

# Bonne Femme Watershed Plan

February, 2007





# **Bonne Femme Watershed Plan**

Bonne Femme Stakeholder Committee  
February, 2007

Edited by W. Terry Frueh, Watershed Conservationist  
Boone County Planning and Building Department

Columbia, Missouri

On the cover:

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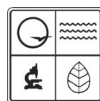
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Bonne Femme Watershed Plan  
Completed by the Bonne Femme Stakeholder Committee  
February, 2007



Bonne Femme Watershed Project  
[www.CaveWatershed.org](http://www.CaveWatershed.org)



U.S. Environmental Protection Agency Region 7, through the Missouri Department of Natural Resources, has provided partial funding for this project under Section 319 of the Clean Water Act.

The Bonne Femme Watershed Stakeholder Committee would like to dedicate this publication to honor the memory of committee member Donna Dodge.

Donna Dodge was an active, articulate and dedicated member of this committee. Her enthusiasm for the project, her passionate defense of her positions and her educator's background made her a valuable and respected member of our diverse group. Even as she debated a contentious point, her respect for each member's opinion and her positive attitude made us value her words even when we did not agree with her position. She was a friend to all of us and her wisdom, humor and smiles helped us work together.

Donna passed away on Thursday, July 13, 2006. Memories of her beautiful spirit stayed with us as we continued on with our work. She would have been thrilled to see the culmination of this project.

As we move on to the next level in this venture, help us honor Donna's memory by working together to preserve and protect the watershed.



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## Foreword

# Foreword

This watershed plan represents years of planning and hard work by local citizens and governments, as well as state and federal researchers and land managers. In 2001, the directors of the Missouri Departments of Natural Resources and Conservation urged a group of interested local, state and federal employees to form a task force. They were asked to consider specific actions that could be taken to protect the water quality in streams of Southern Boone County with particular interest in public lands and endangered species. The primary recommendation of the task force was to pursue a Nonpoint Source Pollution grant (EPA 319 Program) to acquire funds for the protection of streams in the Bonne Femme watershed through:

- Education
- Disbursal of cost-share funds
- Development of a watershed plan that makes policy recommendations.

By the end of 2001, a proposal had been prepared. The Boone County Commission agreed to sponsor the grant. The proposal was funded, and the project began in Spring 2003. A key aspect of the proposal was the formation of three separate entities: Steering, Policy, and Stakeholder Committees (see Appendix D for a list of each committee's members).

The Steering Committee was composed of members from local, state and federal agencies. Several members were involved in the initial task force that helped to establish the Bonne Femme Watershed Project (BFWP). The primary functions of the Steering Committee included project administration, providing technical assistance to the Stakeholder and Policy Committees, and facilitation of Stakeholder meetings. Other important tasks of the Steering Committee included disbursing cost-share funds, and public outreach and education activities. These activities included annual open houses, newsletters, organization of workshops on low impact development, and two debates on water quality and development issues.

The Steering Committee understood that for a watershed plan to be assured of broad citizen support, it must be developed by the community. Thus, the committee turned the responsibility for developing the plan over to a citizen's group, the Stakeholder Committee. The Stakeholder Committee represented a broad and balanced set of the community's interests. While each individual committee member brought a variety of experience and values to the committee, an attempt was made to have six people representing each of these general interest categories: development, landowner, environmental. The Stakeholders' diversity ensured many perspectives were considered in the planning process. The committee's balance ensured that the plan would represent the values of the community as a whole, and not be skewed toward any particular special interest. The diversity and balance of the Stakeholder committee increased the likelihood that the plan would gain acceptance in the physical, social and economic context of our community. It is important to highlight that the Stakeholders were responsible for the

## Foreword

content of the plan, although the Steering and Policy Committees provided feedback during its development.

The Steering Committee understood that for a plan's recommendations to be enacted, there must be political support. Thus, the committee requested that a group of political decision-makers form the Policy Committee to be involved with the plan. This committee's members represented various local agencies that influence how development occurs. Their initial task was to choose the participants on the Stakeholder Committee, because they knew a broad network of community leaders representing diverse interests. Over the course of the project, the Policy Committee observed the Stakeholders' planning efforts, and offered feedback on strengthening the plan's recommendations. Policy Committee participation will be crucial for the eventual adoption of the plan, since their agencies will be responsible for implementing it. Moreover, individual members will be advocates to their respective agencies, as they move through the adoption process. Representatives on the Policy Committee were chosen by the respective agencies.

The primary goal of the plan is to maintain the health of streams within the Bonne Femme watershed, as it urbanizes. The plan attempts to achieve this goal through the recommendation of specific stream protection policies for local government implementation. In addition, this plan can serve to educate the public about the Bonne Femme watershed.

We want to express our gratitude for all the dedication and thoughtfulness of the Stakeholders. They spent about two and a half years, meeting on a monthly basis, forging a consensus on the plan. The Stakeholders did an excellent job crafting a balanced plan that will further the goals of protecting water quality and maintaining economic vitality for the watershed. We believe that local governments should adopt and implement the policies recommended in this plan.

Sincerely,

The Bonne Femme Watershed Project Steering Committee:

Georganne Bowman, Missouri Department of Natural Resources  
Roxie Campbell, Rock Bridge Memorial State Park  
Bill Florea, Boone County Planning and Building Inspection  
Terry Frueh, Boone County Planning and Building Inspection  
Robert Lerch, USDA-Agricultural Research Service  
Scott Schulte, Rock Bridge Memorial State Park (retired)  
Scott Voney, Missouri Department of Conservation

## **NOTE ON THE TEXT**

Words that are defined in the glossary (Appendix B) appear in *this font*.

# Executive Summary

The Bonne Femme Watershed Plan is the product of over two and one-half years of work from a group of Stakeholders (see Appendix D for committee membership). The Bonne Femme Policy Committee chose to have a broad and balanced representation on the Stakeholder Committee in order to produce a plan that reflects its representation: broad and balanced. The wide variety of Stakeholders' perspectives ensured that many points of view were considered in the process, and the balanced nature of the committee improved the likelihood it would be unbiased. Local governments will be more likely to adopt the plan if it has support from a wide and balanced range of interests. Although the plan's focus is on protecting and preserving water quality, the Stakeholders wanted to make sure this was accomplished while maintaining economic vitality, and respecting community values.

It should be noted that although the Stakeholders did receive guidance and feedback from the Bonne Femme Steering and Policy Committees, they had the final say on the plan's content. This ensured it was truly a product of citizen involvement, and not one controlled by politicians or by technical staff.

The plan is designed to focus local governments on protecting stream health in the Bonne Femme watershed as it urbanizes (see Figure ES.1, page 3). It provides policy recommendations that, if adopted, will achieve specific goals that enhance the Bonne Femme watershed.

Chapter 1 outlines the big picture. It discusses how the plan relates to the Bonne Femme Watershed Project and how the Stakeholders developed the plan. Watershed characteristics (social, physical and biological) are addressed. Finally, economic activity in the watershed is discussed.

Chapter 2 outlines issues that Stakeholders wanted to consider during the development of the plan. The issues are listed both in simple form, and also in a consolidated grouping that explains how they are connected to one another.

Chapter 3 discusses scientific information considered by the Stakeholders in the planning process. Parts of this chapter focus on previous (and sometimes general) studies, including karst hydrogeology and cave life. Other sections of this chapter discuss work that was completed in relation to the Bonne Femme Watershed Project, including stream life, water quality monitoring, dye tracing, and the Subwatershed Sensitivity Analysis.

Chapter 4 covers the Stakeholder vision for land use in the Bonne Femme watershed, including its purpose and how they developed it. The vision statement is detailed, along with the elements that formed its basis.

## **Executive Summary**

**Stakeholder vision** In the year 2030, we envision a watershed where quality of life and economic vitality are fostered by: maintaining or improving the current conditions of the water resources, having a mix of land uses and development types, and maintaining thriving agricultural activities.

**Chapter 5** discusses how the Stakeholders transformed the vision into achievable goals. The obstacles to achieving these goals are discussed and rated as to their strength (i.e., how much each obstacle might impede achieving the goal).

**Chapter 6** details how the Stakeholders developed their policy recommendations, lists these recommendations, and discusses how to carry the plan forward.

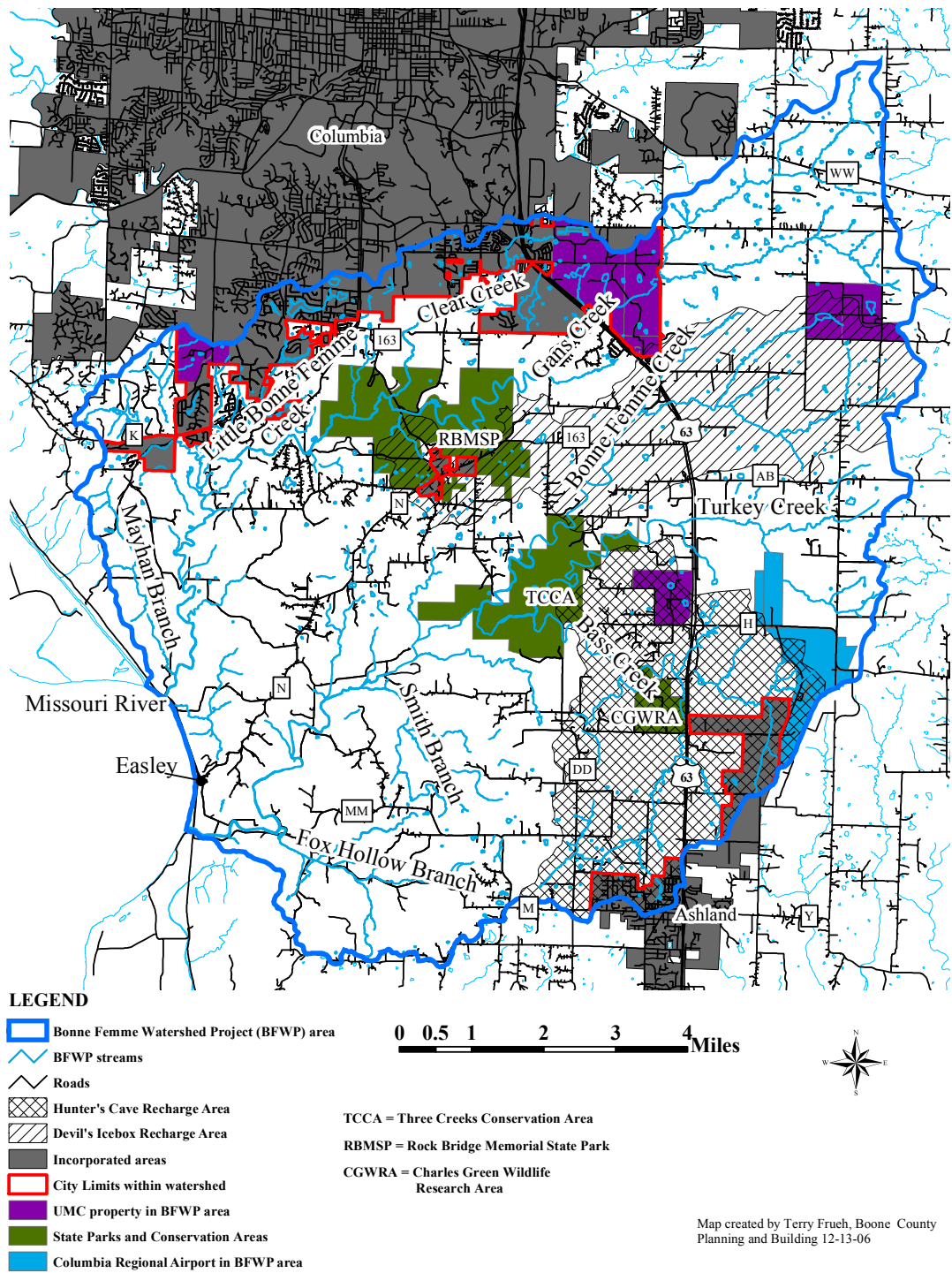


Figure ES.1 Map of the Bonne Femme Watershed Project Area.

## **Executive Summary**

### ***Recommendations***

*Note: these recommendations are not prioritized.*

#### **Recommendations that apply to all goals:**

1) It is important to have a follow-up program to assess the effectiveness of plan implementation. This follow-up program includes three aspects:

- **Enforcement/inspection** will assure that new ordinances are being followed.
- **Maintenance** of new stormwater and sewer infrastructure will be necessary for proper functioning.
- **Plan evaluation** is key to understanding whether the plan is being followed as intended, and how effective the various measures are. This may include actual stream monitoring, as well as analyzing implementation of the recommendations. Stream monitors must use generally accepted, quantifiable measures of water quality obtained at regular intervals on an ongoing schedule, and the data must be collected by certified entities/persons.

2) **Equity:** Measures implemented to protect water quality should not unfairly burden individuals. Every effort should be made to create incentive-based programs.



## Executive Summary

Goal	Strategies	Recommendations
Ensure that structures are not built in places that will flood	Update 100 year floodplain maps and regulations	Political subdivisions should consider complete hydrologic modeling to determine where the 100-year floodplain would be under full build-out conditions, and locate it more accurately on floodplain maps. This modeling should be limited to developing areas to keep costs down. Allow no construction of structures for occupancy in the re-delineated 100-year floodplain.
	Zoning – Streamside buffer ordinance	Adopt a stream buffer ordinance that limits construction within its boundaries
	Design manual	Do not permit new development to increase peak flows downstream so that flooding is not exacerbated.
	Purchase structures that flood now	City or County may offer to purchase a structure, at prevailing market rate, to correct a flooding problem in an existing neighborhood, if the cost of correcting the problem exceeds the value of the structure.

## Executive Summary

Goal	Strategies	Recommendations
Conserve recharge & karst areas with special protections	Design manual/ Performance based goals	The <i>level of service</i> (following Columbia's proposed stormwater manual and ordinance) will be more restrictive (e.g. by one or two points on the level of service scale) in karst and recharge areas than in other areas. Local governments will adopt similar, compatible stormwater ordinances and design manuals.
	Zoning	Zoning ordinances will establish specific criteria for development in karst recharge areas. These should include defining levels of stormwater quantity and quality, and limiting new sanitary sewers to <i>no discharge systems</i> .
	Land purchase	Local governments may purchase land from willing sellers in karst recharge areas, but other options for protecting water quality should be explored first. Create management plans for this purchased land with a primary goal to protect water quality. (Government takings or eminent domain should not be used for acquiring land for this purpose)
	TDRs & conservation easements	Transfer of development rights (TDR) should be established county-wide, with sensitive areas (such as karst recharge areas and steep slopes) being primary sending areas. This program should enable the cities and the county to have <i>joint program reciprocity</i> . TDR and conservation easements should be economically and logistically feasible options for use by landowners and developers.
	Tax relief	Create incentives to encourage conservation in karst recharge areas.
	Zoning and Subdivision regulations; Design manual	Consider a plan to provide special protections to karst and recharge areas.
	Further scientific study and monitoring	More scientific analysis should be done to delineate further karst recharge and other environmentally sensitive areas, and more definitively identify sources of contamination.

## Executive Summary

Goal	Strategies	Recommendations
Ensure that changes in land use do not increase downstream flooding or channel instability, or decrease water quality	Design manual	The <i>level of service</i> (following Columbia's proposed stormwater ordinance and manual) for stormwater runoff flow characteristics post-development shall be no less than pre-development. Similarly, stormwater quality should have the same or better characteristics for post-development as it had pre-development. Local governments should adopt similar, compatible stormwater ordinances and design manuals.
	Encourage <i>low impact development (LID)</i>	Local governments should establish additional zoning and subdivision regulations that allow LID as a <i>matter of right</i> (i.e., approval will be expedited). This avoids the problems associated with the planned development process and encourages LID.
	Education	Make new stormwater manuals and ordinances widely available and familiar to the public through a public outreach and education effort.
	Develop funding mechanisms	New sources of funding should be pursued to assist landowners in implementing stream-protection <i>best management practices (BMPs)</i> . Compile a list of available sources of funding and provide to landowners and developers.
	Financing of storm water program	Secure sustainable, adequate funding for stormwater programs.

Goal	Strategies	Recommendations
Encourage low impact developments as a way to maintain or improve water quality	Education	Implement a comprehensive educational program for the general public, landowners, and developers to encourage LID.
	Design manual	Revise local governments' development regulations to promote environmentally sensitive design and maintenance.  The level of service (following Columbia's proposed stormwater manual and ordinance) will be more restrictive (e.g. by one or two points on the level of service scale) in susceptible subwatersheds (following maps 6.0E, 7.3E and 8.2B of the Subwatershed Sensitivity Analysis) than in less susceptible subwatersheds. Local governments will adopt similar, compatible stormwater ordinances and design manuals.
	Tax relief, funding, Economic development	Create economic incentives to encourage developers to implement LID.

## Executive Summary

Goal	Strategies	Recommendations
In order to maintain quality of life, encourage parks, healthy streams, LID, and municipal services.	Land purchase, Develop funding mechanisms, Economic incentives	Provide mechanisms and/or incentives to set aside land in non-LID developments for land to be set aside for parks or green space, especially in conjunction with a stream buffer. Encourage these features in other new, as well as preexisting, neighborhoods.

Goal	Strategies	Recommendations
Maintain the economic viability of the community while protecting clean streams	Education	Include information on protecting clean streams in development information distributed by the city and county (through web, forms, brochures). Develop a map that shows protected areas and include this in all literature related to development.
	Design manual	Local governments should adopt similar, compatible stormwater ordinances and design manuals that have stream protection information and requirements.
	Zoning	Address zoning where protection is necessary.

Goal	Strategies	Recommendations
Enhance healthy streams in parks	Education	Make stream protection a central part of park management. Establish park definitions to include stream protection goals. BMPs should be used on property owned by local governments.

## Executive Summary

Goal	Strategies	Recommendations
Maintain clean water without unnecessarily restricting property rights	Design manual	Give detailed design information to developers and engineers to assist them in controlling runoff quality and quantity from development.
	Zoning	Use voluntary zoning changes to direct density, and therefore higher runoff, to the most appropriate areas.
	Subdivision and zoning regulations	Revise local governments' ordinances and design manuals to enable reductions in impervious surface by allowing flexibility in street width, sidewalks, etc.
	Education	Expand public education newsletters and mail them more frequently.
	Develop funding mechanisms	Secure sustainable public funding for the operation and maintenance of BMPs, especially those initially funded by government agencies.
	TDRs and conservation Easements	Encourage landowners to use various economic incentives (e.g. conservation easements and TDR).

Goal	Strategies	Recommendations
Have policies which boost jobs, retail, tax base, and local economics	Zoning	Locate retail, by appropriate zoning, to areas that will allow the most efficient use of infrastructure and the least hazard of stream pollution.
	Economic incentives	Consider reduction in fees and other expenses paid by developers of commercial property, in preference to the creation of additional special transportation districts. For locally-owned businesses, give economic incentives to help implement LID. Use tax incentives for owners of LID-style commercial/retail structures.
	Zoning	Exempt agricultural land from restrictions and stream buffers to maintain and enhance maximum economic opportunity for farmers and related agricultural activities, as well as to keep land in agricultural use.

## Executive Summary

Goal	Strategies	Recommendations
The impacts of upstream urbanization should be mitigated to prevent increased costs to agricultural and other downstream property owners.	Performance based goals/ Design manual	1) Determine baseline conditions for the establishment of monitoring programs. These conditions should include stream water quality, amount of stormwater discharge, <i>stream cross-sections</i> . 2) Publicly monitor at specified time periods at specific locations to determine effectiveness of currently implemented plan.
	Develop funding mechanisms	Ensure that local governments provide adequate funding for their stormwater programs via a stormwater utility fee.
	TDR & conservation easements	Use land purchase, TDRs, conservation easements, etc. where applicable to encourage conservation in appropriate areas.

Goal	Strategies	Recommendations
Ensure that BMPs do not unreasonably affect housing affordability.	Education	Publicize information on cost-effective BMPs.
	Zoning	Amend zoning regulations to allow for increased density in exchange for improved stormwater quality and quantity management.

Goal	Strategies	Recommendations
Ensure that certain areas receive special protections while maintaining the economics of urbanization.	Zoning	Zoning regulations will reflect the sensitivity of the watershed/subwatershed. This will allow for economic growth while protecting sensitive subwatersheds.
	Design manual	Revise local governments' stormwater design manuals with specific design criteria for sensitive subwatersheds.