WALNUT BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Little Walnut River
Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Lower Walnut **County:** Butler and Greenwood

HUC 8: 11030018

HUC 11 (HUC 14s)**:** **010** (040, 050, 060, 070, 080 and 090)

Drainage Area: 268.9 square miles

Main Stem Segments: WQLS: 11 and 13 (Little Walnut River) starting at confluence with the Walnut River and traveling upstream to headwaters in southeastern Butler County (**Figure 1**).

Tributary Segments: WQLS: S. Branch, Little Walnut River (34)
Non-WQLS: Hickory Creek (12)
Plum Creek (36)
Honey Creek (33)

Designated Uses: Expected 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 Segments (11 and 13) and Tributary Segment (34).

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

Impaired Use: Contact Recreation

Water Quality Standard: 200 colonies per 100 ml (geometric mean) for Primary Contact Recreation in April-October (K.A.R. 28-16-283(c)(7)(B)); 2,000 colonies per 100 ml for Secondary (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 655 near Douglas

Period of Record Used: 1991, 1995 and 1999 for Station 655; 2000 and 2001 Kansas Biological Survey Data (**Figure 2**)

Flow Record: Whitewater Creek near Towanda (USGS Gage Station 07147070) matched to estimated runoff from Little Walnut River southeast of Gordon (07147408)

Long Term Flow Conditions: 10% Exceedance Flows = 214 cfs**,** 95% = 0.67 cfs

Little Walnut River Watershed
Fecal Coliform Bacteria TMDL
HUC and Stream Segment Map

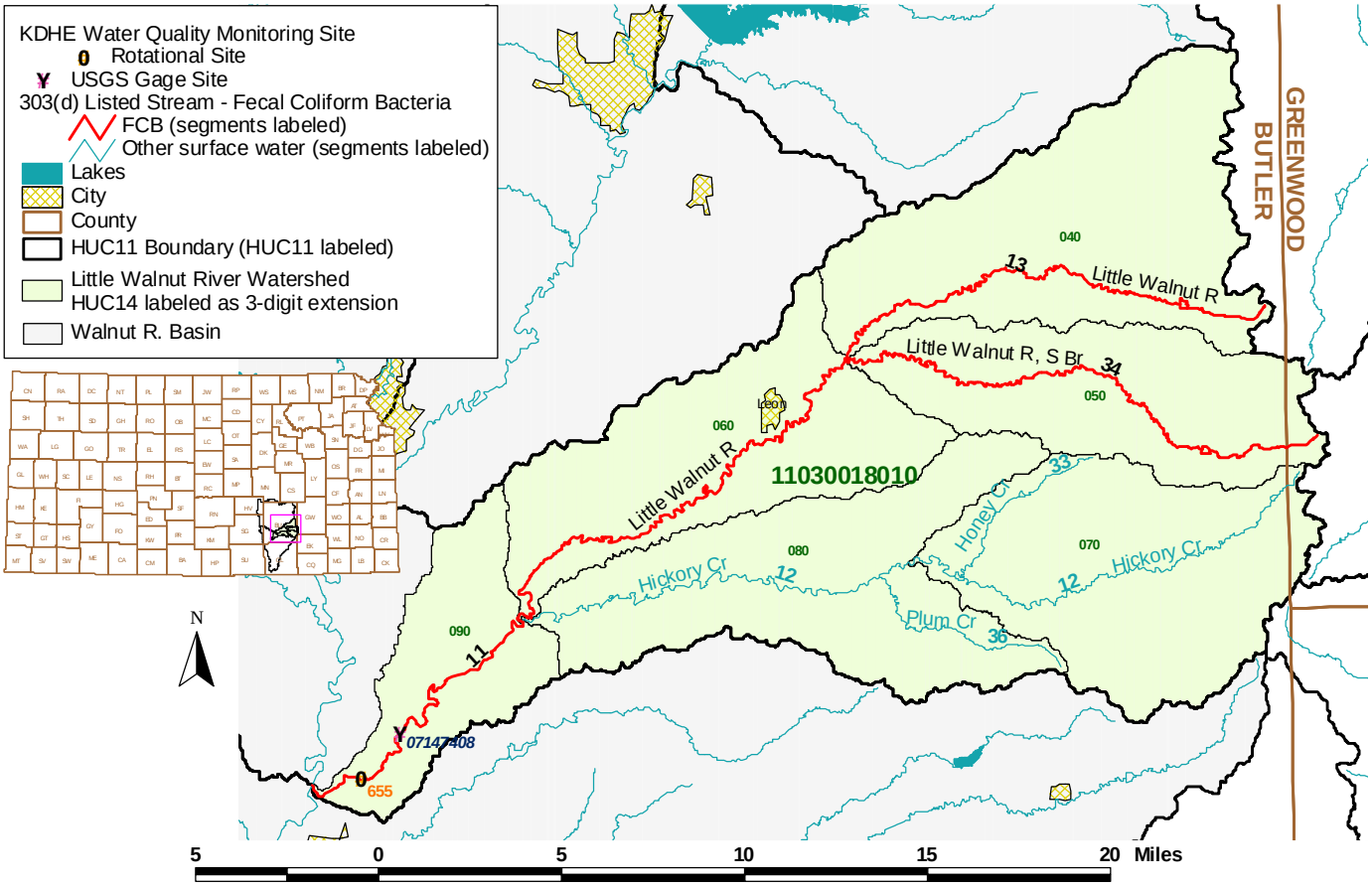

Figure 1

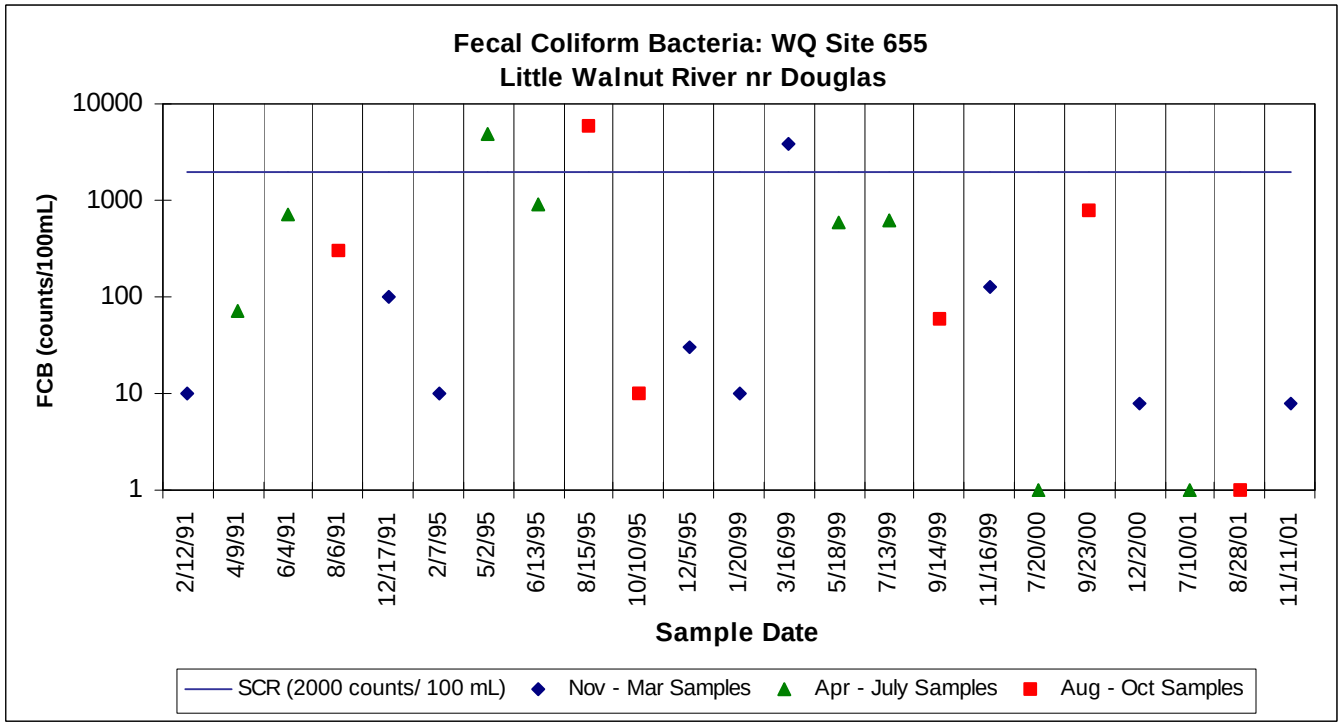

Figure 2

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 has occurred in each of the three defined seasons and these are outlined in **Table 1**. Thirteen percent of Spring samples and 17% of the Summer-Fall samples were over the secondary contact criterion. Eleven percent of Winter samples were over the secondary criterion. Overall, 13% 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 Walnut River near Douglas (655)	Spring	1	0	0	0	0	0	1/8 = 13%
	Summer	1	0	0	0	0	0	1/6 = 17%
	Winter	0	0	1	0	0	0	1/9 = 11%

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 655 over 2007 - 2011

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards which fully support both Primary Contact Recreation and Secondary Contact Recreation. This TMDL will, however, be phased. Kansas has a Primary Contact Recreation standard of a geometric mean of 200 colonies per 100 ml taken from at least five samples taken within a 30-day period. Kansas monitoring protocols do not collect data to evaluate compliance with the five-sample geometric mean criterion. The geometric mean of all samples taken from Little Walnut River in April through October was 115 colonies per 100 ml.

Conversely, the Secondary Contact Recreation standard is measured by a single "not to exceed" criterion of 2000 colonies per 100 ml. This criterion was used to establish a Phase One load duration curve shown in **Figure 5**. A corresponding load curve for the geometric mean of 200 colonies is also shown in Figure 5 as a reference. It is recognized, however, that the Primary and Secondary Contact Recreation criteria will be revised in the future in accordance with national guidance, notably changing the indicator from fecal coliform to *E. coli*. Both geometric mean and single value criteria are expected to be developed. 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 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 are three municipal NPDES permitted wastewater dischargers within the watershed, two of which discharge directly to listed segments (**Figure 3**). All three systems are outlined below in **Table 2**.

All three treatment facilities rely on a three cell lagoon system with 120 day detention times for treatment of their wastewater. Kansas Implementation Procedures - Waste Water Permitting - indicates this lagoon meets standard design criteria which have been shown to consistently meet or exceed the bacteria standard.

Table 2

DISCHARGING FACILITY	STREAM REACH	SEGMENT	DESIGN FLOW	TYPE
Leon WTF	Little Walnut R.	13	0.103 mgd	Lagoon
Butler Co SD No. 17	Hickory Cr.	12	0.011 mgd	Lagoon
Greenwood Co. R.A. (K-96)	S. Br. Little Walnut R.	34	0.003 mgd	Lagoon

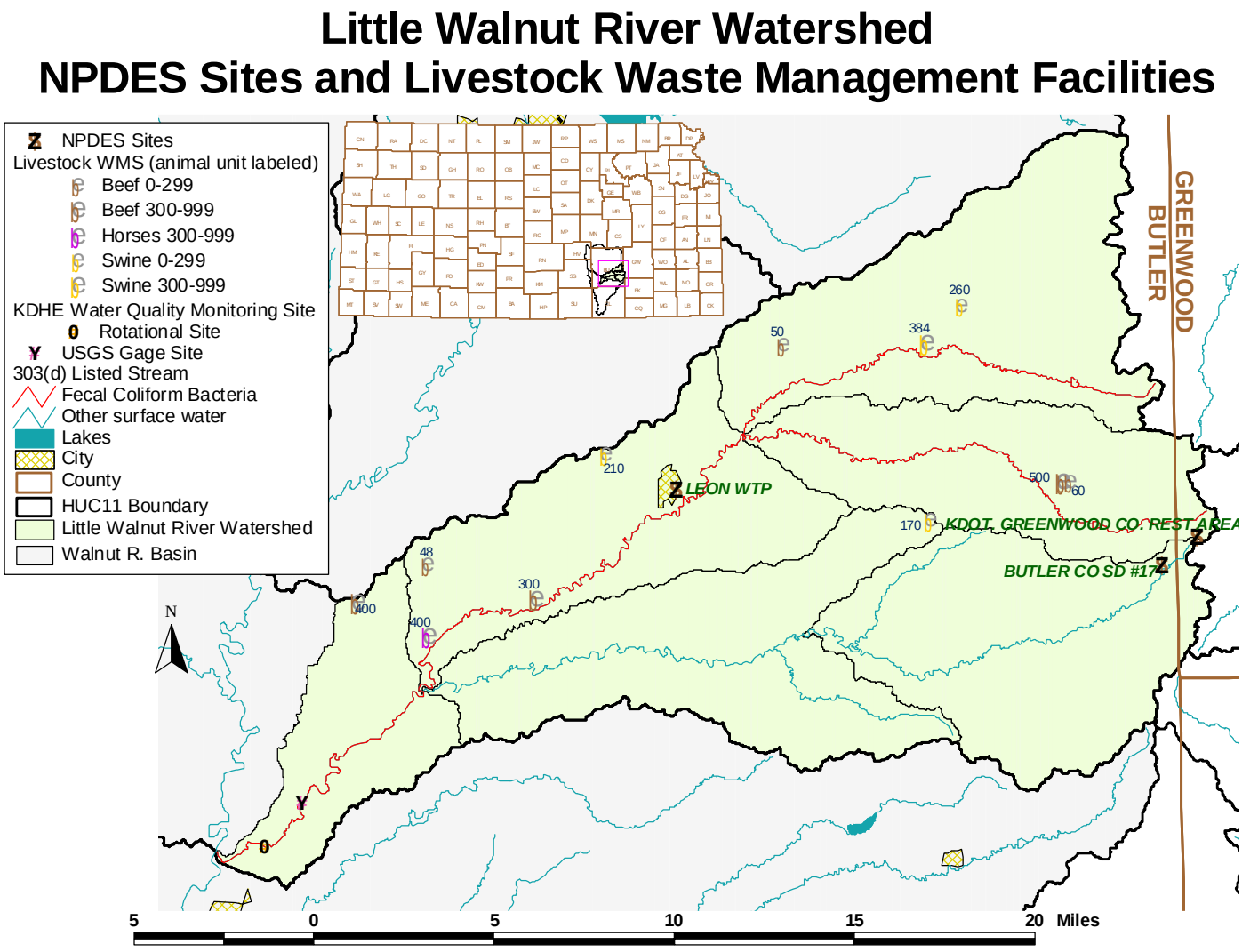

Figure 3

The population projection for Leon to the year 2020 indicate modest increases. Projections of future water use and resulting wastewater appear to be within the design flows for the current system's treatment capacity. At site 655, excursions from the water quality standards appear to occur 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.

Livestock Waste Management Systems: Eleven operations are registered, certified or permitted within the watershed. These facilities (primarily beef or swine) are in subwatersheds contributing to the listed main stem or tributaries (**Figure 3**). 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 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 Butler County, such an event would generate 6.3 inches of rain, yielding 5.1 to 5.9 inches of runoff in a day.

NPDES permits, also non-discharging, are issued for facilities with more than 1,000 animal units. None of the facilities in the watershed are of this size Total potential animal units for all facilities is 2,782. The actual number of animal units on site is variable, but typically less than potential numbers.

Land Use: Most of the watershed is grassland (82% of the area), cropland (15%), or woodland (1.5%). Most of the cropland is concentrated along the main stem or tributaries within the watershed. The grazing density estimate along listed stream segments is low in the watershed when compared to densities elsewhere in the Walnut Basin (19-29 animal units/mi^2) (**Figure 4**).

On-Site Waste Systems: The watershed's population density along listed stream segments is low in the upper half of the watershed and average in the lower half of the watershed when compared to densities across the Walnut Basin (4-28 person/mi^2) (**Figure 4**). The rural population projection for Butler county through 2020 shows significant growth (37% increase). Based on 1990 census data, almost 5,650 households in the 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 smaller size of the rural population and magnitude of other sources in the watershed.

Contributing Runoff: The Little Walnut River watershed's average soil permeability is 0.5 inches/hour according to NRCS STATSGO data base. All of the watershed produces runoff even under relatively low (1.71"/hr) potential runoff conditions (100%). Under very low (1.14"/hr) potential conditions, this potential contributing area is reduced to about 87%. 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 63% 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.

Little Walnut River Watershed
Land Use, Population and Grazing Density

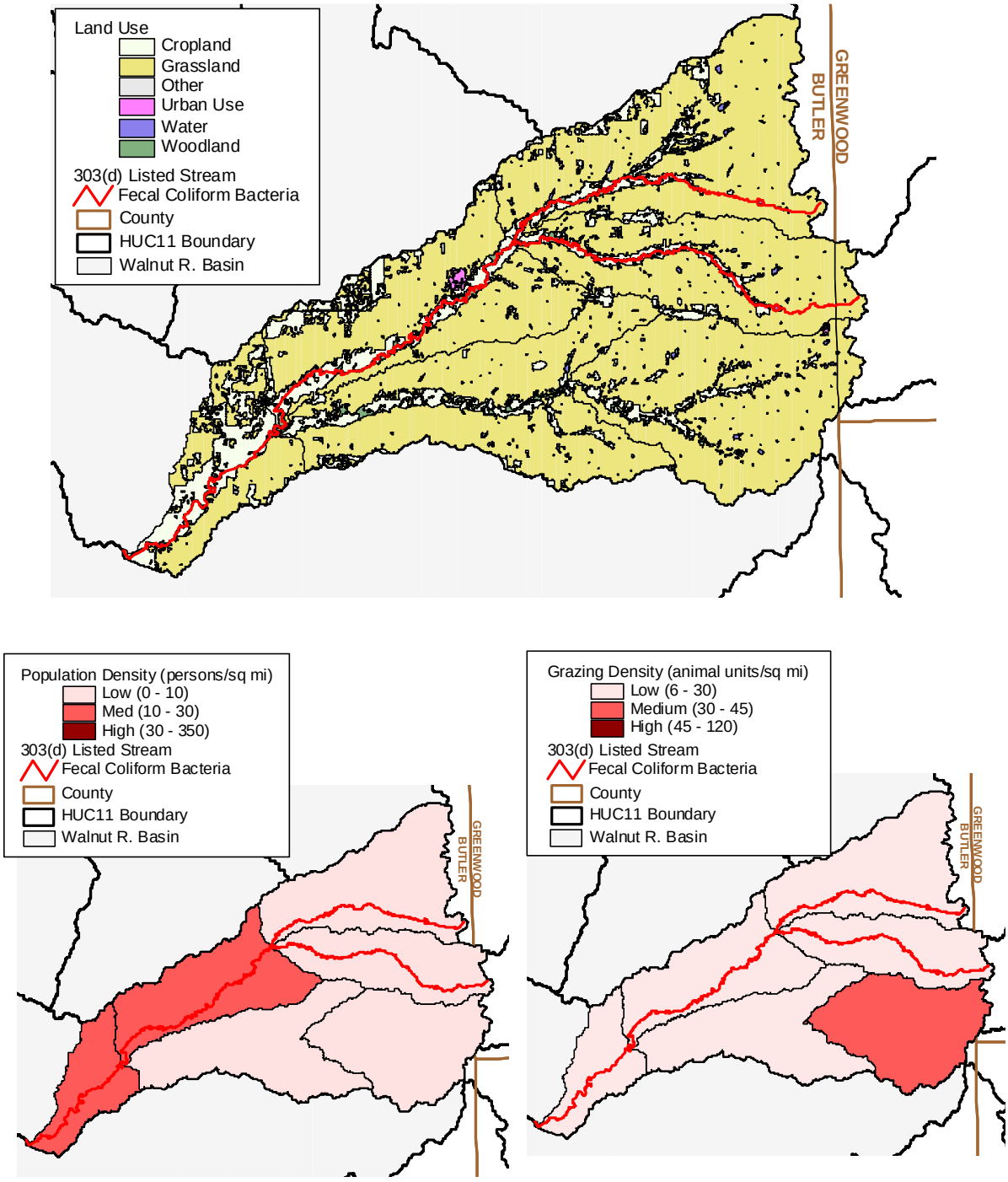

Figure 4

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 TMDL curve 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 facilities in 2000. The Phase One Wasteload Allocations for these facilities will be defined as the product of the 2,000 count bacteria criteria and flows occurring 91-99% of the time (**Figure 5**). Wasteload allocations are established for the low flows conditions which are most susceptible to impact form 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 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 exceed 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 91% of the time (greater than 1.8 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.

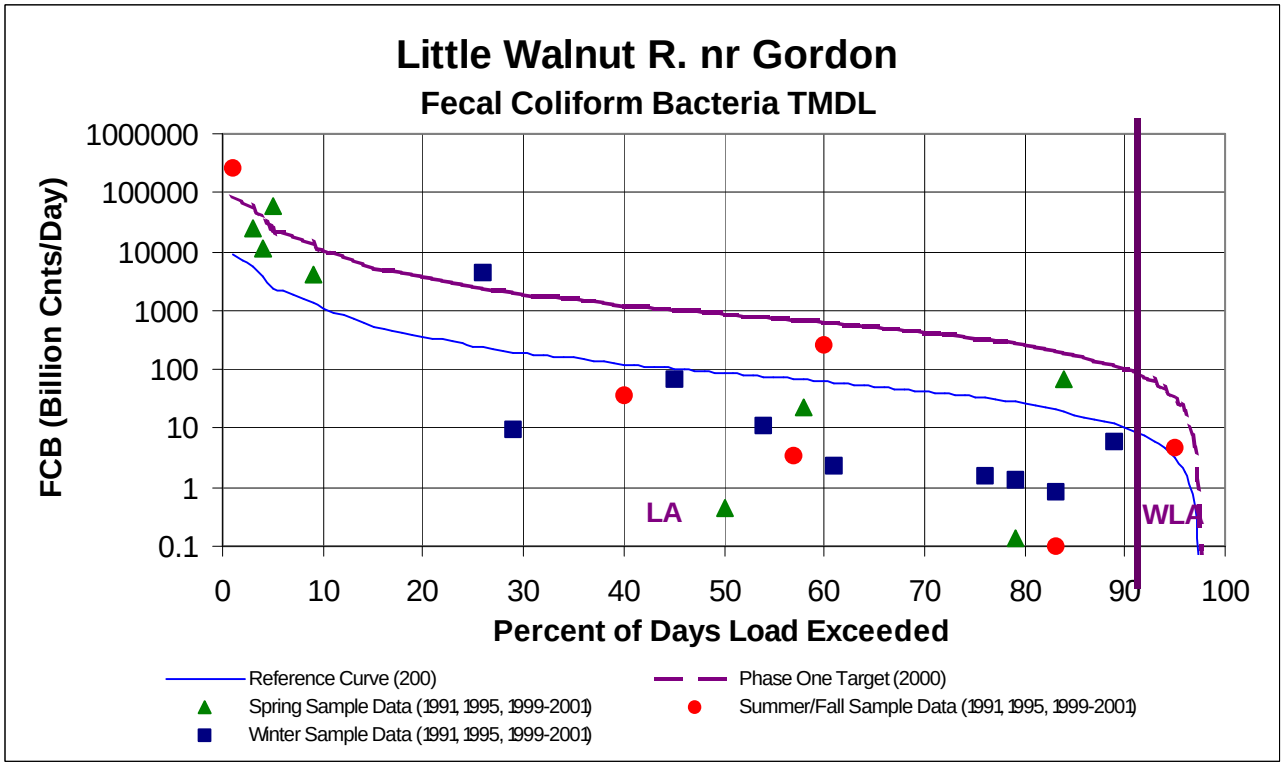

Figure 5

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 the frequency of excursions from the water quality standard is relatively low and the excursions were only noted under some of the highest flows within each defined season, this TMDL will be a Medium Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Lower Walnut Basin (HUC 8: 11070103) with a priority ranking of 42 (Medium Priority for restoration

work).

Priority HUC 11s and Stream Segments: Unless impairment is determined 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 determined 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 655 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 2003 at rotational Station 655, 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 213 cfs with no samples exceeding the criterion at flows under 51 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 Walnut Basin were held January 10

and March 7, 2002 in Augusta. 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 Walnut Basin.

Public Hearing: A Public Hearing on the TMDLs of the Walnut Basin was held in Augusta on June 5, 2002.

Basin Advisory Committee: The Walnut Basin Advisory Committee met to discuss the TMDLs in the basin on October 4, 2001, January 10 and March 7, 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 Little Walnut 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 stream 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.