This plan is a compilation of several plans that have been developed since 2002.
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By Mayor Stan Salva, Chairman

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Chair, Stan Salva, Mayor of Sugar Creek, Missouri
Vice Chair, Dick Champion, Jr., City of Independence, Missouri
Rick Arroyo, City of Grain Valley, Missouri
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Phyllis Dieckmann, City of Levasy, Missouri
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John Reece, Little Blue Valley Sewer District
Bob Spence, Jackson County Legislator
Cesar Yanes, City of Blue Springs, Missouri

*Jackson County Liaison, Mark Trosen*

*Workshop Participants*
The Jackson County Stormwater Commission (JCSC) was formed in October 2000 with the charge of developing and implementing a countywide plan for dealing with stormwater issues. After many years of preparing plans, we’ve compiled them into one document which serves as the Comprehensive Stormwater Management Plan. City and County officials in Jackson County are working together to address problems that cross multiple jurisdictions. In the short-term, we will be asking each governing body to confirm their commitment to working cohesively on stormwater programs in support of this plan.

As a growing county, we are faced with new ecological challenges and responsibilities. Protecting the quality of our water resources and protecting people and property from the dangers of flooding should continue to top the list. This document identifies the progress and accomplishments to date in the development and implementation of a proactive Comprehensive Stormwater Management Plan for Jackson County. This document describes the framework for moving forward together to address important stormwater issues.

Thank you for your efforts and participation.

Mayor Stan Salva
JCSC Chair

Recreational Trail Along Stream

Little Cedar Creek
1 INTRODUCTION

1.1 Document Purpose

This document serves as the Stormwater Management Plan for Jackson County, Missouri. It identifies the progress and accomplishments to date in the development and implementation of a proactive stormwater management by the Jackson County Stormwater Commission. This document describes the framework for moving forward in implementing this agenda.

Stormwater refers to water that runs across the land after rainstorms and eventually winds up in local streams and lakes. It often carries pollutants, such as excess sediment, nutrients, pesticides, oils, heavy metals, and bacteria. These pollutants come from various sources and activities across the landscape.

The large amount of untreated water entering the storm sewer system — and eventually our streams and lakes — has lasting health, safety, environmental and economic impacts on our watersheds and communities. Protecting the health of our watersheds preserves and enhances the quality of life for Jackson County residents and our neighbors.

Today, we know that stormwater pollution is one of the biggest threats to the health of our creeks and streams, and one of the biggest challenges for local governments to manage because stormwater doesn’t begin or end at the city limits. Stormwater runoff follows watershed boundaries. Watersheds are areas that naturally drain over land to one point, usually a stream, lake or river.
1.2 Commission Purpose and Background

The Jackson County Stormwater Commission was formed in October 2000 with the charge of developing and implementing a county-wide plan for dealing with stormwater issues. City and County officials in Jackson County have worked together to address problems that cross multiple jurisdictions. The Commission’s approach is a unique effort to identify, protect and enhance the natural resources throughout Jackson County. The focus of this effort is to develop collaborative city and county projects that consider downstream impacts that maximize project resources and benefits. The projects will take a proactive approach to regional problems with green solutions where applicable.

In a healthy watershed, stormwater is managed by natural systems. Vegetation slows water, porous soils absorb the water, and floodplains receive, store and transmit the excesses. Without protection, as our communities develop, more stormwater runoff is generated causing erosion, flooding and water quality problems. By protecting these natural systems and restoring them, both stormwater quantity and quality can be better managed through green solutions where applicable, often at a lower long-term cost.

As a growing county, Jackson County is faced with new ecological challenges and responsibilities. Protecting the quality of our water resources and protecting people and property from the dangers of flooding should continue to top the list.
1.3 History of Previous Plans and Initiatives

Over the past several years, the Jackson County Stormwater Commission has been involved with projects, plans and initiatives that address stormwater issues in the County, including:

- Blue River Channel Improvements
- Green Infrastructure Plan
- Little Blue River Bank Stabilization
- Subwatershed Plans
- Upper Blue River Watershed Initiative
- Watershed Management Plans– Little Blue River and Sni-A-Bar Creek
- West Branch Sni-A-Bar Creek Watershed Consortium

Details on the projects, plans, and initiatives are listed on the following pages. It is important that work completed in these previous processes be considered when making decisions for future stormwater projects in the County.

Blue River Channel Improvements

The Blue River channel project is located west of I-435 along the Blue River from its mouth at the Missouri River continuing upstream to 63rd Street. The channel runs through a long-standing industrial and manufacturing district with 4,100 businesses employing 66,100 people, and many residential neighborhoods. Portions of the project area experience flooding several times a year, blocking access to facilities, causing property damage, resulting in significant economic loss to the region, pervasive blight and public safety hazards.

Authorized in the 1970 Flood Control Act, construction began in 1983. The project consists of 12 miles of channel modification to reduce the 100-year flood levels by an average of 6 to 8 feet. The project includes a reevaluation effort and developing concepts for “greening-up” the basic flood control project. Kansas City is responsible for providing all lands easements, right-of-way, utility, road and bridge relocations and disposal areas needed for the project. The project is approximately 80% federally funded. The project is estimated at $309 million. Approximately $270 million has been spent to date, which has included the completion of the following projects:

- Stage 1 – Mouth at Missouri River to 9th Street
- Stage 2 – 9th Street to 12th Street
- Stage 3 – 12th Street to 19th Street completed August 1999
- Stage 3 – 19th Street to Stadium Drive completed November 1999
• Stage 3 – Stadium Drive to Brush Creek completed 2002
• Stage 3 – Brush Creek to 53rd Street Design/Build Contract awarded November 2007. Substantially complete May 2010 with American Recovery and Reinvestment Act (ARRA) funding. Green solutions were incorporated.
• Revised floodplain maps became effective May 4, 2006 for the improved channel from the Missouri River to Stadium Drive.
• Lower Blue Parkway Bridge removed in 2006.

The future projects include:
• Construction of New Lower Blue Parkway Bridge (Colorado Ave. Bridge) and associated New Manchester and Hardesty intersection began June 2010.
• 53rd Street to 63rd Street – Awarded June 2010 with American Recovery and Reinvestment Act (ARRA) funding. A Value Engineering study of this reach resulted in a more environmentally friendly design eliminating a concrete Grade Control Structure and berms minimizing the visual impacts to the historical battlefield site of Byram’s Ford. The project includes trails in Swope Park connecting the swimming pool to the Blue River Trails planned north.
• Preliminary design of Blue River Trails from Swope Park to Truman Road completed in 2007. Trail alignment was graded and used as access roads between 53rd Street and 63rd Street during channel construction. Final design of Blue River Trails is expected to begin early 2011.
• Mitigation plan installation - Expected 2013.

Green Infrastructure Plan
Like most counties, Jackson County has a master plan for roads, sewers and other infrastructure. Identifying critical areas for protection is a strategy to conserve the best of Jackson County’s natural resources assets for the public. This document serves as Jackson County’s Green Infrastructure Plan to guide decisions about preservation, restoration and connections to natural and cultural resources. Jackson County has over 22,000 acres of parkland which is the second largest holding by any county in the country. This publicly owned parkland serve as Jackson County’s current green infrastructure. Many more acres of publicly owned lands are held and managed by the various cities.

Additional natural resources have been identified as well as areas that need restoration and connections. Two more specific watershed plans are also included in this document. They provide a greater level of detail to decision-makers. Critical areas for protection and strategies for preservation, restoration and connections were identified.
**Little Blue River Bank Stabilization**

In the 1970s, the US Army Corps of Engineers (USACE) completed a flood control project that resulted in the channelization of approximately fifteen (15) miles of the Little Blue River. The channel was straightened and five (5) miles of oxbows were removed. In addition, Longview Lake and Blue Springs Lake were constructed for flood control and recreational purposes.

The Little Blue River channelization project was designed over 30 years ago, primarily for rural conditions. Heavy development pressure in the Lee’s Summit, Independence and Blue Springs jurisdictions has substantially altered the landscape form and context of the Little Blue River and its tributaries. The flood control project that was designed for rural conditions is now struggling under rapidly urbanizing conditions. Flood protection for the development adjacent to the river is diminishing. If the flood control structure dam fails, the extensive development in the basin will not be adequately protected from flooding.

Reservoirs were also built by Jackson County in the East Fork watershed to provide flood control and recreational assets to the County.

However, the flood control structures are no longer managed for flood control and normal pool elevations remain constant throughout the calendar year. The reservoirs have sedimentation issues that need to be addressed.

In 2005, the U.S. Army Corps of Engineers provided technical assistance to Jackson County, Missouri to complete an inventory of channel deficiencies and bank stabilization issues. Tetra Tech EM, Inc. conducted a stream stability assessment on the flood control channel of the Little Blue River, identifying thirty-seven locations along the main stem from Longview Lake dam to the Missouri River that had channel and bank stability issues. These issues were ranked in priority from one to three, where issues receiving a one rating were the areas that needed first priority.
Figure 1: Little Blue River Bank Stabilization Study Area
Subwatershed Plans

Applied Ecological Services, Inc. (AES) conducted field investigations on three watersheds in Jackson County—Burr Oak Creek, Little Cedar Creek, and Round Grove Creek. The purpose of the field investigations was to assist Jackson County in protecting natural resources, restoring waterways, and protecting water quality through effective stormwater management within these watersheds.

The reports for each watershed (dated November 2004) identified opportunities to implement stormwater management methods in conjunction with natural resource protection and restoration. These methods included policy recommendations as well as demonstration projects. Stormwater control measures were designed for three demonstration projects, one in each watershed. Cost estimates were also developed for the various Best Management Practices (BMPs).

Policy Recommendations

- Adopt the Kansas City APWA 5600 Storm Drainage Systems and Facilities design criteria
- Adopt the Kansas City APWA Manual of Best Management Practices for Stormwater Quality (BMP manual)
- Adopt additional stormwater management and development practices
- Develop and implement a public education and incentive program
- Implement a habitat and biodiversity preservation program

Upper Blue River Watershed Initiative

The Upper Blue River Watershed Initiative (UBRWI), a U.S. Environmental Protection Agency (EPA) grant-funded project, aimed to develop a watershed management strategy for the Upper Blue River Watershed irrespective of city, county and state boundaries. Jackson County applied for the grant in partnership with Johnson County, Kansas. This initiative incorporated innovative partnerships, integrated planning and design, natural resource preservation, and environmentally sustainable planning and design to meet watershed and community needs, now and into the future. The effort built on the many watershed planning and stormwater management efforts already underway in the watershed’s communities, as well as regional initiatives such as the MARC Natural Resources Inventory and the MetroGreen greenways plan.

The Upper Blue River Alliance came together to navigate the challenging waters of the Upper Blue and to guide the watershed to a more sustainable course. The Alliance originated from the Upper Blue River Watershed Initiative led by Johnson County, Kansas; Jackson County, Missouri; and the City of Kansas City, Missouri. Stakeholders included a Steering Committee (elected officials) and four Work Teams
(professional staff from the counties, cities, and regional agencies).

Specific implementation measures, including policies and programs, are needed to integrate regional and local actions to produce meaningful watershed protection efforts and to protect green infrastructure at a watershed scale. The four Work Teams met over a course of several meetings to narrow the list of potential implementation strategies based on actual watershed conditions and the character of the watershed.
and its communities. To be considered for inclusion in the Watershed Implementation Plan, implementation strategies must make a real impact on watershed sustainability.

The implementation measures that were identified are both feasible and innovative. The Alliance partners then identified the most effective and realistic implementation strategies to address these priorities. Taken together, these measures will direct watershed management toward sustainability. The Alliance partners can build on and adapt these strategies with future experience and resources.

Figure 2: Upper Blue River Watershed Map

Implementation strategies were grouped into one (or more) of several general categories listed below (see Appendix A for specific implementation strategy details):

- Watershed Coordination
- Open Space Acquisition and Management
- Planning and Policy
- Private Sector Incentives
- Funding Sources

The Upper Blue River Watershed Initiative was completed in January 2007 when the Watershed Implementation Plan was delivered to the Alliance partners. The Upper Blue River Alliance continued to meet and coordinate on implementation opportunities until June 2010. The Commission was briefed on the implementation plan recommendations and Alliance activities in May 2008. Right now there are no plans for future meetings.

West Branch Sni-A-Bar Creek Watershed Consortium

The West Branch Sni-A-Bar Creek Watershed Consortium was formed in June 2008 in response to the need for local protection and management of a large area in eastern Jackson County experiencing development that threatens open space and critical habitat. The Consortium, a 501(c) non-profit organization, is composed of representatives from several local governments and public agencies including Lake Lotawana, Grain Valley, Blue Springs, Jackson County, Lake Lotawana Association, Carriage Oaks

Attendees at the Upper Blue River Watershed Initiative Kickoff (2006)
Homeowners Association, Mid-America Regional Council (MARC) and the Missouri Department of Conservation. Its mission is "to promote and improve the sustainability, conservation, protection and cooperative management of the cultural and natural resources within the West Branch Sni-A-Bar Creek Watershed."

This watershed covers 18,525 acres, contains a fully developed 600-acre lake, pockets of undeveloped forest, an active limestone quarry, and acres of cropland and pastures. It is the primary headwater source for Sni-A-Bar Creek, which empties into the Missouri River. The water in the West Branch Sni-A-Bar Creek watershed flows from eastern Jackson County farmland and the southern reaches of Blue Springs into Lake Lotawana and then onward to Grain Valley.

The consortium members have pledged mutual assistance and support to begin a formal planning process to identify conservation problems and sponsor EPA grant applications for possible solutions. One of the consortium's first successes is the negotiation with Blue Springs on funding the first stage of wetlands development included in the upcoming reconstruction of the 7 Highway and Colbern Road intersection. This effort is intended to reduce the silt that strangles the Carriage Oaks holding basin.

In 2009 and 2010, the consortium received a grant from MARC to sponsor two education projects to learn about our watershed and to print brochures for distribution. The brochures provide information about the consortium and the watershed and they can be found at local merchants. The first ever Water Fest was held in conjunction with the Lake Lotawana Association’s community picnic in June 2009. In 2009 and 2010, the consortium worked with Blue River Watershed Association to provide a learning experience for fifth grade students at Mason Elementary School in Lee’s Summit. The students participated in the Teaching Rivers in an Urban Environment (T.R.U.E.) Blue program where students learn about water resources, water quality and water quality testing methods in area creeks.

The consortium members are also actively supporting MARC’s application for funding to develop a green infrastructure plan to determine strategies for the protection and restoration of the West Branch Sni-A-Bar Creek watershed below the dam.
2.1 Mission and Desired Outcomes

In 2002, the Jackson County Stormwater Commission participated in a workshop to develop a mission statement for the Commission. The mission statement that was created stated:

The Jackson County Stormwater Commission provides proactive, collaborative stormwater management services to reduce flooding, protect water quality and create new community amenities for citizens of Jackson County.

The Commission also developed some desired outcomes that would result from their work. Those desired outcomes include:

- Protect and improve water quality.
- Minimize and reduce flood damage to property and infrastructure.
- Minimize injury and loss of life due to flooding.
- Maximize and enhance the environmental resources in the watershed.
- Maximize economic development while protecting the health of the County’s watersheds.

The approach used for the purpose of the management plan can be summarized as follows:

- Identify critical protection areas.
- Identify strategies to conserve and enhance the critical protection areas.
- Identify Best Management Practices (BMPs) on public lands.
- Educate decision-makers on protection strategies.
- Develop local projects to consider downstream impacts and implement ways to maximize project resources.

Critical Areas for Protection

Lands should be identified that if protected from development will improve stormwater quantity and quality into receiving streams and lakes. The primary goals of identifying critical areas are:

- Identify priority MetroGreen corridors for implementation (Little Blue River only); and
In addition, lands should be evaluated to determine if multiple benefits could be achieved by stormwater management. For this plan, the multiple benefits selected were:

- Hazard mitigation such as reduced flooding;
- Water quality protection such as sediment loads flowing into reservoirs and streams; and
- Habitat preservation of areas with known protected species or species of high value to the community.

90% of local citizens were very or somewhat concerned with pollution in area waterways.

-Mid-America Regional Council, 2009 Water Quality Survey
2.2 Goals and Action Steps

In 2002, the Commission also worked to develop goals to help meet the mission statement and desired outcomes that were previously determined for the Stormwater Management Plan. The Stormwater Management Plan will be deemed a success if these goals and specific action steps are met within a reasonable timeframe. The goals include:

- Build partnerships and educate stakeholders
- Enact standardized regulations
- Mitigate flood hazards
- Plan on a watershed basis and leverage resources
- Preserve and restore existing natural systems
- Develop a sustainable funding mechanism

On the following pages, more specific information is given for each goal including prior accomplishments that have taken place to help achieve the goal. Additionally, future plans or action steps are given as well as suggested policies, actions and ordinances that should be developed and implemented.

Green Infrastructure Workshop (2006)

Blue River Watershed Association–Water Quality Testing
Goal 1: Build Partnerships and Educate Stakeholders

Educating stakeholders about good stormwater management and building partnerships with key stakeholders are essential and directly tie to a program’s success or failure.

Prior Accomplishments

1. Developed relationships and partnerships with key local, state, and federal agencies, elected officials, non-profits and businesses, including:
   - Johnson County, Kansas;
   - Cass County, Missouri;
   - U.S. Environmental Protection Agency (U.S. EPA);
   - U.S. Geological Survey (USGS);
   - U.S. Army Corps of Engineers (U.S. COE);
   - Mid-America Regional Council (MARC);
   - Missouri Department of Conservation (MDC);
   - Missouri Department of Transportation (MoDOT);
   - Kansas Land Trust;
   - Federal Emergency Management Agency (FEMA);
   - Home Builders Association (HBA);
   - Jackson County Sports Authority;
   - County and city governments;
   - Congressman Emanuel Cleaver’s Office;
   - Former Senator Kit Bond’s Office;
   - Soil and Water Conservation District – received the Government Award from the Mid-America Association of Conservation Districts in 2009;
   - Missouri-Arkansas River Basin Association (MOARK);
   - Local non-profits and environmental activist groups; and
   - Major landowners and developers.

2. Prepared an Education and Outreach Plan for implementation by County staff.

3. Prepared and distributed outreach materials to Stormwater Commission members and stakeholder groups.

4. Prepared congressional briefing reports, presentations and training materials for stakeholder groups including:
• APWA 5600 and Best Management Practice (BMP) Manual training for Jackson County cities;
• Erosion and Sediment Control Ordinance training;
• Meeting to promote development standards to Greater Kansas City Home Builders Association and development community;
• 10,000 Rain Garden presentations;
• Jackson County All Cities presentation; and
• Partnered with Jackson County Extension for Erosion and Sediment Control Training.

5. Established partnerships—Upper Blue River Watershed Alliance with Kansas City, Johnson County and Blue River Watershed Association.

6. Co-sponsored Missouri River Relief.

7. Partnered with the Mid-America Regional Council on Stream Buffer education program.

8. Surveyed city staff regarding education and outreach practices.

**Action Plans**

Jackson County needs to continue to provide education for elected officials, local governments and the development community. Action steps for education and outreach include:

1. Prepare standardized message and presentation materials to be used to inform all stakeholders.

2. Make stormwater a priority. Take the issue to the Mayor’s Caucus, Eastern Jackson County Betterment Council, and Jackson County Legislature. Make presentations on stormwater issues to elected officials and legal counsel.

3. Train city and county staff on stormwater management policies and practices.

4. Participate in and support the Mid-America Regional Council’s Water Resources Education Activities.

Goal 2: Enact Standardized Regulations

It is critical for Jackson County and every municipality in the County to pass three sets of stormwater related regulations:

1. Stream Setback Ordinance;
2. Erosion and Sediment Control Ordinance; and

Prior Accomplishments

1. Jackson County has adopted all three sets of critical regulations (some enhancements are recommended).
3. Drafted Erosion and Sediment Control ordinance that was adopted in Fall 2004 by the County.
4. Researched and made recommendations regarding buffer and protection strategies for County lakes.
5. Reviewed County’s riparian protection ordinance and provided recommendations regarding example stream setback ordinances and overlay protection ordinances.
7. Surveyed cities to assess what ordinances have been enacted and determine where future assistance is needed (survey results are include in Appendix B).

Action Plans

The County and all jurisdictions need to continue to promote local adoption of regulations, provide technical advice/training to cities and begin to build projects with new standards to set an example for cities to follow. Action steps for enacting standardized regulations include:

1. Provide examples of and training on model ordinances for stormwater management to communities.
2. Assist communities to pass or revise stormwater ordinances county-wide.
4. Make presentations to city and county officials regarding the importance of enacting good stormwater management practices and the costs of not taking action.
It is also recommended that the Commission implement selected policies and ordinances, implement specific land management practices, develop a framework for multiple jurisdictions to cooperate on the action items, and develop a proactive, ongoing public outreach program.

**Policies**

The following policies are recommended to be implemented by Jackson County and the municipalities within its jurisdiction:

- Continue development of consistent ordinances and policies across Jackson County.
- Develop a decision-making tool to guide local and inter-jurisdictional decisions.
- Enact low-impact development (LID), Leadership in Energy and Environmental Design (LEED) eligible, or sustainable design for all Tax Increment Financed (TIF) projects.
- Plan on the individual, neighborhood, watershed, and regional scales.
- Enact regulations so there are not new structures in the floodplain. Use 100-year floodplain (1% flood event) at full build-out conditions as a basis for planning and regulation.
- Implement No Adverse Impact (NAI) floodplain management.
- Require all developments to have stormwater runoff releases (volume and rates) that do not exceed calculated releases for a reference land use condition.
- Use green infrastructure and multi-purpose approaches.

**Ordinances**

The recommended ordinances selected as a standard for all communities include:

- Adopt American Public Works Association (APWA) 5600 as a minimum standard
- Require APWA Best Management Practices, as a minimum standard
- Adopt Riparian corridor protection with stream setback ordinance
- Adopt APWA Erosion and Sediment Control Sections 2100, 2600, and 5100
- Adopt Tree and Native Vegetation Protection
- Enact Prime Farmland Protection ordinances

93% of citizens would support local ordinances requiring developers to protect natural areas.

-Mid-America Regional Council, 2009 Water Quality Survey
Goal 3: Mitigate Flood Hazards

Flooding in Jackson County has caused property damage, injury and even loss of life. In most cases, the solution to a flooding problem requires a system approach - detaining or retaining stormwater while enhancing the flood capacity of rivers or streams. This can be completed with gray solutions - concrete basins and channels - or green solutions – ponds, wetlands, rain gardens, and streamside greenways. Green solutions tend to be less expensive, more effective and more pleasant to live near, but they require planning and coordination. For this reason and the fact that stormwater runoff comes from all properties in the community, attention must focus on county and local governments to ensure that damages caused by flooding are mitigated.

Prior Accomplishments

1. Endorsed Little Blue River Position Statement, later adopted by County Legislature.
2. Encouraged cities to participate in National Flood Insurance Program.
3. Developed partnerships with Federal Emergency Management Agency (FEMA), Mid-America Regional Council and state and local governments.

The County is currently in the process of conducting a FEMA review and remap. They are conducting a D-FIRM update, taking the Hydraulics and Hydrology modeling and re-delineating it to fit the topography. This will make the maps compliant in the Little Blue River in two areas:

- County boundary downstream to Lee’s Summit Road which is 18 miles of stream
- From Atherton Mills levee 10 miles upstream

Action Plans

Action steps to mitigate flood hazards include:

1. Disseminate FEMA materials about flood-proofing structures.
2. Review current County Emergency Preparedness Plan for flood response and collaborate with FEMA, State Emergency Management Agency (SEMA), and local agencies to implement a Hazard Mitigation Plan.
3. Install Flood Warning Systems.
4. Continue education and support of BMP’s, green development, and low impact development.
5. Map full built-out conditions.
Goal 4: Plan on a Watershed Basis and Leverage Resources

Because watersheds cross several political boundaries, stormwater problems can best be addressed on a watershed and countywide basis. When different communities share a watershed, the residents of all the cities and counties in the watershed need to address issues like flooding and water quality together. All of our actions impact our upstream and downstream neighbors. This is an opportunity for the County to take a critical leadership role and develop better solutions to stormwater management issues at a lower long-term cost to citizens. Figure 3 below displays the watersheds in Jackson County.

Figure 3: Watersheds of Jackson County, Missouri

Watershed Plans Completed

Two watershed plans were completed in 2007- the Little Blue River Watershed Management Plan and the Sni-A-Bar Creek Watershed Management Plan. Both documents provide a great level of detail for decision-makers when considering watershed issues. Critical areas for protection and strategies for preservation, restoration, and connections were identified.
The purpose of the watershed management plan for the Little Blue River and Sni-A-bar Creek watersheds was to guide the decision-makers in Jackson County and the Jackson County Stormwater Commission on actions to take for the betterment of the watershed and community. The scope of the plan included utilizing the information and data currently available in a rapid assessment to identify the areas and actions with the highest potential for maximum effect in the watershed.

The Little Blue River has a longer course than any other stream in Jackson County and meanders northeasterly through the center of the county. It was reported that “the headwaters of the Little Blue River were three never-failing springs”. The Little Blue River watershed is 168,553 acres and crosses numerous political jurisdictions, communities, streams and lakes.

Water quality impairment has been documented in the watershed in the past. The East Fork of the Little Blue River is listed as a Category 1 impaired stream on the Missouri Department of Natural Resources Section 303(d) waters. Category 1 streams are proposed for full Total Maximum Daily Load (TMDL) development.

Sni-A-bar Creek is located in the eastern portion of Jackson County. It originates in Lafayette County, meanders north through Jackson County and then east back into Lafayette County, eventually flowing into the Missouri River. The Sni-A-bar Creek watershed includes several streams and two lakes. It traverses seven political jurisdictions.

Jackson County Parks and Recreation owns and maintains two major parks within the Sni-A-bar Creek watershed: the Monkey Mountain Nature Reserve and the Blue and Grey Park Reserve. The Missouri Department of Conservation also owns and operates the Lone Jack Wildlife Area.

The area is rich with historical and natural resources. Trappers and Native Americans utilized its natural resources before Kansas City was on the map. Civil war battlefields are located in the Sni-A-bar Creek watershed. Natural features include large tracts of hardwood forest, grasslands, oxbows, bottomland hardwood forests, wetlands, and springs.

**Subwatershed Plans Completed**

In 2004, Jackson County selected Round Grove Creek, Burr Oak Creek, Little Cedar Creek and Round Grove Creek watersheds to explore water resource protection and restoration strategies. The Jackson County watersheds are delineated on **Figure 4**.
During 2003, Applied Ecological Services, Inc. (AES) conducted field investigations in these watersheds and mapped the natural resources of the entire County as part of a region-wide inventory project for the Mid-America Regional Council (MARC). AES used this data to identify opportunities to implement effective natural resource and stormwater management strategies in Jackson County.

The 3,937-acre Little Cedar watershed is located just outside the highly developed southeastern edge of the Kansas City metropolitan area, in south-central Jackson County. It is developed to a significant degree, with less than 42% of the land remaining in permanent vegetative cover. Its remaining natural resources are in fair to poor condition due to inadvertent misuse or neglect. Stream conditions are also moderately to severely degraded because of excessive stormwater runoff from impervious surfaces. Most of the important natural resources coincide with steep slopes throughout the watershed.

The 5,285-acre Burr Oak watershed is located just outside the highly developed southeastern edge of the Kansas City metropolitan area, in north-central Jackson County. Natural vegetation and wildlife habitat occupies less than 43% of the watershed, mostly on steep slopes and in the wettest or most flood-prone valley bottoms. Impervious surface covers a large proportion of the watershed and as a consequence, stream channels are unstable and water quality has deteriorated. Its remaining natural resources are in fair to poor condition due to inadvertent misuse or neglect. Plant communities in Burr Oak Woods Conservation Park are in better condition due to long-term protection. Stream conditions are also moderately to severely degraded because of excessive stormwater run-off from impervious surfaces. Most of the important natural resources coincide with steep slopes throughout the watershed.

The 5,446-acre Round Grove watershed is located in the highly developed southeastern edge of the Kansas City metropolitan area, in northwestern Jackson County. It is largely developed with older, single-family residential development, commercial/industrial development along major streets and freeway interchanges, and the Kansas City Chiefs/Royals Stadium complex. Impervious cover is very high; less than 46% of the land remains in permanent vegetation cover. Its remaining natural resources are in fair to poor condition due to inadvertent misuse or neglect. Very limited green open space occurs within the watershed. Most of the important natural resources coincide with steep slopes in the northern half of the watershed. Stream conditions are also moderately to severely degraded. Stormwater detention is minimal to nonexistent.
Figure 4: Burr Oak, Little Cedar, and Round Grove Watersheds
Prior Accomplishments

1. Submitted Upper Blue River Grant application to U.S. Environmental Protection Agency (EPA) with Johnson County, Kansas and Kansas City, Missouri.

2. Prepared EPA grant application for Upper Blue River Watershed Initiative in partnership with Johnson County, Kansas. Leveraged $105,000 for $5,000 Jackson County investment.

3. Prepared Missouri Department of Natural Resources Grant for three (3) subwatershed studies. Leveraged $90,000 for $0 investment by Jackson County.

4. Negotiated Planning Assistance to States (PAS) agreement with U.S. Army Corps of Engineers with a 50/50 cost share. The first agreement supported stream inventory work in the Burr Oak and Little Cedar Creek subwatersheds. Leveraged $10,000 in federal dollars for $5,000 cash and $5,000 in-kind match from County. The second agreement supported the evaluation of the in-stream stability issues in the Little Blue River. Leveraged $10,000 of federal dollars with $10,000 cash investment by County.

5. Negotiated an agreement with the U.S. Army Corps of Engineers to gather hydrologic and hydraulic models and other data in the Little Blue River Basin. No matching funds were required by the County.

6. Participated in the development of MARC’s Natural Resource Inventory setting stage for county-wide planning.


8. Coordinated and supported Stream Stability Assessment Project for Little Blue River funded by U.S. Army Corps of Engineers.

9. Prepared restoration plan for Little Blue Trace I-470 crossing (see Appendix C).


11. Sponsored erosion and sediment control workshops through the Jackson County Public Works Department and the Soil and Water Conservation District to reach a broader audience.

12. Instituted mitigation program bringing restoration resources to County parkland.

13. Partnered with the Blue River Watershed Association and Kansas Land Trust to seek conservation easements on private lands in the Upper Blue River floodplain.

14. Prepared a Top Ten Projects list with cost estimates for funding applications.
15. Prepared a Stormwater Management Plan from all previous studies and plans pulling into one document and prioritizing projects.

**Action Plans**

The County should continue to build relationships and partner with contiguous counties/cities and watershed planning groups to leverage resources. Action steps for planning on a watershed basis and leveraging resources include:

1. Develop and sign a Memorandum of Understanding (Appendix E) agreement that communities will plan and work together on a watershed basis for Capital Improvement Projects (CIP) and site development within common watersheds.

2. Implement policy and ordinance strategies at the County level and encourage the municipalities to do the same.

3. Prepare a “white paper” on the strategies that are lesser known such as U.S. Department of Agriculture (USDA) programs.

4. Develop a framework for multi-jurisdictional cooperation, especially for projects that affect multiple jurisdictions.

5. Encourage the land management strategies recommended and provide training on these elements.

6. Develop a proactive, on-going public education program. Identify sources of funding for this program.

7. Map the 100-year floodplain at full build-out conditions, and complete a hydrologic/hydraulic model for key watersheds.

8. Prioritize the critical areas and potential BMP projects.

9. Select identified areas or best management practice projects for use as demonstration projects, working with the local municipality on design, costs, installation, and maintenance (up to five in Little Blue; up to three in Sni-A-Bar Creek).

10. Adopt the Kansas City APWA 5600 Storm Drainage Systems and Facilities design criteria.


12. Adopt additional stormwater management and development practices.

13. Develop and implement a public education and incentive program.

14. Implement a habitat and biodiversity preservation program

15. Adopt the sustainable watershed vision and definition by resolution of the jurisdictions’ governing bodies.

16. Conduct regular Alliance meetings to coordinate watershed activities and re-
Action Plans, continued

17. Form a partnership with the development community for the sustainable development of the watershed.

18. Partner with NRCS to systematically leverage the Continuous Conservation Reserve Program (CCR), Environmental Quality Incentive Program (EQIP), Wetland Reserve Program (WRP), and other conservation programs.

19. Partner with MARC with in its transportation planning efforts to better avoid and protect functional open space and direct growth to the most suitable locations.

20. Obtain additional local funding and state and Federal loans, grants, and appropriations.
Goal 5: Preserve and Restore Existing Natural Systems

The Jackson County Stormwater Commission is recommending the County take a proactive approach to stormwater problems by focusing on preserving and enhancing natural systems, promoting “green” solutions where possible. Green solutions are those that not only manage stormwater to reduce flooding but improve water quality and quality of life, typically at a lower cost. The proactive approach will be to create multi-objective facilities that reduce flooding, enhance water quality and create community amenities for Jackson County citizens.

Strategies

The strategies for successfully preserving and restoring existing natural systems include:

- **Protect, restore and connect within and to MetroGreen prioritized corridors.** MetroGreen is an interconnected system of public and private open spaces, greenways and trails designed to link seven counties in the Kansas City metropolitan area. The current plan includes 1,144 linear miles of greenway corridors and a current planning process is identifying and preparing an action plan for the higher priority regional corridors. Jackson County has three of these corridors: Blue River, Little Blue River and a connection to the Katy Trail.

- **Protect, restore and connect critical areas outside of the MetroGreen priority corridors.** Critical areas for protection were identified as part of Mid-America Regional Council’s Green Infrastructure program by integrating Mid-America Regional Council’s Natural Resource Inventory database with mapping layers depicting likely development and the potential for hazard mitigation. The top ten percent (10%) high quality natural areas with the most likely potential to be lost to development in the near future were identified. Stakeholders used this information and their knowledge of the County to identify additional areas to preserve, restore and connect.

Prior Accomplishments

1. Prepared mitigation memorandum describing the options for bringing resources into County lands (see Appendix D). Provide training regarding mitigation.
3. Negotiated mitigation agreement with the Bass Pro Shop developer that will fund restoration of a portion of the Little Blue floodplain.
4. Developed a Horse Sense Workshop to educate small acreage landowners on horse husbandry that protects soil and water resources.
Action Plans

Action steps to help preserve and restore existing natural systems include:

1. Implement an on-going and active public education and outreach program.
2. Develop a decision-making tool or framework for multi-jurisdictional cooperation which will benefit all parties affected.
3. Assist communities in passing a stream buffer ordinance or update an existing ordinance.
4. Prepare a Conservation Plan for County lands.
5. Acquire key natural resource properties.
6. Restore natural systems on County lands.
7. Design and build maintenance improvements to the Little Blue channel.
8. Work together collaboratively to adopt new policies, ordinances and land management strategies.
9. Actively pursue a funding strategy for implementation of green infrastructure projects.
10. Work together to educate and market the green infrastructure plan.
11. Develop a strategic conservation investment policy directing private investment.
12. Select top projects to fund and complete as demonstrations - participate and collaborate.
13. “Green Up” currently planned capital improvement projects.

MetroGreen High Priority Corridors

Jackson County has three MetroGreen high priority corridors: Blue River, Little Blue River and a connection to the Katy Trail. Within these three corridors, there are 10,867 acres of land. A good portion of that acreage is already in park land or already protected by stream setback ordinances (4,550 acres). Land still to be protected either by ordinance or purchase is 6,317 acres. Approximately 4,121 acres of land or 65% of the land can be conserved if cities and the County enact ordinances prohibiting development of the floodplain and protecting high value natural resources in regionally prioritized corridors by enacting a stream setback ordinance. The MetroGreen Action Plan recommends that local governments establish a "variable width" riparian buffer for all streams. The exact width for buffers will be determined by each local government's stormwater management agency.
There are 2,197 acres of area to be conserved outside the floodplain. About one eighth of it is located in unincorporated Jackson County (282 acres or 13%). The other large areas are located in the Kansas City and Lee’s Summit city limits (1,114 and 39 acres respectively or 69%).

**Table 1: MetroGreen High Priority Corridor Summary**

<table>
<thead>
<tr>
<th>Corridor Acreage</th>
<th>10,867 acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Requiring Protection</td>
<td>6,317 Acres</td>
</tr>
<tr>
<td><strong>Floodplain</strong></td>
<td>4,121 Acres</td>
</tr>
<tr>
<td><strong>Upland</strong></td>
<td>2,197 Acres</td>
</tr>
<tr>
<td>Corridor Length</td>
<td>112 miles</td>
</tr>
<tr>
<td>Miles of Trail to Still be Built</td>
<td>81 miles</td>
</tr>
</tbody>
</table>

The length of the three high priority corridors is 112 miles. Thirty-one (31) miles of trail have already been constructed within these corridors. Eighty-one (81) miles of trail remain to be constructed. The majority of the trails to be constructed (37 miles or 33%) are located in corridors in the unincorporated part of the County. The plan is to build trails in regional corridors concentrating first on those that extend existing trails and connect regional special places by working cooperatively. Bringing people in contact with wildlife, history and our cultural resources gives us a deeper understanding and appreciation for their value. Many opportunities exist in the 10,867 acres for ecosystem restoration to improve water quality and fish habitat and to sustain native species in forests, savannas and grasslands.

**Best Management Practices**

Best management practice recommendations are presented in Table 2. The recommendations are based on detention of stormwater and promoting infiltration. While presented in different applications in this plan, the concept of stormwater detention is to reduce the peak stormwater runoff rates and peak stages, potentially providing flood control for select events. An opinion of probable unit cost was derived for each recommended BMP using regionally published reports, conceptual designs, and professional judgment.
### Table 2: Best Management Practices and Estimated Unit Costs

<table>
<thead>
<tr>
<th>Best Management Practice</th>
<th>Estimated Unit Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step pool detention basin within a tributary</td>
<td>$30,000 per step pool</td>
</tr>
<tr>
<td>Regional detention in undeveloped area</td>
<td>$18,000 per acre foot</td>
</tr>
<tr>
<td>Land use conversion</td>
<td>$3,000 per acre</td>
</tr>
<tr>
<td>Use reservoir for stormwater storage</td>
<td>$11,000 per acre foot</td>
</tr>
<tr>
<td>Reconnect stream to floodplain</td>
<td>$250 per linear foot</td>
</tr>
<tr>
<td>Detention in existing open space</td>
<td>$18,000 per acre foot</td>
</tr>
<tr>
<td>Detention within transportation right-of-way</td>
<td>$18,000 per acre foot</td>
</tr>
<tr>
<td>Increase existing open space</td>
<td>$11,000 per acre foot</td>
</tr>
<tr>
<td>Implement detention when area develops</td>
<td>$18,000 per acre foot</td>
</tr>
<tr>
<td>Online detention in tributary channel</td>
<td>$22,000 per acre foot</td>
</tr>
<tr>
<td>Correct sanitary sewer problems</td>
<td>$100 per linear foot</td>
</tr>
<tr>
<td>Use parking lot for detention when unused</td>
<td>$50,000 per lot acre</td>
</tr>
<tr>
<td>Upstream BMPs to improve lake water quality</td>
<td>$800 per watershed acre</td>
</tr>
</tbody>
</table>

Note: Listed in 2004 Dollars
Goal 6: Develop a Sustainable Funding Mechanism

The goals are not feasible without the development of a sustainable funding mechanism.

Prior Accomplishments

1. Prepared a financing plan to fund activities and demonstration projects of the Stormwater Commission. A Finance Sub-Committee was appointed to pursue public and private funding mechanisms.

2. Prepared a financial plan and requested contributions for the Stormwater Commission from Jackson County cities for $1,000 per square mile. Several cities, the County & Little Blue Valley Sewer District participated.

Action Plans

1. Implement a long-term funding mechanism for Jackson County’s Stormwater Management Plan.

2. Continue to encourage annual contributions from communities in the amount of $1,000 per square mile which will allow the Commission to continue to move forward and plan for the County’s continued growth.

3. Consider stormwater fees to fund local programs and the Stormwater Commission.

4. Prepare a long-term funding strategy and funding applications to support the highest priority projects.

5. Further discuss and consider the following funding options (see Section 2.4 for more details):
   - Real Estate Transfer Fee;
   - Property Tax with Proportioning or Dedicated Sales Tax;
   - Strategic Approach to Parkland Dedication;
   - Conservation Easements;
   - United States Department of Agriculture (USDA) programs; and
   - Carbon Banking (Carbon Offsets) or Carbon Credits
   - Stormwater Utility
   - Land Trusts
2.3 Stormwater Management Projects

Throughout the years, projects have been identified by the Stormwater Commission as a result of the various studies and plans that have been conducted.

Green Infrastructure Projects (2007)

Projects were identified to be green infrastructure projects. The projects were divided into three types – areas for protection, areas for restoration, and connections between valuable places in the Jackson County communities. The projects are listed in Table 3, Table 4, and Table 5 on the following pages. A total of fifty-six (56) specific projects in Jackson County were identified, which included twenty-nine (29) conservation projects, thirteen (13) restoration projects, and fourteen (14) connection projects. See the fold out map for detailed project locations.

Conservation corridors and the connections excluded the trails through the Blue River and Little Blue River corridors and the Katy Trail, which are priorities already identified in the MetroGreen Greenway Plan. However, specific areas for conservation or restoration within the MetroGreen corridors are identified. For example, the Blue River corridor contains four projects including some within the Blue River Conservation Opportunity Area (COA) designated by the Missouri Department of Conservation (MDC). A COA is a larger area with higher quality habitat and wildlife resources, identified for special consideration to protect the resources. The Blue River COA is one of two on the Missouri side of the Kansas City metropolitan area.

Table 3: Green Infrastructure Projects– Conservation Priorities

<table>
<thead>
<tr>
<th>ID #</th>
<th>Project Name</th>
<th>Location</th>
<th>Compelling Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>Blue River Conservation Opportunity Area</td>
<td>Middle Blue River, Swope Park</td>
<td>Conservation</td>
</tr>
<tr>
<td>G1A</td>
<td>Blue River Parkway</td>
<td>Blue River Parkway, Swope Park</td>
<td>Conservation Opportunity Area</td>
</tr>
<tr>
<td>G2</td>
<td>Little Blue River Corridor</td>
<td>Independence to Missouri River</td>
<td>Conservation and connection; unprotected river banks</td>
</tr>
<tr>
<td>G3</td>
<td>Battle of Little Blue</td>
<td>Little Blue River and Hwy. 24</td>
<td>Civil War battlefield; development pressure</td>
</tr>
<tr>
<td>G4</td>
<td>Little Blue River and Little Blue Trace</td>
<td>Little Blue River at Hwy. 78</td>
<td>Development pressure in floodplain</td>
</tr>
<tr>
<td>G5</td>
<td>Little Blue Trace</td>
<td>Independence to Longview Lake</td>
<td>Expand park for greater buffer zone; development pressure in floodplain</td>
</tr>
<tr>
<td>G6</td>
<td>Crackerneck Creek</td>
<td>Independence</td>
<td>Conservation</td>
</tr>
<tr>
<td>G7</td>
<td>Burr Oak Creek</td>
<td>Burr Oak Woods to Little Blue Trace</td>
<td>Conservation and connection</td>
</tr>
<tr>
<td>G8</td>
<td>Maybrook subwatershed</td>
<td>Downstream of Lakewood</td>
<td>Stream corridor protection; recreation opportunity; development pressure</td>
</tr>
<tr>
<td>ID #</td>
<td>Project Name</td>
<td>Location</td>
<td>Compelling Reason</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------------</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
</tr>
<tr>
<td>G9</td>
<td>Heron Rookery</td>
<td>Little Blue River near Ess Road</td>
<td>Conservation and connection; located in unprotected area</td>
</tr>
<tr>
<td>G10</td>
<td>Lakewood headwaters</td>
<td>Lakewood, Woods Chapel</td>
<td>Water quality; conservation</td>
</tr>
<tr>
<td>G11</td>
<td>Unity Village, Little Cedar Creek</td>
<td>Unity Village</td>
<td>Recreation opportunities; water quality; valley protection</td>
</tr>
<tr>
<td>G12</td>
<td>John Ivey property</td>
<td>Colbern/Bannister Road between Little Blue River and Hwy. 350</td>
<td>Conservation; remnant habitats</td>
</tr>
<tr>
<td>G13</td>
<td>Teetering Rocks</td>
<td>Raytown</td>
<td>Private area conservation</td>
</tr>
<tr>
<td>G14</td>
<td>Blue River to Little Blue River</td>
<td>Grandview to Kansas City, MO</td>
<td>Connect two major watersheds</td>
</tr>
<tr>
<td>G15</td>
<td>Cedar Creek</td>
<td>Lee’s Summit</td>
<td>Recreation opportunities; water quality with stream protection</td>
</tr>
<tr>
<td>G16</td>
<td>Lee’s Summit south</td>
<td>Southern Jackson County; Lee’s Summit</td>
<td>Water quality; headwater protection</td>
</tr>
<tr>
<td>G17</td>
<td>Mouse Creek</td>
<td>Longview Lake headwaters</td>
<td>Recreation opportunities; water quality with stream protection</td>
</tr>
<tr>
<td>G18</td>
<td>Little Blue River, Longview Lake headwaters</td>
<td>Southwestern Jackson County</td>
<td>Water quality; headwater protection area</td>
</tr>
<tr>
<td>G19</td>
<td>Raintree development headwaters</td>
<td>Greenwood</td>
<td>Water quality; headwater protection area</td>
</tr>
<tr>
<td>G20</td>
<td>Middle Big Creek</td>
<td>Greenwood</td>
<td>Water quality; headwater protection area</td>
</tr>
<tr>
<td>G21</td>
<td>James A. Reed Conservation Area</td>
<td>Greenwood</td>
<td>Natural resource assets; wetlands protection; buffer zone; connection</td>
</tr>
<tr>
<td>G22</td>
<td>Sunset Park</td>
<td>Greenwood</td>
<td>Water quality</td>
</tr>
<tr>
<td>G23</td>
<td>Sni-A-Bar Creek watershed</td>
<td>Oak Grove, Grain Valley</td>
<td>Protection of floodplain and lowland forests; water quality</td>
</tr>
<tr>
<td>G24</td>
<td>Monkey Mountain</td>
<td>Grain Valley</td>
<td>Expand county park; 60 acres in the floodplain; development pressure</td>
</tr>
<tr>
<td>G25</td>
<td>Sni-A-Bar Creek watershed</td>
<td>Entire length in Jackson County</td>
<td>Protection of 100-year floodplain; natural resources</td>
</tr>
<tr>
<td>G26</td>
<td>Lake Lotawana, downstream</td>
<td>Lake Lotawana; West Branch Sni-A-Bar Creek</td>
<td>Floodplain and dam breach protection</td>
</tr>
<tr>
<td>G27</td>
<td>Blue and Grey Park</td>
<td>Lone Jack</td>
<td>Buffer zone for park; floodplain</td>
</tr>
<tr>
<td>G28</td>
<td>Truman Sports Complex</td>
<td>Kansas City, MO</td>
<td>Highly visible demonstration in urban setting</td>
</tr>
</tbody>
</table>
Table 4: Green Infrastructure Projects– Restoration Priorities

<table>
<thead>
<tr>
<th>ID #</th>
<th>Project Name</th>
<th>Location</th>
<th>Compelling Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Missouri River</td>
<td>Kansas City, MO East Bottoms</td>
<td>Restoration of bottom lands and bluffs</td>
</tr>
<tr>
<td>R2</td>
<td>Missouri River</td>
<td>Kansas City, MO downtown</td>
<td>Restoration in urban core; public access to river</td>
</tr>
<tr>
<td>R3</td>
<td>Town Fork Creek</td>
<td>Subwatershed to Brush Creek</td>
<td>Restore open channels; stormwater management</td>
</tr>
<tr>
<td>R4</td>
<td>Brush Creek to Blue River</td>
<td>Subwatershed to Blue River</td>
<td>Restoration in urban core</td>
</tr>
<tr>
<td>R5</td>
<td>Blue River</td>
<td>Blue River at 95th Street</td>
<td>Water quality; stormwater management; development pressure</td>
</tr>
<tr>
<td>R6</td>
<td>Little Blue Trace floodplain, oxbows</td>
<td>Independence to Longview Lake</td>
<td>Water quality; stormwater management; development pressure</td>
</tr>
<tr>
<td>R7</td>
<td>McKee, Prairie Lee Lake park</td>
<td>Prairie Lee Lake</td>
<td>Stream bank stabilization; erosion control and sedimentation; headwater protection for lake; water quality</td>
</tr>
<tr>
<td>R8</td>
<td>Northwest headwaters Lake Lotawana</td>
<td>Colbern Road and Hwy. 7</td>
<td>Improper development practices; erosion control and sedimentation</td>
</tr>
<tr>
<td>R9</td>
<td>Sni-A-Bar floodplain</td>
<td>Oak Gove and Grain Valley</td>
<td>Protection of wetlands and lowlands</td>
</tr>
<tr>
<td>R10</td>
<td>James A. Reed Wildlife Area</td>
<td>Greenwood</td>
<td>Maximize public value of natural resources</td>
</tr>
<tr>
<td>R11</td>
<td>Lee’s Summit</td>
<td>Lee’s Summit</td>
<td>Remnant habitat</td>
</tr>
<tr>
<td>R12</td>
<td>Lake Lotawana headwaters</td>
<td>Southwest branch of lake</td>
<td>Water quality; stormwater management; development pressure</td>
</tr>
<tr>
<td>R13</td>
<td>Truman Sports Complex</td>
<td>I-70 and Blue Ridge Road</td>
<td>Highly visible demonstration in urban</td>
</tr>
<tr>
<td>R14</td>
<td>Little Blue River Channel</td>
<td>Missouri River to Longview Lake</td>
<td>Water quality; public access; floatable river; maximize public value</td>
</tr>
</tbody>
</table>

*Little Cedar Creek*
### Table 5: Green Infrastructure Projects—Connection Priorities

<table>
<thead>
<tr>
<th>ID #</th>
<th>Project Name</th>
<th>Location</th>
<th>Compelling Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Blue River to Little Blue watershed</td>
<td>Blue River Parkway to Grandview</td>
<td>Connect two major watersheds and trail systems</td>
</tr>
<tr>
<td>C2</td>
<td>Trolley Track to Blue River Parkway</td>
<td>87th Street and Paseo, Kansas City, MO</td>
<td>Connection</td>
</tr>
<tr>
<td>C3</td>
<td>Indian Creek connection</td>
<td>Indian Creek trail system to Blue River</td>
<td>Connecting trail systems</td>
</tr>
<tr>
<td>C4</td>
<td>Little Blue River</td>
<td>Missouri River to Little Blue Trace</td>
<td>Expansion of park and trail system</td>
</tr>
<tr>
<td>C5</td>
<td>Burr Oak Creek</td>
<td>Burr Oak Woods to Little Blue Trace</td>
<td>Connecting recreation and natural areas</td>
</tr>
<tr>
<td>C6</td>
<td>Little Blue Trace to Bass Pro Shop</td>
<td>I-70 and I-470</td>
<td>Public access; public education</td>
</tr>
<tr>
<td>C7</td>
<td>Fleming Park to Blue Springs</td>
<td>Fleming Park to southeast Blue Springs neighborhoods</td>
<td>Community connection</td>
</tr>
<tr>
<td>C8</td>
<td>Fleming Park to James A. Reed</td>
<td>Central Jackson County</td>
<td>Finish trail system</td>
</tr>
<tr>
<td>C8A</td>
<td>James A. Reed to Greenwood</td>
<td>Greenwood</td>
<td>Connection to Katy Trail</td>
</tr>
<tr>
<td>C9</td>
<td>Little Blue Trace to Lake Jacomo/Fleming Park</td>
<td>Blue Springs</td>
<td>Community connection; recreation</td>
</tr>
<tr>
<td>C10</td>
<td>Katy Trail</td>
<td>Little Blue Trace though Lee’s Summit</td>
<td>Connection of trail systems</td>
</tr>
<tr>
<td>C11</td>
<td>Longview Lake to Lee’s Summit</td>
<td>Mouse Creek Corridor</td>
<td>Neighborhood connection to recreation area</td>
</tr>
<tr>
<td>C12</td>
<td>Grain Valley</td>
<td>Sni-A-Bar Creek to Grain Valley and Blue Springs</td>
<td>Connecting two parks</td>
</tr>
<tr>
<td>C13</td>
<td>Monkey Mountain to Blue and Grey</td>
<td>Sni-A-Bar Creek corridor</td>
<td>Connecting two parks</td>
</tr>
<tr>
<td>C14</td>
<td>Rail to Trail</td>
<td>Little Blue River and Little Blue Trace north of Hwy. 78 and east</td>
<td>Abandoned railroad line; connect Little Blue Trace to Independence neighborhoods</td>
</tr>
</tbody>
</table>

*Little Blue River—Flooding (2004)*
Little Blue River Bank Stabilization Projects (2005)

The assessment that was conducted identified thirty-seven locations along the main stem from Longview Lake dam to the Missouri River that had channel and bank stability issues. The issues were prioritized failure sites—on a scale of 1 to 3, with 1 as high priority—according to extent and severity erosion, threat to infrastructure, and immediacy of the stabilization need. The following criteria were used:

- **Priority 1**: Sites that exhibit severe erosion contributing sediment nearly year round. Also, sites that pose imminent threats to existing infrastructure.
- **Priority 2**: River segments that exhibit significant erosion but pose no imminent threats to current infrastructure. Left untreated, these sites will continue to deteriorate; stabilizing them now will be less expensive than doing so later as erosion worsens.
- **Priority 3**: Sites that exhibit noticeable erosion that is proceeding at a slow rate or is not large in size. These sites will also continue to worsen with time; therefore, stabilizing them now will be less expensive than doing so later.

It was determined that the Little Blue River had eighteen (18) locations with a Priority 1 ranking, ten (10) locations with a Priority 2 ranking, and nine (9) locations with a Priority 3 ranking.

Costs for each project were estimated, ranging from $3,000 to $193,300. Priority 1 projects were estimated to cost $817,072, Priority 2 projects were estimated to cost $299,325 and Priority 3 projects were estimated to cost $146,371 in 2005 dollars. The total preliminary cost for all the projects was estimated at $1,862,210 (2005 dollars). To date, no projects have been implemented. Development continues in the watershed, adding more stress to some sections of the Little Blue River system.

Details of the projects including costs (2005 dollars) are listed on the following pages. **Figure 5** displays the projects in the study area.
Figure 5: Little Blue River Bank Stabilization Projects
Little Blue River Bank Stabilization– Site 1  
**Estimated Cost: $20,201**
This site exhibits a significant slump along the left descending bank. The area extends approximately 100 yards downstream to a vertical cut bank (Site 2). Overland flow has formed a noteworthy gully entering the LBR upstream of the cut bank. Channel depths in this area range from 3.1 to 6.1 feet. This site is designated **Priority 3**. This site can be protected by installing a series of rock vanes. It is also recommended that the existing streambank be reshaped to a 2.5-foot horizontal to 1-foot vertical slope and establishing appropriate vegetation on the left descending bank.

![Downstream view of left bank slumping](image)

Little Blue River Bank Stabilization– Site 2  
**Estimated Cost: $15,215**
This area was originally stabilized with rock groins placed on 50-foot centers. A vertical cut bank with active erosion has developed along the left bank. Rock size appears inadequate, resulting in groin deterioration and bank erosion. The rock used for groin construction appears to be riprap. Channel depths ranged from 2.7 to 4.2 feet. This site is considered **Priority 2**. Erosion on Site 2 can be resolved by installing a series of rock vanes. It is also recommended that the existing streambank be reshaped to a 2.5-foot horizontal to 1-foot vertical slope and establishing appropriate vegetation.

![Left bank erosion below grade control structure with exposed rock groin remnants](image)

Little Blue River Bank Stabilization– Site 3  
**Estimated Cost: $20,458**
Significant channel erosion occurs below a sheet pile and rock grade control structure at this site. Severe erosion is occurring along the left bank. Rock groin remnants are evident. Again, rock size appears inadequate. Channel depths range from 2.5 to 8.1 feet. This site is designated **Priority 1**. Rock vanes are the recommended measure to stop streambank erosion on site 3. It is also recommended that the existing streambank be reshaped to a 2.5-foot horizontal to 1-foot vertical slope and establishing appropriate vegetation.
Little Blue River Bank Stabilization– Site 4  **Estimated Cost: $26,444**

At this site, a vertical cut occurs along the left bank, outside meander bend. The reach transitions from actively eroding to major slumping at the lower end. Failed rock groins are evident throughout the reach. Channel depths range from 2.5 to 3.5 feet. This site is designated **Priority 1**. Rock vanes are recommended for Site 4. It is also recommended that the existing streambank be reshaped to a 2.5-foot horizontal to 1-foot vertical slope and establishing appropriate vegetation.

Little Blue River Bank Stabilization– Site 5  **Estimated Cost: $15,650**

Significant erosion is occurring on the right bank at Site 5. An existing rock structure on the left bank deflects current across the channel into the right bank. Channel depths range from 2.7 to 3.5 feet. This site is designated **Priority 1**. It is also recommended to remove the left bank rock structure and install rock vanes and longitudinal peaked stone-toe protection. Bank shaping is not recommended on this site. Tree removal should be limited to the extent required to gain access for construction.

Little Blue River Bank Stabilization– Site 6  **Estimated Cost: $30,930**

Site 6 is approximately 300 yards long and contains erosion features on both banks. The reach includes a tire revetment, rock hardpoints, and rock toe protection along with isolated and contiguous slumps. Channel depths range from 1.9 to 5.5 feet. This site is considered **Priority 3**. Installation of a cross vane, rock vanes, and bank shaping is recommended for this site.
Little Blue River Bank Stabilization– Site 7  
Estimated Cost: $41,670

Channel slumping and widening occurs on both banks downstream of the grade control structure underneath Lee’s Summit Road Bridge. Slumping extends approximately 150 yards to the next river bend. Channel depths range from 4.0 to 8.3 feet. This site is designated **Priority 2**. This site can be stabilized by installing longitudinal peaked stone-toe protection and rock vanes, and reshaping and vegetating the streambanks.

Little Blue River Bank Stabilization– Site 8  
Estimated Cost: $2,380

Channel degradation and bank erosion have undercut a rock chute draining right bank overland flow. This site is designated **Priority 3**. This area should be reshaped and a rock chute should be constructed to contain overbank flows.

Little Blue River Bank Stabilization– Site 9  
Estimated Cost: $28,400

This site exhibits channel erosion and bank slumping on both the right and left banks. Channel depths range from 3.7 to 4.2 feet. This site is designated **Priority 2**. Rock vanes, longitudinal peaked stone-toe protection, and bank reshaping are recommended to stabilize Site 9.

Little Blue River Bank Stabilization– Site 10  
Estimated Cost: $36,350

The channel splits at this site and converges at the beginning of Site 11. The original river channel to the left and contains normal flows. The right channel is a constructed high flow channel with a grade control structure at the lower end. Significant debris within the left channel prevented boat passage. The point at the channel split is exhibiting erosion. This site is designated **Priority 3**. Installing two cross vanes (one for each channel) should stabilize the channel and prevent debris buildup.

Debris pile and erosion
Little Blue River Bank Stabilization– Site 11  
Estimated Cost: $74,500

Site 11 is an extended reach of the Little Blue River between the confluence of the original and constructed channels and I-470. Bank erosion is evident along both the right and left banks. Failing rock groin remnants extend approximately 100 yards along the right bank and 500 yards along left bank. Channel depths range from 4.1 to 6.0 feet. Right bank erosion is designated Priority 3, and left bank erosion is designated Priority 2. Bank erosion can be resolved by installing a long series of rock vanes (15 to 25) on the left bank and 3 to 5 vanes on the right bank.

Little Blue River Bank Stabilization– Site 12  
Estimated Cost: $14,700

Minor erosion occurs along both banks at this site, immediately upstream of the grade control structure west of I-470. Channel depths range from 2.5 to 7.8 feet. This site is designated Priority 3. The banks on this site should be reshaped and vegetated. A cross vane will help direct stream flow to the channel center and reduce shear stress near the banks.

Little Blue River Bank Stabilization– Site 13  
Estimated Cost: $42,000

This site consists of extended left bank erosion downstream of the I-470 Bridge. Erosion begins at the end of riprap protection below the bridge and continues 200 yards downstream to meander bend. Gully erosion from overland flow is evident. Channel depths range from 5.3 to 9.1 feet at the upper end and 6.3 to 7.1 feet at downstream limit. This site is designated Priority 2 and longitudinal peaked stone-toe protection is recommended as a solution on this site. A rock chute should be constructed to stabilize the gully erosion.
Little Blue River Bank Stabilization– Site 14  
**Estimated Cost:** $56,900

Riprap failure was observed downstream of the U.S. Hwy 40 Bridge. Bank stabilization is needed along the left bank above the grade control structure and downstream to the next meander bend. Channel depths range from 6.5 to 7.2 feet in riprap zone and 4.5 to 5.2 feet at end of riprap. This site is designated **Priority 1**. It is also recommended that rock vanes be used to stabilize this site, and reshape and appropriately vegetate eroding streambanks.

Little Blue River Bank Stabilization Site 15  
**Estimated Cost:** $22,720

Left bank erosion occurs at a failed rock grade control upstream of I-70. Channel depths average 3.0 feet above the structure and 2.9 to 4.3 feet below the structure. A tire revetment on the left bank is preventing additional downstream erosion. This site is designated **Priority 1**. It is recommended to install a rock cross vane immediately upstream of the failing grade control structure to prevent channel degradation. Rock vanes should be used to stabilize the streambank.

Little Blue River Bank Stabilization– Site 16  
**Estimated Cost:** $3,000

At this site, the channel again splits. The left channel is the original river channel containing the normal flow. The right channel is a constructed high flow channel with a grade control structure at the lower end. A debris jam within the left channel results from a bank slump and fall of a large silver maple. This situation is creating significant flow constriction and erosion on the left bank. Due to high velocities and difficult boat passage, no channel depths or pictures were taken. This site is designated **Priority 2**. It is recommended to remove large woody debris at this site.

Little Blue River Bank Stabilization– Site 17  
**Estimated Cost:** $19,025

Significant right bank erosion occurs at this site, which exhibits 18-foot vertical banks.
Channel depths range from 5.0 to 7.0 feet. This site is designated **Priority 1**. Rock vanes are recommended for this site. Bank shaping is not recommended, and tree removal should be limited to the extent required to gain access for construction.

**Little Blue River Bank Stabilization– Site 18**  
*Estimated Cost: $36,200*

Left bank slumping occurs at this site downstream from the gully repair. This site is designated **Priority 2**. A rock chute should be constructed to stop erosion due to overbank flows. The downstream area should be benched, and longitudinal peaked stone-toe protection and rock vanes installed.

**Little Blue River Bank Stabilization– Site 19**  
*Estimated Cost: $23,375*

A reach of left bank slumping occurs at this site approximately 800 yards upstream of Missouri Hwy 78. Channel depths range from 6.0 to 8.0 feet. This site is designated **Priority 3**. Three to five rock vanes should be installed on this site.

**Little Blue River Bank Stabilization– Site 20**  
*Estimated Cost: $23,900*

Right bank erosion is approximately 500 yards upstream of Missouri Hwy 78. The problem area extends 100 yards, and the bank height is approximately 18 to 20 feet. Channel depth ranges from 4.0 to 8.0 feet. This site is designated **Priority 1**. Three to five rock vanes are recommended for this site.
Little Blue River Bank Stabilization– Site 21  
**Estimated Cost: $24,375**
Right bank erosion occurs approximately 100 yards upstream of Missouri Hwy 78. The problem area is 100 yards long with 16-foot vertical banks. Channel depths range from 5.0 to 9.0 feet. This site is designated **Priority 1**. Bank shaping is not recommended on this site. Tree removal should be limited to the extent required to gain access for construction. Rock vanes should be used to stabilize the streambank.

Little Blue River Bank Stabilization– Site 22  
**Estimated Cost: $71,600**
This site has significant erosion along the left bank extending approximately 500 yards downstream of the Missouri Highway 78 Bridge. Bank height is approximately 10 feet, and channel depths range from 4.5 to 6.5 feet. This site is designated **Priority 1**. Rock vanes should be used on this site. Streambanks should be reshaped and vegetated with appropriate plant species.

![Channel widening](image)

Little Blue River Bank Stabilization– Site 23  
**Estimated Cost: $72,650**
Significant erosion occurs downstream of the grade control structure at this location. Both the left and right banks exhibit excessive erosion. Each bank is approximately 10 to 12 feet high, and channel depths range from 3.3 to 9.1 feet. Back eddying was evident at this site during low flow conditions. This site is designated **Priority 1**. Rock vanes will re-direct flows to the channel center and reduce eddy currents.

Little Blue River Bank Stabilization– Site 24  
**Estimated Cost: $23,450**
At this site, a grade control structure at the mouth of a left bank tributary has failed, resulting in severe bank erosion and rock deposition in the Little Blue River channel. This site is designated **Priority 1**. The existing sheet piling should be straightened if possible. A Newbury rock riffle should be constructed immediately upstream of the sheet pile, a rock chute should be constructed immediately downstream of the sheet pile, and a cross vane should be installed at the end of the rock chute.
Little Blue River Bank Stabilization– Site 25  
$8,260  
A short reach (approximately 50 feet) of the left bank is eroding at this site. This site is designated **Priority 3**. One rock vane should be installed; the bank should be re-shaped and vegetated.

Little Blue River Bank Stabilization– Site 26  
$193,300  
This site is slight channel widening upstream of the grade control structure below the railroad bridge. Significant channel widening and bed degradation are evident downstream of the structure. Channel depths range from 9.0 to 21.0 feet. This site is designated **Priority 1**. Eddy currents were severe at this site. Longitudinal peaked stone-toe protection should be installed along banks to reduce the channel width and reduce eddy currents. The streambanks can be shaped behind the longitudinal peaked stone-toe protection and vegetated as floodplain bench.

Little Blue River Bank Stabilization– Site 27  
$4,775  
Minor erosion is occurring on the left bank. Channel depths range from 6.0 to 10.0 feet. No pictures were taken of this site. This site is designated **Priority 3**.

Little Blue River Bank Stabilization– Site 28  
$25,200  
Isolated erosion is occurring on the left bank as a result of eddy currents. Channel depths range from 6.0 to 10.0 feet. This site is designated **Priority 2**. The bank on
this site should be stabilized with longitudinal peaked stone-toe protection, reshaped, and re-vegetated.

**Little Blue River Bank Stabilization– Site 29**  
*Estimated Cost: $20,800*

Major channel widening and bed degradation is evident downstream of a grade control structure at this site. A park trail and water well are very close to the streambank. Channel depths range from 7.5 to 17.5 feet. This site is designated **Priority 1**. Rock vanes will concentrate stream flows away from the bank. The banks should be reshaped and vegetated. Another alternative would be to install longitudinal peaked stone-toe protection and back fill to avoid reshaping the streambank.

**Little Blue River Bank Stabilization– Site 30**  
*Estimated Cost: $24,100*

Significant erosion is occurring along the left bank. Bank height is approximately 18 feet with channel depth averaging 6.0 feet. This site is designated **Priority 1**. The streambank should be reshaped and vegetated, and rock vanes should be installed.

**Little Blue River Bank Stabilization– Site 31**  
*Estimated Cost: $130,400*

Major channel widening and bed degradation are evident downstream of a grade control structure. Bank height approximately ranges from 8.0 to 10.0 feet, and channel depths range from 4.0 to 9.0 feet. This site is designated **Priority 1**. Longitudinal peaked stone-toe protection should be installed along both banks to reduce the channel width and eddy currents. The streambanks can be reshaped behind the longitudinal peaked stone-toe protection and vegetated as a floodplain bench.
Little Blue River
– Site 32
$14,700
Riprap failure was observed along both banks, with minor designated Priority
should be reshaped. Rock vanes should be installed.

Little Blue River
– Site 33
$12,600
Significant erosion occurs along the left bank downstream from the railroad bridge. Bank height is 10 to 12 feet. This site is designated Priority 1. Erosion controlled by installing rock vanes.

Little Blue River
– Site 34
$49,200
Significant erosion occurs along the left bank. Bank height is approximately 25 feet, and channel depths are 2.0 to 5.0 feet. The erosion zone extends for 200 yards. Bank instability is exacerbated by natural sand deposition at the bank toe. This site is designated Priority 1. A floodplain bench should be created along this bank. The streamside of the bench should be protected with longitudinal peaked stone-toe protection and rock vanes.

Little Blue River
– Site 35
$9,500
Significant erosion occurs along the right bank at this site. The bank height is approximately 35 feet with channel depths ranging from 4.0 to 13.0 feet. Sand deposition at the bank toe.

### Site Number | Description | Priority
---|---|---
1 | Bank slump | 3
2 | Vertical bank cut | 2
3 | Channel widening | 1
4 | Vertical bank cut | 1
5 | Vertical bank cut | 1
6 | Bank slump | 3
7 | Bank slump | 2
8 | Channel degradation | 3
9 | Vertical bank cut | 2
10 | Vertical bank cut | 3
11 | Bank slump | 2/3
12 | Bank slump | 3
13 | Vertical bank cut | 2
14 | Vertical bank cut | 1
15 | Vertical bank cut | 1
16 | Vertical bank cut | 2
17 | Vertical bank cut | 1
18 | Bank slump | 2
19 | Bank slump | 3
20 | Vertical bank cut | 1
21 | Vertical bank cut | 1
22 | Multiple bank slumps | 1
23 | Vertical bank cut | 1
24 | Channel degradation | 1
25 | Bank slump | 3
26 | Vertical bank cut | 1
27 | Bank slump | 3
28 | Bank slump | 2
29 | Vertical bank cut | 1
30 | Vertical bank cut | 1
31 | Vertical bank cut | 1
32 | Bank slump | 2
33 | Vertical bank cut | 1
34 | Vertical bank cut | 1
35 | Vertical bank cut | 1
36 | Bank slump | 3
37 | Bank slump | 2

### Bank Stabilization

**Estimated Cost:**

- Little Blue River
- Site 32
- $14,700
- Riprap failure was observed along both banks, with minor designated Priority should be reshaped. Rock vanes should be installed.

- Little Blue River
- Site 33
- $12,600
- Significant erosion occurs along the left bank downstream from the railroad bridge. Bank height is 10 to 12 feet. This site is designated Priority 1. Erosion controlled by installing rock vanes.

- Little Blue River
- Site 34
- $49,200
- Significant erosion occurs along the left bank. Bank height is approximately 25 feet, and channel depths are 2.0 to 5.0 feet. The erosion zone extends for 200 yards. Bank instability is exacerbated by natural sand deposition at the bank toe. This site is designated Priority 1. A floodplain bench should be created along this bank. The streamside of the bench should be protected with longitudinal peaked stone-toe protection and rock vanes.

- Little Blue River
- Site 35
- $9,500
- Significant erosion occurs along the right bank at this site. The bank height is approximately 35 feet with channel depths 13.0 feet. Sand deposition at the bank toe.
Priority projects were identified through a rapid assessment and critical areas process. These have been selected by their impact on multiple jurisdictions, improvement in stormwater quality, reduction of stormwater quantity, and overall impact. Seventy-two projects were identified throughout the watershed utilizing this process. Numerous other local areas of stormwater concern were also identified by municipalities.

The highest priority projects within the Little Blue River watershed were located in Lee’s Summit. These projects ranked highest because they address at least three of the four areas of concern: safety, property damage, water quality, and habitat. Implementation of these five projects would help alleviate flooding in an area where safety is an issue. The top five projects are being addressed by the City of Lee’s Summit through a bond issue approved by voters in 2007. Some projects incorporate “green” stormwater control measures as part of an engineering solution, such as revegetation of stream and ditch banks and installation of grassy swales to convey stormwater.

The projects for the Little Blue River Watershed are displayed in Table 7. The fold out map shows the project locations.

Detailed information about the highest priority projects are provided on the following pages. Also listed is a summary of Independence projects in the Little Blue River watershed giving the status and detailing future plans (Table 8 and Table 9).
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<tr>
<td>AE</td>
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<td>AO</td>
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<td>AW</td>
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<td>AT</td>
<td>IND70– Sheley West of Crysler</td>
<td>Independence</td>
<td>Design guidance- Ready to bid</td>
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<td>AX</td>
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<td>Design guidance</td>
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<td>AN</td>
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<td>S. L. Grace Park</td>
<td>Jackson County</td>
<td>Detention</td>
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<tr>
<td>Q</td>
<td>Up from Longview</td>
<td>Lee’s Summit</td>
<td>Detention</td>
</tr>
</tbody>
</table>
Little Blue River Watershed Project #1

Located northeast of I-470 at the Woods Chapel Road exit along Lakewood Way, south of Jib Court. At this location, water is entering a business and flooding an arterial street, creating impassable conditions during even small rainfall events. This flooding is the result of an undersized pipe system. The planned project includes replacing various pipe segments. A probable cost of $210,000 was associated with the original project. Further evaluation of the site identified several BMP solutions that could potentially be incorporated into the open area to reduce the size of or eliminate the need for structural improvements downstream. Conceptual recommendations for this site include detention in existing open space year-round, seasonal detention in the parking areas, and upstream BMPs to improve lake water quality such as bioretention, filter strips along parking areas, and small wetlands in appropriate areas.

Figure 6: Little Blue River Watershed Project #1
Little Blue River Watershed Project #2

Lakewood is located along Gregory Boulevard between Blue Jacket and Basswood Drive. Street and area flooding make an arterial collector street impassable during a 10-year rainfall event due to two undersized culverts. The planned solution was associated with a probable cost of $177,000. Further evaluation of the site identified several BMP solutions that could potentially be incorporated into the open area to reduce the size of or eliminate the need for structural improvements downstream. Land use conversion, detention in existing open space and upstream BMPs to improve lake water quality may be integrated with this planned project at Lakewood.

Figure 7: Little Blue River Watershed Project #2
Little Blue River Watershed Project #3

The original projects incorporate detention in existing open space and seasonal parking lot detention at the Lee’s Summit High School. Specifically, along 5th Street, east of M-291, the 100-year rainfall event causes water to enter residential structures and flood residential streets. To remedy flooding issues, the planned projects included installation of 65 feet of parallel pipe. A second component of the original project recommended a concrete open channel along Browning Street between 6th and 8th Streets. These two original projects were associated with a probable cost of $222,000. Further evaluation of the site identified BMP solutions that could potentially be incorporated into the open area to reduce the size of or eliminate the need for structural improvements downstream. The recommended detention in both the open space and parking lot will decrease flows in the channel and through the existing reinforced concrete pipe. The high school is well located for a project to incorporate community education and outreach.

Figure 8: Little Blue River Watershed Project #3
Little Blue River Watershed Project #4

Delta Woods on Lakewood Way, south of Jamestown Drive. The original flood mitigation project addresses street flooding that occurs during the 5-year rainfall event. This planned project replaces an undersized 36-inch pipe at a probable cost of $76,000. Further evaluation of the site identified Best Management Practices solutions that could potentially be incorporated into the open area to reduce the size of or eliminate the need for structural improvements downstream. Additional recommendations incorporate detention in existing open area and upstream Best Management Practices to improve lake water quality such as bioretention or filter strips adjacent to parking areas.

Figure 9: Little Blue River Watershed Project #4
Little Blue River Watershed Project #5

Located near Harrison Memorial Park Drainage structures are a series of undersized corrugated metal pipes located near the intersection of Mission and Pinetree Lanes. These undersized structures cause area residential streets to be impassable during the 10-year rainfall event. Additional flooding of homes occurs during the 100-year design storm. Project CC-21 consists of replacing the corrugated metal pipes with 514 feet of 48-inch reinforced concrete pipe. The second planned project near Harrison Memorial Park addresses a historical drainage problem identified by City staff. An existing mound at the northeast corner of the intersection of U.S. 50 Highway and Jefferson Street directs runoff drainage toward the streets. The planned project includes improving the roadside ditch in this area to drain the runoff toward the east. The original project cost was $229,000. Further evaluation of the site identified BMP solutions that could potentially be incorporated into the open area to reduce the size of or eliminate the need for structural improvements downstream. In addition to the planned improvements, detention in both existing open space and within the transportation right of way is recommended. Use of native vegetation in these detention areas may promote infiltration.

Figure 10: Little Blue River Watershed Project #5
Independence Stormwater Projects

**Table 8: Independence Projects— Acquisition and Construction Phase**

<table>
<thead>
<tr>
<th>City Project #</th>
<th>Description</th>
<th>Plan Year</th>
<th>Construction Completion</th>
<th>Comments</th>
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<tr>
<td>70130501</td>
<td>Queen Ridge Phase 2</td>
<td>2006</td>
<td>Summer 2008</td>
<td>Construction underway</td>
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<tr>
<td>70130502</td>
<td>South Maywood, 19th &amp; Cedar</td>
<td>2006</td>
<td>Spring 2011</td>
<td>Advertise for bids September 2010</td>
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<tr>
<td>70130503</td>
<td>3918 S. Forest Drainage</td>
<td>2006</td>
<td>Summer 2007</td>
<td>Complete</td>
</tr>
<tr>
<td>70130602</td>
<td>Bellevista Neighborhood</td>
<td>2007</td>
<td>Fall 2010</td>
<td>In bid process</td>
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<tr>
<td>70130603</td>
<td>Sheley and Chrysler SD 233</td>
<td>2007</td>
<td>Fall 2010</td>
<td>Ready to bid</td>
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<tr>
<td>70130701</td>
<td>Northern at Westport; SD 228</td>
<td>2008</td>
<td>Fall 2010</td>
<td>In acquisition</td>
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<tr>
<td>70130703</td>
<td>26th– Glendale-Windsor; SD 184</td>
<td>2008</td>
<td>Spring 2013</td>
<td>Hold pending funding</td>
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<td>70130705</td>
<td>Norfleet to Willis</td>
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<td>Spring 2010</td>
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<tr>
<td>70130706</td>
<td>35th &amp; Northern</td>
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<td>Spring 2011</td>
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<td>70130707</td>
<td>39th &amp; Main</td>
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<td>Fall 2010</td>
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<td>Fairway Gardens</td>
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<td>Willis Storm Drainage</td>
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<td>70130804</td>
<td>Redwood at Ute</td>
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<td>70130903</td>
<td>Flood Control/Bank Stabilization– SEP</td>
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**Table 9: Independence Projects— Study and Design Phase**

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<th>Description</th>
<th>Plan Year</th>
<th>Design Completion</th>
<th>Comments</th>
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<td>33rd and Claremont</td>
<td>2009</td>
<td>Summer 2010</td>
<td>Final design plans submitted in August 2010</td>
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<tr>
<td>70130802</td>
<td>Springbranch East Industrial Park</td>
<td>2009</td>
<td>Summer 2010</td>
<td>Final design review meeting held August 2010</td>
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<td>70130901</td>
<td>Pearl to Crane and Hereford</td>
<td>2010</td>
<td>Winter 2010</td>
<td>Prelim. Engineering underway</td>
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<tr>
<td>70130902</td>
<td>Lakeview Farms, 31st and Linwood, SD 206</td>
<td>2010</td>
<td>Spring 2011</td>
<td></td>
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<tr>
<td>70131001</td>
<td>36th and Poplar; SD 226</td>
<td>2011</td>
<td>Summer 2011</td>
<td>Negotiating scope and free</td>
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<tr>
<td>70131002</td>
<td>14th and Arlington</td>
<td>2011</td>
<td>Summer 2011</td>
<td>Waiting for contracts</td>
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</table>
Sni-A-bar Creek Critical Areas (2007)

Critical areas were identified for protection, conservation, or restoration. These are located adjacent to public lands, in the floodplain, and in the headwaters of tributaries. The critical areas and projects for the Little Blue River Watershed are displayed on the following pages.

- Floodplain areas adjacent to Monkey Mountain Park
- Bottomland hardwood forests north of Oak Grove
- Headwater areas of Lake Lotawana
- West Branch sub-watershed

*Prairie Lee Lake Dam*
Sni-A-Bar Creek Watershed Critical Areas #1 and #2

**Critical Area 1: Floodplain areas adjacent to Monkey Mountain Park**

The Sni-A-bar Creek floodplain contains large areas with hydric soils; these are soils that remain wet or saturated during much of the calendar year. Hydric soils are often associated with wetlands which are scattered throughout the floodplain area. Bottomland woodlands are also located in the areas surrounding Monkey Mountain Park. Portions of Sni-A-bar Creek and its tributaries have steep slopes, ranging from seven percent to twenty percent. Disturbance of vegetation on steep slopes results in soil erosion and transport of sediment into downstream creeks and lakes. High sediment loads is a type of water pollution that affects wildlife and recreational use of the water resource.

**Critical Area 2: North of Oak Grove**

The Sni-A-bar Creek area north of Oak Grove has a flatter topography than areas south of I-70. Therefore, this floodplain area has hydric soils, wetland areas, and bottomland woodlands. Such natural resources historically provided flood storage and water quality control for streams and rivers, and can continue to provided these valuable services in the future for Jackson County. The area is currently agriculture with sparsely located residences.

Figure 11: Sni-A-Bar Creek Watershed Critical Areas #1 and #2
Sni-A-Bar Creek Watershed Critical Areas #3 and #4

Critical Area 3: Headwater areas of Lake Lotawana
Forested riparian areas along the four creeks leading into Lake Lotawana and upland grasslands are the primary resources in this area. The headwater areas for the lake are crucial to protect water quality in the lake through control of sediment and water pollution from human practices (agriculture, roads, and development).

Critical Area 4: West Branch Subwatershed
The area to east and northeast of Lake Lotawana is primarily undeveloped in agriculture land use. It contains forests within riparian areas long West Branch and its tributaries, hydric soils and wetlands, steep slopes ranging from seven percent to twenty percent, and hardwood forests in uplands surrounding creeks that flow into West Branch downstream of the Lake Lotawana dam.

Figure 12: Sni-A-Bar Creek Watershed Critical Areas #3 and #4

Priority projects have been identified through the rapid assessment and critical areas process. The ten projects have been selected by their impact on multiple jurisdictions, improvement in stormwater quality, reduction of stormwater quantity, and overall impact. The projects are listed in Table 10 and shown on the fold out maps.

The highest priority projects in the Sni-A-bar Creek watershed are located in Blue Springs and were selected as highest priority because they address at least three of the four areas of concern: safety, property damage, water quality, and habitat. Detailed descriptions for the highest priority projects are listed on the following pages.

The West Branch Sni-A-bar Creek contains high quality habitat areas such as hardwood forests in the uplands, in particular the area east of Lake Lotawana. Verification of the habitat quality has been conducted by the Missouri Department of Conservation and consultants to the Lake Lotawana Association. The Lake Lotawana Association is pursuing protection of this area through purchase. It is recommended that assistance be given to this effort through development of a watershed management plan and formation of a Missouri Stream Team for the West Branch sub-watershed.

Table 10: Sni-A-Bar Creek Watershed Prioritized Projects

<table>
<thead>
<tr>
<th>Map ID</th>
<th>Project Name</th>
<th>Jurisdiction</th>
<th>Best Management Practice</th>
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<tr>
<td>BS-1</td>
<td>Sandstone Ditch</td>
<td>Blue Springs</td>
<td>Use reservoir for stormwater storage; detention in existing open space</td>
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<tr>
<td>BS-2</td>
<td>Summit and Knox</td>
<td>Blue Springs</td>
<td>Increase existing detention storage</td>
</tr>
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<td>BS-9</td>
<td>7-Highway and Clark Road</td>
<td>Blue Springs</td>
<td>Increase existing detention storage</td>
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<td>BS-10</td>
<td>Stonebrook and Keystone</td>
<td>Blue Springs</td>
<td>Reconnect stream to floodplain</td>
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<td>BS-4</td>
<td>Zaun Detention/Vesper</td>
<td>Blue Springs</td>
<td>Increase existing detention storage</td>
</tr>
<tr>
<td>BS-13</td>
<td>7-Highway runoff into and around Turner addition pond</td>
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<td>Increase existing detention storage</td>
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<td>BS-5</td>
<td>7-Highway</td>
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<td>BS-11</td>
<td>Dogwood</td>
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<td>BS-6</td>
<td>Kingsridge Drive and Candletree</td>
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</tr>
<tr>
<td>BS-3</td>
<td>6th and RD Mize</td>
<td>Blue Springs</td>
<td>Increase existing detention storage</td>
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Sni-A-Bar Creek Watershed Project #1– Sandstone Ditch

Sandstone Ditch is located north of Keystone Park. This area experiences yard flooding and residential structure flooding during significant rain events. Further evaluation of the site identified two Best Management Practices that could potentially be incorporated into the open area to reduce the size of or eliminate the need for structural improvements downstream. An existing upstream pond may be expanded for additional stormwater storage and there is opportunity for detention in the park open space.

Figure 13: Sni-A-Bar Creek Watershed Project #1
Sni-A-Bar Creek Watershed Project #2– Summit and Knox Streets

Street flooding has been documented at the second project, located at the intersection of Summit & Knox streets, when a nearby detention basin is at capacity. There may be an opportunity to increase the existing detention storage to alleviate flooding.

Figure 14: Sni-A-Bar Creek Watershed Project #2
Sni-A-Bar Creek Watershed Project #3 – 7 Highway and Clark Road

The third project is located at Highway 7 and Clark Road where street flooding occurs when detention nears capacity. Increasing existing detention storage may alleviate this flooding concern.

Figure 15: Sni-A-Bar Creek Watershed Project #3
Sni-A-Bar Creek Watershed Projects #4 and #5

Watershed Project #4– Stonebrook and Keystone Park
At Stonebrook and Keystone, street flooding occurs when a nearby creek nears capacity. Further evaluation of the site identified that reconnecting the stream to its floodplain may mitigate the flooding issues. This would involve creating a flood bench to convey the flows more efficiently and using vegetation and bioengineering techniques. Increasing capacity with a narrow floodplain would stabilize the existing channel, reduce flooding, and may improve habitat quality.

Watershed Project #5– Zaun Ditch/Detention Area
Located at the Zaun detention site where concerns include yard flooding and erosion. Increasing existing detention storage may alleviate this flooding concern.

Figure 16: Sni-A-Bar Creek Watershed Projects #4 and #5

Opportunities for implementing projects and programs that can be used as County demonstrations were studied for potential demonstration projects. The following pilot projects were recommended, one in each subwatershed:

1. Developing stormwater management demonstration projects at the Truman Sports Complex in the Round Grove Creek Watershed.
2. Detaining runoff and minimizing erosion associated with the Lee’s Summit Municipal Airport in the Little Cedar Creek Watershed.
3. Retrofitting the existing detention ponds at Metropolitan Community College in the Burr Oak Creek Watershed.

The following pages describe potential demonstration projects and best management practices that can be used to assist in developing County and regional understandings of alternative stormwater management strategies, and stream and natural resources restoration.

Figure 17: Burr Oak, Little Cedar, Round Grove Watersheds
Subwatershed Study - Round Grove Watershed Demonstration Project

The Truman Sports Complex provides a significant opportunity for an alternative stormwater management demonstration project for the following reasons:

- Unrestricted stormwater runoff from the stadium complex has caused notable damage to downstream waterways;
- Open-space within the stadium complex is ideally located for detaining runoff;
- Portions of this demonstration project are relatively inexpensive to implement;
- A new, on-site stormwater detention area could be created in conjunction with a new recreational park facility; and
- The stadium complex is a high-profile, high-traffic area that provides maximum exposure to demonstrate BMPs.

Figure 18: Round Grove Watershed
**Best Management Practices**

1. **Practice Field Wetland**

An unused open-space area located southeast of the Chiefs’ practice fields is an ideal location for a stormwater detention pond. The proposed area has a natural depression and is downstream of a large expanse of impervious parking lot. Runoff from a significant area of the parking lot drains to this area. The space is large enough to store a significant volume of runoff and would require a minimal amount of grading to provide detention. There is the potential for almost 5 acre-feet of storage in this area. The pond could be designed to support wetland plants to maximize water quality, habitat, and aesthetic benefits. Trails and other passive recreational amenities could be developed concurrently.

<table>
<thead>
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<th>Conceptual Cost Opinion (2004 dollars)</th>
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<tr>
<td>Grading, Earthwork, and Planting</td>
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<td>Storm Sewer Appurtenances</td>
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<td>Total Including 30% Contingency</td>
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<tr>
<td>Cost per ac-ft of Detention</td>
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</table>

2. **Stepped Wetland Complex**

The area to the northwest of the practice fields could be graded to form a stepped wetland pool complex for detention and treatment of parking lot runoff, with the potential for over 50 acre-feet of storage/detention. The parking lot to the northeast of the practice field could be routed into this area with a reshaped swale/channel feature where there appears to be an eroded drainage way currently existing. The practice field wetland could also have overflow routed to this area, allowing it to function as a primary detention/settling area. The outflow from this feature would flow via culvert to the existing drainage to the south.

<table>
<thead>
<tr>
<th>Conceptual Cost Opinion (2004 dollars)</th>
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<tbody>
<tr>
<td>Grading, Earthwork, and Planting</td>
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<td>Storm Sewer Appurtenances</td>
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<td><strong>Subtotal</strong></td>
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<tr>
<td>Total Including 30% Contingency</td>
</tr>
<tr>
<td>Cost per ac-ft of Detention</td>
</tr>
</tbody>
</table>
3. Southern Swale

A swale could be constructed that would convey runoff from the parking lot to the southwest of the stadium by rerouting its outlet culverts to empty into the head of the swale. Although this would be proportionately more expensive, it would utilize the stepped wetland storage that has the capacity to detain and treat this additional parking lot runoff. The swale would run along the north side of the abandoned railroad berm, possibly using it as the left bank of the open channel. The swale would flow into a culvert under the roadway, through another open channel swale section to the south of the practice field parking area, through a second culvert under another drive, then flow overland into the lower pool of the stepped wetland complex.

**Conceptual Cost Opinion (2004 dollars)**

<table>
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<th>Description</th>
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<tr>
<td><strong>Total Including 30% Contingency</strong></td>
<td>$797,500</td>
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4. Retrofitting Parking Lot Inlets

Substantial stormwater runoff could be detained within the south-central and southeast parking lots by restricting inlets to existing storm sewers. Inlets could be designed to detain water when the parking lot is not in use, and conversely, to allow reduced storage or even the free flow of water when the parking lot is being used. This would be a relatively inexpensive retrofit that could result in detaining a significant amount of water.

Conceptual Cost Opinion (2004 dollars): $52,000

5. Trails and Signage

Trails and interpretive signage could be incorporated into the entire sports stadium complex. While these would not directly improve stormwater runoff, they would draw attention to and describe the benefits of the BMPs used on site.
Subwatershed Study- Little Cedar Creek Watershed Demonstration Project

Undetained runoff from Lee’s Summit Municipal Airport in the eastern area of the watershed is causing severe creek erosion and substantial erosion to downstream tributaries that threaten private residential driveways, culverts, land adjacent to the creeks, and the road leading into the airport. There is an immediate need to stabilize eroding soils and detain runoff to prevent additional damage.

Figure 19: Little Cedar Creek Watershed
**Best Management Practices**

1. **Ditch Restoration**

   The ditches and gullies on the west side of Hagen Road, which convey runoff from the airport, should be restored to prevent additional erosion and damage to private and public property. The reach immediately adjacent to the road could be restored for maximum visibility. This area is highlighted on Sheet 3.

   Conceptual Cost Opinion (2004 dollars): $100,000

2. **On-site Detention**

   Converting an area of open-space in a small area on the southwest corner of the airport property to stormwater detention could provide useful headwater detention to prevent further deterioration of the downstream ditch. This will prevent additional destabilization of the ditch (mentioned above); otherwise it may need additional repair in the future. The area shown on Sheet 3 would provide 3 acre-feet of storage if it were excavated to a depth of 2 feet. There would be a limited amount of work aside from grading and planting, since the excavated earth could be used to form the confining berm on the southeastern boundary of the basin.

   Conceptual Cost Opinion (2004 dollars): $45,000

3. **Off-site Detention**

   Downstream detention opportunity exists along Hagen Road near the intersection south of the church. Removing a portion of Hagen Road (the east side of the “triangle”) would provide an ideal location for stormwater storage. Two drainage channels (one intermittent) could both be routed into this basin, and then be metered with an outlet structure to provide a controlled release rate into the downstream creek. This area should be excavated and graded to provide additional storage, then planted with native vegetation zones to maximize treatment and infiltration. There is the potential for a basin with approximately 20 acre-feet of storage/detention.

   Conceptual Cost Opinion (2004 dollars)
   - Grading, Earthwork, and Planting: $112,700
   - Storm Sewer Appurtenances: $12,375
   - Pavement: $32,360
   - Utility Adjustments: $5,000
   - Subtotal: $162,435
   - Total Including 30% Contingency: $211,165
   - Cost per ac-ft of Detention: $10,500
Subwatershed Project- Burr Oak Creek Watershed Demonstration Project

Retrofitting the existing detention facility west of the Metropolitan Community College would be a good demonstration project for a number of reasons, including the following:

- Retrofitting opportunities would be relatively simple, inexpensive, and effective;
- The existing detention basin is in a high profile, high traffic area that would be a widely visible demonstration project; and
- The retrofitted facility could be used as an outdoor laboratory by the community college for watershed studies, alternative stormwater management, and wetland and stream biology.

Figure 20: Burr Oak Creek Watershed
**Best Management Practices**

1. **Retrofit Outlet Structure**

   The existing outlet structure is sized for a major storm event, as is common throughout the region. While the existing structure and pond provide flood protection, they do little to restrict flows from smaller events. It is these smaller, more frequent storm events that cause the greatest damage to downstream waterways. Retrofitting this structure to provide staged storage that restricts flows from smaller events will greatly reduce the cumulative impacts of common storm events. This retrofit would be a relatively inexpensive way to protect downstream waterways.

   Conceptual Cost Opinion (2004 dollars): $19,500

2. **Provide Additional Detention and Basin Restoration**

   The existing outlet control dam could likely be raised to provide additional detention required by further restricting the outlet structure; raising the crest approximately 5 feet would provide over 10 acre-feet of detention/storage. Additionally, the existing basin and creek currently vegetated with cool season grasses and weedy woody species should be restored to native prairie. The prairie would help slow, filter, and infiltrate water while providing additional habitat, aesthetics, and educational opportunities. Eroded areas along the swale conveying water from the inlet of the pond to the pond outlet could be restored using soil bioengineering practices such as live stakes and native plantings.

   Conceptual Cost Opinion (2004 dollars)
   
<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grading, Earthwork, and Planting</td>
<td>$91,150</td>
</tr>
<tr>
<td>Storm Sewer Appurtenances</td>
<td>$18,750</td>
</tr>
<tr>
<td>Pavement</td>
<td>-</td>
</tr>
<tr>
<td>Utility Adjustments</td>
<td>-</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>$109,900</strong></td>
</tr>
<tr>
<td><strong>Total Including 30% Contingency</strong></td>
<td><strong>$148,870</strong></td>
</tr>
<tr>
<td><strong>Cost per ac-ft of Detention</strong></td>
<td><strong>$11,000</strong></td>
</tr>
</tbody>
</table>

In 2010, each City and Jackson County Public Works staff were asked to submit projects from their jurisdictions. Commission members then responded to a survey to determine what they valued with regard to stormwater projects and what benefits they would like to see from the projects. The list of projects was then compiled and assessed based on the following benefits as a result of the survey (see Appendix B for survey results):

- Ability of local jurisdiction to cost-share;
- Addresses water quantity and quality;
- Incorporates green stormwater practices;
- Problem impacts more than one jurisdiction;
- Reduces erosion of land and stream bank;
- Reduces flooding of buildings and structures;
- Reduces property and infrastructure damage; not related to flooding; and
- Solution impacts more than one jurisdiction.

The projects that were thought to achieve the most benefits were considered to be a high priority. A summary of the stormwater management projects and the associated benefits is displayed in Table 11.

Table 11: Stormwater Management Projects– Benefits

<table>
<thead>
<tr>
<th>Project</th>
<th>Ability of local jurisdiction to cost-share</th>
<th>Addresses water quantity and quality</th>
<th>Incorporates green stormwater practices</th>
<th>Problem impacts more than one jurisdiction</th>
<th>Reduces erosion of land and stream bank</th>
<th>Reduces flooding of buildings and structures</th>
<th>Reduces property and infrastructure damage, not related to flooding</th>
<th>Solution impacts more than one jurisdiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restoration of Sugar Creek</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Highway 350 Detention</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Oak Ridge Meadow and Maybrook Creek</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Prairie Lee Lake and Park</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Carriage Hills Wetland Restoration and Construction</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Sandstone Ditch</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Vesper Ditch/Zaun Detention Area</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Monkey Mountain Park Riparian Protection</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Little Blue River Watershed Concept Plan</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
In May 2010, several Commission members went on a bus tour of each project to get a better sense of the problems and proposed solutions. Table 12 is a summary of the projects and a list of estimated costs for the project.

Table 12: Stormwater Management Projects and Estimated Costs

<table>
<thead>
<tr>
<th>Project</th>
<th>Jurisdiction</th>
<th>Estimated Cost</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restoration of Sugar Creek</td>
<td>Sugar Creek</td>
<td>$520,000</td>
<td>2012</td>
</tr>
<tr>
<td>Highway 350 Detention</td>
<td>Raytown</td>
<td>$2,300,000</td>
<td>2011 Engineering Study 2011 Design Study</td>
</tr>
<tr>
<td>Prairie Lee Lake and Park</td>
<td>Lee’s Summit and Jackson County Parks &amp; Recreation</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Carriage Hills Wetland Restoration and Construction</td>
<td>Jackson County</td>
<td></td>
<td>Design for project is complete. Awaiting funding.</td>
</tr>
<tr>
<td>Sandstone Ditch</td>
<td>Blue Springs</td>
<td>$350,000</td>
<td>N/A</td>
</tr>
<tr>
<td>Vesper Ditch/Zaun Detention Area</td>
<td>Blue Springs</td>
<td>$1,000,000</td>
<td>N/A</td>
</tr>
<tr>
<td>Monkey Mountain Park Riparian Protection</td>
<td>Jackson County Parks &amp; Recreation</td>
<td>$400,000</td>
<td>N/A</td>
</tr>
<tr>
<td>Little Blue River Watershed Concept Plan</td>
<td>Jackson County</td>
<td>$300,000</td>
<td>2011</td>
</tr>
</tbody>
</table>

Details for each project are listed on the next several pages as well as three projects that were selected to be funded:

- Restoration of Sugar Creek
- Little Blue River Watershed Hydrologic Modeling
- Sni-A-Bar Creek Watershed Hydrologic Modeling
Highway 350– Raytown

Commission members on bus tour (2010)
**Project Name:** Restoration of Sugar Creek  
**Jurisdiction:** Sugar Creek  
**Location:** 24 Highway North to Norledge

**Problems to be Addressed:**
- Degradation of stream channel
- Flooding of buildings or structures
- Damage to infrastructure

**Stormwater Control Measures Utilized:**
- Realignment of stream channel
- Riparian corridor establishment
- Wetland construction

**Project Description:**
Modeling of watershed to estimate water quantities. Design of stormwater control measures; utilize a design charrette for preliminary design concepts.

Various options need to be pursued to resolve the issues:
- Detention and/or greater infiltration upstream in Independence;
- Realignment of stream channel;
- Step pool detention in tributary/stream;
- Detention in existing open space;
- Restore riparian corridor and wetland habitats; and
- Greater infiltration within the watershed, lot level (rain gardens, swales, rain gardens, etc.)

**Benefits of Project:**
- Ability of local jurisdiction to cost-share
- Addresses water quantity and quality
- Incorporates green stormwater practices
- Problem impacts more than one jurisdiction
- Reduces erosion of land and stream banks
- Reduces flooding of buildings and structures
- Reduces property and infrastructure damage, not related to flooding
- Solution impacts more than one jurisdiction

**Cost Estimate:** $520,000
Restoration of Sugar Creek
Project Name: Highway 350 Detention
Jurisdiction: Raytown
Location: Highway 350 West of Raytown Road

Problems to be Addressed:
- Storm overflow into transportation system, across Highway 350 occasionally
- Erosion of land and drainage ways
- Routine flooding of the bowling alley, muffler shop, and downstream apartments

Stormwater Control Measures Utilized:
- Detention basin in transportation right-of-way
- Retrofit infiltration control measures where possible at surrounding commercial properties

Project Description:
Various options need to be pursued to resolve the issues:
- Install a detention basin within the right-of-way, between the lanes of traffic; and
- Increase infiltration prior to release into stormwater system, upstream and downstream of proposed detention basin.

Benefits of Project:
- Ability of local jurisdiction to cost-share
- Addresses water quantity and quality
- Incorporates green stormwater practices
- Reduces erosion of land and stream banks
- Reduces flooding of buildings and structures
- Reduces property and infrastructure damage, not related to flooding
- Solution impacts more than one jurisdiction

Cost Estimate: $2,300,000
Engineering Study: $800,000
Construction: $1,500,000

Schedule:
Engineering Study: late 2010
Design: 2011
Highway 350 Detention
**Project Name:** Prairie Lee Lake and Park  
**Jurisdiction:** Jackson County– Parks and Recreation  
**Department:** Public Works  
**Location:** NE Colbern Road and NE Todd George Road

**Problems to be Addressed:**
- Erosion in headwater areas from construction and lawn maintenance  
- Erosion of stream banks along drainage ways and creeks  
- Flooding of structures during large storm events

**Stormwater Control Measures Utilized:**
- Riparian corridor/stream setback protection  
- Detention basins upstream, especially as areas become developed  
- Sedimentation fore bays or wetlands at lake inlets  
- Public education

**Project Description:**
Various options need to be pursued to resolve the issues:
- Construct sedimentation/detention basin upstream of lake in tributaries;  
- Construct sedimentation fore bays or wetlands at lake inlets  
- Revegetation of banks along drainage ways and streams;  
- Restore riparian habitat;  
- Local and neighborhood stormwater infiltration program (rain gardens, swales, rain barrels, etc.); and  
- Education program on “how to live next to a stream”.

**Benefits of Project:**
- Ability of local jurisdiction to cost-share  
- Addresses water quantity and quality  
- Incorporates green stormwater practices  
- Problem impacts more than one jurisdiction  
- Reduces erosion of land and stream banks  
- Reduces flooding of buildings and structures  
- Reduces property and infrastructure damage, not related to flooding  
- Solution impacts more than one jurisdiction
Prairie Lee Lake and Park
Project Name: Carriage Hills Wetland Restoration and Construction
Jurisdiction: Jackson County– Public Works
Department: Public Works
Location: NE Colbern Road and 7 Highway

Problems to be Addressed:
- Erosion from upgradiant properties is transporting sediment into a tributary of Lake Lotawana
- Increased stormwater is elevating peak flows and causing damage to infrastructure and properties within this tributary

Stormwater Control Measures Utilized:
- Wetland construction and modifications

Project Description:
Various options need to be pursued to resolve the issues:
- Construction of a wetland to trap sediment and nutrients from entering tributary that flows into Lake Lotawana; and
- Existing wetland will be modified and improved to be more effective.

Benefits of Project:
- Ability of local jurisdiction to cost-share
- Addresses water quantity and quality
- Incorporates green stormwater practices
- Problem impacts more than one jurisdiction
- Reduces erosion of land and stream banks
- Reduces flooding of buildings and structures
- Reduces property and infrastructure damage, not related to flooding
- Solution impacts more than one jurisdiction

Design for project is complete. Partial funding has been secured from Jackson County, Blue Springs, and Carriage Hills.
Awaiting funding from Section 319 program at Missouri Department of Natural Resources.
Carriage Hills Wetland Restoration and Construction
**Project Name:** Sandstone Ditch  
**Jurisdiction:** Blue Springs  
**Location:** Sandstone and Abbey Streets  
          North of Keystone Park

**Problems to be Addressed:**
- Four (4) houses flood during extreme storm events
- Yard flooding
- Park facilities threatened
- Pedestrian bridge constricts channel flow

**Stormwater Control Measures Utilized:**
- Channel modifications
- Restore nature creek bed
- Public education

**Project Description:**
Various options need to be pursued to resolve the issues:
- Widen channel; and
- Widen pedestrian bridge to park.
- Remove concrete drainage channel, restore creek bed and riparian corridor

**Benefits of Project:**
- Addresses water quantity and quality
- Incorporates green stormwater practices
- Problem impacts more than one jurisdiction
- Reduces erosion of land and stream banks
- Reduces flooding of buildings and structures
- Reduces property and infrastructure damage, not related to flooding
- Solution impacts more than one jurisdiction

**Cost Estimate:** $350,000
Sandstone Ditch
Project Name: Vesper Ditch/Zaun Detention Area
Jurisdiction: Blue Springs
Location: 7 Highway and Vesper Drive, 800 Zaun Avenue

Problems to be Addressed:
- Detention basin overflows causing yard flooding
- Creek eroding near commercial properties on both side of 7 Highway

Stormwater Control Measures Utilized:
- Localized detention basin
- Riparian habitat restoration
- Bank stabilization
- Stream channel restoration

Project Description:
- Increases size of existing detention basin
- Remove concrete and asphalt bed downstream
- Replant riparian corridor downstream at local park for bank stabilization

Benefits of Project:
- Ability of local jurisdiction to cost-share
- Addresses water quantity and quality
- Incorporates green stormwater practices
- Reduces erosion of land and stream banks
- Reduces flooding of buildings and structures
- Solution impacts more than one jurisdiction

Cost Estimate: $1,000,000

Vesper Ditch, Blue Springs
Project Name: Monkey Mountain Park Riparian Protection
Jurisdiction: Jackson County
Location: Monkey Mountain Park
Old U.S. 40 and Fulks Road

Problems to be Addressed:
- Stream bank stabilization
- Development pressure in floodplain

Stormwater Control Measures Utilized:
- Riparian corridor protection
- No building in the floodplain
- Habitat restoration for stormwater infiltration and flood storage

Project Description:
- Purchase land between park boundary and Sni-a-Bar Creek; or
- Obtain conservation easement along creek corridor; and
- Restore riparian corridor habitat.

Benefits of Project:
- Ability of local jurisdiction to cost-share
- Addresses water quantity and quality
- Incorporates green stormwater practices
- Problem impacts more than one jurisdiction
- Reduces erosion of land and stream banks
- Reduces flooding of buildings and structures
- Reduces property and infrastructure damage, not related to flooding
- Solution impacts more than one jurisdiction
Monkey Mountain Park Riparian Protection
Project Name: Little Blue River Watershed Concept Plan
Jurisdiction: Jackson County
Location: Longview Lake to Missouri River
East Fork Reservoirs and subwatersheds of Cedar Creek, Little Cedar Creek, Maybrook Creek, White Oak Creek, Spring Branch, East Fork

Problems to be Addressed:
- Stream bank stabilization
- Flooding of structures in floodplain
- Impervious surface area in subwatersheds

Project Description:
- Conduct hydrologic model of Little Blue River, major tributaries, and reservoirs
- Develop strategy to utilize reservoirs for the original purpose of flood control
- Develop strategy for stormwater infiltration throughout watershed and subwatersheds, especially in the flood plain

Benefits of Project:
- Ability of local jurisdiction to cost-share
- Addresses water quantity and quality
- Incorporates green stormwater practices
- Problem impacts more than one jurisdiction
- Reduces erosion of land and stream banks
- Reduces flooding of buildings and structures
- Reduces property and infrastructure damage, not related to flooding
- Solution impacts more than one jurisdiction

Cost Estimate: $300,000
Schedule: 2011

Stormwater Control Measures Utilized:
- Stream setbacks
- Habitat restoration for infiltration and flood management, such as wetlands and oxbows
Little Blue River Watershed Concept Plan
Project Name: Restoration of Sugar Creek
Jurisdiction: Sugar Creek and Independence
Location: Northeast Jackson County, near Hwy. 24 and Sterling Ave.

Project Background:
The area has been developed for decades and in the early 1900’s was a recreational destination for Kansas City residents with a lake and supporting amenities. These recreational amenities were removed in the 1930’s. Increased impervious surface area in the headwaters has increased stormwater flows, resulting in flooding during large storm events.

Project Objectives:
- Reduce stormwater quantities in Sugar Creek
- Increase infiltration throughout the watershed
- Restore effectiveness of creek and floodplain
- Create habitat assets for the community

Next Steps / Implementation Plan:
- Conduct hydrologic model of Sugar Creek watershed
- Conduct a design charrette to identify stormwater control measures and options available to achieve objectives
- Identify locations for infiltration and storage of stormwater, including detention and wetlands
- Develop a conceptual design of watershed restoration measures

Stormwater Management Tools to Achieve Project:
- Hydrologic model of watershed
- Design charrette for watershed control measures
- Conservation easements in floodplain and critical upstream locations
- Agreement with developer on approach to development along Hwy. 24
- Infiltration and detention throughout watershed

Cost Estimate: $650,000
Restoration of Sugar Creek
**Project to Fund**

**Project Name:** Little Blue River Watershed Hydrologic Modeling  
**Jurisdiction:** Jackson County  
**Location:** Longview Lake to Missouri River; East Fork Reservoirs and subwatersheds of Cedar Creek, Little Cedar Creek, Maybrook Creek, White Oak Creek, Spring Branch, East Fork

**Project Background:**

The Little Blue River channelization project was designed over 30 years ago, primarily for a landscape of agricultural land use. Heavy development pressure in the Lee’s Summit, Independence and Blue Springs jurisdictions has substantially altered the landscape form and context of the Little Blue River and its tributaries. The flood control project that was designed for rural conditions is now failing under rapidly urbanizing conditions. Flood protection for the properties adjacent to the river is diminishing. Some areas flood during large storm events.

**Project Objectives:**

- Reduce flooding of structures in the middle Little Blue River watershed  
- Reduce or eliminate flooding in Oaks Ridge subdivision  
- Reduce risk of flooding structures

**Next Steps / Implementation Plan:**

- Conduct hydrologic model of Little Blue River system, including reservoirs and subwatersheds  
- Identify locations for infiltration and storage of stormwater  
- Identify oxbows and remnant wetland areas for restoration

**Stormwater Management Tools to Achieve Project:**

- Stream setback protection  
- Riparian corridor restoration, including oxbows, wetlands, and bottom land hardwood forest  
- Conservation easements in floodplain and critical upstream locations  
- Purchase floodplain to expand Little Blue Trace park

**Cost Estimate:** $1,200,000
Little Blue River Watershed Hydrologic Modeling
## Project to Fund

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>Sni-A-Bar Creek Watershed Hydrologic Modeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jurisdiction:</td>
<td>Jackson County</td>
</tr>
<tr>
<td>Location:</td>
<td>Blue Springs, Grain Valley, Lake Lotawana, Lee’s Summit, Oak Grove</td>
</tr>
</tbody>
</table>

## Project Background:

Heavy development pressure has substantially altered the landscape form and context of the Sni-A-Bar Creek and its tributaries. Flood protection for the properties adjacent to the river is diminishing. Some areas flood during large storm events.

## Project Objectives:

- Reduce flooding of structures in the Sni-A-Bar Creek watershed
- Reduce risk of flooding structures

## Next Steps / Implementation Plan:

- Conduct hydrologic model of Little Blue River system, including reservoirs and subwatersheds
- Identify locations for infiltration and storage of stormwater
- Identify oxbows and remnant wetland areas for restoration

## Stormwater Management Tools to Achieve Project:

- Stream setback protection
- Riparian corridor restoration, including oxbows, wetlands, and bottom land hardwood forest
- Conservation easements in floodplain and critical upstream locations
- Purchase floodplain

## Cost Estimate:

$1,200,000
Sni-A-Bar Creek Watershed Hydrologic Modeling
2.4 Funding Strategy

The following funding options are recommended for consideration by Jackson County:

- Stormwater Utility
- State Revolving Fund
- Non-Profit Finance Corporation for Stormwater Infrastructure
- Real Estate Transfer Fee
- Property Tax with Proportioning or Dedicated Sales Tax
- Strategic Approach to Parkland Dedication
- Conservation Easements
- U.S. Department of Agriculture (USDA) programs
- Carbon Banking (Carbon Offsets) or Carbon Credits
- Mitigation Program
- Grants

**Stormwater Utility**

Municipalities and governmental entities create stormwater utilities so that dedicated funds are available to operate, maintain, manage, construct or reconstruct their municipal storm water drainage systems. A stormwater utility is a dedicated revenue source intended to alleviate the burden on general funds. Essentially, the stormwater utility is identical to a water or sanitary sewer utility, in which the utility’s users finance the utility’s infrastructure costs. The stormwater utility charge is not associated in any way with property value, property taxes, or the owner's income.

Typically, the municipality charges a stormwater utility fee to all “users” within the city based on the amount of runoff that each property generates and contributes to the stormwater system. As a rule, the runoff generated relates directly to the amount of hard surface, or impervious area, found on the property. Hard surfaces such as rooftops, driveways, and parking lots prevent rainfall from infiltrating into the ground, thus increasing the amount of runoff that a property generates. Consequently, a property with more impervious area uses the system to a greater extent than a property with less hard surface.

**State Revolving Fund**

Funding for selected projects could come through the Missouri State Revolving Fund (SRF). This fund was developed by the Environmental Improvement and Energy Resources Activity and the Missouri Department of Natural Resources under the Clean
Water Act. The fund is operated in under to auspices of the Missouri Clean Water Commission. Recently, funding as come to Missouri through the American Recovery and Reinvestment Act (ARRA).

The fund is a low interest-low fund program to local governments for water, waste water, and stormwater infrastructure projects. The stormwater portion of the fund was approved by voters in 1998 for $200 million in bonds to first class counties and the City of St. Louis. Jackson County is a first class county. Monies in the fund are allocated based on a formula in the state constitution. In 2008, the state formula was amended to allow disbursement of funds as grants (instead of a grant-loan combination), grant-loan combination other than 50-50, and re-offer unused funds.

Each state decides which projects will be funded. In Missouri, the stormwater projects can be BMP construction, modeling, or land purchase for stormwater management.

**Non-Profit Finance Corporation for Stormwater Infrastructure**

One financing option is to develop a non-profit organization similar to the Missouri Transportation Finance Corporation (MTFC) for stormwater infrastructure projects in the state. The purpose of such an organization would be to assist with the financing of local stormwater management improvements, in particular stormwater projects not funded through the State Revolving Fund SRF). Similar to the MTFC, a Missouri stormwater finance entity would provide direct loans. Projects receiving the direct loans would assist the Missouri Clean Water Commission with achieving economic, social and commercial growth of Missouri, act in the public interest, promote improved water quality, and promote the health, safety and general welfare of Missouri citizens.

**Real Estate Transfer Fee**

A real estate transfer fee is a set amount included with other fees incurred during a transfer of real estate from one party to another. The fee would be applied to real estate transactions, business, residential, undeveloped land, and agriculture land. The impact of a real estate transfer fee falls to the new owner of the property. The new property owner will receive the benefits paid for with funds generated, such as parkland, recreational facilities, preservation of open space, protected stream corridors for stormwater management, and potential increases in property values. The real estate transfer fee is dependent on the real estate market within a jurisdiction at any particular moment in time and would not generate a stable revenue stream. However, this funding mechanism is worth consideration in growing communities. If administered properly a real estate transfer fee does not incur costs to the general public.
Property or Sales Tax

Property taxes are the primary revenue source for a local government’s general funds. These funds are used to complete public works projects including stormwater management and green infrastructure projects. However, many other public works projects such as roads, lights, and sidewalks are funded with the general fund. Schools are also funded with property taxes. These competing uses must be considered when choosing to use property taxes to pay for stormwater management and green infrastructure. Missouri law allows local governments to utilize sales tax to fund stormwater and park programs.

Strategic Approach to Park Land Dedication

Many local governments require developers to dedicate parkland to the county or city as part of the development process. If the parkland on the development site is not sufficient or desirable, many communities require developers to pay a park land dedication fee in-lieu of construction. These fees would then be used for green space and park land. A planned, strategic approach for the use of land dedication or fees is recommended to fund the Green Infrastructure Plan. Efforts can be coordinated across jurisdictions.

Conservation Easements

Conservation easements are lands and land use deeded to a local government or non-profit entity to use and manage within agreed upon limitations. The agreements are legally binding and the easements are deeded in perpetuity. Easements may provide a tax incentive for the private property owner. Conservation easements can be utilized for a variety of goals and objectives such as drinking water protection, water quality protection, protection or restoration of native habitats or species, and protecting scenic views. In the Kansas City region, conservation easements are a preferred conservation strategy working primarily on the urban fringe in more rural areas. A conservation easement will conserve the land but not always allow the installation of a trail and public access unless specifically agreed to in writing.

United States Department of Agriculture (USDA) programs

As part of the Farm Service Agency of the USDA, the Conservation Reserve Program (CRP) is a voluntary program that provides annual rental payments to agricultural producers to safeguard environmentally sensitive lands by planting long-term, resource conserving vegetation to control soil erosion improve water quality and enhance wildlife habitat. Program signups are held periodically. A continuous signup provision of the CRP provides funding for installing vegetative buffers and other practices to protect rivers and streams and other environmentally sensitive areas.
Carbon Banking (Carbon Offsets)

Carbon banking or offsets can be used to achieve air quality standards for emissions by private industry as well as communities. As climate change initiatives are instituted in communities and companies across the United States, the demand for carbon banks has increased. To meet air quality standards or program goals, carbon banks can be compatible with wetlands mitigation and habitat restoration efforts.

Forest conservation and reforestation projects include restoration of deforested or degraded forestry lands. The forest holdings must be verified as sustainably managed with a commitment to maintain the carbon stocks. Projects may include urban and suburban tree planting. Forest conservation projects are counted if they are contiguous with a reforestation project. The amount of carbon offsets for a particular project is calculated based on the size and age of the forest stand.

Carbon offsets are an important strategy for restoration of bottomlands with hardwood forests. Bottomland hardwood forests are a key natural resource found in the Missouri River corridor. Revenues from carbon offsets should be focused in these regional corridors.

Mitigation Program

Jackson County has initiated a program for mitigating on County-owned land impacts to wetlands and streams from development. The mitigation would occur when developers or public works (state or local) departments impact wetland or stream areas which require mitigation under federal or other regulations. The goal of the Mitigation Program is to restore and enhance Jackson County property utilizing federal and state environmental requirements for mitigating damage to natural resources. The objectives of the program include:

- Provide a funding source for restoration, repair, and maintenance of County property.
- Restore the ecology of the watershed impacted by development and infrastructure projects.

Grants

- U.S. Environmental Protection Agency - Sustainable Community Grants
- U.S. Environmental Protection Agency - Five Star Wetland Grants
- Private Foundations: YSI Foundation
MAPS

Green Infrastructure Projects
MAPS

Little Blue River Watershed Projects—A, B, C
MAPS

Sni-A-Bar Creeek Watershed Projects– D, E
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