MARAIS DES CYGNES BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: **Little Osage River**
Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Little Osage **County:** Allen, Anderson, Bourbon, and Linn

HUC 8: 10290103

HUC 11 (HUC 14s)**:** **010** (010, 020, 030, 040, 050, 060 and 070)
020 (010)

Drainage Area: 360.6 square miles

Main Stem Segments: WQLS: 3; starting at State Line and traveling upstream to headwaters near Kincaid and Mildred in southeastern Anderson and northeastern Allen Counties, respectively (**Figure 1**).

Tributary Segment:
WQLS: Fish Creek (8)
WQLS: East Lamberdie Creek (13)
WQLS: Clever Creek (7)
WQLS: Elk Creek (11)
WQLS: Lost Creek (10)
WQLS: Reagan Branch (6)
WQLS: Limestone Creek (5)
WQLS: Owl Creek (9); *1998 303(d) list identifies this WQLS correctly, but stream name of Irish Creek is incorrect. Correct stream name of WQLS (9) is Owl Creek (as in **Figure 1**).*

Designated Uses: Special Aquatic Life Support, Primary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segment.

Expected Aquatic Life Support and Secondary Contact Recreation on all tributary segments. Food Procurement on Elk Creek and Limestone Creek.

1998 303(d) Listing: Table 1 - Predominant Non-point Source and Point Source Impacts

Impaired Use: Contact Recreation

Water Quality Standard: Fecal Coliform Bacteria: 900 colonies per 100 mL for Primary Contact Recreation (disapproved); "These criteria shall be in effect from April 1 through October 31 of each year. The concentration of fecal coliform bacteria in surface waters designated for primary contact recreation shall not exceed 2,000 organisms per 100 milliliters beyond the mixing zone, from November 1 through March 31 of each year." K.A.R 28-16-28e(c)(7)(B)
2000 colonies per 100 ml for Secondary (KAR 28-16-28e(c)(7)(C))

Classified streams may be excluded from applying these criteria when streamflow exceeds flow that is surpassed 10% of the time (KAR 28-16-28c(c)(2))

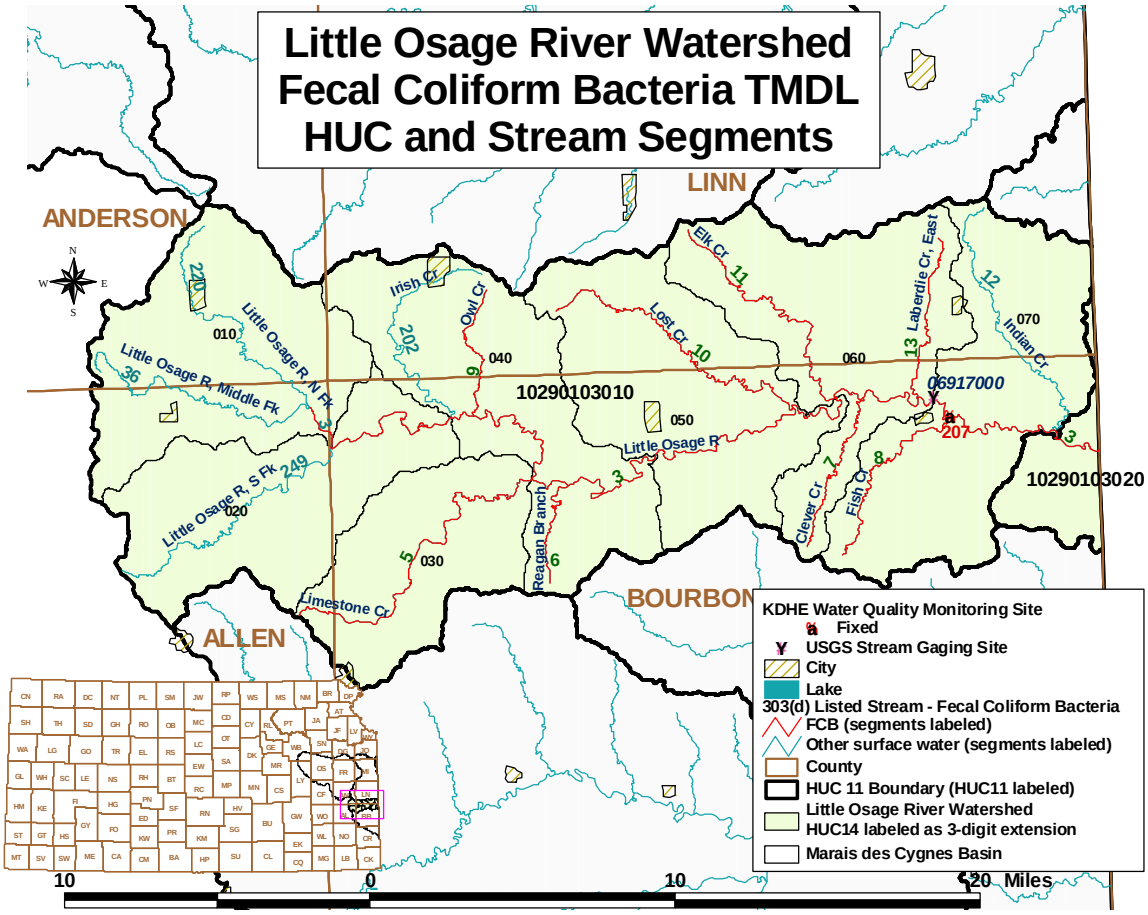

Figure 1

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Not Supporting Contact Recreation

Monitoring Sites: Station 207 near Fulton

Period of Record Used: 1986-1999 for Station 207 (**Figure 2**)

Flow Record: Little Osage River at Fulton (USGS Station 06917000); 1971 to 2000.

Long Term Flow Conditions:10% Exceedence Flows = 485 cfs**,** 7Q10 = 1 cfs

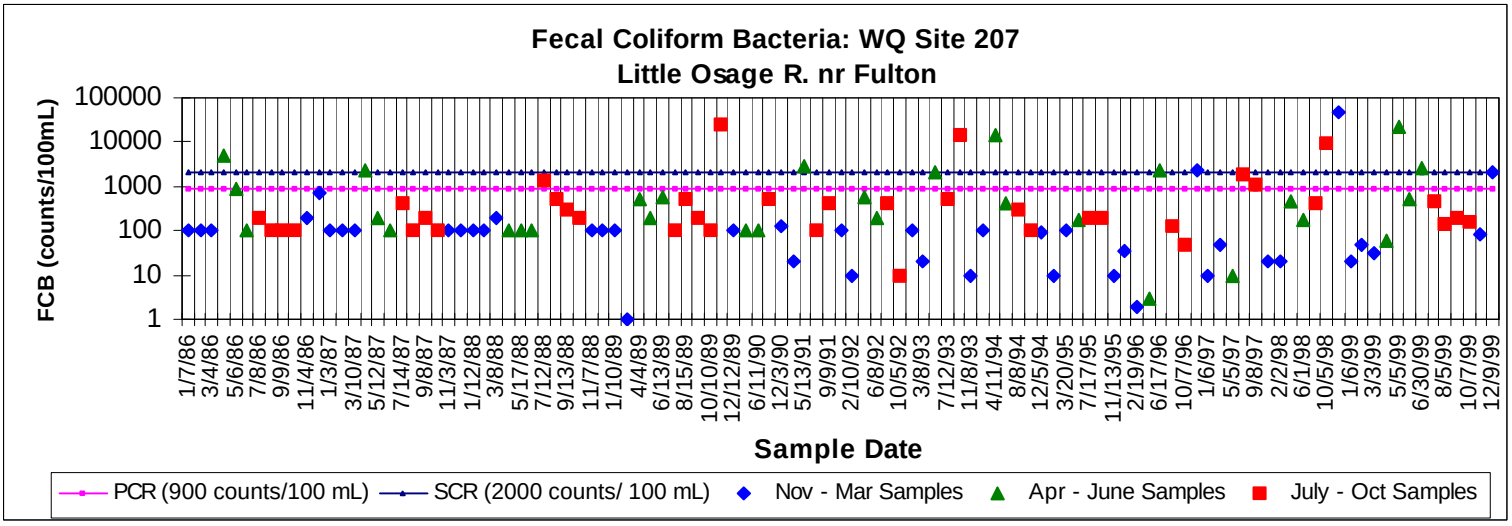

Figure 2

Current Conditions: Since loading capacity varies as a function of the flow present in the stream, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Flow duration data were determined from the Fulton Gage Station for each of the three defined seasons: Spring (April-July), Summer-Fall (August-October) and Winter (November-March). High flows and runoff equate to lower flow durations; baseflow and point source influences generally occur in the 75-99% range. Load curves were established for Primary and Secondary Contact Recreation criterion by multiplying the flow values along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of colonies of bacteria per day. These load curves represent the TMDL since any point along the curve represents water quality for the standard at that flow. Historic excursions from the water quality standard are seen as plotted points above the load curves. Water quality standards are met for those points plotting below the applicable load duration curves (**Figure 5**).

Excursions were seen in each of the three defined seasons and are outlined in Table 1. Twenty three percent of Spring samples and 8% of Summer-Fall samples were over the secondary contact criterion. Seven percent of Winter samples were over the secondary criterion. Overall, 12% of the samples were over the criteria. This would represent a baseline condition of partial support of the impaired designated use.

Table 1
NUMBER OF SAMPLES OVER BACTERIA STANDARD OF 2000 BY FLOW AND SEASON

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Little Osage R. nr Fulton (207)	Spring	2	4	0	1	0	0	7/30 = 23%
	Summer	2	1	0	0	0	0	3/37 = 8%
	Winter	2	1	0	0	0	0	3/42 = 7%

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 207 over 2005 - 2009:

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards fully supporting Primary Contact Recreation and Secondary Contact Recreation. This TMDL will, however, be phased. Kansas adopted a Primary Contact Recreation standard of 900 colonies per 100 ml but EPA subsequently disapproved that standard. This standard was used to establish a load duration curve shown in the TMDL figure (**Figure 5**). It is recognized, however, that this Primary Contact Recreation standard will be revised in the future in accordance with national guidance. A revised Primary Contact Recreation TMDL curve will be established in Phase Two of this TMDL to reflect changes in this standard. For Phase One the endpoint will be to achieve the Secondary Contact Recreation value of 2,000 colonies per 100 ml and this Phase One load curve is also shown in the TMDL figure. The Kansas Standards allow for excursions above these criteria when the stream flow exceeds flow that is surpassed 10% of the time, for this instance, 485 cfs. Monitoring data plotting below the TMDL curve will indicate attainment of the water quality standards.

This endpoint will be reached as a result of expected, though unspecified, reductions in loading from the various sources in the watershed resulting from implementation of corrective actions and Best Management Practices, as directed by this TMDL. Achievement of the endpoint indicates loads are within the loading capacity of the stream, water quality standards are attained and full support of the designated uses of the stream has been restored.

3. SOURCE INVENTORY AND ASSESSMENT

NPDES: There are four NPDES permitted municipal wastewater dischargers within the watershed (**Figure 3**). These systems are outlined in Table 2.

Table 2

MUNICIPALITY	STREAM REACH	SEGMENT	DESIGN FLOW	TYPE
Blue Mound MWTP	Irish Cr	202	0.03 mgd	Lagoon
Fulton MWTP	Little Osage R	3	0.0245 mgd	Lagoon
Kincaid MWTP	N.F. Little Osage R. via unnamed tributary	220	0.03 mgd	Lagoon
Prescott MWTP	E. Laberdie Cr.	13	0.038 mgd	Lagoon

Population projections for Blue Mound, Fulton, and Kincaid to the year 2020 indicate modest declines (5 to 28 % decrease from 1990). Projections for Prescott indicate modest growth (34% increase from 1990). Projections of future water use and resulting wastewater appear to be within design flows for all the current system's treatment capacity. The excursions from the water quality standards appear to occur under a variety of flow conditions but particularly under runoff or higher flow conditions. Of significance to point sources are the excursions under low flow in all seasons, especially during winter, indicating that point sources may have an impact under lower flows in the watershed.

Livestock Waste Management Systems: Twenty one operations are registered, certified or permitted within the watershed. These facilities are located toward the upper and lower ends of the watershed with most fairly removed (more than one mile) from the main stem (**Figure 3**). All facilities are relatively small in size. Potential animal units for all facilities within the watershed total 3,465. The actual number of animal units on site is variable, but typically less than potential numbers.

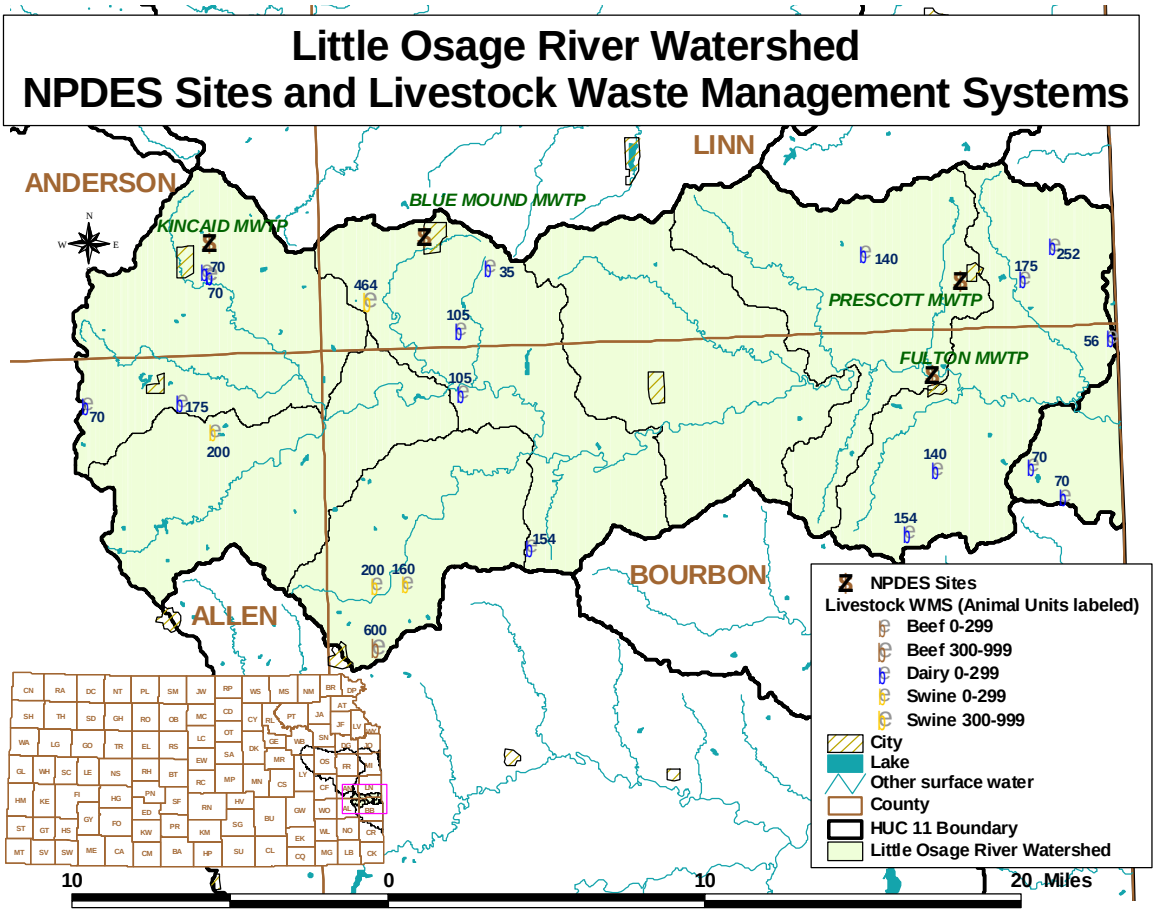

Figure 3

Land Use: Most of the watershed is grassland (48% of the area), crop land (38% of the area) and woodland (13%of the area). The grazing density estimate for livestock is average to high (31

to 55 animal units/mi^2) when compared to densities across the Missouri and Marais des Cygnes Basins. The grassland is evenly distributed across the watershed (**Figure 4**). Based on 1998 water use reports, none of the cropland in the watershed is irrigated.

On-Site Waste Systems: Most of the watershed's population density is very low, 6 - 11 persons/mi^2 (**Figure 4**). The rural population projections for Allen, Anderson, Bourbon and, Linn Counties through 2020 show slight to moderate increases. While failing on-site waste systems can contribute bacteria loadings, their impact on the impaired segments is very limited, given the small size of the rural population and magnitude of other sources in the watershed.

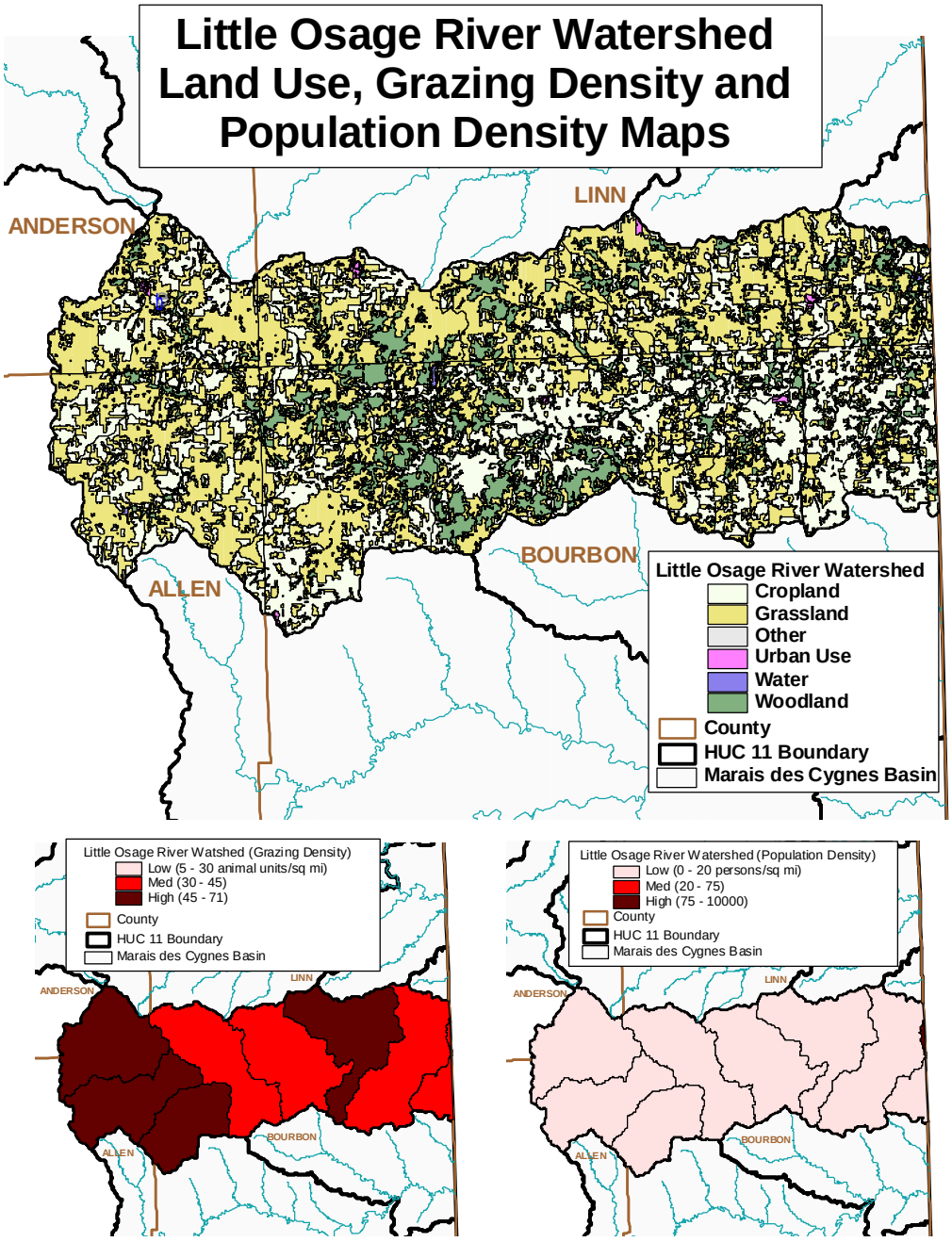

Figure 4

Contributing Runoff: The Little Osage River watershed's average soil permeability is 0.6 inches/hour according to NRCS STATSGO data base. About 98% of the watershed produces runoff even under relatively low (1.71"/hr) potential runoff conditions. Under very low (1.14"/hr) potential conditions, this potential contributing area is reduced about 76%. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. As the watersheds' soil profiles become saturated, excess overland flow is produced. Generally, storms producing less than 0.57"/hr of rain will still generate runoff from 56% of this watershed, chiefly from the upper and lower third of the watershed and along the stream channels.

Background Levels: Some fecal bacteria counts may be associated with environmental background levels, including contributions from wildlife, but it is likely that the density of animals such as deer is fairly dispersed across the watershed resulting in minimal loading to the river below the levels necessary to violate the water quality standards.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

The nature of bacteria loading is too dynamic to assign fixed allocations for wasteloads and non-point loads. Instead, allocation decisions will be made which reflect the expected reduction of bacteria loading under defined flow conditions. These flow conditions will be defined by the presumed ability of point or non-point sources to be the dominant influence on stream water quality. Therefore, the allocation of wasteloads and loads will be made by demarcating the seasonal TMDL curves at a particular flow duration level. Flows lower than that designated flow will represent conditions which are the responsibility of point sources to maintain water quality standards, those flows greater than the designated flow are the responsibility of non-point sources.

Point Sources: The point sources are responsible for maintaining their systems in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. NPDES permits have been reissued for all of the discharging municipalities in 1999 and 2000. The cities of Blue Mound, Fulton and Kincaid rely on lagoon systems with long detention times for treatment of their wastewater. The city of Prescott is presently converting from a mechanical plant to a 3-cell lagoon system with substantial completion scheduled by March 15, 2001. Ongoing inspections and monitoring of these systems will be made to ensure that minimal contributions have been made by these sources.

The Wasteload Allocation is defined at the flow condition ten times the combined design flow these point sources or the 7Q10, whichever is greater, thereby exerting influence on the water quality of the stream. For Little Osage River at Fulton, that flow condition would be flows of 0 - 2 cfs. Such flows have been exceeded 82-99% of the time (**Figure 5**). Any future NPDES and state permits will be conditioned such that discharges from permitted facilities will not cause violations of the applicable criteria at or below this flow.

Non-Point Sources: Based on the assessment of sources, the distribution of excursions from water quality standards and the relationship of those excursions to runoff conditions, non-point sources are seen as a significant cause of water quality violations. Background levels are not

significant as a cause of the problem. Implementation of non-point source pollution control practices should be taken within one mile of the listed stream segments.

Activities to reduce fecal pollution should be directed toward the smaller, unpermitted livestock operations and rural homesteads and farmsteads along the river. The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over flow conditions exceeded 82% of the time (greater than 2 cfs streamflow) (**Figure 5**). Best Management Practices will be directed toward those activities such that there will be minimal violation of the applicable bacteria criteria at higher flows.

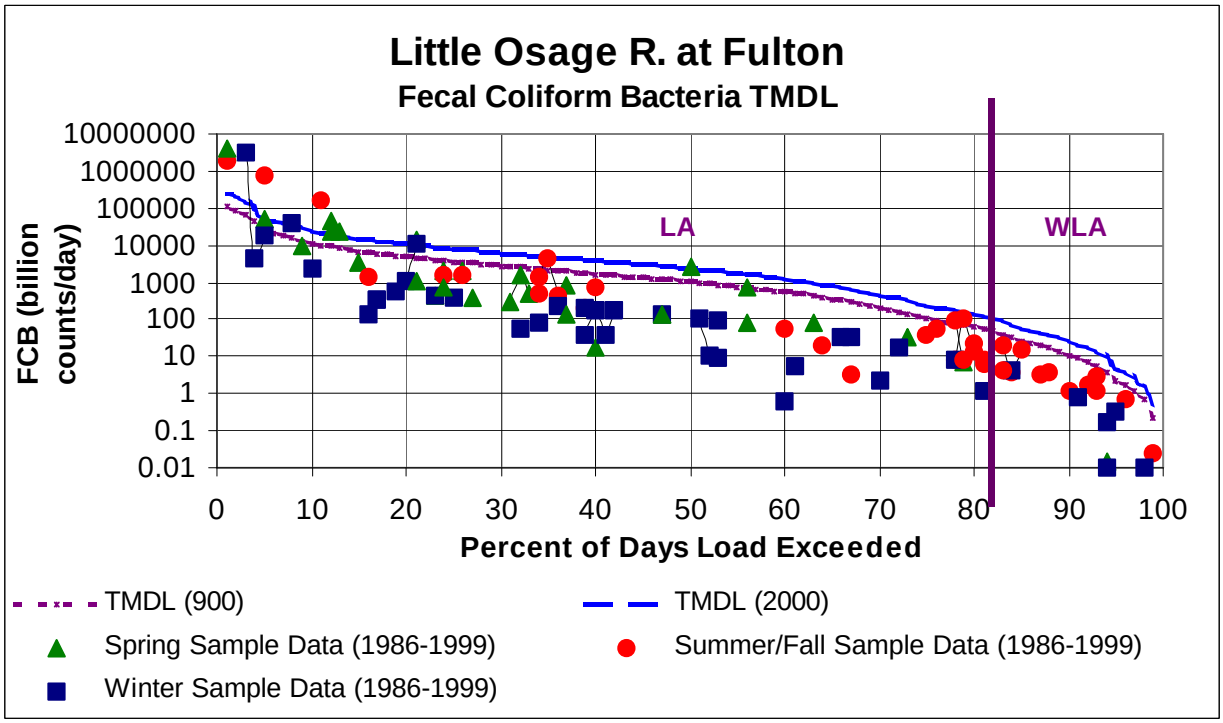

Figure 5

Defined Margin of Safety: Because there will not be a traditional load allocation made for fecal bacteria, the margin of safety will be framed around the desired endpoints of the applicable water quality standards. Therefore, evaluation of achieving the endpoints should use values set 100 counts less than the applicable criteria (800 colonies for primary contact recreation; 1,900 colonies for secondary contact recreation) to mark full support of the recreation designated use of the streams in this watershed. By this definition, the margin of safety is 100 colonies per 100 ml and would be represented by a parallel line lying below the TMDL curve by a distance corresponding to loads associated with 100 colonies per 100 ml.

State Water Plan Implementation Priority: Because of the lack of multiple impairments in the watershed and incidence of exceedence is lower than other watersheds in the Marais des Cygnes basin, this TMDL will be a Medium Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Little Osage River (10290103) subbasin with a priority of 21 (High Priority for restoration work).

Priority HUC 11s and Stream Segments: Until additional assessment is done on the main stem reach between 2002-2006, priority focus of implementation prior to 2006 will concentrate on installing best management practices adjacent to the listed stream segments.

5. IMPLEMENTATION

Desired Implementation Activities

1. Renew state and federal permits and inspect permitted facilities for permit compliance.
2. Install proper manure and livestock waste storage.
3. Install grass buffer strips along tributaries.
4. Install pasture management practices, including proper stock density on grasslands.
5. Remove winter feeding sites in proximity to streams.
6. Reduce livestock use of riparian areas.
7. Insure proper on-site waste system operations in proximity to main streams.

Implementation Programs Guidance

NPDES and State Permits - KDHE

a. Municipal permits for facilities in the watershed will be renewed after 2002 with continuation bacteria monitoring and permit limits preventing excursions in bacteria criteria.
b. Livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
c. Registered livestock facilities with less than 300 animal units will apply pollution prevention technologies.
d. Manure management plans will be implemented.

Non-Point Source Pollution Technical Assistance - KDHE

a. Support Section 319 demonstration projects for pollution reduction from livestock operations in watershed.
b. Provide technical assistance on practices geared to small livestock operations which minimize impact to stream resources.
c. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority watersheds and stream segments within those subbasins identified by this TMDL.

Water Resource Cost Share & Non-Point Source Pollution Control Programs - SCC

a. Develop improved grazing management plans.
b. Install livestock waste management systems for manure storage.

c. Implement manure management plans.
d. Install replacement on-site waste systems.
e. Coordinate with USDA/NRCS Environmental Quality Improvement Program in providing educational, technical and financial assistance to agricultural producers.

Riparian Protection Program - SCC

a. Design winter feeding areas away from streams.
b. Develop riparian restoration projects.

Buffer Initiative Program - SCC

a. Install grass buffer strips near streams.
b. Leverage Conservation Reserve Enhancement Program to hold riparian land out of production.

Extension Outreach and Technical Assistance - Kansas State University

a. Educate livestock producers on riparian and waste management techniques.
b. Provide technical assistance on livestock waste management design.
c. Continue Section 319 demonstration projects on livestock management.

Agricultural Outreach - KDA

a. Provide information on livestock management to commodity advocacy groups.
b. Support Kansas State outreach efforts.

Local Environmental Protection Program - KDHE

a. Inspect on-site waste systems within one mile of main stem and tributary streams.

Timeframe for Implementation: Pollution reduction practices should be installed within the priority subwatersheds over the years 2002-2006, with follow up implementation thereafter.

Targeted Participants: Primary participants for implementation will be small livestock producers operating without need of permits within the priority watershed. Implemented activities should be targeted at those areas with greatest potential to impact the stream. Nominally, this would be activities located within one mile of the streams including:

1. Facilities without water quality controls.
2. Unpermitted permanent feeding/holding areas.
3. Sites where drainage runs through or adjacent to livestock areas.
4. Sites where livestock have full access to contributing tributaries and stream is primary water supply.
5. Grazed acreage, overstocked acreage and acreage with poor range condition.
6. Poor riparian sites.
7. Near stream feeding sites.
8. Failing on-site waste systems.

Some inventory of local needs should be conducted in 2002 to identify such activities. Such an inventory would be done by local program managers with appropriate assistance by commodity representatives and state program staff in order to direct state assistance programs to the principal activities influencing the quality of the streams in the watershed during the implementation period of this TMDL.

Milestone for 2006: The year 2006 marks the mid-point of the ten year implementation window for the watershed. At that point in time, milestones should be reached which will have at least two-thirds of the landowners responsible for the facilities and sites cited in the local assessment participating in the implementation programs provided by the state. Additionally, sampled data from the monitoring station should indicate evidence of reduced bacteria levels at median conditions relative to the conditions seen over 1986-2000.

Delivery Agents: The primary delivery agents for program participation will be the conservation districts for programs of the State Conservation Commission and the Natural Resources Conservation Service. Producer outreach and awareness will be delivered by Kansas State Extension and agricultural interest groups such as Kansas Farm Bureau or Kansas Livestock Association, the Kansas Pork Producers Council and the Kansas Dairy Association. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Linn and Bourbon counties.

Reasonable Assurances:

Authorities: The following authorities may be used to direct activities in the watershed to reduce pollution.

1. K.S.A. 65-164 and 165 empowers the Secretary of KDHE to regulate the discharge of sewage into the waters of the state.

2. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.

3. K.A.R. 28-16-69 to -71 implements water quality protection by KDHE through the establishment and administration of critical water quality management areas on a watershed basis.

4. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.

5. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control non-point source pollution.

6. K.S.A. 82a-901, *et seq*. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.

7. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.

8. The *Kansas Water Plan* and the Marais des Cygnes Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

Funding: The State Water Plan Fund, annually generates $16-18 million and is the primary funding mechanism for implementing water quality protection and pollution reduction activities in the state through the *Kansas Water Plan*. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs supporting water quality protection. This watershed and its TMDL is a Medium Priority consideration.

Effectiveness: Non-point source controls for livestock waste have been shown to be effective in reducing pollution in locales such as the Herrington Lake watershed.. The key to effectiveness is participation within a finite subwatershed to direct resources to the activities influencing water quality. The milestones established under this TMDL are intended to gauge the level of participation in those programs implementing this TMDL.

Should voluntary participation significantly lag below expectations over the next five years or monitoring indicates lack of progress in improving water quality conditions from those seen over 1986-2000, the state may employ more stringent regulations on non-point sources in the watershed in order to meet the desired endpoints expressed in this TMDL. The state has the authority to impose conditions on activities with a significant potential to pollute the waters of the state under K.S.A. 65-171. If overall water quality conditions in the watershed deteriorate, a Critical Water Quality Management Area may be proposed for the watershed, in response.

6. MONITORING

KDHE will continue to collect bimonthly samples at Station 207, including fecal coliform samples, in order to assess progress in implementing this TMDL. During the evaluation period (2005-2009), more intensive sampling will need to be conducted under specified seasonal flow conditions in order to determine the achievement of the endpoint of this TMDL. The manner of evaluation will be consistent with the assessment protocols used to establish the case for impairment in these streams. Following current (1998) Kansas assessment protocols, monitoring will ascertain if less than 10% of samples exceed the applicable criterion at flows under 485 cfs with no samples exceeding the criterion at flows under 160 cfs. Use of the real time flow data available at the Fulton stream gaging station can direct sampling efforts.

Monitoring of bacteria levels in effluent will be a condition of NPDES and state permits for facilities. This monitoring will continually assess the functionality of the systems in reducing bacteria levels in the effluent released to the streams.

Local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2002 in order to support appropriate implementation projects.

7. FEEDBACK

Public Meeting: The public meeting to discuss TMDLs in the Marais des Cygnes Basin was held February 28, 2001 in Ottawa. An active Internet Web site was established at http://www.kdhe.state.ks.us/tmdl/ to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Marais des Cygnes Basin.

Public Hearings: Public Hearings on the TMDLs of the Marais des Cygnes Basin were held in Fort Scott on May 30 and Ottawa on May 31, 2001.

Basin Advisory Committee: The Marais des Cygnes Basin Advisory Committee met to discuss the TMDLs in the basin on October 4, 2000, February 28 and May 30, 2001.

Milestone Evaluation: In 2006, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of the Little Osage River. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

Consideration for 303(d) Delisting: The river will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303(d) list. Should modifications be made to the applicable water quality criteria during the ten year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process: Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2002 which will emphasize revision of the Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process for Fiscal Years 2002-2006.