

MARCH 2010

Updating The 208 Water Quality Management Plan

*for the St. Louis,
Missouri Region*



Missouri Department
of Natural Resources

Environmental Protection Agency Region 7
through the Missouri Department of Natural
Resources has provided partial funding for this
project under Section 604(b) of the Clean Water
Act. MoDNR Subgrant G09-WQM-01.



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

**UPDATING
THE 208 WATER QUALITY MANAGEMENT PLAN
FOR THE ST. LOUIS, MISSOURI REGION,
Including the City of St. Louis, and Franklin,
Jefferson, St. Charles and St. Louis Counties**

Prepared by
East-West Gateway Council of Governments

March 2010

East-West Gateway Council of Governments
One South Memorial Drive, Suite 1600
St. Louis, MO 63102
314-421-4220
www.ewgateway.org

TABLE OF CONTENTS

Introduction.....	3
What is the Cost / Benefit of 208 Water Quality Management Planning?	6
Updating the 208 Water Quality Management Plan in Selected Areas of the St. Louis Metropolitan Region	8
Watershed Planning	9
Nonpoint Source Pollution	13
Stormwater	14
Septic Systems: On-site Sewage Treatment.....	16
Sewer Districts and Sewage Treatment.....	18
Update by County	19
Franklin County	19
Jefferson County	21
St. Charles County.....	24
St. Louis City and County	25
Water Resource Council (WRC).....	30
Conclusion.....	32
Appendix.....	33
Facility Planning Area Maps	
St. Louis Region	
City of St. Louis and St. Louis County	
Jefferson County	
Franklin County	
St. Charles County	
Draft Revision for Pacific Area	
Excerpt from Jefferson County Report Re On-Site Treatment	
Lower Meramec River Source Water Protection Strategy Exchange Report	

UPDATING THE 208 WATER QUALITY MANAGEMENT PLAN FOR THE ST. LOUIS REGION

Introduction

In 1972, Congress passed the Clean Water Act (CWA—Public Law 92-500) to “restore and maintain the chemical, physical and biological integrity of the nation’s waters.” Two primary goals were –1) the elimination of the discharge of pollutants into navigable waters; and 2) to attain “water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water,” (the so-called “fishable and swimmable provision of the law). Under Section 208 of the Act, in 1975, the Governor of Missouri designated East-West Gateway Council of Governments (EWG) as the agency responsible for preparing the Water Quality Management Plan for the five counties in the Missouri portion of the St. Louis region—Franklin, Jefferson, St. Charles, St. Louis and the City of St. Louis.

The St. Louis, Missouri Water Quality Management Plan (208 Plan) was completed in 1978 and encompassed a twenty- year time frame from 1980- 2000. The introduction to the Plan states, “Local governments need to have a major role in devising the 208 Plan because local governments will have primary responsibility for enforcing and financing most aspects of the plan. Control of nonpoint sources, for example, involves programs ranging from zoning and building regulations to streetsweeping and leaf collection.... Although federal and state aid is used for their construction, wastewater treatment plants are generally owned, operated and maintained by units of local government.” (page 3) Thirty years later local authorities continue to focus on issues identified in the plan, including organization and management of “sewer development and pollution clean-up, ...a management approach sensitive to watershed-wide as well as local concerns... and control of pollution from urban stormwater and construction site runoff (page 4).”

Regional Water Quality Management Planning is a requirement of Section 208 of the Clean Water Act and is an important part of protecting water quality. When it was developed, the 208 Plan identified immediate problems—especially a proliferation of point sources that were discharging partially treated sewage into small streams. While the plan had its particular focus for each county, the overall focus was development and management of sewer districts and treatment facilities and a planning approach that addressed both structural (facilities) and non-structural (regulatory) approaches to improve water quality. As the 1978, 208 Plan indicated, the structural approach is more easily quantified, but the regulatory approaches are “less expensive, because their purpose is to prevent rather than treat pollution. Building treatment plants alone will not result in adequate water quality; nor will the passing of ordinances and regulations do the job. The most cost effective way of meeting water quality standards is to do both simultaneously. The plan strives to meet that goal” (Page 10).

The 208 Plan also identified a major concern about implementing nonpoint source controls in second-class counties, even though “these controls are necessary to meet water quality objectives in certain watersheds within these counties.” (page 12) The plan goes on to say that changes in the Missouri State statutes may be necessary to enable counties to have the authority needed to implement adequate protection for water quality. Thirty years later, this question of the limited powers of second-class counties is no longer a concern for the St. Louis Region, but it should be a major concern to the Missouri Department of Natural Resources (MDNR) as it addresses water quality issues on a statewide basis. St. Charles, Franklin and Jefferson Counties have become first class counties. Nevertheless, it is in rural counties where the population is small but growing rapidly that a clear set of regulations can have the most positive impact on protecting water quality with the lowest long-term costs to government or citizens.¹

One of the major focus areas of the 208 Plan is environmental protection and the conservation of natural resources. In the long term, costs required to improve damaged streams are going to be far greater than the costs of implementing strategies to protect healthy streams. Over the last thirty years the reliance on voluntary measures to control nonpoint source pollution has failed to protect streams. In the St. Louis region, just as in other parts of the nation, streams in urban and suburban areas have declined as population centers have expanded and impervious surfaces have increased. As a result, in the last decade, Phase Stormwater II Control measures have been implemented to require local governments to address stormwater runoff and construction site controls. The federal efforts to control stormwater with regulatory procedures remains focused on the more developed areas and on cities with populations above a certain threshold. Federal efforts also give more emphasis to remediation of polluted streams than to protecting healthy streams. Water quality planning needs to focus on a combination of strategies to protect healthy streams, mitigate damage, and improve and restore degraded streams.²

In the five core counties of the St. Louis region, the 208 Plan is a tool to facilitate the review of infrastructure projects to assure they are consistent with the certified regional water quality management plan. Public participation is a part of the water quality planning process and allows collaboration with public and private partners.

¹ It is now areas outside of the original EWG study area—Franklin, Jefferson, St. Charles, St. Louis Counties and the City of St. Louis—where the highest rate of development is taking place, and where the potential for unregulated development to have negative impacts on water quality. In the EWG planning area, where the 208 Plan has been in effect for 30 years, there is more order and effective collaboration to achieve water quality goals. Today the *greatest* challenges to planning and management of sewers and sewage treatment, as well as nonpoint source pollution, are in the outlying or collar counties of the region, including Warren, Lincoln and Washington Counties (now defined by the US Census Bureau as being part of the St. Louis Metropolitan Region). Those areas without a clear plan or planning authority are facing political challenges about sewer district authority, and significant problems in addressing sewage treatment; however, our planning authority does not extend to those counties.

² Since the Missouri Department of Natural Resources (MDNR) is the designated 208 authority for most of the State of Missouri, it will be necessary for the Department to strengthen its non-point source controls over development in outlying areas.

Regional and local governments, as well as private engineering and consulting firms should follow an on-going planning process to implement consistent and effective water quality management programs.

Furthermore, this 208 Plan provided the framework for prioritizing future capital investments based on preserving the natural and scenic qualities of the area and protecting the water resources of the St. Louis Region. Updating the 208 Plan represents a unique opportunity for local governments to assess water quality problems and devise strategies for solving them within the framework of state and federal clean water laws.



What is the Cost / Benefit of 208 Water Quality Management Planning?

Development of wastewater collection and treatment infrastructure, nationally and in Missouri as well as the St. Louis region, has grown at a rapid pace since the passage of the Clean Water Act in 1972. Because in-stream water quality standards have still not been achieved, USEPA and state regulatory agencies have continued to mandate more stringent standards for sewage treatment and for non-point sources controls. New standards lead to increased costs of wastewater treatment. Sprawling communities, with less density and greater distance between houses also increase the cost of construction and maintenance of collection systems. Competition among service providers in areas not covered by 208 Plans can also create complex financial, legal and planning issues for public works authorities and both directly and indirectly increase costs.

By providing a 20-year framework for planning, and a determination of geographic areas of responsibility for sewer district services and treatment, the 208 Plan helps to make systems more efficient and reduces the opportunity for conflicts. It also reduces waste of resources and limits the creation of new point sources by preventing construction of redundant systems. The Missouri Clean Water Law requires the following:

(9) Prohibitions. No permit shall be issued.... (F) For any discharge from a point source inconsistent with a plan or plan amendment approved under Section 208(b) of the Federal Clean Water Act.³

Now that the plan is past its time horizon of twenty years, the need for an updated plan is imperative. Conflicts and disagreement are becoming more commonplace within the 208 Planning areas. Proactive discussions and informal sharing of information can solve many conflicts. Ideally, any decisions by a county or a municipality about new construction would include a cost/benefit analysis of water quality impacts, sewage treatment alternatives and stormwater runoff before the development is approved.

Costs of sewage treatment include the infrastructure of pipes running from homes to the treatment plant. For developers working in areas that are not served by an existing sewer district, having an ability to provide a small sewage treatment facility (package treatment facility) as part of a new residential development can often lower costs significantly – for the developer. However, in many cases over the past thirty years, this practice has served to increase the costs to the residential home buyer, who pays for the developer's costs on the local package treatment facility, and may pay for up-grades to that system to conform to changing water quality standards, and then at a later date must pay to hook on to a sewer district when it is finally brought within a reasonable distance of their home and subdivision. Thus, residential customers in rural growth areas may pay several times for their sewage treatment facilities. A local or sub-regional facilities plan, based on the original 208 Plan recommendations, and especially one that cities and counties follow closely, can serve to reduce long-term costs and provide for improved water quality.

³ Code of State Regulations, 1/29/09, 10 CSR 20-6- Department of Natural Resources, Division 20.

Where new developments are built with on-site treatment (septic tanks) or with small package treatment facilities, the risk to the waters of the state is much higher. Current estimates are that nearly 50 percent of such facilities fail to provide adequate sewage treatment, either because the soils are incapable of handling the flow, or because residents do not operate and maintain the package plans or septic tanks correctly.⁴ Thus the benefits to the public at large, and to the natural resources, are significantly greater when adequate large-scale collection and treatment is built into a project from the beginning. Adequate planning can assist communities to determine the actual costs and benefits of connecting new developments to an existing sewage treatment facility in the planning area. This kind of planning can assist communities in establishing fair and equitable connection fees and in justifying such fees to developers when developments are approved.

In this report, EWG addresses the current situation in the Metropolitan region, provides an update on conflicts that have been addressed or resolved by using the current plan, proposes some updates to the planning area maps, and suggests need for future work in the region.

⁴ *Wastewater Management Plan, Final Report* performed by CH2MHill and Horner and Shifrin, Inc. for Jefferson County in December 2001

Updating the 208 Water Quality Management Plan in Selected Areas of the St. Louis Metropolitan Region

With grant support from the U.S. Environmental Protection Agency (USEPA), through the Missouri Department of Natural Resources (MDNR), East-West Gateway Council of Governments (EWG) has used this current MDNR planning grant to contact local government and sewer district officials and to conduct a review and assessment of issues and concerns as a preliminary step toward an update of the 1978 208 Plan in St. Louis,



Jefferson, St. Charles, and Franklin counties. Since January 2009, EWG has found several serious management challenges to the facility planning areas in maintaining the service agreements that were established, in some cases, 30 years ago. EWG addressed several high growth areas in the region, for special attention. These issues will be addressed below on a county-by-county basis.

The 208 Plan recommended a long-term focus on watershed planning for both sewage facility construction and stormwater management. The 208 Plan also identified the Meramec River as a the region's number one priority river and watershed area, deserving protection both as a drinking water source and because it is biologically diverse and contains important habitat.

One of the key recommendations of the 208 Plan was the construction of a regional secondary wastewater treatment plant at the mouth of the Meramec River. This regional facility was envisioned to provide wastewater treatment for the Lower Meramec region via a deep tunnel interceptor sewer that would have a series of drop shafts. The northern row of watersheds in Jefferson County and the southern row in St. Louis County would be serviced by the deep tunnel interceptor. In 2007, the Metropolitan St. Louis Sewer District (MSD) opened the Lower Meramec regional secondary wastewater treatment plant. This key component of the 208 Plan now provides wastewater treatment for the City of Arnold and portions of south St. Louis County. However, due to funding constraints, the deep tunnel interceptor was significantly reduced in scale and extent. Consequently, the deep tunnel does not provide service to the northern row of watersheds in Jefferson County and does not provide service to the southern areas of St. Louis County near the Grand Glaize watershed.

Today, there are new questions about whether removal of water from the Grand Glaize and neighboring watersheds into a deep tunnel will impact flow levels on the Meramec River. MSD will be addressing such issues in its new plans. Nevertheless, a comprehensive update with new modeling, and new projections of growth in St. Louis, Jefferson and Franklin Counties would provide guidance for additional development.⁵

⁵ A new grant from MDNR to EWG will enable work on watershed plans for streams in this part of the lower Meramec River watershed, but it will not pay for a comprehensive update, with modeling.

East-West Gateway has begun work with St. Charles, Jefferson and St. Louis Counties and MSD to address plans for the next 20 years, and to develop the framework for completion of this essential element in the improvement of sewage treatment. Clearly the process of restoring our rivers to health takes much longer than initially envisioned in the CWA. Much has been learned over the last 30 years about how to manage stormwater, and how to treat sewage. As the state and federal agencies seek to address the disparities between the desired goal of clean water and the result of our efforts to date, the regional 208 Plan should be reviewed and updated at least once every decade. In addition, watershed planning should be emphasized as a way of address pollution in specific water bodies, and watershed plans can eventually be incorporated into an updated 208 Plan.

Watershed Planning

Since the completion of the first 208 Water Quality Plan, Congress has placed significant emphasis on strategies to manage stormwater runoff, and the USEPA has continued to emphasize the importance of watershed planning to address the broad impacts of human activity on water quality. In this plan update, EWG is now pursuing watershed planning and the use of stormwater best management practices to improve water quality. Watershed planning addresses the total impact of point and nonpoint sources of pollution into a given body of water. Watershed planning enables local governments and agencies to focus on cumulative effects contributing both to the quantity of water in a stream as well as to the quality of the water. Sewer facilities that are built to follow watersheds tend to be far more energy efficient, since they use gravity to move the sewage through the system. Thus watershed planning works well for sewer planning as well as nonpoint source planning. It was not until the late 1990s however, that any significant watershed planning efforts began in the region. In the lower Meramec River watershed a model plan to protect a healthy watershed was developed for the LaBarque Creek Watershed.

The Meramec River watershed remains a high priority area. This river is one of the most biologically significant rivers in the United States, with more than 145 species of fish, 45 species of mussels, more than a dozen species of crawfish and a wide diversity of flora and fauna associated with its 220-mile main stem and many tributaries.⁶ In the lower Meramec River watershed, however, the Missouri Department of Conservation (MDC) found a significant decline in fish populations in stream surveys on smaller tributaries in the lower 42 miles. In data collected on fish species in the smaller tributaries of the Meramec between the mouth of the river at the Mississippi and 42 miles upstream to Eureka, MDC found a severe decline in fish species in all tributaries. The maximum number of fish species found in these smaller streams was thirteen, and in one, only three species were found.

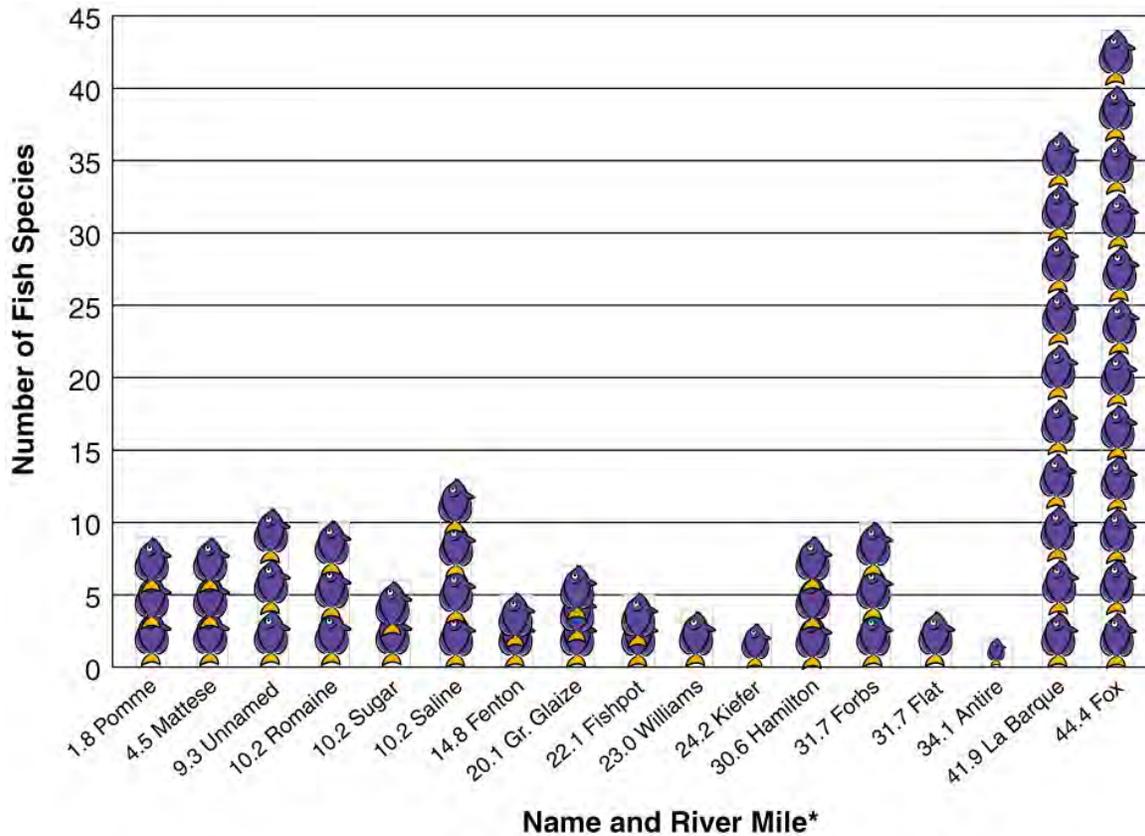


In northwestern Jefferson County, however, just south of Eureka, and at river mile 41, MDC found between 36

⁶ Criss and Wilson, *At the Confluence*, Missouri Botanical Garden Press, 2003, p19

and 42 species of fish in LaBarque Creek. In Fox Creek, flowing into the Meramec at miles 42 from St. Louis County and eastern Franklin County, there are 44 species. These last two streams are far more representative of a healthy tributary.

Fish Diversity in Meramec River Tributary Streams



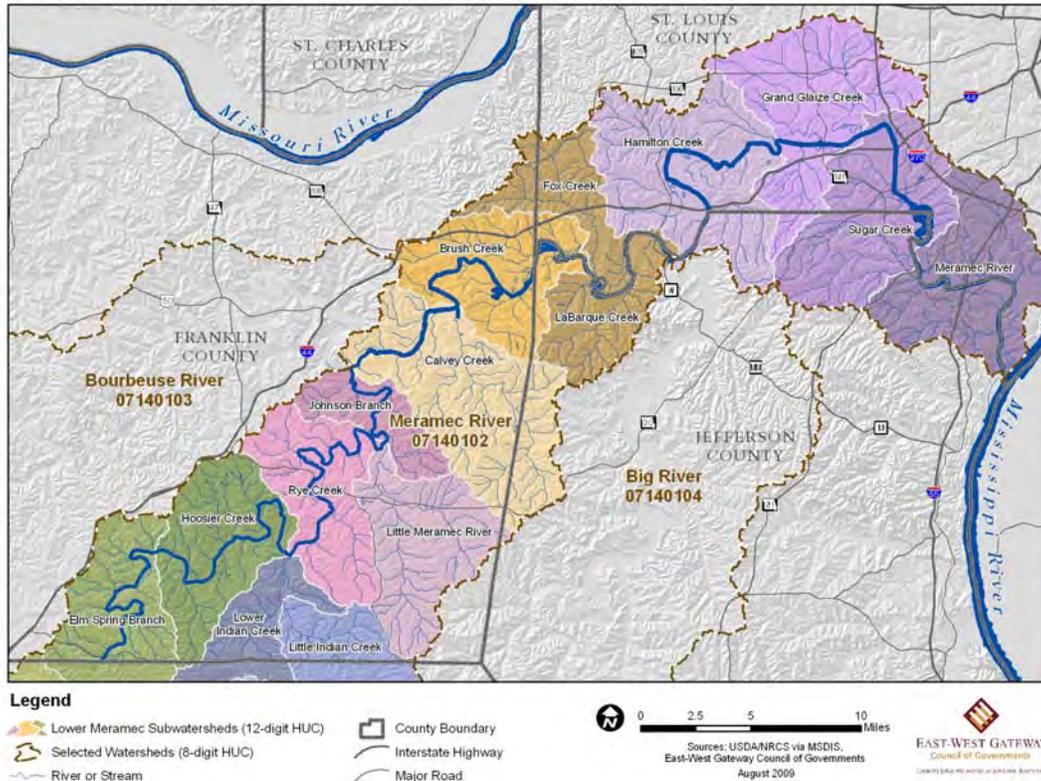
Lower Meramec River Tributaries and Fish Species

*Tributary and distance (in miles) from Meramec River/Mississippi River confluence;
Source: Missouri Department of Conservation

Significantly, in 2010 EWG received a 604(b) planning grant from USEPA through the Missouri DNR to develop a nine-element watershed plan for four sub-watersheds in the lower Meramec watershed. These watersheds are based on the U.S. Geological Survey 12-digit HUC level (which typically include several minor tributaries in a single watershed). They include -

- Brush Creek, primarily in Franklin County, (west of Fox Creek and not on chart)
- Fox Creek in Franklin and St. Louis Counties; and LaBarque Creek in northern Jefferson County
- Hamilton and Carr Creek in St. Louis County (largely in the City of Wildwood). This watershed also includes Kiefer Creek that flows through Castlewood State Park, Forbs and Flat Creeks in Jefferson County
- Grand Glaize Creek and Fishpot Creek in St. Louis County and Williams Creek

Lower Meramec River Watershed



The watershed planning will enable EWG to continue to work on an important and recommended next step in the update of the 208 Water Quality Plan. The long-term goal for the 208 Plan is to have watershed plans completed for the watersheds of the entire region, so that local governments have a tool for cooperating to achieve water quality goals and to address runoff problems associated both with floods and with property loss through erosion. This work is not being done in isolation. Jefferson County, for example, has already established a goal of developing watershed plans for the major watersheds within the county. EWG has also met with Jefferson County regarding the potential to develop a Big River Watershed plan in cooperation with St. Francois and Washington counties. A Big River Watershed plan will be important especially to address lead contamination in the watershed and strategies to protect human health and the environment.

In St. Louis County, the Missouri Botanical Garden is cooperating with 23 cities and MSD to develop a plan and implement strategies for water quality improvement in the Deer Creek watershed. Eventually, watershed plans will be needed in the rest of St. Louis County and in the combined sewer areas of the inner suburbs and the City of St. Louis, in order to reduce stormwater flows into the sewers in the areas where the systems are supposed to be separate, and to remove stormwater from sewers in areas where there are combined storm and sanitary sewers.

In St. Charles County, watershed plans have been developed for Peruque Creek and Dardenne Creek although both plans could use updating. St. Charles County has taken important strides to improve its stormwater management practices, but development regulations remain inadequate to protect property owners from loss of property due to erosion and to protect cities from the liability of eroding stream banks and damage to public infrastructure. After spending as much as \$1.5 million at one site to alleviate stream bank erosion threatening several newly constructed homes, and working to repair less expensive problems (\$30,000 to \$500,000) on other streams, the City of O'Fallon, MO passed a stream buffer ordinance in 2008 that requires a 25 foot set back from the top of the existing stream bank and a 50 foot set back for any construction that involves a foundation.⁷

Looking beyond the EWG planning region, moreover, the US Census now defines the St. Louis Metropolitan area as including 16 counties (8 in Missouri and 8 in Illinois, instead of the eight county total that EWG currently represents). Lincoln, Warren and Washington Counties in Missouri not only experience significant economic integration with the St. Louis metropolitan area, these counties are also experiencing significant growth and development. As a result, watershed plans are important to address stormwater as well as regional sewer and wastewater treatment facilities as that development is occurring, rather than waiting until the development occurs and more problems are created.

Larger scale watershed plans are underway on the Missouri and Mississippi Rivers, although most experts agree that it will ultimately be the planning on smaller watershed scale that leads to significant improvement in water quality on the bigger rivers.

⁷ St. Louis Earth Day symposium, 2010:
http://stlouisearthday.org/images/stories/SymposiumImages/gremminger_creek%20bank%20setback%20ordinance.pdf

Nonpoint Source Pollution

In 2009, as a part of the current project, EWG worked with the Open Space Council, US Forest Service and the Trust for Public Land, to develop a Source Water Protection Strategy Report for the Lower Meramec River. The purpose of this project was to show how land protection and management strategies can be utilized in watersheds to protect raw drinking water quality. EWG has gathered a significant amount of information about the Meramec as a source of drinking water for the region, and about the threats to that resource. In programs held in May at Powder Valley Conservation Center and Wildwood City Hall, the partnership brought in experts on stormwater, on-site treatment systems, and strategies for public education related to water quality protection.

Presenters included:

- Sandy Tassel, President, Look at the Land, Washington, D.C.
- David Casaletto, Executive Director, Table Rock Lake Water Quality, Inc;
- Greg Hoffman, Senior Watershed Engineer, Center for Watershed Protection; and
- Cynthia Hagley, Environmental Quality Extension Educator, Minnesota Sea Grant

The meeting consisted of a 5-day Strategy Exchange where these national experts worked with local, regional and state experts on four issues for the Hamilton, Brush Creek and Fox watersheds. The major issues were selected based on input from approximately 30 members of the Meramec Tributary Alliance, a group that came together following the 2007 Meramec Summit, organized by EWG in partnership with the Open Space Council of St. Louis, and supported by a planning grant from the Department of Natural Resources. The issues identified by this group included the following:

1. Improved stormwater best management practices,
2. Septic system solutions,
3. Successful community outreach campaigns, and
4. Useful demonstration sites for conservation, restoration and stormwater improvements.

The complete report from this program is in the appendix to this document. The report highlighted the important link between ecology, habitat and water quality. A brief summary of the report includes the following points:

1. Preserving a watershed's functions as a drinking water source area requires the same efforts and practices necessary to preserve a watershed's ecological functions and benefits. There is need for leadership and cooperation to achieve water quality goals, and an opportunity for partnerships among agencies and organizations with a wide range of interests in working together to achieve a broad range of mutually supportive goals. Public education and outreach are essential to implement solutions, develop adequate funding and secure a broad base of support.

2. Education, leadership and cooperation are key ingredients of any effort to protect or restore water quality. Demonstration projects are key methods to support public education.
3. Management of on-site treatment systems, generally called septic tanks, is critical to water quality in the Meramec Basin. A large percentage of systems do not provide an adequate level of treatment (waste disposal is not treatment).
4. Stormwater management through a range of control practices generally called Low Impact Development can be implemented to reduce both the volume of stormwater reaching streams and the amount of pollution that the stormwater carries into the stream. Impervious surfaces in developed areas – roofs, roads, parking lots and patios – channel stormwater rapidly to storm drains and into creeks and streams, increasing the volume of water that these water bodies must accommodate and exacerbating erosion and flooding. In addition, stormwater runoff carries significant amounts of pollution into streams. LID practices can significantly ameliorate these runoff pollution problems.

Stormwater

Throughout the 208 planning area, NPDES Phase II stormwater management strategies are being implemented. In St. Louis County, MSD is taking the lead (with 61 municipal co-permittees working together). In St. Charles, Franklin, and Jefferson Counties, this planning and implementation affects larger municipalities, which are basically working on their own. Outside of the MSD area, aside from the support provided by MDNR, there is no coordinated effort to address stormwater best management practices (BMPs). Many of the local municipalities try to follow what MSD is doing, and a structure to support a more regional and collaborative approach could assist both the communities involved and the developers who need to work within the regulations of each separate entity. A regional approach could be an effective way to bring cities into a more unified approach to legislation and management of best practices. A comprehensive update to the 208 Plan should include recommendations for a more regional collaboration on these important stormwater issues.

Public education and awareness of problems and solutions is a key component of efforts to improve and maintain water quality, and must be addressed both regionally and as part of a statewide plan in subsequent updates to the 208 Plan. The City of Arnold and MSD experienced challenges in 2009, when state legislators decided to restrict their ability to collect stormwater fees. In the case of MSD, the new law prohibits MSD from collecting stormwater fees from any property owner whose sewage is not collected by MSD. East-West Gateway contacted the sponsors of the legislation to provide technical information on the value of stormwater management, and to explain that stormwater and sewage treatment are two different kinds of concerns. Eventually the bill passed both the Missouri House and Senate and was signed by the governor. MSD has since responded by notifying MDNR that it will not be responsible for stormwater management of those people who are not paying the stormwater fee. For the City of Arnold, in Jefferson County, the same state legislation restricted the types of organizations that can be charged a stormwater fee in that community.

Educational efforts must include, and perhaps begin with, elected officials. Improved outreach and education about stormwater problems, and the need to control stormwater in order to protect water quality as well as reduce flooding, may be able to reduce adverse legislative actions at the state level. In addition, outreach and education strategies that individual cities and counties may develop can be enhanced by regional coordination to build awareness and encourage BMPs to maintain and improve water quality.

With federal requirements driving much of the change in stormwater management standards, some resistance at the local level may be expected. An educated citizenry is important to maintain support for changes to address water quality. Local government leaders also can benefit from more understanding of the costs to their communities when stormwater is *not* managed effectively.

For example, implementing stormwater management strategies may include certain costs of restricting certain lands in floodplains from development by adopting stream buffer ordinances, and implementing a variety of measures to reduce stormwater flow and pollution runoff from city parking lots and maintenance facilities. On the other hand, implementation of stormwater control measures can have a measurable net benefit to municipalities. In the past year, EWG has learned of numerous instances where communities are spending significant amounts of money to stabilize eroding stream banks, to clean out bridge abutments that are filled with debris, and to replace roads and bridges, which have become unsafe due to erosion. One community has calculated lost revenue from loss of land due to erosion and found that expenses to stabilize stream flow can be justified simply in terms of prevented property loss. These costs and benefits of stormwater management are not well understood by government officials or taxpayers, and could be the subject of an entire project to analyze and explain.

Recent articles on Volume Based Hydrology suggest that control of stormwater volume may be the most effective means of controlling pollutant load from stormwater, or nonpoint sources.⁸ Since volume control should also benefit properties at risk of flooding, and serve to reduce erosion problems, a volume-based approach may serve to increase public interest in and willingness to adopt stormwater management and LID strategies.

EWG has addressed LID with a brochure that focuses on best management practices and highlights examples of new projects from within the region. This brochure will be distributed to local governments and other interested parties.

EWG will begin to address many of the issues described with a new watershed planning effort in the lower Meramec basin.

⁸ Andrew J. Reese, "Volume Based Hydrology" in Stormwater, September 2009.
<http://stormh2o.com/september-2009/volume-based-hydrology.aspx>

Septic Systems: On-site Sewage Treatment

Another significant nonpoint source of pollution is failing septic tank systems. Most rural residences have their own sewage treatment system on site. A revised 208 Plan will need to address a strategy to gather and maintain data on on-site treatment facilities, and recommend strategies for remediation. One effective approach will be to address this issue by watershed, since watershed residents may prove to be an important ally in educational efforts with their neighbors. A watershed plan can identify successful septic system monitoring and enforcement programs that can serve as models for local communities and it can also identify local examples of best practices.

Many of these on-site treatment systems are poorly maintained because residents have little understanding about how sewage treatment works. Some knowledgeable estimates are that 50 percent of all systems are failing or in some way not providing adequate protection to water quality.⁹ In addition, geologic surveys of the soils of Jefferson County in both 1969 and 2001 concluded that soil conditions in the county are “limiting,” with “characteristics which preclude the installation of a standard system...”¹⁰ A long-term process to monitor, inspect and maintain these systems will be necessary to protect water quality. Public education and training is going to be required to bring sufficient awareness to homeowners and renters about how to manage and maintain their own treatments systems.

The Jefferson County On-site Treatment Ordinance requires the installer to service new units for two years and it is enforcing this provision. It also contains a provision for the homeowner to secure an operating permit that is renewed every two years upon provision of evidence that the system has been properly maintained. This provision is not being enforced for two reasons. First, the county has not been able to establish and maintain a reliable database; software problems are a concern. Second, administering such a system requires manpower and resources, which must be paid through a permit fee for on-site systems. Elected officials have not yet approved a permit fee. Jefferson County now has new software and will seek the funding approval for permit fees and staff to manage the system with the code revisions anticipated in 2010.

Second, Jefferson County plans to require soil scientists to be licensed within the county. While soil scientists are currently licensed by the state, whenever a system fails, there is a problem identifying who is at fault. In some cases the soil scientist provided poor data, but the county did have an easy way to hold them responsible for poor quality work. The code that is under consideration will give the county authority to license any individual

⁹ *Wastewater Management Plan, Final Report* performed by CH2MHill and Horner and Shifrin, Inc. for Jefferson County, December 2001. The report estimates 32,700 Septic Tank systems operating in Jefferson County in 2000, and notes that in 1990, 46 percent of housing units in Jefferson County were served by septic tank and drain field systems or cesspools and that the percent did not change significantly in the 1990s. The report goes on to cite the Environmental Health Section of the Jefferson County Health Department estimate that 50 percent of the septic systems currently in operation have failed or are anticipated to fail. Since many of the residential units with failing septic systems utilize private wells for drinking water, this increases health risk. Pages 1.3-7, 1.3-8.

¹⁰ *Wastewater Management Plan*, Dec 2001, p 1.3-10.

who has a state license and provides a bond and insurance to the county. This license will give the county some leverage to correct poor quality work.

EWG has not had an opportunity to explore these issues with Franklin and St Charles County. Future 208 Planning will need to address this issue in more detail, but the information from Jefferson County offers a roadmap. The watershed planning in the lower Meramec River watershed should also be an area where these issues can be addressed.

Sewer Districts and Sewage Treatment

In the 1978 Water Quality Management Plan (208 Plan), EWG mapped the anticipated growth areas, projected growth and allocated service areas based on that current and projected growth. The 208 Plan sought to reduce number of point sources and rationalize the implementation of improved treatment.

During the year of this grant, EWG GIS staff has been successful in producing digitized maps of the original sewer district boundaries; and in a few cases EWG has recommended revised service area boundaries, in order to adequately reflect the changes that have taken place. While these changes serve to bring the plan into alignment with the current situations in the region, the changes do not represent a complete update to the 208 Plan. An updated plan will require thorough analysis of growth in the last 30 years, and a projection of growth for the next twenty years, to provide a roadmap for future development. Such detailed work is well beyond the scope of the current planning grant, but it remains a desirable goal. EWG has been able to address current issues with the 208 Plan, and to meet with local officials to reinforce the importance of the plan, and to review the current service area boundaries and the overall scope of the plan in determining strategies for water quality protection.

Because initial growth projections were reasonably on target, the 208 Plan remains generally reflective of the current situation. Without dramatic discrepancies between the plan and the reality on the ground, the 208 Plan remains a useful tool to assist local government in planning and implementing updates, additions and changes to sewer services and treatment facilities. EWG has used the current grant to evaluate the 208 Plan and confirm that it still applies effectively to the region. The overall plan provides a useful tool for local planning. Some changes in facility planning areas are required, and EWG has made some changes noted in this report. EWG efforts over the last year have been particularly valuable in calling the attention to the 208 Plan, and reminding local officials of the need to follow the plan's major goal of removing point-source discharges from small receiving streams.

Update by County

Over the course of 2009, EWG staff met separately with officials in Franklin, Jefferson and St. Charles Counties to discuss the 208 Plan and any perceived needs to change, amend, or revise it. What follows is a brief summary of those meetings and recommendations by county for plan updates.

Franklin County

EWG has met several times over the course of the grant with Franklin County staff and elected officials to discuss water quality planning and issues related to the 208 Plan. The County is beginning to develop a new comprehensive plan, and EWG has provided some suggestions and recommendations for that plan development, especially with regard to stormwater and watershed planning. In turn, Franklin County officials have invited EWG staff to meet with selected developers in the county to discuss strategies to reduce stormwater runoff and protect natural areas. EWG recommendations included cluster design subdivisions and stream buffer ordinances, and strict limits in building in the flood plain of any size stream as well as a variety of Low Impact Development practices.

Brush Creek Sewer District (BCSD): Early in 2009, Franklin County notified EWG that there were serious issues with the Brush Creek Sewer District (BCSD), and the county hoped that EWG, as the 208 agency, would be able to assist. In late spring EWG met with Franklin County officials to learn more about the problems. At first it seemed like something that would be quickly resolved. Franklin County had formed a special sewer district to accept a federally backed loan through NRCS. The BCSD serves an area along Brush Creek heading west from Pacific toward Gray Summit, and more or less following Interstate 44. While most of the district is on the south side of Interstate 44, a portion is north of the highway. The BCSD area also conforms fairly well to the original 208 Plan and is hooked into the sewage treatment facility in Pacific, as defined by the 208 Plan. When EWG first got involved, Franklin County expressed concern about revenue collection. It was pointed out that the revenues were low because 1) the county had set the rates lower than where they should have been to guarantee coverage expenses; 2) a large percentage of residents served by the new sewer district were simply not paying their bills. In discussions with the county, EWG urged the county to take more aggressive action, and to work with the water district to shut off water to those who would not pay the sewer bill. At the same time, Franklin County made it clear that they did not think they should be in the sewer district business and they preferred to sell.

The city of Pacific had indicated through an official letter of intent, that it would like to purchase the district. However, there seemed to be a number of issues holding up the process. Most critical, as it turns out, is a large problem with inflow and infiltration (I/I) into the sewer district when it rains. The BCSD has a contract for 200,000 gallons per day, which the treatment plant in Pacific can handle. But when it rains, the treatment plant may receive 1 million gallons of flow. Pacific officials were concerned that they could be saddled with the cost of remediation in the system, to reduce the I/I. The city officials also expressed concern that the purchase of a district that lies primarily outside

of the city limits will cause a problem with fees, since the city subsidizes the rates to city residents (est. \$23/ month), but it can not do this for those outside of the city limits where the city estimates the rates may need to be in the range of \$55/month to cover expenses.

Initial conversations with both parties indicated that a solution should be fairly easy to obtain. EWG met with Franklin, then Pacific. Franklin County explained that it has received an offer from Franklin County Public Water District #3 to purchase the entire sewer district, or the part of the sewer district that is north of Interstate 44. The water district said that it might like to reverse the flow in the portion of the BCSD that it acquired, and build a new treatment plant on the Bourbeuse River just upstream from the mouth with the Meramec. EWG explained that such a plan would not be in alignment with the 208 Plan, and that creating a new treatment plant in such a location would create significant redundancy at this time. The Water District then said that they would still like to purchase a portion of the BCSD – or all of it if Pacific was unwilling to act.

Options began to disappear as the conversation went on. Pacific had hoped to take over the low interest loan, but USDA said no. Pacific also insisted that Franklin County take care of the I/I. Franklin County commissioned a study of the I/I problem, which was completed in January 2010.¹¹ The study has convinced Franklin County of the serious nature of the problem. Currently the large I/I means that Franklin is paying considerably more for treatment than it anticipated; and because the I/I volumes are so large, Pacific does not want to allow any additional hookups to the BCSD. Thus the sewer district, which was expected to assist development, has become a hindrance to development in the area. Finally, the increased flow is overwhelming the capacity of the pumps to serve the area, and as a result, pressure in the system has caused raw sewage to flow out of the system and to flood in certain areas.

Franklin County is looking at how it can correct the problem before sale. Pacific insists that it wants to purchase the BCSD but has indicated that it now wants to wait until after the spring 2010 elections to proceed with further action. While there remain many issues to resolve, the 208 Plan has provided a structure to assist all parties to understand more fully the options and requirements, and EWG has sought to facilitate continuing dialogue, discussion and equitable resolution to the problems.

One significant issue that has surfaced during the Franklin County and City of Pacific negotiations has been the fractured management/institutional arrangements that have occurred since the adoption of the original 208 Plan. The 208 Plan envisioned that local 201 and 208 management agencies such as City of Pacific would have complete management control of their projected sewer service areas. Because of recent state enabling sewer legislation, water districts and county administrative entities have entered into the sewer management and operation field. These additional management/institutional arrangements will require further analysis and new regional operating agreements to allow full implementation of the 208 Plan.

¹¹ *Preliminary Engineering Report and I/I Study, Brush Creek Sewer District, Franklin County, Missouri*, Prepared for Franklin County Public Works Division, by Buescher Ditch & Associates, January 2010.

St. Clair vicinity: During 2009, EWG has fielded calls from a subdivision with its own sewer district, which is served by the St. Clair treatment facility and another that is served by individual on-site treatment systems, and is seeking to be brought into the St. Clair sewage treatment area. The former expressed concern about high rates and equity of service. The second was concerned with upgrading their service and was frustrated that St. Clair seemed reluctant to take on their service. In neither case did the caller seem to have a clear idea about the costs of system management and sewage treatment. EWG staff was able to provide some assistance just by offering more complete information to the callers. The calls highlight the challenges with the patchwork approach that has been taken to the development of sewer services in the region.

There are unconfirmed reports from parts of Franklin County indicating that small package treatment plants serving various locations will have problems meeting new clean water regulations, and that some of these are new systems, which are being built with federal assistance and yet will not meet future water quality standards. EWG has not been able to investigate these issues.

Jefferson County

Jefferson County has recently passed a Unified Development Order (UDO), which enables the County Commission to create a Sewer District Board. The County executive requested information on how the County can become a Tier II sewer district, thus provided greater authority over new and existing subdivisions and their package treatment plants.

EWG worked with DNR staff to investigate options and concluded that the UDO provides the county with a significant amount of authority to influence development. The county could request further authority from the Clean Water Commission to move to the Tier II status, similar to what Boone County requested and received in 2009. On further study however, the EWG staff recommended to Jefferson County that it use its current authorities, since the county would be required to develop a comprehensive sewer plan before it could be approved for Tier II status. The cost of such a plan is probably greater than the benefit to the county in the current circumstances, especially since it has an authority that it can use effectively. As the county grows, however, the Tier II authority may become an important management asset.

The Jefferson County UDO provides a standard throughout the county for development. It also requires a stream protection with a buffer of 50 feet on stream orders 1 - 3 and a 100- foot buffer on larger streams. Thus, the UDO provides important protections lacking in much of the St. Louis region to limit development in flood plains, protect water quality and stream channels, and provide a level playing field for developers

EWG also recommended that the county appoint a sewer district board and craft development ordinances if the UDO proves to be inadequate. The county has had success in working with developers already, as in the case of the Mirasol development south of

Eureka where the county and developer worked out an agreement for the developer to create a treatment facility that will be part of the Jefferson County sewer district.

Lake Tekawitha: As mentioned above, Jefferson County has a number of small communities that rely on individual treatment systems, and the county estimates that as many as half of those systems do not function properly, either because of lack of appropriate maintenance or because of the poor quality of the soil. Most of Jefferson County that is not served by sewer districts is zoned either 3 acre or 5 acre, presumably with the assumption that a larger size tract of land will be able to accommodate the flow from an on site individual treatment system. Although individual treatment systems are not directly regulated, the failure of an individual system, and especially the failure of many systems, which leads to pollution of a lake, creates a situation where a County Health Department can step in to deal with the pollution. Such authority allows the county to declare a house uninhabitable.

Lake Tekawitha has small lots surrounding a small man-made lake. In 2009, the township of Tekawitha voted to incorporate in the hope of qualifying for state aid to create a sewage treatment facility for the families living around this lake that is seriously polluted by failing septic systems. EWG staff met with the representatives of Tekawitha and local political leaders to discuss the challenges the community faces. The community leaders initially expressed interest in creating a wetlands treatment area similar to the City of Columbia, but at a much smaller scale. Unfortunately, they do not own sufficient land to accomplish that goal. The current plan calls for a one-acre, sand filtration system that would empty into McFall Creek. This system would be built keeping in mind capacity expansion for Lake Tekawitha lots. They are also looking at the potential to create a treatment plant at the Meramec River to serve the entire McFall Creek watershed, but the costs of such an endeavor are far greater than the small community can afford, and new development in the area – at least currently – does not support such an approach. Some of the larger landowners, who may be interested in seeing their property developed, have an interest in this larger sewage treatment area, but it is not likely that they will be willing or able to pay for such a system at the present time. Jefferson County has a number of small communities similar to Tekawitha, which have problems with failing individual systems and which do not have the resources to solve their sewage problems. External sources of support may be available, but the per capita costs of addressing sewage treatment for these communities is enormous and will be born by the tax payers one way or the other. EWG has urged the Lake Tekawitha residents to work closely with DNR in their planning.

LaBarque Creek: The LaBarque Creek Watershed is in the northwestern part of Jefferson County, adjacent to McFall Creek, and south of the City of Eureka. LaBarque Creek flows north into the Meramec River, and is the first healthy tributary stream, according to the fisheries division of the Missouri Department of Conservation (MDC), from the mouth of the Meramec at the Mississippi River traveling 41 miles west. Over the last 8 years, EWG has worked+ with Jefferson County, MDC and local resource organizations to educate local area residents and invite them to become involved in developing a plan to protect the stream and watershed as development occurs. The

residents have taken an active leadership role in the effort to develop a watershed plan. Because the stream is healthy, and the goal is protect the stream to maintain stream health, the plan does not follow the USEPA 9-Element watershed plan, which is focused on correcting existing pollution problems. Nevertheless the plan provides an important roadmap for the area, and combines public education and strategies to reach new landowners and developers with a wide range of actions to maintain or improve conditions impacting stream health. EWG has been involved throughout the planning process and was one of eleven organizations, which signed the watershed plan in October 2009.

Big River: The Big River flows north to the Meramec River through Jefferson County, creating a portion of its border with St Francois and Washington counties and providing a significant stretch of bottomland as it approaches the Meramec several miles east of LaBarque Creek. In 2009, EWG was contacted by Jefferson County and interested non-profit organizations about the problem of lead in the Big River, and the threat not only to human and aquatic life from the lead present, but also the threat to the Meramec River from lead that has been slowly moving downstream from the mining belt in southern Jefferson County and northern St. Francois County. A citizen watershed group has been meeting in St. Francois County for several years, and in February 2010, EWG was invited to a meeting organized by the citizens of St. Francois and Jefferson Counties to bring attention to the opportunity to begin remediation and restoration planning for the Big River.

The meeting, held at Mineral Area College in Park Hills, included representatives of EPA, MDNR, Fish and Wildlife Service, and local governments. The Jefferson County Executive, two state representatives from the area, representatives of the US Congressmen in District 9 and District 3, and the mayors of 3 cities were present along with representatives of the two regional planning agencies that serve the counties in the area. The political leadership present suggested to the agencies that some funds should be made available now to assist participation by the communities in the Big River Watershed in the development of the Natural Resource Determination and subsequent plans.

One of the more alarming aspects of the current situation is that has recently discovered that soil contaminated with lead is being removed from Big River stream banks and used as top soil for new homes constructed throughout the area. Thus while the agency studies are proceeding, contamination is actually spreading as people who unaware of the risk, or their potential liability, contract for topsoil. This fact alone points to the urgent need to provide resources to the local governments to promote public awareness and education and to become involved in seeking solutions to this serious health risk. A watershed plan involving multiple jurisdictions will be one important step in the process.

Bellews Creek: Jefferson County has adopted a goal of developing watershed plans for all of the major watersheds in the county in order to address water quality, erosion and flooding. The Bellews Creek plan is a significant step in that direction. Having learned from the participation process used in LaBarque Creek watershed, the county was able to

move the Bellews Creek plan forward to completion. However, recent declines in county revenue have created a tight budget, and led to the reduction of staff for watershed planning.

St. Charles County

St. Charles County has experienced the most rapid growth in the decades since the 208 Plan was completed. Although such growth was projected, the county has had a number of disputes over which sewer district should service what area, and which treatment plants will service sewer districts. The plan has been complicated by the interlocking nature of the communities, the rapid annexation that has transformed rural into municipal land, and ease with which builders and developers can simply create their own sewage treatment facility for a new subdivision, leaving to the future owners the eventual connection to a regional authority.

Originally the 208 Plan called for St. Charles County to have a regional system similar to St. Louis City and County, but the Missouri Clean Water Commission agreed to break up the County into several separate districts. The objective was to regionalize treatment to remove smaller discharges of wastewater from the smaller streams. Today the sewer districts create an interesting patchwork of service.

One challenge is that municipalities often want to hook up only those customers who are in the city limits, and the competition for territory among the cities creates some unusual boundaries. Consequently, the sewer systems are not fully rational; nor is coverage as complete as it should be. DNR can withhold permits to package treatment facilities in order to push them into larger sewer districts. Nevertheless, the residential customer is the one who suffers most from the fractured system, which now allows developers to build small package treatment facilities, because the owner is the one who ends up paying a large percent of the cost for the eventual hook up to the larger system, after already paying for the initial treatment plant.

As a part of this project, EWG met with officials in St. Charles County to discuss a number of questions about authority and compliance with the 208 Plan. The fact that the county has separate districts and different ownership of treatment facilities has exacerbated tensions in certain areas, but a conversation about the 208 Plan and requirements has served to clarify responsibilities and improve relationships.

O'Fallon: After meeting with EWG, O'Fallon officials had a much better understanding of the regional 208 plan and its importance to providing a systematic and efficient approach to sewers and treatment facilities. Jurisdictional problems appear to be significantly reduced simply by making all parties aware of the 208 Plan and its regional recommendations.

Foristell: In one recent example, a small sewer district in Foristell has a failing sewage lagoon and has requested to hook into a Membrane Bio-Reactor (MBR)¹² that is part of the St. Charles Public Water District #2 sewer district. Although the original 208 Plan called for Wentzville to handle treatment for sewers in that area, the proposed solution makes sense today, given the fact that the MBR is functioning effectively. In the long term, however, MDNR and EWG should advise both Public Water District #2 and the City of Foristell that to remain consistent with the 208 Plan, their district will be expected to connect to the Wentzville system when the sewer line extension makes it economically feasible to do so.

Following several meetings with St. Charles County officials, current issues over 208 regional facility planning service areas (and who will treat sewage in some areas of dispute) seem to be resolved. However, as growth continues, the potential for additional problems in the future will remain. A complete update to the 208 Plan can serve to revise the boundaries of sewer facility planning areas for the entire county and address the ongoing stormwater problems that have severely damaged a number of smaller streams in the area.

In cooperation with Missouri Association of Councils of Government (MACOG), EWG hosted a workshop in St. Charles County for planners in the region to address stormwater, green infrastructure, and natural resource protection. Tree preservation, stream buffers, and wetlands protection are key ingredients in best management practices for stormwater as well as key to habitat and natural resource protection.

St. Louis City and County

Because St. Louis City and County are served by one sewer district – the Metropolitan St. Louis Sewer District (MSD) – the work of coordinating facilities plans is greatly simplified. Water quality problems, however, are overwhelming, as virtually every stream in St. Louis County is considered degraded by the Missouri Department of Conservation (MDC) Fisheries Biologists, who monitor fish and habitat in Missouri Streams.

Watkins Creek: Several efforts have been undertaken in recent years to develop watershed plans to address water quality issues. First, the organization RegionWise began an effort to develop a plan for Watkins Creek, which flows into the Mississippi River in north St. Louis County, just below the Columbia Bottoms Conservation area, and within the Confluence Greenway project area. RegionWise received a 319 grant to implement demonstration rain gardens and bio-swales at new schools in the Hazelwood School District. These projects have provided the region with some early stage examples of Low Impact Development techniques and some good educational programs. Subsequently, however, RegionWise experienced shifts in management and was eventually closed down as an organization. Priorities of other agencies also shifted, and

¹² For a description of an MBR see:
http://www.membrane.unsw.edu.au/staff/papers/gleslie/mbr_for_reuse_awa.pdf

as a result even with several efforts begun to develop a watershed plan, the plan does not yet exist. EWG assisted the Watkins Creek effort by meeting with other agency representatives to plan and develop an educational session for watershed residents held in August 2009. The educational program was delivered to a dozen volunteers who have committed to speak to groups in North County about water quality, watershed planning, and stormwater best practices, and to work at building more awareness of local conditions and what residents can do to improve water quality. Volunteer efforts have already succeeded in helping MSD to identify pollution hot spots in the Watkins Creek watershed. EWG has also met with Confluence Greenway to encourage that organization to take up the watershed planning effort for Watkins Creek.



Watkins Creek Workshop presenters, August 2009

Deer Creek: In the Deer Creek Watershed, in east central St. Louis County, residents who were interested protecting and restoring creeks in their back yards came together to form a Friends of Deer Creek group. They approached the Missouri Botanical Garden (MBG) for assistance in planning rain gardens to reduce runoff and improve water quality. By developing an approach to create a watershed plan, and by partnering with MSD to develop demonstration rain gardens, the Missouri Botanical Garden was able to obtain a 319 grant. EWG was invited to assist in planning and to work with the local government officials and bring them into the planning process. As the plans took shape, it became clear that although some of the work EWG would do to assist the effort, now expanded from the Friends of Deer Creek to a Deer Creek Watershed Alliance, could come from this current 604(b) grant, the resources required to produce a variety of digital maps for the Deer Creek watershed plan and the research on other data on the plan would exceed both the time frame of our 604(b) grant and the funding of the current grant. Therefore, EWG and the MBG entered into a Memorandum of Understanding that could enable EWG to bill for specific project time on the Deer Creek Watershed Plan. This arrangement has worked well to provide rapid turn around on map and data requests. The watershed planning effort has also been surprisingly well received by local government officials, although many remain uncertain of the benefits to their communities of enhanced watershed planning. Many local government officials are more concerned about flooding, although a few, included the public works director for the City of Ladue who has worked closely with MSD on the Phase II stormwater plan, understand how local governments can directly and indirectly act to protect and improve water quality.

The first draft of the Deer Creek watershed plan is close to completion. Because one of the recommended tools in the watershed plan is a volume based hydrology approach to improving water quality, and another is riparian corridor protection, some local government officials see the potential for the plan to assist them in mitigating flooding impacts while simultaneously addressing water quality needs. Meanwhile the planning for both large scale and residential rain gardens has contributed to dialogue and discussion about best management strategies. The Deer Creek Watershed Alliance was instrumental in helping define the issues addressed at the St. Louis Earth Day, November 2009 Symposium technical workshop. Moreover, the plan to conduct on-going water quality monitoring to evaluate performance sets an important standard for the region. Because the use of rain gardens and other Low Impact Development strategies is new in the region, more empirical research is needed to see what effectively works to protect water quality and what works most economically.

The Deer Creek research model helped to inform the proposal EWG submitted for installation of rain gardens on South Grand Boulevard in the City of St. Louis. EWG has also committed to continuing work with the MBG and the Deer Creek Watershed Alliance on Deer Creek projects in a second proposal to MDNR for 319 funding. At this stage in the watershed planning process, it is important the local governments see on-the-ground project implementation work in order to motivate their continued participation and acceptance of watershed planning. Additional data collection is also important to understanding how bio-retention systems operate in this region.

The U.S. Army Corps of Engineers has attended the Deer Creek watershed planning meetings, and there is a general expectation among the communities that the Corps may be able to assist them in addressing long term flooding issues. Moreover, the City of Brentwood has already identified property for FEMA flood buy-out, and the watershed plan may contribute to using such land for water quality protection.

Great Rivers Greenway (GRG) remains another potential partner for watershed planning, but with parks and trails as a priority, it is most likely that GRG can best work in partnership with other groups to implement watershed plans. GRG is a partner in the Deer Creek watershed planning effort, and is working to develop a trail and a pocket park in Webster Groves, which is intended to serve as a demonstration project in the watershed to improve water quality and control stormwater.

Lower Meramec River Tributaries: The Lower Meramec Source Water Protection project focused on West St. Louis County, in an area that is partially served by MSD sewers and is partially served by on-site individual treatment systems. Failure of these systems is a source of pollution in local streams. In addition, stormwater runoff, especially in terms of the high volumes generated by impervious surfaces and poor building methods, has significantly increased erosion and sedimentation and caused an alarming decline in water quality. EWG will be addressing this part of St. Louis County in the next two years through an ARRA grant received from USEPA through MDNR.



Meramec River near Wildwood

CityGarden: The installation of the CityGarden in downtown St. Louis, just in time for the All-Star Baseball Game in July 2009, provided an important demonstration of rain gardens on an urban street. The bump outs and rain gardens were something that was already in the South Grand Blvd. conceptual plan, and CityGarden provided an immediate example of what might be achieved on South Grand and elsewhere in the city.

The CityGarden project inspired the St. Louis Earth Day symposium planners, including EWG, to invite the designer, landscape architect Warren Byrd, to be the keynote speaker at the November symposium partially sponsored by this grant. The program encouraged active and fruitful dialogue between landscape architects and engineers about rain gardens, bioswales and other best management practices.



Bump-out and rain garden in CityGarden

City of St. Louis, Combined Sewer Area: EWG has been involved in water quality projects in the City of St. Louis, under this current grant, with staff attending a monthly meeting at the Board of Public Service (BPS) to plan and implement a demonstration project on pervious pavements. Three alleyways have been selected and will be re-paved with three porous pavements – blocks, concrete, and asphalt. The three alleyways should be installed by the summer of 2010 and post installation water quality data monitoring will be compared with pre-construction to help determine effectiveness. This project, along with the Deer Creek project work has helped to inform the plan (and 319 proposal) for the installation of demonstration Rain Gardens along South Grand Boulevard. as a part of the EWG Great Streets program. EWG also provided assistance to residents in the vicinity of South Grand to submit their own 319 proposal for pervious alleyway paving. In addition, EWG attended a meeting early on at the Operation Brightside building on Shenandoah and Kingshighway, where a proposal to create demonstration rain garden and other low impact development techniques has been developed. The three- 319 proposals represent an excellent combination of demonstration projects for the south St. Louis area, and will help build awareness and interest in green infrastructure, which is critical to addressing water quality in the Mississippi River.

These projects increase awareness among the city and agency staff about opportunities and alternative methodologies to improve stormwater management practices. Such projects also provide tangible demonstration of best practices and increase public understanding of water quality issues and solutions.

Water Resource Council (WRC)

The 208 Planning grant has enabled EWG to host a quarterly meeting of the Water Resources Council (WRC). The minutes from those meetings are in the appendix. The WRC has been a valuable forum for non-profit organizations, the development community, and federal, state and local agencies to come together to discuss water related issues. While communication alone will not address the problems, the sharing of information has helped county and municipal government officials to be more proactive, and assisted agency representatives to have a more complete perspective on work of others.

In March 2009, at the first meeting conducted under this grant, EWG provided an overview of this project for the 32 representatives present. The WRC also heard from Metropolitan Sewer District on Stormwater Phase II planning, and heard an update on the MSD rain barrel program. The WRC discussed regional issues related to stormwater management. The WRC also discussed Confluence Greenway and Meramec Greenway projects, which are creating more public awareness and interest in the regional rivers and water quality.



Water Resource Council Meeting

At the June 2009 WRC, members heard from Laura Cohen about the new Confluence Greenway 10-year strategic plan that is being developed, the efforts of the Missouri Coalition for the Environment to become a central clearinghouse for information on water quality, anti-degradation and wetlands, and water quality protection. EWG also provided an update on this project work including meetings with Franklin, Jefferson and St. Charles County officials.

In October 2009, Leanne Tippitt Mosby, newly appointed Water Protection Program Director, met with the WRC to explain her vision for the MDNR water program. Over the years, this regular interaction with the MDNR has been valued by EWG partner agencies. Preston Lacy, of the Southwestern Illinois Resource Conservation and Development (RC&D) provided an overview of their initiative to educate builders and

communities about best management practices for stormwater control, and a demonstration development. David Wilson provided an overview of a presentation at the September REGFORM Conference, on water quality and stormwater conjunction where he was on a panel with Ruth Wallace and Tina White of MDNR.

At the February 2010 WRC meeting, members heard from Joanne Boulton of Confluence Greenway on its completed strategic plan. Karla Wilson, from the Deer Creek Watershed Alliance, presented an update on watershed planning in St. Louis County. Brittany Barton and Ron Coleman of The Open Space Council provided an overview of the work completed over the previous year on identifying strategies to protect drinking water in the Lower Meramec River Basin. EWG presented an update on the 208 assessment and coordination that has been done, and also announced receipt of a new grant through USEPA and MDNR to conduct watershed planning in the Lower Meramec tributary watersheds.

Overall the WRC provides an important link for public information about EWG water quality activities. The WRC also provides an important forum for discussion of important regional issues. EWG will use the new ARRA planning grant to continue quarterly WRC meetings, and will also work closely with the Meramec Tributaries Alliance and the Open Space Council to hold quarterly meeting in alternate months. The WRC continues to provide a forum for sharing of information about the local area watershed projects.

St. Louis Earth Day Symposium: The symposium was the tenth annual conference to address local water quality issues. EWG used the 604(b) grant to support EWG participation in planning and publicity of the program to local governments. Feedback from the Earth Day symposium was overwhelmingly positive. Evaluation forms were included with the packet and also made available online; 48 were returned on site; another 37 were completed after the fact online. Because many of the questions in the two formats were different, not all replies fit all questions.

Of those responding:

- 40% had previously attended an Earth Day symposium;
- 58% were attending for the first time.
- 83% of those answering said content has influenced they way they work
- 91% were either *very satisfied* (66%) or *somewhat satisfied* (25%) with the event;
- 95% said they were *very likely* (60%) or were *somewhat likely* (35%) to attend next year;
- 98% were *very likely* (62%) or *somewhat likely* (36%) to recommend the event to a colleague.

Conclusion

Watershed planning remains a top priority for the region. Watershed planning will provide a strategy both to restore degraded streams and to protect healthy streams. Watershed planning will also provide a geographic basis for sewer district and sewage treatment facility planning and construction on the one hand, and for stormwater and non-point source planning and implementation on the other. Watershed planning will enable and require a more complete and detailed analysis of stormwater runoff than is possible in the regional 208 Plan, and is therefore an important supplement to the 208 Plan. Finally, watershed planning requires significant resources to support the involvement and education of citizens and local government officials.

EWG has received funding through the ARRA water quality planning funds to build on the work begun over the last year on this project. EWG will seek partnerships with a variety of organizations and local governments in order to maximize available resources in conducting watershed planning in the Lower Meramec River as a tangible next step. In addition to work with local governments, state agencies and non-profit organizations, EWG will reach out to homebuilders and developers in order to strengthen collaboration and support for water quality goals.

Finally, EWG recommends that USEPA and MDNR continue to prioritize funding and efforts to update and implement the 208 Plan and facility planning goals in a comprehensive format and to address the range of issues and opportunities addressed in this report.

Appendix

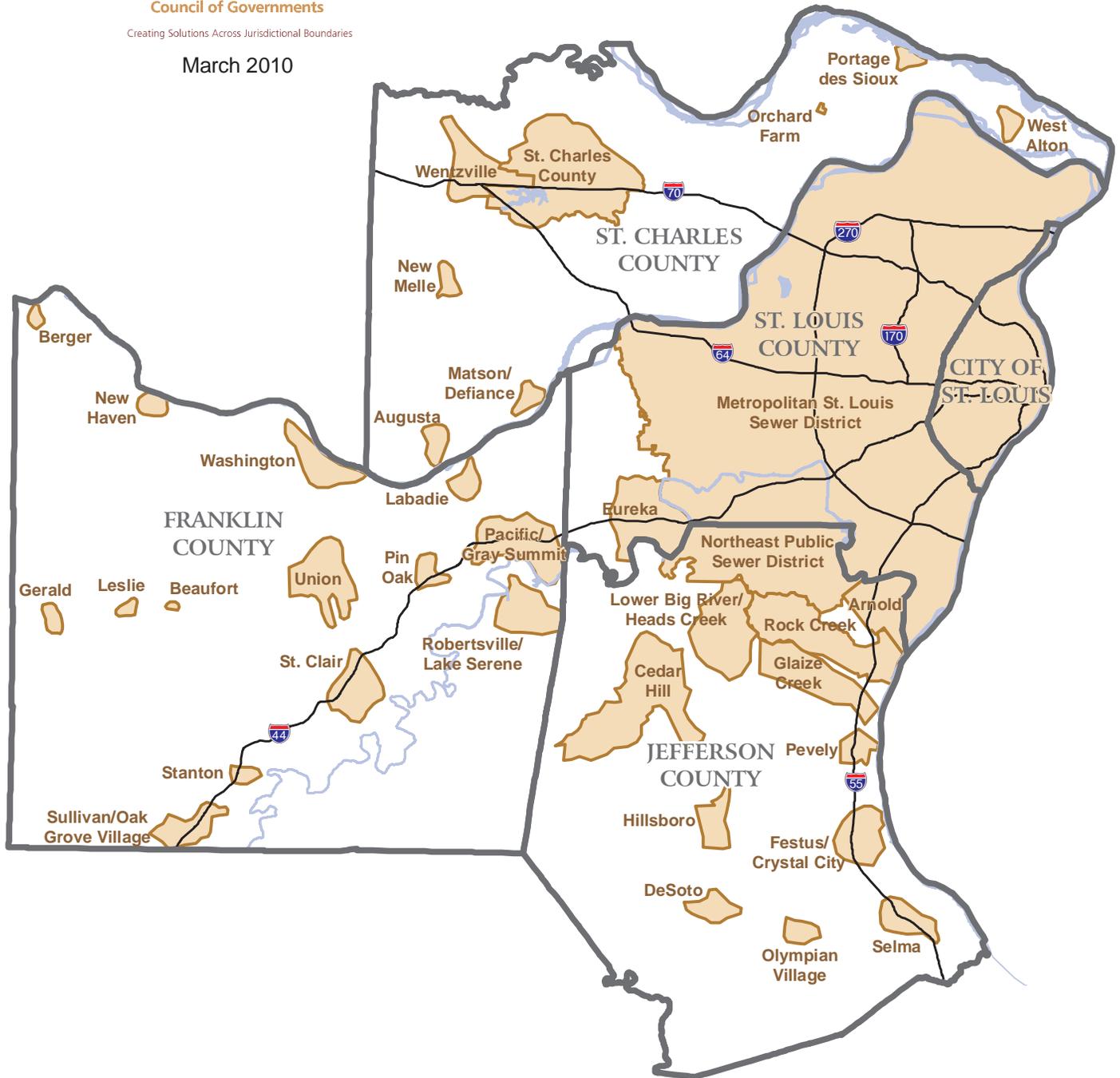
Facility Planning Areas



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

March 2010



Legend

-  County Boundary
-  Interstate
-  Facility Planning Areas

Environmental Protection Agency Region 7 through the Missouri Department of Natural Resources has provided partial funding for this project under Section 604(b) of the Clean Water Act. (MoDNR Subgrant G09-WQM-01)



Miles 0 5 10

Source: East-West Gateway Council of Governments

Facility Planning Areas

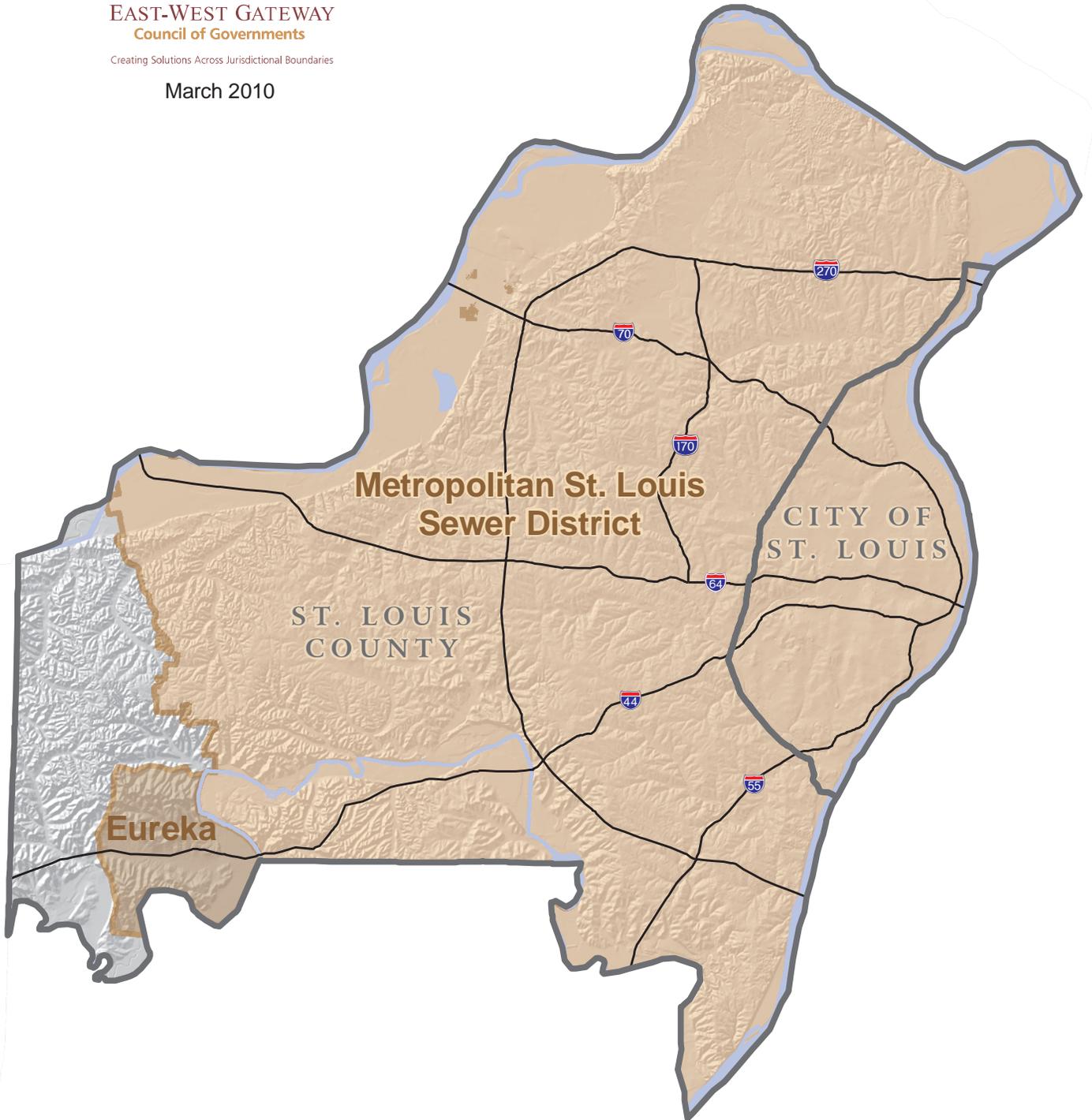
St. Louis City & County



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

March 2010



Legend



County Boundary



Interstate



Facility Planning Areas

Environmental Protection Agency Region 7 through the Missouri Department of Natural Resources has provided partial funding for this project under Section 604(b) of the Clean Water Act. (MoDNR Subgrant G09-WQM-01)



Miles 0 2.5 5

Source: East-West Gateway
Council of Governments

Facility Planning Areas

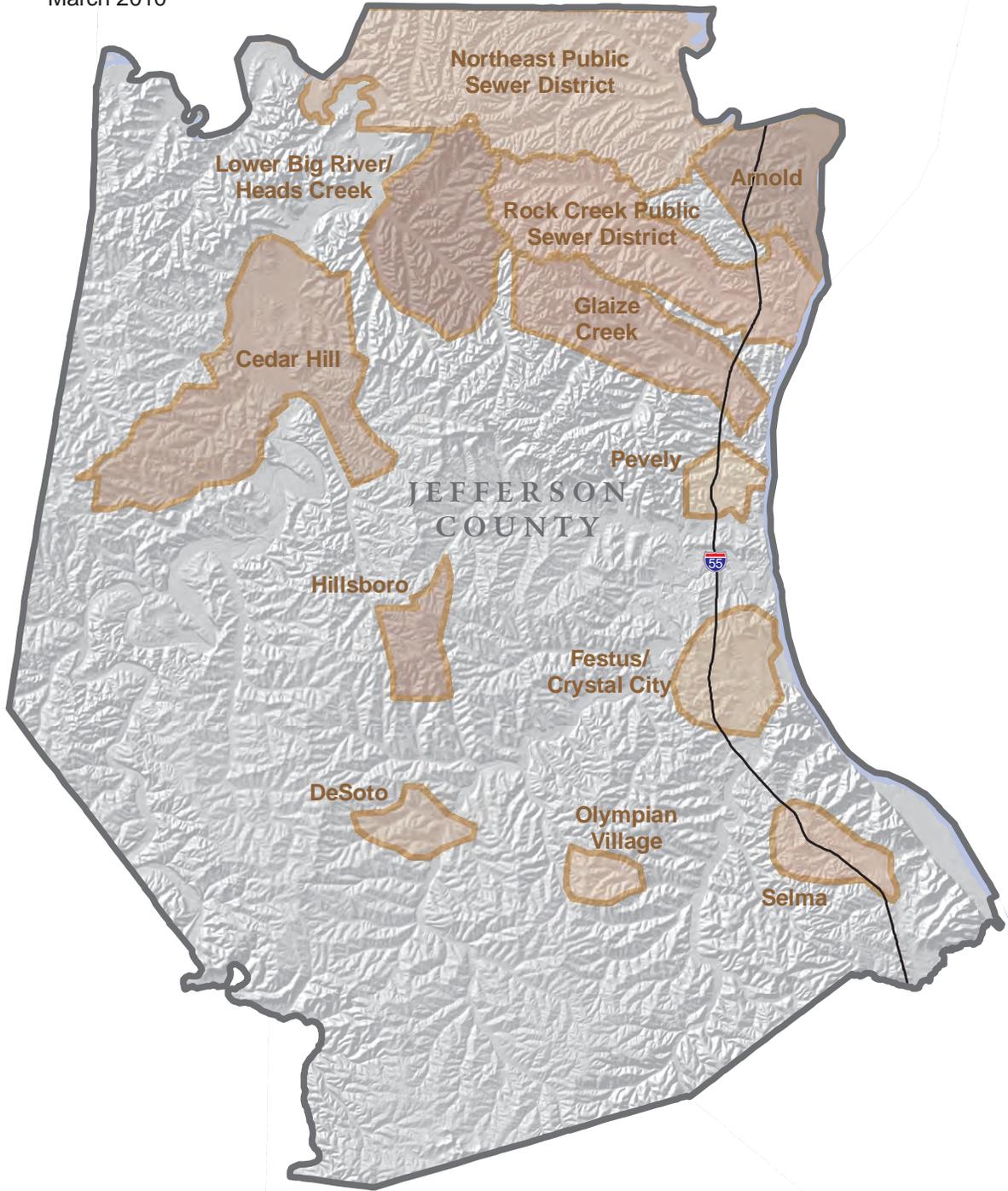
Jefferson County



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

March 2010



Legend



County Boundary



Interstate



Facility Planning Areas

Environmental Protection Agency Region 7 through the Missouri Department of Natural Resources has provided partial funding for this project under Section 604(b) of the Clean Water Act. (MoDNR Subgrant G09-WQM-01)



Miles 0 2.5 5

Source: East-West Gateway
Council of Governments

Facility Planning Areas

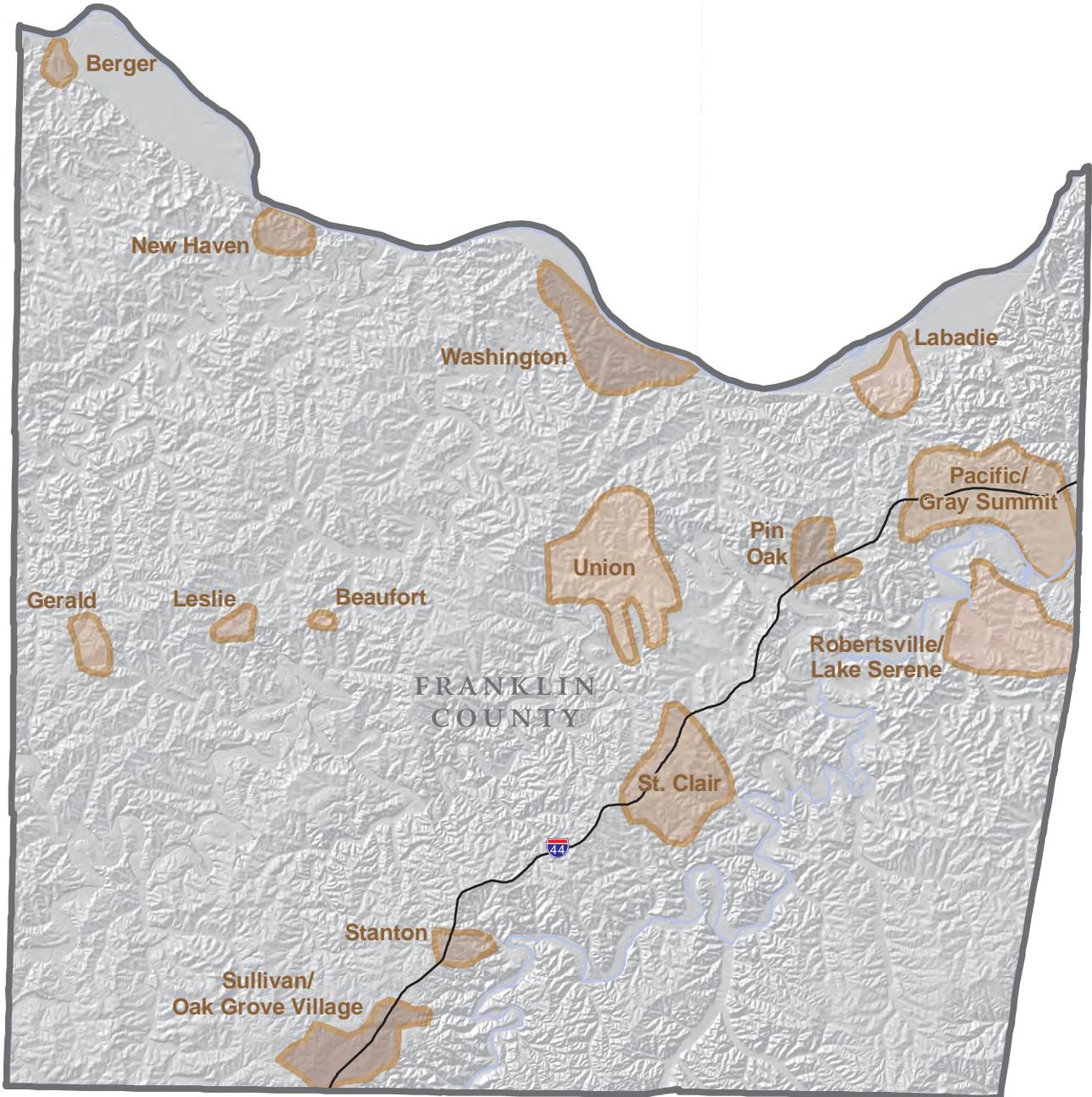
Franklin County



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

March 2010



Legend



County Boundary



Interstate



Facility Planning Areas

Environmental Protection Agency Region 7 through the Missouri Department of Natural Resources has provided partial funding for this project under Section 604(b) of the Clean Water Act. (MoDNR Subgrant G09-WQM-01)



Miles 0 2.5 5

Source: East-West Gateway
Council of Governments

Facility Planning Areas

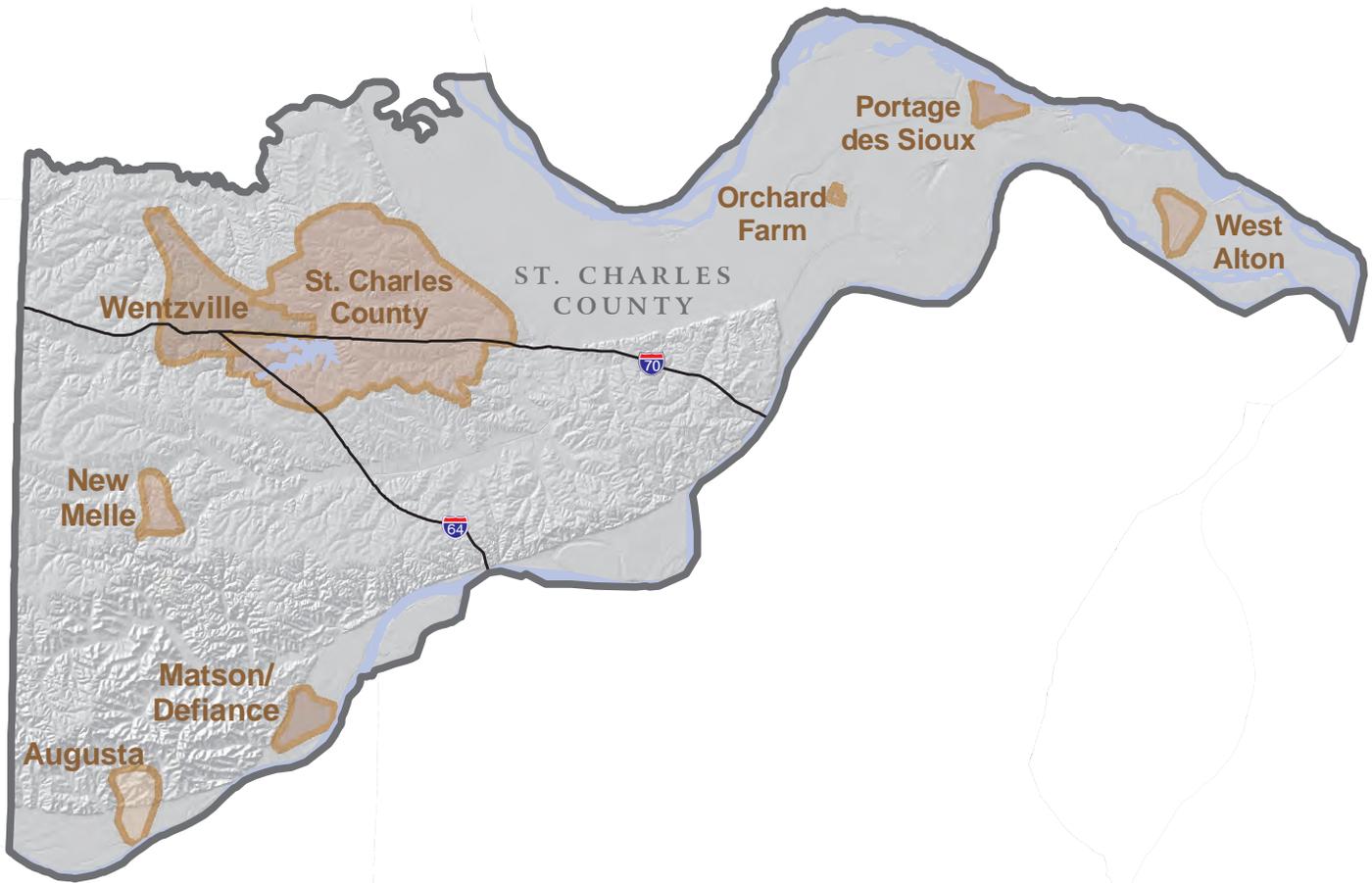
St. Charles County



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

March 2010



Legend



County Boundary



Interstate



Facility Planning Areas

Environmental Protection Agency Region 7 through the Missouri Department of Natural Resources has provided partial funding for this project under Section 604(b) of the Clean Water Act. (MoDNR Subgrant G09-WQM-01)

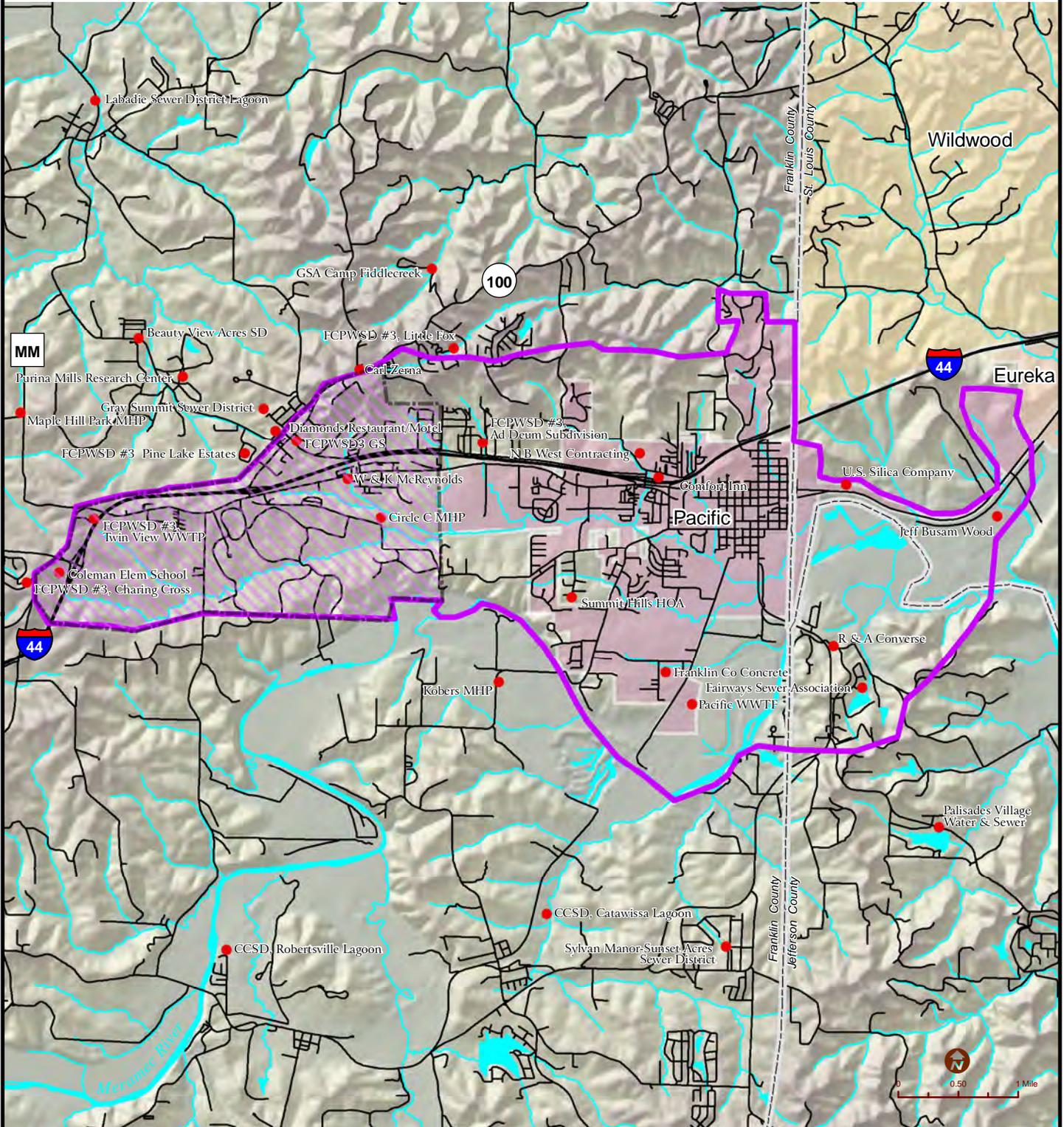


Miles 0 3 6

Source: East-West Gateway
Council of Governments

Pacific, MO Draft Facility Planning Area

June 2009



Legend

- | | | | |
|---|------------------------------|---|------------------|
|  | Brush Creek Sewer District |  | County Boundary |
|  | NPDES Permits |  | Surface Water |
|  | Draft Facility Planning Area |  | Rivers & Streams |



Environmental Protection Agency Region 7 through the Missouri Department of Natural Resources has provided partial funding for this project under Section 604(b) of the Clean Water Act. (MCDNR Subgrant Q09-WCM-01)



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

Type 3 – Improper Design and Components

Type 4 – Inadequate Biosolids Handling

Type 5 – Inadequate Receiving Stream Assimilative Capacities

Table 1.3.2-1 is a summary of the estimated number of wastewater treatment facilities in Jefferson County with effluent violations in Years 1999 and 2000. Shown is the type of effluent violation, which can be related to the problem types listed above.

1.3.3 Problems With On-Site (Residential) Systems

1.3.3.1 Estimated Numbers Of On-Site (Residential) Systems

According to the 1990 Census, of the 63,423 housing units in Jefferson County, fifty two percent (52%) were served by some form of public or private sanitary sewer service; forty six percent (46%) were served by septic tank and drain field systems or cesspools; and, two percent (2%) used some other means for disposal of sanitary wastewater. The 2000 Census on-site wastewater treatment facilities data will not be available for use until 2002, as indicated by Census officials; but the overall percentage of dwelling units served by on-site treatment facilities is estimated to be about the same as in 1990.

In the 1997 Sanitary Sewer Services In Jefferson County, Missouri Report, it was estimated that (as of the end of 1996), there were about 31,200 septic tanks operating in Jefferson County. This was the largest number of operating septic tank systems in one county in the State of Missouri. The Missouri State average for housing units served by septic tank systems was 24 percent, or nearly one-half of the percentage in Jefferson County.

The 31,200 septic systems in 1996 represented an increase of nearly 7% (1.17% per year) from 1990. This figure was reportedly an estimate because there was no readily accessible data source to document the number of housing units constructed which rely on individual, on-site septic systems for the treatment of sanitary waste. The information is included as a reporting item on applications for building permits through the Jefferson County Building Division, but there is no program to allow for the information to be easily accessed. The increase from 1990 to 1996 was based on an estimate provided by the Jefferson County Planning Division that an average of 30% of the building permits reviewed and approved by the Planning Division annually, had individual, on-site septic systems for the treatment of sanitary waste. While this rate of increase in septic tanks is lower than in previous years, the number of septic tanks in Jefferson County obviously continues to grow.

Based on a rate of increase of about 1.17% per year, the following is an estimate of the number of septic tank systems in service in Jefferson County between 1996 and 2000.

<u>Year</u>	<u>Estimated Number Of Septic Tank Systems</u>
1996	31,200
1997	31,570
1998	31,940
1999	32,310
2000	32,700

**Summary Of The
Estimated Number Of
Wastewater Treatment Facilities
In Jefferson County
With Effluent Violations In 1999 And 2000**

Table 1.3.2-1

Type Of Violation	Number Of Violations		Type Of Facility Problem(s)
	1999	2000	
(TSS) Total Suspended Solids	52	60	1, 2, 3, 4
(BOD ₅) 5-Day Biochemical Oxygen Demand	66	67	1, 2, 3, 4
(COD) Chemical Oxygen Demand	1	4	1, 2
(CL) Chlorine	1	1	2, 3
(DO) Dissolved Oxygen	0	1	1, 5
(NH ₃) Ammonia Nitrogen	1	5	1, 2, 3
(NO ₃) Nitrate Nitrogen	1	1	1, 2, 3
(NO ₂) Nitrite Nitrogen	0	1	1, 2, 3
(FC) Fecal Chloriform	44	38	1, 2, 3
(CLTRC) Chlorine Total Residual	22	29	1, 2, 3
(FT) Flourine Total	1	2	-
Temperature	3	4	-
(O&G) Oil & Grease	6	2	2

Legend for Facility Problems

- Type 1 – Inadequate Capacity
- Type 2 – Improper Operations and Maintenance
- Type 3 – Improper Design and Components
- Type 4 – Inadequate Biosolids Handling
- Type 5 – Inadequate Receiving Stream Assimilative Capacities

As indicated in the 1997 Sanitary Sewer Services Report, it was assumed by many that the number of septic tank systems would increase more rapidly in the southern portion of Jefferson County. This is because of the absence of public sewer districts and the lack of franchised areas granted to private sewer companies. Unfortunately, it appears that this is not the case. The number of septic systems increased, generally, throughout the majority of Jefferson County, including the northern portion of the County. The notable exception to this was a band which extends south from northeastern Jefferson County, which includes the City of Arnold, along the Mississippi River through Kimmswick, Barnhart, Pevely, Herculaneum, Festus and Crystal City, then extending westward to the City of De Soto. In this area the number of septic tanks declined from 1980 to 1990.

Based upon prior information from the Environmental Health Section of the Jefferson County Health Department, it is estimated that of the septic systems currently in operation in Jefferson County, fifty percent (50%) have failed or are anticipated to fail in the future. Based on the estimated current number of 32,700 septic tank systems currently in Jefferson County, this would mean that approximately 16,350 septic tank systems are failing or are anticipated to fail in the future.

Many of the residential units with failing septic systems utilize private wells for drinking water, which creates a significant health risk.

These figures help demonstrate the potential impact of failing wastewater treatment facilities, the difficulty in regulating the on-site systems, and the potential health hazards present in the County.

1.3.3.2 Regulatory Background For On-Site Treatment Systems

The following on-site treatment systems regulatory background was excerpted from the 1997 Sanitary Sewer Services Report.

In 1990, the Jefferson County Health Department was authorized by the Jefferson County Commission to assume full responsibility for the investigation of sewage complaints. Prior to receiving this designation, the responsibility for investigation of complaints was shared between the Health Department and the Building Division. This responsibility extended only to the unincorporated portion of Jefferson County. No additional powers were granted or conferred on the Health Department by the County Commission with this consolidation of responsibilities.

In May 1993, the Jefferson County Health Department was also designated as the agency responsible for evaluation and approval of sanitary sewer systems for housing units that are being sold for which a loan is to be obtained. The County Commission authorized this designation and passed a resolution authorizing the evaluating agency to charge a fee of \$50.00 per visit. This sanitary sewer designation was complimentary to the existing responsibility of the Health Department to evaluate and approve private wells and water supply systems. Again, no additional powers were granted or conferred on the Health Department by the County Commission as a result of this action. The 1990 and 1993 designations were rescinded by the County Commission in 1997. At this time, the County Commission designated the Building Division to handle the investigation of sewage complaints and to evaluate and approve sanitary sewer systems in accordance with recommendations in the 1997 Sanitary Sewer Services Report.

In June 1997, the Jefferson County Commission approved the last revisions to the Jefferson County On-Site-Sewage Disposal Systems Ordinance. The basis of this Ordinance is the International Private Sewage Disposal Code with local revisions and MoDNR Regulations 19CSR-20-3.060 minimum construction standards for On-Site Sewage Disposal Systems with local revisions. This Ordinance also included requirements for the certification of on-site sewage disposal system contractors and designers. The Ordinance indicates all newly created lots with on-site sewage disposal systems shall have a minimum of 60,000 square feet, unless provided otherwise in the Jefferson County Zoning Ordinance.

The Jefferson County Subdivision Regulations include the following criteria for on-site treatment systems:

“Individual sewage disposal systems may be used in subdivisions where central sewer systems or other similar mains of disposal are not feasible, provided each lot is 60,000 square feet or more in area in those locations where percolation tests, soil depth, and site slope indicate that the soil characteristics and site conditions are suitable for the type of individual sewage disposal systems proposed. If the subdivider can demonstrate to the Planning and Zoning Commission that the use of individual sewage disposal systems on tracts less than 60,000 square feet would be feasible, and would have no detrimental effect on surrounding properties, the Planning and Zoning Commission may approve individual sewage disposal systems on tracts of less than 60,000 square feet.

Individual sewage disposal systems shall be designed and installed in accordance with the standards, criteria, procedures, and approval of the Department of Natural Resources and/or the Jefferson County Building Commission. The Building Commission shall have jurisdiction over final approval and inspection of all individual sewage disposal systems.”

While the regulatory frame work for the placement of individual septic systems has been increased as a result of changes to both the Zoning Ordinance, Subdivision Regulations, Building Code, and On-Site Sewage Disposal Systems Ordinance, there are still areas of concern regarding approvals for septic systems on pre-existing recorded lots. The Building Division currently allows for the placement of septic systems on “all pre-existing recorded lots prior to the adoption of the On-Site Sewage Disposal Ordinance that are as small as 20,000 square feet with public water or 40,000 square feet with a private well.” Individuals with lots within these categories must request a variance from the Jefferson County Board of Appeals. The Board of Appeals may consider this only under the following conditions: lot size; reserve area requirements; location from property lines and drain field quantity requirements with provisions of a holding tank.

1.3.3.3 Review of Problems With On-Site Septic Tank/Drain Field Systems

As indicated in Section 1.2.4 of this CCWMP Report, the majority of complaints to the Building Division concern either on-site or off-site drainage of septic tank/drain field system effluent and the nuisance conditions the effluent creates. This condition occurs primarily due to the incompatible soil and geological conditions in the majority of Jefferson County with septic tank/drain field systems.

In the Jefferson County On-Site Sewage Disposal Systems Ordinance, Paragraph 101.7.1 Failure describes a failing private sewage disposal system as follows:

"A failing sewage disposal system shall be one causing or resulting in any of the following conditions:

1. The failure to accept sewage discharges and backup of sewage into the structure served by the private sewage disposal system.
2. The discharge of sewage to the surface of the ground or to an open ditch.
3. The discharge of sewage to any surface waters or ground water.
4. The introduction of sewage into saturation zones adversely affecting the operation of a private sewage disposal system.

Exception: Any on-site sewage system design and approved to surface by the governing authority within the guidelines of this ordinance shall not be considered a violation."

MoDNR 10 CSR 20-8.021 Individual Sewage Treatment System Standards indicate the following soil characteristics as limiting for septic tank drain field systems:

"Soil characteristics - limiting. Those soil characteristics which preclude the installation of a standard system, including, but not limited to, evidence of water table or bedrock closer than three feet (3') to the ground surface and percolation rates slower than one hundred twenty (120) minutes per inch. Also the amount of rock fragments in areas of significant potential for groundwater contamination."

Appendix E includes the latest Map of the Soils of Jefferson County prepared in 2001 along with indexes for the 2001 Map, soil descriptions and recommendations for wastewater facilities.

A report prepared in 1969 by Mr. Edwin Lutzen, Engineering Geologist of the Missouri Geological Survey entitled "Suggested Waste Disposal Plan for Jefferson County", concluded that septic tanks and drain fields are not appropriate for use in most of Jefferson County. The 2001 and 1969 reports recommend that installation of septic tanks and drain fields in Jefferson County should be tightly controlled and restricted. The 1969 Report also recognized that every lot must be considered on an individual basis and that the specific conditions on one lot may differ dramatically from a lot in the same vicinity. Nonetheless, the recommendation of the 1969 report was that existing septic tanks and drain fields, generally, be eliminated and that new installations not be allowed without detailed soil evaluations.

Adoption of the On-Site Sewage Disposal Systems Ordinance in June 1997 was a significant step in alleviating potential future problems with newly constructed on-site septic tank/drain field systems in Jefferson County. The Jefferson County Commission and Building Commission had the foresight to recognize the significant problems with on-site septic tank/drain field systems that were installed without the more stringent lot and system requirements contained in the Ordinance. However, as indicated in Section 1.3.3.1, there were an estimated 31,200 septic tank systems in Jefferson County in 1996 and there are

an estimated 16,350 of these systems that have failed or are anticipated to fail in the future. These numbers for pre-existing systems and estimated failing systems gives an order of magnitude of the problems with on-site septic tank/drain field systems.

1.3.3.4 Other Significant Problems Associated With On-Site Systems

- **Operation and Maintenance**

An operation permit is not required for septic tank/drain field systems in Jefferson County. Maintenance and repair is on a voluntary basis by the owner. Conventional septic tank systems, particularly those installed prior to the control by the County Building Department, are sometimes maintained by pumping only when failure is evident. The County Building Division responds to complaints regarding the systems and has some enforcement capabilities of its own, but compliance is generally voluntary.

- **Disposal of Septic Tank Septage**

Septage haulers are not licensed and records are not maintained of either the septage pumped or the septage discharged at treatment plants. These conditions can lead to unauthorized discharges of septic tank septage to sanitary sewer systems.

- **Potential Contamination of Wells and Water Bodies**

As noted earlier in this section about 50 percent of the dwelling units in Jefferson County utilize on-site wastewater treatment facilities. A sizable portion of those dwelling units also utilize private wells for drinking water. The on-site septic tank/drain field systems can pose a potential health hazard for contamination of the private wells. Several lake developments in the County presently use septic tank/drain field systems for the disposal of sanitary wastewater at the developments, which can also present a potential health hazard for water recreation in the lakes.

1.3.4 Areas with On-Site Treatment System Problems

Section 1.2.4 of this CCWMP Report presents a summary of areas with significant problems with septic tank/drain field systems in Jefferson County. As noted in Section 1.2.4, this summary was taken from Attachment B of the 1997 Sanitary Sewer Services in Jefferson County, Missouri Report. Appendix F contains a summary and descriptions of the problems in each of the areas with septic tank/drain field systems as listed in Table 1.2.4-1 based on Attachment B.

In addition to the original list of septic tank/drain field system problem areas as presented in Table 1.2.4-1 and Appendix F, several new areas were identified in Jefferson County with potential problems with failing on-site septic tank/drain field systems. These areas are briefly summarized as follows:

- **Byrnes Mill Vogt Road Area**

The Vogt Road Area consists of approximately 40 to 50 homes with relatively small lots located in the City of Byrnes Mill. It is estimated that approximately 50 percent of the homes in this area have failing septic tank/drain field systems. The City of Byrnes Mill was unsuccessful in the early 1990's with obtaining a Community Development Block

Grant (CDBG) to provide new sanitary sewers to serve the homeowners of this area which could be readily connected to the City's existing sewer system. However, homeowners in the area have not cooperated with the City's efforts to provide sanitary sewers in this area.

- **Cedar Hill Old Town Area**

In accordance with discussions with representatives of the Cedar Hill Utility Company, Inc. that have the certificated service area for the Cedar Hill Area, there are about 120 to 130 dwelling units and small businesses in the general area around Highway B in the Old Town Area of Cedar Hill that have a significant number of failing septic tank/drain field systems. It is estimated that approximately 80 percent of the dwelling units and businesses in this area have failing septic tank/drain field systems. The effluent from the failing septic tank/drain field systems drain to tributaries of the Big River.

Representatives of the Sewer Company have attempted to develop a project to provide sewer service to this area. But, due to the limited income of the primarily elderly residents of this area, the sewer service project has not been approved by the local residents and the project has not moved ahead.

- **High Ridge Area**

In accordance with public comments received at a Public Meeting for the CCWMP, significant problems are occurring with the failure of on-site treatment systems in the High Ridge Area within the service area of the Northeast Public Sewer District. One of the areas contains about 20 homes and this area is generally in the area of Ridge Drive and Forest Lane. It is estimated that about 90 percent of the on-site treatment systems are failing and septic tank effluent is surfacing in roadside ditches and roadway areas.

- **Highway 61-67 Area Southwest of Festus**

According to representatives of the Jefferson County Building Division, there are several residential subdivisions and businesses located near Highway 61-67 in the Buck Creek Watershed between Stonegate Road and Meyer Road that have failing on-site septic tank/drain field systems. There are 3 subdivisions in this area with about 70 to 80 homes per subdivision and it is estimated that approximately 50 percent of the septic tank/drain field systems are failing in these subdivisions. There has been no organized effort to provide sewer service in this area.

- **Hoene Springs Area**

Hoene Springs is an unincorporated area located in north central Jefferson County adjacent to Highway W. Hoene Springs includes approximately 185 homes and it is estimated that about 50 percent of the homes have failing septic tank/drain field systems. In 1998, the Hoene Springs Improvement Association, a homeowner's improvement group, had an Engineering Feasibility Study prepared to identify alternatives and costs to provide a wastewater collection and treatment system for the Hoene Springs area. The opinion of probable cost for the project was \$2,200,000 in 1998. After the study was prepared, the Hoene Springs homeowners voted to defer action on the wastewater collection and treatment system project until a continuing authority such as the newly-formed Jefferson County Public Sewer District was operational.

- **Lake Tishomingo Area**

The Lake Tishomingo Area is an unincorporated area located north of Hillsboro, Missouri on Lake Tishomingo Road approximately 2 miles west of old Highway 21. Each homeowner provides on-site wastewater treatment contained within their property. Water supply is provided by private individual wells throughout the Lake Tishomingo Development. There are approximately 140 permanent residences and 80 part-time residences in the development plus about 175 additional building sites in the development.

In 1997, the Lake Tishomingo Property Owners Association proposed that central wastewater collection and wastewater treatment be evaluated for the area and a report was prepared and entitled "Engineering Report, Lake Tishomingo Wastewater Treatment Facility, Jefferson County, Missouri" dated November 1997. The Engineering Report indicated an initial total project cost of \$485,000. Representatives of the Property Owners Association decided to defer action on the wastewater collection and treatment system project until a continuing authority such as the newly-formed Jefferson County Public Sewer District was operational.

- **Old Highway 141 Area Subdivision**

There is a subdivision area with about 100 homes located in Jefferson County between Old Highway 141 and New Highway 141 near the St. Louis County line with failing on-site treatment systems. It is estimated that 50 percent or more of the on-site treatment systems are failing. The Northeast Public Sewer District is considering extending the District's sewer system to this unsewered subdivision area. The proposed project will consist of collector and interceptor sewers, a pump station, and a force main connecting to the District's interceptor sewer system.

1.3.5 Drinking Water Well Contamination Concerns

As part of the preparation of the Management Plan, the MoDNR-St. Louis Regional Office-Public Drinking Water Program Office, Jefferson County Health Department-Environmental Health Section and the Jefferson County Building Division were contacted to determine if these governmental agencies were aware of any reports or claims that non-community or community wells were contaminated by either septic tank/drain field systems or wastewater treatment facilities. Representative of the MoDNR Public Drinking Water Program Office indicated that they had not received any reports or claims of well contamination in Jefferson County for either community or non-community wells. Community wells have fairly stringent MoDNR requirements for casing pipes and pressure grouting to seal off formations that are, or may be, contaminated; or that may yield undesirable water. Community wells have also isolation radiuses from potential sources of contamination. For example, the isolation radiuses for sewage treatment plants, septic tanks and disposal fields are 100 feet minimum and 300 feet recommended.

Representatives of the Jefferson County Environmental Health Section and Building Division did not have any reports of well contamination in either community, non-community or residential wells from either septic tank/drain field systems or wastewater treatment facilities.

Due to the geology in some parts of Jefferson County (with Karst and fractured rock formations), however, the potential exists for potential contamination of residential wells and non-community wells by septic tank/drain field systems or wastewater treatment facilities. This is especially true for older wells that were constructed prior to the development of the current well standards and specifications.

1.3.6 Other Types Of Wastewater-Related Problems

1.3.6.1 Handling And Disposal Of Biosolids From Wastewater Facilities

As noted in Sections 1.2.1 to 1.2.3 of this CCWMP Report, public and private wastewater treatment plants in Jefferson County generate a significant volume of waste biosolids (sludge) which must be processed and disposed. Currently only a few of the treatment plants in the county, such as the existing Festus-Crystal City WWTP and RCPSD Black Creek WWTP which use belt filter presses, utilize any process to remove water and reduce the volume of the biosolids before land application and disposal.

As example of the magnitude of the problem, the NEPSD generated the following volumes of liquid biosolids during the Year 2000. At the District's fourteen smaller wastewater treatment facilities, the biosolids volume generated was about 2,161,000 gallons, which was taken to either the Ron-Rog or Highway 141 treatment facilities. The liquid biosolids removed from the District's Ron-Rog and Highway 141 Treatment Facilities were as follows during the Year 2000:

<u>Treatment Facility</u>	<u>Gallons Of Biosolids (Sludge)</u>	<u>Dry Tons Of Sludge</u>
Highway 141	2,444,000	239
Ron-Rog	2,269,000	258
Total	4,713,000 (a)	497

- a) Based on a typical tank truck volume capacity of about 3,000 gallons, this volume of biosolids is equivalent to approximately 1,600 tank truck loads of biosolids.

The District currently uses a contract hauling and disposal firm to land apply the liquid biosolids on one of the St. Joe Lead/Doe Run Company land reclamation sites at Desloge, Missouri in St. Francois County at an estimated cost of about \$350,000 in the year 2000.

The RCPSD's new 4.8 MGD capacity Kimmswick Wastewater Treatment Facility is estimated to produce thickened, liquid biosolids at a rate of about 28,000 GPD or 1,000,000 gallons on a yearly basis in 2003. Final disposal of these biosolids is presently planned to be at a Metropolitan St. Louis Sewer District Treatment Facility.

Lower Meramec River Source Water Protection Strategy Exchange Report



PREFACE

The Trust for Public Land (TPL) and the United States Forest Service (USFS) began work on a project in the fall of 2007 to demonstrate the value of protecting forest lands in source watersheds. They evaluated subwatersheds throughout the Upper Mississippi River Basin to select a midwest demonstration project. Given the capacity of the Open Space Council of St. Louis (OSC) as a strategic partner, as well as the high priority nature of the source water and its simultaneous susceptibility to development pressure, the Lower Meramec River Basin was selected as the next demonstration site. The primary purpose of this demonstration project was to show how land/forest protection and management strategies can be utilized in watersheds to protect and improve raw drinking water quality.

The Meramec River Tributary Alliance – a collaboration of about 30 agencies and organizations with an interest in the river – worked with USFS, TPL, and OSC to identify areas within the watershed most likely to benefit from conservation, restoration and stormwater best practices. MRTA determined that the study area would be: Fox Creek, Brush Creek, and Hamilton Creek subwatersheds of the Lower Meramec River Basin encompassing about 130 square miles. The downstream water intakes serve over 200,000 people in the St. Louis metropolitan area. The study area encompasses parts of three Missouri counties: St. Louis, Franklin, and Jefferson.

TPL, together with project partners, developed maps that identify target areas for conservation, restoration and stormwater objectives. USFS and TPL worked with the Tributary Alliance to identify additional questions that must be tackled in order to develop an integrated approach to on-the-ground implementation in the watershed.

These questions were examined by the Strategy Exchange Team (sometimes referred to in this report as “outside experts”) during a five-day visit to the study area between May 11 and May 15, 2009. The Strategy Exchange Team was an interdisciplinary team of 4 professionals who had developed successful programs in other watersheds and wanted to share their skills and experiences with colleagues facing similar challenges. The team followed a schedule of community gatherings with local experts to discuss watershed issues. Tributary Alliance members and others worked closely with the Exchange Team, and together came up with strategies contained in this report.

This project would not have been possible without support from the USFS (Northeastern Area State and Private Forestry Division), The Trust for Public Land, the Open Space Council of St. Louis, the East-West Gateway Council of Governments, The National Fish and Wildlife Foundation, Boeing Charitable Foundation, Great Rivers Greenway District, Missouri American Water and the Norman J. Stupp Foundation.

June 2009

**Lower Meramec Source Water Demonstration Project Report:
Strategy Exchange Team Recommendations**

I. PROBLEM STATEMENT

I.A. Ecological Concerns = Water Quality Concerns

The primary problem to be addressed by any actions taken with respect to the Lower Meramec River Tributary (LMRT) watersheds is the same problem that all watersheds face – the natural functions and benefits of a watershed become significantly degraded when combined with human influence and development, unless proactive efforts are made to protect the watershed's functions and benefits. While the LMRT watersheds are generally considered to be in good condition, especially considering their proximity to a large urban area, evidence of degradation, in the form of increased erosion, decreased biodiversity, changing flow dynamics, and other effects has already been clearly documented.

For the LMRT watersheds, the functions and benefits that face the threat of degradation are numerous, but can be summed up in two main elements. The first involves the Meramec River's use as a drinking water source for a large population (about 200,000 people) in the metropolitan St. Louis area. The surface water intakes for Missouri-American Water Company's drinking water treatment operation are located a short distance downstream of the LMRT watersheds. Therefore, the quality of the water that leaves the LMRT watersheds is a direct contributor to the quality of the drinking water produced, and to the viability of the Meramec River as a continued drinking water source. The second element is the overall ecological value of the LMRT watersheds themselves, particularly to the residents who live in them. Much of the appeal of this area lies in its rural character, its forests and open spaces, and its healthy streams. These qualities are both contributors to and results of the overall health of the LMRT watersheds.

These two elements of the functions and benefits provided by the LMRT watersheds are somewhat exclusive in the sense that each element is experienced by a different population. While there is some overlap, most of the people who use the drinking water produced from the Meramec River do not live in the LMRT watersheds – they live farther downstream. Likewise, much of the population residing in the LMRT watersheds utilizes private wells for drinking water, so do not utilize the Meramec River as a drinking water source. However, while they may be experienced by different groups of people, these two elements are by no means unrelated.

Preserving a watershed's functions as a drinking water source area requires the same efforts and practices necessary to preserve a watershed's ecological functions and benefits. This synergy has important implications for the strategies employed to protect these watersheds, and provides opportunities for partnerships between all the stakeholders in the quality of the LMRT watersheds.

I.B. Need for Leadership and Grassroots Involvement

During the Strategy Exchange, the "outside experts" heard from many local experts on their agency's or organization's experience with topics related to watershed protection. In the course of field visits and in the roundtable sessions people who live and work in the project area provided insights into the barriers they encounter in their efforts to protect and restore the natural resources of the Lower Meramec. Our analysis suggests that lack of cohesive, organized leadership is one of the fundamental sources of these barriers.

It was clear that there are many capable and committed individuals who are working hard within the state and local government departments connected to conservation and water quality and that area nonprofits have excellent, dedicated staff. In addition, we were impressed by the caliber of people and products associated with the LaBarque Creek Watershed Association. Nevertheless, the depth and breadth of leadership and engagement needs to be substantially increased in order to achieve meaningful shifts in public policy and accomplish large-scale conservation and restoration initiatives.

On the surface it might appear that change can occur through local government intervention and investment. And, ultimately conservation of the areas' land and water resources does depend on municipal actions. But those actions will require difficult political choices on the part of elected officials. Whenever and wherever there is a confluence of issues related to land, water, regulation and money elected officials tend to become very cautious. Citizens and community leaders will have to convince elected officials to think big and do formerly unthinkable things such as campaign for voter authorization for a bond to pay for acquiring conservation easements and funding septic upgrades. **Therefore, there is a strong need for grassroots organizing and leader mentoring in order to build the political momentum that will make implementation possible.**

The Tributary Alliance provides a good core of leadership and offers potential for expansion. It is not, however, likely to be very influential with local officials. The agencies represented are very important for their combined expertise, funding, relationships and possibly enforcement authority. The nonprofit participants bring a whole suite of skills and capabilities that nicely complement those of the agencies. **Yet none of the Alliance members is currently able (by mission, fiscal abilities, or staffing levels) to lead implementation of a multi-pronged strategy for protecting or improving water quality in the Lower Meramec. A cohesive vision is needed for the target watersheds – one that can unify the Alliance and help motivate its members.**

I.C. Importance of Cooperation

Cooperation among groups in the Lower Meramec Watershed, via the Meramec River Tributary Alliance, will help develop a common strategy for information collection and analysis as well as a common understanding of the roles, priorities, and responsibilities of all stakeholders, organizations and governmental entities and thereby avoid duplication of efforts and conflicts of interest. Water quality problems, like the accumulation of pollutants or nonpoint source pollution can be addressed collectively and at the watershed level to identify the most cost-effective pollution control strategies to meet these clean water goals.

Efforts done at the watershed level are appropriate because they are readily identifiable landscape units with readily identifiable boundaries that integrate terrestrial, aquatic, and geologic features. Focusing on the whole watershed helps reach the best balance among efforts to control point source pollution and polluted runoff as well as protect drinking water sources and sensitive natural resources.

The Meramec River Tributary Alliance through increased organization and cooperation can reach its full potential in 1) Aligning and assigning roles and responsibilities based on the different organizations capacities, 2) Identifying and prioritizing water quality problems in the watershed, 3) Developing increased public involvement including help in forming local watershed partnerships, 4) Coordinating activities with other agencies, 5) Defining problem

areas and measuring success through increased and more efficient monitoring and other data gathering, 6) Developing and implementing public education campaigns designed to give a consistent message throughout the watershed, and 6) Coordinating regulation and conservation efforts.

A fully organized Alliance will allow for the close cooperation among local citizen groups, local governments, other state agencies, and federal agencies and allow a focus on those controls necessary to produce measurable improvements in water quality. This also results in a more efficient process: It encourages agencies to focus staff and financial resources on prioritized geographic locations and specific goals and projects thereby avoiding duplication of resources and funding and allowing coordination between agencies and individuals with an interest in solving water quality problems.

I. D. Need for Education and Outreach

Many things are going right for the lower Meramec and most of the elements are in place to achieve the goal of sustaining and improving the quality of LMRT waters (e.g., technical expertise, organizational structure). ***There are examples of successful partnerships and cooperatively-generated action plans in place (e.g., LaBarque Creek Watershed Conservation Plan), but what appears to need reinforcement and invigoration is transferring these successful examples to other watersheds and communities, finding the resources to implement action plans, and getting the grass roots support and political will to make significant changes in ordinances, priorities, enforcement, and individual action.*** As was quoted in the Strategy Exchange background materials, “We have the expertise, but we are not reaching the people.” Barriers identified by people participating in the Strategy Exchange included:

- It is difficult to reach people, particularly in larger watersheds. This is particularly true in the areas where many residents are commuting to St. Louis to work. This is compounded by a lack of agency staff and funding for education and outreach.
- There are a number of overlapping organizations trying to get messages out to people. At the same time, in the case of overlapping jurisdictions (e.g., city/county), there is the potential for issues regarding whom is in control of regulations.
- There is a general lack of public understanding of the sensitivity of the resource and the potential costs of inaction. This is manifested in a reluctance to spend money for services that benefit the environment, such as stormwater fees or septic system maintenance.

With 33 subwatersheds draining directly to the river, 3 counties, and multiple municipalities, as well as unincorporated areas, coordination and cooperation take substantial, intentional effort. The major cross-cutting challenges identified in the Issues Report prepared by the Trust for Public Land and Open Space Council, namely policy implementation hurdles, a need for landowner and developer education and outreach, better agency and organization collaboration, and better funding, all require a strong, coordinated, proactive approach to public outreach in order to succeed.

Though successful coordination and shared goals at the organizational level are critical to implementing solutions, adequate funding and a knowledgeable, willing citizenry are also essential. At this point it appears that most of the new developments that are contributing to stormwater and habitat stresses to the river and its tributaries are being designed, built, and perhaps occupied by people who may not be aware of the ecological value and fragility of the

resource. It was not apparent based on the supporting documentation that the panel received that any research has been done to evaluate citizen attitudes or behaviors, so this statement is somewhat speculative at this point.

Although Missouri has an excellent volunteer stream monitoring program, the data collected through this program could be used more effectively for increasing citizen awareness and perhaps for tracking regional changes in stream water and habitat quality caused by land use change.

II. OVERARCHING SOLUTIONS SUGGESTED

II.A. Cooperation

The LMRT watershed comprises three counties and numerous small cities underlining the **need among all the agencies within the watershed to develop a method of cooperation and regular communication** to allow for 1) Sharing of information, 2) Coordination of efforts in the enforcement of the regulations designed to protect water quality, 3) Finding funding needed for enforcement of existing and new regulations, and 4) Working for passage of any needed legislation both in and beyond the watershed

II.B. Leadership

As noted above, the lack of a clear organization to champion implementation of LMRT watershed protection efforts is an important problem to solve. However, picking a group or creating one and saying, “Go,” is not a sufficient solution. There are several key steps involved for the stakeholders in the LMRT watersheds that must be undertaken in order to develop a strong and effective leader. **The first step is to create or affirm a watershed vision.** Clear goals need to be defined. This report may be a key part of that step, but it is not the only part. Stakeholders will need to reach some level of consensus on the desired outcome for the watersheds.

Once goals are defined, the stakeholders need to develop a structure for implementation. Who is best to lead this effort? It may make sense for an existing organization, such as the Meramec River Tributary Alliance to take on the leadership role. Having a single organization in a leadership role ensures that there is a responsible party that can focus very specifically on implementation efforts, but it can lead to a lack of participation or interest by other organizations. Alternatively, it may make more sense to use a model of shared and distributed responsibility. With this model, different organizations take on different aspects of the leadership responsibilities through a formal agreement, which allows the stakeholders to take advantage of each organization’s strengths. There are several different models of leadership. It’s important to choose the model that is most amenable to the stakeholders and appropriate for accomplishing the consensus goals. **It is recommended that this issue be carefully considered – securing the assistance of a professional facilitator to help identify the roles for individuals and organizations in the leadership structure may be worthwhile.**

II.C. Education and Outreach

Given the difficulty of finding sustainable funding and of reaching the public with conservation messages, it is important that the multiple jurisdictions concerned with the Meramec River watershed find ways to work together to reduce inefficiencies, develop shared messages, and

fine-tune their education and outreach efforts to target specific interest groups with messages and programs tailored to their attitudes and behaviors. This cooperative effort would also be the vehicle for applying for the grant funds that would be necessary to accomplish the goals outlined in this report.

An important tool for disseminating information to the public, as well as communicating among watershed partners is a “watershed community” Web site. Many groups of seemingly disparate and disjointed organizations and governmental entities have been able to coalesce around interactive Web sites.

The Panel recommends that Community-Based Social Marketing be considered as a framework for designing a cooperative, unified educational program focused on improving land use behaviors and personal choices, ultimately leading to better stewardship of aquatic resources. **A better understanding of the barriers to behavior change is an important prerequisite to a successful outreach program. It is also important to develop some sort of evaluation program to document changes in attitudes and behavior as a result of education and outreach.**

Missouri is ahead of most states with its volunteer stewardship and monitoring programs. The Missouri Department of Natural Resources (MDNR) Volunteer Water Quality Monitoring Program and the Missouri Stream Teams are excellent ways to involve and educate citizens. **The Panel recommends promoting these excellent programs throughout the study area and encourages participation in a new program titled Cooperative Stream Investigations (CSI).** Experienced participants in these programs should be enlisted for peer-to-peer mentoring of new teams.

Demonstrations sites should be selected and developed with behavior change education in mind. Demonstration sites including innovative stormwater and wastewater management technologies, private woodlot management, environmentally sustainable lawn and garden care, and other sustainable practices could be used for educational workshops.

II.D. Demonstrations

There are a variety of interpretations of the word “demonstration” in the context of this project. In the broadest sense, the entire project demonstrates how recent advances in GIS technology can be combined with hydrological data to evaluate conservation and restoration priorities in a watershed. Bringing this cutting edge methodology to the Lower Meramec allows interested parties to quickly determine which lands contain resources that need to be retained or restored if residents want to maintain a clean, drinkable, fishable, swimmable Meramec.

The maps created in Phase I, using the “priority index” methodology, can be a powerful tool for building partnerships, support and funding for implementation. **A well-articulated and comprehensive acquisition plan for the Lower Meramec should be formulated – possibly based on the recommendations in the report – to guide additional prioritization among the parcels shown on the maps as being important for water quality protection.** Currently over 12,000 acres are considered high priority for either conservation or restoration. Completing a vision will provide additional criteria to use as finer screens for determining which tracts deserve/require immediate attention. The process of creating this project selection system will demonstrate to the public and municipalities where to focus their time and money for maximum benefit. **Implementation partners will need to investigate each of the priority parcels to determine which ones offer the best combination of natural features, funding leverage and landowner motivation.**

Although research from around the country has shown that protecting large forested areas provides the greatest returns on investment in terms of water quality and quantity, conservation alone will not assure the long-term water quality in the Meramec. Stormwater, sewage and other forms of pollution from existing and new developments, agriculture, roads, landfills and municipal treatment facilities can all cause significant degradation of surface and ground waters. Accordingly, the panel recommends that implementation include methods to control pollutants. Many of these methods can be demonstrated to important audiences ranging from **homeowners to developers to public lands managers to elected officials. Sites selected as conservation and restoration targets may offer opportunities for testing and teaching about technologies that minimize or mitigate or fix stormwater and septic problems. In fact, the selection criteria could favor sites that provide demonstration opportunities.**

Of particular interest in site selection should be locations that would be suitable for a “conservation development” that would utilize careful site preparation, cluster design for the homesites and state-of-the-art stormwater management and septic treatment. Combining restoration with a demonstration-oriented development would be especially appropriate on a degraded or other cleared property.

In addition, the panel recommends securing a publicly accessible site suitable for educational activities. Especially valuable features could include exposed karst formations, springs or other visible features that can help explain watershed function and fragility.

Some of the important demonstrations will take place in existing developments or even outside of the study area. Several of the education and outreach activities described below need to be undertaken in neighborhoods where residents can see the results of improved handling of stormwater or upgrades of old septic systems.

Watersheds and communities in other parts of Missouri (including Table Rock Lake) and around the country have been testing new regulations, education initiatives, methods of controlling and cleaning run off, and alternatives to conventional septic facilities. The results of these experiments offer lessons for the study area’s leaders.

III. SPECIFIC RECOMMENDATIONS

III.A. Specific Recommendations for Wastewater

1. Challenges & Opportunities

The use of septic tank absorption fields in the soils of the study area is generally considered to be very limited due to the shallow depth to bedrock, steep slopes, and poor soils usually requiring the use of alternative treatment systems, such as Class 1 aeration units followed by drip irrigation lateral fields. The consensus of the stakeholders of the study area (who participated in the Strategy Exchange) is that current regulations dealing with the permitting, design and installation of on-site wastewater treatment systems is sufficient and that new systems are being installed that do allow for protection of ground and surface waters from pollution.

One of the key characteristics of the use of alternative on-site treatment systems is that they require ongoing management and maintenance. The U. S. Environmental Protection Agency (EPA) in its “Voluntary National Guidelines for Management of Onsite and Clustered

(Decentralized) Wastewater Treatment Systems” (produced March 2003 and available at http://www.epa.gov/owm/septic/pubs/septic_guidelines.pdf) states:

Few systems receive proper maintenance because homeowners are either unaware of the need for maintenance or find it a distasteful task. In addition, most regulatory programs do not require homeowner accountability for system performance after installation. Although it is difficult to measure and document specific cause-and-effect relationships between onsite wastewater treatment systems and the quality of our water resources, it is widely accepted that improperly managed systems contribute to major water quality problems. The *National Water Quality Inventory 1996 Report to Congress* states that “improperly constructed and poorly maintained septic systems are believed to cause substantial and widespread nutrient and microbial contamination to ground water.” Ultimately it is the absence of a comprehensive management program addressing each of these issues that prevents onsite and clustered (decentralized) systems from being considered as an effective and reliable wastewater treatment strategy. Consequently, the potential for health and water quality problems from poorly managed systems is increasing.

It is generally agreed in the study area that there is no regulatory requirement for the ongoing management and maintenance of on-site systems after installation. Without proper maintenance, the best designed and installed system will someday fail and pollute the environment.

Another concern is the hundreds, if not thousands, of ineffective septic systems (now old and failing) were installed before current regulations were in effect. The identification and remediation of these systems is essential to any comprehensive water quality effort. Again, EPA states in the management guidelines referenced above:

Unfortunately, many of the systems in use do not provide the level of treatment necessary to adequately protect public health or surface and ground water quality. Many were initially sited and installed as temporary solutions as a result of the perception that centralized treatment and collection would soon replace them. Comprehensive, life-cycle management did not play a role in the approval or the ongoing operation of many systems. More than half the existing onsite systems are over 30 years old, and surveys indicate at least 10 percent of these systems back up onto the ground surface or into the home each year. Other data have shown that at least 20 percent of systems are malfunctioning to some degree. In most cases the homeowner is not aware of a system failure until sewage backs up into the home or breaks out on the ground surface. In many places, local authorities lack records of many of the systems in the service area.

2. Recommended Strategies

(a) Work with the various on-site regulatory agencies to require ongoing maintenance of on-site wastewater systems. One method of insuring maintenance is the adoption of EPA’s Management Model 3: Operating Permits as outlined their management guidelines referenced above:

Model 3 - The Operating Permit Model ...A principal objective of this management program is to ensure that the onsite wastewater treatment systems **continuously** meet their performance criteria. Limited-term operating permits are

issued to the property owner and are renewable for another term if the owner demonstrates that the system is in compliance with the terms and conditions of the permit. In subareas where it is appropriate to use conventional onsite system designs, the operating permit may contain only a requirement that routine maintenance be performed in a timely manner and the condition of the system be inspected periodically. With complex systems, the treatment process will require more frequent inspections and adjustments, so process monitoring may be required....The operating permit provides a mechanism for continuous oversight of system performance and negotiating timely corrective actions or levying penalties if compliance with the permit is not maintained. To comply with these performance standards, the property owner should be encouraged to hire a licensed maintenance provider or operator.

It is recommended that a committee comprised of all the regulatory agencies meet and develop a model ordinance for requiring ongoing maintenance of alternative on-site wastewater systems and then the committee develop a plan to educate the public and elected officials that will allow passage of the model ordinance.

(b) Develop and work to obtain passage of an ordinance that will require the inspection of on-site systems at the time of sale of the property and will require repair or replacement of failing systems that would bring them up to current standards. Suggested ordinance language is contained in Appendix A.

(c) Produce a “Septic Systems Owners Guide” that can be distributed to property owners in the study area. Information on obtaining a “Septic System Owners Guide” as developed by the Minnesota Extension Service can be found at: <http://septicprotector.com/Education.html>.

3. Demonstration Ideas

(a) Develop a demonstration site utilizing a working alternative wastewater treatment system, and showcase it during field days and public educational events. An on-site demonstration site can be developed to allow for education of the public, regulators and on-site professionals on new alternative systems and on the maintenance required. Many times, manufacturers, distributors and installers will donate systems, equipment and labor towards such a project. Distribute the “Septic Systems Owners Guide” mentioned above at these events.



The following is an example of a highly successful public on-site education campaign. In 1995, Ken Olson of the University of Minnesota Extension Service started a community education program for homeowners in the Twin Cities metro area. These 2-hour classes teach homeowners the health, environmental and financial damages failing septic systems have caused, what a proper system is, and how to use and maintain those systems. The objective of each class is to show homeowners that properly designed, installed and maintained septic systems are better for the environment

and less expensive than sewage treatment facilities, but they must be properly used and maintained. Here is a sample course outline:

- Explain the difference between disposal of waste water and treatment.
- Explain how soils naturally perform the treatment process.
- Give the history and evolution of septic systems.
- Explain how a septic system functions and what causes them to fail.
- Describe steps that can be taken to prevent a failure.
- Share environmentally safe methods that may rejuvenate a failed system.
- When applicable, focus on how small communities can map out a plan of action to deal with sewage treatment and show them how not to get “taken to the cleaners”...a very common occurrence with smaller communities.
- Answer questions and facilitate discussion.

Because of the number of questions from the audience these classes typically run 2½-3 hours. Follow-up studies have shown virtually 100% of the people that attend these classes make changes in their life-styles to protect their systems and a large percentage voluntarily replace/repair their failing systems. Requests from small communities outside the metro area and in other states proved the nation-wide need for this educational process.

Having worked with the Extension Service on various educational programs, Jim vonMeier volunteered to take this a step further by working with Health Departments and communities performing these classes in other parts of the country. These agencies/groups welcome the help and have said this [educational process] is long over-due. Many have also stated homeowners seem to listen to an outside source more readily than a local source.

A balance of new regulations and increased public education can allow on-site wastewater systems to be properly designed, installed and maintained to allow for protection of ground and surface waters in the study area.

4. Funding Sources

(a) Encourage the Missouri Department of Resources (DNR) to use a portion of the State Revolving Fund (SRF) they receive from EPA for repair and replacement of failing onsite systems. For years EPA has encouraged states to use a portion of the SRF funds for repair and replacement of onsite systems. While many states have a successful onsite SRF program in place that is not the case in Missouri. Even though a substantial amount of Missouri SRF money was set aside for onsite systems, to date none of it has been spent for this purpose. DNR should be strongly encouraged to develop an onsite SRF program patterned off the successful programs in other states.

(b) Utilize the Rural Development 504 Loan/Grant Repair & Improvement Program for very low income home owners. Rural Development, a division of the USDA, has a program that can provide low interest loans or even grants for very low income homeowners if they meet the program requirements. Contact the local USDA, Rural Development office for complete program details.

III.B. Specific Recommendations for Stormwater

1. Challenges

General background information on the nature of common stormwater problems and management solutions for addressing them is provided in Appendix B. During the panel's meeting on stormwater issues during the Strategy Exchange Week, several specific challenges became evident.

(a) Varying regulations of varying effectiveness. The LMRT watersheds include at least seven (7) jurisdictions (Franklin County, Jefferson County, St. Louis County, City of Ellisville, City of Eureka, City of Pacific, and City of Wildwood), all with different post-construction stormwater management requirements. Some jurisdictions have robust stormwater regulations, effectively addressing all four levels of stormwater management, some have no post-construction stormwater management regulations, and some fall in between, regulating some levels of stormwater management, but not fully integrating all levels.

(b) Improper installation and maintenance procedures. Regulations are important to ensure proper design of stormwater management practices, but proper design does not ensure proper function. Appropriate installation and maintenance procedures must also be utilized for practices to function as designed. Lack of knowledge of installation procedures on the part of construction personnel and lack of knowledge of maintenance requirements on the part of property owners were both noted as important challenges to overcome.

(c) Redevelopment not included in stormwater management regulations. When stormwater managers discuss the issue of redevelopment, the phrase, "death by a thousand cuts," is often mentioned. The reason is that redevelopment is often not covered under traditional stormwater management regulations because it is either not addressed in the same manner as new construction, or it falls under the area threshold (1 acre for many jurisdictions in LMRT watersheds) for application of the regulations. While it is often not regulated for stormwater, that does not mean redevelopment does not affect stormwater quality. Redevelopment projects usually result in increased impervious surface and increased stormwater runoff compared to the pre-existing condition. If redevelopment is common in a community, the combined effect of each small individual redevelopment project can lead to problems with both stormwater quality and quantity.

2. Programmatic recommendations

(a) Regulation upgrades and coordination. It is important for each jurisdiction in the community to assess whether or not its stormwater management regulations are sufficient to do their part in achieving the goals set for the watershed. In order to meet those goals, each jurisdiction will likely have to develop stormwater management regulations that effectively address all four levels of stormwater management: flood control, channel protection, water quality, and natural resource protection as described in Appendix B. Redevelopment cannot be ignored either. Adjusting the regulations to address redevelopment, either directly, or by decreasing the minimum area threshold is another important step.

While each jurisdiction has different needs, goals, and enforcement capabilities, it is not necessary for each jurisdiction to individually develop its own stormwater regulations. Good examples of each level of stormwater management exist amongst the jurisdictions in the watershed, and much can be gained by coordinating efforts to develop sound stormwater management regulations. For example, the city of Wildwood has strong natural resource

protection and tree preservation regulations, the counties all require detention for varying degrees of flood protection, and the Metropolitan St. Louis Sewer District has adopted comprehensive water quality regulations. In addition to these local examples, CWP has developed a model stormwater management ordinance, which is included in the manual by Hirschman & Kosco (2008): *Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program*, available at: http://www.cwp.org/Resource_Library/Controlling_Runoff_and_Discharges/sm.htm.

(b) Improved inspection programs. While the panel does not have specific knowledge of the stormwater inspection programs of the jurisdictions within the LMRT watersheds, problems with installation and maintenance were noted as a considerable issue. Inspection is one method for addressing this issue. Inspection needs to happen during the installation process and after construction is complete. One effective inspection technique for construction is to require certification of stormwater management practices before they are approved and a certificate of occupancy is granted or the performance bond is released. After construction is complete, periodic inspections need to continue to ensure proper function of the practices. Since it is difficult for local governments to spend the time needed for this type of inspection, one solution would be to require periodic third party inspections as part of an approved maintenance plan. CWP's model ordinance provides further guidance on inspection and maintenance requirements for stormwater management practices.

(c) Education on the benefits and techniques of stormwater management to foster commitment. The programmatic stormwater management recommendations discussed above are relatively straightforward concepts, but that does not make them simple or easy to implement by any means. Ordinances do not get changed and inspection budgets do not get increased merely because a recommendation was made for improvement. For changes in stormwater management to occur, key stakeholders must be educated as to the benefits and techniques involved. The stakeholders include elected officials, local and county stormwater managers, construction personnel, and property owners. Each of these groups need to be made aware of the direct connection between stormwater management and watershed quality, as well as the techniques involved in successful stormwater management – elected officials, so they can change regulations to better address watershed goals; stormwater managers so they can implement the regulations; construction personnel, so they can improve installation techniques, and property owners, so proper maintenance of stormwater practices ensures continued function.

3. Demonstration

Demonstration projects can be an effective method for education of all the stormwater management stakeholders. They create the opportunity for people to see how a successful project can work. In the case of stormwater management, there are generally two types of demonstration projects, retrofits and new development.

(a) Retrofits. Stormwater retrofitting is a process used to implement stormwater management in locations where practices previously did not exist or were ineffective. Stormwater retrofit demonstration projects are typically installed on publicly owned properties, where property acquisition costs are not an issue and the visibility of the project will be high.

Watershed mapping, as has been undertaken for the LMRT watersheds is extremely useful in locating ideal sites for stormwater retrofit demonstration projects. The following table, excerpted from *Urban Stormwater Retrofit Practices*, Manual 3 in the CWP's Urban Subwatershed

Restoration Manual Series (available at <http://www.cwp.org/Store/usrm.htm#3>), provides a guide for using watershed mapping information to locate different types potential retrofits. The types of retrofits, as well as the process of retrofitting are further described in the Manual.

Table 4.11: Desktop Search Criteria for Different Retrofits	
Retrofit Location	What to Look For
SR-1: Existing Pond	Evaluate stormwater layer to find existing stormwater ponds with a contributing drainage area greater than 5 acres or Superimpose topography, drainage layers and aerial photos to identify low points in the drainage network where dry ponds may exist.
SR-2: Roadway Culvert	Superimpose topography and headwater stream layers (zero, first and second order) over the local and state road network to identify road crossings.
SR-3: Below Outfall	Superimpose publicly-owned stream corridor land parcels at least two acres in area with storm drain outfalls with a diameter greater than 12 inches and less than 60 inches.
SR-4: Conveyance System	Superimpose ditch lines, zero-order streams, conveyance easements or open channels with open land adjacent to the drainage network
SR-5: Transport Right-of-Way	Compare local, state or federal highway right-of-way layers against the stream or drainage network to identify open spaces one acre or greater or review highway agency GIS for existing stormwater infrastructure or treatment practices suitable for retrofitting.
SR-6: Large Parking Lot	Match large contiguous parking areas/rooftops greater than 5 acres in size with adjacent open land in public or institutional ownership, or owned by the same landowner.
OS-7: Hotspot Operation	Review land use maps to identify commercial, industrial, or municipal land uses or search permit databases to identify industrial operations that hold stormwater permits.
OS-8: Small Parking Lot	Search for parking lots less than five acres in size that are municipally or institutionally owned.
OS-9: Individual Street	Screen for streets that meet street retrofit feasibility criteria, such as slope, right-of-way width, open section drainage, presence/absence of sidewalks and parking lanes.
OS-10: Individual Rooftop	Superimpose property ownership layers with aerial photos or planimetric data to locate large municipal, institutional, commercial or industrial buildings that may be assessed for demonstration rooftop retrofits or look for clusters of building permit data that indicates areas experiencing active redevelopment
OS-11: Little Retrofit	A desktop search is not helpful in finding specific locations for little retrofits, although a GIS can help find tax reverted vacant lots and publicly owned parcels, such as parks, schools, recreation centers to investigate in the field.
OS-12: Landscape/Hardscapes	A desktop search is not helpful in finding specific locations for landscaping and hardscaping retrofits although it can find the general public spaces with high exposure and outdoor amenities, such as parks, schools, central business districts, spaces etc.
OS-13: Underground	A desktop search is not helpful in finding specific locations for underground retrofits, although storm sewer and utility maps are essential for field investigations.

(b) New development. A new development provides a greater opportunity to demonstrate to stakeholders many of the benefits and techniques of stormwater management and show how stormwater management can be included as an important attribute of a development. With this type of project, the entire process can be used for demonstration, from planning and permit review through construction and maintenance. Also, an entire property can be treated with proper stormwater management practices whereas with a retrofit, it would typically be just a small portion of the property that can be treated.

On the other hand, it may be much more difficult to locate a suitable new development project for demonstration. Unless a new school or government building is planned, cooperation with a private developer will likely be necessary. In addition, watershed mapping is less useful in this situation. Finding a suitable site will depend more on communication with local developers in order to find the right partnership and location. If a willing developer cannot be readily found, it

might be necessary to offer an incentive such as agreeing to take over maintenance responsibilities in order to get innovative stormwater management practices included in a development.

III.C. Specific recommendations for conservation and restoration

Research in watersheds around the country has shown that conserving and/or restoring forests can be the most efficient and cost effective way to prevent declines in water quality and quantity. Forests retain rain, allowing the water to slowly percolate down into the soil, eventually reaching the aquifer or surface water. In addition, preventing development -- particularly in highly sensitive locations such as those revealed by the priority index mapping done in the Lower Meramec -- keeps pollutants ranging from construction runoff to lawn fertilizers to pet waste out of the water. In keeping with findings from watershed research in other parts of the country, monitoring data from the study area reveals that water quality has decreased as subdivision and development increased. The research on the role of forests in maintaining water quality and quantity, shows that water quality begins to decline measurably when the percent of forested land decreases below 75%. In the LMRT watersheds today, 65% is still forested (Data from 2005, Missouri Resource Assessment Partnership). Accordingly, the project implementation in the Meramec must include strategic land conservation and restoration in order to achieve its water-related objectives and the natural resource/open space goals of the area's residents.

1. Opportunities and challenges

The study area is approximately 65% forested or forested wetlands. Almost 19% of the study area is grassland, 8% is developed, 6% is cleared for agriculture, about 2% is open water, and less than 1% is barren or sparsely vegetated ((Data from 2005, Missouri Resource Assessment Partnership). So there are still opportunities both to conserve relatively undisturbed lands and to restore tracts that have lost their native vegetation. Arguably, the national economic downturn increases the opportunities to acquire properties -- or property interests such as leases or conservation easements -- for these purposes because the study area is suffering more than other parts of the state according to Realty Trac (As of January 2009, St. Louis County (1 in every 604 housing units) and Jefferson County (1 in every 619) had two of the highest home foreclosure rates in the state. Franklin County was only slightly better. For more information, see <http://www.realtytrac.com/MapSearch/Missouri.html>). Parcels that were purchased for development in the past few years may become available as a result of the downturn. And landowners who were previously holding large tracts off the market in anticipation of increasing interest on the part of developers may now be amenable to other alternatives.

Prior to this quick market reversal, there had been substantial growth in the suburban and exurban communities surrounding the City of St. Louis. Local experts indicated that most new residents in the study area fit one of three profiles -- commuters, retirees or work-from-home professionals. In all cases, homebuyers are generally seeking a rural lifestyle, improved quality of life and relatively inexpensive property (compared to similar homes in the city).

The "outside experts" participating in the Strategy Exchange, and the local experts, believe it is only a matter of time before land sales and the conversion patterns resume, changing forests and farms into subdivisions and commercial sites to serve new residents. As one person interviewed for the Strategy Exchange commented, "Time is not on our side. We had better get

busy.” In order to ‘get busy’ and conserve the tracts that are most critical to the future health of the waters and ecosystems of the Lower Meramec, priorities must be established quickly.

Some parts of the study are better suited than others for providing water quality protection. The Conservation Priority Index map in Appendix C shows the areas that have forests and wetlands and key hydrologic features in the watersheds studied. The most suitable lands comprise about 8,700 acres (10% of the study area). When overlaid with property boundary locations, this includes 326 parcels. The map in Appendix D shows the areas that are most important for restoration or implementation of best practices for agriculture. The most suitable lands comprise 4,320 acres (5% of the study area). When overlaid with property boundary locations, this includes 117 parcels. Protecting large contiguous parcels of forest land, wetlands and farmland can play a critical role in preserving water quality and quantity and the quality of life that area residents value. Development of these parcels – particularly using standard development techniques that clear the land as a precursor to construction --would lead to substantial degradation of water quality and a loss of groundwater recharge.

Together, the conservation and restoration priority maps show over 12,000 acres of important land that could serve the project’s purposes if protected or restored (almost 25% of the study area). This represents an unmanageably large number that is likely to overwhelm anyone interested in helping pursue conservation. At this time, funding for conservation and restoration is very limited outside of the area covered by the Great River Greenway District. Even when additional funding is secured, as suggested in the section on funding that follows, it will be imperative that projects be selected in a highly strategic way as there will always be more need than money.

2. Programmatic recommendations

As previously recommended in earlier sections of this report, the next steps for this project will require new levels and types of cooperation among the agencies and organizations that are already working in the watersheds, plus engagement of a larger cross section of stakeholders. Previously, we mentioned the **need for both a strong leadership structure and a “vision” that describes what those leaders want to achieve.** The vision will be essential for expanding local political and financial support for conservation and restoration, and for determining what properties should be targeted for protection.

There are a handful of agencies and organizations whose missions and capabilities make them potential participants in future conservation and restoration activities. Specifically, the Open Space Council, Great Rivers Greenway District, The Nature Conservancy, The Trust for Public Land, the Ozark Regional Land Trust, Missouri Department of Natural Resources and Missouri Department of Conservation all have experience with land acquisition or other forms of conservation and restoration agreements with landowners. In order to maximize ecological and public benefits from future land protection investments **it is imperative that these entities (and possibly others) work in a coordinated manner using a collective vision.**

Once the overarching vision for future action has been established, the entities with an interest in the land conservation implementation (for example land or easement acquisition, or other types of negotiations with private landowners) should **establish additional guidelines for selecting the highest priority tracts from among the many possibilities identified during the mapping phase.** These guidelines should help participating entities focus their limited time and funding on parcels that will have the biggest conservation impact. The implementing

partners must also conduct on-the-ground assessments and evaluate the landowners' motivations to identify best short term and long term conservation priorities. Prioritizing should be a collaborative effort that involves all key participants so that partners are deployed effectively, funds are used efficiently, competition is minimized and public visibility is maximized.

The types of guidelines that the implementing entities may want to evaluate for screening potential conservation projects could include:

- Property size – The mapping work identified parcels over 20 acres. It might be desirable to seek out tracts of considerably greater acreage.
- Access by a public road- If the vision includes a site which would be available to the public for educational and recreational purposes, it will be important to prioritize tracts with a direct connection to a public road.
- Contiguity with existing protected lands or connectivity to greenways – There are many ecological benefits to expanding existing parks and preserves. Even small parcels can be important buffers to sensitive lands or links in a trail system.
- Presence of endangered species – If any of the mussel species have been designated as federally threatened and endangered, there may be possibilities to secure funds for habitat protection that also serves water quality.
- Frontage on a waterway – Fishing, swimming and boating are all important recreational activities that draw visitors to the area and improve residents' quality of life. If these are important considerations for involving the public, it may be wise to prioritize parcels that expand access to significant rivers and/or streams.
- Matching fund availability – It is important to be familiar with sources of matching monies and the purpose of each.

This list is not exhaustive. Rather it gives some ideas that can be used by the coalition of implementers as they define and refine the criteria for selecting the highest priority parcels.

There are few regulations available in the study area to help protect forests and/or wetlands, therefore acquisitions or voluntary land protection strategies (such as forest management plans or conservation easements) for private land will be essential for protecting the largest remaining forest tracts. The Panel recommends that the prioritization process consider all possible tools for retaining natural land cover on as many of the large, priority tracts as possible.

Well-managed farmland, particularly pastureland, also contributes greatly to water quality and quantity by allowing infiltration and filtering pollutants. Poorly managed farmland, on the other hand, can contribute to fecal coliform and nitrate problems. Although agriculture is not a major economic activity in the study area, local investigations have determined that livestock practices can have a significant impact on water quality, especially where cattle and/or horses are allowed to access streams and wetlands. The Panel recommends that implementation include conservation of priority agricultural parcels (through fee purchase or conservation easements), use of practices such as planting buffers and building fences around waterways and wetlands, and other voluntary measures and incentives to restore degraded lands. In places where degradation has been substantial there may be opportunities to create a partnership with a developer with an interest in low impact construction, combined with a restoration effort.

A conservation easement (sometimes referred to as a purchase of development rights) is a good tool when a landowner is interested in protecting his property, but not in selling. The landowner agrees not to develop the land, but retains ownership and rights to conduct forestry, agriculture, and other agreed-upon open space land uses that are compatible with the water

quality and other objectives of this project. A landowner may agree to allow public access, but access is not generally provided for without additional payment. The Forest Legacy Program administered by the USDA Forest Service provides funds for purchase of conservation easements in states with an approved plan (Assessment of Need or AON). Missouri completed its AON, and at least one easement (over the property owned by the Wild Canid Center) has already been purchased in the study area.

3. Demonstration projects

As discussed in Demonstration Section II.D of this report, there are several demonstration approaches associated with conservation and stewardship that would address the opportunities and challenges described above. Most exciting to many of the partners and funders is the possibility of acquiring (through purchase or donation) land or development rights to conserve significant resources. As described in the preceding sections, the conservation and restoration priority maps provide a starting point for identifying a few key parcels. (Funding for these transactions is discussed in the following section.) The sites themselves will help maintain water quality and quantity by virtue of their protection. In addition, these protected tracts could also provide a variety of other public benefits including water access for fishing and boating, seasonal hunting areas, trails and contributions to larger networks and locations for other types of education and demonstration activities related to watershed conservation. If the vision for future action requires multi-benefit sites (for example, parcels that provide opportunities for hunting and forest conservation and limited tree harvest) the project selection criteria need to be designed to favor this type of property.

The techniques that could be used to secure a site for demonstration purposes include:

- Acquiring (through purchase or donation or a combination) fee title to private land that either becomes public or is conserved by a private nonprofit which could offer certain limited types of public access for education or recreation.
- Acquiring (through purchase or donation or a combination) development rights on private land that stays in private ownership but an agency or nonprofit has the perpetual right and responsibility to ensure that the property is conserved. There would be value in simply demonstrating this conservation tool. In addition, some landowners are willing to allow specified public uses such as school visits or bird walks.
- Securing temporary conservation of private land using a lease or management agreement, often by paying for specific conservation practices or sharing the cost of improvements, such as fencing cattle out of wetlands or planting buffer zones along streams.
- Assisting public agencies with the stewardship or restoration of public land, which could involve volunteers and opportunities to demonstrate techniques that landowners could use such as preventing or correcting erosion.

4. Funding strategies

Implementing successful long-term conservation, restoration and remediation strategies requires substantial, reliable funding from a wide range of sources. Each of the roundtables and all the conversations with local experts during the Strategy Exchange revealed the serious constraints created by lack of sufficient funding. Almost all of the recommendations contained in this report will demand some amount of money. Accomplishing a meaningful series of land or development rights acquisitions will be virtually impossible without new or expanded sources of funding.

a. Local Funding

Local funding is the most reliable long-term way to fund land conservation since state and federal funding can be scarce (and variable) and the competition for those funds is often fierce. Hence, these sources are best viewed as supplements or complements to local land conservation. **Creating local funding with a larger revenue stream -- a dedicated, long-term funding source -- would enable the counties/communities within the study area to protect important natural areas and watershed lands and possibly fund infrastructure improvements.** The local funding purposes could be tailored to citizen interests and needs, potentially including monies for recreation, parks, trails, habitat and working landscapes.

A combination of other funding sources —state, federal and private— can be brought together to help achieve conservation objectives and leverage the local revenues. Local funds should be viewed as the cornerstone upon which the larger funding strategy is built, leveraged by other sources that may be available only for very specific types of projects.

According to research done by the Trust for Public Land for the Strategy Exchange, local governments in Missouri typically fund local land conservation with sales taxes and general obligation bonds.

Sales Taxes. A sales tax increase could be used to finance land acquisition in each of the counties or support maintenance and operational needs. Revenues from a sales tax could be used for parks, storm water and capital improvements.

- A 1/10 cent sales tax increase in Franklin, Jefferson or St. Louis Counties for land conservation would have an annual cost per capita of \$6, \$6, and \$8, respectively. Jefferson County could generate over \$1.7 million annually with this sales tax.
- Since 2000, there have been 13 municipal and county sales tax measures for parks, open space, and watershed protection. All 13 were successful as shown in the chart in Appendix E.

General Obligation Bonds. Each of the three counties could hold a general obligation bond referendum, which would provide the authority to issue long-term debt to finance land conservation. The bonds could be repaid through an increase in property taxes.

- A \$20 million bond in Franklin, Jefferson or St. Louis Counties for land conservation would cost the average household approximately \$24, \$16, and \$2 per year, respectively.

If the implementation partners decide to pursue local funding to provide the core funding to execute their shared vision, the following steps could guide the process:

- Conduct feasibility research to examine fiscal options, including spending tolerance; legal issues such as ballot language requirements; election timing, and other competing spending priorities.
- Conduct a public opinion survey to determine voter priorities, test potential ballot language, assess messages, determine willingness to pay and test arguments for and against the funding.

- Create a broad-based coalition of supporters who reflect the area. This should include political leaders, supporters of greenspace and conservation, the business community, owners of farm and forestland, heads of civic and religious groups and others.
- Develop a ballot measure, based on the survey results, that incorporates the messages found to be most compelling at a price voters are willing to pay.
- Conduct education and outreach to inspire support for the ballot measure. Garner the necessary public support by having appropriate, consistent messages. With the right coalition behind it, there is a range of education activities that can be successful.

b. State Funding

The State of Missouri does not have a funding source from which it makes grants for local government land acquisition. However, the Missouri Department of Conservation (MDC) does offer Community Assistance grants for Fisheries, Outdoor Classroom grants, Fire Department Matching grants, Trees Resource Improvement and Maintenance grants which might help in the course of a demonstration project.

The Department of Natural Resources (DNR) land acquisition budget is funded exclusively from state parks earnings. DNR receives approximately \$1 million from the state every two years for acquisition, which is limited to purchasing land adjacent to existing state parks and state historic sites. Missouri ranks 42nd in the country in state spending on parks on a per capita basis.

c. Federal Funding

A number of sources of federal funding could potentially leverage local dollars for conservation and water quality protection in the Lower Meramec study area, on a limited basis. (Research for this section was conducted by The Trust for Public Land). See Appendix F for details.

The counties might also want to consider creating tax classification programs that encourage conservation and the preservation of existing forest, farm, and recreational land. These are real estate tax classifications that reduce the landowner costs of retaining open space, forests or other natural vegetation by offering preferential tax rates. These classifications do not provide permanent protection, because land uses can be changed after payment of a roll-back tax. These programs can be used to encourage landowners who want to keep their land in open space, but are not able or willing to execute a conservation agreement. However, there could also be a “rollback” provision that would require that some portion of the property tax foregone by the local government through the preferential treatment to be repaid when a parcel is sold and/or the use changed. When the tax is repaid it could be directed to a fund for conservation, restoration and demonstration activities.

III.D. Specific Recommendations for Education and Outreach

1. Challenges

Put simply, improving environmental sustainability requires working from both the bottom up (grassroots level) and from the top down (organizational level). If everyone who lives or recreates in the Lower Meramec is part of the problem, then a key challenge is to find ways to influence average citizens to the point that they change to more sustainable behaviors, resulting in improved environmental stewardship, willingness to pay for environmental quality, and reduced impacts to the environment. Meeting this challenge requires coordination and consistency at the jurisdictional and organizational level and a means to influence policy maker understanding and behavior toward more environmentally sustainable approaches.

2. Programmatic recommendations

The Panel cannot overemphasize the need to **create a comprehensive coordinating body (or modify an existing structure) to lead this effort**. Representatives from nonprofits, business, industry, utilities, citizen watershed groups, local government, academia, and resource agencies should all be included to ensure buy-in and lasting change. This body has the ability to create a shared vision for the whole basin. Involving citizen groups brings the grassroots energy that leads to lasting policy change. Many examples of successful collaborative efforts can be found online (e.g., northern Minnesota's Regional Stormwater Protection Team (<http://www.lakesuperiorstreams.org/stormwater/rspt.html>)).

The first step for this group is to identify shared goals and an action plan to meet those goals (preferably led by a trained facilitator). Clearly there will never be enough funding, time, or ability to reach all the diverse stakeholder groups in the Lower Meramec, so an important early step is to **identify "critical control points."** In other words, influencing the behavior of which stakeholder groups could yield the biggest resource protection or improvement. Part of the planning effort should include creating a list, prioritized by potential for resource protection or improvement, of audiences to reach. The Panel encourages the coordinating body to look beyond the boundaries of their counties and consider who else might be allies in achieving their goals. For example, outdoor recreation interests from St. Louis might carry some weight and have resources to contribute to maintain the high quality environment of the Lower Meramec if they were made aware of the need. Similarly, in considering audiences to reach, groups beyond the counties may be critical, e.g., St. Louis-based developers might be a high priority group.

The Panel recommends Community-Based Social Marketing (CBSM) as a framework from which to work (Citation: Doug McKenzie Mohr and William Smith, 1999, *Fostering Sustainable Behavior: An Introduction to Community-Based Social Marketing*, New Society Publishers, Gabriola Island B.C., Canada, 160 pp. Web site: www.cbsm.com). This approach, based on extensive behavioral research, involves several steps:

1. *Identify barriers to desired behavior change and potential benefits of making the changes*
2. *Develop a strategy or action plan targeted toward your specific audience using proven "tools" to change behavior*
3. *Pilot the strategy with a small group before full implementation*
4. *Evaluate effectiveness and behavior change after implementation.*

Each of these steps is critical to overall success. The LaBarque Creek watershed protection efforts provide a good example for elaborating on each of these steps. As stated earlier, much has already been done in this watershed to retain the high quality of its water. A watershed conservation plan was developed by an organized group of watershed landowners (now the Friends of LaBarque Creek Watershed) along with agency and non-profit partners. The plan provides a vision, common understanding, goals, and action items, assigns responsibility, and recommends measurable indicators of success. The watershed is one of the Missouri Department of Conservation's Conservation Opportunity Areas. It has a volunteer stream monitoring group collecting data that are posted online. Yet even in this progressive watershed, small enough to have a sense of community, it is difficult to reach people with compelling information that leads to behavior change.

EXAMPLE: Goal I.4.B. of the LaBarque Creek Watershed Action Plan aims to conserve riparian corridors by encouraging streamside landowners to establish or conserve 100 foot buffers, discourage clearing, and discourage grazing or agriculture in the buffer zone. It recommends a combination of technical assistance, outreach, conservation, and regulation. Using this goal as an example, the Panel would recommend the following:

- Do a "risk" analysis to target outreach where it will do the most good. Which of the land uses along the stream are causing the most damage and would most benefit the stream if buffers were installed? This step often requires research or analysis and has already been completed for many of the risks in the Lower Meramec. Prioritize efforts to achieve the greatest benefits.
- Elaborate upon the existing goal to make it specific and quantifiable. Develop measurable objectives, (e.g., 90% of private shoreline pasture will be fenced and have 100' buffers by 2015), using "SMAART objectives (Specific, measurable, audience-directed, ambitious but realistic, and time-bound).
- Once a critical target audience has been identified, determine what behaviors you need people to adopt to achieve your goal (e.g., keep horses out of LaBarque Creek; plant buffers between pasture and creek).
- Determine what barriers might keep people from adopting those behaviors.
- Once the behavior you seek has been identified, social marketing comes into play.

Social Marketing, Step 1: Identifying barriers and benefits.

Step 1 of CBSM, identifying barriers and benefits to achieving the behavior you are seeking, requires some background research to understand what is motivating the group you need to educate. Research should include literature reviews, focus groups, and surveys. What techniques are most effective in changing a particular behavior? What distinguishes the group of people who are "on board" with a sustainable behavior versus those who have not adopted the sustainable behavior? The goal of CBSM is to make it easier to do the "right" thing by removing perceived barriers and increasing the benefits of the new behavior. Focus groups with a small representative sample of the people you need to reach help you refine your questions which can then be asked of a larger population through a survey.

So, for example, if you seek to get horse owners to plant buffers and keep horses away from the creek, you must first do the research to understand their current attitudes, including the reasons they have not already adopted the behavior.

	Old Behavior: No buffer No fence	Behavior You Seek: Plant 100' native plant buffer and install fencing
Benefits (as perceived by target audience)	<ul style="list-style-type: none"> ▪ I decide what I do on my land ▪ Doesn't cost money ▪ Horses have access to water 	<ul style="list-style-type: none"> ▪ Protects the stream ▪ Keeps the government off my back ▪ More birds
Barriers (as perceived by target audience)	<ul style="list-style-type: none"> ▪ I've always done it this way – there is no reason to change 	<ul style="list-style-type: none"> ▪ Costs money and time ▪ Doesn't look "tidy" ▪ Reduces the size of my pasture

Next, the coordinating committee can develop targeted approaches to make it less attractive to do things the old way and more attractive to use sustainable practices, e.g., plant the buffers and build the fence.

Social Marketing, Step 2: Developing a strategy using proven “tools” to change behavior

Once the barriers to change have been identified and verified, a number of behavior change “tools” can be combined to create an action plan. Social marketing research has shown some tools to be particularly effective. These include:

Commitment – Asking people to commit to an initial small request makes them more likely to agree to a larger request in the future. Getting people to make a commitment to do things differently in a public setting helps ensure that they will live up to their commitment. Look for natural opportunities to reach people with requests for commitment. Using the horse farmer example, this might take the form of getting livestock owners to initially just allow a few trees to be planted along their stream frontage.

Prompts – We are all prone to forgetting, so prompts are essential reminders; strategically placed, self-explanatory, highly visible, and oriented toward positive behaviors. A well-known example is the storm drain stenciling program, in which storm drains are stenciled with the simple message, “Don't dump, drains to stream.”

Norms – Social research shows that if we observe others in our peer group or community following sustainable behaviors, we are more likely to do so. Norms need to be highly visible at the community level to work effectively. For example, a livestock owner who fences fields to keep animals out of the creek can be honored for his/her behavior and perhaps can be recruited to give talks to other livestock owners. Demonstrations of sustainable practices can help to change the norms.

Communication – Communication needs to be specific to the attitudes and beliefs of the primary audience you are trying to reach, needs to be from a credible source, should express the costs of inaction, be easy to remember, and be goal-oriented. Community activities and peer-to-peer communication are highly effective ways to share behavior change messages. One property owner proudly explaining their new rain garden to another can do much more than general fact sheets or workshops attended by only a few already committed shoreland property owners.

Incentives – Incentives can be very effective, particularly in cases when people are not highly motivated to change their behavior. Incentives should reward the desired behavior, should be publicly visible, and do not have to be monetary to work. An incentive could be as simple as

allowing realtors who have completed a workshop on environmentally sensitive shoreland property management to be included on a list of “green” realtors.

Looking again at the example above, the following approaches might be considered.

	Old Behavior: No buffer No fence	CBSM Approach: Decrease benefits and increase barriers	New Behavior You Seek: Plant 100' native plant buffer and install fencing	CBSM Approach: Increase benefits and decrease barriers
Perceived Benefits	<ul style="list-style-type: none"> ▪ No one tells me what to do on my land ▪ Doesn't cost money 	<ul style="list-style-type: none"> ▪ Work with “converted” pasture owners to reach their peers or others they trust (e.g., Extension Service) ▪ Fine them for noncompliance 	<ul style="list-style-type: none"> ▪ Protects the stream ▪ Keeps the government off my back 	<ul style="list-style-type: none"> ▪ Outreach campaign to link erosion and bacteria in creek from pastures to swimming or fish ▪ Increase threat of government fines for no buffer
Perceived Barriers	<ul style="list-style-type: none"> ▪ None – it has always been this way 	<ul style="list-style-type: none"> ▪ Honor those who plant buffers at event that horse owners all attend – change the norm – make them want to conform ▪ Incentives ONLY for those who plant buffers 	<ul style="list-style-type: none"> ▪ Costs money ▪ Takes too much time ▪ Doesn't look “tidy” ▪ Reduces the size of my pasture 	<ul style="list-style-type: none"> ▪ Financial incentives ▪ Volunteer or civic organizations to help plant ▪ Demonstration site – beautiful established buffer ▪ Reduced property tax for buffer area

The Panel is well aware that lack of funding for outreach and education, a general lack of public understanding, and a reluctance among the public to spend money for services that benefit the environment, such as stormwater fees might make the audience-specific, research-driven social marketing approach seem rather daunting. Nevertheless, if the Lower Meramec is able to develop a coordinating body with shared goals, the Panel believes it will be possible to develop and implement an effective social marketing plan for high priority audiences and watersheds.

3. Additional specific recommendations to consider

As part of the social marketing strategy the Panel has suggested, some of the following outreach, education, and communication approaches might be particularly appropriate for the Lower Meramec watershed.

▪ **Join the national organizations involved in outreach to increase environmentally sustainable behavior as a way to learn of resources** such as model ordinances, successful approaches to behavior change, new technical approaches, and demonstration projects. Excellent examples include:

- The National NEMO (Nonpoint Education for Municipal Officials) Network. <http://nemonet.uconn.edu/>. A confederation of programs in 31 states that educate local land use decision makers about the links between land use and natural resource protection.

- The Center for Watershed Protection. <http://www.cwp.org/>. Provides practical and technical information for people and communities interested in protecting and restoring urban watersheds.
- Center for Landuse Education and Research (<http://clear.uconn.edu/>). In particular, there is a national Low Impact Development geo-referenced database (<http://clear.uconn.edu/tools/lidmap/>) as well as a variety of other tools.
- As part of developing a stronger and more diverse coordinating body for outreach, education, and demonstration sites, **consider developing a citizen friendly Web site.** This Web site can contain much more than educational information. It can also be a central data and report repository; place to feature demonstration sites, model ordinances, stormwater plans, and other technical information; and a place to document successful outreach programs. An example of such a site is www.lakesuperiorstreams.org. It can be a “home” for downloadable outreach materials, a place to house online courses for realtors, and a central home for all the jurisdictions in the Lower Meramec.
- **Take full advantage of peer-to-peer mentoring opportunities and “train-the-trainer” programs such as Master Naturalists** to improve interest and capacity of citizens as well as transfer successful approaches and examples to other watersheds and communities.
- As progress is made toward shared, consistent messages across jurisdictions, look for ways to “tell the whole story” of the Lower Meramec by linking research and environmental monitoring to better understanding of the resource to community action. **The Panel encourages continued efforts to develop more Stream Teams in additional subwatersheds.** Data from these teams would ideally be combined with other data sources (e.g., agency data) in a geo-referenced data visualization tool that would make the data more accessible and interpretable. See <http://lakesuperiorstreams.org/streams/data/Java/DVTexamples.html> for an example of a stream water quality data visualization tool.
- **Consider including representatives from K12 education on the coordinating body.** Most teachers are limited by time, money, and expertise from including a great deal of “place-based” environmental education in their curriculum. K12 representatives can help develop targeted materials of greatest use to teachers.
- **Consider including representatives of the academic water quality research community on the coordinating body.** They may be able to access new funding sources for research, demonstration, and restoration projects.

APPENDIX A: Excerpts from Stone County, Missouri Department of Health's on-site wastewater system management ordinance

"DRAFT" Property Transfer Regulation

Section 11 – PROPERTY TRANSFER CERTIFICATES

The purpose of a property transfer certificate is to, at the time of property transfer (i.e. sale of property), verify the adequacy of the existing onsite wastewater system (OWS) if it was previously approved and permitted, or assure that an unapproved OWS will be permitted and approved within one year of the property transfer. At the time of property transfer, properties with an approved OWS (i.e. septic system) will need to pass another inspection to ensure that the OWS continues to operate properly. If the OWS does not pass this inspection, the property owner will be required to obtain a repair permit to correct deficiencies or obtain an agreement signed by the new owners acknowledging they have accepted responsibility for repairing the deficiencies. In addition, all new construction that requests to connect to an existing OWS will be subject to these same requirements of Section 11 – PROPERTY TRANSFER CERTIFICATES.

11.0 Applicability

- A. Effective June 1, 2009, prior to the sale or transfer of ownership of a property served by an onsite wastewater system (OWS, or septic system), the owners of the dwelling or occupied building shall obtain, or have in their possession, a property transfer certificate and subsequent certificate of operation for that system unless exempted or waived as noted below.
- B. If the onsite wastewater system serving the dwelling or structure was installed and given final approval by Stone County Health Department (SCHD) ten (10) years or less prior to the date of closing on the property sale, a property transfer certificate shall not be required. But if an OWS Inspection is requested by the buyer or lending institution, a copy of the inspection is to be filed with SCHD for their records, but shall not be used for requiring action on the part of the seller.
- C. A property transfer certificate and certificate of operation will be issued to any owner of a property with an OWS upon completion of a property transfer application and submission of the required documents verifying compliance with these regulations.
- D. All properties must have an existing approved OWS permit from SCHD. Property owners without an existing permitted and approved OWS will need to go through a verification process and/or apply for a repair permit, and therefore would not need to obtain a property transfer certificate. Verification and repair of an unapproved OWS are both done by way of a major repair permit. In order to be exempt from these property transfer certificate requirements, owners of a property with an unapproved OWS must apply for a major repair permit to either verify that the OWS works adequately or have it replaced.
- E. Property owners that have a permit for their OWS but did not receive final approval from SCHD will need to contact SCHD to determine the necessary steps to obtain the OWS approval.
- F. The following additional situations will not require a property transfer certificate:
 - 1. The change in ownership is solely to include or exclude a spouse.

2. The transfer is creating or ending a joint ownership if at least one person is an original owner of the property and/or his/her spouse.
3. The transfer of property contains a building or buildings connected to an OWS that will be demolished (or already has been), and the building/buildings will not be occupied after the property transfer.
4. The transfer of property is to a trust.
5. The transfer of property is to effect foreclosure or forfeiture of real property.
6. The owner of the property or the person acquiring title has signed an enforceable agreement with SCHD to upgrade the system.
7. The owner of the property will connect the dwelling or occupied building to a sanitary sewer or a shared system within the next two years following the transfer of title, provided that such agreement has been disclosed to and is binding on the subsequent owner(s).
8. The property owner is part of a community plan or management district for his/her onsite wastewater system that has been approved in writing by SCHD, and the system has been inspected as required by the plan.

11.1 Application Requirements

A. Applications for a property transfer certificate shall be made on the appropriate form furnished by SCHD and shall include:

1. Name, address, and phone number of current owner.
2. Name, address, and phone number of current occupant, if different from owner.
3. Address of the property.
4. Legal description of the property.
5. Size of the property in acres, rounded to the nearest tenth acre (1/10).
6. Type of water supply.
7. Type of existing building or structure (if commercial, list all uses or tenants).
8. Number of bedrooms in the dwelling.
9. Statement from the current property owner regarding the present operational status of the onsite wastewater system.
10. A non-refundable certificate fee, as established by SCHD.

11. A septic tank pumping receipt from a licensed cleaner and a SCHED OWS inspection report form from a certified inspector (as identified in #13 below).

12. Where required, a copy of a maintenance contract and inspection report dated not more than thirty (30) days prior to the date of application if the system contains any mechanical components, such as an aeration or secondary treatment system, and an inspection report from the service provider.

13. A report on the appropriate form provided by the Missouri Department of Health and Senior Services from an inspector who has been certified and licensed by the Missouri Department of Health and Senior Services (MDHSS) or equivalent level of training and experience as established by SCHED. The form cannot be dated more than ninety (90) days prior to the date of the property transfer certificate application and must contain the information required for an inspection by MDHSS and include the following:

- a) A drawing showing the location of the dwelling or structure with two-point triangulated distance measurements to the septic tank lid(s) or global positioning system (GPS) coordinates. This requirement may be waived if such a drawing or data is already on file with SCHED.
- b) An inspection report for the onsite wastewater system which states whether each component is in good repair and proper working order, and that the inspection was conducted to meet all SCHED requirements, as outlined in guidance provided by SCHED.
- c) Any other information as required by SCHED.
- d) If vacant, a statement of when the vacancy occurred.

B. All reports shall be submitted on the MDHSS onsite wastewater system inspection report forms that have been provided by MDHSS.

C. Unless a property transfer permit is issued, applications shall become void ninety (90) days from the date of application or at the time of closing on the property.

11.2 Issuance of a Property Transfer Certificate

A. When the conditions in Section 11.1 have been met, SCHED shall approve the property transfer certificate and issue a certificate of operation, setting forth the terms and conditions of approval, including:

1. The existence of any permits in SCHED files.
2. Determination of size, type, and capacity of the system.
3. Evidence of past failures or malfunctions within the previous three years, as shown in SCHED records.
4. Any circumstances, such as lack of occupancy, snow coverage, or other factors, that may have affected the ability of the inspector to evaluate the system.
5. Any other information as deemed appropriate by SCHED.

B. The property transfer certificate shall remain valid for a period of four (4) years from the date of issuance.

11.3 Waiver of Property Transfer Certificates

If it is determined that an onsite wastewater system does not meet any of the requirements in Section 11.2, the requirement for a property transfer certificate may be waived, provided that: The buyer has executed a written agreement with SCHED agreeing to repair or re-place the onsite wastewater system within one (1) year of the closing date of the sale or transfer of the property.

11.4 Revocation of a Property Transfer Certificate

The health officer may revoke a property transfer certificate based upon a determination that the onsite wastewater system is no longer functioning in accordance with these regulations, or if any of the requirements noted in Section 11.2 are subsequently violated, or if false or misleading material statements were made on the application or inspection reports.

Appendix B: Common stormwater problems and approaches for addressing them

Communities across the country are increasingly viewing stormwater management as an opportunity to improve the environment, create attractive public and private spaces, engage the community in environmental stewardship, and remedy the ills of the past, when development took place with inadequate stormwater controls.

Many local programs already have a strong emphasis on the stormwater basics of providing flood control and adequate drainage. Recently, many stormwater programs have become more sophisticated and more effective by incorporating channel protection, water quality treatment, and natural resource protection into their stormwater management regulations.

Common Stormwater Problems

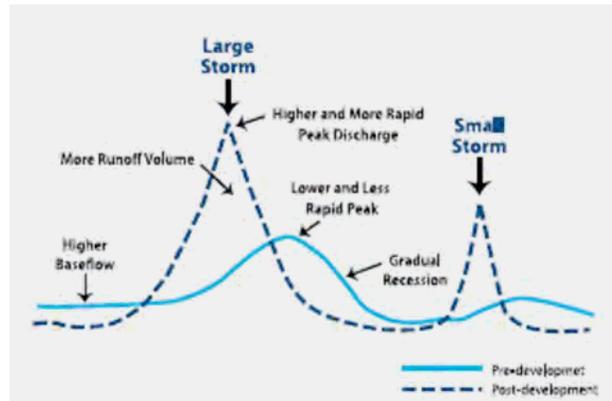
Water quality impacts from urban runoff can be significant. Many streams, lakes, and estuaries in urban areas are impaired due to urban runoff. Impervious surfaces, disturbed soils, and managed turf associated with urban development can have multiple impacts on water quality and aquatic life. These impacts are summarized in the table below, excerpted from the Center for Watershed Protection's (CWP) manual, *Managing Stormwater in Your Community: A Guide for Building an Effective Post-Construction Program*.

Summary of Development Impacts on Water Resources

Increases in:	Decreases in:
Impervious cover, compacted soils, managed turf, and other land covers that contribute pollutants	Health and safety of receiving waters
Stormwater volume	Groundwater recharge
Stormwater velocity	Stream channel stability
Pollutant loads	Health, safety, and integrity of water supplies, reservoirs, streams, and biological communities
Stream channel erosion	Stream habitat

Urban development can also impact the post-development hydrograph discharging to urban streams, as shown in the figure below. Compared to the pre-development condition, post-development stormwater discharges can increase the runoff volume, increase the peak discharge, and decrease the infiltration of stormwater, which thereby decreases baseflow in headwater streams. These changes to stream hydrology result in negative impacts on channel stability and the health of aquatic biological communities. Common problems

include bank scouring and erosion, increased downstream flooding, and loss of in-stream habitat for macroinvertebrates, fish, and other organisms. (Hirschman and Kosco, 2008)



Urban development increases runoff volume, peak discharge, and time to peak.

Stormwater Management Solutions

Four levels of stormwater management have been developed to attempt to address the degrading effects of stormwater on stream and watershed resources:

1. **Flood control.** Flood control requirements are design to mitigate the increase in the peak flow of runoff caused by development. Development leads to increased impervious surface coverage on a site. More impervious surface means more stormwater will run off the site more quickly, as there is opportunity for water to soak into the ground. The result is significantly higher peak flows in streams and waterways that can cause flooding downstream. Flood control practices, which mainly include ponds of various types mitigate the increase in peak flow by storing excess stormwater, then releasing it slowly. Flood control regulations often require that detention be provided so that peak flows from a given magnitude storm event (10-year, 25-year, or 100-year storms are typical standards), are kept at the level they were prior to development.
2. **Channel protection.** Flood control practices can effectively limit the potential for downstream flooding and property damage caused by development, but they do not address damage to stream channels in the form of erosion. The increased peak flows caused by development do not only cause flooding, they also cause stream channel erosion. In order to address this issue, a much smaller storm event must be planned for, as even the runoff from a development site produced by small storms can cause stream channel erosion. Channel protection practices are also based upon detention, but regulations typically require that 24-hour detention be provided for the 1-year storm.
3. **Water quality.** Both flood control and channel protection practices are designed to address the excess *quantity* of stormwater runoff produced by development. They do not address development's negative impact on stormwater *quality*. Development and increased impervious cover lead to significant increases in pollutant concentrations in stormwater runoff, including sediment, nutrients like phosphorous and nitrogen, bacteria, heavy metals, and other pollutants. For example, a typical developed site can easily discharge over ten times more phosphorous and nitrogen than the site would in a forested condition. Water quality practices employ techniques such as infiltration,

filtering, and biological treatment to remove pollutants from stormwater runoff before it is discharged. Typical water quality regulations require that these practices be designed to treat 90% of the annual stormwater runoff from a site. Some states and communities take water quality regulations a step farther by requiring the water quality practices to include runoff reduction or other low impact development principles. The runoff reduction principle, which requires that the quantity of stormwater runoff be reduced, rather than just captured and treated encourages a developed site to retain as much of its pre-development hydrologic characteristics as possible.

4. Natural resource protection and tree preservation. While the requirements described above are important, even the most effective stormwater management practices do not reach the level of stormwater management provided by natural systems. Therefore, natural resource protection and tree preservation are an important part of a stormwater management regulation system. Natural resource protection regulations require that the key natural features on a site be identified and preserved. A development must be planned around the important natural features, rather than eliminating them through clearing and grading. Tree preservation regulations require that a percentage of existing trees or tree canopy remain on the site through the development process.

APPENDIX C: Conservation Priority Index Maps (see next page)

Proximity to Streams and Watersheds



Soils Hydrologic Class



Soil Erodibility - K Factor

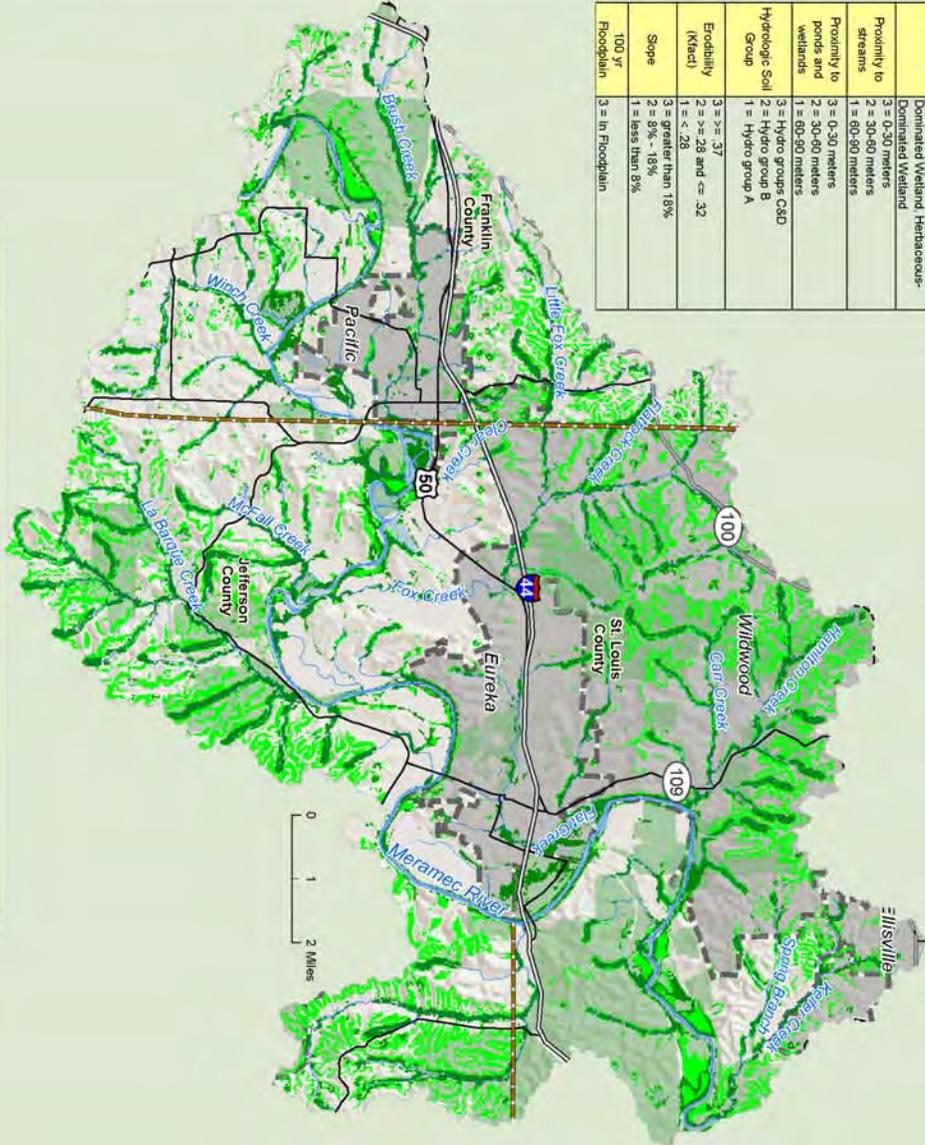


Lower Meramec Drinking Water Source Protection Project

Conservation Priority Index (CPI) Areas

May 5, 2009

Scored on 0-5 scale	CPI
3 = Deciduous Forest, Evergreen Forest, Deciduous Woodly/Herbaceous, Wood-Dominated Wetland	Herbaceous
2 = 0-30 meters proximity to streams, 1 = 60-80 meters proximity to ponds and wetlands	Herbaceous
Hydrologic Soil Group	Herbaceous
Erodibility (Kfact)	Herbaceous
Slope	Herbaceous
100 yr Floodplain	Herbaceous



Legend

- CPI 90th Percentile 13 - 21
- CPI 70th Percentile 12 - 21
- Protected Land
- Meramec River
- City Boundary
- County Boundary
- Rivers and Streams
- Interstate
- Highway
- Local Road

Slope



FEMA 100 Year Flood Plain



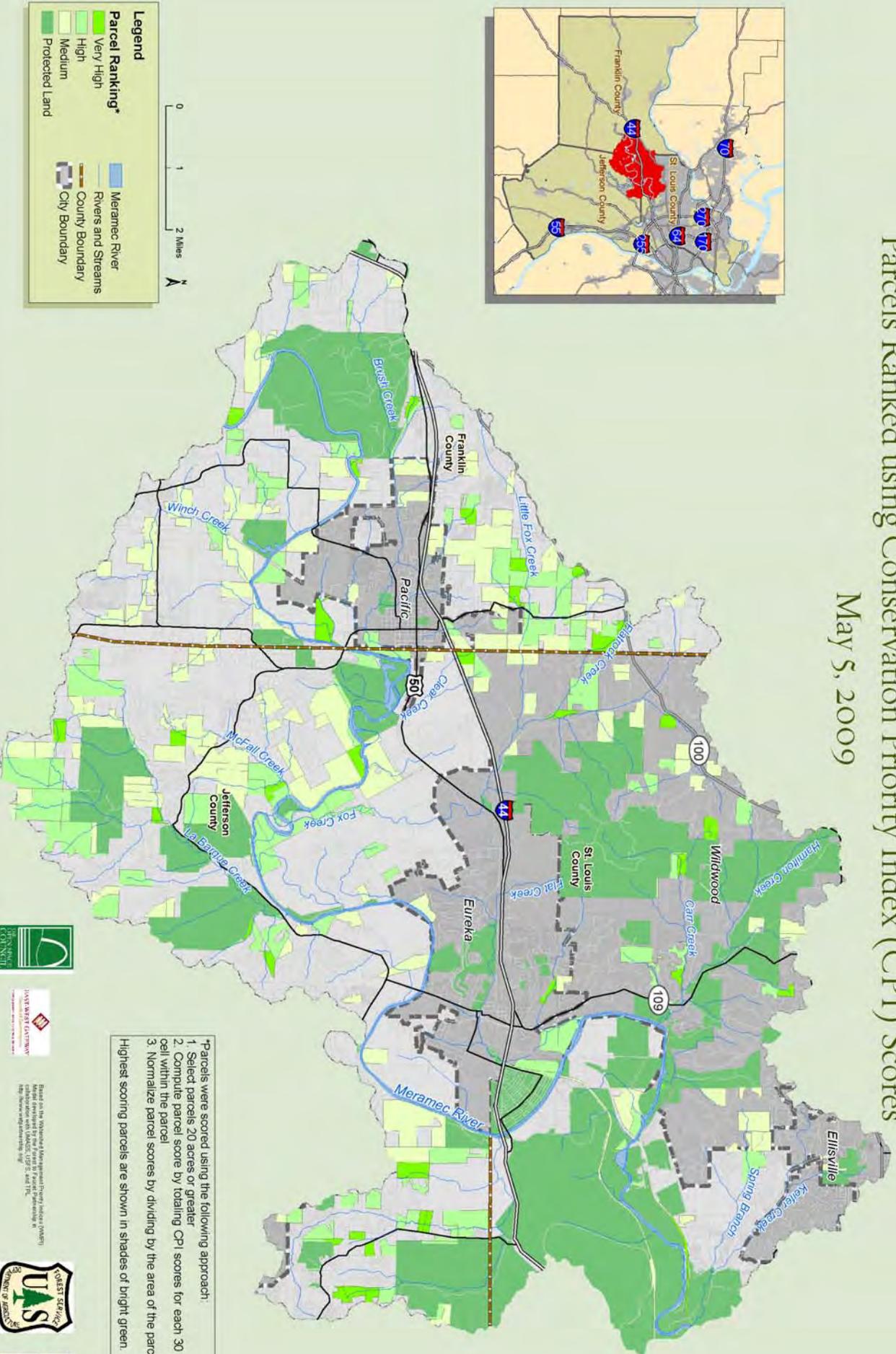
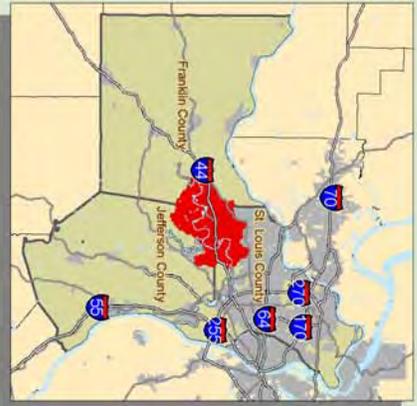
Landuse - Natural



Lower Meramec Drinking Water Source Protection Project

Parcels Ranked using Conservation Priority Index (CPI) Scores

May 5, 2009



Legend

Parcel Ranking*

- Very High
- High
- Medium
- Protected Land

— Meramec River

— Rivers and Streams

— County Boundary

— City Boundary

*Parcels were scored using the following approach:

1. Select parcels 20 acres or greater
2. Compute parcel score by totaling CPI scores for each 30 meter cell within the parcel
3. Normalize parcel scores by dividing by the area of the parcel

Highest scoring parcels are shown in shades of bright green.



Based on the Missouri Department of Conservation's Priority Index (CPI) methodology, which is based on the National Conservation Priority Index (CPI) methodology. For more information, visit <http://www.mdc.mo.gov/cpi/>



APPENDIX D: Restoration Priority Index Maps (see next page)

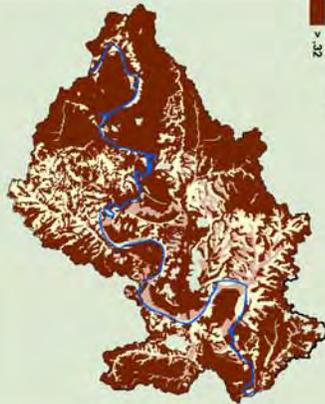
Proximity to Streams and Watersheds



Soils Hydrologic Class



Soil Erodibility - K Factor

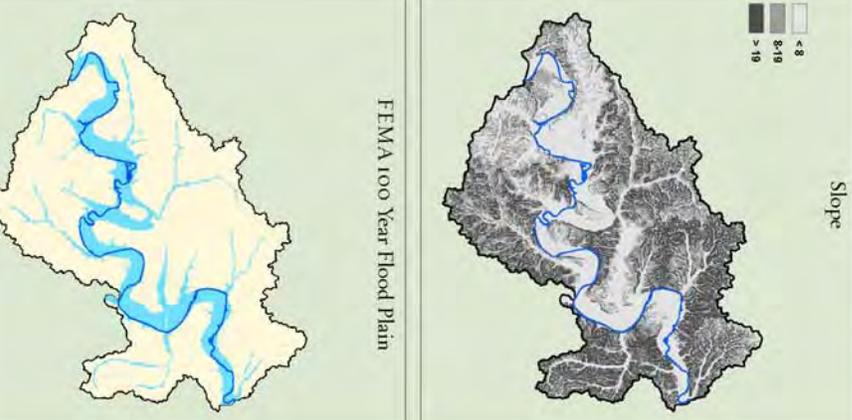


Lower Meramec Drinking Water Source Protection Project

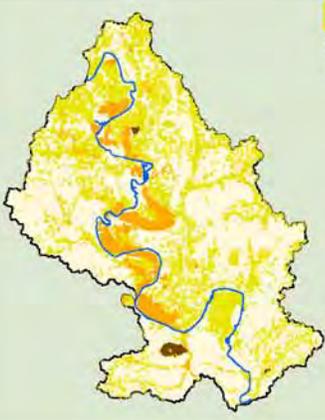
Restoration Priority Index (CPI) Areas

May 5, 2009

Scored on 0-3 scale	RPI Restoration Priority Index
Land Use	3 = cropland, barren or sparsely vegetated 2 = Grassland 1 = Forest
Proximity to streams	3 = 0-30 meters 2 = 30-60 meters 1 = 60-90 meters
Proximity to ponds and wetlands	3 = 0-30 meters 2 = 30-60 meters 1 = 60-90 meters
Hydrologic Soil Group	3 = Hydro groups C&D 2 = Hydro group B 1 = Hydro group A
Erodibility (Kfact)	3 = >= .37 2 = >= .28 and <= .32 1 = <= .28
Slope	3 = greater than 18% 2 = 8% - 18% 1 = less than 8%
100 yr Floodplain	3 = In Floodplain



Landuse - Agriculture, Barren, Grassland



Legend

- RPI 90th percentile (dark green)
- RPI 70th percentile (medium green)
- Protected Land (light green)
- Meramec River (blue line)
- City Boundary (dashed line)
- County Boundary (dotted line)
- Rivers and Streams (blue lines)
- Interstate (thick black line)
- Highway (thin black line)
- Local Road (dashed black line)

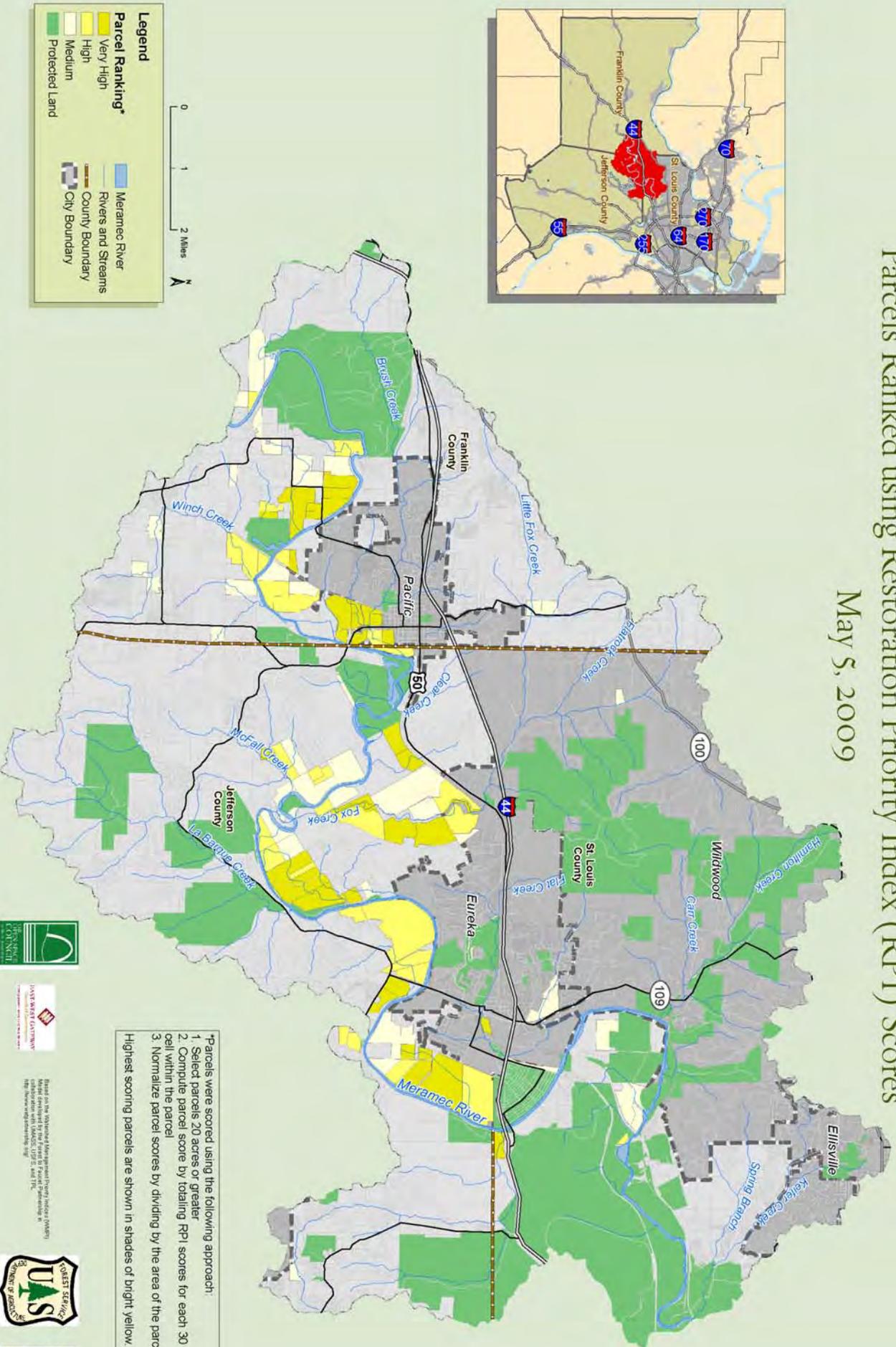
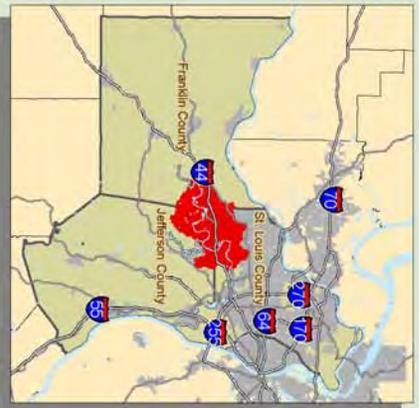


Map created by the staff of UAS and UAS, 2009. Content provided by: The Nature Conservancy, St. Louis Waterworks, and the University of Arkansas System Center for Watershed Sciences. The map is a generalization of the data and should not be used for navigation or other purposes. All rights reserved. No warranty is made by the University of Arkansas System Center for Watershed Sciences for the accuracy or completeness of the information presented on this map.

Lower Meramec Drinking Water Source Protection Project

Parcels Ranked using Restoration Priority Index (RPI) Scores

May 5, 2009



Legend

Parcel Ranking*

- Very High
- High
- Medium
- Protected Land

Meramec River
Rivers and Streams
County Boundary
City Boundary

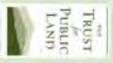
*Parcels were scored using the following approach:

1. Select parcels 20 acres or greater
2. Compute parcel score by totaling RPI scores for each 30 meter cell within the parcel
3. Normalize parcel scores by dividing by the area of the parcel

Highest scoring parcels are shown in shades of bright yellow.



Based on the Missouri Department of Conservation's Priority Index (RPI) methodology, which is a combination of the National Wetlands Inventory (NWI) and the National Wetlands Inventory (NWI) and the National Wetlands Inventory (NWI).



Appendix E: Successful Local Financing Referenda for Land Conservation

Since 1994, 100 percent of Missouri local conservation measures have passed generating almost \$600 million in new funds for land conservation.

Jurisdiction Name	Date	Finance Mechanism	Conservation Funds Approved	Status	% Yes
Arnold	8/5/1997	Sales tax	\$3,131,912	Pass	53%
Bel-Ridge	2/8/2005	Sales tax	\$120,000	Pass	82%
Belton	11/4/1997	Sales tax	\$11,000,000	Pass	63%
Beverly Hills	11/7/1995	Sales tax		Pass	55%
Chesterfield	11/8/1994	Bond	\$8,287,386	Pass	68%
Columbia	11/7/2000	Sales tax	\$17,000,000	Pass	54%
Columbia	11/8/2005	Sales tax	\$2,500,000	Pass	53%
Greene County	11/6/2001	Sales tax	\$7,480,000	Pass	60%
Greene County	8/8/2006	Sales tax	\$17,400,000	Pass	58%
Lee's Summit	11/4/1997	Sales tax	\$4,000,000	Pass	51%
Lee's Summit	4/5/2005	Sales tax	\$33,000,000	Pass	69%
Maryland Heights	11/7/1995	Sales tax	\$40,000,000	Pass	51%
O'Fallon	4/4/1995	Bond	\$2,000,000	Pass	76%
Overland	8/8/1995	Utility Tax	\$1,150,000	Pass	78%
Rolla	4/4/2004	Bond	\$800,000	Pass	66%
St. Charles County	11/7/2000	Sales tax	\$60,000,000	Pass	57%
St. Louis	11/7/2000	Sales tax	\$72,000,000	Pass	68%
St. Louis County	11/7/2000	Sales tax	\$280,000,000	Pass	70%
Town and Country	4/7/1998	Sales tax	\$186,000	Pass	55%
			\$560,055,298		

Appendix F: Potential Sources of Federal Funding for Land Acquisition in the Study Area

The Clean Water State Revolving Fund program provides low-cost financing for a wide range of water quality infrastructure projects. Federal funds must be matched by 20% non-federal funds. The funds water quality projects including nonpoint source, watershed protection or restoration, and estuary management projects, as well as more traditional municipal wastewater treatment projects. Land or easement acquisitions are permitted if they reduce nonpoint source pollution. Missouri's FY 2008 allotment of CWSRF funds was \$19,055,500.

The Drinking Water State Revolving Fund (DWSRF) program was established by the 1996 Safe Drinking Water Act Amendments. EPA provides grants to states for revolving loan funds for loans and other types of financial assistance to public water systems for eligible infrastructure improvements. There is growing recognition that protecting the source from contaminants is often more efficient and cost-effective than treating drinking water later. Missouri's FY 2008 DWSRF allotment was \$15,816,000.

Recovery Land Acquisition Grants from the US Fish and Wildlife Service provide funds to states and territories for the acquisition of habitat, through both fee and easement, in support of federally listed threatened and endangered species recovery. These funds must contribute to the implementation of a finalized and approved recovery plan for at least one species under the Endangered Species Act. If one of the mussel species is listed and has a recovery plan in place, this program may offer some opportunity to the study area.

Farm and Ranch Lands Protection Program grants are awarded by the Natural Resource Conservation Service (NRCS) to states, local governments and non-governmental entities on a competitive basis, according to national and state criteria and require up to a 50 per cent non-NRCS match to cover the cost of the easement. Up to 25 per cent of donated land value can be counted as the match. In FY 2007 Missouri received an allocation of \$639,621 from this program.

The Forest Legacy Program provides federal funding to states to assist in securing conservation easements on forestlands threatened with conversion to nonforest uses. The state can submit up to three grant applications each year for projects within previously designated areas. The federal government may fund up to 75 percent of project costs, with at least 25 percent coming from private, state, or local sources. In FY 2009, the Forest Legacy Program was funded at \$57.5 million. Since it joined the program in 2007, Missouri has received an allocation of \$2 million for the LaBarque Creek project in Jefferson County.

The stateside Land and Water Conservation Fund program provides a 50 percent match to states for planning, developing and acquiring land and water areas for natural resource protection and recreation enhancement. Funds are distributed to states based on population and need. Once the funds are distributed to the states, it is up to each state to choose the projects, though the National Park Service has final approval. Eligible grant recipients include municipal subdivisions, state agencies and tribal governments, each of whom must provide at least 50 percent matching funds in either cash or in-kind contributions and a detailed plan for the proposed project. Grant applications are evaluated based on the technical merits of the project, the public/private partnerships, and how the project addresses the identified needs and priorities of a statewide comprehensive plan. In FY 2008, Missouri received \$433,651 from LWCF.

Administered through the Department of Agriculture's Natural Resources Conservation Service, **Wetlands Reserve Program** is a voluntary program to restore wetlands. Participating

landowners can establish conservation easements of either permanent or 30-year duration or can enter restoration cost-share agreements of a minimum 10-year duration. In order for a property to be eligible for a WRP grant, the landowner must have owned the land for at least seven years, and the land must be restorable and suitable for wildlife benefits. The landowner continues to control access to the land and may lease the land for recreational activities. In FY 2007, Missouri received \$10,639,172 in WRP funds.

In 1984, Congress created the **National Fish and Wildlife Foundation** to benefit the conservation of fish, wildlife, plants, and the habitat on which they depend by attracting diverse investments to conservation and encouraging locally supported stewardship on private and public lands. Eligible grantees include federal, tribal, state, and local governments, educational institutions, and non-profit conservation organizations. Grants can range from \$50,000 to \$300,000 and typically require a 2:1 nonfederal match.

The **North American Wetlands Conservation Act** (NAWCA) provides matching grants for the acquisition, restoration, and enhancement of wetland ecosystems for the benefit of wetland dependent migratory species. Administered by the U.S. Fish and Wildlife Service, grants are available to nonprofit organizations, state and local agencies, tribes, and private individuals in the U.S., Canada, and Mexico. Two types of grants are awarded; small grants for up to \$75,000 and standard grants for up to \$1 million. There is a 1:1 non-federal match requirement for each grant although the average match of successful proposals is over 2:1. The Congressional appropriation to fund the grant program in FY 2009 was approximately \$42.64 million.

The **State Wildlife Grants Program** is a matching grant program that supports conservation efforts aimed at restoring or maintaining populations of native species to avoid listing under the Endangered Species Act. States' comprehensive wildlife conservation action plan determines what projects would be eligible. The State Wildlife Grants Program provides matching funds that are to be used to implement the conservation recommendations outlined in these plans. Since its inception in 2001, Missouri has received slightly over \$8.8 million in matching funds from this program.

The **Army Corps of Engineers has a Civil Works Program**. Two programs, Section 1135 and Section 206 are of special interest. Section 1135 provides authority for the Corps of Engineers to investigate study, modify, and construct projects for the restoration of fish and wildlife habitats where degradation is attributable to water resource projects previously constructed by the Corps of Engineers. Aquatic Ecosystem Restoration (WRDA Section 206) provides authority for the Corps of Engineers to carry out aquatic ecosystem restoration and protection projects. Each project is limited to a Federal cost of \$5,000,000. The total program limit is \$25 million.

Other federal programs can be used to get funding that could encourage conservation and active management of forested land, and increase the likelihood of permanent forestland protection by increasing the number of forest landowners enrolled in management programs. Forest Stewardship Programs (which are supported by funds from the USDA Forest Service, State and Private Forestry), and in Natural Resources and Conservation Service (or NRCS) programs under the Farm Bill (e.g., Wildlife Habitat Incentives Program or Environmental Quality Incentives Program).



EAST-WEST GATEWAY
Council of Governments

Creating Solutions Across Jurisdictional Boundaries

Gateway Tower
One Memorial Drive, Ste. 1600
St. Louis, MO 63102-2451

314-421-4220
618-274-2750