

PERRY COUNTY  
COMMUNITY  
CONSERVATION PLAN

*By: Perry County Community Economic and Environment Committee*

PROTECTING OUR WATER TO PROTECT OUR COMMUNITY



Perry County Missouri  
DRAFT submitted April 7, 2013

## Table of Contents

Perry County Overview	2
Karst & Water	4
Phase 1	5
Phase 2	12
Educational Objectives & Activities	13
Our Mission	13
Our Goal	13
Activities	13
Within the City of Perryville	14
Perry County Health Department	19
Business and the Community	20
Aquatic Life, Watershed and Karst Education	21
Educational Objectives Rural Landowners and Livestock Producers	23
Rural Sinkhole Management Education	23
Pasture Management Education	24
Manure Management Education	25
Managing Water Sources	25
Dead Animal Management	26
Hay Waste Management	26
General Continuing Education in Agriculture	27
Best Management Practices Applied and Currently Utilized	30
Dollars invested and acres covered	35
Vertical Drain & Gully Erosion Practice	38
Cost Share Administration	40
Plan Implementation	42
About our plan	46

## Welcome to Perry County

Nationally recognized for its stability, economic recruitment, expansion and growth, and for progressive initiatives, Perry County, Missouri and its county seat, Perryville, are located in southeast Missouri, approximately 80 miles south of St. Louis. Interstate-55 transects the county with exits at the rural towns of Brewer, Biehle, and Perryville at Missouri State Highway 51 which leads to the Mississippi River Bridge to Chester, Illinois. Perry County's and Perryville's location affords easy accessibility to metropolitan St. Louis, Missouri's, population of 2.6 million, as well as Lambert-St. Louis International Airport, and southern Illinois and the I-57 and I-24 corridors. Approximately 70 percent of all North American manufacturing and 30 percent of the US population can conveniently travel to and through Perry County.

Perry County's economic and population growth can be attributed to both its geographic location and the influx of immigrants from the Saxon region of Germany, as well as settlers of French heritage who made their way up the Mississippi River. Both groups provided settlers with deep religious convictions, dedication to family and education, a strong work ethic and a sense of stewardship of the land, in agriculture, business and industry. Their descendants make up a strong workforce and a populace with a dedication to the land and its resources, care of the environment, community betterment and each other.

The City of Perryville has grown as a commercial and service center for the surrounding rural area, and in its function as the county seat. Perryville was incorporated as a village in 1831 and became a fourth class city in 1882 by ordinance. It remains a fourth class city to date, although it meets the standards for third class status. It has enjoyed and sustains strong economic base consisting of several businesses and industries.

According to the 2010 census data 18,971 people live in Perry County, with 8,225 residing in Perryville. The remaining population is dispersed among smaller incorporated communities and in the unincorporated part of the county. The city population increases 42 percent each day due to thriving local industries and businesses.

The focus of economic and industrial development in Perry County has been and continues to be based on diversification. For almost 90 years city and county officials and local business leaders have worked closely together to build and improve employment and business opportunities throughout the local area. This process began in 1923 with the formation of the Perryville Chamber of Commerce which launched one of the first economic development initiatives in the nation; continued in 1954 with the establishment of the Perryville Development Corporation to promote future industrial development; culminated in 1980 with the creation of the Perry County Industrial Development Authority with its focus on business recruitment, a collaborative effort which has succeeded in attracting, growing and expanding business and industry in the area. All have contributed to a broad economic base that does not rely solely on just one sector of business or manufacturing, lessening the chance of setbacks during economic downturns.

A major employer in Perry County is Toyoda Gosei (TG-Missouri), a manufacturer of interior and exterior automotive products, including moldings, consoles, dash-boards, steering wheels and airbags for Toyota and a other auto manufacturers. Established in Perryville in 1986 as a cooperative venture with its Japan-based parent company, TG-Missouri currently employs over 1,200 and is in the process of further expansion and product development.

Another major local industry is Gilster-Mary Lee, a private label food company, employing as many as 1600 at its five Perry County plants that process and package baking mixes, cereal and popcorn. Gilster-Mary Lee recently expanded in Perryville, consolidating its trucking operation and building a new truck service facility, as well as a large warehouse in the industrial park. Gilster-Mary Lee has discussed the possibility of additional future expansions.

At the Perryville Municipal Airport, Sabreliner Corporation continues to reconfigure, service and refurbish jet airplanes, helicopters and fixed-wing aircraft, both for the private sector as well as the US military. A large percentage of their employees are highly skilled mechanical, airframe and paint technicians with many years of service to the company. Approximately two years ago, Sabreliner also expanded, adding a multi-million dollar state-of-the-art paint facility. Unfortunately, federal cutbacks have led to a company-wide slowdown.

Other local businesses encompass a wide spectrum and include diverse businesses such as barrel coopers, plastics manufacturers, large construction firms, hardwood and lumber production, wineries, decorative and construction stone suppliers, and a number of third- and fourth-generation businesses. Local industrial parks comprise over 100 acres of industrially-zoned property, well equipped with the necessary infrastructure, concrete streets, street lights and utilities and ready for additional development. Recent engineering studies support the ability to provide adequate water supply and wastewater treatment for future expansion.

Agriculture was the keystone to early settlement and growth in Perry County and remains a viable industry to this day. According to the 2007 Census of Agriculture, there are 983 farms in Perry County representing 238,893 acres. These are modern farms, many of which are, using current best environmental practices and scrupulous stewardship of the resources available. A variety of agricultural boards and organizations support the industry through programs, resources and expertise.

Perry County is progressive with a strong history of self-reliance and community stewardship. Anyone visiting Perryville, the county seat, will notice the clean streets and sidewalks, beautiful parks and the obvious care and pride the community takes in itself. We take personal responsibility for ourselves, the community and our environment. We work collaboratively to problem solve and be proactive to address any current or future issues. We are able to maintain a quality of life that includes building a thriving economy through our multigenerational work ethic. Our local families, work-force and businesses are hardworking, dedicated and community minded. Our business and industry sector is committed and involved in the community of Perry County and is invested in both time and dollars.

We are not a passive community. Historically we self-regulate, not waiting for external regulations and policies to be implemented, but create local policies and practices that address issues long before external legislative bodies and regulating agencies take action on a state or national scale. Our proactive nature is because we simply believe community and environmental stewardship is the right thing to do. Our self-reliance and self-sufficiency mean we are able to put words to action. If there is a problem we fix it. We are able to blend community ideals with action because of our strong community values and the strength of our local leadership.

Our diverse community groups actively work to retain and recruit business and industry and are quick to point out they do not recruit jobs just for jobs sake We have a history of thoughtful recruitment including giving consideration to a possible employer's potential environmental impact. Local industry, city and county programs continually meet or exceed environmental standards.



Blue Spring Branch



Natural Sinkhole



Cedar Spring

### **Karst & Water**

The grotto sculpin (*Cottus specus*) is a cave-dwelling fish that exhibits characteristics typical of troglomorphic (adapted to living in constant darkness) organisms, including greatly reduced or absent eyes and skin pigmentation (Burr et al. 2001). The grotto sculpin is currently found in two karst areas (limestone regions characterized by sink holes, abrupt ridges, caves, and underground streams) in Perry County, Missouri: Central Perryville and Mystery-Rimstone (Burr et al. 2001). The grotto sculpin occurs in Blue Spring Branch (from the Moore Cave System resurgence to the confluence with Bois Brule Creek) and the Cinque Hommes Creek drainage, including underlying caves, and Cinque Hommes Creek, its tributaries, resurgences, and springs. Within the Cinque Hommes Creek drainage, populations have been documented in five cave systems: Moore Cave, Crevice Cave, Mystery Cave, Rimstone River Cave, and Running Bull Cave (Adams et al. unpub. data; Adams 2012, pers. comm.). Within these cave systems, grotto sculpin occur in cave streams and associated resurgences and springs. Thus far Cinque Hommes Creek and Blue Spring Branch are the only surface streams where grotto sculpin have been found. Cinque Hommes Creek is the primary resurgence stream for caves in the Mystery-Rimstone Karst and Crevice Cave in the Central Perryville Karst, whereas Blue Spring Branch is the resurgence stream for the Moore Cave System (Burr et al. 2001). (Courtesy US Fish and Wildlife)

The grotto sculpin requires karst habitats that provide consistent water flow, high organic input, and connection to surface streams, which allow for seasonal migrations to complete its life cycle. The karst

topography in Perry County is characterized by thousands of sinkholes (Vandike 1985) and over 700 caves (Fox et al. 2009) – more than any other county in Missouri. Water flow in karst systems occurs by way of surface features, such as sinkholes and losing streams, as well as connectivity to the underlying aquifer.

The quality of life for the people of Perry County has historically been and currently *is* integrated with the local karst system. Through generations our community has demonstrated environmental stewardship and has developed best management practices for sinkhole stabilization. Many of these are included in this community plan. The community of Perry County proposes continuing these solid practices that have proven to be effective, some for decades or longer, and further developing these practices. Because times and technologies change, our plan has been drafted a living document with an adaptive management approach.

Overall community and agricultural practices have changed and evolved through time. As a community we are aware of old historical practices that, unfortunately, at the time unknowingly were not best management practices. As a progressive community we have actively worked through the years not only to correct past mistakes but have consistently acted in a proactive manner to do our best to continue to be good environmental stewards and maintain the quality of life that we have come to value. We work for our community's quality of life today and into our children's future.

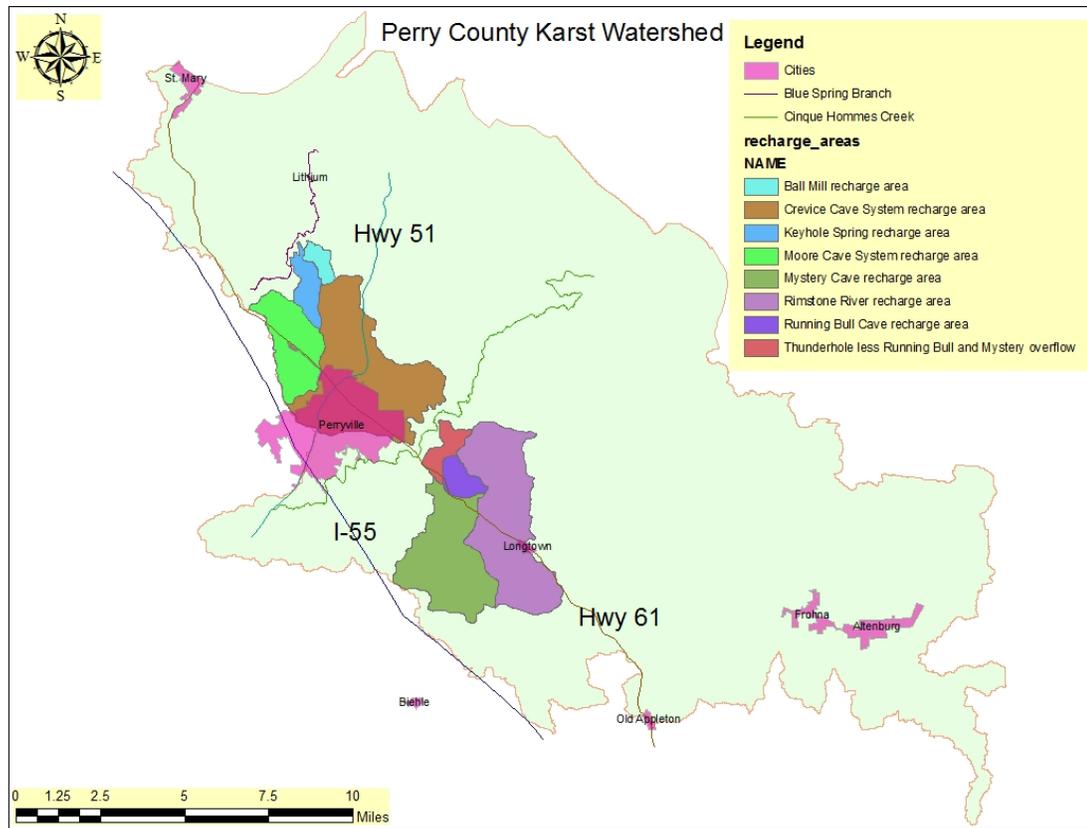
### *Phase 1*

The community of Perry County has assembled this draft of our community plan to integrate and maximize our current environmental stewardship practices and refine and expand those practices where feasible. Although we have an excellent track record of leveraging funds, still the most limiting factor has been and will most likely continue to be funding.

Community stakeholders are helping shape our community plan: City of Perryville, Perry County Presiding Commissioner, Perry County Commissioner District 1 & 2, Perry County Economic Development Authority, Perry County Industrial Development Authority, Perryville Development Corporation, Perryville Area Chamber of Commerce, Perryville & Chester Economic Development Board, Perry County Farm Bureau, Perry County Soil & Water District, Perry County Health Department, Southeast Missouri Regional Planning & Economic Development Commission, University of Missouri Extension, Perry County Extension Council, Bank of Missouri, Robinson Construction, Klaus Construction Co., Schumer Bros. Heating & Air Conditioning, SEMCO Distributing, Inc., Citizens Electric Corporation, Baer Engineering, TG Missouri, Gilster-Mary Lee Corporation, Buchheit, Inc., Rozier Mercantile Company, Sabreliner Corporation, Perryville Higher Education Center, Perry County District 32 Career & Technology Center, Richard DeWilde CPA, Guyot Lumber & Hardware Co., Perryville Overhead Door, Richardet Floor Covering, Dreyer Electric, Perry County Mutual Insurance, Meyer Bus Line, Edward Jones Investments, Healthcare Equipment & Supply, Toohey Law Firm, The Arbeiter and Brewer Law Firm, P.C., Scott Hotop, CPA, Sears, Eagle Bank & Trust, Regions Bank, Rozier's True Value Hardware, Zoellner Construction Co., Rozier's Radio Shack, Modern Woodmen of America, Perry

County 4-H Council, Perryville FFA Chapter, Sequin Moreau Napa Cooperage, Hoff Brothers, Inc., Perryville Pumpkin Farm, Hoff Brothers LP Gas, Steinbecker Livestock Farms, Loida Ag Service, MFA Incorporated, Agricultural Producers of Grain & Livestock and representatives from private land owners.

Below is the Perry County karst watershed map. Our plan encompasses all of the watershed area but we are prioritizing our efforts to focus on Grotto Sculpin recharge areas. The bigger light green area represents the application area for our plan. The recharge areas for the caves listed in the plan legend are the known habitat of the grotto sculpin.



The karst area, mapped above, has thousands of sinkholes and miles of caves. It has the highest density of sinkholes and cave miles of any similar area in Missouri and nearly any area of the United States. The vast majority of the sinkholes in Perry County are in their natural undisturbed state. The soils of this area are very erodible and some of the unimproved sinkholes show moderate to heavy levels of erosion. This has led to the community working to stabilize those sinkholes that show the worst erosion. These efforts include grass buffers, waterways and stabilization structures. A very small percentage of sinkholes have, in the past, been used as dump sites. Those sites have been replaced with a county landfill/transfer station and numerous trash services throughout the county for the disposal of household waste. Also, the use of sinkholes as trash dumps is no longer an accepted practice by conscientious landowners.

*What areas are the priority recharge areas for the grotto sculpin?*

The area that recharges the four caves that include 36.28 square miles of underground aquatic habitat in recharge areas plus 19.2 miles of surface stream as the habitat for the grotto sculpin. The first area is the recharge areas of the Moore Cave System, the Crevice Cave System, Ball Mill Spring, and Keyhole Spring. The second area is the recharge areas of Mystery Cave, Rimstone River Cave, Running Bull Cave, and Thunderhole Resurgence. The third is the 4 miles of Blue Spring Branch from its emergence within the Moore Cave System to its confluence with Bois Brule Creek. The fourth area is 15.2 miles of Cinque Hommes Creek from its emergence near Mystery Cave and Resurgence to its confluence with Bois Brule Creek.

Working in partnership with U.S. Fish and Wildlife the following environmental concerns and objectives have been identified: *Sinkhole clean-up*. ✎ *Minimize movement of surface chemicals to groundwater* ✎ *Application of vertical drain practice and sinkhole stabilization/protection* ✎ *Improved vertical drain installation and maintenance* ✎ *Proper installation and function of septic tank or sewage lagoon* ✎ *Improved runoff control along roadways* ✎ *Improved management of wastewater outflows* ✎ *Improved management of storm water outflows* ✎ *Continue to ensure chemical spill plans are available* ✎ *Proper installation and maintenance of storage tanks* ✎ *Improve animal waste management* ✎ *Minimization or avoidance of livestock waste in streams and sinkholes* ✎ *Proper disposal of animal carcasses* ✎ *Minimization of erosion and sediment transport to aquatic systems*. Current practices addressing these concerns as objectives are listed in the corresponding appendices.

### **Objective 1)**

#### ***Sinkhole Cleanup***

##### **To prevent using sinkholes for disposal**

A31, B1, B2, B3, B4, B5, B6, C1, C2, C32, C33, C34, C70, C71, C87, C91, C96, C100, C132, E1, E2, E3

##### **Sinkhole clean up**

A28, B1, B2, B3, B4, B5, B6, C17, C26, C70, C71, C87, C91, C96, C100, C101, C131, C132, E1, E2, E3

We recommend prioritizing clean-up of sinkholes in locations where the current landowner believes there may be contaminants even if not known.

### **Objective 2)**

#### ***Minimize movement of surface chemicals to groundwater***

- Adequate filter strip around sinkholes where possible
- Adequate filter strip around vertical drainpipes where possible
- Apply herbicide according to instructions on the label maintaining appropriate set back requirements keeping in mind any aquatic life restrictions.

#### **Chemicals**

Surface chemicals and other foreign substances getting into groundwater

A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, A17, A18, A19, A20, A21, A22, A23, A24, A25, A26, A27, A28, A29, A30, A31, A32, A33, A34, A35, A36, A37, B1, B2, B3, B4, B5, B6, C2, C38, C43, C99, D10, D17, D18, D19, D20, D21, D22, D23, D24, D25, D26, D27, D28, E1, E2, E8, E9, E11, E13, E14, E15, E16, E17, F16

**Pesticide application near groundwater or ground water access**

A1, A2, A7, A9, A10, A27, C132, D19, D23, E16

**Disposal of chemical containers**

A27, B1, B2, B3, B4, B5, C2

**Vegetative strips around sinkholes**

A1, A2, A3, A4, A5, A6, A7, A9, A10, A12, A13, A14, A15, A16, A17, A18, A19, A20, A21, A24, A25, A26, A27, A28, A29, A30, A31, A34, A35, A36, A37, C17, C117, C131, C132

Vegetative buffers around sinkholes range from 0-200 feet. Many of these buffers are in unmanaged or unimproved areas where the natural geology, weather and geography have created those buffers.

*Objective 3)*

*Application of vertical drain practice concern: continue to review what qualifies a sinkhole for vertical drain installation and explore other options for sinkhole stabilization/protection.*

*Educational objective: Application of vertical drain practice and sinkhole stabilization protection.*

**How sinkhole management practices might differ in stable versus unstable sink holes**

C4, C5, C6, C7, C8, C9, C13, C14, C17, C19, C60, C101, C132

*Objective 4)*

*Improved vertical drain installation or maintenance*

**Vertical drains and vertical drain management**

A13, A14, A15, A24, A25, C4, C5, C6, C7, C8, C9, C13, C14, C17, C19, C60, C100, C101, C131

**Strips are buffers around vertical drains**

A1, A2, A3, A4, A5, A6, A7, A10, A13, A14, A15, A24, A25, C131, C132

*Objective 5)*

*Proper installation and function of septic tank or sewage lagoon*

**Septic and Sewer**

C10, C72, D1, D2, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, E9, E10, E12, F9

**Any problematic sewage lagoons**

C10, C72, D1, D2, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, E9, E10, E12, F9

We recommend prioritizing any funds for this effort to assist any informal neighborhoods with wastewater management.

*Objective 6)*

*Improve runoff control along roadways*

**Runoff**

A4, A6, A8, A9, A11, A12, A14, A15, A16, A17, A18, A19, A20, A21, A23, A24, C15, C17, C19, C23, C25, C26, C30, C36, C37, C43, C44-59, C60, C78, C79, C86, C90, C100, C101, C131, C132. D15, D16, F4, F5

*Objective 7)*

*Improved management of wastewater outflows*

**Wastewater**

C9, C13, C16, C20, C24, C27, C36, C43, C61, C62, C63, C64, C65, C66, C67, C68, C72, C81, C82, C83, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, D16, E9, E10, E12, F9, F18, F18

*Objective 8)*

*Improved management of storm water outflows*

**Storm Water Runoff**

A1, A2, A7, A9, A10, A11, A12, A14, A15, A16, A17, A18, A19, A20, A21, A23, A24, C15, C17, C19, C23, C25, C26, C36, C37, C43, C44-59, C60, C78, C79, C86, C90, C100, C131, C132, D15, D16, F4, F5

**Storm Water Drains**

A12, C4, C5, C6, C7, C8, C9, C13, C14, C16, C19, C23, C25, C30, C36, C37, C43, C60, C78, C86, C90, C101, C131, C132, D15, D16, F4, F5

*Objective 9)*

*Continue to ensure chemical spill plans are available*

**Disaster chemical spill plans**

A27, C132, D21

We recommend continuing guidance be provided to review community and private business spill plans through the appropriate local and regional organizations

*Objective 10)*

*Proper installation and maintenance of underground storage tanks*

C130

*Objective 11)*

*Improve animal waste management*

A19, A20, A21, A23, A24, A25

*Objective 12)*

*Minimization or avoidance of livestock waste in streams and sinkholes*

**Lower Livestock Waste in Streams and Waterways**

A19, A20, A21, A23, A24, A25

*Objective 13)*

*Proper disposal of animal carcasses*

**Animal Carcass Disposal**

A26, C64

This is regulated by DNR and Missouri law refers to University of Missouri Extension guides for education and understanding of compliance. The local Extension center has increased educational efforts for dead animal disposal.

*Objective 14)*

*Minimization of erosion and sediment transport to aquatic systems*

**Ways to Address Erosion and Sediment**

A1, A2, A3, A4, A8, A9, A10, A11, A12, A14, A15, A16, A17, A18, A19, A20, A21, A22, A23, A24, C4, C5, C6, C7, C8, C9, C13, C14, C16, C17, C19, C23, C25, C30, C36, C37, C44-59, C60, C78, C79, C86, C90, C100, C101, C117, C131, C132, F4, F5

*Environmental Concerns (general)*

E4, E5, E6, E7, E18

Assets the community has that work toward addressing the above threats

*Our community's capacity to leverage funds and collaborate for projects and examples of progressive community actions*

Our ability to successful leverage funds and economic development practices are in appendices E and F .

### *Caving and the Perry County Karst*

Most private caves in Perry County are just that, private caves. For those caves within our karst that allow cavers or people to enter more than one cave we recommend the following:

Use of Clean Caving strategy as defined by National White-Nose Syndrome Decontamination Protocol - Version 06.25.2012 refer to WNS decontamination protocol for cavers as recommended by US Fish & Wildlife.

### *Phase 2*

- Develop educational objectives that correspond to environmental concerns
- Begin to expand educational opportunities that relate to environmental concerns
- Begin to identify and prioritize action items
- Begin to identify additional local, regional, state and national resources and partners to help implement and continue to draft our plan.
- Begin increasing public awareness of the importance of water quality

## *Educational Objectives & Activities*

---



**Dry Fork**



**Vertical Drain**



**Cinque Hommes Creek**

### **Our Mission**

*Improve water quality throughout the Perry County Karst Watershed and Perry County through outreach and education.*

### **Our Goal**

*Through continuing community outreach, educational efforts, civic engagement, and interagency support we will be able to continue, initiate and implement good land stewardship to promote good water quality and a sustainable biota.*

## *Activities*

### **Sinkholes**

- By increasing the number of tire collections, e-cycling, recycling, prescription disposal and trash forgiveness days more people will continue to keep possible contaminants out of the watershed. These programs also help increase the number of sinkholes cleaned out by private landowners.
- Prioritizing clean-up of sinkholes in locations where the current landowner believes there may be contaminants even if not known.
- Further prioritizing sink hole clean-up to those that could have the greatest impact on our watershed.
- We have already identified that we will need to use nontraditional marketing methods to increase awareness of these events (Fliers in local businesses, word of mouth etc.).
- Additional sinkholes could be cleaned out if funding were available to assist private landowners.
- The community is already working with MDC, US Fish and Wildlife and DNR to assist in the sinkhole clean-out process.

- Sinkhole stabilization has been a generational objective and remains an ongoing priority.

### **The City of Perryville**

- The City of Perryville has increased their annual budget to nearly \$62,000 annually to help provide sinkhole cleanup, maintenance and repair.
- Additional work needs to be done in this area. The city also requires additional easements to fully complete the work and provide proper maintenance. Additional money is also necessary for staffing as chemical treatments will no longer be applied near sinkholes and surface water.
- Grand Street's sewer was only partially replaced. This was related to budgetary constraints in the sewer fund. More work is needed on Grand Street and throughout town to address Inflow and Infiltration issues.
- More money is needed to continue to bring necessary infrastructure to neighboring communities (e.g. Shakertown) with substandard infrastructure.
- Storm water continues to be a significant concern for our system. There are some months our sewer plant treats more water than we produce (attributed to Inflow and Infiltration).
- The recycling center needs additional capacity, equipment and space to continue to service the community and take additional material.
- Northdale Park needs significant attention. We dug it up once before to no avail. The hole is very small and it provides drainage for a large area of the city.
- Other “new” sinkholes continue to open up throughout the city, often very close to homes, schools, hospitals and other developed areas.

### *Within the City of Perryville*

### *Sinkhole Improvement Plan*

### **Policy Statement**

Sinkholes provide a vital storm water function within the City of Perryville. The Karst topography of the area is very prone to sinkholes and it is our responsibility to ensure proper sinkhole maintenance and development to best protect our citizens, our property and our environment. The goal is not to develop every sinkhole within the City of Perryville but only those which are believed necessary. This policy shall serve to guide that improvement.

### **Preferred Sinkhole Improvement Method**

The City of Perryville’s typical sinkhole improvement process consists of excavating the depression and removing any debris (e.g. trash, soil, mud, gravel, etc.) present to expose the crevice, or opening in

the bedrock of the karst subsurface system. Ideally, the crevice is excavated completely and a vertical standpipe (a 48" diameter pre-cast concrete manhole preferred) is installed over the crevice. Any portions of the crevice that extend beyond the edge of the standpipe are grouted with low-slump concrete to effectively prevent groundwater from penetrating the crevice except through the opening within the standpipe. The standpipe is extended to the existing or proposed final ground elevation and the structure backfilled with graded crushed rock and compacted earth. The area around the standpipe is graded to allow surface runoff to drain into the standpipe opening. The standpipe shall be covered with a trash rack or other suitable grated intake to help ensure safety and prevent larger debris from entering the standpipe. Wherever possible, the area immediately surrounding the improved sinkhole is established as a vegetative buffer as a means of filtration to prevent sediment and other contaminants from entering the standpipe. The city shall acquire a permanent easement for perpetual maintenance of the improved sinkhole. In general, the agricultural areas within the city limits will minimally require a 50-foot easement, measured from the center of the standpipe, to be used as a vegetative buffer area. In other areas within the city limits, the preferred easement and vegetative buffer area will minimally be a 25-foot radius measured from the center of the standpipe. It may be possible to reduce this vegetative buffer provided property owners apply herbicide in strict accordance with the instructions found on the label, maintaining appropriate set back requirements while also keeping in mind any aquatic life restrictions (See Diagram 1).



## **Alternative Sinkhole Improvement Methods**

Each sinkhole improvement is unique due to variables such as the crevice depth and geometry, surface runoff drainage area, and the location of the sinkhole relative to existing and proposed developments. It may be necessary to take a customized approach on a specific sinkhole improvement and assess various design alternatives. These alternate approaches to improving the sinkhole may include, but are not limited to, the following:

- Using a smaller diameter standpipe if the surface drainage area is small and/or if access to the crevice by a person is not necessary.
- If the sinkhole location does not allow for the preferred buffer, and with the approval of the city, storm water runoff can be directed to a sedimentation or detention basin upstream of the sinkhole standpipe, mechanical filters upstream of the piping connection to the standpipe may be utilized, or other suitable methods to improve surface runoff water quality may be used with the approval of the city.

## **Temporary Best Management Practices**

Prior to, during, and after sinkholes are improved it is important that any necessary best management practices (BMP's) are utilized when construction or land disturbance activities are performed within the watershed of a particular sinkhole. When any activities are performed upstream of the sinkhole that may induce sedimentation and pollution of surface water runoff, siltation and erosion control methods shall be installed. Additionally, any work on or in the immediate vicinity of the sinkhole shall be performed with siltation and erosion control measures in place and shall be timed with concern for weather conditions to minimize the possibility of sedimentation and polluted runoff from entering the sinkhole.

## **Permanent Best Management Practices**

After sinkholes are improved it is important that any necessary best management practices (BMP's) are implemented. The primary BMP for surface water runoff quality shall be the vegetative buffer, or alternatively sedimentation or detention basin, mechanical filters, or other method as approved by the City. Sinkholes will be inspected regularly and vegetative buffers shall be maintained by mowing or trimming methods rather than using chemical treatment. Grass clippings or other debris shall be kept clear from the standpipe opening.

## **Long-term priorities**

We would like to retrofit existing streets to improve collected storm water by adding a cleansing process of sorts. This should include the storm drains on curbed streets and general runoff on streets without curbs. External sources of funding will be necessary for this to occur; however new streets are and will be designed giving consideration to these matters.

### *Challenges within the City of Perryville as we move forward*

- More money is needed to continue to bring necessary infrastructure to neighboring communities (e.g. Shakertown) with substandard infrastructure.
- Storm water continues to be a significant concern for our system. There are some months our sewer plant treats more water than we produce (attributed to Inflow and Infiltration). More work is needed to replace sewer lines throughout town to address Inflow and Infiltration issues. In addition, there have been many unfunded mandates of late that have severely reduced our meager reserves.

### *Educational Objectives and Activities*

How we will achieve our goals: Building on our strengths, we are, and will be able to implement actions more effectively. We will use traditional and nontraditional approaches to have the greatest educational reach possible. These include workshops, for credit courses, continuing education credits, workshops and field days. By maximizing our existing education networks of Perryville Area Higher Education, Southeast Missouri State University, Mineral Area College, University of Missouri Extension Perry County, Perry County District 32 we will be able to reach more people.

### *Increasing Public Awareness*

A county wide Stream Team with participation of the residents of the City of Perryville, Perry County, business and industry and youth increases awareness and improves our area while building on our intergenerational strengths.

Increase existing signage near storm drains, on street catch boxes and in the watershed area to further educate the public, including the visiting public, about the importance of water quality.

### **Poster and Coloring Contest**

- Activity provides a theme connected with soil and water conservation to educate youth in Perry County
- Poster Contest offered to all schools in Perry County for 4 & 5 grade students. First three place winners and families are invited to annual meeting and presented an award. **Recent award April 4, 2013**
- Coloring contest offered to all schools in Perry County for 1 & 2 grade students. First three place winners and families are invited to annual meeting and presented an award. **Recent award April 4, 2013**

### **Newsletters**

- Newsletters containing educational information, upcoming events, and programs available through both the Perry County Soil & Water Conservation District and Natural Resource

Conservation Service are sent to approximately 700 landowners/operators in the county. **Recent mailings- January 2013 and March 2013**

#### **Grassland Contest- Local & State Sponsor**

- Contest consists of four sections: (1) Grassland Condition, (2) Soil Evaluation, (3) Wildlife Habitat and (4) Plant Identification and is available for students who are currently enrolled at high school level FFA or 4-H.
- The Perry County SWCD gives financial support to local and state contest, along with personnel time at local level for this program. **Last contest October-November 2012**

#### **Envirothon- Local & State Sponsor**

- Contest consists of five sections: soil, aquatic, forestry, wildlife, and current environmental issues and is available for High School Science classes.
- The Perry County SWCD gives financial support to local and state contest, along with personnel time at local level for this program. **Local March 2013, State May 2013**

#### *Perry County Health Department*

- A priority is to connect any neighborhoods to sewers who may not be connected at this time
- Monthly check with 911 office for new addresses in the county, we then notify the property owner of the State On-Site Sewage laws
- Host on-site waste water installers educational training and workshop
- Enforce state on-site sewage system program
- Provide one-on-one consultations with homeowners and installers to ensure correct installation, i.e. Plan reviews
- Investigate waste water complaints
- Issue waste water violations and enforce compliance schedule
- Maintain on-site waste water records
- Provide permits to install on-site sewage systems in accordance with the Missouri State Laws
- Provide on-site evaluations and inspections to ensure compliance
- Emergency planning for safe wastewater disposal
- Collaborate with soil scientists and professional engineers regarding the best design for the site
- Provide official free private drinking water analysis for coliform bacteria and inorganic substances completed by health department
- Provide individual homeowners with sampling bottles for coliform bacteria
- Provide drinking water consultations for homeowners and businesses
- Provide guidance and resources in response to DNR public drinking water boil orders

- Emergency planning for safe drinking water
- Collaborate with well drillers regarding drinking water issues
- Work with homeowners on well placement
- Establish and maintain private drinking water analysis records
- Communicable disease investigations of waterborne illnesses
- Consult and educate private homeowners on drinking water issues

### *Business and the Community*

The Perryville Development Corporation was established to promote economic development in Perry County by making suitable land available to business prospects. Part of the Corporation's mandate has always been to ensure that new developments meet all relevant state and federal requirements. This policy remains in place. When necessary educate potential business and work with prospects to network with appropriate agencies.

The Perry County Economic Development Authority (EDA) is a long standing public /private partnership, the Perryville Development Corporation (PDC) and the local government's willingness to invest in the infrastructure and marketing (the economic office itself was established when many communities had no plan to do such an activity) to be prepared when the opportunities arose.

The Citizens of Perry County have clearly demonstrated the progressive thinking required to move the community forward and provide the advantages we have today. The Perry County Economic Development Authority will continue to support our local businesses and help foster entrepreneurship development. We are proud to continue marketing Perryville and Perry County as a great place to locate a new development.

The EDA has established itself as a professional and reliable source of information for many new area developers as well as to existing Perryville businesses. We will continue to cultivate those relationships for additional development in Perryville.

The Perryville Industrial Park is owned by the Perryville Development Corporation which is a non-profit corporation. They currently own around 90 acres of available land that has all of the infrastructure in place to provide new or expanding business the ability for fast startup times.

When a company has been identified that is searching for a new or expanding area of land, the EDA will create a project proposal package for the client. The needs of the business determine the amount of land that is required. Also, the requirement is evaluated based on historical sinkhole emergence patterns.

Once the location is selected we have an engineering firm that is familiar with our Karst environment. The engineering firm will take core samples to evaluate the level of rock, if there are any sinkholes present and created a project area plan to mitigate the sediment that enters the Karst system. We follow the City of Perryville's sinkhole management policies.

The EDA working with the PDC is always looking towards the future growth of the community. There has been discussion about further diversification and expansion of our economic base. Some of the industries that we have been targeting are green industry and technology based businesses.

Local business and industry have a solid history of community partnership. We have identified volunteers from the business and industry sector and city and county to participate in a Perry County Stream Team. MDC has offered the idea for train the trainer workshops so we can implement the stream team approach more quickly.

The local electric utility, Citizens Electric Corporation, whose service territory encompasses Perry County, has used best judgment when designing electric lines as to avoid locating electric poles in and in very close proximity to known sinkholes. In the 66 year history of the corporation, there is no report or memory of ever having an auger pierce a hidden cavern during the pole digging work procedure.

Moving forward, per an email received by the Service on August 24, 2012, CEC will implement these avoidance and minimization measures even though negative impacts to a cavern are unlikely:

- 1) If an auger were to penetrate a cavern, CEC would use directed effort to protect the cavern integrity by:
  - i) investigating the best method to plug the auger hole, ii) placement of an unvented pipe in the auger hole to seal the opening, iii) rerouting the electric line for an alternate pole location.
- 2) During the planning phase of the placement of the pole locations, the avoidance measures include maintaining a buffer zone distance of 100 feet from any known sink hole along the selected route.
- 3) CEC received and accepts the Missouri Department of Conservation's Best Management Practices (BMP's) as recommendations for construction projects affecting Missouri Karst areas.
- 4) CEC also utilizes the City of Perryville's "Sinkhole Improvement Specification" (BMP's) as recommendations for construction projects affecting sinkholes.

### *Aquatic Life, Watershed and Karst Education*

Director of the District 32 Career Center and the director of the Perryville Area Higher Education Center have agreed to integrate the introduction of watershed/karst/conservation-related topics as an addition to existing agriculture and science curricula at the Career Center and Perryville High School, and science education at PAHEC. Presentations and personnel from Missouri Department of Conservation and the Department of Natural Resources will be needed. We have identified agency personnel to help with this project.

MDC has a curriculum for every grade level of schools and it is called the Discover Nature Schools. This grade level appropriate curriculum has an aquatic component for middle school. This unit includes:

- Aquatic ecosystem investigation
- Watershed mapping

- Water runoff and infiltration
- Sampling macro-invertebrates for water quality
- Fishing
- Network schools with MDC so they can take advantage of the field trip grants for schools for schools participating in the above programs.

MDC can also train teachers on use of two nationally renowned and tested collections of curricula. The curricula can't be purchased it has to be obtained through a workshop. Curriculum includes:

#### **Project Wet Teacher Training**

- Water quality
- Watershed dynamics
- Point and nonpoint pollution sources
- Groundwater contamination
- Waterborne illnesses
- Obtain funding so teachers can participate

#### **Project Aquatic wild**

- Fish form and function
- Obtain funding so teachers can participate

**MDC has agreed to teach a *Cave Life for Teachers* workshop that deals with:**

- Karst topography
- Cave geography
- Cave formation
- Cave and groundwater function and flow
- Cave life form and function
- Cave ecosystems
- Sinkholes
- Practices that promote ground water health

- Watershed and ground water movement
- Human impacts on caves
- Course costs revolve around college credit
- Obtain RPDC funding

The above information was provided in partnership with Missouri Department of Conservation

### *Educational Objectives Rural Landowners and Livestock Producers*

Landowner cooperation is essential, and voluntary, incentive-based programs should be used to assist individuals in improving practices on their private land. Selection and use of Best Management Practices (BMPs') must be tailored to the given situation to maximize their impact and effectiveness. Recognizing that not all landowners have or will want to participate in cost share and/or incentive programs, continued encouragement of BMP usage is essential. Educational efforts should build on the substantial successes while still bringing in new farmers and landowners for BMP adoption. Educational efforts should be in a variety of formats including workshops, meetings, field days, newspaper, internet media and school curriculum to increase impact. Ideally, these programs will be administered locally through agencies such as Perry County Soil and Water Conservation District, Natural Resource Conservation Services, Missouri Department of Conservation, University of Missouri Extension, Perry County Farm Bureau etc. which already have a strong relationship with the members of the community. Programs for maximum benefit are coordinated and marketed locally with all of our community partners.

### **Rural Sinkhole Management Education**

- Critical area planting/filter strip or buffer planting for filtration of contaminants including sediment
- Proper pesticide use around sinkholes and vertical drains
- Benefits of sinkhole cleanup
- Benefits of the natural conditions
- Stabilization of sinkhole to control erosion

Education planned to promote rural community awareness about sinkhole management includes providing information on proper techniques on buffers using vegetation and grasses to filter contaminants from entering the underground water system. Also, proper maintenance of sinkholes, vertical drains and grade stabilization will be provided with environmental awareness concerns. Information regarding the correct installment of future vertical drains will be provided. Grazing school will be offered to help enhance vegetative cover, therefore preventing erosion. Information regarding

program availability of cost share programs is routinely available through the Perry County Soil and Water Conservation District (SWCD) office. To increase awareness of these programs SWCD will also offer public meetings on rural sinkhole education and conservation. Notices for these meetings will be sent out by fliers and radio announcements along with the use of newspaper and internet media. Written articles on best management practices of rural sinkholes will be submitted to local news media by the University of MO Extension office. The Perry County University of MO Extension Agriculture and Natural Resources faculty will also offer meetings and workshops to promote BMPs for rural sinkholes.

Our rural cleanout objective: increase sinkhole cleanout annually, prioritize clean-up according to the proximity of sinkhole locations to the Recharge Area. We will seek new funding to promote cleanup and cost share for debris removal. We have had discussions with the Fish and Wildlife Service, MDC, and DNR regarding the possibility of acquiring cost share funding for landowners. Perry County 4-H Clubs working together with the Perryville FFA Chapter are just two of the organizations that have volunteered to help landowners clean historic debris. Applications will be made for Building Communities Together Service grants, Missouri 4-H Foundation and other community service grants to partially fund the clean-up projects. Local labor and donations will be used. We will promote a better understanding of how water moves in the karst system. This knowledge, partnered with our county's history of pride in our community, will have a positive impact on rural sinkhole cleanup. We will provide landowners and the public with information regarding the process for record keeping of cleaned sinkholes. Record keeping of our successes will be kept by our long term community group.

### **Pasture Management Education**

- Benefits of cross-fencing.
- Benefits of exclusionary fencing and limit grazing of riparian corridors.
  - Some landowners may want to participate in agency cost share programs
  - Interagency coordination of incentive programs for landowners
- Benefits of perennial forage species to reduce erosion.
- Benefits of warm and cool season forages.
- Benefits of legume establishment in pastures.
- Benefits of vegetative filter strips along drainage ways and streams to reduce sediment, organic material, and nutrient runoff.
- Benefits of soil testing for nutrient content.
- Benefits of cover crops for managing nutrients
- Benefits of establishing nutrient management plans.

## **Manure Management Education**

- Benefits of managing stored manure by maintaining buffer strips of vegetation between manure storage areas and waterways to filter sediments and absorb nutrients.
- Benefits of storing stockpiled manure on flat ground.
- Benefits of removing stockpiled manure on a regular basis.
- Benefits of how and when composting manure piles should be kept moist and well aerated to speed decomposition and manure pile temperature should be above 131 degrees F.
- Benefits of monitoring manure piles for rain runoff to prevent contamination of surface and/or ground water.
- Benefits of following appropriate manure application setback distances around drinking water supplies, lakes, streams, wetlands, springs, cave entrances, sinkholes, and residences.
- Benefits of using of buffer strips that do not receive fertilizer applications around a stream, pond, sinkhole, or wetland area.
- Benefits of using fertilizer spreader calibration to ensure proper application.
- Benefits of effective record keeping to ensure a properly managed manure application process

Pasture and cropland management education of landowners and livestock producers will be provided by workshops and field days with cooperation of the Soil and Water Conservation District, Missouri Department of Conservation, University of MO Extension, and the Perry County Farm Bureau. Written articles on best management practices of pasture management and manure management will be submitted to local news media by the University of MO Extension office. We will seek funding to promote soil testing, nutrient management education, and to establish nutrient management plans. Local FFA teachers will be encouraged to include pasture and manure management in their curriculum. Perry County 4-H youth development will annually train county 4-H livestock leaders, parents and youth on proper pasture and manure management in their livestock programs.

Our goal is to promote best management practices especially for use by landowners and livestock producers within our karst areas, to help improve our water quality and aquatic ecosystems. Knowledge of the practices and benefits of good BMPs will help our conscientious citizens be even better stewards of the land. Seeking funding for these measures from the Perry County Soil and Water Conservation District, MDC, and DNR will help to encourage their participation.

## **Managing Water Sources**

- Benefits of developing off-stream water sources.
- Benefits of fencing cattle from streams and ponds.

- Increased awareness of cost share programs that are available for landowners
- Benefits of using permanent cattle waterers located away from streams that have an improved apron around them of concrete or gravel.

Sharing of best management practices of livestock water sources with livestock producers and landowners will closely correlate with BMPs for pasture management. Providing information on the benefits of developing off-stream water sources and the placement of those waterers along with information on preventing livestock from eroding stream banks and ponds can be presented in the same workshops, meetings, and field days with the cooperation of the Perry County Soil and Water Conservation District, MDC, University of MO Extension office, and the Perry County Farm Bureau. Written articles on best management practices of livestock water sources will be submitted to local news media by the Perry County University of Missouri Extension Agriculture and Natural Resources faculty. We will seek funding to promote education. Local agriculture education teachers/FFA advisors will be encouraged to include water source management in their curriculum. Perry County 4-H youth development will annually train county 4-H livestock leaders, parents and youth on proper water source management in their livestock programs.

Our objective is to reduce soil erosion and nutrient leaching by the use of BMPs. By better informing landowners and livestock producers, we will reduce the possibility of sediment and excess nutrients in our local water, therefore, creating a better habitat for all aquatic life. By using educational opportunities with our youth, we can promote good stewardship practices for future generations.

### **Dead Animal Management**

This is regulated by DNR and Missouri law refers to University of Missouri Extension guides for education and understanding of compliance. The local Extension center has increased educational efforts for dead animal disposal.

### **Hay Waste Management**

- Benefits of placing round bale feeding sites away from any watershed or riparian areas.

We increase the awareness of and better inform the public and landowners of the proper placement of bale feeding areas in order to decrease the possibility of forage materials entering the water. Also, we plan to educate landowners and livestock producers on the current Missouri law and DNR regulations regarding the proper disposal of dead animals through the cooperation of the Perry County Soil and Water Conservation District, Perry County Farm Bureau, and the Perry County University of Missouri Extension Agricultural and Natural Resources faculty. With the use of workshops, newspaper articles, and internet media, landowners and livestock producers will become familiar with the BMPs for animal disposal. The Perry County University of Missouri Extension Natural Resource Engineer continues efforts to educate the public regarding new and emerging proper dead animal disposal methods. We will seek funding to educate, promote, and establish livestock producer composting sites for dead

animals. Local agriculture/FFA teachers will be encouraged to include proper feeding placement and dead animal management in their curriculum. Perry County 4-H youth development will annually train county 4-H livestock leaders, parents and youth on proper feeding placement and dead animal management in their livestock programs.

Our goal is to increase the awareness of and better inform the public and livestock producers on the current laws and regulations to keep unwanted forage materials and nutrients out of our water system. By using BMPs and current information on dead animal composting, we will help to protect our local waters. Seeking funding for these measures will help to encourage participation. We believe landowners will embrace this information because of their past history of good stewardship and the desire of our community to be proactive in protecting the environment.

### **General Continuing Education in Agriculture**

- Establish a Community Water Quality Education Committee facilitated by the Perry County University of Missouri Extension Staff to plan and implement education efforts. Topics to be addressed include:
  - Water Testing
  - Manure management record keeping
  - Proper petroleum product storage
  - Proper pesticide management
  - Soil Testing
  - Manure sampling
  - Rotational grazing practices
  - Forage choices
  - Nutrient management plans
  - Alternative water sources for livestock
  - Using GPS for herbicide application
    - Commercial and individual education
  - Additional educational opportunities to address emerging issues.

## **Water Testing Clinic**

The University of Missouri Extension Natural Resources Engineer will annually conduct at least one water testing clinic for private wells evaluating the potential for nitrate contamination. Data will be tracked and compared to baselines. **July, 2013**

## **Recycling Pesticide Containers**

- Increase the number of Perry County sites for recycling triple rinsed pesticide containers.

## **Commercial and Private Pesticide Applicator Training**

New in January, 2013, the Cape Girardeau annual commercial applicator training conducted by University of Missouri Plant Science Department included best management practices and requirements for pesticide application around sinkholes. This is mandatory yearly training for all commercial applicators to receive a license from the Missouri Department of Agriculture. **January, 2014**

The 2013 Private Applicator Training, conducted by University of Missouri Extension Agriculture and Natural Resources faculty, emphasized the rules for pesticide application near sinkholes. This is mandatory training for every pesticide applicator who purchases and applies restricted- use pesticides. The Missouri Department of Agriculture issues a permit to each operator upon completion.

**February, 2014**

## **Regional University of Missouri Extension Corn, Soybean and Wheat Meetings**

Encourage Perry County agricultural producers to utilize the latest crop scouting techniques to determine if/when pesticides are necessary for application. **January-February, 2014**

## **Perry County Scrap Tire Collection Day**

Free disposal of scrap tires from Perry County private citizens is being offered by Perry County Administration and Soil and Water Conservation District of Perry County in cooperation with the State of Missouri Solid Waste Management Department. **August 17, 2013.**

## **Perry County Soil and Water Conservation District Annual Meeting**

- Reaches out and educates community through displays and formal program.
- Approximately 225-250 landowners/operators attend this meeting. **Next meeting March, 2014**
- Presentations on Karst, watershed and environmental concerns listed in this plan

## **Perry County Farm Bureau Annual Meeting**

- Educates community through speakers and displays directed toward the general welfare of all aspects of farm and rural life through this to the general welfare of Perry County.
- Perry County Farm Bureau is an independent, non-governmental, voluntary organization of 682 farmer and rural citizen members in Perry County. **September, 2014**

### **Women in Agriculture Tour/ Meeting - Local & State**

- Education program for women landowners/operators.
- The Perry County SWCD gives financial support to local and state tours / meetings along with personnel time at local & state level for this program. **Local tour May 2013, State tour Sept 2013**

### **Grazing Schools**

- Outreach and education for landowners/operators about Grazing Systems including, forages and their management, water, its distribution and preservation.
- Various schools are held throughout the state. The Perry County SWCD gives financial support to these events as well as personnel time. **One scheduled April 18-19, 2013 Jackson Mo.**

### **Teacher Workshops**

At least one time annually, a workshop will be held for county teachers encouraging educators to incorporate curriculum into the classroom that teaches students to be good stewards of the land and water as well the source of their food and water. It will be coordinated by the Perry County Farm Bureau Promotion and Education Committee in conjunction with Missouri Farm Bureau Promotion and Education Director and Perry County University of Missouri 4-H staff. Teacher resources from various sources will be highlighted. Each year different grade levels will be targeted and the program will be approved for Perry County School District #32 Professional Development (PD) hours. An initial introductory workshop was held March, 2013 for all grade levels K-12 and the next workshop will be held summer 2013 for grade K-6 teachers. Promotion of workshops will be through the Perry County School District #32 on-line PD system, e-mails/letters to all public and parochial schools in the county. Surveys will be conducted to determine the number of youth reached through this effort. **July-September, 2014**

Cooperation among farmers and landowners is essential to improving water quality and habitat for the species. Sharing relevant, cost-effective BMPs and providing cost-share assistance through voluntary programs will increase landowner and farmer interest in taking additional action(s) on the property. Our local economies benefit from farming and ranching, therefore it is imperative we (including state and federal agencies) work with farmers and landowners to keep land in production while putting in place common-sense, cost-effective BMPs.

Benjamin Franklin is quoted as saying, "An investment in knowledge pays the best interest." With the knowledge our community will gain through the programs and measures we have planned, the payoff will be a cleaner, safer water supply for all. By educating our children and passing on our community pride and good stewardship practices, we will guarantee the future water quality of our karst system.

### Best Management Practices Applied and Currently Utilized

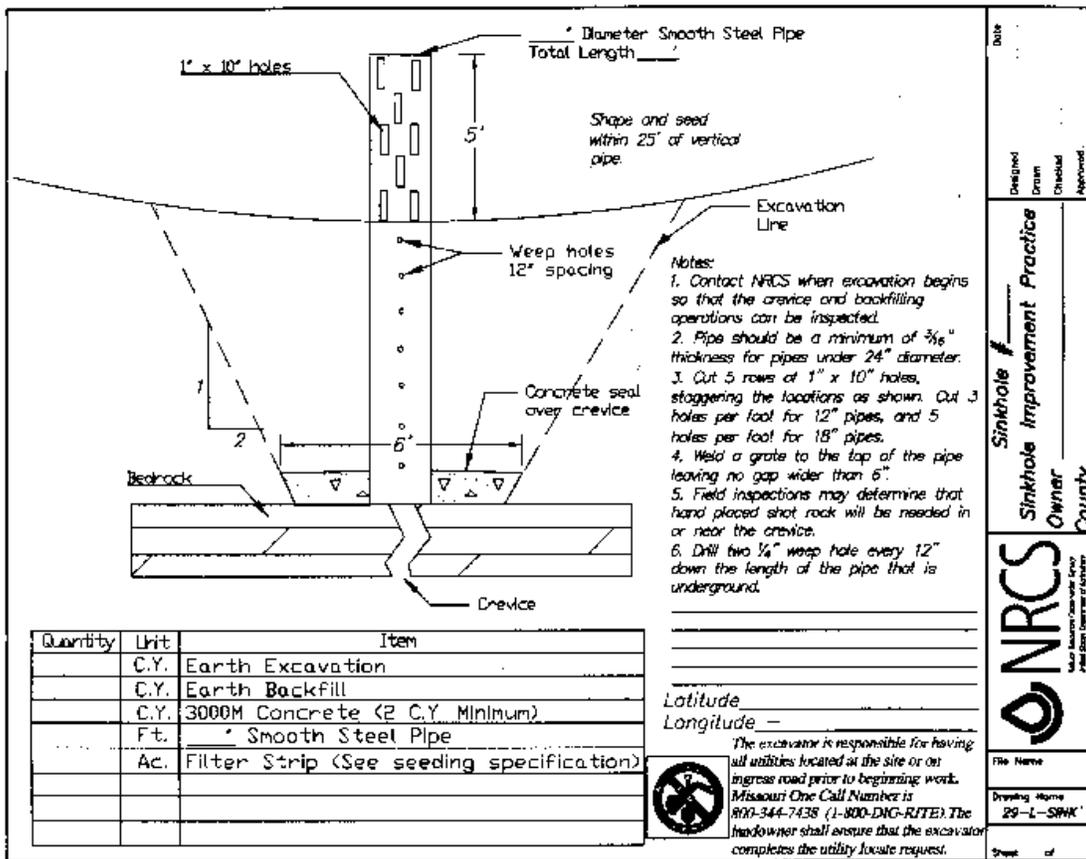
<u>TOPIC/ PRACTICE</u>	<u>ACTIVITIES/ CHARACTERISTICS</u>	<u>KNOWN OUTCOMES/ IMPACTS</u>
Forage and Biomass Planting	*Grasses and/or legumes are seeded or reseeded *Perennial forage species, warm and cool season grasses are used.	Reduced soil erosion by providing soil cover. Provides higher quality forage for livestock.
Conservation Cover	Grass and/or legume plantings	Reduced soil erosion by providing soil cover. Cover also benefits wildlife
Conservation Crop Rotation	Uses a diverse crop rotation	Reduced soil erosion by providing soil cover. Improved soil health
Cover Crop	Temporary cover planted to fallow land	Reduced soil erosion by providing soil cover. Trap nutrients, and improves soil health
Critical Area Planting	Planting of permanent vegetative cover on steep slopes	Reduced soil erosion by stabilizing steep slopes, usually done with other practices
Field Border	Permanent grass/legume planting at edge of field	Reduced soil erosion by using vegetative buffer at edge of field. Buffer also traps sediment
Filter Strip	*Permanent grass/legume planting near streams and ponds *Vegetative filter strips are planted along drainage and waterways	Buffer reduces sediment, organic material and nutrient runoff. Reduced soil erosion by using vegetative buffer to slow runoff entering a water body.
Terrace	Constructed ridge to collect water in field and guides to conduit for safe discharge	Reduced soil erosion by controlling overland flow
Grade Stabilization Structure	Embankment constructed with a conduit discharge	Reduced soil erosion by controlling runoff.
Grassed Waterway	Channel constructed for water passageway	Reduced soil erosion by channeling runoff into grassed structure. Traps sediment
Pond	Embankment constructed to hold water permanently	Reduced soil erosion by controlling runoff. Provides water for livestock, fish, recreation,. Traps sediment
Water and Sediment Control Basin	Embankment constructed to pool runoff and discharge safely through a conduit	Reduced soil erosion by controlling runoff. Traps sediment
Vertical Drain (See Diagram 2 & appendix AA1 & AA2)	Structure by which water safely is outlet through a conduit	Reduced soil erosion by controlling runoff.
Vertical Drain Incentive	Continued management/ maintenance of buffer around completed vertical drains	Maintains reduced soil erosion. Landowner incentive payment
Riparian Buffer	Tree/shrub planting along streams and other water bodies	Reduced soil erosion by filtering runoff near streams and other water bodies. Traps sediment

Conservation Tillage	Tillage that leaves crop residue on top of soil	Reduced erosion by minimum tillage or no till . Promotes soil health
General Conservation Reserve Program	Vegetative plantings in whole field situations	Reduced erosion by removing cropland out of ag production to permanent cover.
Continuous Conservation Reserve Program	Vegetative plantings near sensitive areas	Reduced erosion by removing sensitive cropland/pastureland out of ag production to permanent cover.
Access Control	*Fence is constructed to control livestock access * Cattle fenced from streams	Reduced erosion by limiting livestock access to water bodies, woodlands, & sensitive areas
Nutrient Management	Regulate/reduce excessive nutrients *Use of soil testing analysis eliminates excessive nutrient applications. * Fertilizer/manure spreaders calibrated to insure proper application.	Reduced nutrient leaching. Proper application of nutrients based on crop needs. Timing of application. Safe handling of nutrients (fertilizer and manure)
Prescribed/ Rotational Grazing	* Controlling livestock density * Cross fencing	Reduced erosion by controlling livestock grazing. Improved forage utilization.
Livestock Water Development	* Well drilling * Off stream water sources * Permanent Cattle waterers located away from waters of the state * Stream hard access * Spring development, * Pond development. *Use of other water sources for livestock	Reduced erosion and nutrient entry by eliminating livestock concentrations near/in water bodies. Provides source of clean water for livestock
Livestock Water Distribution systems	Installation of pipeline and tanks for water throughout grazing area	Reduced erosion and nutrient entry by eliminating livestock concentrations and herding near/in water bodies. Provides source of clean water for livestock
Livestock Feeding Sites	Select proper sites, ie. level ground, away from riparian Areas	Reduced erosion and nutrient entry by use of feeding sites away from sensitive areas
Manure Management	Proper handling of manure storage, processing & application	Reduced entry to water bodies because of safe handling, timing of application, proper application methods including separation distances, barriers /buffer around feedlots stockpiles etc. soil testing
Dead Animal Disposal	Disposal of dead animals in a timely manner according to state law	Reduced entry of nutrients to water bodies because of safe handling, timing of disposal

Pesticide Management	<ul style="list-style-type: none"> <li>* ALL private and commercial applicators attend an Applicators Training program and receive a license from the Missouri Department of Agriculture.</li> <li>* Crops are scouted to determine if applications are necessary based on established economic thresholds.</li> <li>* Pesticide and herbicide applications are made as required by law on the individual label of each product which includes the separation distances from waters of the state.</li> <li>* Crop protection applications are managed by accurate recordkeeping.</li> <li>* Sprayers are calibrated to insure proper application and are operated in accordance with training guidelines to insure safety to the environment and the individual applicator.</li> </ul>	Reduced entry to water bodies by safe handling, timing of application, proper application methods including separation distances, sprayer operation.
Sinkhole Trash Cleanout	<ul style="list-style-type: none"> <li>* Private landowners have removed solid waste and trash from sinkholes</li> <li>* Costs of sink hole cleanout were tracked in Past 319 project, ranging in cost from \$2400-\$8000</li> </ul>	Reduced entry to water body by trash and undesirable materials not being in sinkholes
Above Ground Fuel Storage	Secondary containment best management practices and emergency containment equipment are used.	Reduced entry to water body by containment of leak
Underground Fuel Storage	Removal of tanks	Reduced entry to water body by tanks and undesirable material not being in the ground
Rubber Tire Disposal	Pay fee when new tire purchased, participate in tire collection programs	Reduced entry to water body by rubber tires not being present.
Forest Stand Improvement	Removal of undesirable woody vegetation to promote growth on desirable vegetation	Selective cutting to improve forestland for timber &/or wildlife
Upland Wildlife Habitat Management	Structural and management practices	Wildlife practices mainly for small game
Sinkhole/ Vertical Drain Livestock Exclusion	Livestock exclusion is only needed if adequate grass buffer cannot be maintained around the sinkhole.	Reduced erosion, traps sediment, nutrients and other contaminants for reduced entry to cave ( water bodies)

Sinkhole/ Vertical Drain Buffer On Cropland	Vegetative plantings surround a sinkhole extending a distance	Reduced erosion, traps sediment, nutrients and other contaminants for reduced entry to cave ( water bodies)
Sinkhole/ Vertical Drain Buffer On Pasture	Vegetative plantings are part of pasture fields surrounding a sinkhole	Reduced erosion, traps sediment, nutrients and other contaminants for reduced entry to cave ( water bodies)
Sinkhole/Vertical Drain in Forest/woodland	Tree/Shrub and ground floor protection	Erosion control provided by undisturbed environment
Stream Team/Environmental Stewardship	* Stream Team and Environmental Stewardship activities have been consistently conducted with youth at 4-H camps, 4-H clubs and schools in Perry County during the past 20 years. Programs have included but are not limited to the following: Streets to Streams activities, Missouri Ground Water Flow Program, EnviroScape Program (watershed & erosion), Bottle Biology, Recycle-Reduce-Reuse.	County youth are educated about water quality and environmental stewardship and they are moved to action to protect the quality of area waters and the environment in both present day and throughout their lifetimes.
Water Testing Clinics Septic Tank Installers Training.	* Helping landowners make good decisions with water supplies and on-site sewage systems, follow state and county rules.	* Several hundred private wells have been test with follow-up on those indicating issues * 54 on-site contractors have been trained for site evaluation and system selection
Abandon Well Plugging Program	Education of home owners and contractors on proper techniques for managing abandon wells	4 demonstration sites used
Watershed location education / signage	Education local community on the boundaries of the watershed drainage to caves and streams	Signage on roads as they cross the boundaries of drainage

**NRCS Sinkhole Improvement Practice  
Diagram 2**



**Dollars invested and acres covered by the Perry County Soil Water Conservation District & Natural Resource Conservation Service in partnership with local landowners**

<b>2002-2012</b>				
<b><u>TOPIC/ PRACTICE</u></b>	<b><u>PURPOSE/ WHAT THIS ADDRESSES</u></b>	<b><u>KNOWN OUTCOMES/ IMPACTS</u></b>	<b><u>QUANTITY APPLIED</u></b>	<b><u>DOLLARS APPLIED</u></b>
<b>ACCESS CONTROL</b>	Control livestock access to water bodies, woodlands, & sensitive areas	Reduces sheet, rill, and gully erosion; Improves water & timber quality	954 ac	\$47,866
<b>PERMANENT COVER ESTABLISHMENT</b>	Seeding & Reseeding of Pastureland and Grass Cover	Reduces soil erosion; Improves soil & water quality	191 ac	\$9,017
<b>CONSERVATION COVER</b>	Permanent vegetative plantings	Reduces erosion; Provides Wildlife protection; Improves soil & water quality		
<b>CONSERVATION CROP ROTATION</b>	Crop rotations that improve soil quality	Reduces sheet & rill erosion; Improves water quality		
<b>COVER CROP</b>	Annual crop planted while land is fallow	Reduces sheet & rill erosion; Improves soil & water quality	20.7 ac.	\$829
<b>CRITICAL AREA PLANTING</b>	Permanent vegetative cover on steep slopes	Reduces sheet, rill, and gully erosion	104.9 ac	\$104,990
<b>FIELD BORDER</b>	Vegative buffer at edge of fields	Reduces sheet & rill erosion; Traps sediment along with other particals attached to the sediment	10.2 ac.	\$1,638
<b>FILTER STRIP</b>	Vegative buffer to slow runoff near streams and ponds	Reduces sheet & rill erosion; Traps sediment along with other particals attached to the sediment	12.3 ac.	\$1,025

<b>FOREST STAND IMPROVEMENT</b>	Selective cutting to improve forestland for timber &/or wildlife	Improves forest health and wildlife habitat	1093.1 ac.	\$111,289
<b>GRADE STABILIZATION STRUCTURE</b>	Erosion control structure	Reduces gully erosion; Traps sediment along with other particals attached to the sediment	9 no.	\$12,783
<b>GRASSED WATERWAY</b>	Erosion control structure	Reduces gully erosion; Traps sediment along with other particals attached to the sediment	15.8 ac	\$42,224
<b>NUTRIENT MANAGEMENT</b>	Improves water quality by reducing excessive nutrients	Improves water quality	4550 ac	\$69,146
<b>POND</b>	Erosion control structure	Reduces gully erosion; Traps sediment along with other particals attached to the sediment	125 no	\$625,690
<b>PRESCRIBED GRAZING</b>	Matches stocking density with available forages	Reduces sheet & rill erosion through improved grassland mgt	3602 ac	\$53,064
<b>RIPARIAN FOREST BUFFER</b>	Buffer to slow runoff near streams and ponds	Reduces sheet & rill erosion; Traps sediment along with other particals attached to the sediment	10.2 ac.	\$1,860
<b>TERRACE</b>	Intercepts and guides runoff to safe outlet	Reduces sheet, rill, and gully erosion	20263 ft	\$62,979
<b>VERTICAL DRAIN</b>	Erosion control structure	Reduces gully erosion; Traps sediment along with other particals attached to the sediment	781 no	\$1,156,436
<b>UPLAND WILDLIFE HABITAT MANAGEMENT</b>	Wildlife practices mainly for small game	Improves wildlife	950.7 ac	\$28,938
<b>WATER AND SEDIMENT CONTROL BASIN</b>	Intercepts, pools, and releases runoff slowly	Reduces sheet, rill, and gully erosion	250 no	\$529,272

---

**Total**

**\$2,859,046**

**All 24,000 +/- ac. in the recharge area are determined highly erodible land, (HEL).**

**653 or 82% of vertical drain practices listed above are in the recharge area.**

**You can see a significant percentage of practices are applied to recharge areas.**

**Future application funds will provide emphasis to expand practices in this community area.**

---

**Practices above are known to occur as they are used for landowner/operator to meet erosion requirements on highly erodible land, (HEL). Perry County has 69,401 determined HEL acres for FSA farm program payments. No direct cost share available. The above cost share dollars represents a minimum of \$3.8 million ( \$2.8 mil /75% cost-share) of best management practices applied to the land in Perry County.**

**Vertical Drain & Gulley Erosion Practice  
Signups vs. Projects Funded**

	<b># Of Landowners Signed Up For Cost Share</b>			<b># Of Landowners Served</b>	<b>% Of Landowners Served</b>	<b># Of Projects Funded</b>		
	<b>Vertical Drain Practices</b>	<b>Gulley Erosion Practices</b>	<b>Total</b>			<b>Vertical Drain Practices</b>	<b>Gulley Erosion Practices</b>	<b>Total</b>
<b>2002</b>			101	56	55%	89	47	136
<b>2003</b>			131	54	41%	59	56	115
<b>2004</b>			170	52	31%	48	49	97
<b>2005</b>			187	54	29%	61	59	120
<b>2006</b>			211	59	28%	62	53	115
<b>2007</b>			207	43	21%	58	43	101
<b>2008</b>			169	43	25%	36	48	84
<b>2009</b>			164	39	24%	53	36	89

	<b># Of Landowners Signed Up For Cost Share</b>	<b># Of Landowners Served</b>	<b>% Of Landowners Served</b>	<b># Of Projects Funded</b>	20%	82	30	112
<b>2011</b>	58	107	165	48	29%	80	40	120
<b>2012</b>	55	110	165	39	24%	64	47	111
<b>Total</b>	<b>187</b>	<b>357</b>	<b>1884</b>	<b>529</b>	<b>28%</b>	<b>692</b>	<b>508</b>	<b>1200</b>
<b>Uncompleted FY 2013</b>	33	118	151			40	35	
<b>Just completed 2014 signup</b>	19	101	120					
<b>Historically demand for cost share funds has far exceeded funds available.</b>								
<b>Frustration from landowners has occurred.</b>								

## Vertical Drain Incentive Program For Continued Maintenance

Eligible For Extended Maintenance	Maintenance Ending	# Vertical Drains Eligible	# Vertical Drains Renewed	# Of Landowners Participated
2006	1997	19	3	2
2007	1998	30	12	6
2008	1999	34	5	2
2009	2000	44	20	6
2010	2001	54	1	1
2011	2002	89	3	3
2012	2003	59	18	4
2013	2004	59	28	3
<b>Total</b>		<b>388</b>	<b>90</b>	<b>27</b>

**A one-time \$300 incentive payment is paid to landowner to renew  
A 10 year maintenance agreement.**

**Letters were mailed to 134 landowners notifying them of eligibility.**

**Above demonstrates recent developed and implemented best management  
practice through outreach, education, and incentive.**

### *COST SHARE ADMINISTRATION*

#### Funding of Historical Practices

- **Federal Dollars**
  1. Administered by NRCS
  2. Funded by USDA
  3. 4 year Farm Bill

4. Requires congressional renewal
- **State Dollars**
    1. Administered by Missouri DNR through local SWCD offices
    2. Funded by the 1/10 cent state sales tax
    3. 10 year referendum (will expire in 2016)
    4. Requires simple majority voter approval

#### **State Program Policy**

- Allows for 75% cost share of practices performed.

#### **Perry County District Policy**

- Maximum of \$8500 per landowner per eligible funding.
- Lottery System whereby landowner may enter annually, however no landowner may be eligible for funding any 2 consecutive years.
- Landowner must draw in separate lottery for practices they wish to participate in.

#### **Recent Additions to Vertical Drain Practice**

- In 2008 a one-time incentive program (approved by Missouri DNR) was initiated for continuation of vertical drain maintenance. Land owner receive a onetime \$300.00 payment for renewal of 10 year maintenance agreement.

#### **Adopted by Perry County Board of Supervisors**

- On September 3, 2008 the board initiated a spot check program whereby 15% of vertical drain practices within the 10 year maintenance period are checked annually.
- On December 29, 2011 the board approved a policy that before any landowner can qualify for new cost share on vertical drains all past cost-shared vertical drain practices must be in compliance with current vertical drain cost share guidelines.

#### **Conclusion**

- Landowners are willing to participate in programs; many at a level greater than 25% cost-share

### *Plan Implementation*

Because our plan is a living document we have already been able to move words to action. A short term list of project outcomes that are already in progress are listed below.

Our community advocates regular and ongoing water sampling in cooperation with US F&W, DNR and local resources. Our approach uses long term sampling methods with an adaptive management approach to address any problems that may arise. In partnership with US Fish and Wildlife, DNR and local SWCD begin training additional local individuals to assist in gathering water samples. September, 2013

### *Perry County*

November 2012	Established our Perry County Community Economic and Environment group.
November, 2012	Volunteers, local government organizations and agencies have invested thousands of hours to create and implement this plan. The local cost of assembling this plan including cost of volunteer time during the first 90 days was over \$250,000 in time and labor. This represents a substantial community investment that is ongoing. No end date, continuous.
March, 2013	Local landowner in partnership with MDC and area volunteers removed more than 350 tires from sink holes
April, 2013	Perry County Community Economic and Environment group becomes a permanent group based out of the University of Missouri Extension Council, Perry County.
April, 2013	Permanent community group becomes central record keeper for activities and events related to water quality.
December, 2013	Additional trash forgiveness recycling days have been added
November, 2012	Funds set aside to assist with the plan process by local nonprofits \$20,000
March, 2013	K-12, first teacher signed up for Project Wet
March, 2013	Local Envirothon - Aquatic, Soils and Grotto Sculpin Education
April 4, 2013	Perry County Soil and Water Conservation District Annual Meeting - Karst and Watershed Education
April 18-19, 2013	Grazing School - Preventing Erosion and Promoting Water Quality in Karst Areas
May, 2013	Women in Agriculture Local Tour/ Meeting - Karst and Watershed Education for Women Landowners

May, 2013	State Envirothon – Aquatic and Soils Education
June, 2013	The City of Perryville adds a prescription disposal station at the local police station to assist residents countywide in keeping these potential contaminants out of our watershed.
July, 2013	Water Testing Clinic – Private Wells
July, 2013	Cave Life for Teachers MDC Workshop
August, 2013	Completed draft watershed plan in partnership with MDC, DNR and other relevant agencies. Community stakeholders recognize that a Perry County Karst Watershed Plan would maintain and enhance ecological, agricultural, educational, and the quality of life in the Perry County Karst Watershed. It will assist in monitoring water quality and provide guidance as well as cost-share assistance for agricultural landowners in the karst region in order to implement best management practices.
July-September, 2013	Teacher Workshops – Karst and Water Quality Education
August 17, 2013	Perry County Scrap Tire Collection Day
September, 2013	Women in Agriculture State Tour/Meeting–Karst & Watershed Education for Women Landowners
September 4, 2013	Perry County Farm Bureau Annual Meeting – Presentation on Perry County Karst and Watershed Issues
September 20-21, 2013	East Perry Community Fair - Informational Booth on Perry County Karst and Water Quality Issues
January, 2014	Educational outreach programs reach 800 landowners and stakeholders see Appendix AA3 for historic information from one local agency.
January, 2014	Commercial Pesticide Applicator Training including a Karst educational component
January/February, 2014	Regional University of Missouri Extension Corn, Soybean and Wheat Meetings Karst Pesticide Application Techniques
January, 2014	Host on-site waste water installers educational training and workshop
February, 2014	Private Pesticide Applicator Training with Karst component
February, 2014	Emergency planning for safe drinking water

March-April, 2014      SMQA Training – Livestock Water Source Management; Feeding Placement and Dead Animal Management; Pasture and Manure Management

***Regular and Ongoing Programs by the Perry County Health Department***

- Monthly check with 911 office for new addresses in the county, we then notify the property owner of the State On-Site Sewage laws
- Enforce state on-site sewage system program
- Provide one-on-one consultations with homeowners and installers to ensure correct installation, i.e. Plan reviews
- Investigate waste water complaints
- Issue waste water violations and enforce compliance schedule
- Maintain on-site waste water records
- Provide permits to install on-site sewage systems in accordance with the Missouri State Laws
- Provide on-site evaluations and inspections to ensure compliance
- Emergency planning and updating for safe wastewater disposal
- Collaborate with soil scientists and professional engineers regarding the best design for the site
- Provide official free private drinking water analysis for coliform bacteria and inorganic substances completed by health department
- Provide individual homeowners with sampling bottles for coliform bacteria
- Provide drinking water consultations for homeowners and businesses
- Provide guidance and resources in response to DNR public drinking water boil orders
- Collaborate with well drillers regarding drinking water issues
- Work with homeowners on well placement
- Establish and maintain private drinking water analysis records
- Communicable disease investigations of waterborne illnesses
- Consult and educate private homeowners on drinking water issues
- See Appendix DD1 for 3 year plan

***City of Perryville Current Projects***

- The City of Perryville continues educating ourselves through attending “2013 Show-Me Stormwater Management Webinar” sponsored by the *Show-Me Stormwater Management and The Center for Watershed Protection*. The following workshops will be attended:
  1. **April 17, 2013** - Watershed Arithmetic -- Crediting & Counting Your Watershed Practices Towards TMDL Goals
  2. **May 15, 2013** - Please Come Audit My MS4
  3. **June 19, 2013** - Mastering the Language of Talking to Elected Officials

4. **September 18, 2013** - Combining Green & Grey in Combined Sewer Watersheds

5. **October 16, 2013** - Stormwater Trading – Markets or Mayhem?

6. **November 20, 2013** - Stormwater Utilities: Reckoning the Cost Side of the Equation:

#### **2012-2013**

- Development of a new sinkhole policy
- Modified specifications for existing street project (Rand Street/Elk Drive) to include catch box notice that inlets drain to water
- Developed a sinkhole improvement budget to track our financial efforts
- Increased budget by an estimated \$15,000, priorities include:
  - Retrofitting improvements on existing sinkholes (including BMPs)
  - Added part-time maintenance staff to aid in mowing around sinkholes (done to eliminate the process spraying chemicals for weed control around sinkholes)
- Worked with SEMO RPC to inventory sinkholes (includes identifying numbers, GPS location, aerial photo, BMP radius, and condition grading)
- Incorporated vegetative buffers (BMPs) into recent street design (Rand Street/Elk Drive)
- Ongoing acquisition of easements for existing and “new” sinkholes throughout town to help ensure proper improvement and subsequent maintenance (city to assume all costs as a property owner incentive)
- City has developed and proposed a new policy to address sinkhole development. Includes standards. Requires significant money to retrofit existing sinkholes and ensure proper development of future sinkholes.
- City has budgeted to replace TV camera for sewer lines which aids in this process. Storm water continues to be a significant concern for our system. There are some months our sewer plant treats more water than we produce (attributed to Inflow and Infiltration). More work is needed to replace sewer lines throughout town to address Inflow and Infiltration issues. In addition, there have been many unfunded mandates of late that have severely reduced our meager reserves.

### *About our plan*

Our plan was written by our community. We used a facilitator to help us with the overall process and public meetings. The facilitator was Community Development Specialist, Celeste Vanderbrugen M.S., University of Missouri Extension. The narrative was written by core board members and incorporated public comments from meetings and interviews conducted in conjunction with the facilitator. Formal and informal educational sessions, public meetings and interviews were conducted from November 1 through April 6<sup>th</sup>. Every effort was made to make the process as broad and inclusive as possible that the condensed timeframe would allow.

As of this date, April 7, 2013, our plan is in an early draft format. As a living document it will continue to grow and evolve. By using adaptive practices we are able to grow our best management practices as technology and local need evolves. To all of the people and organizations who helped make this possible, thank you.

The performance of the activities, goals and timing of the Plan may be affected by events beyond the control of the community. The community plan will be impacted by acts of God, public disaster, fire, terrorism, civil discord, flood, war, government laws/regulations, state and federal budgets, economic downturns, interruptions of communication, transportation or electricity and the availability of state, federal and private funding specifically allocated to the activities of the plan.

This is a draft version of our community plan. We are still developing additional goals, benchmarks and indicators. See timeline above.