

# NEOSHO BASIN TOTAL MAXIMUM DAILY LOAD

**Waterbody: South Cottonwood River**  
**Water Quality Impairment: Fecal Coliform Bacteria**

## 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Upper Cottonwood

**County:** Marion

**HUC 8:** 11070202

**HUC 11 (HUC 14s):** 010 (060, 070 and 080)

**Drainage Area:** 118.1 square miles

**Main Stem Segments:** WQLS: 17 and 18 starting at confluence with the Cottonwood River and traveling upstream to headwaters in western Marion County (**Figure 1**).

**Tributary Segments:** WQLS: Antelope Creek (19)  
Stony Brook (25)  
Non-WQLS: Unnamed Stream (456)

**Designated Uses:** Expected Aquatic Life Support, Secondary Contact Recreation, Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segments 17 and 18.

Expected Aquatic Life Support and Secondary Contact Recreation on Tributary Segments 19 and 25.

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

**Impaired Use:** Contact Recreation

**Water Quality Standard:** 2,000 colonies per 100 ml for Secondary Contact Recreation (KAR 28-16-28e(c)(7)(C))

## 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

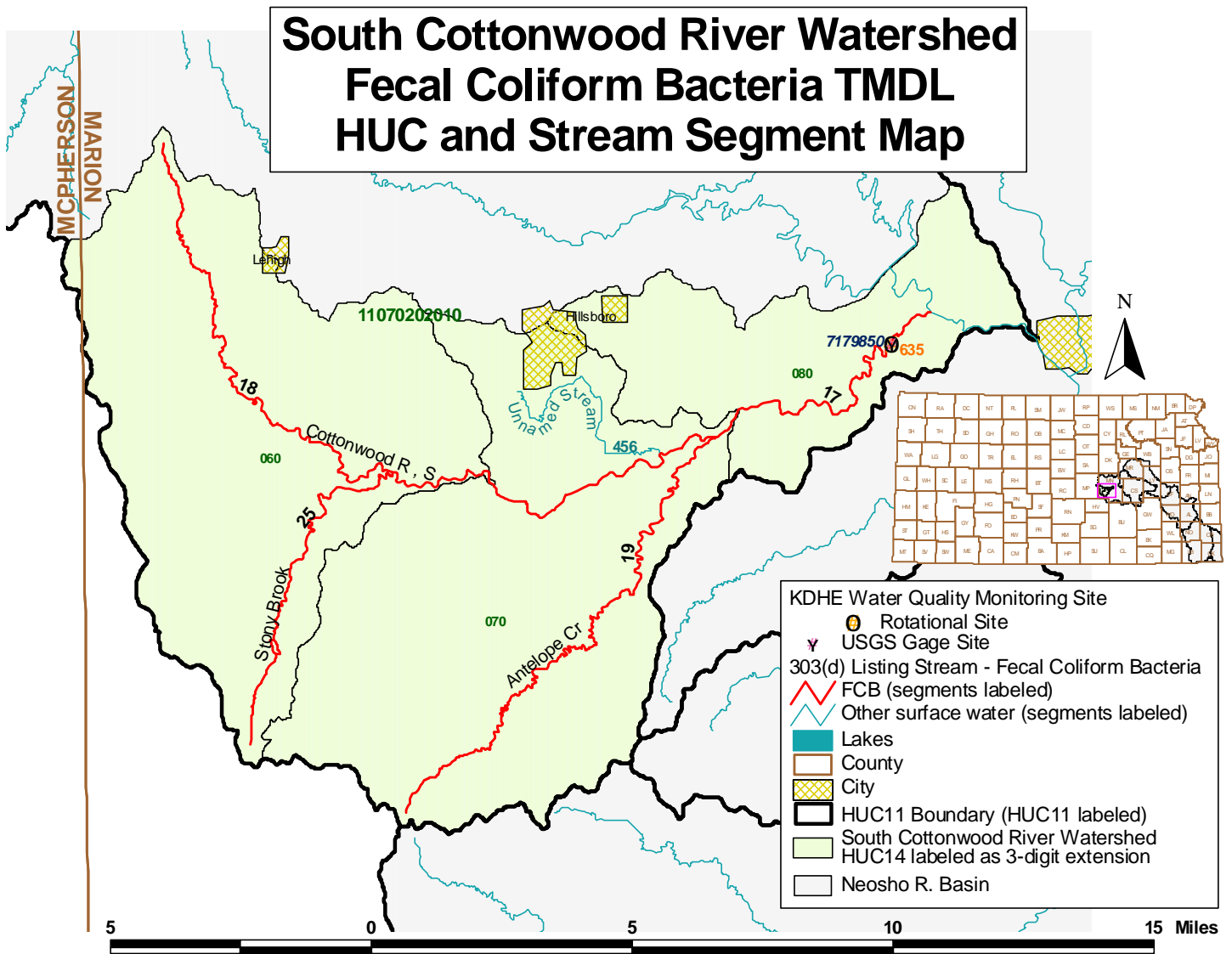
**Level of Support for Designated Use under 1998 303(d):** Not Supporting Contact Recreation

**Monitoring Sites:** Station 635 near Canada

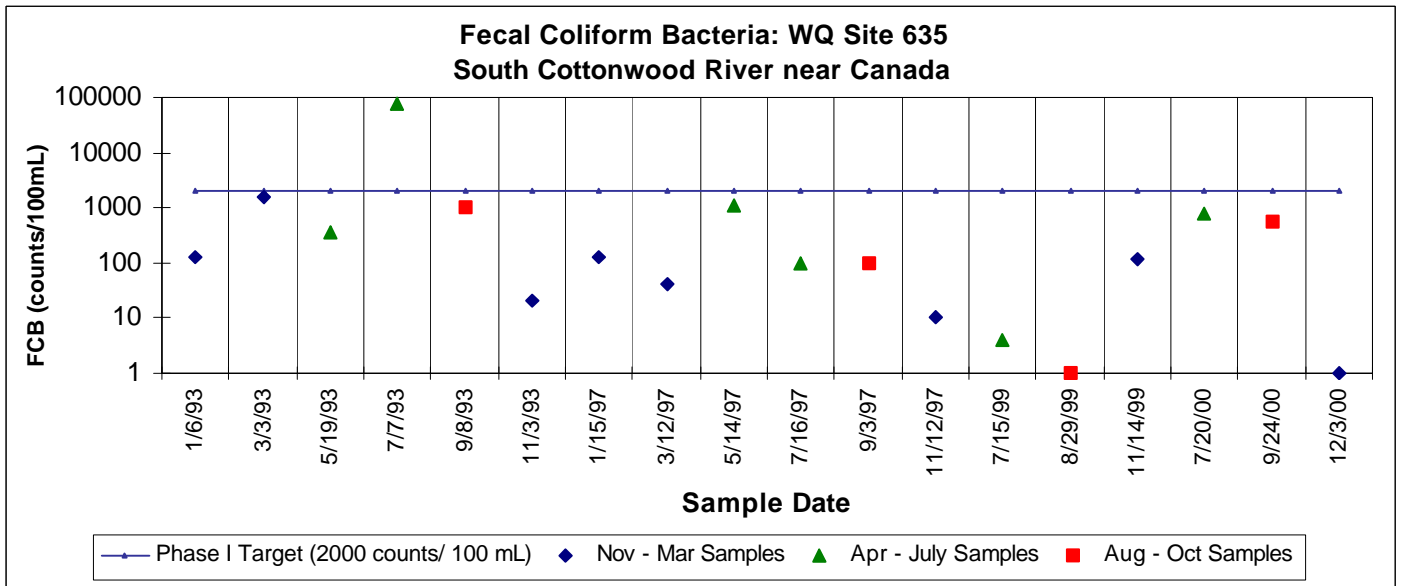
**Period of Record Used:** 1993 and 1997 for Station 635; 1999 and 2000 Kansas Biological Survey Data (**Figure 2**)

**Flow Record:** Cedar Creek near Cedar Point (USGS Station 07180500) matched to South Cottonwood River near Marion (USGS 07179850).

**Long Term Flow Conditions:** 10% Exceedance Flows = 79 cfs, 95% = 1.1 cfs



**Figure 1**



**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. Sample data for the sampling site were categorized for each of the three defined seasons: Spring (Apr-Jul), Summer-Fall (Aug-Oct) and Winter (Nov-Mar). High flows and runoff equate to lower flow durations; baseflow and point source influences generally occur in the 75-99% range. A Load curve was established for the 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. This 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 curve. Water quality standards are met for those points plotting below the load duration curve (**Figure 5**).

A single excursion was seen in one of the three defined seasons and is outlined in **Table 1**. Seventeen percent of Spring samples were over the secondary contact criterion. None of the Summer-Fall or Winter samples were over the secondary criterion. Overall, 6% of the samples were over the criteria. This would represent a baseline condition of full 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.
South Cottonwood R. near Canada (635)	Spring	1	0	0	0	0	0	1/6 = 17%
	Summer	0	0	0	0	0	0	0/4 = 0%
	Winter	0	0	0	0	0	0	0/8 = 0%

**Desired Endpoints of Water Quality (Implied Load Capacity) at Site 635 over 2007 - 2011**

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards which fully support Secondary Contact Recreation. The Secondary Contact Recreation standard is measured by a single “not to exceed” criterion of 2,000 colonies per 100 ml. This criterion was used to establish a load duration curve shown in **Figure 5**. It is recognized, however, that the Secondary Contact Recreation criterion will be revised in the future in accordance with national guidance, notably changing the indicator from fecal coliform to *E. coli*. A revised Secondary 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 maintain the Secondary Contact Recreation value of 2,000 colonies per 100 ml represented by the load curve shown as the Phase One TMDL figure (**Figure 5**). 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.

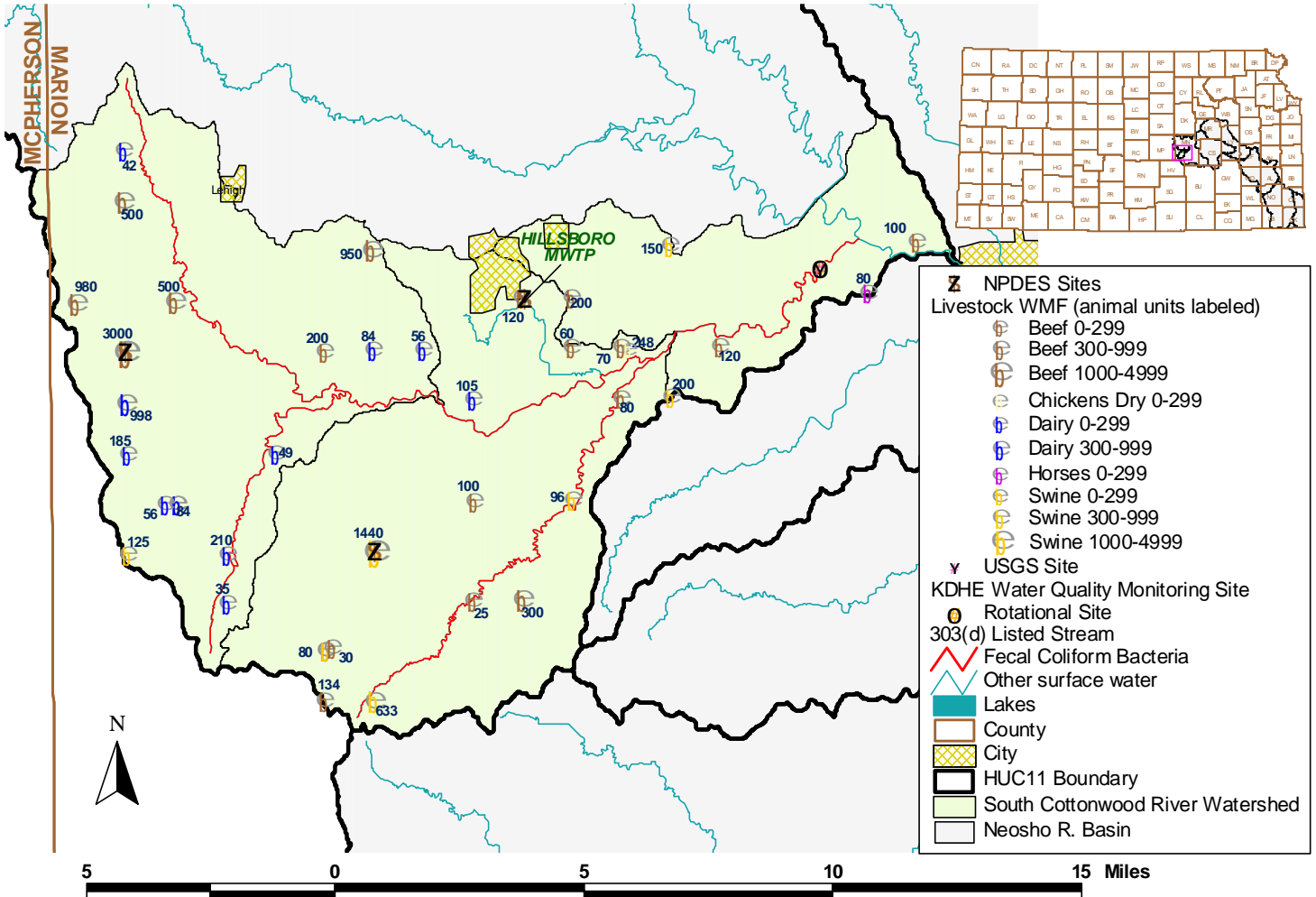
**3. SOURCE INVENTORY AND ASSESSMENT**

**NPDES:** There is one NPDES permitted wastewater discharger within the watershed (**Figure 3**). This system is outlined below in **Table 2**.

**Table 2**

DISCHARGING FACILITY	STREAM REACH	SEGMENT	DESIGN FLOW	TYPE
Hillsboro MWTP	S. Cottonwood R.	18	0.042 mgd	Mech.

# South Cottonwood River Watershed NPDES Sites and Livestock Waste Management Facilities



**Figure 3**

The city of Hillsboro relies on an activated sludge mechanical system for treatment of their wastewater. The permit for the city of Hillsboro has recently been renewed allowing one year for the city to show it can meet bacteria limits. Failure to do so by the city creates a schedule of compliance for disinfection by the end of 2006. At site 635, the only excursion from the water quality standard occurred under runoff or higher flow conditions. Of significance to point sources are the lack of excursions under low flow in all seasons, especially during winter, therefore point sources are not seen as a significant cause of water quality violations in the watershed.

The population projection for Hillsboro to the year 2020 indicates significant growth (47% increase). Projections of future water use and resulting wastewater still appear to be within the design flow of the current system's treatment capacity.

**Livestock Waste Management Systems:** Thirty eight operations are registered, certified or permitted within the watershed. These facilities appear to be evenly distributed across the watershed (**Figure 3**). Two of these facilities are NPDES permitted. One a non-discharging beef facility with 3,000 animal units and the other a non-discharging swine facility with 1,440 animal units. Both are located toward the upper end of the watershed. All permitted livestock facilities have waste management systems designed to minimize runoff entering their operations or detaining runoff emanating from their areas. Such systems are designed to retain the 25 year, 24 hour rainfall/runoff event, as well as an anticipated two weeks of normal wastewater from their operations. Such a rainfall events typically coincides with stream flows which are exceeded less than 1 - 5 percent of the time. Therefore, events of this type, infrequent and of short duration, are not likely to cause chronic impairment of the designated uses of the waters in this watershed. Requirements for maintaining the water level of the waste lagoons a certain distance below the lagoon berms ensures retention of the runoff from these intense, local storm events. In Marion County, such an event would generate 6.1 inches of rain, yielding 4.9 to 5.7 inches of runoff in a day. Additionally, manure management plans and nutrient utilization plans are in place for NPDES permitted swine facilities. Total potential animal units in the watershed for all these facilities is 12,425. The actual number of animal units on site is variable, but typically less than potential numbers.

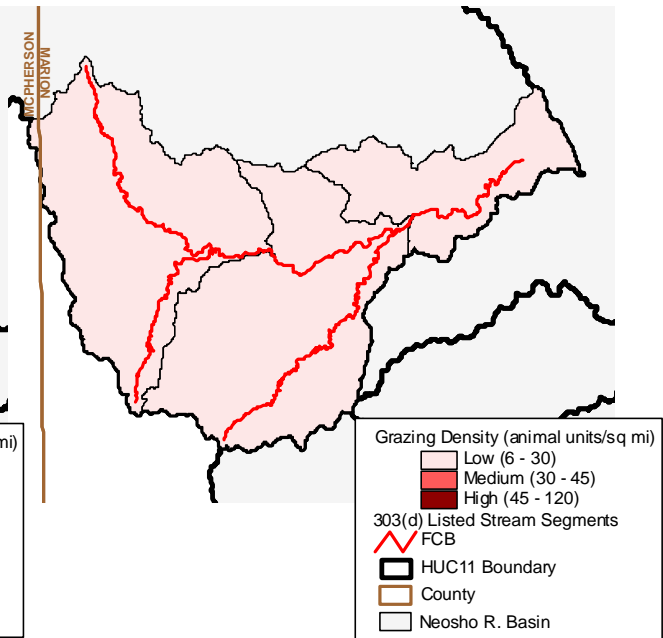
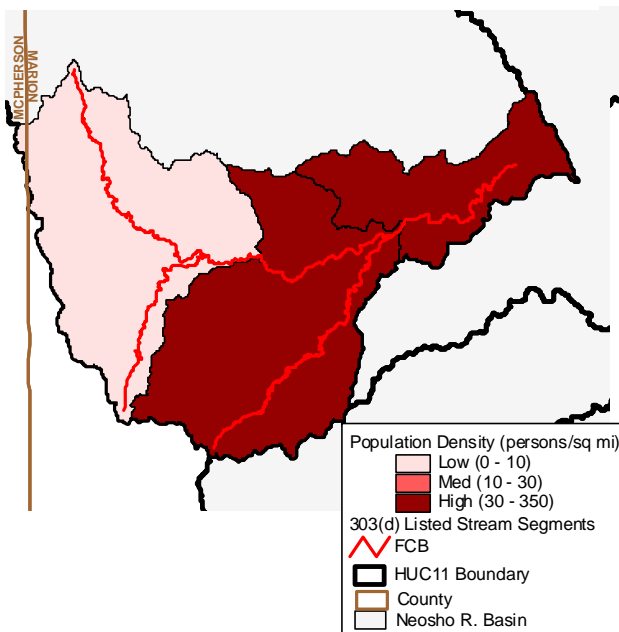
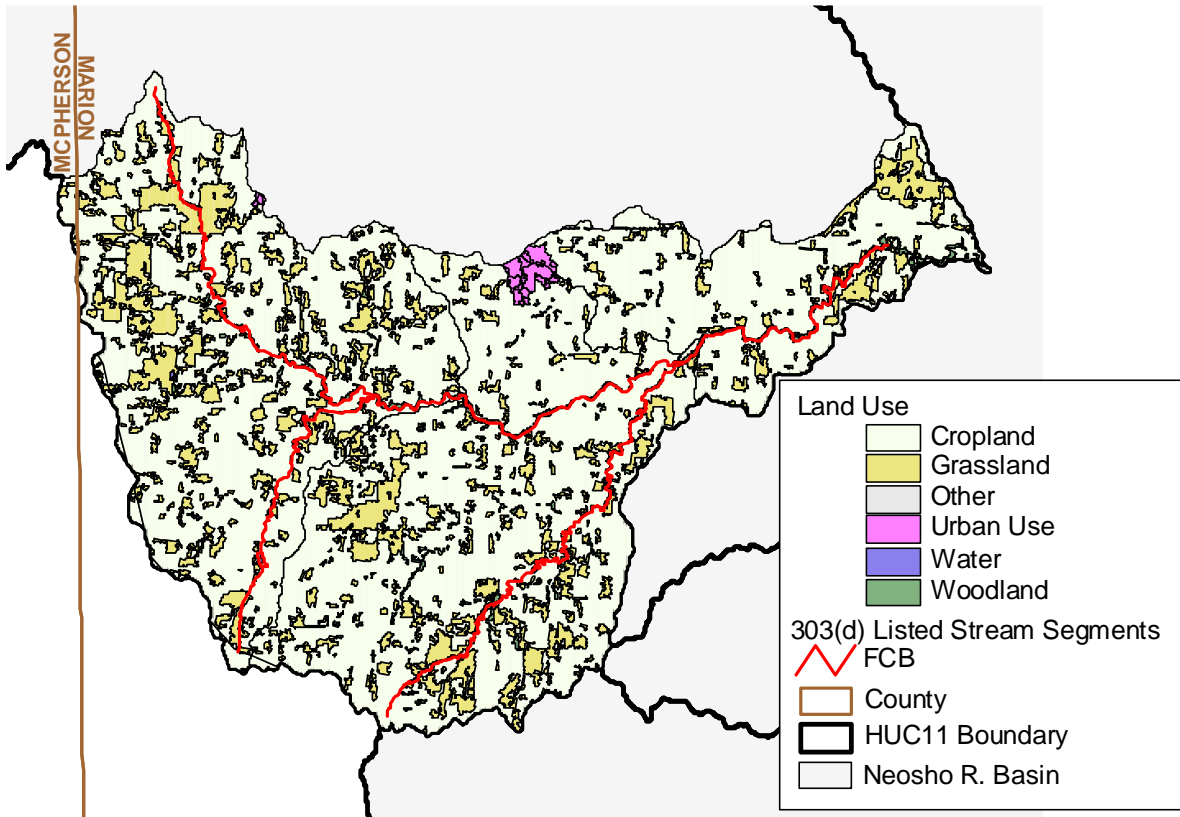
**Land Use:** Most of the watershed is cropland (78% of the area), grassland (20%), or woodland (2%). The cropland also appears to be evenly distributed across the watershed. The grazing density estimate is low in the watershed when compared to densities elsewhere in the Neosho Basin (12-18 animal units/mi<sup>2</sup>) (**Figure 4**).

**On-Site Waste Systems:** The watershed's population density is low in the upper half of the watershed and high in the lower half when compared to densities across the Neosho Basin (10-40 person/mi<sup>2</sup>) (**Figure 4**). The rural population projection for Marion County through 2020 shows little change. Based on 1990 census data, about 1,675 households in Marion county are on septic systems. While failing on-site waste systems can contribute bacteria loadings, their impact on the impaired segments is generally limited, given the small size of the rural population and magnitude of other sources in the watershed.

**Contributing Runoff:** The South Cottonwood River watershed's average soil permeability is 0.5 inches/hour according to NRCS STATSGO data base. Essentially all of the watershed produces runoff even under relatively low (1.71"/hr) potential runoff conditions (99.9%). Under very low (1.14"/hr) potential conditions, this potential contributing area is reduced about 72%. 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 66% of this watershed.

**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.

# South Cottonwood River Watershed Land Use, Population and Grazing Density









**Figure 4**

#### **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 the discharging facility in 2002. The Phase One Wasteload Allocations will be defined as the product of the 2,000 count bacteria criteria and flows occurring 62-99% of the time (**Figure 5**). Wasteload allocations are established for the low flows conditions which are most susceptible to impact from point source discharges. Typically, these conditions are deemed to be ten times the combined design flow of the facilities or the 7Q10, whichever is greater. This allocation accounts for future point source loads exerting some impact on the water quality of the stream.

State and NPDES permitted non-discharging livestock waste management facilities will have a Wasteload Allocation of zero, given that these facilities will not discharge to receiving streams throughout the majority of hydrologic conditions, defined by the curve ranging from 5 to 100 percent of the time. Depending on the areal extent of the storm creating a 25 year, 24 hour precipitation event, the associated stream flows would be exceeded less than 1 - 5 percent of the time.

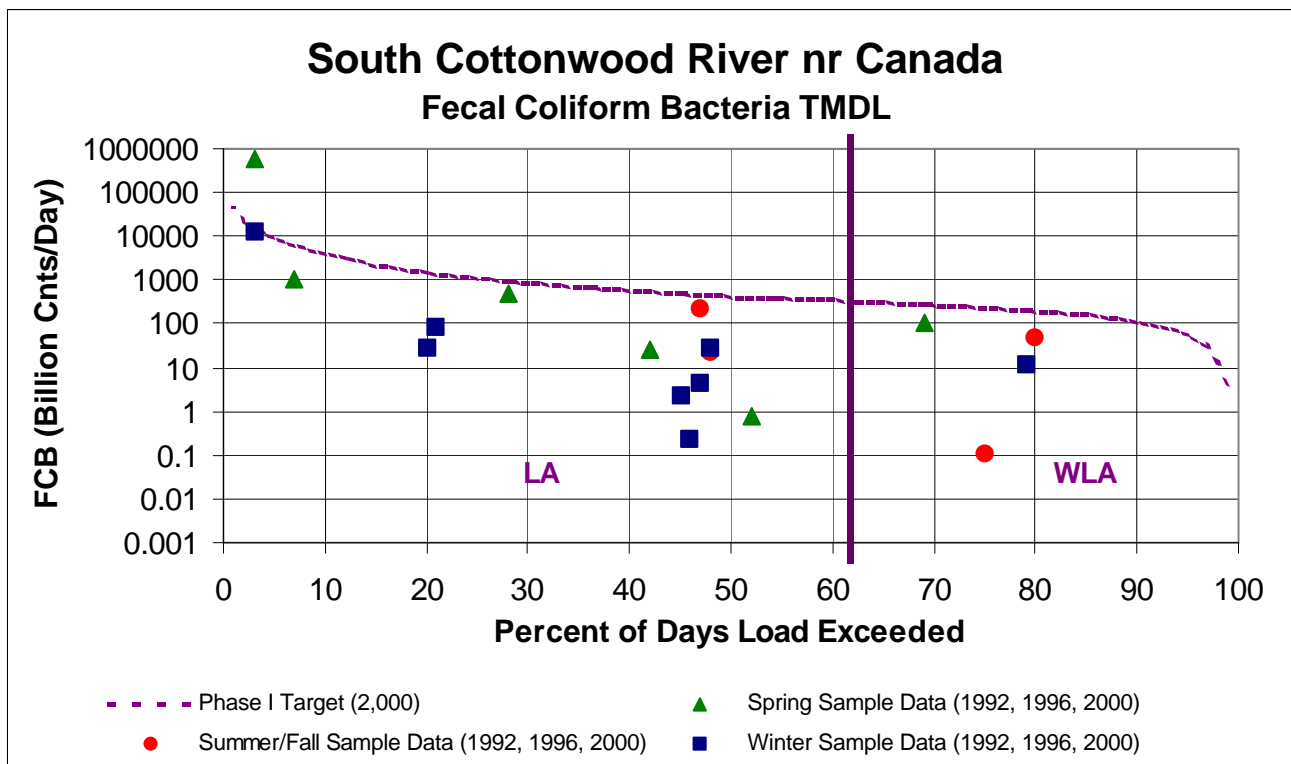
Given the large contributions from both the CAFO bypass and non-point sources, substantial reductions would be necessary. There is a need to maintain zero discharge from CAFOs or state permitted facilities to protect water quality, but under extreme high flow conditions, the ability to retain all the runoff from these feeding areas is hydrologically exceeded. Additionally, the ability of Best Management Practices to reduce non-point source contributions under these conditions to levels where the TMDL might be met is elusive. Fortunately, the frequency of such events is low and their duration short, because of the passing of the high flow crest. Recreation use of the stream is unlikely under these extreme high flow conditions.

Any future NPDES and state permits will be conditioned such that discharges from the permitted facilities will not cause violations of applicable criteria below the flows amenable to respond to management practices. Ongoing inspections and monitoring of these systems will be made to ensure that minimal contributions have been made by these sources.

**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 the water quality violation. Background levels are not a significant 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 62% of the time (greater than 6.5 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 (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 this watershed has relatively low frequency of excursion (less than 10%) from the water quality standard when compared to other watersheds in the Neosho Basin, this TMDL will be a Medium Priority for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Upper Cottonwood Basin (HUC 8: 11070202) with a priority ranking of 36 (Medium Priority for restoration work).

**Priority HUC 11s and Stream Segments:** Unless impairment is confirmed by additional monitoring between 2003- 2007, no priority HUCs or stream segments will be identified.

## **5. IMPLEMENTATION**

### **Desired Implementation Activities**

1. None, unless impairment is confirmed by additional monitoring between 2003- 2007.

### **Implementation Programs Guidance**

Unless impairment is determined by additional monitoring between 2003- 2007, no direction is needed on implementation programs.

**Time frame for Implementation:** Conditions will be evaluated based additional on monitoring between 2003- 2007.

**Targeted Participants:** None, until 2007 evaluation.

**Milestone for 2007:** The year 2007 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, additional monitoring data from Station 635 will be reexamined to confirm the impaired status of the streams within this watershed. Should the case of impairment be confirmed, source assessment, allocation and implementation activities will ensue.

**Delivery Agents:** None at this time. Status will be re-evaluated in 2007.

### **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 Walnut 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:** Improvements in reducing bacteria loading to streams can be accomplished through appropriate management and control systems for livestock waste and on-site waste systems.

## 6. MONITORING

KDHE will continue to collect bimonthly samples during 2005 at rotational Station 635, over each of the three defined seasons. Based on that sampling, the priority status of 303(d) listing will be evaluated in 2006. Should impaired status remain, the desired endpoints under this TMDL will be refined and direct more intensive sampling may need to be conducted under specified seasonal flow conditions over the period 2007-2011. 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 79 cfs with no samples exceeding the criterion at flows under 21 cfs.

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.

## **7. FEEDBACK**

**Public Meetings:** Public meetings to discuss TMDLs in the Neosho Basin were held January 9, 2002 in Burlington and March 4, 2002 in Council Grove. 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 Neosho Basin.

**Public Hearing:** Public Hearings on the TMDLs of the Neosho Basin were held in Burlington and Parsons on June 3, 2002.

**Basin Advisory Committee:** The Neosho Basin Advisory Committee met to discuss the TMDLs in the basin on October 2, 2001, January 9 and March 4, 2002.

**Milestone Evaluation:** In 2007, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of the South Cottonwood 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 creek will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2007-2011. Therefore, the decision for delisting will come about in the preparation of the 2012 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 2003 which will emphasize implementation of TMDLs. 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 2003-2007.