

Tree preservation ordinances should provide for protection from salt damage, but should not prevent use of trees in bioretention areas that may be used for storing snow. Careful consideration should be given to planting deciduous trees in areas more likely to be impacted by salt, because their roots go dormant in the wintertime. Evergreens are more susceptible to salt damage as their roots grow all year round.

H. Parking Standards and Ordinances

Non-residential parking can be a large portion of the impervious surface in a watershed, depending on land use. Green infrastructure can be integrated into parking standards or ordinances, including:

- Reduce minimum parking space count requirements, establish maximum parking space counts and allow shared parking. Allow for exceptions where the developer can meet specific compensatory requirements through supplemental stormwater control measures such as pervious pavement, additional rain gardens or other infiltration method.
- Reducing minimum required area per parking space can directly reduce the size of parking lots and length of drive lanes. EPA's water quality scorecard recommends a nine foot wide by 18 foot long parking space (162 square feet). St. Louis County requires a minimum 9 foot wide by 19 foot space (171 square feet)
- Encouraging one-way directional, angled parking minimizes drive lane widths and can decrease parking lot impervious surface by up to 10 percent without reducing parking space counts. Requiring developers to submit four parking layouts using perpendicular and angled parking configurations and applying two-way and one-way drive lanes to each style can help ensure that impervious surface is minimized as part of design.

"Natural stream stability is achieved by allowing the stream to develop a stable dimension, pattern and profile such that, over time, channel features are maintained and the stream system neither aggrades or degrades. For a stream to be stable it must be able to consistently transport its sediment load, both in size and type, associated with local deposition and scour. Channel instability occurs when the scouring process leads to degradation, or excessive sediment deposition results in aggradation." (Rosgen, 1996)

Example : St. Louis County Phase II Stormwater BMP Implementation Work Group, 2011

Maximum parking – requirements are based on Chesterfield's City Code, Section 1003.165 Parking, Stacking and Loading Requirements. The recommended model parking ordinance contains a section that requires increases in parking areas over 10 percent of the maximum parking requirement to be reviewed and approved by the Planning and Development Services Director and applicants must include measures to mitigate for the increase, such as, increased open space, pervious pavement, green roofs and more.

Shared parking – City of Maryland Heights Zoning Ordinance, Article 14, Section 25-14.10, Shared Parking allows for shared use of a parking lot where uses are unlikely to produce substantial demand for parking at the same time, based on a parking study and legal agreement between all land owners.

Modifications of Parking Requirements – Chesterfield's City Code states that a Parking Demand Study can modify zoning ordinance requirements to reduce the number of required parking spaces. The request must include various analyses, as prescribed. Parking lot design strategies must use pavement reducing strategies that mitigate stormwater runoff.

Landscape Guidelines – City of Chesterfield's Tree Preservation and Landscape Requirements in Chapter 27.5 of City Code (Ordinance 2512) requires landscaped islands with trees in parking lots. The island size must be a minimum of nine feet wide and 135 square feet of pervious area per parking row. No parking space can be located farther than 50 feet from a tree.

I. Parking Landscape Requirements

Landscape guidelines can be used to require a minimum amount of green space within the parking lot. Green infrastructure elements may include:

- Where practicable, parking landscapes should be constructed to receive and manage stormwater runoff.
- Shade trees should be required to intercept and evapotranspire rainfall.
- Deep rooted native vegetation to increase infiltration capacity of soils.
- Linear parking islands should be encouraged over perpendicular designs to increase opportunities for stormwater management and tree canopy.

J. Weed Ordinances

Ordinances should be checked and updated to address conflicts between weed ordinances prohibiting the use of many native species and stormwater control measures that require their use. To help ensure attractive native plant landscapes, native species lists may be limited or their use otherwise restricted within the landscape guidelines or other relevant municipal technical manual. In general, hardy - deep-rooted species are recommended for stormwater management to help ensure long term infiltration of runoff and high survivability during periods of drought. Multiple species are not required for success relevant to stormwater management, however increasing species variety helps increase habitat diversity and lowers the risk of die off due to species-specific stressors.

Native plants identified by the Missouri Department of Conservation is available at Grow Native at www.grownative.org and the Missouri Botanical Garden's Flora of Missouri Project, at www.tropicos.org/project/mo.

K. Street Standards

Similar to parking standards, street standards should encourage for reduction in widths where practical and allow for stormwater infiltration or retention in the right of way. Issues and ideas to consider include:

- Pervious pavements, pavers or other aggregate may currently be prohibited or not be pre-approved for use as construction materials in existing ordinances.
- Fire code and other public safety access restrictions preclude narrowing streets in some cases. However, alternatives such as stabilized turf shoulders or other pervious media can be used to minimize impervious surface while providing adequate emergency access.
- Prohibiting and enforcing on-street parking restrictions may be needed on narrowed streets.
- Converting two-lane, two-way traffic to one-lane, one-way traffic can reduce street widths by one lane.
- Converting two-lane, two-way traffic to one-way traffic with angled parking can further reduce street width and provide opportunities for rain gardens.

L. Right of Way Uses and Standards

Managing runoff in the right of way generates numerous issues and concerns from competing uses. Transportation, public safety, utilities and stakeholders all have vested interests in designing and managing the right of way for their primary functions.

Most municipalities currently require a variance from existing street design criteria in order to place stormwater control measures in the right of way. Results in the St. Louis County Phase II Stormwater BMP Implementation Work Group, or STLBMPWG, February 2011 report describe several issues and potential solutions:

Right-of-ways – would be limited to the street edge of pavement. Public maintenance of the street would be enabled through a permanent roadway, improvement, maintenance, utility, sewer and sidewalk easement, or PRIMUSSE, up to the former right-of-way limits. For Missouri Department of Transportation streets, the stormwater control measures would be allowed in the Missouri Department of Transportation right-of-way and a maintenance agreement would be executed so the property owners or subdivision trustees would be responsible for maintenance.

PRIMUSSE – shown on the property plats up to 12 feet from the edge of pavement will provide public agencies the access needed to maintain the streets, utilities and sidewalks. Underground utilities should be placed perpendicular to the sidewalk, not parallel under the sidewalk. Coordination with utilities is necessary and utilities may be placed in an additional utility easement located outside the PRIMUSSE.

Sidewalks – can be located in the PRIMUSSE. In some cases, sidewalks can be limited to one side of the street subject to the Americans with Disabilities Act, or ADA, requirements.

Common Ground – would be established for the stormwater control measure's footprint to ensure the subdivision trustees would maintain the stormwater facility so it operates properly. This is a typical arrangement for stormwater control measures located elsewhere in a development. The property plat shows the area as common ground and identified as a stormwater management reserve area. This reserve area is subject to a stormwater control measures maintenance agreement between the metropolitan sewer district and the property owner(s) to ensure the owners maintain the stormwater control measure.

Curb Cuts – allow stormwater from the street to flow into bioretention areas next to the street or through a "bioretention sump" located at the edge of the roadway transitioning into the bioretention area. The sump design can allow for non-erosive flows into the bioretention area and for larger flows to bypass into the curb gutter for management in a storm sewer inlet. Alternatively, an inlet can be located within the bioretention stormwater control measure.

Cul-de-sac Islands – create an excellent location for a bioretention stormwater control measure that would avoid the issues identified above and would typically not require significant changes to current development property plat plans, since these areas are already in common ground that is maintained by the subdivision trustees.

M. Residential Drives and Alleys

Less impervious area used for residential driveways can be accomplished by making the effective width of paved surface in the driveway smaller, by reducing the amount of driveway needed to serve a residential property or by substituting pervious materials for construction.

Two-track driveways – reduce the impervious area of a driveway by providing for green space on the portion of the driveway that is not needed for a vehicle's wheels to travel on. Local American Planning Association members were queried as to their use of this solution. Of the 12 STLBMPWG responders, only one city allows the construction of two-track driveways and three do not allow them. The majority of the responders, eight, do not specifically prohibit or allow. Various additional comments indicate that this solution is not very popular.

Shared driveways – are commonly used in St. Louis County, primarily in duplex properties, where two residences use the same driveway. Also, where off-street parking is provided, such as in lieu of on-street parking along a 20 foot wide street, shared driveways and shared parking can be a tool to reduce the impervious area.

Figure 4.4 Residential alley. Source: Metropolitan St. Louis Sewer District

Figure 4.5 and 4.6 Before and after street edge alternatives (SEA Streets Project) - Seattle, Washington. Source: www.epa.gov/greenkit/stormwater_studies/SEA_Streets_WA.pdf

Smaller driveways – less than nine feet per lane width was deemed not popular with the public or practical for use by the work group and therefore, is not being recommended.

Pervious driveways – can reduce the impervious area by using paving materials and designs that allow rainwater to pass through the surface. Options typically include: pervious asphalt, pervious concrete and pervious pavers.

Residential Alleys – can incorporate two-track, reduced width or pervious material concepts similar to those presented above.

Green Streets Initiatives – can aid the adoption and implementation of stormwater control measures such as bioswales with flat curbed streets, rain gardens, and similar functional and aesthetic landscapeds to manage stormwater quality. See Appendix C for green street resources

4.3.3 Legal Impediments and Considerations

Portions or all of a stormwater community may be subject to oversight or regulation by other jurisdictions. For that reason, it is important to identify other departments or agencies that have jurisdiction over relevant physical areas or operations within a municipality in order to include them as stakeholders in the ordinance review and revision process.

To ensure any proposed stormwater ordinance does not conflict with existing ordinances, the municipality should review and identify issues that may arise with the implementation of green infrastructure. The review should be thorough and included everything from parking and street standards to weed control ordinances.

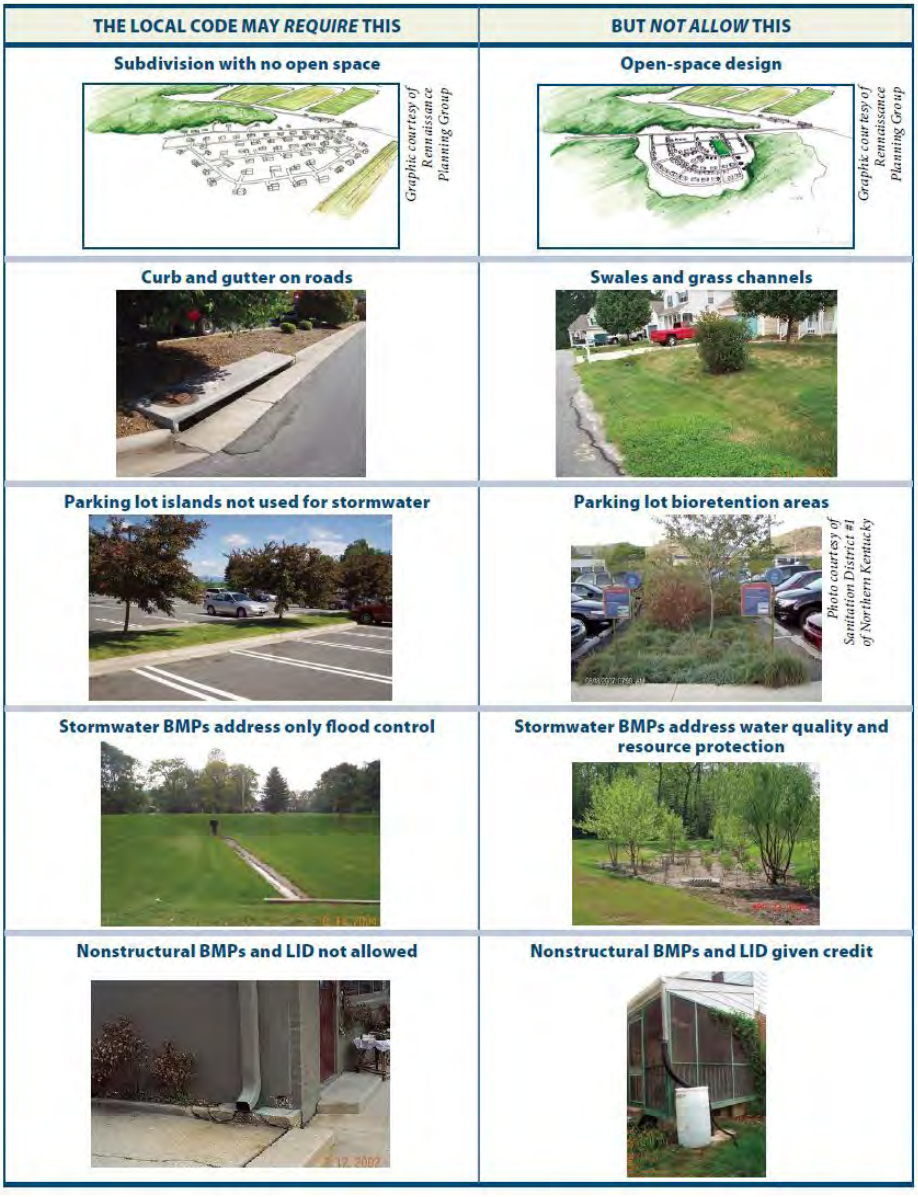


Figure 4.7: Existing codes that may conflict with stormwater management ordinances.
Source: Center for Watershed Protection's *Managing Stormwater n Your Community: A Guide for Building and Effective Post-Construction Program*, 2008

Key Local Documents that could Impact Development Regulations
Zoning Ordinance
Subdivision Codes
Street Standards or Road Design Manual
Parking Requirements
Building and Fire Regulations/Standards
Stormwater Management or Drainage Criteria
Buffer or Floodplain Regulations
Environmental Regulations
Tree Protection or Landscaping Ordinance
Erosion and Sediment Control Ordinances
Public Fire Defense Master plans
Grading Ordinances
Weed Ordinance

Table 4.1 Source: Shockey Consulting

To meet the goals of the 2007 Phase II Stormwater Management Plan, St. Louis County assembled a work group to evaluate legal impediments that may occur to meet the water quality requirements set forth by Metropolitan St. Louis Sewer District (St. Louis County Phase II Stormwater BMP Implementation Work Group, 2011).

This section highlights five of the potential challenges to adopting or revising ordinances to better accommodate green infrastructure. Although not binding on Missouri courts and arising out of different constitutional and statutory backdrops, challenges in other states offer insight into the types of challenges that might be raised in Missouri.

A. Authority

The most basic challenge is whether a community even has the authority to enact stormwater ordinances and fees. While there is no statute specifically permitting Missouri cities, towns and villages to adopt a post-construction runoff management ordinance, the Missouri zoning enabling statute 1, as with all development regulations, would seem to provide authority for stormwater regulations during and after development. Other authority such as the general police power (i.e., protection of the welfare, safety, health and even morals of the public), the power to construct and maintain a sewerage system and nuisance authority appear to apply as well.

Additionally, in other states, courts have found authority for these ordinances under the police power. Where there appears to be adequate authority, a municipality should be careful to draft regulations that squarely fit into the municipality's existing authority to control and regulate development and stormwater runoff.

B. Fees

Legal challenges regarding post-construction runoff management ordinances could arise in ordinances where the municipality, in addition to regulation, also provides for a funding mechanism for stormwater projects or programs. In Missouri, the Hancock Amendment (Mo. Const., Art X, §§ 16-24) mandates that any charge made by a municipality that constitutes a "tax, license or fee" can only be imposed after voter approval. The courts have determined, however, that a charge that constitutes a true user fee is not subject to the voting requirement. Generally, under Missouri case law, a charge is a user fee (i.e., not a tax) and could be imposed by a municipality without voter approval:

- A fee charged for an actual service or good; charged only to persons receiving the goods or service; (1 Chapter 89 of the Revised Statutes of Missouri authorizing regulation for "the coordinated development of the city, town or village." See, e.g., §89.410).
- Charged after or at the time the service or good is provided.
- Based on the actual cost of providing the service or good to the specific person charged the fee.
- This is not a service, permission or activity historically and exclusively provided by the government. This concern arises with any charge whether for capital projects or application review.

In other states with similar user fee/tax distinctions, courts generally have held that the fees for stormwater system users are not illegal taxes. For example:

- Densmore et al. v. Jefferson County et al., (Densmore, 2001) where the Alabama court system found that a "stormwater-program fee is a valid fee for the purpose of regulating stormwater discharge and that it is not a tax designed to raise revenue."
- Teter v. Clark County, (Teter, 1985) where the Washington court system found that because "the primary purpose of the stormwater ordinance is regulatory, the charges are properly characterized as 'tools of regulation' rather than taxes."
- Twietmeyer et al. v. City of Hampton, (Twietmeyer, 1998) where the Virginia court system dismissed the argument that the stormwater management fee is a tax because it is "tied directly to the administration of stormwater management and is not meant to raise general revenue."
- Sarasota County v. Sarasota Church of Christ, Inc., et al., (Sarasota, 1996) where the Florida court system found that a "flat fee for the services based on the number of individual dwelling units on the property" for residential property and "non-residential developed property owners pay a fee based on a formula that is designed to create a direct relationship between the method of assessing a non-residential unit and the average residential unit" upheld.
- Bolt v. City of Lansing, (Bolt, 1997) where the Michigan court system heard the case on a landowner's challenge that the city's stormwater service charges were disguised taxes without submitting such charge to the taxpayer's vote failed because charging each parcel for stormwater runoff was a user fee and not a tax.

C. Takings

Another possible challenge is that the municipality's stormwater regulation goes too far and effectively "takes" all use of the owner's property without just compensation. This is known as a "takings" claim. To avoid this challenge, the municipality should draft its ordinance to avoid regulations that effectively deny an owner all economically viable use of the owner's property. For a variety of procedural and substantive reasons, takings claims would be difficult to prove against a municipality as is demonstrated by the fact that not one reported "takings" challenge with respect to stormwater management has been successful.

D. Equal Protection

Municipalities intending to charge a fee to property owners who use the stormwater system should also strive to avoid any irrational distinctions between property owners in the assessment of the fee. Failure to do so could lead to equal protection challenges depending upon how the fee structure is arranged. The most common argument arises when an ordinance distinguishes between different types or classifications of properties. However, an equal protection challenge places a high burden on the challenger because the challenger should show that no rational relationship exists between the classification and a legitimate governmental interest. Most courts faced with this issue have rejected arguments that a classification that applies uniformly to similar properties violates the equal protection clause.

E. Enforcement of Stormwater Ordinances

Clearly defining enforcement procedures and penalties for non-compliance with the requirements of the post-construction runoff management ordinance would help to minimize confusion and challenges to the program's requirements. Development of enforcement procedures and penalties should be closely coordinated with existing enforcement and penalty codes and precedents that have been set. *The Center for Watershed Protection's Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program* (Center, 2008) provides an overview of the types of penalties that a community could choose to employ. The ordinance should be enforced even-handedly and in all circumstances with limited exceptions and should decide what events would trigger non-compliance with the ordinance and what developments would be considered too far along to be brought within the ordinances' scope. This would avoid claims that enforcement is selective or retroactive.

For example, Heaton v. City of Princeton, et al., (Heaton, 1997) where the court dismissed a selective enforcement challenge because although many developers and businesses had not had to comply with the Stormwater Ordinance Management Control to receive a permit, there is no right to have a law go unenforced, "even if you are the first person against whom it is enforced and even if you think (or can prove) that you are not as culpable as some others who have gone unpunished," and because plaintiffs could not prove that the alleged selective treatment was used "as a means of achieving invidious discrimination because of membership in a protected group or in retaliation for the exercise of a constitutionally protected right," however Myers v. Penn Township, (Myers, 2002) the court ruled for plaintiff finding that the ordinance was retroactively applied to plaintiff who received preliminary approval from the city and installed several stormwater management ponds in accordance with the plan's specifications and then the township rejected plaintiff's offer to dedicate the ponds solely because he would not agree to provide funds pursuant to the newly enacted stormwater ordinance.

The relatively recent governmental focus on water quality has led to challenges by those having to comply with the new laws. Courts seem inclined to uphold these regulations as being necessary for the public health and safety and would only strike

them down when the ordinance or fees bear no rational relationship to the purpose of controlling and treating stormwater or are clearly a revenue-generating vehicle with no true service being provided. Minimally, an ordinance should cite the authority and public need for the stormwater regulations. The community should also ensure that any fees charged to property owners are true user-fees that are rationally related to the control and maintenance of the ordinance and that the landowner's use of or benefit received from the ordinance rationally relates to the amount that the landowner should pay. The community should strive to narrowly draft the regulations to ensure that implementation would not be a physical taking or deprive the property owner of all viable use of that property and clearly define to whom and at what point in the development process the stormwater ordinance would be enforced.

Penalities and Remedies for your Community	
Type	**Description**
Notice of violation	Written notice served on the responsible party stating the cause of the violation, and consequences for noncompliance (e.g., stop work, revoke permits, and pursuit of civil and/or criminal penalties.)
Stop work order	Provisions for the enforcing agency to stop work on a site if the responsible party fails to comply with an notice of violation.
Civil penalties or charges	Civil penalties can impose charges for specific violations. The ordinance can include a schedule of civil penalties (specific charges linked to specific types of violations), and inspectors can use this schedule in "ticket book" fashion when in the field. Civil penalties provide more flexibility than criminal penalties.
Criminal penalties	Criminal penalties establish violations as misdemeanors, subject to specific fines and/or imprisonment. Each day the site is not in compliance is considered a separate violation. Although criminal penalties represent the biggest "hammer" in the enforcement toolbox, most programs resort to them rarely and could find it difficult to garner the political support to use such penalties.
Withholding other permits or approvals	Perhaps the biggest motivator to comply during the construction process is withholding certificates of occupancy or other approvals until all measures have been properly installed. This tool would not apply to long-term maintenance, however, and might also present timing challenges for the applicant and jurisdiction (e.g. site work lags behind building and occupancy).
Revoking or suspending other permits or approvals	Revoking or suspending other permits or approvals. This tool is similar to withholding permits, but it applies to permits or approvals that have already been granted (e.g. building or grading permits). The appropriate permit or authorization can be suspended until the required actions are taken, at which point the permit is reinstated. This tool can be quite effective, but implementing it usually takes political support.
Performance bonds	Performance bonds are not an enforcement tool in the strict legal sense, but many programs use them to motivate compliance. Bonds can be particularly useful for a stormwater program because their duration can cover the proper installation of stormwater measures plus a reasonable period thereafter to ensure that practices function properly. The bond concept can also be expanded to maintenance in the form of a maintenance bond, escrow, or other financial guarantee that should be posted by the responsible party. In the ordinance, the performance bond section would likely not be in the penalties section but rather in the plan submission and review section.

Table 4.2. Source: Shockey Consulting

Introduction to Case Studies

Throughout the U.S., there is a growing recognition of the benefits green infrastructure provides to communities. Many municipalities and other jurisdictions have begun to effectively incorporate these practices. The following case studies were selected to showcase both site and landscape scale GI projects which have successfully been implemented. Additional case studies are included in Chapter 6. Readers are encouraged to follow the links or titles provided for each case study to learn more about these projects.

Case Study: The Milwaukee River Basin Overlay Districts

Overlay districts are typically developed in conjunction with the preparation of a comprehensive land-use plan. They can provide significant improvements to overall water quality. Careful consideration of economic impacts, natural impacts and private rights should be exercised when using overlay districts.

An overlay district is an additional zoning requirement that is placed on a geographic area but does not change the underlying zoning. Overlay districts have been used to impose development restrictions in specific locations in a watershed in addition to standard zoning requirements. These districts are created to protect natural resources, promote safety and protect health. Some examples of overlay districts are:

- Airport overlay district.
- Wind energy system overlay district.
- Wireless communication facilities overlay district.
- Shoreland wetland overlay district.
- Floodplain overlay district.
- Agricultural overlay district.
- Aquifer protection overlay district.

Source: Williams Creek Consulting

Shoreland, floodplain, aquifer and agricultural overlay districts have a direct benefit on the water quality of a watershed by imposing additional restrictions on the type of land use allowed within their boundaries. Depending on the environmental conditions, more than one overlay district may apply to a single area.

Floodplain Overlay Districts

It is known that allowing uncontrolled development within floodplains results in damage to private and public facilities, creates safety hazards, impacts the tax base and can lead to expensive floodway improvement projects. Floodplain overlay districts try to minimize these impacts by allowing only uses that will not experience significant impact by floods and will not obstruct flood flows.

These districts do not intend to completely restrict development in this zone. For example, the Dodge County land use code allows uses such as parking lots, roadways, airport landing strips and golf courses to be constructed within the overlay zone.

Case Study: Kansas City, MO Stream Ordinance

Riparian corridors are natural areas located adjacent to linear waterways and typically have trees and herbaceous vegetation adapted to the localized environment. Riparian corridors provide water quality benefits, assist with in-stream stability, are wildlife corridors and often convey flood water. To protect these and other benefits, Kansas City has implemented a stream buffer ordinance. Additionally, the stream buffer ordinance also encompasses public health and safety rules for developing within a potential floodplain. To implement the ordinance, Kansas City developed a natural resource map that assists the public to identify streams that the stream buffer ordinance encompasses. The ordinance includes three zones:

1. Streamside Zone - The streamside zone extends 25 feet landward from the edge of stream.

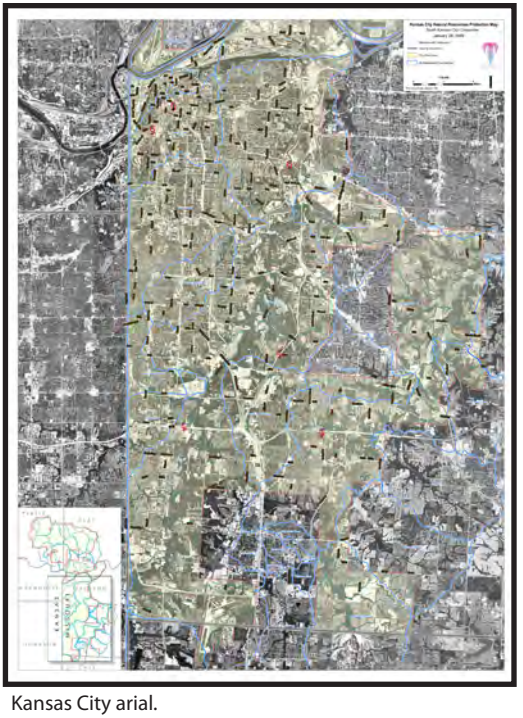
2. Middle Zone - The middle zone extends landward beyond the streamside zone and encompasses the FEMA- or city-designated 100 year floodplain or the limits of the 100 year floodplain as determined by a qualified engineer and any jurisdictional wetlands. The middle zone may be adjusted based on permitting and mitigation requirements.

3. Outer Zone - The outer zone extends landward 75 feet from the outer edge of the middle zone. When slopes exceeding 15 percent or mature riparian vegetation areas are contiguous with the middle zone boundary, the width of the outer zone is expanded to encompass such resource areas.

Although development activities are required to follow the ordinance, some activities are allowed within the stream buffer areas:

- The streamside zone may include vegetation management and trail development with administrative approval.
- The middle zone may include paved and unpaved trails and underground utilities that are restored.
- The outer zone may include middle zone allowances, stormwater management, other described development and variance to include additional building heights and reduces off street parking. In some instances, mitigation may be approved in this zone for projects that require additional land use.

As part of the ordinance, the proposed development must develop a site plan with required information and submit as part of the city approval process.



Kansas City arial.

Case Study: Georgia Forestry Commission Tree Ordinance

The following sample tree ordinance is provided as a tool to help communities develop the initial stages of tree protection ordinances. It provides one example of basic document formatting and verbiage. As a starting point, such an ordinance serves as the baseline for communities to build an ongoing process for community tree care and tree conservation. It should be noted that tree ordinances should be made compatible with bioretention provisions.

PURPOSE: The purpose of this ordinance is to provide for the protection, management, removal and replacement of trees on public property and public rights-of-way.

WHEREAS, the health, safety and general welfare of the public and the conservation and protection of the natural resources of the county/city and their values necessitate the implementation of regulations to guide the planting, maintenance and removal of shade and ornamental trees on public property and rights-of-way within the county/city and

WHEREAS, high growth areas, where natural green spaces are diminishing, have fewer trees remaining to transform the carbon dioxide of ever increasing, harmful vehicular and industrial emissions into oxygen, resulting in severe air quality degradation and

WHEREAS, the removal of forest canopy from urban areas of the state and its replacement with more intensive land uses exacts real costs upon the infrastructure which must be borne by all citizens of the community and

WHEREAS, community forests function to the benefit of the local citizenry as a part of the public infrastructure as much as streets, utilities, stormwater management structures and sewers and integrated forest canopies reduce the costs of maintenance of other co-located parts of the urban infrastructure and

WHEREAS, well-managed urban forest resources increase in value and provide benefits to all the citizens of the community with respect to air quality, water quality, stormwater management, temperature amelioration, community aesthetics and general quality of life and, healthy community forests increase local commercial and residential property values and

WHEREAS, these benefits are crucial to the long-term health, benefit, welfare and safety of the citizens of the community and

WHEREAS, this tree protection law is one part of a dedicated and integrated planning process dealing with land use, impacts of impervious surface, urban hydrology and water quality, air quality, soil erosion, transportation, noise abatement and wildlife habitat and

WHEREAS, the board of commissioners/city council finds that it is in the best interest of the public to provide standards and requirements for the conservation, protection and replacement of trees on public property for the purpose of making this county/city a more attractive and healthier living environment;

(Georgia. 2004)

Case Study: Taylor v. Harmony Township Board of Commissioners

Timber Ordinance

Taylor v. Harmony Township Bd. of Comm'rs, 851 A.2d 1020, 1024-27 (Pa. Commw. Ct. 2004)

Under the Township's local Ordinance No. 335, "…no timber harvesting shall take place in areas determined by the Engineer, with reference to published or commonly accepted guidelines, to be landslide-prone or flood-prone."

Landowner contended that:

- The general "police power" provisions of the Code do not specifically authorize the Township to regulate logging or timber harvesting as the Township suggests.
- The Pennsylvania Municipalities Planning Code, is the enabling statute that controls this case and because the code prohibits unreasonable restrictions on logging and timber harvesting, Ordinance 335 is invalid.

As to the landowner's first argument, the Code has numerous sections referring to general police powers of first class townships. Under Section 1502, cl. X of the Code, first class townships may "take all needful means for securing the safety of persons or property within the township."

In addition, Section 1502, cl. LII of the code provides that a first class township may:

"…make and adopt all such ordinances, by-laws, rules and regulations…as may be deemed expedient or necessary for the proper management, care and control of the township and its finances and

the maintenance of peace, good government and welfare of the township and its trade, commerce and manufactures."

Finally, Section 1502, cl. XLIV of the code provides that first class townships may

"…make such regulations as may be deemed necessary for the health, safety, morals, general welfare, cleanliness, beauty, convenience and comfort of the township and the inhabitants thereof."

Although police powers are not without limitation, commonwealth courts have recognized that municipalities have the power to enact legislation aimed at protecting the health, safety and welfare of citizens under the general welfare clauses contained in municipal codes.

In conclusion, the judge of the commonwealth court found the township had the authority to enact Ordinance 335 under the First Class Township Code.

Case Study: Brockman Enterprises LLC v. City of New Haven, 868 N.E.2d 1130, 1134-35 (Ct. App. Ind. 2007)

Plaintiff's equal protection challenge that the ordinance illegally distinguished between residential and non-residential properties by placing a cap on the charge for non-residential properties was rejected, because since the classifications apply uniformly to similarly-sized lots, the cap is rationally related to a governmental interest.

However, requiring one developer or landowner to pay the entire bill for a public improvement may not be rational because the one property owner would not be the only owner to benefit from such an improvement. For example, in Christopher Lake Development Co. v. St. Louis County, (Christopher Lake Development v. St. Louis County, 1994) where the court system overruled a grant of a motion to dismiss, because "although the county's objective to prevent flooding may be rational, it may not be rational to single out the *plaintiff to provide the entire drainage system."

Rain garden.

Flat curb edge with receiving vegetated swale.

Case Study: Lenexa, Kan.

Some communities, such as Lenexa, Kan., incorporated natural resource protection and green infrastructure components into their comprehensive planning strategies. The integration into community planning was driven by the community's value of natural resources. Communities that place a high value on natural resources, setting goals for resource protection at the comprehensive planning scale assist to reinforce good stewardship and sets the foundation for good stormwater management.

Lenexa Vision 2020 discussed both the importance of stormwater management to quality growth and the desire to maintain a balance between Lenexa's natural and man made environments. As a community that promotes the coexistence of the natural environment and quality planned development, the city is leading in developing and following effective stormwater management practices and implementing a long-term, comprehensive stormwater management program that meets the desired balance of the city's environmental and development goals.

The city's stormwater management planning targets the goals of flood reduction and avoidance, water quality protection, stream corridor conservation and the creation of recreational amenities. An overall watershed-based strategy is being developed in cooperation with neighboring jurisdictions and the public will be encouraged to monitor their own activities that may affect the stormwater management goals. All parties will acknowledge that there will always be inherent dangers from extreme storm events and that individuals must exercise responsibility, even as the city plans to manage risks. The city created a stormwater utility in the spring of 2000, which acts as a primary funding source for construction and maintenance of watershed-based stormwater facilities.

A stream setback ordinance was applied to all land or new development within the stream corridor and establishes permanent buffers along most streams and creeks. GIS mapping identifies stream quality and stream order affected by this ordinance.

No development is to occur within a stream corridor unless a development application has been approved authorizing the proposed development and provided that, the development proposed is, in all respects, in conformity with the requirements of this stream setback ordinance.

Stream Setback Requirements: Lenexa, Kan.

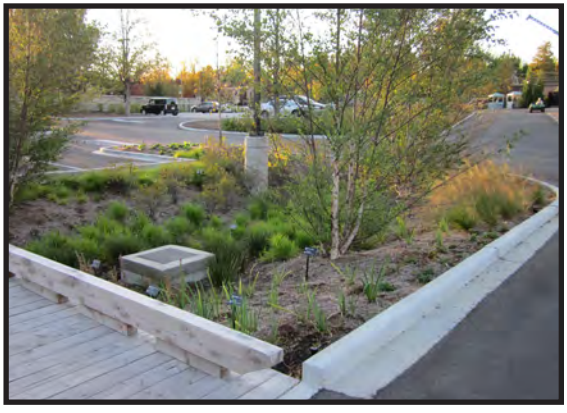
Stream Order	Types 1-2 Sensitive Streams	Type 3 Restorable Streams	Types 4-5 Impacted Streams
1	150 ft.	125 ft.	100 ft.
2	250 ft.	200 ft.	150 ft.
3+	300 ft.	250 ft.	200 ft.

Case Study: Stormwater Best Management Practices Post-Construction Recommendations

A St. Louis County work group reviewed legal impediments to implementing green infrastructure. As a result, the work group developed the *Stormwater Best Management Practices Post-Construction Recommendations* report in 2011.

1. A recommended model property plat for stormwater control measures at the edge of a roadway has been drawn up and is located in Appendix F of this report. This model has been reviewed and agreed to by the work group, which consists of municipal and private engineers and planners and utilities. Each of the individual elements of the model have been approved locally. Also, refer to the recommended Note (5) in Appendix E, Residential Street Design Criteria.

The report can be viewed at www.stlmsd.com by searching legal impediments.



Parking lot with rain garden and overflow, plus permeable pavement and curb cutouts above. Source: Metropolitan St. Louis Sewer District

River de Peres Greenway, St. Louis MO. Source: Williams Creek Consulting

2. Metropolitan St. Louis Sewer District's Non-Standard Details of Sewer Construction Drawings for Roadway Bioretention located at the edge of street pavement, are located in the Appendix G of this report. These four non-standard detail drawings were reviewed and agreed to by the work group as a recommendation for locating stormwater control measures next to roadways. Details of the bioretention sump are also included.

3. Parking Bioretention Areas – Bioretention areas are used as water quality stormwater control measures under Metropolitan St. Louis Sewer District's Rules and Regulations and in fact, are the most popular post-construction stormwater control measure used in the community. Bioretention stormwater management facilities are ideally suited to being located in cul-de-sacs. If it is necessary to build a cul-de-sac, MSD has developed plans for a stormwater infrastructure project to include bioretention in a cul-de-sac on Chalet Court in Creve Coeur.