

Marais des Cygnes Basin High Priority Issue Comprehensive Flood Assessment January 2009

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Issue

Persistent flood damages in the [Marais des Cygnes basin](#) indicate a need for a comprehensive assessment of existing flood control infrastructure and storage to determine current status, mapping needs and opportunities for flood management actions in the future.

In the summer of 2007, widespread flooding occurred in the lower Marais des Cygnes basin. Heavy [precipitation](#) fell downstream of the federal flood control reservoirs in the basin. The City of Osawatomie and other communities sustained considerable flood damage. Numerous flood control structures and levees in the basin were also damaged.

The 2003 Marais des Cygnes Basin Section of the *Kansas Water Plan* contained a priority issue on Fort Scott Flooding. Major floods in the Marmaton River watershed impacted the City of Fort Scott in 1986 and 1998. Four water control structures received federal funding in 2004 in the Marmaton Joint Watershed District No. 102. To date, two of these flood control structures have been built and another is under construction.

Flood Insurance Rate Maps (FIRMS) have been prepared for most of the communities subject to flooding in the basin by the Federal Emergency Management Agency (FEMA). Dam breach inundation zone mapping has been conducted by the State Conservation Commission (SCC). Development downstream of some small dams has resulted in changes in hazard class and necessitated upgrading of some structures.

Description

Rivers and streams in the Marais des Cygnes basin have been historically prone to flooding during high rainfall events. Most communities and cities are sited near stream channels and Osawatomie and Fort Scott are located at the confluence of major drainages in the basin, making them especially vulnerable to flood damage.

Three federal reservoirs: Pomona, Melvern and Hillsdale, have been constructed in the basin by the U.S. Army Corps of Engineers (Corps), primarily for flood control. There are eight [watershed districts](#) in the basin administering 100 water retention structures (including permitted structures pending construction). These smaller flood control structures are located on tributary streams and have multiple benefits including protecting crops planted in the floodplain.



Pomona Reservoir

In 2002 the Kansas Legislature directed the Secretary of Agriculture and the Chief Engineer, Division of Water Resources (DWR) to evaluate the current policies regarding stream obstructions (roads, bridges, culverts, levees) and present a report outlining the strengths and weaknesses of a watershed approach to the permitting of dams and other stream obstructions. The Secretary and the Chief Engineer were to make recommendations to the Legislature with regard to clarifying the obligations of the Water Structures Program to upstream and downstream landowners.

A questionnaire was sent to city and county governments, the Kansas Department of Transportation (KDOT) and other interest groups to gather their input on pros and cons of a watershed-based approach to permitting of stream obstructions. The approach would have required more rigorous hydrologic and hydraulic modeling to evaluate the effect of structures further upstream and downstream of proposed projects than was currently required. Several alternatives were evaluated that would have imposed various levels of increased requirements.

Two public hearings were held. As a result of the evaluation and public input, the approach was not adopted due largely to concerns of local governments about increased costs and time to process permits. In addition, local governments did not recognize that the current procedures were causing problems and the benefits did not seem to justify the increased cost and work load. Some changes were made to the program including increased notification of upstream and downstream land owners of pending permits. An in-house evaluation was conducted on several streams with permitted structures to determine the downstream flooding impact resulting from the structures.

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Accumulation of debris within and behind bridges, culverts and other structures can obstruct the flow of water and limit the ability of the stream to carry flood water through permitted stream obstructions. It is important that permitted obstructions be kept clear of log jams caused by trees, utility poles and other debris that may wash into streams during high flows. Management of riparian areas to prevent debris from entering the system and causing blockages is an important part of a preventive and routine maintenance program. Well-managed and healthy riparian and wetland areas along streams also benefit flood reduction by storing water on floodplains.

Summer 2007 Flooding

Nearly \$40 million was approved by the FEMA and the U.S. Small Business Administration to assist those affected by the severe storms and flooding occurring from June 26 through July 25, 2007 in Kansas. The Kansas National Guard was sent to help with a mandatory evacuation of the City of Osawatomie, as overflowing Pottawatomie Creek inundated neighborhoods.

A total of 31 watershed district water control structures in the Marais des Cygnes basin sustained an estimated \$378,500 in damage during the 2007 summer floods. Pottawatomie Creek Watershed District site H-26 had an estimated \$250,000 in damage. On June 30, 2007, Cedar Creek Valley Reservoir which is the public water supply for the City of Garnett sustained an estimated \$645,000 in damage when almost half of a 400-foot spillway wall was eroded.

Although the federal flood control reservoirs in the basin functioned properly, this event demonstrated that even with extensive structural efforts to control flooding, excessive rainfall over successive days can overcome the ability of the system to prevent damage. Additionally, the Marmaton River (Fort Scott) and Pottawatomie Creek (Osawatomie) watersheds lack flood protection from federal reservoirs.

National Flood Insurance

The Flood Management Policy Section of the *Kansas Water Plan* describes flood related activities of FEMA and the National Flood Insurance Program (NFIP).⁽¹⁾ DWR provides coordination and technical assistance for the NFIP in Kansas. DWR provides technical assistance to local governments and offers the *Floodplain Manage-*

ment Guide⁽⁶⁾ to landowners.

To be eligible to participate in the NFIP, cities or counties must enact flood control ordinances designed to limit floodplain development and to protect those buildings that are constructed in the floodplain from flood damage. Management of floodplain development is the first priority in preventing flood damage.

DWR assists cities and counties with the development of flood control ordinances and is responsible for approving them. In the Marais des Cygnes basin, seven counties and 24 cities have enacted floodplain ordinances. Property owners in these political subdivisions are eligible to buy flood insurance through the NFIP program. All eligible entities in the basin participate in the NFIP program with a total of 208 policies. Bourbon County had the seventh highest flood insurance payments of all Kansas counties since 1978, with \$2,421,938 paid on only 59 claims (Table 1).

Table 1.

County	Number Policies	Total Coverage	Total Premium	Total Claims Since 1978	Total Paid Since 1978
ANDERSON	12	\$ 690,100	\$ 5,545	4	\$ 190,554
BOURBON	34	\$ 5,342,900	\$ 31,163	59	\$ 2,421,938
FRANKLIN	57	\$ 6,787,100	\$ 41,784	12	\$ 164,432
LINN	7	\$ 767,000	\$ 4,560	0	\$ 0
MIAMI	67	\$ 8,742,500	\$ 30,472	15	\$ 608,546
OSAGE	31	\$ 1,624,500	\$ 9,110	10	\$ 129,477

Source, Division of Water Resources, 2008

In 1997, FEMA initiated a plan to modernize the flood mapping program. The plan proposed a seven-year upgrade of the flood map inventory and enhancement of the associated products and services. Most existing FEMA flood maps were produced using now outdated manual cartographic techniques and do not include recent development. The desire was to produce digital maps compatible with computerized geographic information system (GIS) software. Federal funding to implement the map modernization plan has not yet been made available.

The FY 2005 *Kansas Water Plan Flood Management Policy Section* identified 29 priority counties to be mapped, remapped or to have existing information digitized. Financial assistance from the State Water Plan Fund has been provided for mapping in Allen, Anderson, Bourbon, Coffey, Douglas, Franklin, Johnson, Osage and Wabaunsee counties. Digital flood insurance maps were approved for Miami and Linn counties in 2007.

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The Kansas Hazard Mitigation Plan was updated in 2007 by the Kansas Division of Emergency Management (KDEM).⁽¹⁾ In the prioritization of risk associated with 22 hazards conducted as part of the planning process, flooding and winter storms ranked second behind only tornadoes in the degree of risk present. The plan contains the following in the *Mitigation Action Strategy Summary*: "Integrate flood mitigation into KDOT construction projects. Lead agency: KDOT; Support Agency: Kansas Department of Agriculture". This is shown in the Hazard Mitigation Plan as having a medium planning priority. It is noted that this action applies to all new construction projects and that more coordination with other state and local agencies is needed. This recommendation also addresses some aspects of watershed based planning and permitting discussed above.

The *Kansas Hazard Mitigation Plan* includes a summary of high and significant risk dams (Table 2). A high hazard dam (Class C) is a structure located in an area where failure could result in any of the following: extensive loss of life, damage to more than one home, damage to industrial or commercial facilities, interruption of a public utility serving a large number of customers, damage to traffic on high volume roads, a high volume railroad line, inundation of a frequently used recreation facility serving a relatively large number of persons, or two or more individual hazards described in Hazard Class B. A significant hazard dam (Class B) is a dam located in an area where failure could endanger a few lives, damage an isolated home, damage traffic on moderate volume roads, damage low volume railroad tracks, interrupt the use or service of a utility serving a small number of customers, or inundate recreation facilities such as campground areas used intermittently and serving a relatively small number of persons. Dam hazard ratings are based on the risk for loss of life and/or property damage and are not related to the condition of the structure. The DWR requires emergency action plans to be developed for Hazard Class C dams. In May 2007, this requirement was extended to include Hazard Class B dams.

The Hazard Mitigation Plan also includes a summary of flood control levees in Kansas (Table 3). Levees, along with dams, are engineered to withstand floods with a computed risk of occurrence (100-year flood).

Watershed Districts

The eight [watershed districts](#) in the Marais des Cygnes basin have developed general plans, approved by the SCC or the Natural Resources Conservation Service

Table 2.
Dams in the Marais des Cygnes Basin

County*	Population	Total dams	High hazard (w/out plans)	Significant Hazard
Allen	13,677	23	0	1
Anderson	8,051	51	1 (1)	1
Bourbon	14,950	72	5 (2)	4
Coffey	8,701	53	0	5
Crawford	38,059	59	1 (1)	1
Douglas	112,123	97	7 (1)	3
Franklin	26,513	68	0	2
Johnson	516,731	103	20 (7)	14
Linn	9,962	81	8 (7)	7
Lyon	35,369	108	2 (1)	12
Miami	30,900	68	1	5
Osage	16,958	52	5 (1)	1
Wabaunsee	6,895	50	2	6

* Counties either wholly or partly within the MDC basin
Source: Kansas Hazard Mitigation Plan, 2007.

Table 3.
Levees in the Marais des Cygnes Basin

County*	Levee design standard	Flooding source	Protected Community	Federal Levee?
Franklin	100-year	Marais des Cygnes River	Ottawa	yes
Franklin	100-year	Marais des Cygnes River	Unincorporated	yes
Miami	100-year	Marais des Cygnes River	Osawatomie	unknown
Miami	100-year	Pottawatomie Creek	Osawatomie	unknown

* Includes only counties subject to flooding by the MDC River and tributaries
Source: Kansas Hazard Mitigation Plan, 2007.

(NRCS), that describe the location and floodwater storage capacity of flood control retention and detention structures. Most impound water even during non-flood conditions and many have benefits in addition to flood control. General plans also include watershed protection actions including construction of terraces, grassed waterways and grade control structures to limit sediment delivery to the structures.

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Watershed districts have the authority to levy taxes on residents within the district to be used for operating expenses, new structure construction, and routine maintenance of infrastructure. Local funding can also be used to implement best management practices (BMPs) to restore wetland and riparian areas that also provide flood detention benefits.

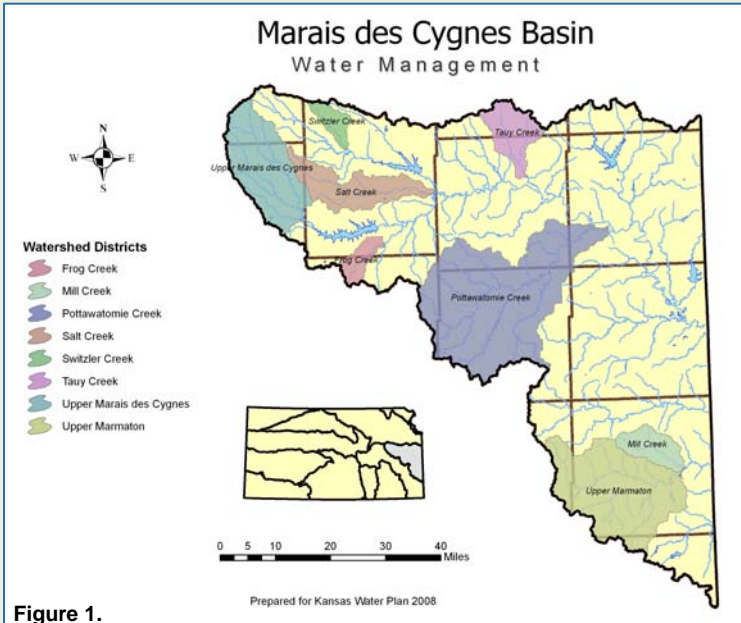


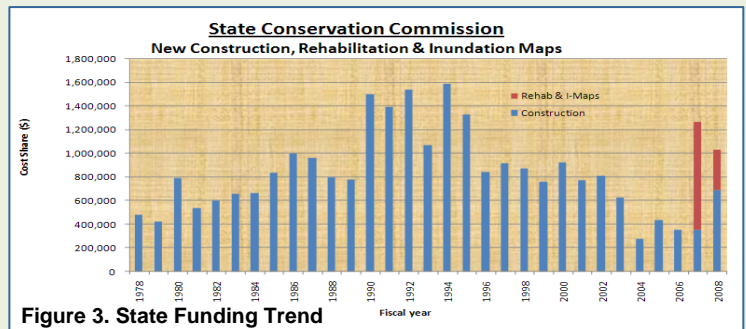
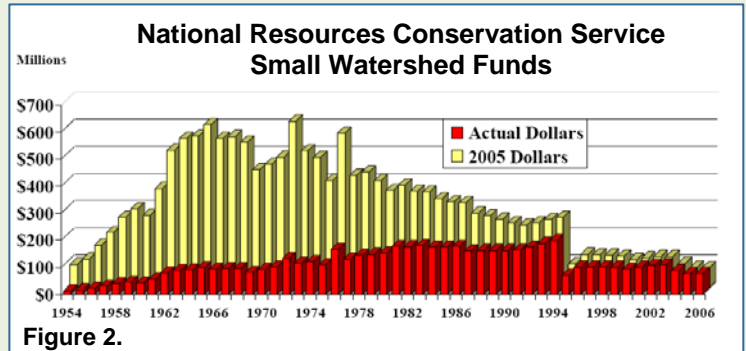
Figure 1.

Funding for construction of watershed structures comes from federal, state and local sources (Figure 1). Construction under the NRCS P.L. 83-566 Program in the basin includes a total nine structures built in the Frog and Middle Creek Watersheds. NRCS activity peaked in Kansas in 1964 with over 70 structures completed. There has been no funding in Kansas under the program since 2006.

One hundred SCC watershed district structures are in place with two pending permits in the basin. State assistance to the watershed dam construction program peaked in 1994 at about \$1.6 million (Figure 2).

Local Floodplain Development and Management

Expansion of urban development in floodplains has increased the potential for flood damage. Future flood damages may be reduced by preventing inappropriate development in flood prone areas. Local governments can implement floodplain management through use of planning and zoning authority. There is no state requirement for local units of government to implement floodplain management.



By minimizing structural development in floodplains, the land is available to allow flood waters to spread out, thus slowing the water and reducing erosive potential. Culverts and bridges can be designed to minimize flood damage by allowing adequate space for floodwater conveyance which reduces backwater effects and damage to upstream areas. Roads can be designed to be at elevations high enough to minimize floodwater encroachment. Increased watershed storage of floodwater in key areas can also reduce the volume of runoff, reducing impacts to structures.

Nonstructural mitigation measures including forecast and warning systems, and wetland and riparian areas can reduce flood damages. The National Weather Service (NWS) provides river stage and flood forecasts for the basin through its Missouri River Basin Forecast Center located in Pleasant Hill, Missouri. The Kansas Mesonet Steering Committee selected priority counties for new automated weather stations in 2008. River Forecast Center needs were considered in this process and additional near real-time hourly [precipitation](#) data stations are planned for Wabaunsee, Osage and Miami counties. This network will be informative in developing future design standards for permitted stream obstructions.

Watershed Planning Coordination

The 2005 Flood Management Policy Section of the *Kansas Water Plan* recommends multi-objective management of flood prone areas and the incorporation of non-

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structural measures into watershed district plans to further reduce flood damage while providing other benefits. The 2007 Kansas Hazard Mitigation Plan supports incorporating nonstructural measures into wetland and riparian management plans to further enhance the reduction of damage from floods.

Since 2005, the state has coordinated the development of Watershed Restoration and Protection Strategies (WRAPS). Local WRAPS groups develop management plans to address locally identified priority issues. Each watershed district in the basin is also within an area covered by a WRAPS.

Recommended Actions

1. Assess the effectiveness of existing flood control infrastructure and develop plans to address necessary improvements.
2. Address repair of damaged flood control structures and deferred maintenance.
3. Determine the current floodplain status and promote model ordinances and BMPs to local units of government. Promote limiting development in the 100-year floodplain using FIRMs to delineate prohibited areas.
4. Engage basin WRAPS groups, watershed districts and federal agencies to integrate flood management with existing floodplain and riparian programs. Assess and inventory watersheds to identify potential locations for nonstructural flood control measures.
5. Examine the basin application of nonstructural flood controls.
6. Purchase properties having repetitive flood damage and prevent redevelopment of these areas.
7. Develop emergency plans for high hazard dams still needing them.
8. Complete breach inundation zone mapping.
9. Coordinate with DWR, Water Structures Program to determine if increased hydrologic and hydraulic evaluation of stream obstructions should be considered in the Marais des Cygnes basin in areas particularly prone to flooding. Identify and evaluate areas where flooding may be attributed to permitted stream obstructions. Consider the costs to repair flood damages against the costs to implement watershed based permitting.
10. Coordinate with county emergency management agencies on development of county-wide All Hazards Mitigation Plans.

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Resources

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