

NEOSHO BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Neosho River Headwaters Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Neosho Headwaters

County: Morris

HUC 8: 11070201

HUC 11 (HUC 14s): 010 (010 and 020)

Drainage Area: 87 square miles

Main Stem Segments: WQLS: 23 (Neosho River) starting at Council Grove Lake and extending upstream to headwaters in north-western Morris County (Figure 1).

Tributary Segments: Non-WQLS: Crooked Creek (35)
WQLS: Haun Creek (29)
Non-WQLS: Parkers Creek (27)
WQLS: W. Fork Neosho River (28)
Non-WQLS: Level Creek (9023)

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 Segment (23).

Expected Aquatic Life Support and Secondary Contact Recreation on Haun Creek (29); 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 W. Fork Neosho River (28).

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))

Headwaters Neosho River Watershed Fecal Coliform Bacteria TMDL HUC and Stream Segment Map

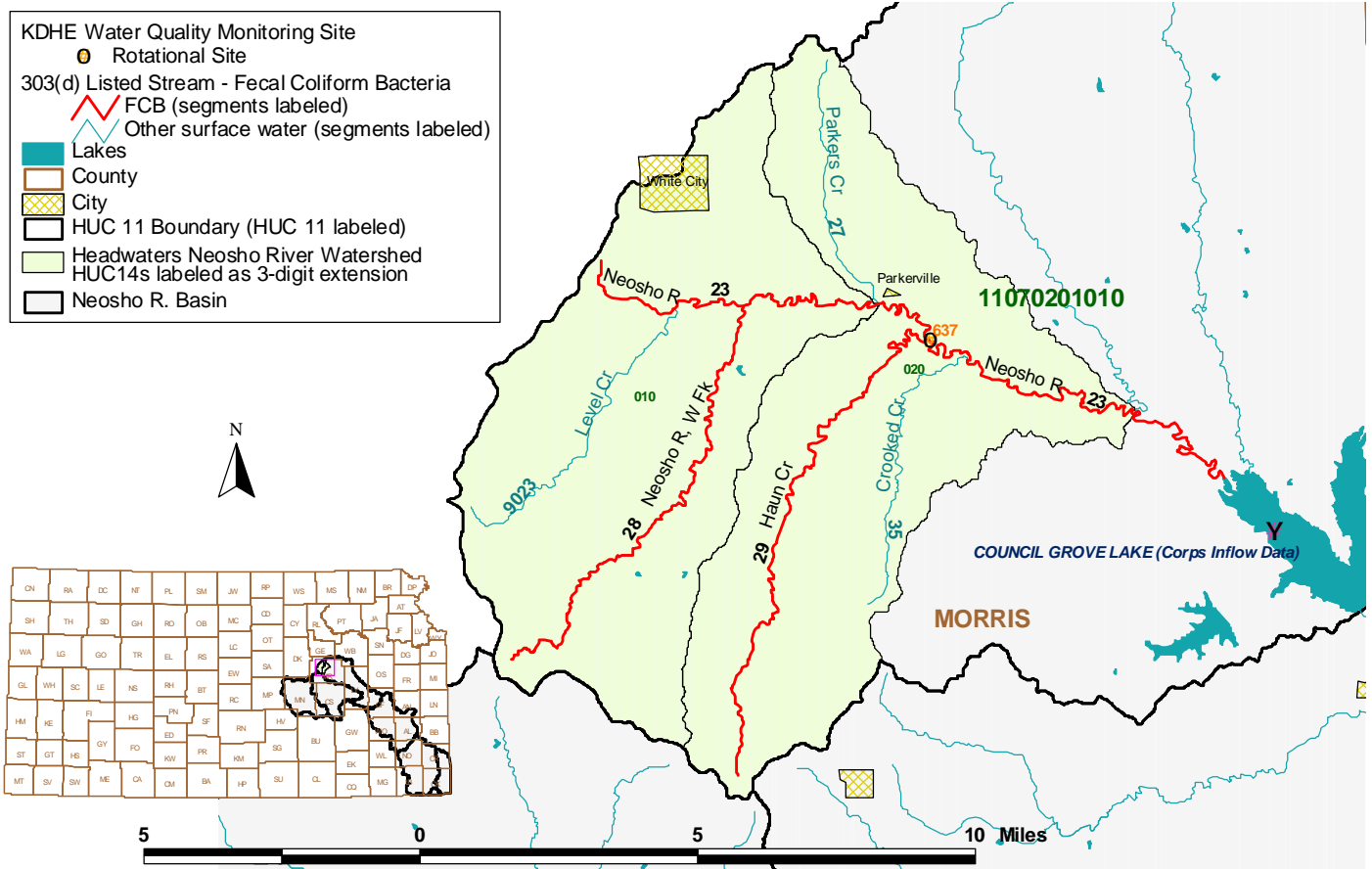


Figure 1

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 637 near Parkerville

Period of Record Used: 1992-1993, 1996 and 2000 for Station 637; Some 2000 and all 2001 Kansas Biological Survey Data (**Figure 2**)

Flow Record: Council Grove Lake Inflow Data (1994-2001).

Long Term Flow Conditions: 10% Exceedance Flows = 360 cfs, 95 % = 0 cfs

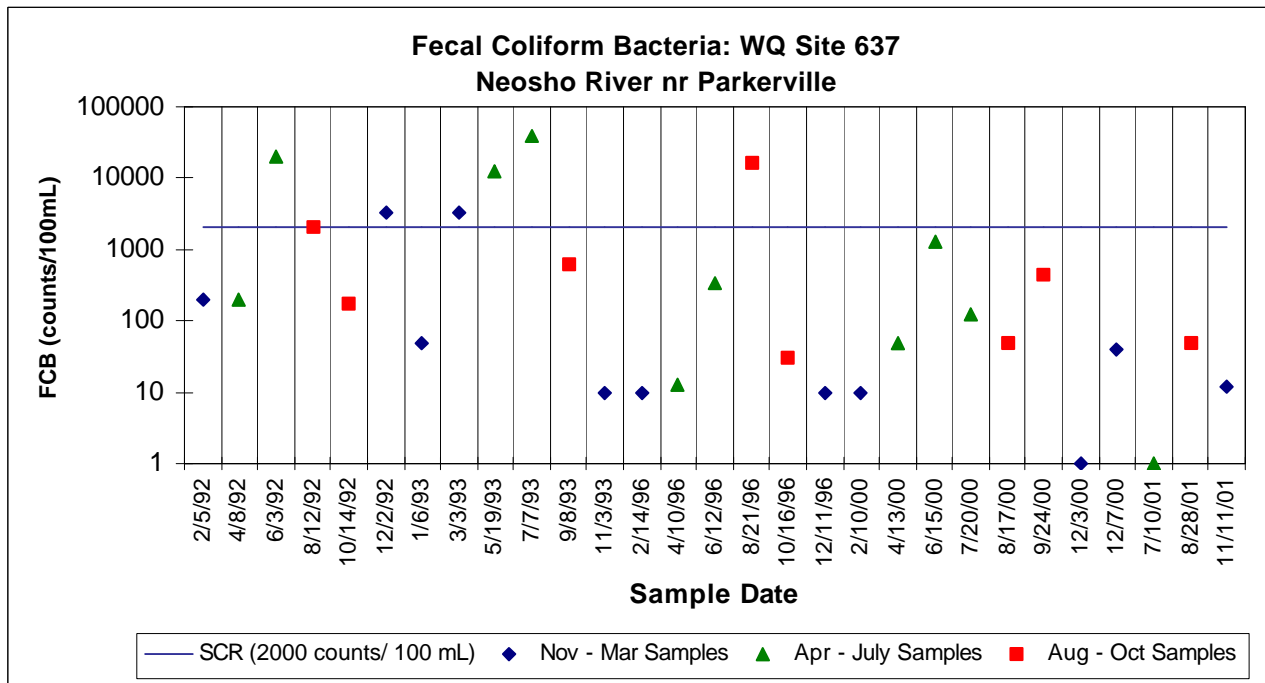


Figure 2

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. 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).

Excursions were seen in each of the three defined seasons and are outlined in Table 1. Thirty percent of Spring samples and 25% of Summer-Fall samples were over the secondary contact criterion. Eighteen percent of Winter samples were over the secondary criterion. Overall, 24% 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.
Neosho River near Parkerville (637)	Spring	1	0	1	1	0	0	3/10 = 30%
	Summer	0	0	2	0	0	0	2/8 = 25%
	Winter	0	1	1	0	0	0	2/11 = 18%

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 637 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 samples taken from Neosho River in April through October over the entire record was 355 colonies per 100 ml. The more recent geometric mean taken over 1996, 2000-2001 was 106 colonies per 100 ml, indicating that major excursions may have been associated with the higher flow conditions prior to 1996.

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 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
White City WTF	Neosho River	23	0.080 mgd	Mech.

Headwaters Neosho River Watershed NPDES and Livestock Waste Management Facilities

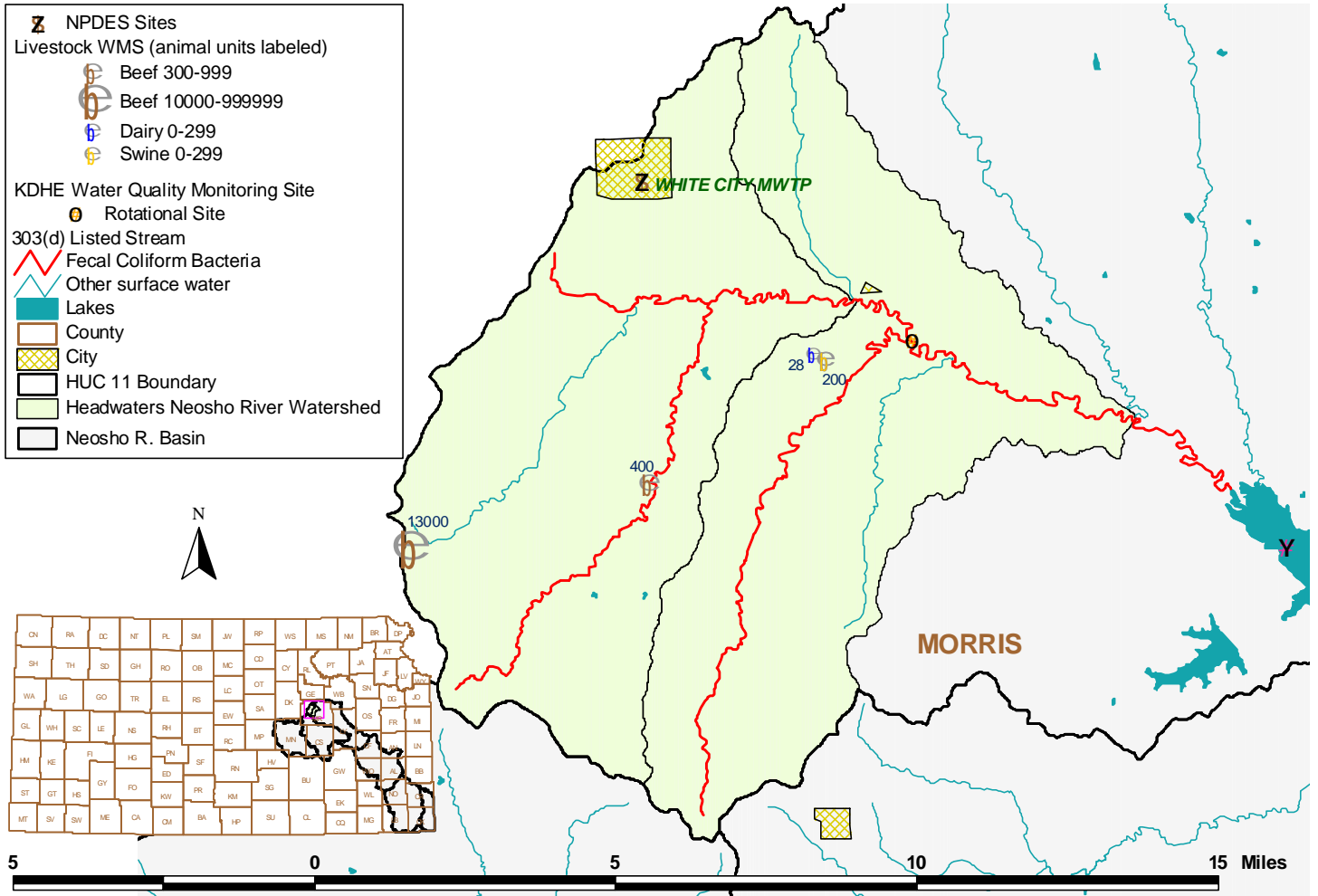


Figure 3

The city of White City has plans to change from a mechanical treatment system to a lagoon system. Kansas Implementation Procedures - Waste Water Permitting - indicates this lagoon will meet standard design criteria which have been shown to consistently meet or exceed the bacteria standard.

The population projection for White City to the year 2020 indicates a slight increase. Projections of future water use and resulting wastewater appear to be within the design flows for of the current system's treatment capacity. At site 637, excursions from the water quality standards

appear to occur primarily under runoff conditions or higher flows. 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: Four operations are registered, certified or permitted within the watershed. These facilities (beef, swine and dairy) are located south of the main stem (**Figure 3**). One of these four facilities is an NPDES permitted, non-discharging beef facility with 13,000 animal units near Segment 9023 of Level Creek (**Figure 3**). NPDES 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 Morris County, such an event would generate 6.1 inches of rain, yielding 4.9 to 5.7 inches of runoff in a day. Total potential animal units for all facilities in the watershed is 13,628. The actual number of animal units on site is variable, but typically less than potential numbers.

Land Use: Most of the watershed is grassland (58% of the area), cropland (39%), or woodland (2%). Most of the cropland is located either along the main stem and tributaries of the watershed or along the perimeter of the watershed. The grazing density estimate is low in the upper half of the watershed (28 animal units/mi²) and average in the lower half (36 animal units/mi²) when compared to densities elsewhere in the Neosho Basin (**Figure 4**).

On-Site Waste Systems: The watershed's population density is average (11 persons/mi²) in the upper half of the watershed and low (4 person/mi²) in the lower half when compared to densities across the Neosho Basin (**Figure 4**). The rural population projections for Morris County through 2020 shows slight growth (6% increase). Based on 1990 census data, 1,589 households in Morris 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 Neosho River headwaters watershed's average soil permeability is 0.3 inches/hour according to NRCS STATSGO data base. All 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 to about 97%. 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 85% 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.

Headwaters Neosho River Watershed Land Use, Population and Grazing Density

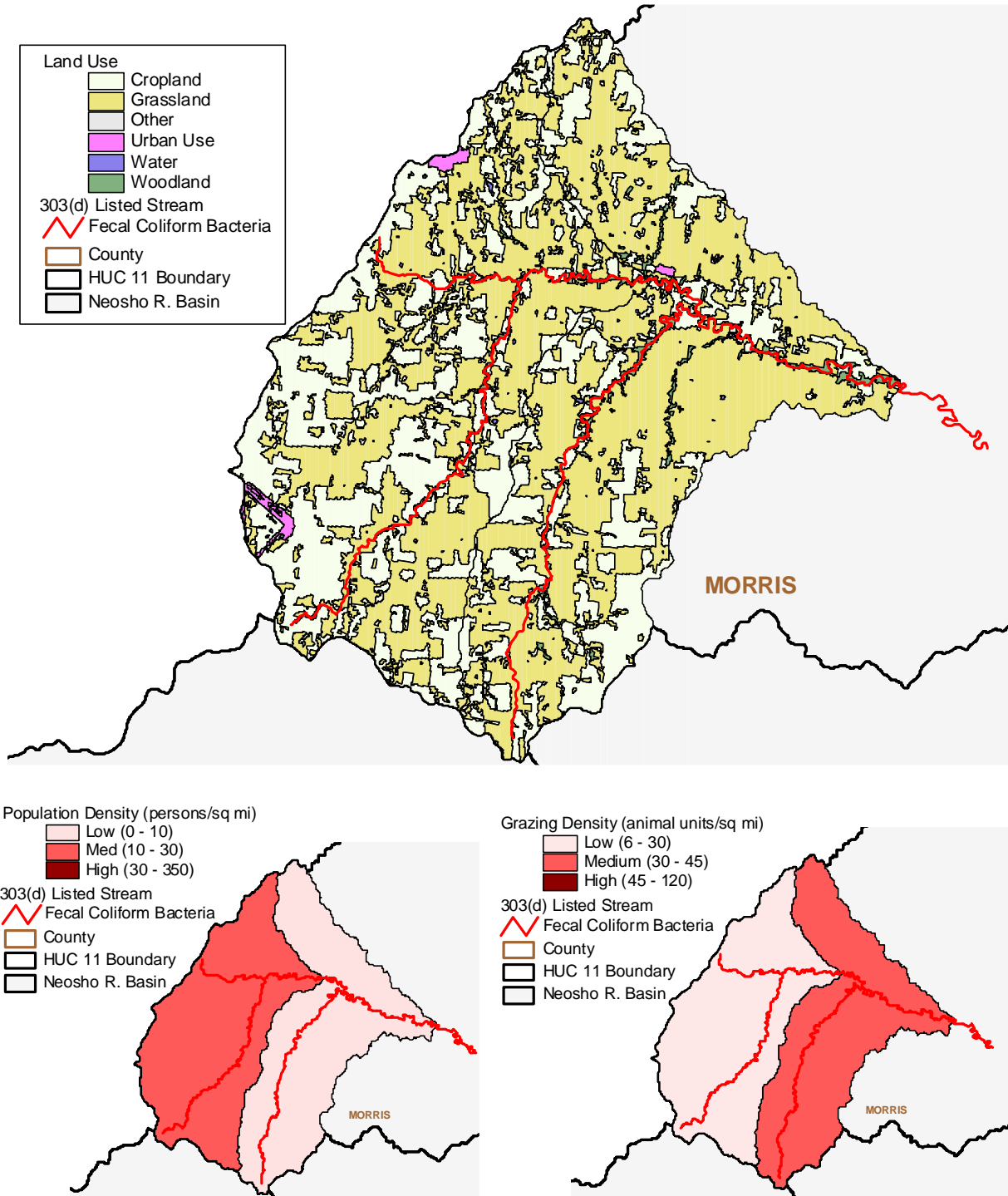


Figure 4

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 2001. The Phase One Wasteload Allocations 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 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.

NPDES and 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 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.

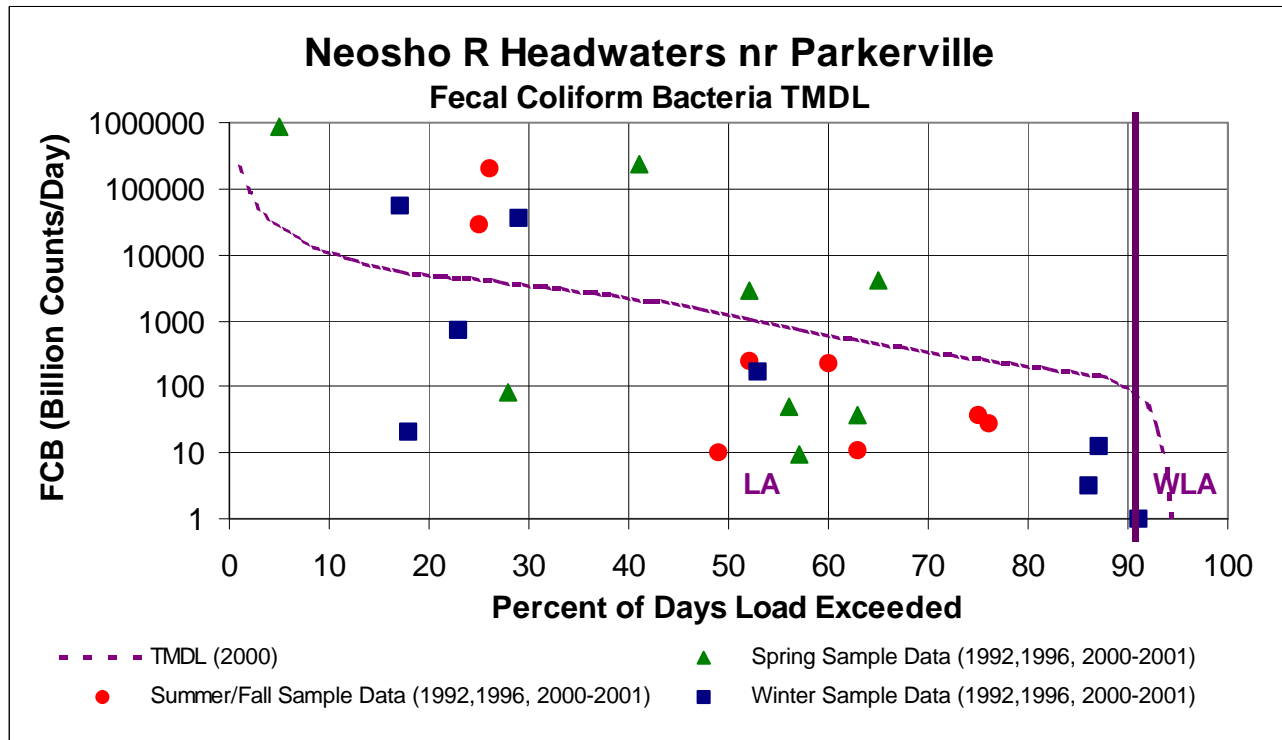


Figure 5

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 91% of the time (greater than 1.2 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.

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 a high frequency of excursion from the water quality standard, this TMDL will be a High Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Neosho Headwaters Basin (HUC 8: 11070201) with a priority ranking of 38 (Medium Priority for restoration work).

Priority HUC 11s and Stream Segments: Priority focus of implementation prior to 2007 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 2003 with continuation of 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 to prevent bacteria loadings to the stream.

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.

- d. Assist local efforts to monitor water quality from managed grasslands, pre- and post- spring prescribed burn, to further target practices to contributing areas

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 and repair on-site waste systems within 500 feet of main stem and tributary streams.

Timeframe for Implementation: Pollution reduction practices should be installed within the priority subwatersheds over the years 2003-2007, 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 with inadequate 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 in proximity to listed segments and feeder tributaries.

Some inventory of local needs should be conducted in 2003 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 2007: The year 2007 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 prior to 2002.

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 Morris county.

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 Neosho 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 High 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 1990-2000, 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 rotational Station 673, including fecal coliform samples over each of the three defined seasons in 2004, in order to assess progress in implementing this TMDL. During the evaluation period (2007-2011), more intensive sampling may 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 225 cfs with no samples exceeding the criterion at flows under 85 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.

Local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2003 in order to support appropriate implementation projects.

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 Neosho River headwaters. 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.