SMOKY HILL/SALINE RIVER BASIN TOTAL MAXIMUM DAILY LOAD

Water Body/Assessment Unit: Wilson Lake and the Wilson Lake Watershed including Paradise Creek, Saline River (Russell), and Saline River (Hays)
Water Quality Impairment: Sulfate

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Upper Saline

Counties: Ellis, Ellsworth, Gove, Graham, Lincoln, Logan, Osborne, Rooks, Russell, Sheridan, Thomas, Trego

HUC 8: 10260009 **HUC 11** (14)**:** **010** (010, 020, 030, 040, 050, 060, 070) (Figure 1)
020 (010, 020, 030, 040, 050, 060, 070, 080)
030 (010, 020, 030, 040, 050, 060, 070, 080)
040 (010, 020, 030, 040, 050)
050 (010, 020, 030, 040, 050)
060 (010, 020, 030, 040, 050, 060)
070 (010, 020, 030, 040)

Ecoregion: Western High Plains, Flat to Rolling Cropland (25d)
Central Great Plains, Smoky Hills (27a)
Central Great Plains, Rolling Plains and Breaks (27b)

Drainage Area: Approximately 1,900 square miles.

<u>Wilson Lake</u>

Conservation Pool: Area = 8,293 acres
Watershed Area: Lake Surface Area = 147:1
Maximum Depth = 18 meters (59 feet)
Mean Depth = 7.4 meters (24 feet)
Retention Time = 1.9 years (23 months)

Designated Uses: Primary and Secondary Contact Recreation; Expected Aquatic Life Support; Food Procurement

Authority: Federal (U.S. Army Corps of Engineers) and State (Kansas Dept. of Wildlife and Parks)

2002 303(d) Listing: Smoky Hill/Saline River Basin Lakes

Wilson Lake Watershed

Main Stem Segment: WQLS: (4), 8, 9, 11, 12, 14, & 16 (Saline River) starting at Wilson Lake and traveling upstream to the headwaters west of Oakley.

Main Stem Segments with Tributaries by HUC 8 and Watershed/Station Number:

HUC8:	**10260009**		
Watershed:	**Wilson Lake (014001)**		
	Saline R (4)	Cedar Cr (30)	
HUC8:	**10260009**		
Watershed:	**Paradise Creek (538)**		
	Paradise Cr (5)	Eagle Cr (6)	
	Paradise Cr (7)		
HUC8:	**10260009**		
Watershed:	**Saline R. (Russell) (011)**		
	Saline R (8)	Salt Cr (20)	
	Saline R (9-part)	Sweetwater Cr (29)	
HUC8:	**10260009**		
Watershed:	**Saline River (Hays) (548)**		
	Saline R (9-part)	Sand Cr (10)	
	Saline R (11)	E. Spring Cr (19)	
	Saline R (12)	Tomcat Cr (28)	
		Wild Horse Cr (27)	
		Unnamed Stream (13)	
	Saline R (14)	Chalk Cr (26)	
		Happy Cr (25)	
		Trego Cr (24)	
		N. Fk. Saline R. (15)	
	Saline R (16)	Coyote Cr (23)	Unnamed Stream (1061)
		Plum Cr (22)	
		Spring Brook Cr (21)	
		N. Fk. Saline R (17)	
		S. Fk. Saline R (18)	

Designated Uses: Secondary Contact Recreation; Expected Aquatic Life Support; Drinking Water; Food Procurement; Groundwater Recharge, Industrial Water Supply, Irrigation; Livestock Watering on Main Stem Segments

Primary Contact Recreation on Main Stem Segments except 14 and 16

2002 303(d) Listing: Wilson Watershed Streams

Impaired Use: Domestic Water Supply (Potentially)

Water Quality Standard: Domestic Water Supply: 250 mg/L at any point of domestic water supply diversion (K.A.R.28-16-28e(c) (3) (A)

In stream segments where background concentrations of naturally occurring substances, including chlorides and sulfates, exceed the domestic water supply criteria listed in table 1a in subsection (d), at ambient flow, due to intrusion of mineralized groundwater, the existing water quality shall be maintained, and the newly established numeric criteria for domestic water supply shall be the background concentration, as defined in K.A.R. 28-16-28b(e). Background concentrations shall be established using the methods outlined in the ''Kansas implementation procedures: surface water quality standards,'' as defined in K.A.R. 28-16-28b(ee), available upon request from the department. (K.A.R. 28-16-28e(c) (3)(B))

Figure 1

Wilson Lake TMDL Reference Map

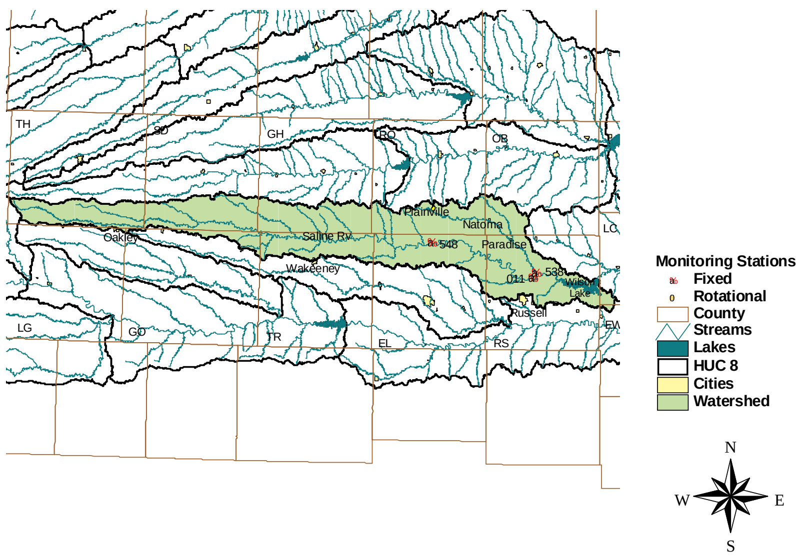
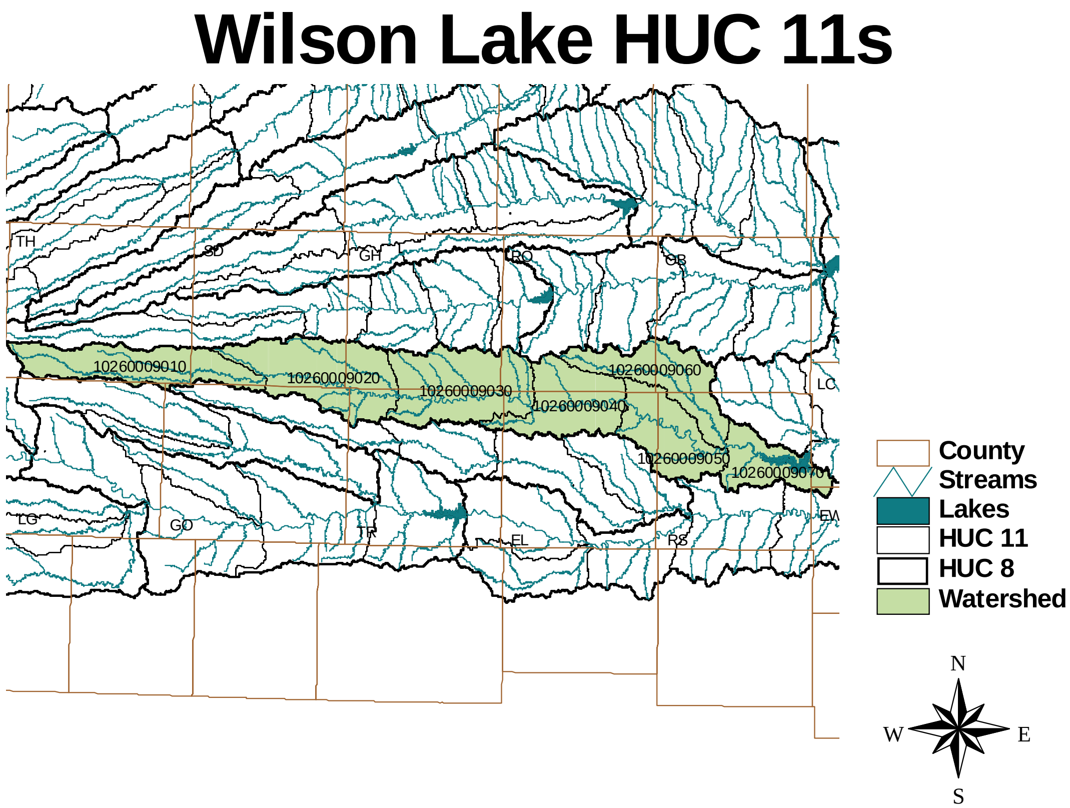


Figure 2



2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Lake Monitoring Site: Station 014001 in Wilson Lake (Figure 2).
Period of Record Used: Six surveys during 1988 - 2003
Elevation Record: Wilson Lake near Wilson, KS (USGS Gage 06868100)

Stream Chemistry Monitoring Site: Station 011 near Russell (Saline River)
Period of Record Used: 1990 - 2003
Flow Record: Saline River near Russell, KS (USGS Gage 06867000)

Stream Chemistry Monitoring Site: Station 538 near Waldo (Paradise Creek)
Period of Record Used: 1990 - 2003
Flow Record: Matched to flow duration for Salt C near Ada (06876700)

Stream Chemistry Monitoring Site: Station 548 near Hays (Saline River)

Period of Record Used: 1990 - 2003

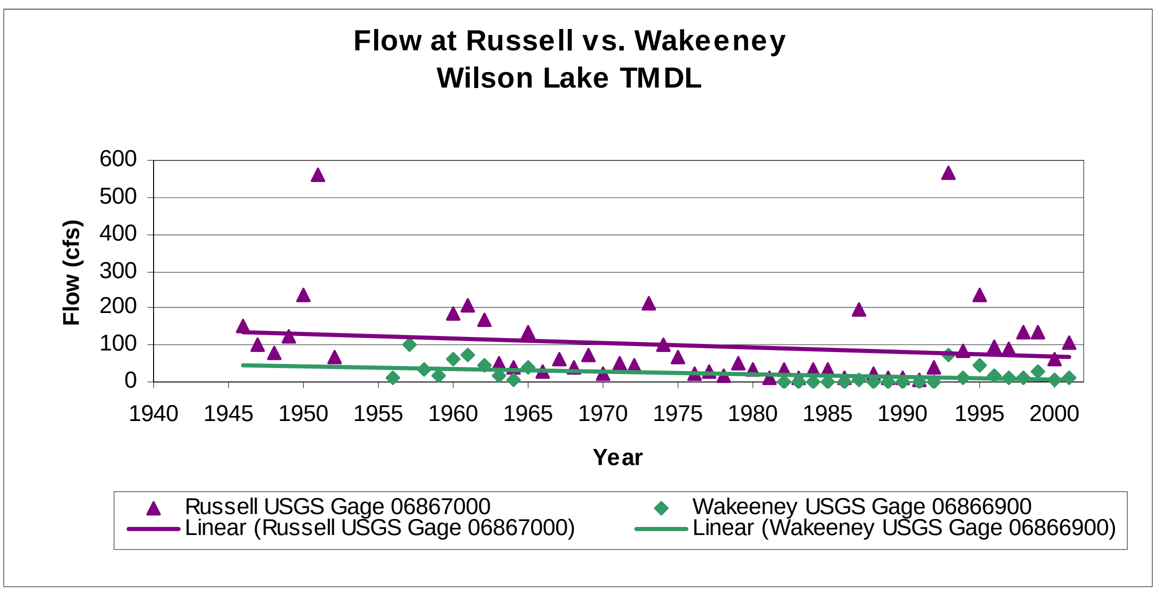
Flow Record: Saline River near Russell, KS (USGS Gage 06867000)

Current Condition: There is a relatively good relationship between flow within the drainage basin of the Saline River and the sulfate content of Wilson Lake. Large fluctuations in the amount of rainfall that flows into Wilson Lake cause variations in the sulfate concentrations. The runoff following a substantial rainstorm is appreciably fresher than most of the baseflow of streams and can dilute the sulfate concentration of the lake and stream water (Figure 14). The flood of 1993 significantly increased the flow at the Saline River near Russell to an annual average flow of 566 cfs (Figure 3). The lake was replenished, and the salinity decreased. A low of 306 mg/L of sulfate was seen in 1994. In drought years, the sulfate concentration is approximately 520 mg/L (Appendix A).

Average Sulfate Concentrations in Wilson Lake

Date	Sulfate (mg/L)	Average Annual Flow at Saline Rv. Near Russell (cfs)
6/27/1988	402.5	22.2
8/13/1991	524.3	5.3
6/7/1994	305.5	85.4
6/24/1997	373.4	87.0
7/18/2000	439.8	60.3
7/21/2003	521.7	16.6

Figure 3



The sulfate concentrations in Wilson Lake parallel the concentrations at the stream stations during the six months prior to sampling (Figure 4). On the Saline River near Russell (011), sulfate levels increase with low flow, while on Paradise Creek (538) and the Saline River near Hays (548), the sulfate levels are more constant. Concentrations over the period of record for the three stream stations can be seen in Figures 5 through 7. From 1990 to 2003, the average sulfate concentrations were 543 mg/L for the Saline River near Russell, 520 mg/L for Paradise Creek, and 372 mg/L for the Saline River near Hays.

Figure 4

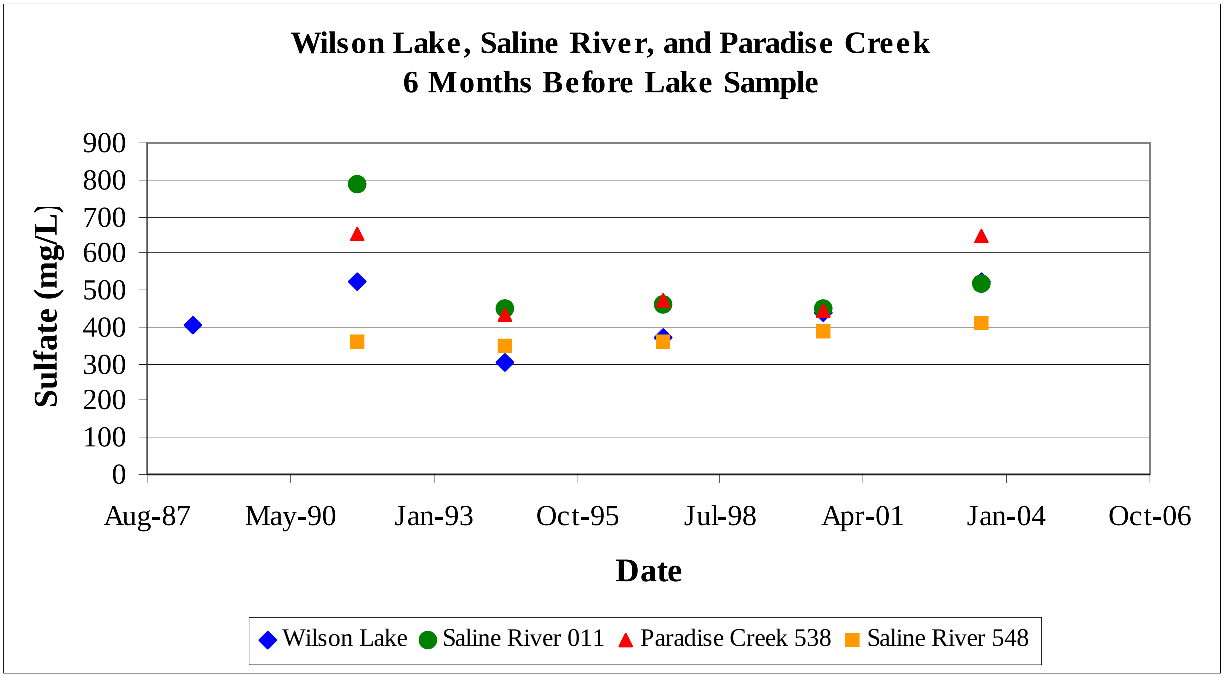


Figure 5

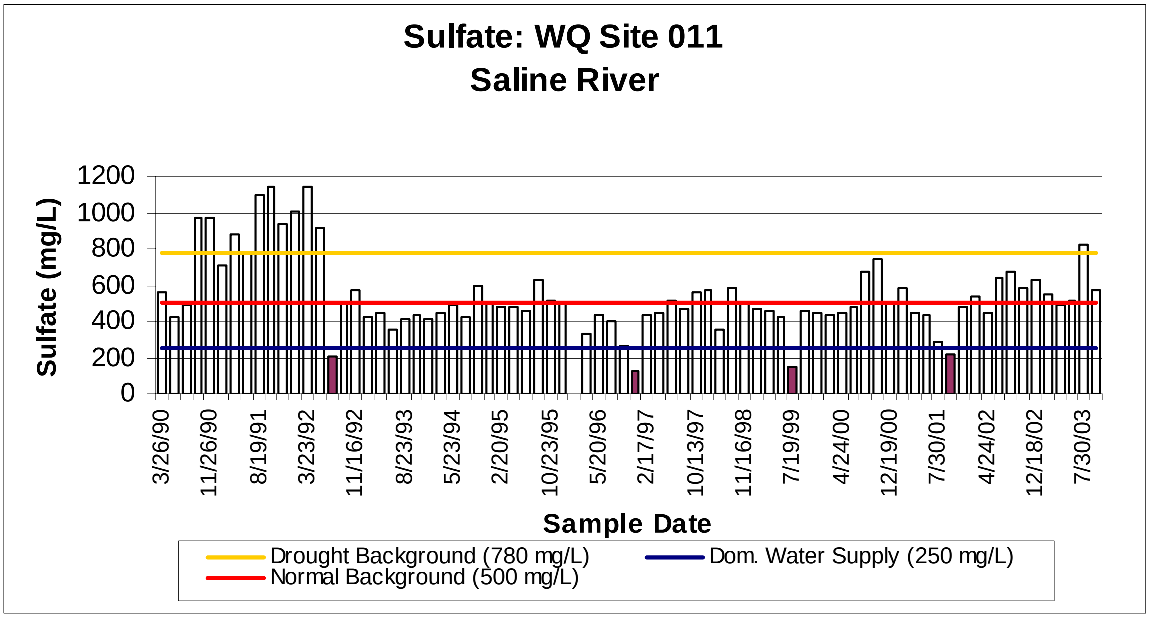


Figure 6

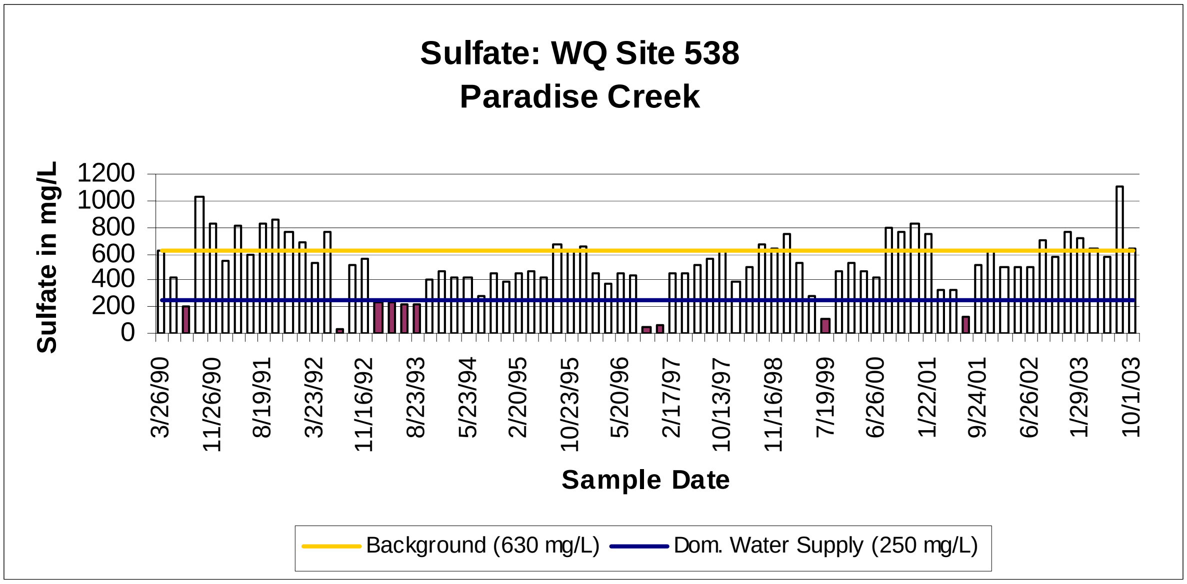
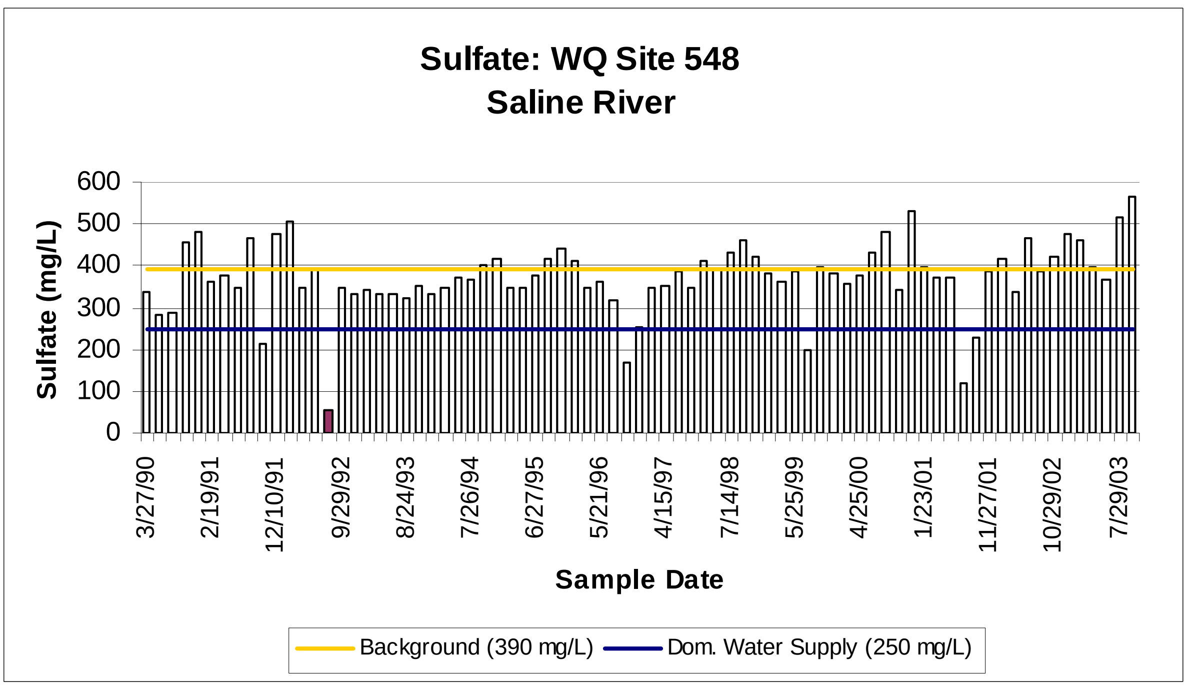
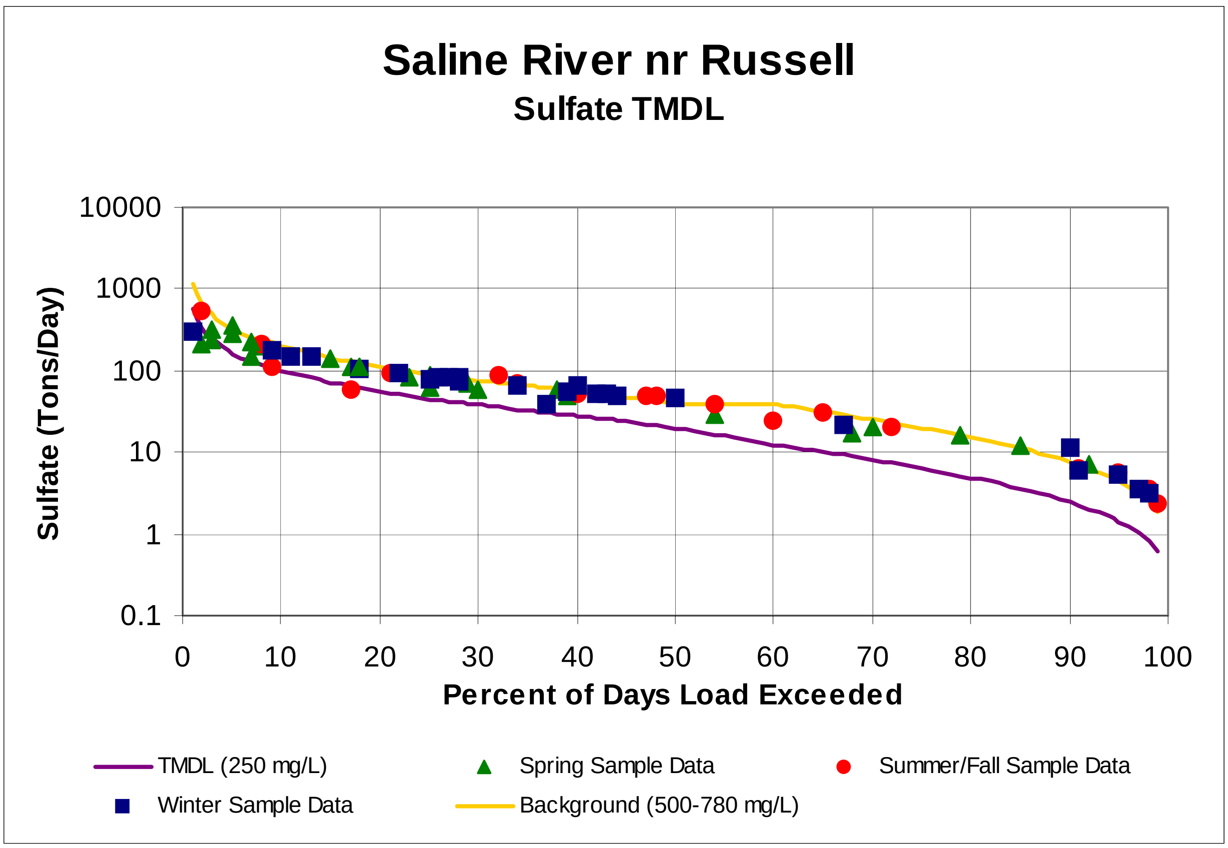


Figure 7



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 sites 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 Domestic Water Supply 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 tons of sulfate 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 (Figures 8-10).

Figure 8



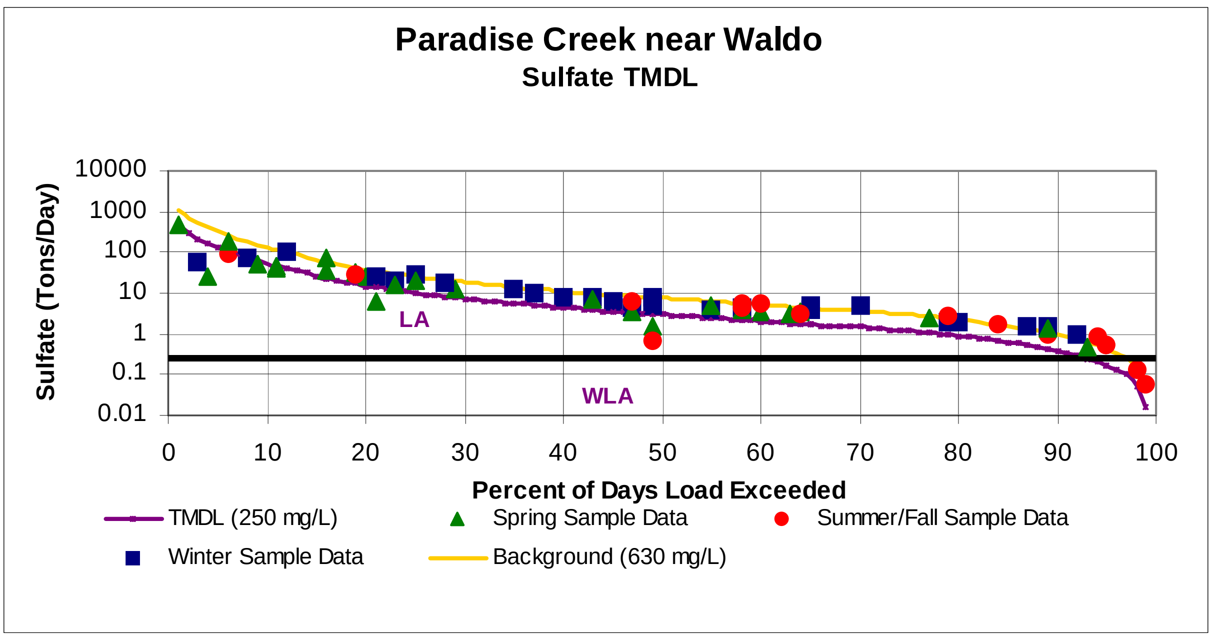
<u>Station 011:</u> Excursions were seen in each of the three defined seasons and are outlined below. Ninety-two percent of Spring samples and 94% of Summer-Fall samples were over the domestic supply criterion. Ninety-six percent of Winter samples were over the criterion. Overall, 94% of the samples were over the criteria. This would represent a potential baseline condition of non-support of the impaired designated use, if a point of diversion for water supply was present along the river.

NUMBER OF SAMPLES OVER SULFATE STANDARD OF 250 mg/L 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.
Station 011 near Russell (Saline River)	Spring	6	6	4	3	2	1	22/24=92%
	Summer	3	1	5	4	0	3	16/17=94%
	Winter	1	5	12	1	1	4	24/25=96%

Station 538: Excursions were seen in each of the three defined seasons and are outlined below. Seventy-two percent of Spring samples and 88% of Summer-Fall samples were over the domestic supply criterion. Ninety-two percent of Winter samples were over the criterion. Overall, 84% of the samples were over the criteria. This would represent a potential baseline condition of non-support of the impaired designated use, if a point of diversion for water supply was present along the river.

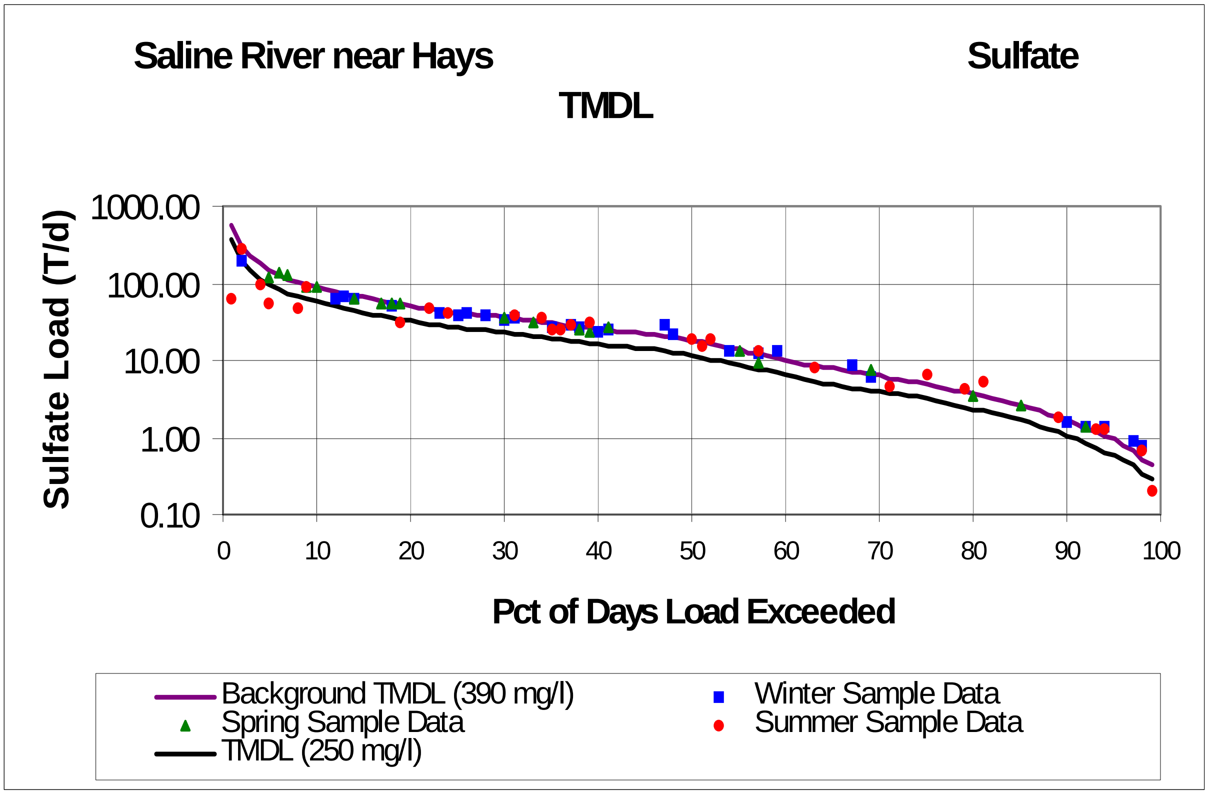
Figure 9



NUMBER OF SAMPLES OVER SULFATE STANDARD OF 250 mg/L 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.
Station 538 near Waldo (Paradise Creek)	Spring	1	6	3	5	2	1	18/25=72%
	Summer	0	1	3	3	3	4	14/16=88%
	Winter	0	4	10	5	4	1	24/26=92%

Figure 10



Station 548: Excursions were seen in each of the three defined seasons and are outlined below. Ninety-one percent of Spring samples and 84% of Summer-Fall samples were over the domestic supply criterion. One hundred percent of Winter samples were over the criterion. Overall, 92% of the samples were over the criteria. This would represent a potential baseline condition of non-support of the impaired designated use, if a point of diversion for water supply was present along the river.

NUMBER OF SAMPLES OVER SULFATE STANDARD OF 250 mg/L 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.
Station 548 near Hays (Saline River)	Spring	5	3	6	3	2	1	20/22=91%
	Summer	2	1	6	3	1	3	16/19=84%
	Winter	1	5	10	1	0	5	22/22=100%

Interim Endpoints of Water Quality (Implied Load Capacity) at Wilson Lake and Stations 011, 538, and 548 over 2008 - 2012:

Current Condition and Reductions for Wilson Lake

Parameter	Current Condition	TMDL/Background	Percent Reduction
Sulfate (mg/L)	439	480	0 %

The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standards fully supporting Drinking Water Use. This TMDL will, however, be phased. The current standard of 250 mg/L of sulfate was used to establish the TMDL. However, the discharge of saline ground water from the Dakota aquifer, gypsum dissolution, and pyrite weathering are the main sources of the sulfate in the surface water entering Wilson Lake. As such, the watershed's main stem and many of its tributaries have elevated sulfate levels from these natural sources. . The natural background of sulfate, consistently above 250 mg/L at all flow conditions, makes achievement of the Standard unlikely at Stations 011, 538, and 548. Since the Standard is not achievable because of natural contributions to the sulfate load, alternative endpoints are needed.

Kansas Implementation Procedures for Surface Water allow for a numerical criterion based on natural background to be established from samples taken at flows less than median in-stream flow. However, Figures 8 through 10 indicate sulfate levels are elevated well above 250 mg/l at flows greater than median flow, as well. Figure 5 indicates the need to have a dual endpoint for the Saline River near Russell, with one established for low flow, drought conditions and another for normal flow conditions. Under normal conditions, there is more likelihood of flows from above Station 548 near Hays diluting the mineralized inflows along the Saline River entering Russell County, and lowering sulfate levels. A higher sulfate endpoint is needed for drought periods when the upstream inflows dwindle and flow at Station 011 is dominated by the local ground water contributions. Concentrations at Stations 538 and 548 tend to be less variable with flow and therefore, a single endpoint will be determined for sulfate at those stations.

Tentative Endpoints for Stations 011, 538, and 548

Station	Low Flow Background (mg/L)	Normal Flow Background (mg/l)
Station 011 near Russell (Saline River)	780	500
Station 538 near Waldo (Paradise Creek)	630	630
Station 548 near Hays (Saline River)	390	390

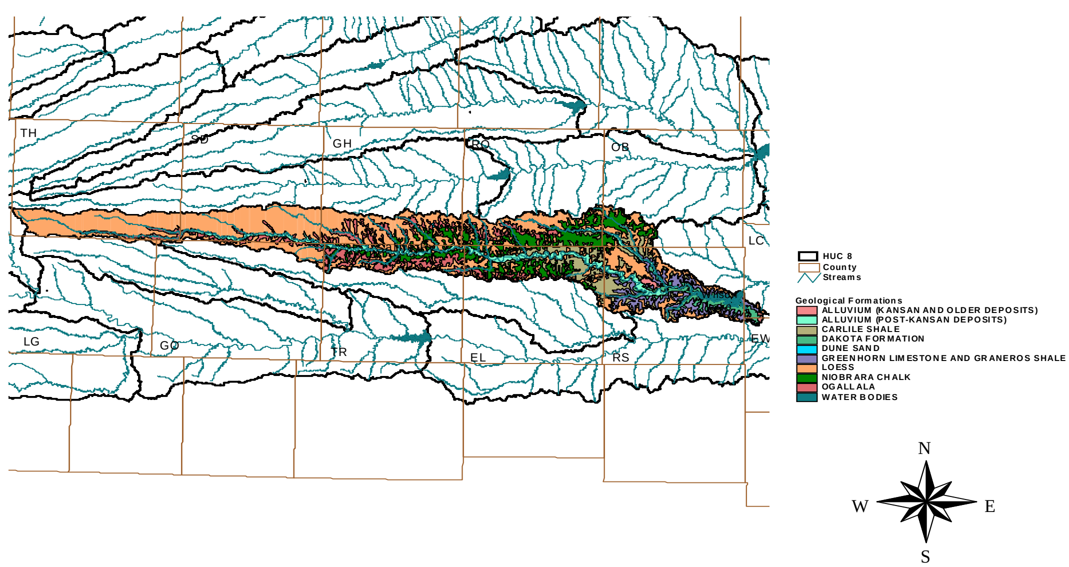
These specific stream criteria to supplant the current standard will be developed concurrent with Phase One of this TMDL following the appropriate administrative and technical Water Quality Standards Processes. The Phase Two TMDL will be based on the future standard applied to these flows within the contributing portions of the Saline River and Paradise Creek. Seasonal variation has been incorporated in this TMDL through the documentation of the seasonal consistency of elevated sulfate levels. Achievement of the endpoints indicates that 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

Background Conditions: One of the major natural sources of sulfate in Wilson Lake is the discharge of naturally saline groundwater from the Dakota aquifer into the alluvial aquifer of the Saline River. The saline groundwater originates from upward intrusion of saltwater from the Cedar Hills Sandstone of Permian age, which underlies the Dakota aquifer in parts of central and north-central Kansas. Although the chloride content of the saltwater in the Cedar Hills Sandstone is substantially greater than the sulfate content, the sulfate is generally in the 5,000 mg/L range in Russell and Ellis Counties. Another natural sulfate source is the dissolution of gypsum (hydrous calcium sulfate) that occurs in small amounts in selected units of the Cretaceous bedrock that underlies the drainage basin of Wilson Lake. Cretaceous units containing some gypsum in the basin include the Carlile and Graneros shales (Figure 11). Rainfall dissolves the gypsum exposed at the surface in outcrops or in the shallow subsurface and increases the sulfate concentration of water moving through soils and shallow bedrock and sediment that discharges into streams. In addition, some shale members in the Greenhorn Limestone and the Carlile Shale and sometimes shales and sandstones in the Dakota Formation contain pyrite (iron sulfide) that weathers to produce locally high concentrations of sulfate in groundwater. This groundwater slowly flows toward streams and adds to the sulfate load of water draining into Wilson Lake.

Figure 11

Wilson Lake Geology



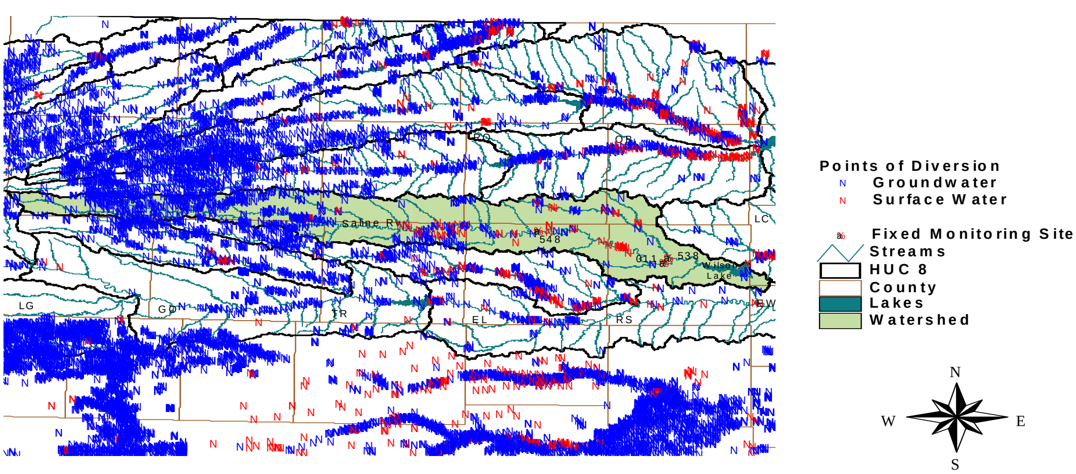
Irrigation Return Flows: Land use and water use are expected to have caused a small long-term increase in the sulfate concentration (in comparison to conditions without these impacts) by increasing evapotranspiration consumption. Residual dissolved solids are left in a smaller volume of water because of reduced discharge of fresh groundwater and watertable levels from consumptive water use. Most of these land and water use changes are related to irrigation. However, the majority of irrigation occrus west of Wakeeney (Figure 12) and there is no sulfate exceedances on the Saline River in Trego County. The sulfate impairments begin in Ellis County because of natural ground water and gypsum runoff influences. Irrigation declines in Ellis County and substantially in Russell County because of chloride intrusion, rendering most water unusable for irrigation. Furthermore, the sulfate excursions occur at high flows with similar frequency as at low flows, indicating that factors other than irrigation are contributing to the impairment. Irrigation reports from 2003 show the following:

Water Use Statistics for Each Monitoring Site

Monitoring Sites	Surface Water		Groundwater		1990-2003
	Area (acres)	Volume (acre-feet)	Area (acres)	Volume (acre-feet)	Sulfate Conc. (mg/l)
Saline River Valley above Wakeeney (USGS est)	0	0	27,957	26,898	176
Station 548 near Hays up to Wakeeney (Saline R)	20	15	742	832	374
Station 011 near Russell (Saline River)	0	0	79	64	547
Station 538 near Waldo (Paradise Creek)	0	0	130	23	520

Figure 12

Wilson Lake Points of Diversion



Evapotranspiration consumption of water in the drainage basin and evaporation from the surface of streams and the lake can increase the sulfate concentration of the surface water. Long-term chemical data of the Saline River near Hays and Paradise Creek show that there is a slight increase in sulfate content with time while Russell has a decrease(Figure 13). The climatic variations have a much greater effect on the short-term sulfate concentration of the reservoir than the long-term land and water use changes. The monitoring record is insufficient to determine whether long-term climatic changes will have a greater impact on the sulfate than the land and water use changes. Any high flow events will dilute the sulfate content (Figure 14).

Figure 13

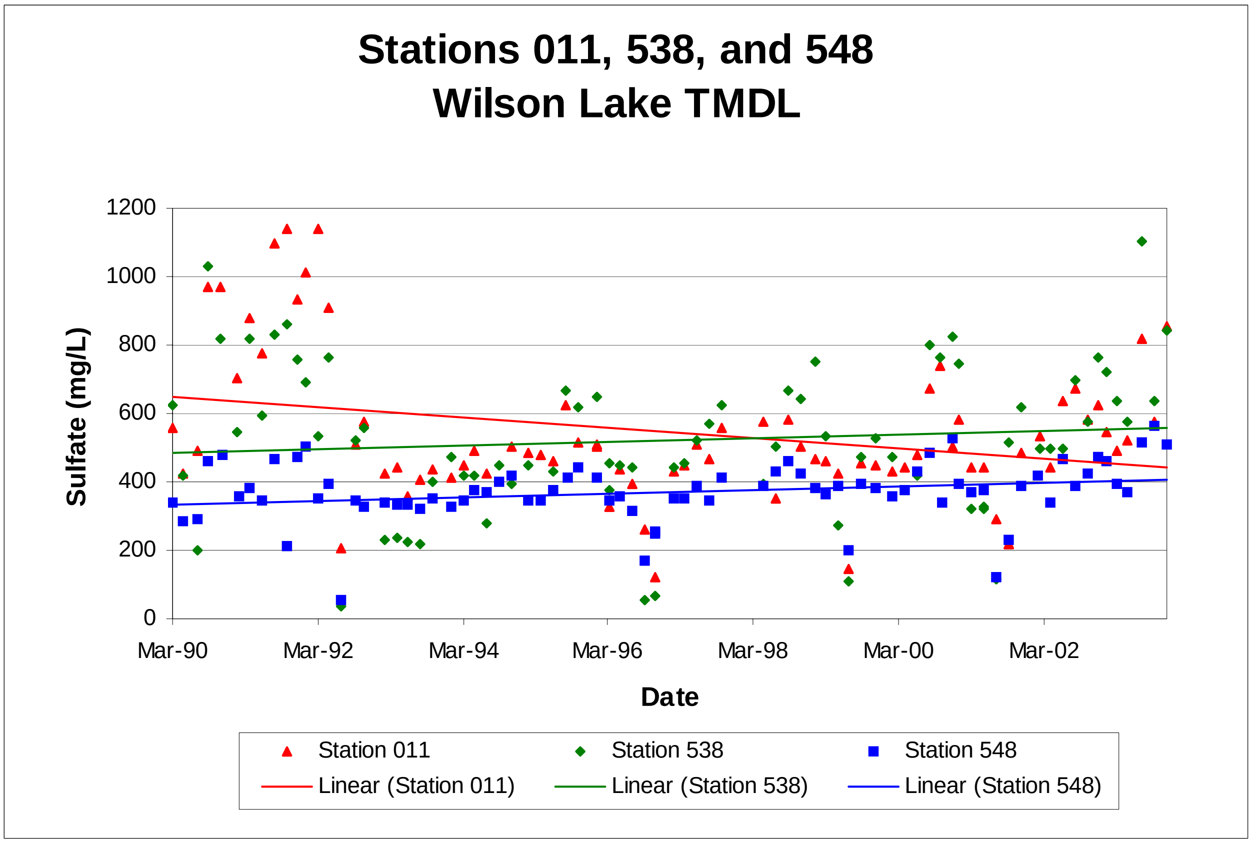
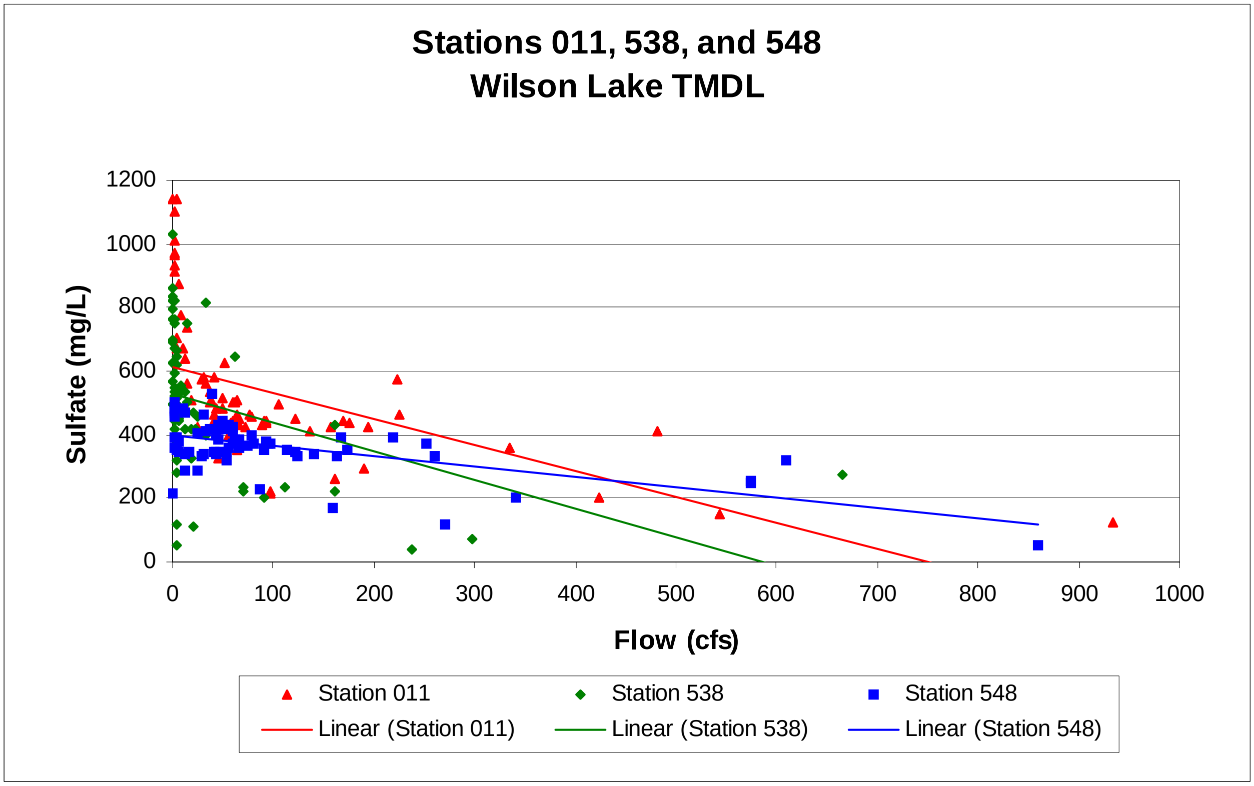


Figure 14



NPDES: Thirteen permitted waste treatment facilities are located within the watershed (Figure 15). Ten are non-overflowing lagoons that are prohibited from discharging. Because the source water for the discharging municipalities is lower than the background levels of sulfate in the receiving streams, their wastewater acts a dilution base for the background levels seen on the Saline River and Paradise Creek

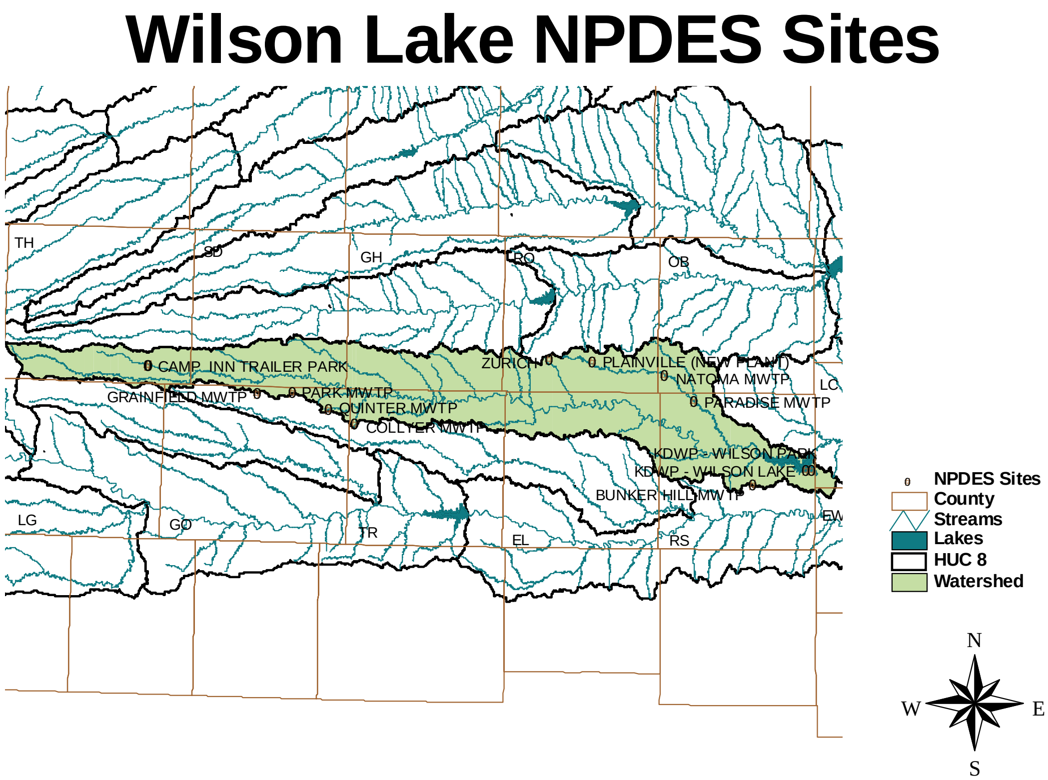
Waste Treatment Plants in the Wilson Lake Watershed

Kansas Permit Number	Name	Design Capacity (MGD)	Type	Average Sulfate (mg/L)	Sulfate WLA (tons/day)
C-SH29-NO02	CAMP INN TRAILER PARK	non-overflowing	4-cell Lagoon	0	0
C-SH29-NO04	JOHN JONES OIL CO. TRUCK STOP	non-overflowing	2-cell Lagoon	0	0
M-SA03-NO01	BUNKER HILL MWTP	non-overflowing	2-cell Lagoon	0	0
M-SA04-NO01	COLLYER MWTP	non-overflowing	3-cell Lagoon	0	0
M-SA10-OO01	NATOMA MWTP	0.054	3-cell Lagoon	391.4	0.09
M-SA12-NO01	PARADISE MWTP	non-overflowing	2-cell Lagoon	0	0
M-SA13-NO01	PARK MWTP	non-overflowing	4-cell Lagoon	0	0
M-SA14-OO02	PLAINVILLE MWTP (NEW)	0.225	4-cell Lagoon	378.0	0.38
M-SA15-OO01	QUINTER MWTP	0.107	3-cell Lagoon	22.2	0.02
M-SA19-NO01	ZURICH MWTP	non-overflowing	3-cell Lagoon	0	0
M-SH12-NO01	GRAINFIELD MWTP	non-overflowing	3-cell Lagoon	0	0
M-SH05-NO03	KDWP - WILSON PARK	non-overflowing	2-cell Lagoon	0	0
M-SH05-NO02	KDWP - WILSON LAKE	non-overflowing	2-cell Lagoon	0	0

Since none of the municipal NPDES sites in the watershed are currently required to monitor for sulfate in their effluent, average sulfate concentrations for municipal sources were estimated based on the sulfate of their source water. Wasteload allocations were set at concentrations of 50, 400 and 400 mg/l for Quinter, Natoma and Plainville, respectively.

Figure 15

Oilfield Brine: Oilfield brine in Kansas that was disposed at or near the surface in the past generally has a sulfate concentration that is relatively low in comparison with the high chloride content. Thus, oil-brine contamination in the drainage basin is not expected to be a significant source of sulfate in the lake water.



Contributing Runoff: The watershed's average soil permeability is 1.4 inches/hour according to NRCS STATSGO database. About 82.1% of the watershed produces runoff even under relatively low (1.5''/hr) potential runoff conditions. 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 0.5"/hr of rain will generate runoff from 5.4% of this watershed, chiefly along the stream channels.

4. ALLOCATION OF POLLUTANT REDUCTION RESPONSIBILITY

The source assessment has ascertained that natural sulfate loading within the watershed is the primary factor for the excursions seen at the monitoring stations within the Wilson Lake basin.

Point and Nonpoint Sources: In the table below, under Phase One, the Wasteload and Load Allocations are given for all the stations included in this TMDL. The total Wasteload Allocation entering Wilson Lake is 0.49 tons per day. Wasteload Allocations were established based on the concentration of sulfate assumed to be in each discharger's effluent, reflecting their source water content. Under Phase Two, Load Allocations were calculated from the applicable background concentrations designated in the endpoint. Since sulfate levels differ between low and normal flows, dual background concentrations were used at Russell.

Wasteload and Load Allocations (tons per day) of Sulfate in Wilson Lake Watershed

Sulfate TMDL			
	SC548	SC011	SC538
Low Flow (90% excd) - cfs	1.6	3.6	0.6
Median Flow (50% excd) - cfs	16.7	29.2	4.4
Wasteload Allocations	0.02	0.00*	0.47
Phase One Load Allocation - Low	0.97	2.19 **	0.36
Phase One Margin of Safety - Low	0.11	0.24 ***	0.04
Phase One TMDL - Low	1.10	2.43	0.87
Phase One Load Allocation - Normal	10.15	17.74	2.67
Phase One Margin of Safety - Normal	1.13	1.97	0.30
Phase One TMDL - Normal	11.30	19.71	3.44
Phase Two Load Allocation - Low	1.51	6.82	0.92
Phase Two Margin of Safety - Low	0.17	0.76	0.10
Phase Two TMDL - Low	1.70	7.58	1.49
Phase Two Load Allocation - Normal	15.83	35.48	6.74
Phase Two Margin of Safety - Normal	1.76	3.94	0.74
Phase Two TMDL - Normal	17.61	39.42	7.95
Phase Two Concentrations	390 mg/l	780/500 mg/l****	630 mg/l

* represents point sources between Stations 548 & 011
** cumulative load allocation from entire upstream watershed
*** margin of safety is an explicit 10% off the load allocation
**** 780 mg/l at low flows; 500 mg/l at normal flows

Defined Margin of Safety: Since the majority of contribution of sulfate to the Saline River derives from natural mineralized ground water intrusion, the Margin of Safety is explicitly 10% of calculated Load Allocations using either the original water quality criterion or the proposed background concentrations. Additionally, a Margin of Safety is applied to the Wasteload Allocations by their calculations based on sulfate concentrations in the discharger's effluent below the Phase One or Two endpoints (range 50-400 mg/l). Both of these calculations ensure that resulting loadings will cause the sulfate content in the Saline River and Paradise Creek to remain below the intended endpoints.

State Water Plan Implementation Priority: Because the impairment is due to natural geologic sources, this TMDL will be a Low Priority for implementation.

Unified Watershed Assessment Priority Ranking: Wilson Lake lies within the Upper Saline (HUC 8: 10260009) with a priority ranking of 39 (Medium Priority for restoration).

Priority HUC 11s: Because of the natural geologic contribution of this impairment, no priority subwatersheds or stream segments will be identified.

5. IMPLEMENTATION

Desired Implementation Activities

1. Monitor any anthropogenic contributions of sulfate loading to the lake and streams.
2. Establish an alternative background criterion.
3. Assess likelihood of the lake being used for domestic uses.

Implementation Programs Guidance

NPDES and State Permits - KDHE

a. Municipal permits for facilities in the watershed will be renewed after 2004 with annual sulfate monitoring and any excessive sulfate discharge will have appropriate permit limits which do not increase the ambient background levels of sulfate.

Non-Point Source Pollution Technical Assistance - KDHE

a. Evaluate any potential anthropogenic activities which might contribute sulfate to the lake as part of an overall Watershed Restoration and Protection Strategy.

Water Quality Standards and Assessment - KDHE

a. Establish background levels of sulfate for the lake, river, and tributaries.

Use Attainability Analysis - KDHE

a. Consult with Division of Water Resources on locating existing or future domestic points of diversion from Wilson Lake for drinking water purposes.

Time Frame for Implementation: Development of a background level-based water quality standard should be accomplished with the next water quality standards revision.

Targeted Participants: Primary participants for implementation will be KDHE, KWO and DWR.

Milestone for 2008: The year 2008 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, additional monitoring data from Wilson Lake will be reexamined to confirm the impaired status of the lake and the suggested background concentration. Should the case of impairment remain, source assessment, allocation and implementation activities will ensue.

Delivery Agents: The primary delivery agents for program participation will be the Kansas Department of Health and Environment, Kansas Water Office and the Kansas Department of Agriculture, Division of Water Resources.

Reasonable Assurances:

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

1. 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.

2. 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.

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

4. 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.

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

6. The *Kansas Water Plan* and the Smoky Hill/Saline 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 pollutant 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 are a Low Priority consideration and should not receive funding.

Effectiveness: Minimal control can be exerted on natural contributions to loading.

6. MONITORING

KDHE will continue to collect samples from Wilson Lake and at Stations 011, 538, and 548. Based on that sampling, the priority status will be evaluated in 2008 including application of a numeric criterion based on background concentrations. Should impaired status remain, the desired endpoints under this TMDL will be refined and direct more intensive sampling will need to be conducted under specified seasonal flow conditions over the period 2008-2012.

Monitoring of sulfate 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 sulfate levels in the effluent released to the streams upstream of Wilson Lake.

7. FEEDBACK

Public Meetings: Public meetings to discuss TMDLs in the Smoky Hill/Saline Basin were held January 7 and March 5, 2003 in Hays. 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 Smoky Hill/Saline Basin.

Public Hearing: A Public Hearing on the TMDLs of the Smoky Hill/Saline Basin was held in Hays on June 2, 2003.

Basin Advisory Committee: The Smoky Hill/Saline Basin Advisory Committee met to discuss the TMDLs in the basin on October 3, 2002, January 7, March 5, and June 2, 2003.

Milestone Evaluation: In 2008, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of Wilson Lake. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

Consideration for 303(d) Delisting: The lake will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2008-2012. 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.

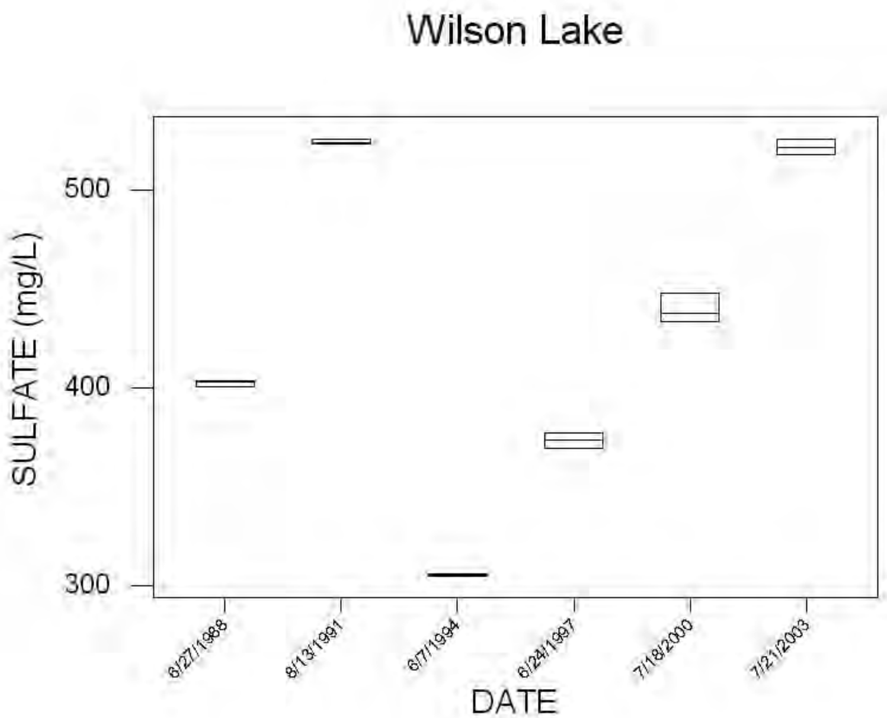
Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process: Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2004 which will emphasize revision of the Water Quality Management Plan. At that 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 2004-2008.

Bibliography

Liscek, Bonnie C. Methodology Used in Kansas Lake TMDLs [web page] Jul. 2001; http://www.kdhe.state.ks.us/tmdl/eutro.htm [Accessed 30 September 2002].

Whittemore, D. (1 Jul 2003). Wilson Lake/Saline River Cl & SO4 TMDLs

Appendix A - Boxplots



9/15/04