

NEOSHO RIVER BASIN TOTAL MAXIMUM DAILY LOAD

**Water Body: Mined Land Lakes #6, 7, 12, 17, 22, 23, 27, 30, & 44 and #42 Wetland
Water Quality Impairment: Sulfate**

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Middle Neosho and Spring

County: Cherokee, Crawford, and Labette

HUC 8: 11070205 **HUC 11 (HUC 14):** 030 (050)
060 (010, 020, 030)

HUC 8: 11070207 **HUC 11 (HUC 14):** 150 (010, 020, 030, 040)
160 (030)

Ecoregion: Central Irregular Plains - Cherokee Plains (40d)

Drainage Area: Approximately 446 square miles (Entire Mined Land Lakes Watershed)

Conservation Pools:

Lake Name	Area (Acres)	Maximum Depth (m)	Maximum Depth (ft)	Mean Depth (m)	Mean Depth (ft)
MINED LAND LAKE 12	28.5	6.0	19.7	3.3	10.7
MINED LAND LAKE 17	22.3	15.0	49.2	7.9	26.0
MINED LAND LAKE 22	33.4	7.0	23.0	3.8	12.5
MINED LAND LAKE 23	54.4	5.0	16.4	2.8	9.2
MINED LAND LAKE 27	20.4	10.5	34.4	5.6	18.4
MINED LAND LAKE 30	39.6	18.0	59.1	9.5	31.0
MINED LAND LAKE 44	93.6	13.5	44.3	7.1	23.4
MINED LAND LAKE 6	6.3	5.5	18.0	3.0	9.9
MINED LAND LAKE 7	14.6	9.0	29.5	4.8	15.8
MINED LAND LAKE 42 WA	4.6	0.1	0.3	0.0	0.1

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

Authority: State (Kansas Department of Wildlife and Parks)

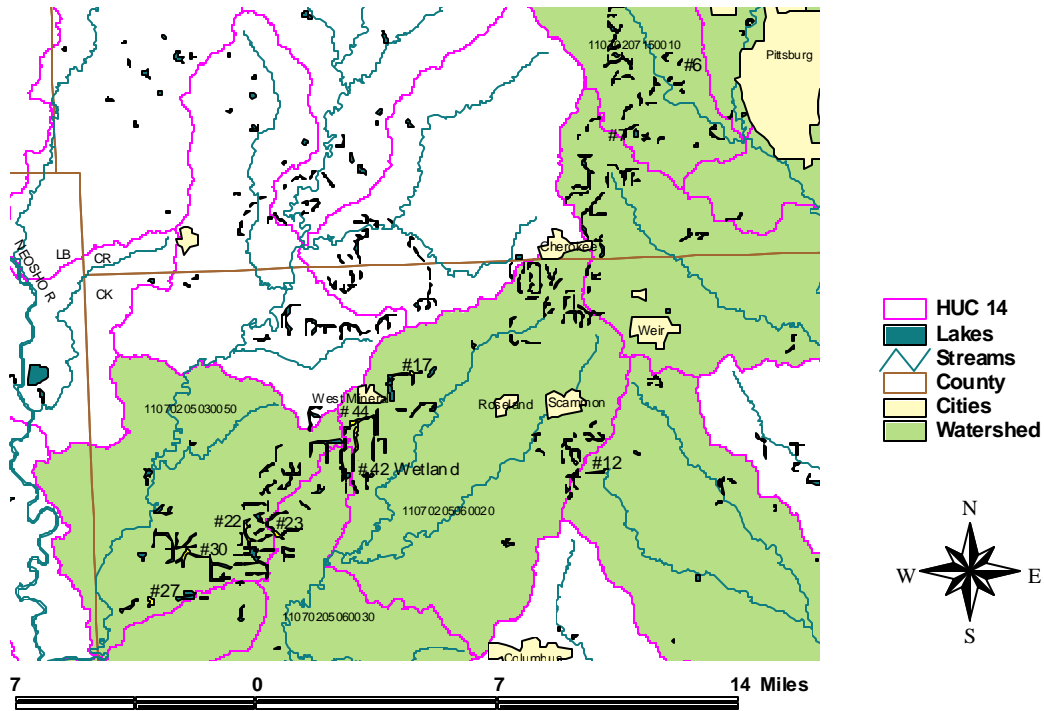
2002 303d Listing: Neosho Basin Lakes

Impaired Use: Livestock

Water Quality Standard: Livestock: 1,000 mg/L K.A.R.28-16-28e (d) (1a)

Figure 1

Mined Land Lakes Area TMDL Reference Map



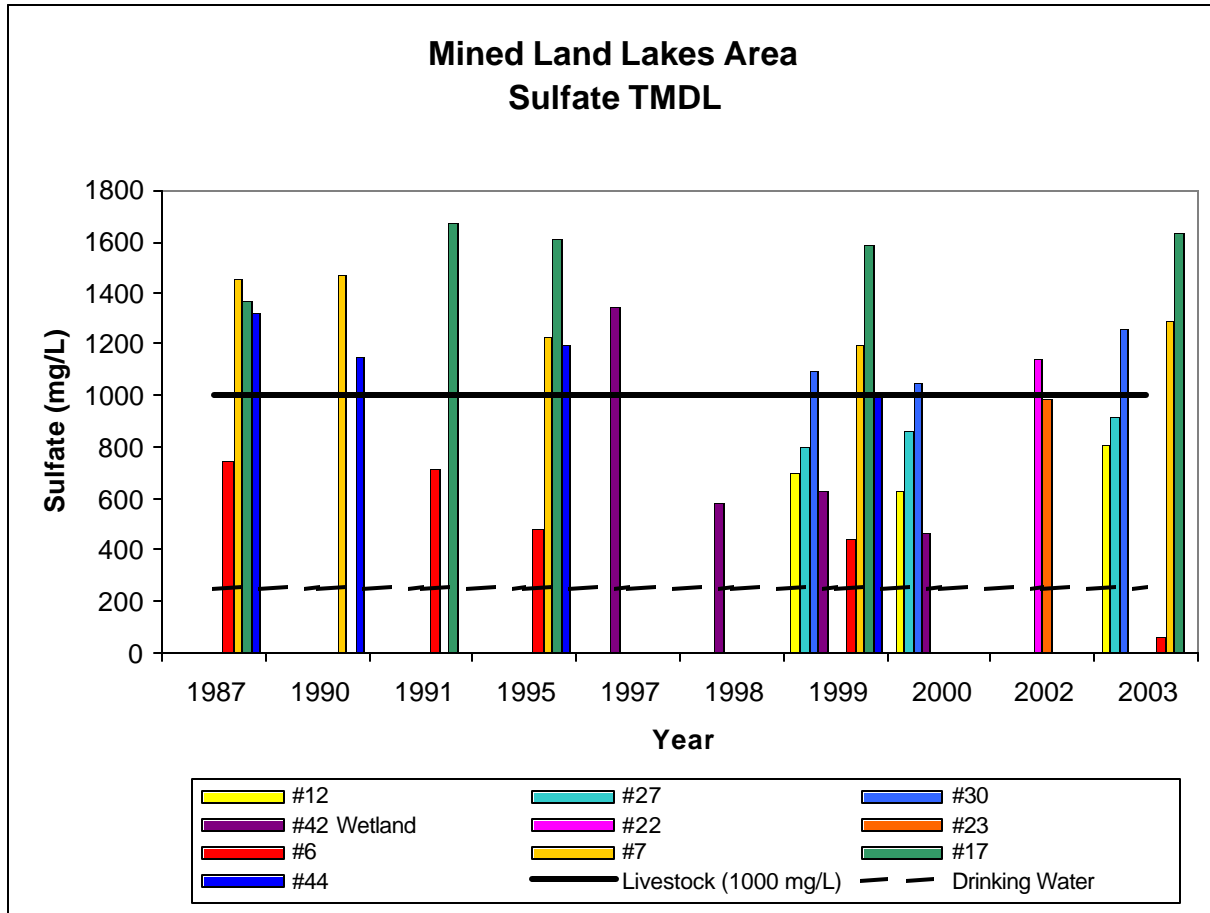
2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Monitoring Sites and Current Condition for Impaired Mined Land Lakes

Mined Land Lake Number	Monitoring Site	Period of Record	Number of Surveys	Average Sulfate (mg/L)
6	LM047601	1987 to 2003	Five	538
7	LM047801	1987 to 2003	Five	1,326
12	LM035901	1999 to 2003	Three	716
17	LM048201	1987 to 2003	Five	1,573
22	LM036801	2002	One	1,146
23	LM036901	2002	One	983
27	LM037301	1999 to 2003	Three	875
30	LM037601	1999 to 2003	Three	1,142
44	LM048401	1987 to 1999	Four	1,165
42 Wetland	LM038841	1997 to 2000	Four	756

See Figure 1 for the site locations and Figure 2 for a graph of the annual sulfate concentrations at each of the sites over time.

Figure 2



Interim Endpoints of Water Quality (Implied Load Capacity) at Mined Land Lakes #6, 7, 12, 17, 22, 23, 27, 30, & 44 and #42 Wetland over 2007 - 2011:

The desired endpoints will be sulfate concentrations at or below 1,000 mg/L. Refined endpoints will be developed in 2007 to reflect additional sampling and artificial source assessment and confirmation of impaired status of lakes and wetland.

3. SOURCE INVENTORY AND ASSESSMENT

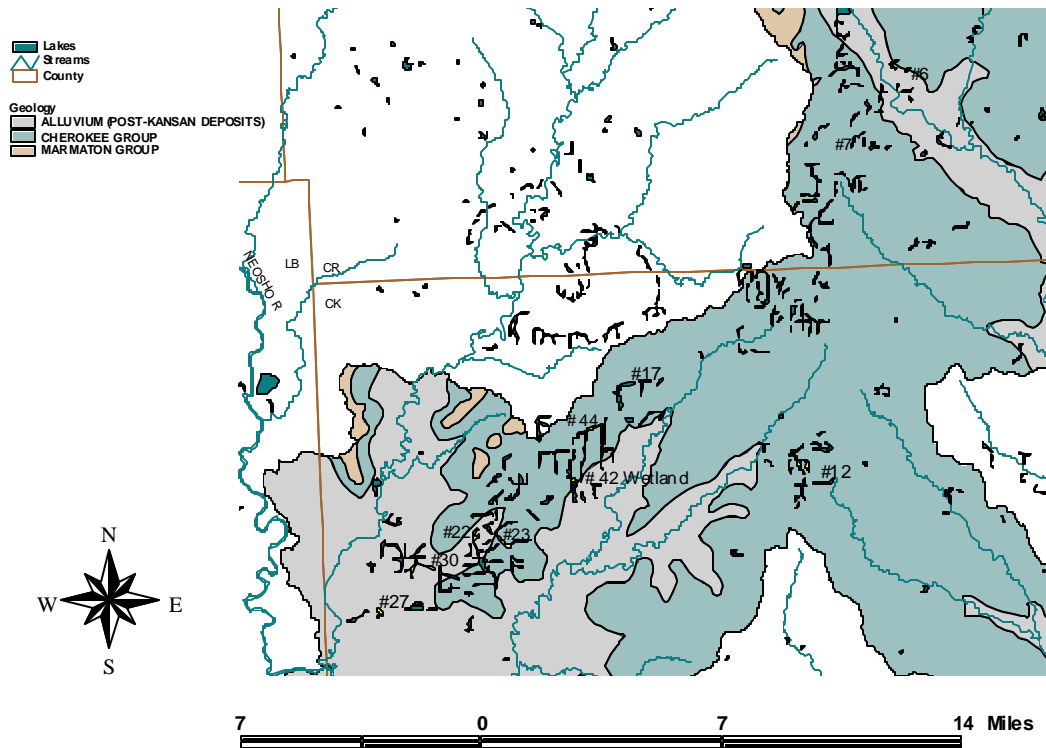
Geology: The formerly mined land was donated from the Pittsburg and Midway Coal Company to the Kansas Fish and Game Commission. The Kansas Department of Wildlife and Parks manages the property now. The Mined Land Lakes and Wildlife Areas are strip-mined pits that filled with water.

The high sulfate concentrations in the Mined Land Lakes are derived from the oxidation of the sulfide in pyrite (iron sulfide) in the carbonaceous shales and coal in the bedrock as a result of the exposure of

the rock and coal to the atmosphere and water containing dissolved oxygen (Figure 3). The mining of coal exposed the bedrock containing the pyrite to the oxidation process. Pyrite remaining in the spoil material can continue to weather to release sulfate. The acidity released is neutralized by carbonate minerals, primarily calcite, in limestone and dolomite in the bedrock or in crushed limestone that might have been mixed with the soil during reclamation. The calcium and magnesium released from carbonate dissolution exchanges for sodium on the clays to increase the sodium content in the water. Thus, the sodium/chloride ratio is very high because of the exchanged sodium and the low chloride content of the water.

Figure 3

Mined Land Lakes Area Geology



Presently, the Mined Land Lakes Area is surrounded by cropland (55%), healthy grassland (28%), woods (11%), and numerous lakes and wetlands (2%). The mined land wildlife area has a diverse habitat and an abundance of fishes, waterfowl, and other wildlife. The grazing density is moderate in the summer and low in the winter.

Irrigation Return Flows: The irrigation impact on the mined land watershed is minuscule. The volume of surface water used for irrigation is minimal and would not influence the sulfate content. Irrigation reports from 2003 show the following:

Water Use Statistics for the Entire Watershed

Monitoring Site	Surface Water		Groundwater	
	Area (acres)	Volume (acre-feet)	Area (acres)	Volume (acre-feet)
Mined Land Lakes Area	69.0	12.0	90	34.9

Contributing Runoff: The watershed’s average soil permeability is 1.1 inches/hour according to NRCS STATSGO database. About 100% 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

Additional monitoring over time will be needed to ascertain the sulfate characteristics of the mined land area and ascertain the level of impairment throughout the watershed.

Point Sources: A current Wasteload Allocation of zero is established by this TMDL because of the lack of point sources discharging directly to the mined land lakes and wetland. Should future point sources be proposed in the watershed and discharge into the impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these new point source dischargers.

Nonpoint Sources: The sulfate impairment is due to previous mining activity. Nonetheless, the livestock watering use needs to be protected. Therefore, the Load Allocation will be set at concentrations of sulfate not to exceed 900 mg/L.

Defined Margin of Safety: The margin of safety provides some hedge against the uncertainty of the lead endpoint. Therefore, the margin of safety will be 100 mg/L (10%) taken from the load capacity to ensure that adequate load reduction occurs to meet the endpoint.

State Water Plan Implementation Priority: Because the Mined Land Area has already been converted to a wildlife area and will not be affected by further mining activity, this TMDL will be a Low Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Middle Neosho (HUC 8: 11070205) with a priority ranking of 24 (Medium Priority for restoration) and the Spring (HUC 8: 11070207) with a priority ranking of 16 (High Priority for restoration).

Priority HUC 11s: The impaired water bodies are located within HUC 11s 11070205030, 11070205060, 11070207150, and 11070207160.

5. IMPLEMENTATION

Desired Implementation Activities

Minimize anthropogenic oriented contributions of loading of sulfate to the Mined Land Area.

Implementation Programs Guidance

Until the 2007 assessment of the continuation of monitoring is made, no direction can be made to those implementation programs.

Time Frame for Implementation: Continued monitoring over the years from 2002 to 2007.

Targeted Participants: Primary participants for implementation will be the Kansas Department of Wildlife and Parks. A detailed assessment of sources will be conducted by KDHE over 2002-2007.

Milestone for 2007: The year 2007 marks the midpoint of the ten-year implementation window for the watershed. At that point in time, sampled data from Mined Land Lakes #6, 7, 12, 17, 22, 23, 27, 30, & 44 and #42 Wetland will be reexamined to confirm the impaired status of the lakes and wetland. 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 Wildlife and Parks, 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.

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 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 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 until after 2007.

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

6. MONITORING

Further sampling and evaluation should occur once before 2007.

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, March 4, and June 3, 2002.

Discussion with Interest Groups: Meetings to discuss TMDLs with interest groups include:
Kansas Farm Bureau: February 26 in Parsons and February 27 in Council Grove

Milestone Evaluation: In 2007, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of Mined Land Lakes #6, 7, 12, 17, 22, 23, 27,

30, & 44 and #42 Wetland. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

Consideration for 303(d) Delisting: The wetland 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 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 2003-2007.

Bibliography

Liscek, Bonnie C. Methodology Used in Kansas Lake TMDLs [web page] Jul. 2001;
<http://www.kdhe.state.ks.us/tmdl/eutro.htm> [Accessed 17 May 2002].

Whittemore, D. (25 Mar 2004). Mined Land Lake sulfate - short answer.

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