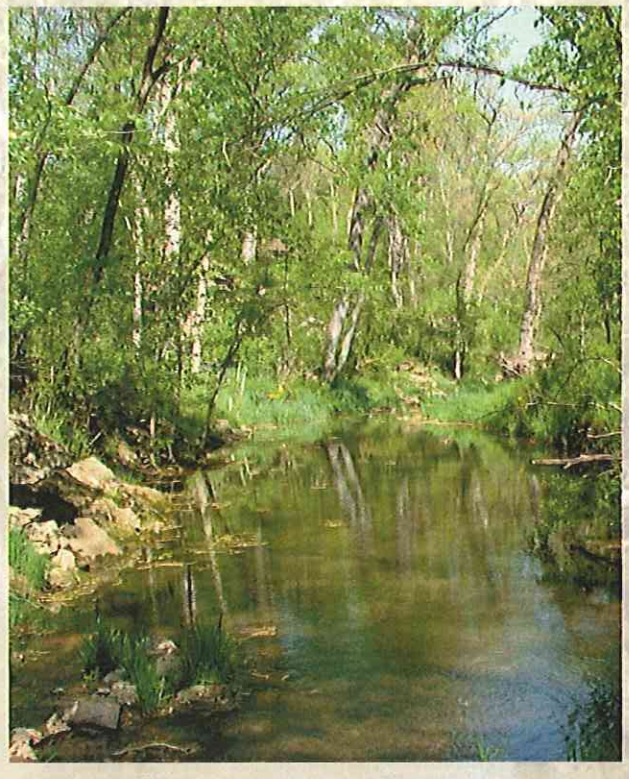
THE CITY OF

MISSION HILLS

KANSAS



Open Channel Master Plan Implementation

THE CITY OF

MISSION HILLS

KANSAS

Table of Contents

Prepared for the City of Mission Hills, Kansas
by Black & Veatch and Patti Banks Associates
July 2008

Introduction

The City of Mission Hills is working on an overall Open Channel Master Plan to ensure compliance with current and anticipated requlations and to encourage high water quality, stream stability and preservation of community character over the long term within stream corridors throughout the city. Important elements of the program include:

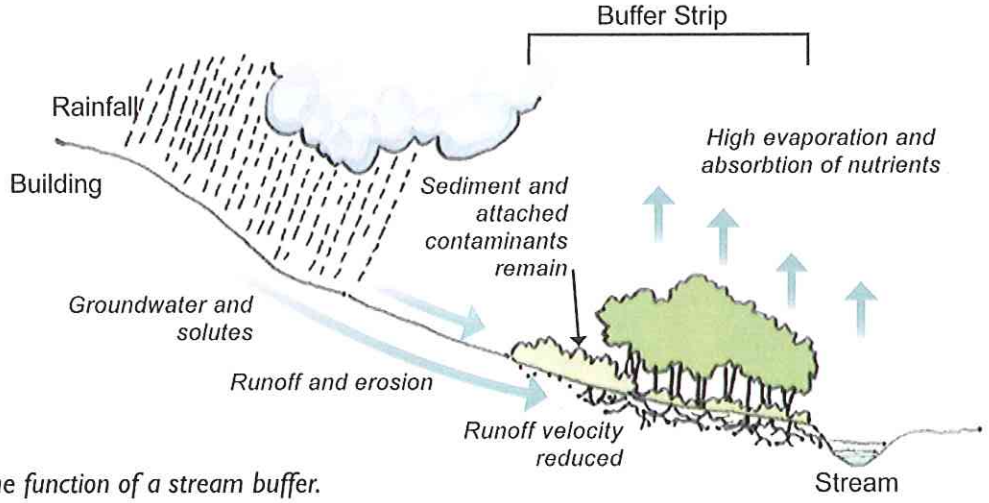
- Educating property owners on the importance of stream buffers and how they can preserve or create them on their property
- Providing information to help homeowners ensure that chemicals used in lawn maintenance do not harm water quality
- Explaining how impervious surfaces can be replaced with pervious surfaces so runoff is reduced
- Developing guidelines for wall construction along community streams

Toward this end, the following information illustrates concepts that residents bordering the community's creeks can implement to improve conditions in their streams. Additional information including the appendices to this document can be found on the city's web site, www.missionhillsks.gov

What is a Stream Buffer and Why is it Important?

A stream buffer is the area beside a stream, usually vegetated, that provides a water quality and stability benefit to the stream. The wider and more natural the buffer is, the greater the benefit to the stream. A buffer has many uses and benefits. The main purpose of the buffer is to physically protect the stream and filter water running off adjacent developed property. A network of buffers sustains the integrity of stream ecosystems and habitats.

In the case of Mission Hills, the streams also help define the community's character. There are six miles of streamway within the city, with approximately 6% in public ownership, 33% owned by the country clubs, 1% owned by a church, and 50% owned by private residents. The majority of the streamways in the city are privately owned.



The function of a stream buffer.

Best, Better, Acceptable

In considering stream buffers in Mission Hills, a developed community, it is necessary to adapt expectations to existing conditions.

Best Long Term - Natural stream buffers are the best long term solution. They do the best job of stabilizing the stream, provide the most water quality benefit, reduce maintenance and contribute to the beautiful character of Mission Hills. Preserving existing natural buffers is paramount. Replanting corridors to achieve natural buffers over time is the most desirable.

Better – Wider planting areas streamside with a combination of ornamental trees, shrubs and groundcover provide stability and water quality benefits.

Acceptable - Where conditions require or where very narrow planting strips exist or can be installed, something is better than nothing. Please note these solutions are "acceptable" from a landscape perspective only. The illustrated walls do not meet the guidelines set out in pages 17-18.

Definitions

Annual: A type of plant that germinates, flowers, goes to seed, and dies within the same season.

Biannual: A type of plant that germinates, grows, and goes dormant in the first season. Then, in the second season of growth, the plant flowers, goes to seed, and then dies.

Erosion: The wearing away of land or soil by the action of wind, water, or ice.

Groundwater: Water beneath the earth's surface that fills pores between materials such as sand, soil or gravel. Groundwater is a major source of water for agricultural and industrial purposes and is often an important source of drinking water.

Impervious Surface: A surface which does not allow the penetration of water into the ground.

Integrated Pest Management: The use of different techniques in combination to control pests, with an emphasis on methods that are least injurious to the environment and most specific to the particular pest.

Invasive Species: An organism that is so reproductively successful and aggressive that it can dominate an area, often to the point of becoming the only plant in the area. It interferes seriously with the natural functioning and diversity of the system where it becomes established.

Perennial: A plant that continues to live and grow from year to year. Some plants in this category may die back to the ground each year and others may continue to grow on the previous year's growth. All of the plants recommended in the landscaping guidelines are perennial plants.

Pervious Surface: A surface which allows the penetration of water into the ground.

Runoff: That part of the precipitation that appears in surface water bodies after traveling across land.

Sediment: Any particulate matter that can be transported by fluid flow and which eventually is deposited as a layer of solid particles on the bed or bottom of a body of water or other liquid. Sedimentation is the deposition by settling of a suspended material.

Stream Buffer: The area beside a stream, usually vegetated, that provides water quality and stability benefit to the stream.

Resources

The following organizations and companies provide information that will be useful when doing stormwater related or landscape improvements at your own home:

Johnson County Extension Office: 13480 South Arapaho Drive, Olathe, Kansas 66062 Tel: 913-764-6300

Information about native plants is available on the Grow Native! web site at www.grownative.org/

10,000 Rain Gardens initiative provides information on building your own rain garden or rain barrel on their web site, www.rainkc.com

For streambank wall questions, call:
Donald W. Baker, Principal Water Resources Engineer
Black & Veatch Corporation
8400 Ward Parkway, Kansas City, Missouri 64114
Tel: 913-458-3093 Fax: 913-458-3518
bakerdw@bv.com

For landscape questions, call:
Patti Banks, Landscape Architect, Principal/Owner
Patti Banks Associates
929 Walnut St., Suite 200, Kansas City, MO 64106
Tel: 816-756-5690 Fax: 816-756-1606
pbanks@pbassociates.com

Pervious Concrete

The following companies have contractors that have obtained certification for pervious concrete installation by the Concrete Promotional Group (CPG) serving the Kansas City area:

Artisan Earthworks contact Corey Wright or Jamie Howard at 913-851-3777
Bartec Construction contact Tim Reichard at 816-256-0749 or Tony Simanowitz at 913-208-0015
Horizon Construction Companies, LLC contact Warren Roberts at 816-421-0800 or Paul Backhus at 816-332-2640
Intec contact Rocky Queen at 816-365-5014 or Gordon R. Hitt at 816-616-2501
J.E. Dunn contact Rick Masters or M. Carol Brown at 816-474-8600
Jeff Hoge Concrete contact Kyle Berggren at 913-927-0232
John Belger Construction Co. contact John Belger or Steve Prettyman at 816-356-9440
John Rohrer Contracting contact James Pierce at 913-236-5005
Leavcon II, Inc. contact Brent Leintz at 913-351-1430
Lithko Contracting contact Dawayne Barnett at 913-281-2700
Mead Construction contact Michael Mead at 816-587-8989
Murray Concrete contact Phillip Murray at 913-422-8886
Musselman & Hall contact Stacey Swickhamer at 816-918-1199 or Brian Kroesen at 816-918-1197
Nate Apple Concrete contact Mike Gregg at 913-207-3949, Scott Apple at 913-837-3022, Jeremy Maynard at 913-927-2399, or Kevin Czereda at 913-592-2061
Overland Concrete contact Patrick Brown at 913-393-4200
Summit Concrete contact Beau Hahn or Louis at 816-215-5680
Tenoch Construction contact Dustin Durand at 816-651-3534, Sonya Ulrich at 913-671-7706, or William Hayes at 816-322-5702
Wm White & Sons Construction contact Kurt D. Bowers at 913-927-4273, John M. Wienke at 816-452-8663, or Bill White at 913-375-9161

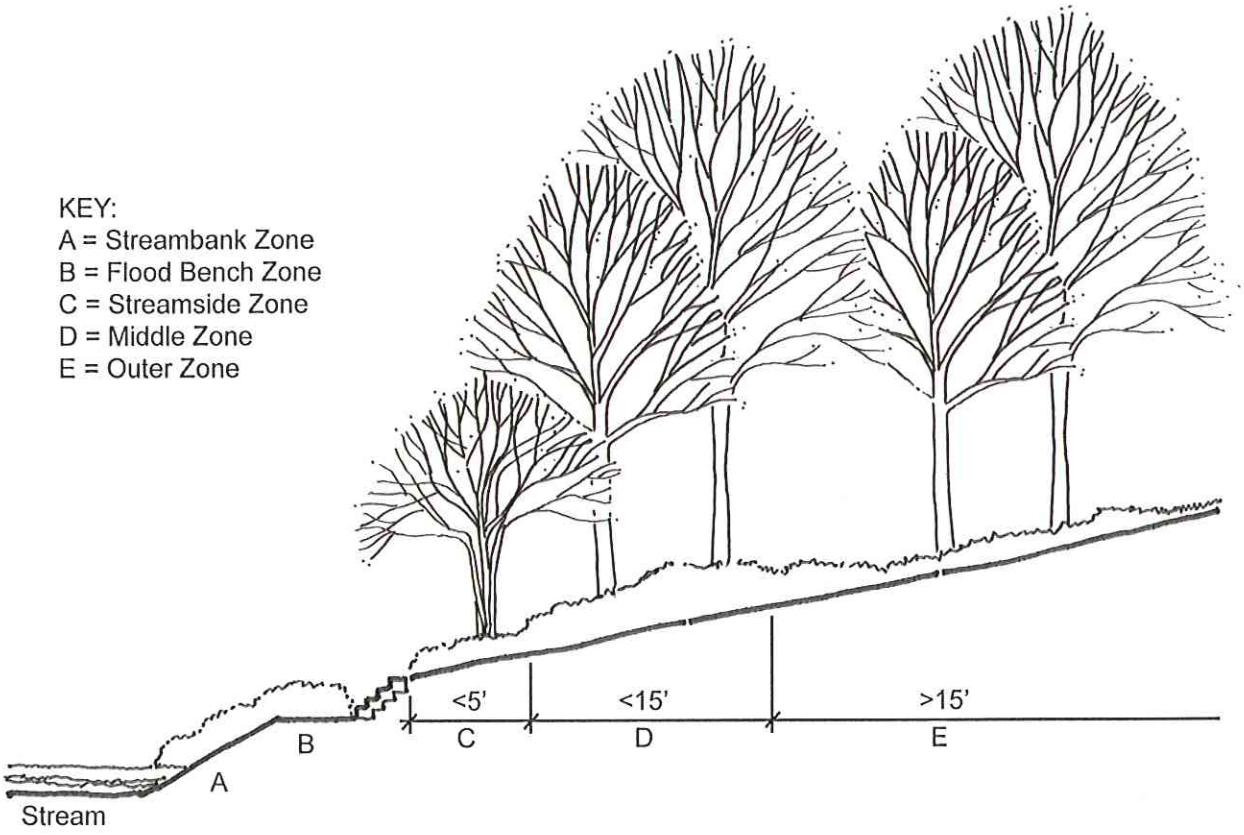
Porous Asphalt

The National Asphalt Pavement Association (NAPA) does not have a certification process for installing porous asphalt, therefore a list of contractors who install porous asphalt cannot be provided. Contact a local asphalt contractor to find out if they install porous asphalt. To learn more about porous asphalt visit the following web page: http://www.hotmix.org/view_article.php?ID=533

Landscaping Guidelines

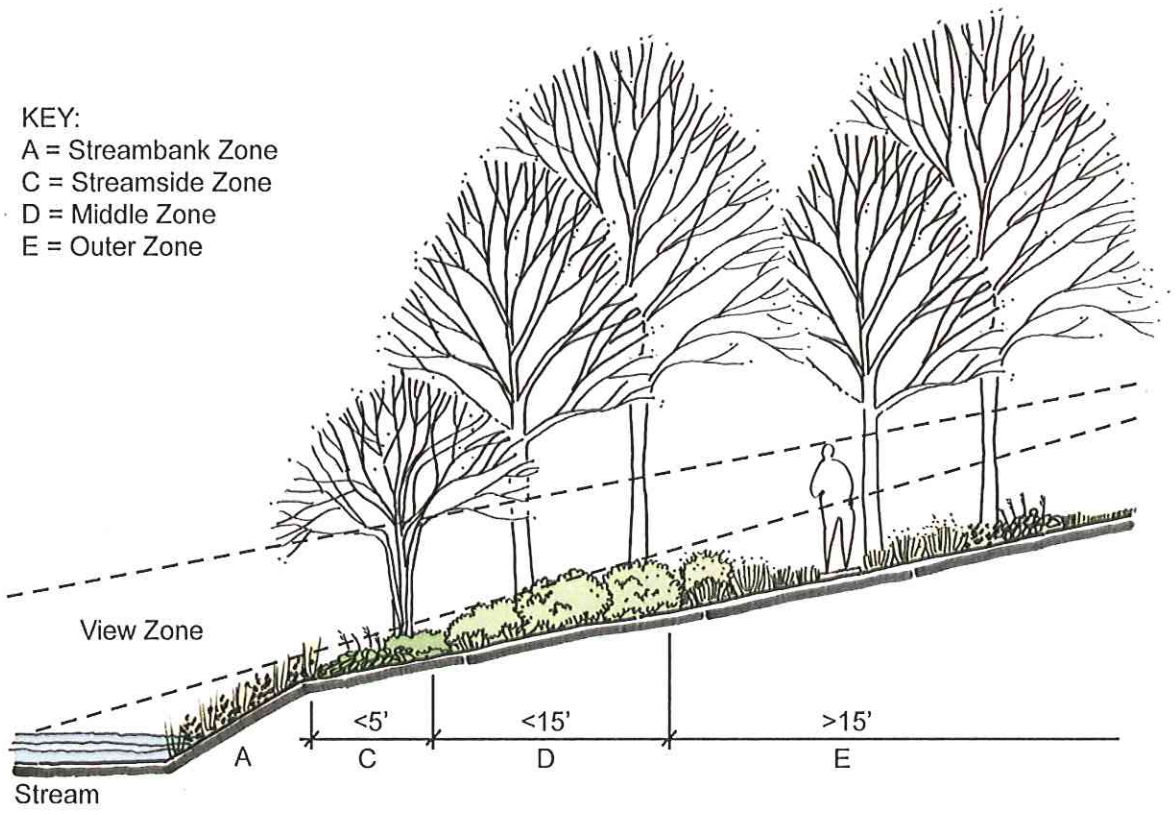
The Landscaping Guidelines (Guidelines) provide examples of streamside conditions, buffer widths and suggested plant materials within specific zones of the buffer. The illustration below shows the variety of streamside conditions/locations and is a key to the planting recommendations.

Trees are the most important component of a stream buffer because the canopies provide stream shading and the roots stabilize stream banks. Shrubs and groundcover plants are also important to slow surface runoff and absorb pollutants before they reach the stream. The landscaping guidelines are designed to maximize the use of these plants.

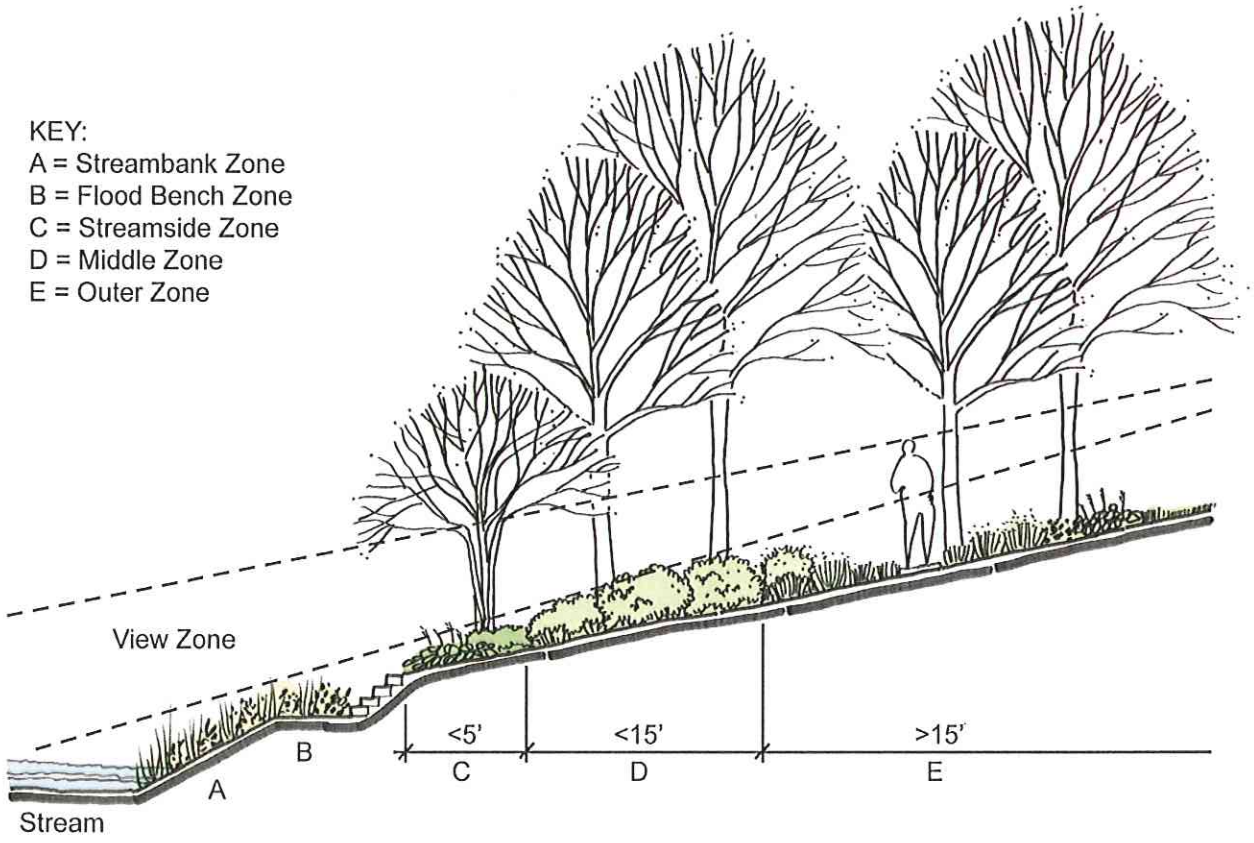


Any specific location may have one or all of the conditions. For example, if a five foot area beside the stream is the only area available to provide a buffer, the configuration and associated plant materials for C-Streamside Zone would apply.

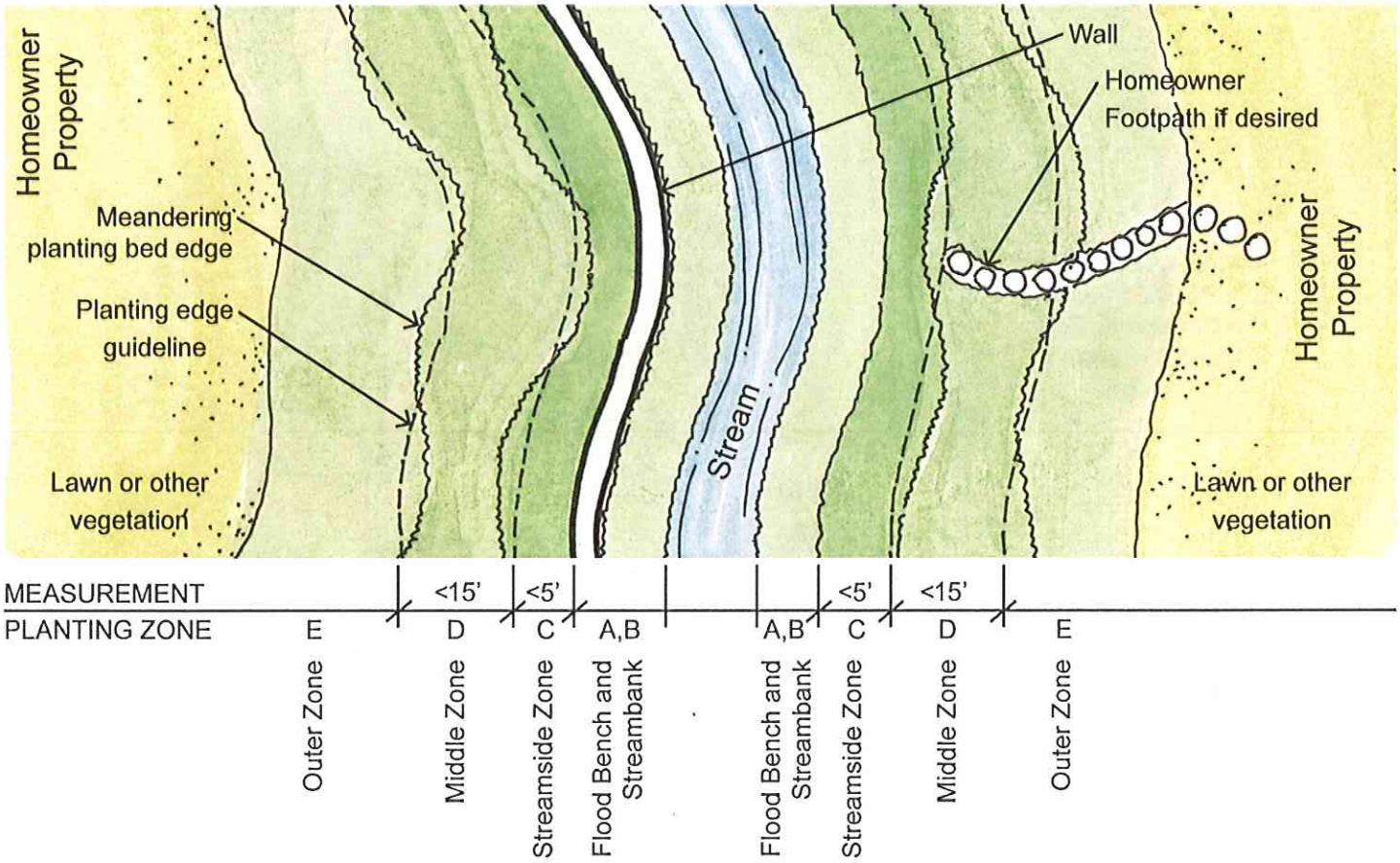
Stream buffer conditions will vary for each homeowner. Stream bank types and space available varies from property to property. For example, the illustration below shows a stream with sloped banks and a gentle rise in elevation from the stream towards the home. In this case, there is space to accommodate planting zones A-Streambank Zone, C-Streamside Zone, D-Middle Zone, and E-Outer Zone. The homeowner with the conditions below would refer to plant lists A, C, D, and E to select their plants.



As an additional example, the illustration below shows a stream with sloped banks, flood bench, wall, and gentle rise in elevation from the stream towards the home. In this case, there is space to accommodate planting zones A-Streambank Zone, B-Flood Bench Zone, C-Streamside Zone, D-Middle Zone, and E-Outer Zone. The homeowner with the conditions below would refer to plant lists A, B, C, D, and E to select their plants.



Planting areas should be defined by curvy, meandering edges to create visual interest, similar to other planting areas in the home landscape. Ornamental trees and shade trees should be planted in clusters to create a more natural appearance. Homeowners might want to add a stepping stone footpath, mulch path, or other design features to their stream buffer to enhance their stream buffer landscape. Refer to the plan illustration below for planting bed edges within the stream buffer.



Appendix A contains recommended plant materials lists and photographs. The plant lists contain attractive, beneficial plants for stream buffer plantings. Plants for each zone were selected to have appropriate size and growth requirements for their recommended place in the landscape. With proper placement and care, the recommended plants will allow a "View Zone" to maintain desirable views from the home to the stream. The first list is sorted by plant type and the second is sorted by planting zone location.

Appendix C contains a list of plants to avoid planting or remove if present. These plants have aggressive growth habits and could quickly overwhelm desirable plantings. Many of the listed plants are also invasive species that colonize nearby natural areas through seed dispersal.

Generally, plantings within the streambed (or stream bottom) portion of a stream channel are not recommended for the following reasons:

- Water velocities are likely too great for plants; plants will generally tolerate water velocities of 2-4 cfs (cubic feet per second) and flows in urban streams are usually much greater than this.
- Plants within the streambed can change flow patterns to potentially undesirable locations.
- Plants within the streambed can act as traps for debris and trash which will become unsightly and require additional maintenance.
- Under the right circumstances, wetland plants generally become established on their own within stream corridors, selecting places that have the most suitable conditions for their growth habits.

Practices to encourage the success of your plantings are included in the Gardening Tips section.

Gardening Tips

The following tips include general gardening practices and organic gardening methods to help encourage the success of your new plantings. Visit your local library or book store for more detailed organic gardening references.

Build Your Soil

- Test your soil's drainage with a percolation test to see if you have suitable growing conditions for plants. Dig a hole 8 inches wide and 8 inches deep. Pour a bucket of water into the hole and allow it all to infiltrate. Pour in another bucket of water and monitor how long it takes to sink in. If infiltration is slower than 1 inch per hour, the soil does not drain well enough for many landscape plants.
- To improve your soil's drainage, amend the soil with organic compost. One cubic yard of compost will amend eighteen square yards of planting bed area. Spread the compost to an approximate depth of two inches over the area to be amended and mix in using a rototiller or shovel.
- Mix black worm castings into soil during planting for a natural fertilizer. More information available at www.scdworld.net.
- Water your garden with compost tea made from black worm castings
- Top dress plants with organic compost and use organic compost during planting
- Maintain a three to four-inch layer of mulch around plants
- To prevent soil erosion crimp 2,000 pounds per acre of clean, weed free straw or hay for erosion control onto slopes greater than one foot horizontal to five feet vertical (1:5) within 7 days of seeding. Plant a cover crop in seeded areas to further prevent erosion (see information on cover crops below).

Use Organic Pest Control

- Use homemade remedies or commercially available organic insect and disease control products
- Practice companion planting such as planting marigolds near tomato plants to repel pests. Companion planting is based on the idea that certain plants can benefit others when planted in near proximity.
- Use barriers and traps
- Try a bacterial agent
- Use techniques that attract beneficial insects or purchase and release beneficial insects into your garden.

Use Organic Weed Control

- Provide the best conditions possible for the growth of desirable plants. Water according to plant needs, avoid compacting the soil, and maintain a three to four-inch layer of mulch around plants. Refer to "Build Your Soil" section.
- Remove existing offenders by hand weeding.
- Turn the weeds into the soil with a weeding hoe.
- Lay weed barriers down around plants to block weeds.
- Use a fast-growing and short plant (or "live mulch") to cover the surface of the soil around the garden plants. Thyme is a good choice for this method.
- Plant a cover crop in areas where you are waiting for seeds to grow, such as streambanks. The best time to plant cover crop is as a late fall, dormant seeding (after December 1) or in early spring (as soon as the soil is free of frost and in a workable condition but no later than July 15). Annual Rye and Winter Rye are suitable cover crops for stream buffer areas.
- To prevent erosion, crimp 2,000 pounds per acre of clean, weed free straw or hay for erosion control onto slopes greater than one foot horizontal to five feet vertical (1:5) within 7 days of seeding.
- Corn gluten meal can be applied as a pre-emergent weed killer. It has been shown to inhibit the growth of dandelions, crabgrass, and many other annual weeds.

Marigolds deter some garden pests.

Worms create natural soil enhancers called "Worm Castings" through digestion.

Weeds will Happen

There is no doubt that weeds will invade your new plantings. They inhabit the soil, they are released when the soil is exposed, and they can be transported by the wind and animals. When a new planting is installed, it is critical that weeds are controlled. These new plants are most vulnerable, their roots haven't penetrated the surrounding soil, and they often suffer from shock as they are moved from the safety and care of the plant nursery. This is when weeds can interfere and steal valuable water and nutrients from the new plants and, without intervention, grow and crowd out any benificial plantings. Even though there will be a thick layer of mulch over the new plantings, weeds will still find a way to grow.

What are Weeds?

Weeds are essentially any plant that is in a place that it is not desired. Appendix C contains a list and photographs of 'weeds', or plants to avoid planting or remove in the Kansas City metropolitan area. There are 3 classes of weeds, based upon their lifespan.

Annual: Probably the easiest to control, these weeds germinate, flower, go to seed, and die within the same season.

Biannual: These weeds germinate in the first season, grow and go dormant in the first season. Then, in the second season of growth flower, go to seed, and then die.

Perennial: This class of weeds are the most difficult to eradicate. Perennial weeds not only flower and seed much like an annual, but a single plant can flower and go to seed over multiple years. Probably the most frustrating aspect of perennial weeds is their ability to spread through vegetative means, such as rhizomes, which are fleshy underground stem structures (similar to an iris). They can even spread from a small scrap of root.

How do you Control Weeds?

Weeds can be removed by chemical and non-chemical methods. Just remember when using any chemical products to control weeds that you ***follow the specific directions provided by the manufacturer***, or please call a professional to help. Weed control information is provided in Appendix D.

Chemical Use

One of the recommendations included in the Open Channel Master Plan drafted by the Planning Commission focused on landscape maintenance chemical applications within the City.

Landscape maintenance chemicals are the fertilizers, herbicides, pesticides and insecticides used in lawn and garden care. When lawn chemicals are applied improperly, they run off into streams, harm fish and other animals and negatively impact water quality. Environmentally-friendly landscape maintenance practices can help prevent negative environmental impacts and still keep your home landscape looking beautiful.

The following table provides voluntary guidelines that suggest recommended chemicals to use at specific distances from the stream or storm drain.

Distance From Stream/Storm Drain	Recommended Products
0 – 2 ft.	Glyphosate (Roundup, Accord, Rodeo, and Campadre)
2 – 6ft.	Metsulfuron (Escort),Gulphosinate (Finale), Fosamine (Krenite), Triclophyr (Garlon)
Outside 6ft. Buffer Zone	Imazapry (Arsenal), Sulfometuron (Oust), Dicamba (Banvel), 2,4-D (Generic)

NOT FOR USE: Hexazinone, Picloram, Atrazine, Fluazifop

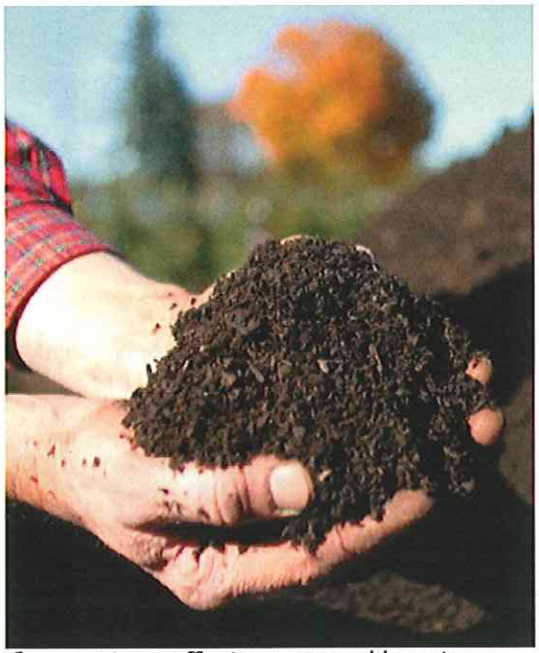
Source: A Restore Corps Training Module developed by the Alliance for the Chesapeake Bay, Common Threats to Newly Planted Buffers

Issues to Consider Before Chemical Application

Fortunately, there are some things that you can do to lessen the effect landscape maintenance chemicals have on water quality:

- If you use a lawn care company, look for one that uses "Integrated Pest Management (IPM)", as this indicates the company is treating only the portions of the property with problems, rather than the entire property.
- Consider using compost instead of fertilizer. Composting creates an organic, slow-release fertilizer and soil-enhancing material.
- Test the soil for nutrient deficiencies before using fertilizers.
- Read labels on lawn chemicals carefully and always apply products correctly. Using extra product does not provide extra benefit. For weed control, spot treatments are recommended over blanket applications.

- Try limiting lawn fertilizer and herbicides to three applications per year.
- If granular fertilizer lands on hard surfaces (driveways, curb lines, etc.) blow them back into the lawn or yard to avoid it being washed away into storm sewers.
- Allow proper drying time for liquid chemicals, and never use lawn chemicals before a heavy rainfall is expected.
- When using herbicides near streams, avoid spray drift into streams.
- Use caution on slopes and lawn edges so fertilizer will not wash into nearby storm sewers or waterways.
- Mowing to the edge of the stream is strongly discouraged. Mowing to the edge of the stream allows pollutants to enter the creek directly. This approach also results in higher velocities of run–off since there is no vegetation to slow the storm water.
- Contact the Johnson County Extension Office at 913-715-7000 for more information on specific lawn chemical use.



Compost is an effective way to add nutrients.

Ladybugs are a common IPM strategy.

Pervious Alternatives

One of the recommendations included in the Open Channel Master Plan drafted by the Planning Commission was to encourage the use of pervious pavement when residents replace drives or patios. Pervious pavement allows storm water to absorb and filter through, therefore reducing surface runoff. Impervious pavement does not absorb storm water and causes runoff. The City is looking at adopting a new fee that would be collected when impervious surface is added to a property. Using pervious alternatives, such as the examples listed below, would result in no fee being charged.

Different Types of Pervious Surfaces

When choosing the type of pervious surface that is best for your particular application, there are a few things to consider, such as the proposed use of the area and the overall appearance you desire. All of these pervious surfaces allow water to infiltrate or filter through the surface and down into the ground beneath instead of becoming runoff that ends up in the stormwater system or in a stream. Some of the more common pervious alternatives include:

Natural Surfaces

These include aerated grass, groundcover, plantings, gravel, mulch, or other natural materials. These are frequently used in the home landscape and are effective pervious surfaces. These surfaces are most pervious when they are not compacted and vehicles are kept off.

Complimenting Impervious Materials

For example, planting strips of grass between traditional impervious pavers to form a grid design on your patio or setting your patio pavers or bricks on a sand base to provide pervious benefits.

Pavers with grass between

Pavers set in sand or gravel

Pervious Grid Pavers

Grid pavers are often made from either recycled plastic or concrete. The grid pattern is usually honeycombed or lattice shaped and the voids collect water during rain events, which then slowly drains into the soil below.

Plastic pervious grid pavers with grass

Concrete pervious grid pavers with grass

The grid pattern is filled with gravel and/or grass to create an appealing look. If grass is desirable, better growing conditions are best encouraged by the addition of soil to the sub-base sand and gravel mix. The grid's physical structure provides support for vehicular use and helps prevent erosion. The flexibility of plastic type grid pavers allows their use at sites with uneven topography.

Grid pavers are ideal for natural landscape projects involving gardens or recreational areas that support both vehicular and pedestrian traffic and include sidewalks, parking areas, golf cart paths, and patios. For aesthetic reasons, the City of Mission Hills does not recommend planting grass between grid pavers for residential driveways.

In order to get the best performance and drainage capacity from your grid pavers it is necessary to maintain them. The general requirements are that you sweep them on a regular basis, vacuum them about four times a year, and re-fill in the voids when necessary.

Pervious Concrete

Pervious concrete is a special mix of concrete that comes out with pores or small holes in it, which is where the water can filter through. It not only reduces stormwater runoff, but recharges groundwater. It has has been successfully used for low-volume streets, driveways, sidewalks, golf cart paths, retaining walls, slope protection, and french drains. It can also be utilized for a variety of paving projects. Pervious concrete contractors are listed in resources section.

Pervious concrete lined with cobble pavers

Pervious concrete close-up

The majority of pervious concrete pavements function well with little or no maintenance. Vacuuming annually or more often may be necessary to remove debris from the surface. Other cleaning options may include power blowing and pressure washing.

Porous Asphalt

This is a special mix of asphalt that has the same 'blacktop' appearance of traditional impervious asphalt. The formula is different with small stone and fine particulate matter being removed and the quantity of tar reduced. ***Sealants to waterproof new surfaces are not applied.***

Water drains through pervious asphalt

Pervious asphalt used on a road surface

More information about porous asphalt is listed in resources section.

Regardless of which pervious pavement option you select, water should not pool on the surface for more than 48 hours. If the water does not infiltrate within 48 hours maintenance will be needed to reestablish infiltration through the pavement.

Channel Wall Design Guidelines

The Channel Wall Guidelines provide direction on the types of stream channel walls that are appropriate for Mission Hills channels if a wall is necessary. The guidelines provide examples of appropriate wall type and they provide direction on where walls are appropriate.

Stream channels provide important ecological and flood control benefits to the City. In the past, communities have accepted the channelization of streams and even condoned the lining of these streams with concrete. With the passage of time, the detrimental impact to property, flooding, water quality, and ecologic health of the stream has been realized. In addition to the undesirable effects on streams, the cost of maintaining and replacing walls at the end of their useful life can be prohibitive.

The Open Channel Masterplan has identified locations along City streams where walls are necessary to act as earth retaining structures, typically at the bottom of steep hillsides. These areas are illustrated on accompanying maps located in Appendix B. Property owners are encouraged to limit the construction of stream channel walls to these areas as old walls need to be replaced.

In locations that currently have walls, but no walls are recommended by the Open Channel Master Plan, the Plan illustrates basic channel dimensions that should be designed and constructed for a stable channel.

Where walls are to be constructed, the walls should be dry stacked, natural limestone with a minimum thickness of 15 inches. If adjacent properties do not have channel walls, the wall should be transitioned back to the slope of the stream bank at each property line.

The stream beds of all channels should be unpaved. This is consistent with federal law.

All stream channel walls taller than 3 feet should be designed by a Professional Engineer registered in the State of Kansas.

All work completed in streams must be approved by the U.S. Army Corps of Engineers, and the Kansas Department of Agriculture, Division of Water Resources.

Examples of acceptable limestone walls are shown on the following page. Refer to Appendix B for maps of Acceptable Wall Locations.

Recommended dry stacked, natural limestone wall.

Stones should have a minimum thickness of 15 inches.